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THE ENGINEERING FACTORY GAME:
FACILITATOR'S GUIDE

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The Engineering Factory Game

Facilitator’s Guide
# Table of Contents

## Installing the Software
- Purpose of this chapter ........................................... 5
- Pre-installation activities .......................................... 5
- To install the Engineering Factory game .......................... 5
- Linking the files with the chosen directories .................... 6
  - Amending the Java Runtime Environment directory path ... 7
  - Amending the Engineering Factory Game directory path ... 7
- To register the game databases as ODBC databases ............. 8
- Recording correct directory paths internal to the databases ... 10
- To rebuild the EngFactory database ............................... 12

## Introduction to the Game
- Learning objectives .................................................. 14
- Learning activities ................................................... 14
- Game overview ....................................................... 15
- Scoring ............................................................... 16
- Game versions ........................................................ 16
  - Standalone version ............................................... 16
  - Network version .................................................. 16
- Game duration ....................................................... 17
- Reports ............................................................. 17
  - Printing the reports ............................................. 17
  - Facilitator overview report .................................... 18
  - Player team report ............................................... 18
- To launch the Factory Engineering Game .......................... 19
- Stages of play ....................................................... 21
  - Planning Teams ................................................... 21
  - Scheduling Work .................................................. 22
  - Advancing Plan ................................................... 22
- To play the Engineering Factory Game ............................ 22

## Functions and Features
- Purpose of this chapter ........................................... 24
- The Game Board ..................................................... 24
  - Game Line ........................................................ 25
  - Tree View ........................................................ 25
  - Document View ................................................... 25
  - Information Type .................................................. 25
  - Control Panel ..................................................... 25
  - Message Center .................................................... 26
- Exploding the tree .................................................. 26
- Displaying specific tree level information ....................... 26
- To identify axis values for a graph or flow chart ............... 27
- To display all values for a column or row ....................... 28
- To identify the date on any point of the program line .......... 28
- To zoom in on a section of a graph ............................... 29
To zoom out on a graph .................................................. 30
To restore the graph or flow chart to its original size .................. 32
To clear a bar graph or flow chart .................................. 32
To scroll a graph in the Document View .................................. 33

Analyzing Information ........................................................................ 34

Purpose of this chapter ..................................................................... 34
Milestones function ........................................................................ 34
To use the Milestones function ....................................................... 34
Network function ........................................................................... 35
To use the Network function .......................................................... 35
Work Cell function ........................................................................ 37
To use the Work Cell function ........................................................ 37
To evaluate work cells in detail .......................................................... 39
To identify work activities requiring proactive action ...................... 39
Flagstone function ........................................................................... 40
‘Early Start Date’ anchor point ......................................................... 40
‘Latest Finish Date’ anchor point .................................................... 40
To launch the Flagstone function .................................................... 40
To view flagstones by program .......................................................... 41
To interpret Flagstone information .................................................. 42
To review flagstones by Staff .......................................................... 43
To update permissions ..................................................................... 45
To display flagstone information in tabular form ......................... 48
To identify the amount of effort being applied ............................... 50
To display detailed information about a work cell ....................... 51
Teams function ............................................................................. 52
To launch the Teams function .......................................................... 53
To evaluate a specific skill ............................................................... 53
To identify performance/salary values for a specific resource .......... 54
Analysis function ........................................................................... 56
To launch the Analysis function ....................................................... 56
Interpreting the Analysis graph ....................................................... 57
To determine a course of corrective action .................................... 58

Using the Mail Function .................................................................. 60

Purpose of this function ................................................................. 60
Types of messages .......................................................................... 60
To launch the Mail function ............................................................ 61
To review messages for a specific game player .............................. 61
To display a message ....................................................................... 62
To file a message ........................................................................... 63
To compose a message .................................................................. 63

Reviewing Situations ....................................................................... 65

Purpose of this function ................................................................. 65
To view situations ........................................................................... 65
Technology advancement situations ............................................ 67
Production impact situations .......................................................... 68
Planning Resources ........................................................................ 69

Purpose of this function ................................................................. 69
# Table of Contents

Planning variables..................................................................................................................... 69
To launch the Plan Teams function ............................................................................................. 69
To set ‘Accept’ or ‘Transfer’ permissions...................................................................................... 73
To identify the members of a design team or EPN ...................................................................... 74
To display key information for an individual .............................................................................. 76
To train an individual in a new technology ................................................................................. 76
To transfer an individual to the pool ............................................................................................ 78
To recruit an individual from the pool ......................................................................................... 79
To initiate overtime ....................................................................................................................... 80

Scheduling Work............................................................................................................................ 82
   Purpose of this function ........................................................................................................... 82
   Launching the Schedule Work stage ....................................................................................... 82
   To display the work schedule for a specific team .................................................................... 83
   To review work cell inputs and outputs .................................................................................. 85
   To adjust the starting date of a work cell ............................................................................... 86
   To adjust work cell priorities ................................................................................................. 87
   To adjust work cell effort ........................................................................................................ 88
   To initiate overtime ................................................................................................................... 89
   To transfer work cells between skills .................................................................................... 90
   To set ‘Accept’ or ‘Transfer’ permissions .............................................................................. 92

Advancing Play.............................................................................................................................. 94
   Purpose of this chapter .......................................................................................................... 94
   Purpose of the Advance Play function ................................................................................... 94
   Game player requirements for advancing play ....................................................................... 94
   Game Facilitator information for advancing the game ............................................................. 96
   To force the game to advance .................................................................................................. 97

Reviewing Scores.......................................................................................................................... 99
   Purpose of this chapter ........................................................................................................... 99
   To launch the Score function ................................................................................................. 99
   Types of scores ...................................................................................................................... 100
      Program Delivery Score .................................................................................................... 101
      Cell Delivery Score .......................................................................................................... 101
      Resource Performance Score ............................................................................................ 101

Customization Features.............................................................................................................. 103
   Purpose of this chapter ........................................................................................................... 103
   To access the customization features .................................................................................... 103
   To edit player names and passwords ..................................................................................... 104
   To assign the design teams to players .................................................................................... 104
   To edit team transfer permissions ....................................................................................... 105
   To edit a team’s default behavior ............................................................................................ 106
      Priority rule ......................................................................................................................... 106
      Effort rule ........................................................................................................................... 106
      Training rule ....................................................................................................................... 107
      Hiring rule ........................................................................................................................ 107
   To edit the situation schedule ............................................................................................... 107
   To edit program generator parameters .................................................................................. 108
   To edit miscellaneous game parameters .............................................................................. 109
Table of Contents

Presentation ........................................................................................................................................... 110
  Purpose of this chapter....................................................................................................................... 110
  Topics ............................................................................................................................................... 110
Installing the Software

Purpose of this chapter

This chapter explains the procedures for installing the Engineering Factory Game in a Windows 95, Windows 98 or Windows NT environment.

The Engineering Factory setup program will install the game files into a directory of your choice and make available a ‘readme.txt’ file with the current installation instructions.

Pre-installation activities

Prior to installing the Engineering Factory Game you must install the following programs:

- Microsoft Access 97
- Java Runtime Environment (JRE1.1)

The Java Runtime Environment is available from Sun Microsystems. To install this file, download the file called jre\_1\_8-win.exe that is available from the Sun website. The file self installs when you run it.

To install the Engineering Factory game


The Welcome dialog box displays.

   ![Welcome dialog box]

   This program will install the Engineering Factory onto your computer. Press the OK button to start the installation. You can press the Cancel button if you do not want to install this software.

2. Click OK to display the Select Destination Directory dialog box.
3. Select the drive and the destination directory where you want to install the Engineering factory game. The default destination directory is `c:\program files\engfact`.

4. Click OK to commence the installation.

Once the installation of the program files is complete, the current installation instructions display. These are similar to the ones covered in this chapter.

**Linking the files with the chosen directories**

The following steps are required to link the installed files Java Runtime Environment and/or Engineering Factory Game files with the directories where you installed these programs.

If you select the default settings, these changes are not necessary.
10. Click OK. And select the Advanced button.

11. Set the login name to Admin. Leave the password field blank.

12. Click OK.

13. Repeat the above steps with the following information:

<table>
<thead>
<tr>
<th>Identification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Source Name</td>
<td>EngFactory</td>
</tr>
<tr>
<td>Description</td>
<td>Engineering Factory game database</td>
</tr>
<tr>
<td>Database Name</td>
<td>\Data\Engfactory.mdb</td>
</tr>
<tr>
<td>Login Name</td>
<td>Admin</td>
</tr>
</tbody>
</table>

Recording correct directory paths internal to the databases

1. Use Microsoft Access 97 to launch the database
   \Data\EngFactMap.mdb from the directory where you installed the software.
2. Replace the \RemoteApp with the directory path where you installed the Engineering factory game.

3. Close the database.

4. Open the database \Data\EngFactMngr.mdb

When the database is loaded a form called TableStatus displays.

5. Close the form to display the list of tables in the database.

6. Open the TablePaths table.
7. Replace `c:\Progr~1\EngFact\Data` with the directory path where you installed the Engineering Factory Game databases. It should be a subdirectory `\Data` within the directory where the game was installed.

8. Close the database.

To rebuild the EngFactory database

1. Open the database `\Data\EngFactMgr.mdb`.

2. Select the Forms tab.

3. Open the FormStatus form.

4. Select the Execute Game Commands button.

5. Select the RECREATEALL command from the dropdown list.

6. Click the Execute button.

The action will take a few minutes to complete.
If an error message displays, use the Windows Explorer to locate and delete the file `Data\EngFactory.mdb` that is located in the directory where you installed the Engineering Factory game. Then repeat the process to rebuild the EngFactory database.

Once the process is finished you can test the connection by running the batch file `EngFact.bat`. This should launch the Engineering Factory in local mode.
Game overview

Participants in The Engineering Factory Game are organized into groups of two or three people per workstation. Each group of participants at a workstation is referred to as a ‘Game Player’. Each game player is assigned responsibility for one or more engineering design teams within the game.

There are a number of major engineering design programs in the game database. Each program has a number of subsystems with the potential for multiple Engineering Program Numbers (EPNs) within each subsystem. Each EPN comprises a number of work cells that are organized together in a cell network.

Game players use the various sources of information available in the game to make decisions about the recruitment, training and transfer of resources.

Game players can also adjust scheduling priorities, change the amount of effort, transfer work between design teams or initiate overtime in order to address problem areas.

During the early cycles of the game, game players are only able to adjust scheduling priorities. As the game proceeds, they can perform some of the other management activities.

The best results are achieved when individual game players work together to improve the efficiency of the entire design process. Game players must look for ways to cooperate with the other players. This will at times involve the sharing of work and/or people.

The game advances automatically once all players have recorded their design teams’ willingness to advance. The game advances by one cycle (the default cycle length is two weeks) and the process repeats itself.

The goal is to cover from 30 to 50 two-week cycles during a game-playing session lasting only a few hours.

Throughout the course of the game, there are a number of variables that impact on an engineering team’s ability to meet work cell deadlines. Some of these variables are random (system-driven) and others are controlled (game player driven).

A mail system is used to advise game players of situations triggered by random variables. The mail system is also a valuable communication tool between game players. Game players must check their mail on a regular basis.

The game can be played in either a standalone or a network version. These versions are explained later in this chapter.
Scoring

There are different scoring components. These components are:

- Program Delivery
- Cell Delivery
- Resource Performance

The most important score is the Program Delivery score followed by the Cell Delivery score. Both of these scores require the close cooperation of the different game players.

The Resource Performance is an individual game player score and is the least important of the three scores.

These scores are explained in detailed in Chapter 10 – Reviewing Scores.

Game versions

There are two versions of the game that can be played using the same software:

- Standalone version
- Network version

Standalone version

New training sessions typically begin with each game player playing the standalone version of the game. This version of the game is usually played for 2-3 hours. The standalone version of the game should progress through about 8 or 9 cycles. This provides participants with the opportunity to experience all the resource planning and scheduling activities.

The standalone version provides game players with an opportunity to familiarize themselves with the functions, tools and strategies in a controlled environment. Their database is not shared with any other player except for the system-controlled ‘Auto’ player.

Each game player triggers the advancement of their game through the next two-week cycle when they are ready.

The standalone version of the game is launched using a player name ‘Test01’ and the password ‘pdq’.

Network version

In the network version of the game, each game player interacts with at least three other game players as well as with the system-controlled ‘Auto’ player.
A network game usually involves at least three teams of game players but can involve more. For good gameplay, there should be at least one game player for each of the following roles:

- Design Team
- Develop Team
- Release Team

The basic database for the Engineering Factory Game comes with three of each of the above teams. The Game Administrator can add additional design teams if required.

As long as all game players have access to the network, teams can be physically located in different rooms. This is often a benefit, it forces the game players to use the mail system within the game as a communication tool rather than shouting across the room.

Game duration

While the Engineering Factory game typically requires about 3-4 hours to play in network mode, it will simulate approximately 1-2 years of work covered in two-week intervals.

Reports

There are two reports provided with the game database:

- Facilitator Overview
- Player-Team Relationships

Printing the reports

1. Locate and launch the Access database EngFactMgr.

If the default installation values were used, this will be found in c:\program files\engfact\data folder.
2. Select the ‘View Facilitator Reports’ button.

Two reports are available:
- Facilitator Overview
- Player Team Report

Facilitator overview report
1. Select the ‘Preview Facilitator Overview’ button.

The Facilitator overview report provides a list of all game players with their respective design team, staff and skill. It also provides the current password for each game player.

Since multiple game players display on a single page of the report, this report is only suitable for the facilitator.

The report can be printed out for easy reference by the Game Facilitator

2. Select the Close button to close the report.

Player team report
1. Select the ‘Preview Player Team Report’ button.
The Player-Team Relationship report is similar to the Facilitator Overview report except that it prints the information for only one game player per page.

This page is suitable for distributing to game players at the beginning of the session.

2. Select the Close button to close the report.

To launch the Factory Engineering Game
1. Click the small icon in the Control Panel section of the game board.

The Welcome dialog displays in the Control Panel section of the game board.

There are three login options:
- Observer – In this option, the player is able to see all the data for all the teams but is unable to make any decisions. This option is only used in the network version of the game.
• Player – In this option, the player is able to see all the data for all the teams but is only able to make decisions for the game teams they control. This option can be used for both the standalone and network versions of the game.

• Facilitator – In this option, the player can provide administrative functions such as restarting the database and forcing the game to advance to the next cycle. This option is only used in the network version of the game.

2. Click the Continue button.

The Get Password dialog box displays.

There are six types of game players in the basic network version of the Engineering Factory Game. There are multiple versions of some of the types.

<table>
<thead>
<tr>
<th>Player Codes</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>This is a system-controlled player who manages a portfolio of personnel not employed by any player-controlled team.</td>
</tr>
<tr>
<td>Body01</td>
<td>Each of the three ‘Body’ game players manages a Design, Develop and Release skill for the Body staff.</td>
</tr>
<tr>
<td>Body02</td>
<td></td>
</tr>
<tr>
<td>Body03</td>
<td></td>
</tr>
<tr>
<td>Chassis01</td>
<td>Each of the three ‘Chassis’ game players manages a Develop skill for a Body staff and a Design and Release skill for a Chassis staff.</td>
</tr>
<tr>
<td>Chassis02</td>
<td></td>
</tr>
<tr>
<td>Chassis03</td>
<td></td>
</tr>
<tr>
<td>Electric01</td>
<td>Each of the three ‘Electric game players manages a Develop skill for a Body staff and a Design and Release skill for an Electrical staff.</td>
</tr>
<tr>
<td>Electric02</td>
<td></td>
</tr>
<tr>
<td>Electric03</td>
<td></td>
</tr>
<tr>
<td>Observer</td>
<td>An observer can see all the data for each game player as well as the data for the Auto player, but cannot make any decisions.</td>
</tr>
<tr>
<td>Player Codes</td>
<td>Responsibility</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Facilitator</td>
<td>The facilitator can see all data for each game player as well as the data for</td>
</tr>
<tr>
<td></td>
<td>the Auto player. The facilitator does not make any decisions but triggers</td>
</tr>
<tr>
<td></td>
<td>the Advance function once each game player has implemented their decisions for</td>
</tr>
<tr>
<td></td>
<td>a given cycle.</td>
</tr>
</tbody>
</table>

3. Type the applicable Player Code.
4. Click in the Password field and type the game player’s password as provided. **Do not** hit the Enter key as it adds an invisible character to the password. Go to Step 5 instead of hitting the Enter key.
5. Click the Log In Button.

The game board displays.

![Game Board](image)

**Stages of play**

The Engineering Factory game has three key stages of play:

- Plan Teams
- Schedule Work
- Advance Play

**Planning Teams**

During this stage of play, each game team develops the human resources required to accomplish the necessary tasks. This involves the recruitment and training of employees and/or sub-contract personnel.
It can also include the transfer of people when the resources exceed the available work or when an individual’s experience, efficiency or cost does not reflect the needs of the game player.

Scheduling Work
During this stage, each game player makes decisions that impact the scheduling of work. This can involve:

- Changing work cell priorities.
- Initiating overtime.
- Modifying the amount of effort applied to a work cell on a daily basis.
- Transferring a work cell to a team that has surplus resources with the right skills, and is willing to assist in the completion of the required work.

Advancing Plan
During this stage of play, the Facilitator triggers the function that performs the following activities:

- It processes the decisions made by the game players.
- It triggers the random system-controlled variables.
- It advises game players about situation-related changes through the mail system.
- It updates the schedules based on the combined impact of the player-controlled system-controlled variables.
- It advances the game date by two weeks.

To play the Engineering Factory Game
General directions for playing the Engineering Factory Game are as follows:

1. Each game player reviews the different information available through the information source icons in the Information section of the game board.
   - The information sources are explained in Chapter 4 – Analyzing Information.
   - The Mail function is explained in Chapter 5 – Using the Mail Function.
   - The Situations are explained in Chapter 6 – Reviewing Situations.
This information helps them identify work areas that are behind schedule or that may fall behind schedule unless corrective action is taken.

2. Each game player determines the action they want to take.

3. Each game player uses the Plan Teams and/or Schedule Work functions to implement their decisions.

4. Each game player uses the Advance play function to advise the Game Facilitator that they are ready to advance to the next round.

5. The Game Facilitator advances the game by two weeks and the process repeats itself.
Functions and Features

Purpose of this chapter

This chapter explains a number of functions and features that are referred to throughout this manual and that you can use in conjunction with the information sources that are explained in Chapter 4 – Analyzing Information.

The Game Board

The basic game board is shown below.

The game board is divided into six major sections as shown in the following illustration.
Game Line

This section provides the following information:
- The current date in the game cycle
- The currently selected design team.
- The login name of the game player.

TreeView

This section shows different types of information that are organized in a hierarchical relationship. Selection of a level of the tree displays information for that level in the Document View section of the game board.

The values in this view can be expanded or contracted by clicking on the circle to the left of a value until the lowest level of the tree structure is reached. The level of detail increases the lower one goes in the tree structure.

Document View

This section provides a variety of details based on the current activity. The types of information shown in here are:
- Information about a selected engineering team.
- Information about personnel.
- Charts or graphs that provide feedback on work performance.
- Situations that have a potential impact on productivity and that may require some action of the game player teams.

Information displays in this view based on the level selected from the tree hierarchy.

Some of the information in this section is shown in graphical form, some is displayed in flow chart form and some is provided in tabular form.

Information Type

This section contains six icons representing different types of information sources on the status of programs. It also has an icon to access the internal mail system used within the game, an icon to display the contents of randomly-generated situations that impact on performance, and an icon for accessing the score-keeping function.

Control Panel

This section provides summary information on selected personnel or design teams. It also contains buttons that are used by the game team to implement resource planning or work scheduling decisions, or to advance play.
Message Center

This section displays a chart legend when one of the graphs or flow charts is displayed in the Document View section. It also displays graphics relating to Situations.

Exploding the tree

The Tree View lists certain types of information that is organized in hierarchies. The type of information that displays depends on the view of the game board being displayed.

When the circle to the left of a value in the tree is selected, the level expands to show more values. Any levels with a circle can be expanded further. The lowest level in any tree has an icon that looks like a sheet of paper with the corner turned down.

For example, when the Plan Teams mode is triggered, the tree lists the game players.

This level can be exploded to show the engineering teams (staffs) controlled by each game player and the team identification number of each Skill within the Engineering team.

Displaying specific tree level information

Specific information about a tree level displays in the Document View section of the game board when you click on the specific level in the Tree View.

The displayed information might represent a graph, a flow chart or a table such as that shown below for Cell network GMT940.

When a high level of the tree is selected, the displayed information provides a high level view that can be used to pinpoint areas requiring further investigation but it lacks the level of detail necessary for determining a course of action.
To zoom in on a section of a graph

This function is useful when you want to zoom in on a specific section of a graph so that you can get a more accurate reading of dates or other information.

It is also very valuable when you are modifying schedules through the Plan Schedule mode as explained in Chapter 8 – Scheduling Work.

1. Click the right mouse button anywhere in the open area of the Document View section of the game board to display the function control box.

2. Select the ‘Zoom In’ option.

The mouse pointer changes to a hand image.

3. Position the hand in the top left corner of the area that you want displayed in the expanded view.

4. Click and hold the left mouse button and drag to the bottom right corner of the area that you want to expand.

The illustrations shown below are for the Milestones function but they apply to other functions as well.
To scroll a graph in the Document View

Once the game has progressed through several cycles of play, the time frame covered by the game are such that entire bar graphs or networks will not display in the Document View of the game board without using the ‘Zoom In’ tool.

There is a feature that allows game players to scroll through certain graphs so that a different time period can be viewed without having to reduce the size of the graph.

1. Click and hold the left mouse button in the graph area of the Document View.

2. Continue to hold the mouse button and drag the mouse to the left.

As you drag the mouse, the contents of the Document View scroll so that you are able to view a different area of the graph or network.

The contents of the Document View can be scrolled in the other direction by dragging the mouse to the right.
Analyzing Information

Purpose of this chapter

The Engineering Factory Game has a variety of information sources that can be used to determine the status of different programs and the impact that previous decisions and system-controlled random variables have had on specific work cells.

This chapter explains the six main information sources within the game. These sources are:

- Milestones
- Networks
- Work Cells
- Flagstones
- Teams
- Analysis

Milestones function

The Milestones function shows in graphical form, the status of the various programs relative to the current date. Since it only shows information at the program level, it presents a high level view of the current status.

This graph helps game teams quickly identify programs that are behind schedule and that require a special emphasis of effort.

Other sources of information as described in this chapter are then used to find out specific details about the problem.

To use the Milestones function

1. Select the Milestones icon from the Information Type section of the game board.

The ‘Milestones’ graph displays in the Document View section of the game board.
The horizontal lines represent different programs. The thin blue vertical line indicates the current date.

2. Review the legend in the Chart Legend section of the game board.

The programs with a red section are the ones that require special attention.

3. Use one or more of the techniques explained in Chapter 3 – Functions and Features to identify the ID number of specific programs that are behind schedule and that require a detailed analysis.

Network function

The Network function shows the relationship between individual work cells for a selected program. A color-coding system indicates the status of each individual work cell relative to the program design plan.

The information from this function can be used to identify work cells that are behind schedule and the expected finish date based on the amount of work remaining.

This information can help determine the amount of effort (time) required to complete a work cell.

To use the Network function

1. Select the Network icon from the Information type section of the game board.

The game board redispays with the programs listed in the tree view section.

2. Explode the tree in the Tree View.
5. Click on a work cell that is behind schedule. Information about the cell displays in the ‘Show Work Cell Network’ dialog box in the Control Panel section of the game board.

The dialog box provides important information about the work cell. This information can be used to identify the number of man-days of effort that is required to complete the cell.

6. Click Continue to return to the main game board.

Work Cell function

The Work Cell function is similar to the Network function in that it can be used to identify specific information about work cells that are behind schedule.

Key differences between these two information sources are:

- The Network function can also provide information at the ‘Staff’ and ‘Team’ levels.
- The Work Cell function provides detailed information on the specific inputs and outputs to each work cell.

This information on inputs and outputs can be used proactively to prevent problems before they occur or to at least reduce the length and impact of potential delays.

To use the Work Cell function

1. Click the Work Cell icon from the Information Type section of the game board.

The game board redisplay similar to the following illustration.
2. Explode the program tree in the Tree View.

The exploded tree provides a breakdown on programs to the Work Cell level but excludes the Staff and Skill levels that are available for analysis through the network function.

3. Review the different EPNs and identify work cells that require closer examination.

The Chart Legend from the Message Center section of the game board provides the information required for understanding the status of individual work cells.

Work cells where work is currently in progress have two colors. They are green and teal if the work is on schedule and they are red and teal if the work is behind schedule.
The thickness of the input lines indicates whether or not a pre-requisite work cell is complete.

4. Review the different programs and identify programs that are late.

These programs need to be evaluated closer to determine possible corrective action.

To evaluate work cells in detail

1. Expand the tree in the Tree View until individual work cells are listed.

2. Select a specific work cell from the Tree view.

3. Click on the work cell in the graph section of the Document View.

Information about the work cell displays in the Show Work Cell Detail dialog in the Control Panel section of the game board.

To identify work activities requiring proactive action

In addition to using this function for identifying work cells under your control that are behind schedule, it can also be used to identify work cells where the requirements or inputs are behind schedule and the pre-requisite requirements are the responsibility of a different game team.

Communication with the other team and perhaps the offer of assistance might reduce the potential for future problems.
1. Review programs and identify uncompleted (blue) work cells under your game team's responsibility where an immediate or predecessor requirement is behind schedule.

2. Communicate with the game team responsible for the late cell and try to identify a corrective course of action so that the problem is solved before it has a negative impact on other work cells.

The Mailing function is explained in Chapter 5 – Using the Mail Function.

Flagstone function

The Flagstone function shows anchor points for work cells within programs and indicates the amount of effort that is required to complete a work cell. It provides information that can be used to change scheduling priorities and to shift work cells between Engineering teams.

‘Early Start Date’ anchor point

The ‘Early Start Date’ anchor point represents the earliest date that work can commence on the selected work cell based on the expected completion date of any required inputs.

This date can be moved up if greater effort is applied to any input work cells.

‘Latest Finish Date’ anchor point

The ‘Latest Finish Date’ anchor point represents the date that the work cell must finish if it is to meet the Early Start Date of a dependant (output) work cell.

Work cells that are outputs of the selected work cell cannot begin until this date. This date can be moved up if greater effort or overtime is applied to the current cell or if other action can be taken to move up the start date of the current cell.

The amount of elapsed time between the ‘Early Start Date’ and the ‘Latest Finish Date’ for a selected cell may be shorter or longer than the amount of man-days required to complete the work cell based on the current level of effort and overtime being applied.

To launch the Flagstone function

1. Click the Flagstone icon from the Information Type section of the game board.

The game board redisplays similar to the following illustration.
Flagstones can be displayed by program or by staff.

To view flagstones by program

1. Select the By Program option in the Tree view.

The game board redisplayes with the programs listed in the tree View. The exploded version of the tree goes to the EPN level.

2. Explode the Tree View and select a program.

The Document View of the game board redisplayes with schedule information about the selected program displayed in bar graph format.

This view shows a number of things:

- The length of a bar indicates the number of man-days required for completing a work cell and the time it will take based on the current technology level and overtime rate.
- The color of a bar indicates the whether or not the work cell is expected to be started and completed between the current 'Early Start Date' and 'Latest Finish Date' anchor points.

- The lines that connect different work cells indicate the relationship between work cells. The work on one cell must be complete before work on the following cell can begin.

3. Select a specific EPN from the Tree view.

EPN-specific information displays in the Document View section of the game board. **Rows with a yellow background are under the control of the current game player.**

4. Click on a specific work cell within the EPN.

Information about the work cell displays in the dialog box in the Control center section of the game board.

To interpret Flagstone information

The table below gives the Dialog box values for the graph example shown above.

<table>
<thead>
<tr>
<th>Work Cell</th>
<th>Proc. Kit</th>
<th>Analysis</th>
<th>P.A.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Start Date</td>
<td>March 10, 2000</td>
<td>April 6, 2000</td>
<td>October 10, 2000</td>
</tr>
<tr>
<td>Projected Finish Date</td>
<td>April 1, 2000</td>
<td>April 22, 2000</td>
<td>November 10, 2000</td>
</tr>
<tr>
<td>Days of Work Left</td>
<td>34.0</td>
<td>20.0</td>
<td>35.0</td>
</tr>
<tr>
<td>System Due Date</td>
<td>March 15, 2000</td>
<td>April 26, 2000</td>
<td>June 7, 2000</td>
</tr>
</tbody>
</table>
Based on the above information there are 34.0 man-days of work left for the Process Design Kit work cell. Since the due date is March 15 and the projected finish date is April 1, the cell will be completed late unless extra effort is applied or scheduling priorities are changed.

Similarly, both the Analysis and P.A.D. work cells will be late unless corrective action is taken.

To review flagstones by Staff

1. Select the By Staff option from the Tree view.

The game board redisplays and lists the four Staff groups.

2. Select a specific staff.

The Document View redisplays with staff level information.

The legend explains the color codes used in the graph. This level of detail helps the game player identify problem areas that require more in depth analysis.

Work cells that are overlapping (yellow cells) and cells that are late (red cells) require closer examination to see if there are scheduling priorities that can be made or corrective action implemented.

The ‘By Staff’ view through the Flagstone function provides information that can help determine work cells that can be considered for transfer and identify Skills that have available capacity.

3. Explode the Tree View.

4. Select a specific Engineering skill or team.

The graph redisplays with the detail for the selected skill or team.

5. Click on a work cell with the graph.

The anchor points for the selected work cell display on the graph.
Information about the work cell also displays in the dialog box in the Control Center section of the game board.

In the above graphical example, the specific value for each of the visible cells is provided in the table below.

<table>
<thead>
<tr>
<th>EPN</th>
<th>Work Cell</th>
<th>Planned Start Date</th>
<th>Projected Finish Date</th>
<th>Days of Work Left</th>
<th>System Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>202029</td>
<td>Production Kit</td>
<td>Feb. 29, 2000</td>
<td>Mar. 13, 2000</td>
<td>34.4</td>
<td>Feb 8, 2000</td>
</tr>
<tr>
<td>202022</td>
<td>Process Design Kit</td>
<td>Mar. 10, 2000</td>
<td>April 1, 2000</td>
<td>34.0</td>
<td>Mar. 15, 2000</td>
</tr>
<tr>
<td>202029</td>
<td>P.A.D</td>
<td>Apr. 7, 2000</td>
<td>May 1, 2000</td>
<td>37.0</td>
<td>June 13, 2000</td>
</tr>
</tbody>
</table>

For each of the above EPNs, the expected completion date based on the current schedule and the current level of effort, is after the system due date.

There are four markers associated with each cell although all markers are not necessarily visible.

- ‘Early Start Date’ – This green marker indicates the earliest possible date that a work cell can begin based on the expected completion date of any pre-requisite cells.
• ‘Start Date’ – This is the current planned start date. This may be after the ‘Early Start Date’. This date marker is represented by a black square at the bottom left-hand corner of the work cell. It is joined to the ‘Early Start Date’ with a straight line that lies along the x-axis.

• ‘Latest Finish Date’ – This is the latest date that the work cell can finish if the planned start dates of dependant cells are to be met. This date is represented by a green square that is linked to the ‘Finish date’ marker.

• ‘Finish Date’ – This is the planned completion date based on the technology level of the current mix of resources and the current overtime rate. This marker is represented by a black square at the top right-hand corner of the work cell. It is linked to the ‘Latest Finish Date’ marker.

When the ‘Latest Finish Date’ is earlier than the ‘Start Date’, the line joining the ‘Latest Finish Date’ and the ‘Finish Date’ cuts diagonally across the work cell.

To update permissions

Permissions define whether or not a design team is willing to accept personnel or work cells from another game player or to permit another game player to take existing personnel or a work cell.

1. Launch the Flagstone function.
2. Select the By Staff option from the Tree view.
3. Select a specific work cell to display the Show Flagstones by Staff dialog box.
4. Select the Permits button.

The game board redisplayes and shows staffing information in
the Document View section of the game board.

<table>
<thead>
<tr>
<th>Player</th>
<th>Staff</th>
<th>Skill</th>
<th>Team</th>
<th>MaxHead</th>
<th>HeadCount</th>
<th>OKToHire</th>
<th>MinTi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD01</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD02</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE01</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE02</td>
<td>4</td>
<td>2</td>
<td>-1</td>
<td></td>
</tr>
</tbody>
</table>

**Column**          | **Explanation**                                                                                                                                 |
---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
Player               | This is the name of the game player selected from the first level of the tree view.                                                            |
Staff                | This is the specific staff for which the game player has responsibility.                                                                      |
Skill                | This is a specific skill within the staff.                                                                                                   |
Team                 | This is the specific team within the skill.                                                                                                  |
Max Head Count       | This is the maximum allowed head count for the team. A team cannot exceed this value.                                                        |
Head Count           | This is the current head count for the team.                                                                                                 |
OK To Hire           | This value indicates whether or not the team as the authority to hire. A team can only hire if the ‘Head count’ value is less than the ‘Max head Count’ value. A value of ‘0’ means that the team is unable to hire. A value of ‘-1’ means that the team is able to hire. |
### Column | Explanation
--- | ---
Minimum Training Level | This field indicates the training level that a team has reached. There are three training levels with ‘0’ representing the lowest level and ‘2’ representing the highest level. A team only moves to the next highest level once all members of the team have completed the applicable training.
Maximum Training Level | This represents the maximum training level currently available. New levels are introduced with new technologies. Productivity improvements are achieved as soon as all team members reach the current training level.
Is Fully Trained | This field indicates whether or not the team is fully trained for the latest technology. If the value is ‘0’, the team is not fully trained. If the value is ‘-1’, the team is fully trained and the new efficiencies are realized.
Training Factor | This is a factor that is multiplied by the efficiency rate.
Effective Hours Per Day | This is the total number of effective hours per day for the entire team.
Total Salary | This is the total salary for all team resources including employees and contract personnel.
OK To Accept | This flag indicates that the team is willing to accept a qualified resource. If this flag is selected, another game player or the Auto player can transfer any qualified resource to this Skill team.
OK To Transfer | This flag indicates that a team is willing to transfer a member of the team to another player. If this flag is selected, the team can lose any player from the team.
Effort Efficiency | This field indicates the current level of efficiency that is being applied by the team for the current training level.
Overtime Percent | This reflects the overtime percentage rate at which the team is currently operating.

5. Select a specific team.

The current permissions for the selected team display in the Show Permissions dialog box in the Control Panel section of the game board.
6. Select the Modify button to change the ‘Transfer’ and ‘Accept’ permissions.

The Set Permissions dialog box displays.

7. Select the ‘Yes’ radio button to indicate a willingness to accept a resource from another game player.

8. Select the ‘Yes’ radio button to indicate a willingness to transfer a resource from this team to another game player.

9. Select the Update button to update these changes.

10. Select the Continue button to exit this function.

To display flagstone information in tabular form

1. Launch the Flagstone function.

2. Select the By Staff option from the Tree View.

3. Explode the tree and select a specific Team.

4. Select the Table button from Show Flagstones By Staff dialog box in the Control Panel section of the game board.

The Flagstone information for the selected skill displays in the Document View section of the game board.
Column | Explanation
---|---
Player | This is the name of the game player selected from the first level of the tree view.
Staff | This is the staff for the game player. If a specific staff was selected from the tree view, this column is filtered to that selection only.
Team | This is the specific team within the skill. If a specific team was selected from the tree view, this column is filtered to that selection only.
Program | This column lists the valid program for the selected team(s).
EPN | This column lists the valid EPN for each listed program.
Skill | This column lists the valid skill for each listed EPN.
Deliverable | This is the required deliverable for the work cell.
Percent Complete | This is the work cell completion percentage. It is updated by the system.
Due Date | This is the planned work date.
Days Work Left | This is the number man-days of effort required to complete the work cell.
Long Name | This is the full name of the work cell activity.
Effort Rank | This represents the rank in priority when two or more work cells are scheduled at the same time. The work cell on the bottom generally has the highest priority and the lower effort rank number.
<table>
<thead>
<tr>
<th><strong>Column</strong></th>
<th><strong>Explanation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort Rate</td>
<td>This is the percentage of available team effort being applied to the work cell. The value equals 100% if all team members are assigned to this work cell.</td>
</tr>
<tr>
<td>Start Date</td>
<td>This is the date when the activity is planned to start.</td>
</tr>
<tr>
<td>Effective Hours Per Day</td>
<td>This is the total effective hours worked for the entire team based on the current efficiency rates. With a team of four, the maximum number of expected hours is 32.</td>
</tr>
<tr>
<td>Work Rate</td>
<td>This is an intermediate calculation used by the system. It serves no purpose for the game player.</td>
</tr>
<tr>
<td>Minimum Work Rate</td>
<td>This is an intermediate calculation used by the system. It serves no purpose for the game player.</td>
</tr>
<tr>
<td>Duration</td>
<td>This value indicates the width of the box that represents the work cell.</td>
</tr>
<tr>
<td>Finish Date</td>
<td>This is the expected finish date based on the current amount of effort.</td>
</tr>
<tr>
<td>Is Ready?</td>
<td>This field indicates whether or not all input work cells are complete. A ‘0’ indicates they are not all complete. A value of ‘-1’ indicates that all input work cells are complete and this work cell is now ready to be worked on.</td>
</tr>
<tr>
<td>OK To Transfer</td>
<td>This indicates whether or not the team that owns this work cell is willing to transfer resources or work.</td>
</tr>
<tr>
<td>Effort Efficiency</td>
<td>This is a variable used in a system calculation. It serves no purpose for the game player.</td>
</tr>
<tr>
<td>Program Announce Date</td>
<td>This is the date that the program was first announced.</td>
</tr>
<tr>
<td>Finish Date</td>
<td>This is the date that the program is planned to finished as determined when the program was first announced.</td>
</tr>
</tbody>
</table>

To identify the amount of effort being applied

The height of the colored bar relative to the width of the row, indicates the amount of effort being applied by the team.
If all team members are assigned to the work cell the width of the bar equals the height of the row. If only one-half the team members are assigned to work on the cell, the bar is only one-half the width of the row.

Because the amount of effort in man-days remains unchanged for a work cell, reducing the number of personnel assigned to a work cell, results in a lengthening of the elapsed time until completion.

In the example shown above, the colored bar fills the full depth of the row thereby indicating that the team is giving 100% effort.

1. Move the cursor over the first (i.e. left) 'Daily Effort %' column.

The percentage range displays in increments of 10%.

Blue lines display to mark the upper and lower levels of the selected range.

2. Move the cursor over the second (i.e. right) Daily Effort column.

The effort percentage display in units, and a blue line marks the percentage level on the graph.

Assume as an example that the team is working at 80% effort rate. In this case, the graph would look similar to the following illustration.

To display detailed information about a work cell.

1. Click in the graph on the work cell for which you want more information.

There are four markers associated with each cell although all markers are not necessarily visible.

- 'Early Start Date' – This green marker indicates the earliest possible date that a work cell can begin based on the expected completion date of any pre-requisite cells.
- ‘Start Date’ – This is the current planned start date. This may be after the ‘Early Start Date’. This date marker is represented by a black square at the bottom left-hand corner of the work cell. It is joined to the ‘Early Start Date’ with a straight line that lies along the x-axis.

- ‘Latest Finish Date’ – This is the latest date that the work cell can finish if the planned start dates of dependant cells are to be met. This date is represented by a green square that is linked to the ‘Finish date’ marker.

- ‘Finish Date’ – This is the planned completion date based on the technology level of the current mix of resources and the current overtime rate. This marker is represented by a black square at the top right-hand corner of the work cell. It is linked to the ‘Latest Finish Date’ marker.

When the ‘Latest Finish Date’ is earlier than the ‘Start Date’, the line joining the ‘Latest Finish Date’ and the ‘Finish Date’ cuts diagonally across the work cell.

Details about the work cell also display in the Schedule Work dialog box in the Control Panel section of the game board.

Teams function

The Teams function provides information about the performance of each team and team member based on efficiency and cost.
Since a color code is used to distinguish employees from contract personnel, this function also enables a game team to compare the performance of these two types of team members.

It also allows for a comparison of the performance between individuals within the same salary range, regardless of the nature of their employment.

Specific changes to the resources of a team including training, recruitment, or transfer are made through the Plan Teams mode on the main game board.

To launch the Teams function

1. Click the Teams icon from the Information Type section of the game board.

The game board redisplays similar to the following illustration.

The expanded Tree View for this function lists skills and team ID numbers in each skill area.

To evaluate a specific skill

1. Select the Skill from the first level of the tree.

The Document View redisplays with information about the specific skill.

The symbols represent specific resources on an engineering skill or engineering team.
2. Select a specific Engineering team for a Skill.

The chart redisplays and shows all resources for each engineering team within the selected skill.

This chart can be used to quickly review each engineering team that are the responsibility of the game player, and to identify:

- Resources that require training.
- Resources that can be transferred when there is surplus capacity.
- Resources that have too high a salary level relative to their efficiency rate.

To identify performance/salary values for a specific resource

When the cursor is positioned over a specific symbol, the name of the person represented by that symbol displays.

1. Position the cursor over a specific resource.
A pop-up message identifies the name of the specific resource.
The position of a resource symbol relative to the ‘y’ (vertical) axis indicates the relative efficiency of the resource.

2. Position the cursor in the right-hand Efficiency % column so that the horizontal blue line passes through the mid-point of the symbol.

The efficiency level of the resource displays.
The position of a resource symbol relative to the ‘x’ (horizontal) axis indicates the cost of the resource.

3. Position the cursor in the Salary ($) row so that the vertical blue line passes through the mid-point of the symbol.

The salary level of the resource displays.
The Chart Legend provides the color scheme used to identify the highest level of training that a resource has completed.
- **Green** = Base level (level 0)
- **Blue** = Midrange level (level 1)
- **Red** = Advanced level (level 2)

The Chart Legend also differentiates between contract personnel and employees.
- Employees are represented by symbols with hats that match the color of the symbol.
- Contract personnel are represented by symbols with black hats. They also have a white belt with white suspenders.

**Analysis function**

The Analysis function provides information in graphical form that compares the required and actual cumulative hours for completed work relative to a given staff or skill.

It also shows the required and projected cumulative hours for any uncompleted work cells.

To launch the Analysis function:

1. Select the Analysis icon from the Information type section of the game board.

The game board red displays to show the Cumulative Work heading in the Document View of the game board.
2. Explode the Tree View.

The exploded tree in the Tree View lists the different skills for each staff.

3. Select a specific staff or skill from the Tree View.

The Document View section of the game board redispays with analysis information for the selected staff.

Interpreting the Analysis graph

The Analysis graph has three lines.

- The line with the yellow triangular markers represents the cumulative planned hours for a program. Each triangle represents a new work cell.
- The line with the red squares represents the actual cumulative hours for work cells that are completed.
- The short line with green circles represents the projected cumulative hours for the next two months based on the current efficiency rate and the current usage of overtime.

The slope of the different graphs determines the extent to which hours are being accumulated versus the original planned rate of accumulation.

- If the projected rate of accumulation is less than the original rate (indicated by a flatter slope for the projected values), the project will fall further behind schedule unless corrective action is taken.
- If the rate of accumulation is greater than the original rate (indicated by a steeper slope for the projected values), the project is coming closer to being on schedule.
- If the line showing projected accumulation crosses the planned accumulation, there will be excess capacity that can possibly be made available for other projects.
1. Move the cursor over either of the two ‘Cumulative Work (Hours)’ column.

The left-hand column shows the cumulative hours in ‘thousands’. The right-hand column shows the cumulative hours in ‘hundreds’.

2. Move the cursor over the Date row.

The specific date for the selected point in time displays.

By measuring the level of effort between the planned accumulation and the projected accumulation at a given point in time, a game player can estimate the shortfall in capacity or the amount of excess capacity.

This information can be used to determine appropriate corrective action that will reduce potential problems.

To determine a course of corrective action

When one work cell is behind schedule, there will be an impact on following work cells and a potential impact on the ability to meet the program deadline.

It is important to remember that game players are not competing with the other game players. One of the objectives is to maximize the effectiveness of all game players.
Game players must work together to reduce the impact of work cell delays.

When a work cell is behind schedule, the game player responsible for the cell might consider implementing one or more of the following strategies:

- **Change priorities.** A game player may be able to adjust work cell priorities by moving the start date for a cell that is behind schedule. The process for changing priorities is explained in *Chapter 8 – Scheduling Work*.

- **Change effort.** A game player can modify the amount of effort on two or more work cells and plan a schedule that results in the effort of an engineering being split between two or more work cells. The process for changing priorities is explained in *Chapter 8 – Scheduling Work*.

- **Use overtime.** A game player can increase the amount of effort applied to a work cell by adding overtime. Overtime can only be applied to a design team not to a specific individual on a design team. The process for applying overtime is explained in *Chapter 8 – Scheduling Work*.

- **Adjust the resource mix.** If a design team is understaffed, a game player can consider adding additional personnel. If the design team is fully staffed, the game player may consider transferring one or more people with relatively low levels of efficiency and recruiting those with a higher level of efficiency. The techniques for adjusting the personnel mix are explained in *Chapter 7 – Planning Resources*.

- **Transfer work.** If a game team is unable to complete the necessary work within a reasonable amount of time, it might be able to arrange to transfer it to another game player with the right skills and with excess capacity. The steps for assigning a work cell to a different game team are explained in *Chapter 8 – Scheduling Work*.

- **Initiate training.** The productivity rate of an engineering team can be improved by ensuring that all personnel are trained to the highest available level. When training is initiated, there is a short-term reduction in productivity until the training is complete. The steps for initiating training are explained in *Chapter 7 – Planning Resources*.

When a work cell for belonging to another game player is behind schedule, a game player might considering implementing one or more of the following strategies:

- Offer the loan of skilled personnel.
- Indicate a willingness to accept a transfer of work.
Using the Mail Function

Purpose of this function

The Engineering Factory Game requires that game players work together to solve design bottlenecks. The Mail function acts as a communication tool that enables game players to ask for help or to offer assistance or suggestions to other players that are experiencing difficulties.

When the network version of the game is being played, game players may actually be located in different physical locations. This setup more closely resembles the real world environment when the internal email system is used as a primary communications tool.

Types of messages

Messages are sent automatically by the system to game players to notify them about the completion of certain types of activities or about randomly generated situations that impact them. All game players receive the same set of messages at the same time.

Many of the system-generated messages such as the one shown below direct the game player to the Situation function for news.

Other system-generated messages provide the game player with information that about work completion activities by other players.
Chapter 5 – Using the Mail Function

Messages can also be sent between game players to make requests or to communicate information.

For example, a game player with excess capacity can use the message function to advise other game players of their ability to offer help in resolving a bottleneck.

A game player who is unable to commence work because of an uncompleted task from another area, might use the messaging function to advise another game player of the need for action.

The mail function in the Engineering Factory Game is not a confidential mail service. All mail to all players can be viewed. However, a game player is only able to file mail that is directed to them.

To launch the Mail function

1. Select the Mail icon from the Information type section of the game board.

The game board redispays with mailbox information displayed.

To review messages for a specific game player

1. Select the name of the game player in the Tree view of the game board.

A list of all mail for the selected game player displays.
### Document View

<table>
<thead>
<tr>
<th>Mailbox</th>
<th>TO</th>
<th>FROM</th>
<th>Subject</th>
<th>Time Sent</th>
<th>Message</th>
<th>MsgID</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>Design01</td>
<td>System</td>
<td>Completion</td>
<td>09:56 AM</td>
<td>Team ED</td>
<td>12</td>
</tr>
<tr>
<td>New</td>
<td>Design01</td>
<td>System</td>
<td>Completion</td>
<td>12:33 AM</td>
<td>Team ED</td>
<td>2</td>
</tr>
<tr>
<td>Old</td>
<td>Design01</td>
<td>System</td>
<td>Completion</td>
<td>12:33 AM</td>
<td>Team ED</td>
<td>7</td>
</tr>
<tr>
<td>Old</td>
<td>Design01</td>
<td>System</td>
<td>Completion</td>
<td>12:33 AM</td>
<td>Team ED</td>
<td>6</td>
</tr>
</tbody>
</table>

### Column Explanation

<table>
<thead>
<tr>
<th>Column</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailbox</td>
<td>This column indicates whether a message in the mailbox is a 'new' message or whether it is an 'old' message that has been read and filed.</td>
</tr>
<tr>
<td>To</td>
<td>This column indicates the recipient of the message. The recipient is always a game player.</td>
</tr>
<tr>
<td>From</td>
<td>This column indicates the sender of the message. The sender can be either a game player or the system.</td>
</tr>
<tr>
<td>Subject</td>
<td>This column indicates the basic subject of the message.</td>
</tr>
<tr>
<td>Time Sent</td>
<td>This column indicates the time when the message was sent.</td>
</tr>
<tr>
<td>Message</td>
<td>This column contains the content of the message. The column is usually only wide enough to display a portion of the message content. Dragging the column header to the desired width can modify the column width.</td>
</tr>
<tr>
<td>MsgID</td>
<td>This column contains an ID number that is assigned by the system when a message is created.</td>
</tr>
</tbody>
</table>

To display a message

1. Select the desired message in the Document View section of the game board.

The complete message displays in the Show Messages dialog box that appears in the Control Panel section of the game board along with the name of the sender.
To file a message

Once a message has been reviewed and is no longer required, it can be filed.

1. Select the message from the Document View section of the game board.

The contents of the message are displayed in the Show Messages dialog box in the Control Panel section of the game board.

A game player can only file mail that is for that player. If a game player attempts to file mail for someone else, the following dialog box displays.

2. Select the File button.

- If the Document View section of the game board lists both old and new messages, the value in the ‘Mailbox’ column changes to ‘Old’ the next time this view is refreshed.
- If the Document View section of the game board has been filtered to display only ‘New’ messages, the newly filed message disappears immediately from the list. It appears in the list of ‘Old’ messages.

To compose a message

1. Select the Compose button from the Show Messages dialog box.

The Address New Message dialog box displays.
2. Use the drop-down list to select the name of the game player who is to receive your message.

In the Standalone version of the game, a game player can only send messages to the Game Facilitator (who is essentially the game player) or to the System. Since these messages are not used by either the system or the game facilitator, the ‘Compose’ functionality has no use in the Standalone version.

In the Network version of the game, a game player can also send a message to any of the other game players.

3. Use the drop-down list to select the message subject.

4. Click the ‘Next’ button to display the Compose message Text dialog box.

5. Type the message.

6. Click the ‘Send’ button to transmit the message to the defined recipient.
Reviewing Situations

Purpose of this function

Situations are activities that occur randomly and that impact on one or more programs.

Notification about new situations is provided through the mail function. It is essential that situations be reviewed frequently as many of them will impact on work cell schedules.

To view situations

1. Select the Situations icon from the Information Type section of the game board.

The game board redisplay with a list of current situations that have been triggered to date in the Tree View. All game players receive the same list of situations.

2. Select the specific situation from the Tree View.

The game board redisplay with the contents of the Situation shown in the Document View section of the game board.

Door Needs Impact Bar

Tests from the NAO Center show that the new door design will not withstand a side impact in excess of 30 mph. We propose an impact bar as illustrated. This will likely delay final drawings by another week.

The Show Situation dialog box in the Control Panel section of the game board provides more information about the situation. This information might include:

- EPN affected.
- Work cell(s) affected.
- Special instructions.
The graphic in the Message Center section of the game board serves no specific function.

NOTE: There is one graphic that can be rotated. Instructions on the use of this graphic are provided in the Show Situation dialog box. This graphic serves to illustrate some of the capabilities of emerging technologies.

3. Click the Continue button to clear a situation from the game board.

There are eight situations that provide useful instructions for game players.

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>Priority Scheduling</td>
<td>This situation explains the procedures for changing the priority between work cells.</td>
</tr>
<tr>
<td>002</td>
<td>Overtime</td>
<td>This situation explains the use of overtime and how it is initiated.</td>
</tr>
<tr>
<td>003</td>
<td>Transfer Work</td>
<td>This situation explains the purpose of the work transfer function and how it is used.</td>
</tr>
</tbody>
</table>
Chapter 6 – Reviewing Situations

005 Recruit Personnel
This situation explains why a team may want to recruit personnel and how it is done.

007 Transfer Personnel
This situation explains why a team may want to transfer a resource and how it is done.

008 Scale Effort
This situation explains how the amount of effort applied to a work cell can be scaled down so that work can progress on two or more work cells at the same time.

The majority of the remaining situations fall under one of two categories:
- Technology advancement situations
- Production impact situations

Technology advancement situations
As the game advances through a number of cycles, new technologies are introduced. Notification of these is made through the Situations function.

The exploded tree view reflects a situation with information about a technology enhancement that requires training.

Information about the technology enhancements and comments about the need for training appear in the Document View section of the game board similar to the following illustration.

![Advanced System Available](image)

When technology advancements occur, a game team must determine how training will be implemented. Some suggested strategies are:
• **Send all personnel for training in the same time period.** This option stops work during the training period and may result in one or more work cells falling behind schedule. However, once the training is completed there will be an immediate increase in productivity.

• **Spread training over multiple work cycles.** This option reduces the impact on production in a given time period but delays the start of improved productivity.

• **Spread training over multiple work cycles and increase overtime until all personnel are trained.** This option uses overtime to offset the impact on production while personnel are being trained.

• **Spread the training over multiple work cycles and increase the number of resources.** This option uses temporary help to offset the impact on production while personnel are being trained.

Production impact situations

Some situations impact on the rate of production.

Some of these situations are informational and no action is required or is possible. Other situations offer opportunities for a design team to reduce the impact of the situation through proactive action.

This action might include actions such as the following:

• The transfer of resources in order to reduce short term over capacity.

• The acceleration or delay of training programs.

• The transfer of work cells between engineering teams.

• The initiation of overtime.

• An adjustment to scheduling priorities between work cells.
Planning Resources

Purpose of this function

The purpose of the Plan Teams function is to provide experience in impacting design team effectiveness through the selection and training of employee and/or sub-contract personnel.

During this stage, game teams can transfer or acquire resources up to capacity limitations, and invest in technology training activities for specific individuals on their design team.

Planning variables

There is a number of planning variables that impact on the timely completion of projects for a given game player.

Some of these variable are randomly generated by the system while others are controlled either by the specific actions of the game player or by actions taken by another game player.

<table>
<thead>
<tr>
<th>Random Elements</th>
<th>Controlled Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attrition</td>
<td>Recruiting</td>
</tr>
<tr>
<td></td>
<td>Transferring</td>
</tr>
<tr>
<td></td>
<td>Overtime</td>
</tr>
<tr>
<td>Technology Options</td>
<td>Training</td>
</tr>
</tbody>
</table>

To launch the Plan Teams function

1. Click on the Plan Teams button located in the Control Panel section of the game board.

The game board redisplay similar to the following illustration.
The Tree view lists all game players. The ‘Auto’ game player is controlled by the system.

When the tree list is fully exploded, it lists staffs, skills and engineering teams for each game player.

2. Select a specific value form the exploded tree view.

Selection of a specific value from the Tree view, displays details about the selection in the Document View section of the game board.

<table>
<thead>
<tr>
<th>Player</th>
<th>Staff</th>
<th>Skill</th>
<th>Team</th>
<th>Max-leadC</th>
<th>HeadCount</th>
<th>OkTo Hire</th>
<th>MinTi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD01</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD02</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE01</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE02</td>
<td>4</td>
<td>2</td>
<td>-1</td>
<td></td>
</tr>
</tbody>
</table>

**Column** | **Explanation**
--- | ---
Player | This is the name of the game player selected from the first level of the tree view. Although the information from another game player can be selected, changes can only be made to the game player that matches the logon ID from the Player ID field in the Game Line.

Staff | This is the name of the design team(s) applicable for the selected Game Player.
<table>
<thead>
<tr>
<th>Column</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill</td>
<td>This is the specific engineering skill that applies to the selected Player-Staff combination.</td>
</tr>
<tr>
<td>Team</td>
<td>This is the code number used in the Engineering Game for the Player-Staff-Skill combination.</td>
</tr>
<tr>
<td>Maximum Head Count</td>
<td>This is the maximum allowable head count for the specific design team. Maximum head count is a fixed, budgeted amount and cannot be changed.</td>
</tr>
<tr>
<td>Head Count</td>
<td>This is the current head count for the selected engineering team. Personnel can be transferred if they are under utilized or recruited if additional resources are needed and the current head count is below the maximum head count.</td>
</tr>
<tr>
<td>OK To Hire</td>
<td>A value of ‘-1’ (True) displays if the value in the Maximum Head Count column exceeds the value in the Head Count column. A value of ‘0’ (False) indicates that the team is not able to hire additional resources.</td>
</tr>
<tr>
<td>Minimum Training</td>
<td>This represents the lowest training level of all people on the engineering design team. There are three training levels with ‘0’ representing the lowest level and ‘2’ the highest.</td>
</tr>
<tr>
<td></td>
<td>The Engineering Factory game follows the premise that productivity gains are not achieved unless everyone on the team has reached at least the minimum level of training required for the applicable technology.</td>
</tr>
<tr>
<td>Maximum Training</td>
<td>This indicates the maximum training level that is available to the team based on the technological advancements that have been introduced into the game.</td>
</tr>
<tr>
<td>Is Fully Trained</td>
<td>A value of ‘-1’ (True) indicates that all current members of the team have been fully trained to the current technology level. A value of ‘0’ (False) indicates that not all members have reached the current training level.</td>
</tr>
<tr>
<td>Effective Hours</td>
<td>This is a system calculated daily efficiency level of the entire engineering team. The maximum efficiency level for a 4-person team working an 8-hour day is 32 hours. Efficiency levels increase with training.</td>
</tr>
<tr>
<td>Column</td>
<td>Explanation</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Total Salary</td>
<td>This is the total of the salaries of all team members. An individual’s salary is subject to an increase when he or she receives training.</td>
</tr>
<tr>
<td>OK to Accept</td>
<td>When this box is checked, an engineering team indicates a willingness to accept someone from another team. Any team wishing to reduce their resources or to get rid of a low-performing resource or high-priced resource (including the ‘Auto’ team) can transfer a person to a team with this box checked. A game player has no control over the qualifications, salary or employment status of any individual added to its team by another game player.</td>
</tr>
<tr>
<td>OK to Transfer</td>
<td>When this box is checked, an engineering team indicates a willingness to lose a resource to another team. Any team wishing to add a resource (including the ‘Auto’ team) can select any team member from a team that has this option checked. When this option is checked, a game player has no control over the individual members available for selection by another game player. The game player will not necessarily lose an unproductive member of the team and may lose a skilled and highly effective team member.</td>
</tr>
<tr>
<td>Effort Efficiency</td>
<td>This indicates the current level of effort being applied by the engineering team.</td>
</tr>
<tr>
<td>Overtime Percent</td>
<td>This indicates the current overtime rate expressed as a percentage of regular time.</td>
</tr>
</tbody>
</table>
When a specific line in the Document View is selected, key information about the selected line displays in the Plan Teams box in the Control Panel section of the game board.

To set ‘Accept’ or ‘Transfer’ permissions

Permissions define whether or not a design team to is willing to accept resources from another team (up to the maximum head count) or willing to permit the transfer or one or more team members to another team.

1. Select the Permits button from the Plan Teams dialog box.

2. Select the Modify button.

3. Select the applicable radio button(s).

4. Click the Update button to redisplay the permission settings.
5. Click the Continue button to redisplay the Plan Teams dialog box.

To identify the members of a design team or EPN
1. Click the Personnel button in the Control Center section of the game board.

The game board redisplayed with information about the employees and contract personnel.
2. Select the circles in the Tree view until the desired design team or EPN is displayed.
3. Select the appropriate design team or EPN to display the information about the team or EPN personnel.
<table>
<thead>
<tr>
<th>Column</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team</td>
<td>This is the code number of the Design Team that currently employs the individual. When an engineering team is selected in the Tree View, all individuals with the specific engineering skill are listed. By selecting the Auto team, a list of unassigned personnel available for selection displays.</td>
</tr>
<tr>
<td>Title</td>
<td>This is the title of the individual.</td>
</tr>
<tr>
<td>Is Contract</td>
<td>The box is checked if the individual is a contract employee. The attrition rate for contract employees tends to be higher than the rate for employees.</td>
</tr>
<tr>
<td>Last Name</td>
<td>This is the individual’s last name.</td>
</tr>
<tr>
<td>First Name</td>
<td>This is the individual’s first name.</td>
</tr>
<tr>
<td>Training Level</td>
<td>This field indicates the individual’s acquired level of training. There are three levels with ‘0’ being the lowest level and ‘2’ the highest level. As an individual’s training level increases, both their efficiency rate and their pay rate also increase.</td>
</tr>
<tr>
<td>Is Fully Trained</td>
<td>This indicates whether or not the individual is fully trained at the current technology level. A value of ‘-1’ means that the person is fully trained and a value of ‘0’ means that they are not trained to the current level.</td>
</tr>
<tr>
<td>Current Efficiency</td>
<td>This is the individual’s current level of efficiency expressed as a percentage.</td>
</tr>
<tr>
<td>Current Salary</td>
<td>This is the individual’s current salary. The salary rate increases automatically as the individual completes training.</td>
</tr>
<tr>
<td>Send to Training</td>
<td>If this box is checked, it indicates that you are ready to send the individual for training.</td>
</tr>
<tr>
<td>Promotion Date</td>
<td>This is the date that the individual was last promoted to a new skill level.</td>
</tr>
<tr>
<td>Training Until Date</td>
<td>This is the date when the individual is scheduled to finish their current training program. Once training is complete, there is an immediate boost in the individual’s efficiency level and salary.</td>
</tr>
<tr>
<td>Days In Training</td>
<td>This is the duration of the training session in days. The individual is unavailable for work while in training.</td>
</tr>
<tr>
<td>Column</td>
<td>Explanation</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Player</td>
<td>This is the name of the Game Player for whom the individual currently works.</td>
</tr>
<tr>
<td>Staff</td>
<td>This is the engineering staff area for the individual.</td>
</tr>
<tr>
<td>Skill</td>
<td>This is the individual’s skill. When an individual is transferred to a new engineering team, they must remain within the same skill area.</td>
</tr>
<tr>
<td>Personnel ID</td>
<td>This is the individual’s personnel ID reference number used in The Engineering Factory Game.</td>
</tr>
</tbody>
</table>

To display key information for an individual:

1. Click on the individual’s line in the Document View section of the game board.

Key information for the individual displays in the Control Panel section of the game board.

![Show Personnel](Image)

To train an individual in a new technology:

There are three levels of technology in the game: levels ‘0’ through ‘2’. All individuals begin the game at level ‘0’.

New technology options are introduced randomly by the system. Once a new technology is introduced, each Game Player defines its own strategy for improving the skills of its personnel.

The impact of a new technology on a team is not experienced until all members of the team have been trained.

Typical training strategies are:

- Train individuals one at a time. This minimizes the loss of production in a given game cycle.
- Train multiple employees at one time. While this strategy has a major impact on production levels in one game cycle, it will result in significant improvements in the next cycle.

- Recruit an individual with the required level of skills. This strategy may first require the transfer of an individual with a lower skill level in order to create an opening.

1. Use steps described in this chapter to display the list of team members in the Document View section of the game board.

2. Select the specific individual to be trained. Information about this individual displays in the Show Personnel dialog box.

3. Select the Train button. If a game player tries to train someone prior to the technology being introduced, the following message displays.

   ![Message](image1)

   If the individual is not trained to the current level of technology, the game board redisplay and the Plan Training dialog box displays.

4. Select the 'Yes' radio button.

5. Click the 'Update' button.
The game board redisplay with the list of the team resources and the Show Personnel dialog box for the individual sent on the training course.

6. Click the Continue button.

7. Repeat this process to send additional team members for technology training.

Once the game advances, individuals selected for training are sent for training and the new schedule reflects the loss of their time.

When the training is complete, all applicable personnel are updated.

**To transfer an individual to the pool**

1. Use the steps provided in this chapter so that the list of personnel in the Document View of the game board includes the individual that to be transferred.

2. Select the line that relates to the resource to be transferred.

Information about the specific resource displays in the Show Personnel dialog box.

3. Click the Transfer button.

The game board redisplay. The list of employees disappears from the Document View section and the dialog box in the Control Panel changes to the “Confirm Personnel Transfer to Pool” dialog box.

4. Click the Confirm button to confirm the transfer.
The game board redisplay and the transferred individual is no longer part of the design team. Their personnel record now belongs to the Pool.

To recruit an individual from the pool

1. Use the steps listed in this chapter to display the list of resources on a specific team.

2. Select the Pool button from the Show Personnel dialog box.

The game board redisplay. The Document View provides a list of all players currently in the pool.

3. Review the characteristics of the personnel listed in the pool.

Key characteristics to considering when recruiting are:

- **Skill** – A game player can only hire someone with the skill that matches the team Skill.

- **Contract or staff** – The attrition rate for contract personnel is higher than that for staff.

- **Training level** – Persons who have not been trained to the current level will require training during which there is a negative impact on production.

- **Current efficiency rate** – The higher the efficiency rate the higher the level of production but the higher the salary.

- **Current salary** – This impacts the cost of the design program. However, it is better to meet the deadline dates and have high costs than to have lower costs and miss the delivery dates.

4. Select the individual to be recruited.

The Show Pool dialog box displays in the Control Panel section of the game board with a summary of selected information about the individual.
5. Click the Recruit button to display the Confirm Personnel Recruit from the Pool dialog box.

6. Click the Confirm button.

The game board redisplay and the newly recruited resource is included with the other members of the team.

To initiate overtime

1. Use the steps covered in this chapter to display the list of teams for the current game player in the Document View section of the game board.

2. Select the team that is going to use overtime.

3. Click the O/T button in the Plan Teams dialog box.

The Set Overtime percent for Team dialog box displays.

The maximum allowable overtime percentage is provided.

4. Type the overtime percentage that you want to apply to the team.
This percentage applies to all members of the team. You are not able to assign overtime on an individual resource basis.

5. Click the Update button.

The list of teams redisplay in the Document View section of the game board and the Overtime percentage column is updated for the applicable team. This rate remains until you adjust it back to ‘0’.
Scheduling Work

Purpose of this function

The Schedule Work function is used to implement action that will address work that is behind schedule.

The types of action that can be applied through this function are:
- The adjustment of work cell schedules.
- The changing of work priorities.
- The transfer of work between skills.
- The initiation of overtime.
- The adjustment of effort.
- The changing of permissions.

Launching the Schedule Work stage

1. Click the Schedule Work button located in the Control Panel section of the game board.

The game board redisplay is similar to the following illustration.

The exploded Tree view lists all the work cells for the team.
There are a number of variables that relate to the Schedule Work mode.

<table>
<thead>
<tr>
<th>Random Variables</th>
<th>Controlled Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Delays</td>
<td>Priority Setting</td>
</tr>
<tr>
<td>Target Date Priority</td>
<td>Resource Allocation</td>
</tr>
<tr>
<td>Minor Programs</td>
<td>Work Transfer</td>
</tr>
<tr>
<td></td>
<td>Work Sizing and Fitting</td>
</tr>
</tbody>
</table>

To display the work schedule for a specific team:

1. Click on specific team in the exploded Tree view whose schedule you want to display.

The Chart Legend in the Message Center section of the game board explains the color codes for the graph. Each bar represents a work cell.

The width of the vertical bars reflects the elapsed time period displays in the graph.

The prompted date is the current date based on the cycle of the game.

2. Use the Zoom function as described in Chapter 2 to zoom in on a section of the graph.
3. Click on a vertical bar to display information about the selected work cell in the Schedule Work dialog box.

The dialog box provides specific information about the projected finish date versus the system due date as well as the amount of effort required in man-days.

In addition, the graph shows two green squares that represent the 'Early Start Date' and 'Late Finish Date' for the selected work cell. If you hold the mouse pointer over the green squares a pop-up box indicates the point that is represented by the square.

The 'Early Start Date' is the earliest projected date that the work cell will be able to begin. This is based on the projected finish date of input work cells.

The 'Late Finish Date' is the last possible date by which the work cell must be completed in order to meet the planned start date of output work cells.

In the illustration show above, the 'Late Finish Date' is earlier than the 'Early Start Date'. This is an indication that the work cell is seriously behind schedule and it is delaying the start date for a following work cell.

When a diagonal line crosses the selected work cell as it does in the above illustration, this indicates that the 'Late Finish Date' precedes the 'Early Start Date'

Every effort must be made to expedite the work on this cell otherwise there will be a major impact on the completion date of a design program.
To review work cell inputs and outputs

Work cell inputs and outputs as viewed through the selection of the Work Cell icon in the Information Type section of the game board, can also be directly launched from the Schedule Work function.

1. Use the steps covered in this chapter to display the work cells relating to a specific engineering team through the Schedule Work function.

2. Use the Zoom function to enlarge a section of the graph.

3. Select a specific work from the cells displayed in the bar graph.

Detailed information about the selected work cell displays in the Schedule Work dialog box.

4. Select the I/O View button

The Document View section of the game board redisplay with the Input and Output information for the selected work cell.
This information can be used to identify the inputs to the selected work cell. If any of these inputs are late, communication should be made with the game player responsible for the cell to expedite the work.

5. Click the Continue button in the Show Work Cell Detail dialog box to return to the Plan Schedule function.

To adjust the starting date of a work cell

In the early cycles of the game, a game player is only able to change the position of a work cell in the schedule. As the game progresses, other scheduling options become available.

1. Use the zoom function to enlarge the detail level and identify work cells that require adjustment.

![Image of Work Schedule For 'TE01' with yellow highlighted sections]

As an example, in the above illustration, all three work cells need some kind of schedule adjustment. Two of the work cells are overlapping as indicated by the yellow section.

2. Use the mouse to drag work cells to the right or left in the graph so that if possible, the color of a work cell is teal.

The cell can be dragged to any position to the left of the vertical blue line that represents the current date.

It should also be dragged to a position where the leading edge of the work cell is equal to or later than the current ‘Earliest Start Date’ for the work cell.

In the above example, the first work cell changes to teal if the cell is dragged to the right. The overlap of the second and third work cells is eliminated if the third work cell is also dragged further to the right. The middle cell changes to teal when it is dragged slightly to the right.
In this example, the third work cell cannot be adjusted sufficiently to cause it to change to teal, because the amount of effort required in man-days exceeds the available time between the ‘Early Start Date’ and the ‘Late Finish Date’. Other approaches must be tried such as adding overtime or resources.

To adjust work cell priorities

Work cell priorities can be adjusted by changing the order in which the cells are aligned on the bar graph.

This approach is useful when the time frame between the ‘Early Start Date’ and the ‘Late Finish Date’ for a given work cell is long relative to the amount of effort required, and there is some overlap with the time frame of another cell.

1. Use the Zoom tool to enlarge the section of the graph requiring an adjustment of cell priorities.
2. Select the different work cells in turn, and identify potential opportunities for changing the scheduling priority of two or more work cells.

In the above illustration, the scheduling and overlap problems for the first (‘A’) and second (‘B’) work cells were corrected by reversing their order on the schedule.

It is not always possible to eliminate late work cells. When this happens, it is important to complete the work as soon as possible and to take action to complete subsequent cells on time if possible.

To adjust work cell effort

The width of a ‘Team’ row in the graph reflects 100% of available team effort. This can be reduced so that the team resources can be assigned concurrently to 2 or more work cells.

The coordination problems of having too many individuals working on the same work cell at the same time can lead to inefficiencies. Therefore, it is more efficient to split resources among different work cells when possible.

1. Use the steps explained in this chapter to display the section of the graph where you what to adjust the level of effort.

2. Select the specific work cell.
When you select a work cell, four small squares display.

The two green cells represent the Early Start date and the Late Finish Date. The two black squares are 'handles' on the work cell that can be used to adjust the amount of effort.

3. Use the mouse pointer to grab one of the black 'handle' squares.

4. Drag the handle to change the height of the work cell.

Since the amount of effort in man-days remains the same, a reduction in height results in an increase in the width meaning that the work spreads over a longer period of time.

5. Adjust the size of another work cell that has similar Start and Finish dates.

6. Drag the two cells and position them so that one is above the other. This means that they are both being worked on at the same time.

To initiate overtime

When it is impossible to complete a work cell by the 'Last Finish Date' even when 100% of the effort is being applied, a game team can elect to use overtime to reduce the amount of the delay. This will also minimize the impact on any work cells that rely on the completion of this cell.

1. Use the steps explained in this chapter to display the graph for the applicable engineering team.

2. Select the O/T button in the Schedule Work dialog box.

The Set Overtime Per Cent for Team dialog box displays.
3. Type the percentage of overtime that you want to apply, up to the allowed maximum.

The overtime applies to the entire team, not just an individual or a work cell.

4. Click the Update button to update the overtime records.

The overtime rate remains for the selected engineering team until it is changed through either the Schedule Work function or the Plan teams function.

To transfer work cells between skills

Another option for handling scheduling problems is to transfer a work cell to a matching skill that has surplus capacity. Work can only be transferred between cells with the same engineering skill.

This option is not available in the early cycles of the game.

1. Use the steps explained in this chapter to display the graph for the engineering team whose schedule you want to modify.

2. Select the Transfer button in the Schedule Work dialog box

The game board redisplay. The tree view lists the different Staffs. The 'Show Flagstones by Staff dialog box displays in the Control Panel section of the game board.

3. Explode the Tree View and select the appropriate Skill level for which you want to initiate work cell transfers.

All teams for the selected skill display.
4. Select the work cell that you want to transfer and drag it to the row that corresponds to the team that is to receive the work.

You can only transfer a work cell that is the responsibility of your game team. The team that is the intended recipient of the transfer must have their permissions set to accept a transfer. If the permissions are not correctly set, a dialog box displays. See the section ‘To change work cell permissions’ for instructions on setting the permit.

If the transfer is permitted, the game board redispalyes with the Confirm Work Cell Transfer dialog box displayed.

5. Click the Confirm button to confirm the transfer.

The game board redispalyes and the work cell appears in the other teams section of the graph.

6. Adjust the schedule to minimize late completion dates.
To set ‘Accept’ or ‘Transfer’ permissions

Permissions define whether or not a design team to is willing to accept work or resources from another team or willing to permit the transfer of work or resources to another engineering team. You are only able to change the permissions for teams controlled by your game player. Use the mail function to communicate with another team if your need them to modify the permissions for one of their engineering teams.

1. Select the Transfer button from the Schedule Work dialog box.

2. Select the Permits button from the Show Flagstones By Staff dialog box.

The ‘Okay to Accept’ and ‘Okay to Transfer’ sections show the current status of these permissions.

3. Select the team whose permissions you want to change from the table in the Document View of the game board.

4. Select the Modify button to display the Set Permissions dialog box
5. Select the applicable radio button(s).

6. Click the Update button to redisplay the permission settings.

7. Click the Continue button.
Purpose of this chapter

This chapter explains the purpose of the Advance Play function and the activities for advancing play in both the standalone and network versions of the game.

Purpose of the Advance Play function

When the Advance Play function is triggered, the system advances the date. The default length is two weeks but the Game Administrator can change this time period. In addition to advancing the date, the function also processes the decisions made by individual game teams and updates the work activities based on these decisions and system-controlled variables.

This function enables the game players to simulate several months of activity within an elapsed time of only a few hours.

Game player requirements for advancing play

Each game player must notify the system that they are ready for the game to be advanced by two weeks.

1. Click the Advance Play button in the Control Panel section of the game board.

The game board redisplayes with the current status of each team displayed in the Document View section of the game board.

The “OK to Advance” column indicates whether or not a specific staff and skill for a game player has notified the system of their state of readiness to advance play by two weeks.

A value of ‘0’ indicates that they are not yet ready to advance.
A value of ‘-1’ indicates that they are ready to advance.
2. Select a staff and skill for the applicable game player that has an ‘OK to Advance’ value of ‘0’ from the list of players shown in the Document View section of the game board.

<table>
<thead>
<tr>
<th>Player</th>
<th>Staff</th>
<th>Skill</th>
<th>Team</th>
<th>OKToAdvance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD01</td>
<td>0</td>
</tr>
<tr>
<td>Test01</td>
<td>Body</td>
<td>Design</td>
<td>BD02</td>
<td>0</td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE01</td>
<td>0</td>
</tr>
<tr>
<td>Test01</td>
<td>Test</td>
<td>Integrate</td>
<td>TE02</td>
<td>0</td>
</tr>
</tbody>
</table>

The Advance dialog box for the selected player displays in the Control Panel section of the game board.

3. Click the Modify button.

The Notify Game Manager of Readiness to Advance dialog box displays.
4. Select the ‘Yes’ radio button.

5. Click the Update button.

The OK to Advance status updates.

6. Repeat steps 2 through 5 if there are other staff groups or skills under the control of the game player that do not show an ‘OK to Advance’ value of ‘-1’.

Game Facilitator information for advancing the game

The Engineering Factory Manager function must be open on a PC before the game is able to advance the defined period of time. (Default is two weeks).

- When participants are involved in Standalone play, this function must be open on each PC.

- When participants are involved in the Network version, the function runs on the server.

1. Use Windows Explorer to locate the Microsoft Access database EngFactMgr.mdb.

If the default installation settings were used, this will be in the c:\programs\EngFact\Data directory.

2. Launch the program.

A window similar to the following should automatically display once the file opens.
If this window is visible, the game will advance automatically once each game player has signaled that it is okay to advance.

To force the game to advance

The facilitator can force the game to advance without waiting for each game player to signal their readiness by following the steps listed below. For example, the Facilitator may want to advance the game a few weeks before play begins. This is often the case when the game players begin the network version of the game following the practice session.

1. Click the Execute Game Commands button.

A window similar to the following displays.
2. Select ‘ADVANCE’ from the drop-down list.
3. Click the Execute Command button.

The system processes the controlled and random variables and advances the time by the defined time period (default period is two weeks).

4. Select the Close button.

The Status shows as Processing command ‘ADVANCE’.

Once the processing is complete, the status changes.
Reviewing Scores

Purpose of this chapter
This chapter explains the different scores tracked by the Engineering Factory Game.

The costs associated with a late program delivery far exceed the cost of resources used to meet the delivery date. Therefore, a general strategy to be followed in this game is to do whatever is necessary in order to keep work cells and programs on time. Once the delivery dates are under control, efforts can then be made to reduce the cost of meeting these deadlines.

Since each score represents a ‘penalty’, the objective is to have the lowest possible score.

To launch the Score function
1. Click the Score icon from the Information Type section of the game board.

The game board redisplayes with a view similar to the following.
Chapter 10 – Reviewing Scores

The current total score displays in the Document View section of the game board.

2. Expand the History value in the Tree View.

The expanded Tree View for this function lists the three different scores and the specific score grouping within each score.

3. Select the ‘By Player’ option from the Tree view.

The Tree view re-displays with the different game players listed.

4. Select a specific game player.

The three scores display in the Document view of the game board.

Types of scores

There are three basic scores that are tracked in the Factory Engineering game.

- Program Delivery
- Cell Delivery
- Resource Performance

The Chart legend indicates the line that represents each score. The line markers indicate the start of end of the game cycles. (Usually a two week time period.)
Each of these scores has different tracking levels. Each score is based on 33.33% with a high score being best.

The three scores are added together with weights. The default weights are .3333 but the Game Administrator can change the weights.

The objective is to strive for a total score of 100%.

All scores are equally important.

Program Delivery Score

This score measures the efficiency and effectiveness of all game players as they work together to complete individual programs on time.

The Program Delivery score is computed as follows:

- Compute the following value for each program:
  \[ 1 - \frac{\text{Program Days Late}}{\text{Game Days Played}} \]
- Raise each ratio to the power 4 (i.e. multiply it by itself 4 times). This makes the resulting number smaller than the original ratio.
- Multiply the result by 100%.
- Pick the smallest result among the programs.

Cell Delivery Score

This measures the efficiency and effectiveness in the completion of individual work cells. This score is tracked by individual work cell, by individual player and by team.

The Cell Delivery Score is computed as follows:

- Compute the following value for each cell:
  \[ 1 - \frac{\text{Cell Days Late}}{\text{Game Days Played}} \]
- Raise each ratio to the power 2 (i.e. multiply it by itself once) This makes the resulting number smaller than the original ratio.
- Multiply the result by 100%.
- Compute the average score across all cells owned by the player or team displayed.

Resource Performance Score

This score measures the efficiency and effectiveness of individual teams and of individual resources within a team.
The Resource Performance Score is computed as follows:

- Compute the ratio of Cost Allowed for Work Completed to Cost of Work Completed multiplied by 100% for each work cell.

- Average these percentages over all work cells owned by the player or team displayed. The ‘Cost of Work Completed’ includes the accumulated salaries and overtime of all personnel working on this cell for the actual time required to complete it. The ‘Cost Allowed for Work Completed’ multiplies the actual work done by a standard salary and efficiency rating.
Customization Features

Purpose of this chapter

This chapter explains the key customization features that are provided with the Engineering Factory game and available to the Game Facilitator.

To access the customization features

1. Select the \Data\engfactmgr.mdb file from the directory where you installed the software for the Engineering Factory game.

When this database is launched, the TableStatus form automatically displays.

2. Click the Edit Game Parameters button.
3. A select of buttons display with the various customization functions.

NOTE: When the customization features covered in this chapter are applied, it is necessary to recreate the database before they take effect.

The steps for completing this process are covered in Chapter 1 – Installing The Software under the topic ‘To rebuild the EngFact database’.

To edit player names and passwords

1. Select the ‘Edit Player names and Passwords’ button.

The list of all players, passwords and nicknames displays.

<table>
<thead>
<tr>
<th>Player</th>
<th>Code</th>
<th>Nickname</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body03</td>
<td>eco</td>
<td>LongShot</td>
</tr>
<tr>
<td>Chass01</td>
<td>tgu</td>
<td>Fireball</td>
</tr>
<tr>
<td>Electrical01</td>
<td>ts</td>
<td>AheadOTime</td>
</tr>
<tr>
<td>Body02</td>
<td>dgu</td>
<td>UnderHovor</td>
</tr>
<tr>
<td>Chass03</td>
<td>in</td>
<td>Turbo</td>
</tr>
<tr>
<td>Test02</td>
<td>ng</td>
<td>DoAgain</td>
</tr>
<tr>
<td>Test02</td>
<td>in</td>
<td>NeverWrong</td>
</tr>
<tr>
<td>Chass02</td>
<td>gpe</td>
<td>Supercharged</td>
</tr>
<tr>
<td>Electrical02</td>
<td>nz</td>
<td>OnTrack</td>
</tr>
<tr>
<td>Electrical03</td>
<td>ndy</td>
<td>OnTheMoney</td>
</tr>
</tbody>
</table>

2. Click in the field that you want to edit.
3. Type the new name, password or nickname.
4. Tab out of the field.

When you exit this form, the changes save automatically.

To assign the design teams to players

1. Select the ‘Assign Design Teams to Players’ button.

The current player for each design team displays.
2. Select the drop down list for the design team where you want to change the player.

3. Select the new player.

When you exit this form, the changes save automatically.

To edit team transfer permissions

1. Select the ‘Edit Team Transfer Permissions’ button.

This function allows you to change the maximum allowable head count for each game player and to change the default setting for the permissions.

2. Select a field under the MaxHeadCount column to change the maximum head count allowed for a design team.

The ‘OK To Accept’ permissions flag indicates whether or not the design team for a specific game player is willing to accept additional work cells or additional personnel from another game player.
The ‘OK To Transfer permissions flag indicates whether or not the design team for a specific game player is willing to transfer additional work cells or additional personnel to another game player.

3. De-select a flag in one of the permission fields to change the default permission settings.

When you exit this form, the changes save automatically.

To edit a team’s default behavior

1. Select the ‘Edit Design Team Default Behavior’ button.

This feature allows you to change four default rule settings for the different design teams.

2. Select the appropriate rule for a selected design team.

3. Close the function to save the rule change(s).

Priority rule

This rule is used for defining the rule for prioritizing work cells. The options are:

- Earliest late start date
- Highest user priority
- User-defined effort

Effort rule

This rule is used for assigning the default amount of effort to the current work cells.
The options are:

- Assign 100% on top priority.
- Spread the effort 33%, 33% and 34% on the top three priorities.
- Spread the effort 60%, 30% and 10% on the top three priorities.
- Assign a user-defined effort.

Training rule

This rule is used for assigning the default rule for training personnel.

The options are:

- Never auto train.
- Train midway through the experience level.
- Train when promoted

Hiring rule

This rule is used for assigning the rule for hiring personnel.

The options are:

- Hire personnel with experience level 2 or better.
- Hire personnel with experience level 3.
- Hire the least experienced available.
- Hire the most experienced available.
- Never auto-recruit.

4. Select the appropriate default rule(s) for each design team.

When you exit this form, the changes save automatically.

To edit the situation schedule

1. Select the ‘Edit Situation Schedule’ button.
Chapter 11 – Customization Features

### Microsoft Access - [Situation Schedule]

<table>
<thead>
<tr>
<th>Title</th>
<th>Visible On Cycle</th>
<th>Is Visible at Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 Priority Scheduling</td>
<td>1</td>
<td>✓</td>
</tr>
<tr>
<td>002 Overtime</td>
<td>1</td>
<td>✓</td>
</tr>
<tr>
<td>003 Transfer Work</td>
<td>2</td>
<td>✓</td>
</tr>
<tr>
<td>004 Multi-Stage Training</td>
<td>3</td>
<td>✓</td>
</tr>
<tr>
<td>005 Recruiting Personnel</td>
<td>3</td>
<td>✓</td>
</tr>
<tr>
<td>007 Transfer Personnel</td>
<td>4</td>
<td>✓</td>
</tr>
<tr>
<td>008 Sales Effort</td>
<td>5</td>
<td>✓</td>
</tr>
<tr>
<td>009 Arm Rest Cuts</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>010 Cash Bar</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>011 Speaker Design</td>
<td>8</td>
<td>✓</td>
</tr>
<tr>
<td>012 Simplification</td>
<td>9</td>
<td>✓</td>
</tr>
<tr>
<td>013 CAD Tubest High</td>
<td>9</td>
<td>✓</td>
</tr>
<tr>
<td>014 Breakthrough</td>
<td>9</td>
<td>✓</td>
</tr>
<tr>
<td>015 Hinge Sourcing Late</td>
<td>10</td>
<td>✓</td>
</tr>
<tr>
<td>016 DFM Analysis</td>
<td>10</td>
<td>✓</td>
</tr>
</tbody>
</table>

This feature allows you to define the cycle in which you want a specific situation to display and whether or not it is to be visible at the beginning of the cycle.

This feature is useful when you need to reduce the duration of a game and therefore want to have situations appear in earlier cycles than the default values.

2. Select the appropriate situation and change the value in the cycle number field to the cycle in which you want a situation to appear.

3. Select the flag for a specific situation if you want it displayed at the beginning of a cycle.

When you exit this form, the changes save automatically.

### Microsoft Access - [Edit Program Generator Parameters]

<table>
<thead>
<tr>
<th>Program Prefix</th>
<th>8MAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Program ID</td>
<td>930</td>
</tr>
<tr>
<td>Days Between Releases</td>
<td>98</td>
</tr>
<tr>
<td>Days Before Release</td>
<td>540</td>
</tr>
<tr>
<td>EPN Base Number</td>
<td>262000</td>
</tr>
<tr>
<td>EPILe Per Program</td>
<td>6</td>
</tr>
<tr>
<td>Max Difficulty Factor</td>
<td>3</td>
</tr>
<tr>
<td>Random Seed</td>
<td>12345</td>
</tr>
</tbody>
</table>

To edit program generator parameters

1. Select the ‘Edit Program Generator Parameters’ button.
This feature allows you to modify various parameters relating to the design programs.

2. Select the field for the parameter you wish to change and type the new value.

When you exit this form, the changes save automatically.

To edit miscellaneous game parameters

1. Click the ‘Edit Miscellaneous Parameters’ button.

```
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Delivery Score Weight</td>
<td>0.3335</td>
</tr>
<tr>
<td>Work Cell Delivery Score Weight</td>
<td>0.3320</td>
</tr>
<tr>
<td>Resource Cost Score Weight</td>
<td>0.3335</td>
</tr>
<tr>
<td>Effort-Duration Trade-off Efficiency</td>
<td>0.8</td>
</tr>
<tr>
<td>Maximum Overtime Per Cent</td>
<td>65</td>
</tr>
<tr>
<td>Training Efficiency Gain</td>
<td>0.1</td>
</tr>
<tr>
<td>Training Duration (in days)</td>
<td>53</td>
</tr>
<tr>
<td>Days per Advance Cycle</td>
<td>14</td>
</tr>
<tr>
<td>Is Overtime Initially Enabled?</td>
<td></td>
</tr>
<tr>
<td>Is Work Sharing Initially Enabled?</td>
<td></td>
</tr>
<tr>
<td>Is Recruiting Initially Enabled?</td>
<td></td>
</tr>
<tr>
<td>Is Transfer to Pool Initially Enabled?</td>
<td></td>
</tr>
<tr>
<td>Is Effort Scaling Initially Enabled?</td>
<td></td>
</tr>
</tbody>
</table>
```

This feature enables you to change various game parameters from the default values.

2. Select the applicable parameter and change the value in the field or the flag setting to the desired value.

When you exit this form, the changes save automatically.
Presentation

Purpose of this chapter

This chapter provides a series of overheads that can be copied on foils and used by the facilitator to introduce a game session.

Topics
- Cover slide
- Agenda
- Learning Objectives
- Milestones View
- EPN View
- Network View
- Work Cell Set
- Team View
- Resource Pool: Skill Sets
- Resource Deployment: Skill Sets to Teams
- Individual Profile
- Modes of Play
- Planning Variables
- Scheduling Variables
- Game Play Screen
- Screen Content
- Game Setup and Play
- Roadmaps – Team Capacity Planning
- Roadmaps – Work Scheduling
- Measurements / Scoring
- Players Assignments
- Recap / Review
GM Truck Engineering

THE
ENGINEERING FACTORY
GAME

GAME PLAY
x/xx/xx
AGENDA

“The Engineering Factory Game”

♦ Introduction
♦ Game Demo
♦ Kickoff
♦ Competitive Game Play
♦ Recap
♦ Kickoff
♦ Cooperative Game Play
♦ Recap
LEARNING OBJECTIVES

Learn to improve the efficiency and effectiveness of the truck design process through experiential learning by:

♦ Scheduling work to meet Work Cell delivery dates.
♦ Coordinating work with other Design Teams to improve Major Program delivery dates.
♦ Selecting appropriate people for Design Teams.
♦ Scheduling work to maximize deployment of people and reduce resource cost.
♦ Adopting more efficient Technology Design Tools through training.
♦ Using information effectively.
MILESTONES VIEW

GAME TIME DOMAIN:
2 years, 50 two week periods

Major Programs

MAJOR PROGRAM DESIGN NETWORKS

 COMMON WORK CELL SETS

status color codes
planned = cyan
completed = green
behind = red
**EPN VIEW**

Each EPN explodes to a network

<table>
<thead>
<tr>
<th>Major Programs:</th>
<th>Sub Systems:</th>
<th>Chassis</th>
<th>Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

Two or three EPN’s per Sub System

~ 30 to 50 networks per game play
# NETWORK VIEW

<table>
<thead>
<tr>
<th>STAFF</th>
<th>TEAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Shows Work Cell relationships
- w/o time scale

**Status color codes**:
- planned = cyan
- completed = green
- behind = red
WORK CELL SET

INPUT

MAKES

OUTPUT

STAFF/TEAMS:

BODY

CHASSIS

ELECTRICAL

TEST

WORK CELL DETAIL

STAFF______ SKILL______
DELIVERABLES____ TEAM____
(MAN) DAYS WORK LEFT____
IS WORK READY?___________

LEGEND

- REQUIREMENT COMPLETE
- WAITING
- WORK CELL
# TEAM VIEW

<table>
<thead>
<tr>
<th>Staff</th>
<th>Design</th>
<th>Develop</th>
<th>Verify</th>
<th>Integrate</th>
<th>Release</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concept</td>
<td>Geometry</td>
<td>Physical</td>
<td>Designs</td>
<td>Product</td>
</tr>
<tr>
<td>Body</td>
<td>BD01</td>
<td>BV01</td>
<td></td>
<td></td>
<td>BR01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BV02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BV03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chassis</td>
<td>CD01</td>
<td></td>
<td></td>
<td>N/A</td>
<td>CR01</td>
</tr>
<tr>
<td>Electrical</td>
<td>ED01</td>
<td></td>
<td></td>
<td></td>
<td>ER01</td>
</tr>
<tr>
<td>Test Center</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Note:**
One, two or three teams per Skill/Staff

~ 20 to 30 teams per game play
RESOURCES POOL: Skill Sets

Note: Skill sets include both regular Corporate employees and Contract personnel.
RESOURCE DEPLOYMENT: Skill
Sets to Teams

Skill Set

Team #1
- Attrition
- Recruiting
- Transfer

Team #2

Team #3
INDIVIDUAL PROFILE

<table>
<thead>
<tr>
<th>Skill / $ Level</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>100%</td>
</tr>
<tr>
<td>Qualified</td>
<td>80%</td>
</tr>
<tr>
<td>Trainee</td>
<td>55%</td>
</tr>
<tr>
<td></td>
<td>30%</td>
</tr>
</tbody>
</table>

Learning Curve

Training

$\text{NOW}$
MODES OF PLAY

Planning Resources of regular Corporate employees and Contract personnel to maximize their individual and Design Team efficiencies. Game activity is at the individual level, except for overtime that is at the team level.

Scheduling Work to maximize the design effectiveness of each Design Team and the collective Team. Game activity is at the team level.
PLANNING VARIABLES

RANDOM

♦ Attrition

♦ Learning Technology Options

CONTROLLED

♦ Overtime
♦ Recruit
♦ Transfer
♦ Train
SCHEDULING VARIABLES

RANDOM

♦ Design Delays
♦ Target Date Priority
♦ Design Rework
♦ System Problems

CONTROLLED

♦ Priority Setting
♦ Work Transfer
♦ Work Scaling
GAME PLAY SCREEN
GAME SETUP and PLAY

♦ The game is initialized with Design Teams in place that covers all work on Major Programs.
♦ In the classroom, each player is assigned to a group of three. Each Group is given a set of Design Teams to manage.
♦ The game is advanced based on rules imbedded in the game engine (simulator).
♦ Between these game periods, players supersede the rules based on their review of status, and respond to random events, exercising controlled variables as they are made available, in both the planning and scheduling modes.
♦ Work cells not managed by players proceed based on rules imbedded in the game engine.
ROADMAPS

Team Capacity Planning

Man-Days
Days

Transfer
Recruit
Technology / Train
Overtime
Learning & Attrition

Enhanced Capacity (Efficiency)
Base Team Capacity (Efficiency)

Available in Stages: ROADMAPS for each Stage
ROADMAPS

Work Scheduling

Team 100% Capacity

Work Cells:

Work Content & Schedule

Serial: Priority

Work Transfer

Parallel: Scaling

Available in Stages: ROADMAPS for each Stage
MEASUREMENTS and SCORING

Major Program Delivery
♦ Based upon the number of program delivery days late.

Network Cell Delivery
♦ Based upon the number of network cell delivery days late.

Resource Cost Performance
♦ Based upon the resource cost for work days completed.

Overall Score
♦ A weighted average of the above parameter scores.
RECAP / REVIEW

Typical learning points for the facilitator to raise:

♦ What rule of work scheduling (serial or parallel) does the auto play use?
♦ Does the Flagstone Chart enable any scheduling advantages?
♦ Does this game provide for a finer level of planning and scheduling than the existing real work systems?
♦ Is information available in the game system that is not available in the real work system? If so, is there any utility in this additional data?
♦ What advantages are there with the game on-line communication?
♦ Did you pursue a strategy of using more or fewer subcontractors?
♦ As a result of having played the game, are there changes and improvements that you would like to have in your real work environment?