

FTAT

FREIGHT TECHNOLOGY ASSESSMENT TOOL



User Guide

Quality Assurance Statement

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1. WELCOME

The Federal Highway Administration (FHWA) works with its partners to evaluate potential technology solutions to improve the reliability, efficiency, and security of the freight transportation system. Technology evaluation is a complex process requiring analysis of many factors, including freight transportation needs, supply chain performance, costs, and benefits. Not surprisingly, the complexity increases as the number of criteria and parties involved rises.

Recognizing the need for evaluation tools to sift through technology options, FHWA developed the Freight Technology Assessment Tool (FTAT). The tool is aimed at giving decisionmakers the information and tools needed to invest wisely and prioritize future projects. Making good investment choices for the transportation system is critical to enhancing America's economic productivity and global connectivity.

1.1 What Is FTAT Software?

Freight Technology Assessment Tool (FTAT) software enables transportation planners and decisionmakers in both the public and private sectors to bring the power of qualitative as well as quantitative analysis to their technology assessment and selection. FTAT is a decision support system that helps decisionmakers evaluate potential technologies and their effect on the performance of the end-to-end business process. The business process is evaluated before and after the technology is deployed against an array of performance metrics to select the technology that will yield the best financial and non-financial performance. Through the combination of a qualitative and quantitative analysis, FTAT enables the prioritization of a group of technologies for deployment.

1.2 Who Is FTAT's Intended User?

FTAT software is designed to be used by public or private organizations or any group or person who would like to evaluate a technology's effect on an end-to-end business process.



2. INSTALLATION

2.1 Software Requirements

Prior to installing FTAT, the following components should be installed:

1. Windows Installer: For Windows 2000 (or earlier) users, this component may be missing; download the latest version from Microsoft's Web site <http://www.microsoft.com/downloads>.
2. Install .NET framework 1.1 or higher by downloading the latest version from Microsoft's Web site <http://www.microsoft.com/downloads/details.aspx?FamilyId=262D25E3-F589-4842-8157-034D1E7CF3A3&displaylang=en>.
3. Install Visio 2003 using the instructions supplied with the CD. If installed, you need to update it by inserting the CD and running the setup; select the "Add/Remove Features" option and click "Next," then select the ".Net Programmability Support" option.
4. Install Microsoft Office 2003 Web Components using the latest version from Microsoft's Web site <http://www.microsoft.com/downloads/details.aspx?FamilyID=7287252c-402e-4f72-97a5-e0fd290d4b76&DisplayLang=en>.

2.2 Installation Instructions

Insert the CD, and a menu will pop up. Follow menu instructions.



3. GETTING STARTED

After installation, the user can open the application using a shortcut icon placed on the desktop or by clicking on **Start > Programs > FTAT**.

After opening the application, the software will automatically create a new project file and the user will be asked to save that file. To open an existing file, go to the menu and click **File > Open**; an explorer window will open; select the file you want.



4. USING FTAT

Figure 1 shows the components in the Freight Technology Assessment Tool.

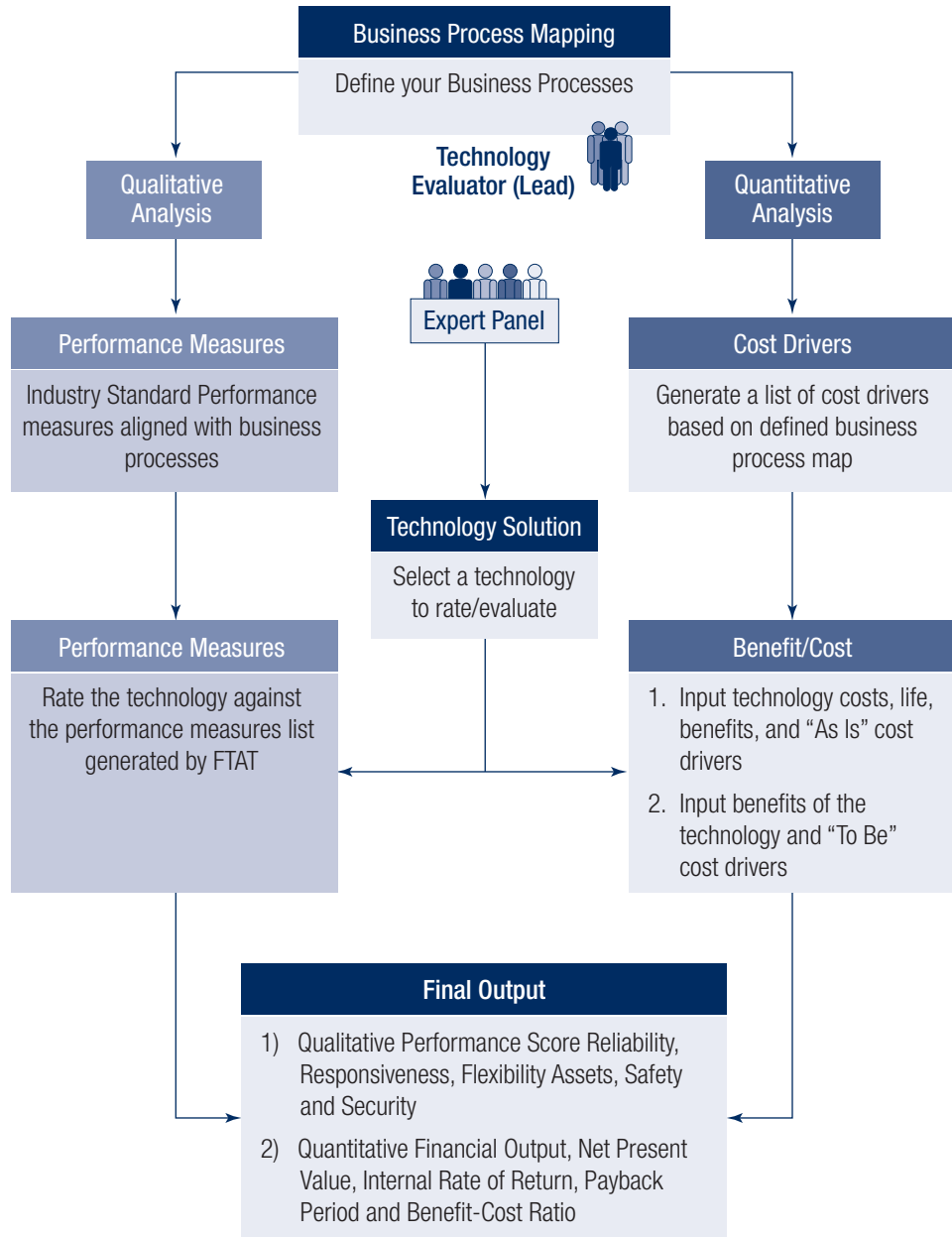


Figure 1. The Freight Technology Assessment Tool

The tool may be used from two perspectives, either the “Business Process Mapping/Technology Evaluator” perspective or the “Expert Panel” perspective. Each perspective is summarized as follows:

The Business Process Mapping/Technology Evaluator Perspective:

1. Defines/maps the different parties involved in the process.
2. Defines the relationship between the different parties.
3. Defines the business processes of each party.
4. Defines cost drivers.
5. Assigns cost drivers to business processes.
6. Generates a list of the cost drivers associated with the business process.
7. Inputs the as-is process cost.
8. Inputs the as-is cost driver value.
9. Defines qualitative measures.
10. Assigns qualitative measures to business processes.

The Expert Panel Perspective:

1. Selects a technology to be evaluated or defines a new technology.
2. Selects business processes that will be affected by the technology.
3. Rates the technology against the list of qualitative measures generated.
4. Runs the qualitative analysis using the Quality Function Deployment (QFD).
5. Inputs the technology cost information.
6. Inputs the to-be cost driver value.
7. Inputs technology benefits information.
8. Generates the output report.

Also, the Technology Evaluator or Expert Panel will have the right to:

1. Add new processes, assign performance measures to new processes, and assign cost drivers to new processes.
2. Add new performance metrics and assign new measures to processes.
3. Add a new cost driver and assign a new cost driver to processes.

The integrated methodology presented in Figure 1 is described below.

4.1 Business Process Analysis

4.1.1 Business Process Mapping

The Business Process Mapping portion enables a user to define and map the end-to-end business process. A user identifies business processes by documenting business units on a geographical map and assigning processes to business units by selecting from a predetermined list of processes or by defining new processes. The business processes can be mapped when users:

1. Select **Geographical Map** from the left panel.
2. Drag and drop a **shape** that identifies the node in the supply chain from the Supply Chain Stencil.
3. Select the **shape**.
4. Select **Edit > Edit Node** from the menu after which the **Edit Business Processes** window will open (Figure 2).

Figure 2. Edit Business Processes

5. Click the **Add Process** button at the bottom of the window, and the **Processes** window will appear (Figure 3).

Figure 3. Processes – Process Category

- a. Add a **Process Category** (Figure 3):
(The fields will be blank if no processes are added.)
 1. Type **Category ID**.
 2. Type the **Category Name**.
 3. Type the **Category Definition**.
 4. Click **Update**.

The screenshot shows a window titled "Processes" with a close button in the top right corner. It has three tabs: "Process Category", "Process", and "Cost Drivers". The "Process" tab is selected. The form contains the following fields and controls:

- Process ID:** A dropdown menu.
- Name:** A text input field.
- Process Category ID (Level 2 ID):** A dropdown menu.
- Definition:** A large text area for entering the process definition.
- Buttons:** "Delete" and "Update" buttons are located at the bottom right of the form area. A "Close" button is located at the bottom center of the window.

Figure 4. Processes – Process

- b. Add a **Process**:
 1. Go to **Process tab** (shown in Figure 4).
 2. Type **Process ID**.
 3. Type **Process Name**.
 4. Select the process **Category ID** from the drop-down menu.
 5. Type the **Process Definition**.
 6. Click **Update** and close window.
6. Click **Edit** on the toolbar and select **Edit Node**, after which a window will pop up. The added process will now appear in the screen shown in Figure 2.
7. Click boxes that apply to the supply chain partner.
8. Click **OK**.
9. Repeat steps 2 through 8 to add processes.
10. Select two shapes to **connect** the nodes in the supply chain in their flow order by selecting the **first shape** then holding the **Ctrl key** and then **selecting** the **second shape**; to establish the connection, click **Deliver** or **Return** on the toolbar.
11. After dragging and dropping all required shapes, select the one that is the focus of the study. Then click **Processes** on the toolbar or **Edit > Edit Node** from the menu and check the box next to the name of the process to indicate the node that is the focus of the study. If you don't, the program will select a default focus.

4.1.2 As-Is Processes Cost

The Business Process Mapping/Technology Evaluator user can input the cost of each process. The as-is process cost can be defined when users:

1. Click **As-is Process Cost** on the toolbar or select menu **Edit > Process Costs**.
2. A **Process List** is generated based on the business process mapped; the window that will pop up is shown in Figure 5.
3. Input the **Annual Cost** of each process.
4. Click **OK**.

Figure 5. Process Costs

4.1.3 Cost Drivers

The Business Process Mapping/Technology Evaluator user can generate a list of predetermined cost drivers or add a new cost driver. A new cost driver can be added when users:

1. Click the toolbar and select **Edit > Cost Drivers**; a window will pop up (as shown in Figure 6).

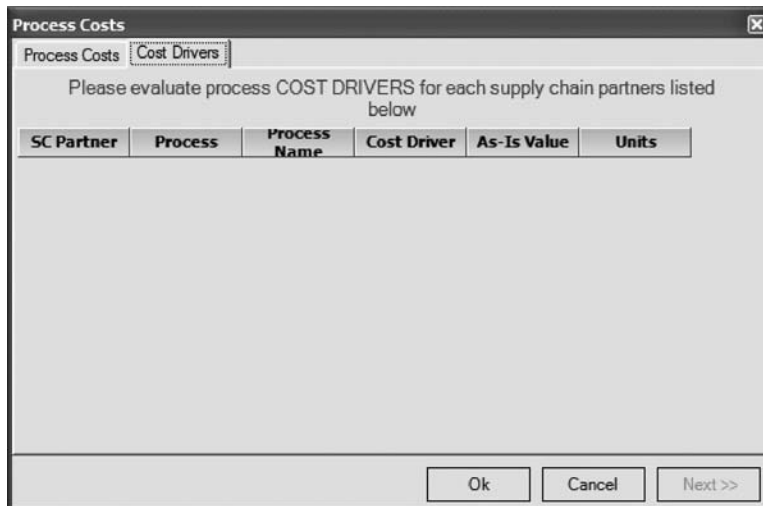
Figure 6. Cost Drivers

2. Add a **Process Cost Driver**:
 - a. Select **Process ID** from the drop-down menu.
 - b. Type **Cost Driver Name**.
 - c. Type the **Process Definition**.
 - d. Click **Add**.
 - e. Close window.
 - f. Repeat steps 1 and 2 to add other cost drivers.

4.1.4 As-Is Cost Driver Values

Business Process Mapping/Technology Evaluator users can enter the as-is value of a generated list of predefined cost drivers or newly added cost drivers. A cost driver is defined as the value that drives the cost of the process up or down. A cost driver value can be added when users:

1. Click **As-is Process Cost** on the toolbar or select menu **Edit > Process Cost**, then select the **Cost Drivers** tab (as shown in Figure 7).



Process Costs

Process Costs Cost Drivers

Please evaluate process COST DRIVERS for each supply chain partners listed below

SC Partner	Process	Process Name	Cost Driver	As-Is Value	Units
------------	---------	--------------	-------------	-------------	-------

Ok Cancel Next >>

Figure 7. Cost Drivers

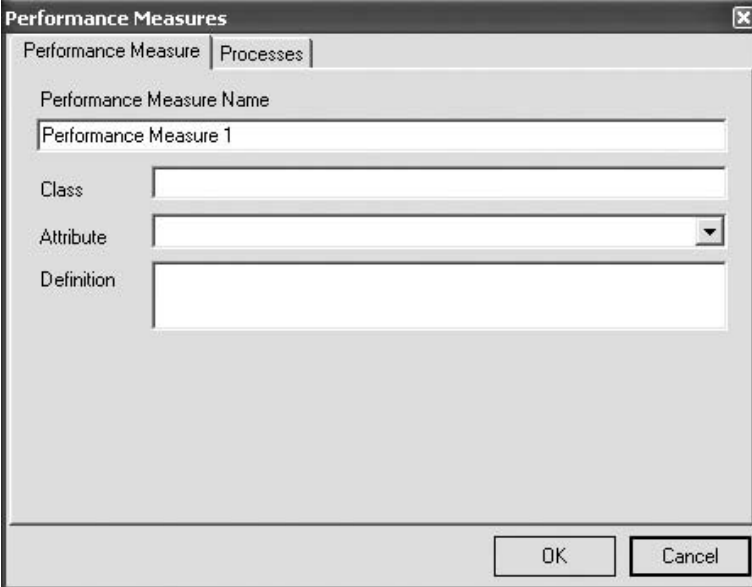
2. A **Cost Drivers** list is generated.
3. Input the **“As Is” Value** of each process.
4. Input unit information on the cost driver (e.g., year) by typing in the unit value or by selecting from the drop-down menu.
5. Click **OK**.

4.1.5 Performance Measures

Business Process Mapping/Technology Evaluator users can generate a list of predefined performance measures or add a new performance measure when they:

1. Select **Performance Measures** from the left panel.
2. Click the **Add** button below the right panel to cause a window to pop up (as shown in Figure 8).

3. Input the information related to the new performance measure:
 - a. Type **Performance Measure Name**.
 - b. Type **Performance Measure Class**.
 - c. Select **Performance Measure Attribute** from the drop-down menu.
 - d. Type **Performance Measure Definition**.
 - e. Click **Processes** tab.



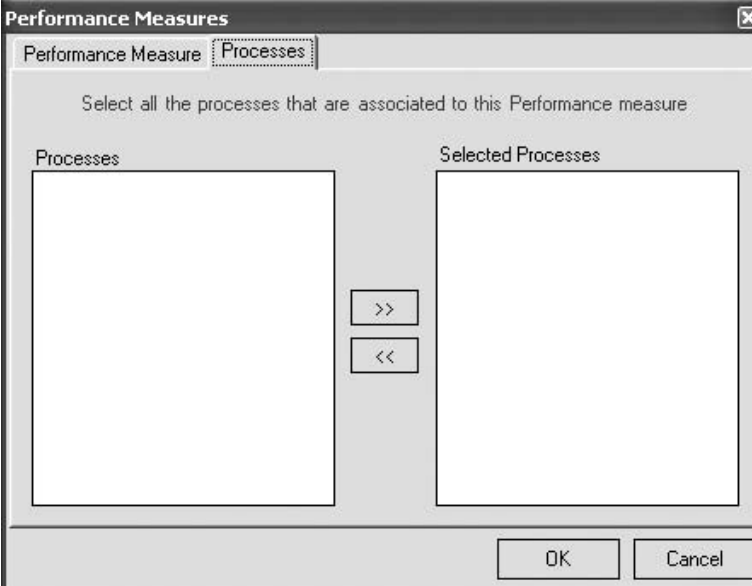
The screenshot shows a dialog box titled "Performance Measures" with a close button (X) in the top right corner. It has two tabs: "Performance Measure" and "Processes", with "Processes" currently selected. The dialog contains the following fields:

- Performance Measure Name:** A text input field containing "Performance Measure 1".
- Class:** An empty text input field.
- Attribute:** A drop-down menu.
- Definition:** A large empty text area.

At the bottom right, there are "OK" and "Cancel" buttons.

Figure 8. Performance Measures

4. When users select the **Processes** tab shown in the window above, a new window will open (as shown in Figure 9).



The screenshot shows the same "Performance Measures" dialog box, but with the "Processes" tab selected. The dialog contains the following elements:

- Performance Measure:** A tab labeled "Performance Measure" is visible but not selected.
- Processes:** A tab labeled "Processes" is selected and highlighted with a dashed border.
- Text:** "Select all the processes that are associated to this Performance measure".
- Processes:** An empty list box on the left.
- Selected Processes:** An empty list box on the right.
- Navigation:** Two buttons between the list boxes: ">>" (move right) and "<<" (move left).

At the bottom right, there are "OK" and "Cancel" buttons.

Figure 9. Performance Measures Processes

5. **Assign Processes** that apply to the new performance measure:
 - a. Select a **Process** from the left.
 - b. Click (>>) button or double-click the **Process**.
6. Click **OK**.
7. Repeat steps 1 through 6 to add other performance measures.

4.2 Technology Evaluation

The quantitative analysis is the second phase of the technology evaluation methodology used by the Freight Technology Assessment Tool. The tool enables the user to assess a technology (or a group of technologies) quantitatively by computing a set of financial measures for each technology. The financial measures include the net present value (NPV) of the technology(ies), internal rate of return (IRR), payback period, discounted payback period, and the benefit-cost ratio. To compute these financial measures, the user has to input some financial data for each technology. The inputs include technology costs (initial investment and annual costs), the useful life of the technology, and the required rate of return. The expert panel will add the to-be cost driver value to the technology benefits input (annual anticipated gains and cost reduction) related to processes (as-is process cost and as-is cost driver value during the business process mapping phase). The as-is process cost, the as-is cost driver, and the to-be cost driver will be used to compute the to-be process cost from which the process improvement cost will be computed. The process improvement cost is a direct input to the technology benefits.

4.2.1 Technology Selection/Rating

Expert Panel or Technology Evaluator users can define a new freight technology when they:

1. Select **Technologies** from the left panel.
2. Click the **Add** button from the toolbar below the right panel, after which a window will pop up (as shown in Figure 10).
3. Type **Technology Name**.
4. Type **Technology Class**.
5. Type **Technology Definition**.
6. Click **Update**.

4.2.2 Select Processes

Users must select processes that a particular technology will impact. To select processes, the user must:

1. Click **Next** or select the **Processes** tab, after which a window will be displayed (as shown in Figure 11).

2. Select **Processes** to identify what the technology will impact.
 - a. Double click the process or click the (>>) button to move it to the right.

Figure 10. Technology

Figure 11. Technology – Process

4.2.3 Performance Measures Ratings

The Expert Panel or Technology Evaluator user rates the technology with respect to performance measures. The ratings range from -5 to +5 (in increments of 1), where a negative rating indicates the technology downgrades the performance measure, a zero rating indicates the technology does not affect the performance measure, and a positive rating indicates the technology enhances the performance measure.

1. Click the **Rating** tab or **Next** button, after which a window will pop up (as shown in Figure 12):
2. A list of **performance measures** will be displayed.

3. The Expert Panel user will select a measure and use the drop-down menu under **Rating** to rate the performance measure.

Technology - Technology 1

Technology | Processes | **Rating** | Costs | Drivers | Benefits

Please rate this technology against the following performance measures

Performance Measure	Rating
---------------------	--------

Close Next >>

Figure 12. Intermodal Database – Rating

The completion of performance measure rankings is the first step toward evaluating a particular technology. The user will repeat the same step for other technologies, then move on to the next step, Quality Function Deployment (QFD), which qualitatively assesses a technology or group of technologies.

4.2.4 Technology Cost Information

The user will select a technology or define a new technology, then enter financial information for each technology as follows:

1. Click **Next** or select the **Costs** tab. A window will pop up with the **Cost fields** that need to be populated (as shown in Figure 13).

Technology

Technology | Processes | Rating | **Costs** | Drivers | Benefits

Initial Investment \$

Operating Cost per Year \$

Maintenance Cost per Year \$

Other Costs per Year \$

Useful Life

MARR

Close Next >>

Figure 13. Technology – Costs

2. Under Costs, type in Initial Investment, Operating Cost, Maintenance Cost, Other Costs, and Useful Life.

4.2.5 To-Be Cost Driver Values

The Expert Panel or Technology Evaluator user enters cost driver values based on the as-is process costs and as-is cost drivers defined and entered in the tool by the business process mapping user. **To-be cost drivers** can be populated when users:

1. Click **Next** or select the **Drivers** tab. A window will pop up (as shown in Figure 14).
2. Add the **To-Be** Cost Driver Value for each process

SC Partner	Process	Cost Driver	As-Is Value	To-Be Value	Units

Figure 14. Intermodal Database – Drivers

4.2.6 Technology Benefits Information

The Expert Panel or Technology Evaluator user will enter the monetary benefits of each technology. **Benefits** can be populated when users:

1. Click **Next** or select the **Benefits** tab. A window will pop up with the **Benefits field** to be populated (as shown in Figure 15).
2. Add all **Benefits**: Reduced Insurance, Reduced Pilferage, Reduced Customs, and Other Benefits.

That was the last step to be carried out in the integrated methodology. Up to this point the technologies were evaluated qualitatively and quantitatively. The final output of the methodologies is summarized in a table format with columns representing different technologies and rows representing qualitative criteria (i.e., performance attribute scores and total score) and quantitative criteria (i.e., financial measures such as IRR, NPV, and benefit-cost ratio).

3. Click **Close**

4. USING FTAT

- Repeat steps in section 4.2.1 through 4.2.6 to evaluate additional technologies.

The screenshot shows a software window titled "Wireless dispatch" with a tabbed interface. The "Benefits" tab is active, displaying several input fields for monetary values:

- Process Improvement \$: 144,400.00
- Reduced Insurance per Year \$: 100,000
- Reduced Pilferage per Year \$: 30,000
- Reduced Customs per Year \$: 10,000
- Other Benefits per Year \$: 0

At the bottom of the window, there are "Close" and "Next >>" buttons.

Figure 15. Wireless Dispatch

4.2.7 Quality Function Deployment (QFD)

The QFD portion enables the user to assess a technology qualitatively (or group of technologies) by generating a total score for each technology. The QFD analysis can be executed after defining the business process and rating the technology against the performance measures. The total score is computed automatically for each technology, given that an Expert Panel has rated the technology against the list of performance measures. The QFD (shown in Figure 16) can be executed when users:

- Select **QFD** from the left panel.
- Select menu **View > Update**.

The screenshot shows the QFD Matrix software interface. The main window displays a table with performance measures (rows) and technologies (columns). The table is as follows:

Performance Measures		Intermodal database	Wireless dispatch	Intermodal database with scheduling applications	Portal-cellphone-pda	Intermodal database, sched, and wireless
Reliability	Data accuracy	2	2	2	2	2
	Information Sharing Visibility	2	4	4	4	5
Security	Information Sharing Security	-1	-1	-1	-3	-3
	Physical Asset Security	-2				
	Cargo Security	-1				
Score		0	25	15	15	20

Figure 16. QFD Matrix

The QFD matrix, which consists of performance metrics (rows) grouped by performance attribute and technologies (columns), will be generated; it is populated with the ratings of each metric for each technology. The total score of each technology will be computed below the QFD matrix.

The primary QFD execution gives equal weight to performance attributes. However, relative weights of the seven attributes can be

altered to change the focus of the QFD analysis. For example, if the user would like to select a technology that increases the relative weight of security measures, the user would:

1. Click **Attribute Weights** from the toolbar in the QFD screen.
2. A window will pop up with **seven attributes**, all selected by default and weighted equally (as shown in Figure 17).

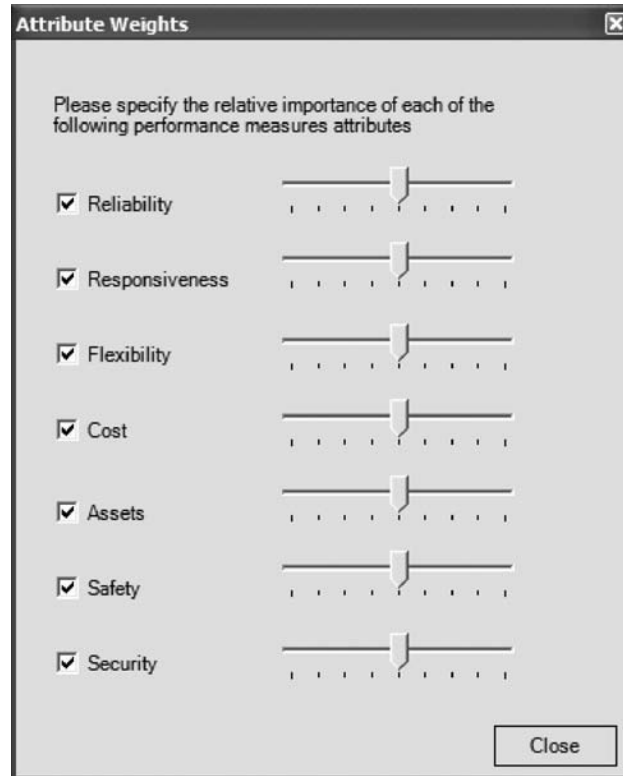


Figure 17. Attribute Weights

3. Select required performance **attributes**; deselect attributes that do not apply whatsoever.
4. Increase the **weight** of an attribute relative to all the other selected attributes' weights by moving the scale.

4.2.8 Final Output

The final output includes a summary report of the qualitative and the quantitative analysis of each technology, including its performance score, net-present value, internal rate of return, payback period (years), discounted payback period (years), and benefit-cost ratio.

The output summary can be generated by:

1. Selecting the **output summary** from the left panel.
2. Selecting menu **View > Update**.

4.2.9 Output Reports

Several output reports may be generated for a project and may be accessed by selecting **View > Report**, after which a window will pop up like the one shown in Figure 18.

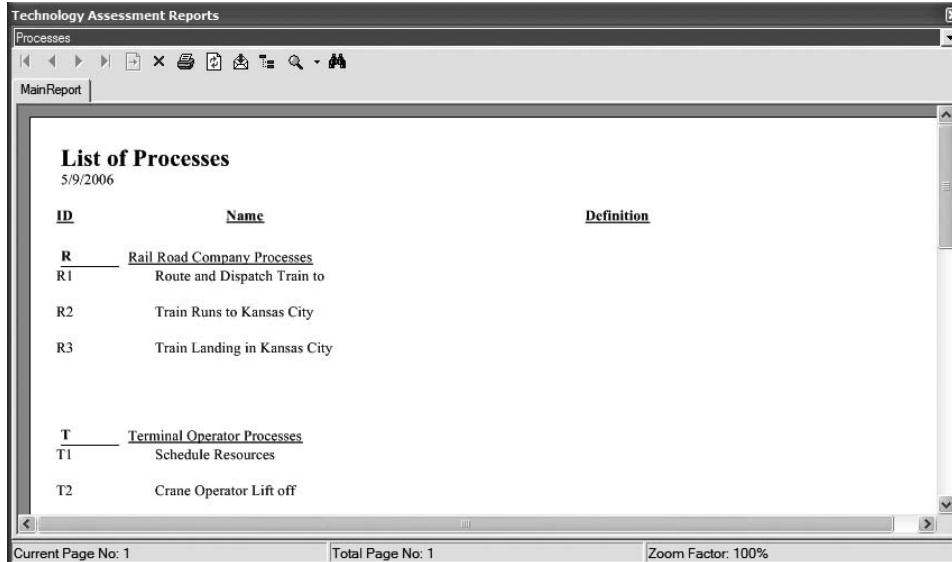


Figure 18. Reports

Reports can be generated for:

- Processes.
- Performance Measures.
- Process Costs.
- Technologies.
- As-Is Cost Drivers.
- Technology Ratings.
- Technology Assessments.

The user can print displayed reports by clicking the printer icon on the toolbar.

4.2.10 Export to Excel

The user can export the QFD worksheet and the output summary to Excel by selecting **File > Export to Excel**.

5. GLOSSARY OF TERMS

As-is Process Cost

The current cost of performing a process over a specified period prior to introducing the technology change being considered.

Benefit-Cost Ratio

A method used to help understand whether a new project or technology is economically feasible. The ratio is calculated by dividing the quantified benefits by a measure of the cost. A result greater than one means the project/technology is feasible; less than one means the project/technology is not feasible.

Business Process

A collection of activities that have definable starting and ending points and that achieve something of value to one or more organizations. For example, the business process of delivering a shipment can be described as a series of activities whose value is transferring the possession of goods.

Business Process Mapping

A tool used to understand business processes and a means to help meet one of several possible goals, such as measuring process performance or understanding how a business process would change if a new technology was applied. Business process maps generally include documenting specific activities or steps in the process, who performs them, and which activities are dependent on previous activities being completed.

Cost Driver

A factor related to an activity or a process that changes the volume or characteristics of that activity or process, and in doing so changes its costs. Activities and processes can have multiple cost drivers.

Cost Driver Value

The numeric value of the cost driver, including the units of that value.

Expert Panel

A group of domain experts who have the expertise and the authority to subjectively assess the impact of a particular technology on business processes and associated performance measures.

Internal Rate of Return (IRR)

Measures the attractiveness of an investment decision or proposed new project. IRR is the rate of return that would make the present value of future cash flows plus the final market value of an investment equal the current market price of the investment.

Net Present Value (NPV)

A measure used in capital budgeting to assess the profitability of a proposed investment or project. It is the difference between the sum of a project's benefits over time and the sum of the costs over time. To do this, monetary values are assigned to each benefit and cost. The calculation also recognizes the time value of money: that is, \$1 today is not worth the same as \$1 five years from now.

Payback Period

The length of time required to recover the cost of an investment. For example, if a \$1million investment generates a positive return of \$500,000 per year, then the payback period would be 2 years.

Performance Attribute

A characteristic of a performance measure.

Performance Class

A classification of performance measures in terms of attribute units, such as time and dollar value.

Performance Measure

A qualitative or quantitative measure of outcomes, outputs, efficiency, or cost-effectiveness. In general, measures should be related to an organization's mission and programs, and should not merely measure one-time or short-term activities.

Process Category

A high-level grouping of business processes. A category can be developed using a phase of the process flow, such as planning processes, execution processes, or enabling processes.

Process Category ID

An identifier used in FTAT that uniquely refers to a process category. Users should consider using a letter of the alphabet to identify a process category. For example, the letter "P" should be used to identify the "Plan" process category.

Process Definition

A brief description of the process that FTAT displays to users. The definition may include a summary of the kinds of activities included in the process and what organization is responsible for performing the process.

Quality Function Deployment

A structured method used to help connect user needs (or requirements) to the design features of a project proposed to address those needs. This method is particularly useful in accounting for needs that are not easily articulated or precisely defined.

Supply Chain

A collection of activities and organizations involved in moving products (for example, raw materials) from one point (such as a manufacturer's facility) to another (such as a customer's distribution center). It includes the exchange of both material and associated information flows (for example, shipment notices).

Technology Class

A term used to categorize the technology, such as software or hardware.

Technology Definition

A brief description of a specific technology, including some indication of the business application of that technology.



Technical Report Documentation Page

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16. Abstract <p>The Freight Technology Assessment Tool (FTAT) helps public and private organizations and individuals evaluate the effect that a technology, or group of technologies, has on the end-to-end business process. The technology is evaluated based on an array of performance measures. This information can be used to prioritize future projects. Making good transportation choices is critical to continued economic growth.</p> <p>FTAT combines and customizes well-defined and accepted industrial engineering approaches and benchmarking and uses best practices to determine the costs and benefits of using a particular technology.</p>					
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FTAT

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U.S. Department of Transportation
**Federal Highway
Administration**

U.S. Department of Transportation
Federal Highway Administration

Office of Freight Management and Operations

Phone: 202-366-9210

Fax: 202-366-3302

Web site: <http://www.ops.fhwa.dot.gov/freight>

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