

Grail 

Professional Services

Forecasting Case Study

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Forecasting

- Uses what is known now to make estimates or predictions about a project's status in the future.

Project Management Institute, A Guide to the Project Management Body of Knowledge, PMBOK® Guide) – Sixth Edition, Project Management Institute Inc., 2017, Pages 261-265.

Bottom-Up Estimate at Completion (EAC) Method

- **EAC = Actual Cost + bottom-up Estimate to Complete**
- It is the most commonly used estimate at completion method.
- Problematic method because detailed Estimate to Complete formulations are time consuming and calculated by people actually doing project work
- Time and effort required to perform these calculations are often not programmed into the cost to perform the project.

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Estimate at Completion (EAC) Method at Budgeted Rate: Temporary

- When you expect current inconsistencies or variances with past project estimates to be temporary, the EAC formula is as follows:
- **$EAC = (\text{Actual Cost} + \text{Budget at Completion}) - \text{Earned Value}$**

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Scenario 1: Temporary Change in the Price of a Key Material (Consumable)

- Your project management team is working on a construction project in Houston. Diesel fuel is a major cost in your project.
- A hurricane appears in the Gulf of Mexico in August, and (as a result) the price of diesel fuel dramatically increases.
- The hurricane does not do any damage to the refinery infrastructure, and the price of diesel fuel returns to its original price in September.

Budget at Completion (BAC) Scenario 1

Cost Projections

- BAC (original project budget) is \$1,000,000.
- At this point in the project (beginning of September), your project cost management plan says \$400,000 should have been spent.
- Cost remaining to finish the project is \$600,000.

Scenario 1 Cost Change

- The original total diesel fuel cost estimate for August for this project was \$25,000.
- Because of the hurricane, the total diesel fuel cost for August for this project is \$50,000 (\$25,000 *more* than originally projected).
- Hence, Actual Cost (AC) equals \$425,000 (\$400,000 as projected plus another \$25,000 to account for the increase in the price of diesel).

Scenario 1 Note

- Even if the actual cost varies (increase or decrease) from the projected cost, the value (e.g., earned value) of what is produced does not vary.
- Example: The value (e.g., earned value) of the construction project is \$400,000 at this point in the project even though \$425,000 has been spent (actual cost).

Estimate at Completion (EAC) Scenario 1

Cost Projections

- $EAC = (\text{Actual Cost} + \text{Budget at Completion}) - \text{Earned Value}$
 - Actual Cost: \$425,000
 - Budget at Completion: \$1,000,000
 - Earned Value: \$400,000
- $EAC = (\$425,000 + \$1,000,000) - \$400,000$
- $EAC = \$1,025,000$

Estimate at Completion (EAC) Method at Present Rate (Permanent)

- When you expect current inconsistencies or variances with past project estimates to continue in the future, the EAC formula is as follows:
- **EAC = Budget at Completion / Cost Performance Index**

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Scenario 2: Permanent Change in the Price of a Key Material (Consumable)

- Your project management team is working on a construction project in Houston. Diesel fuel is a major cost in your project.
- A hurricane appears in the Gulf of Mexico in August, and (as a result) the price of diesel fuel dramatically increases.
- The hurricane does significant damage to the refinery infrastructure, and the new (higher) price of diesel fuel will persist for the duration of the project.

Budget at Completion (BAC) Scenario 2

Cost Projections

- The project will take 10 months.
- BAC (original project budget) is \$1,000,000.
- The first three months of the project cost \$300,000 (actual cost), which is as predicted.
- The hurricane causes the cost of diesel fuel to increase by \$25,000 starting in month four, and this new higher cost of diesel fuel is expected to persist over the duration of the project.

Scenario 2: Calculating Cost Performance Index (CPI)

- $CPI = \text{Earned Value} / \text{Actual Cost}$
- Earned Value at the end of the project will be \$1,000,000.
- Actual cost at the end of the project will be \$1,000,000 plus the additional cost associated with the higher cost of diesel fuel.
- Added cost of the diesel fuel is $\$25,000 \times 7$ months, which is equal to \$175,000. The (projected) actual cost at the end of the project is \$175,000 plus \$1,000,000 or \$1,175,000.
- $CPI = \$1,000,000 / \$1,175,000$ or approximately .8511

Estimate at Completion (EAC) Method at Present Rate (Permanent) Cost Projections

- $EAC = \text{Budget at Completion} / \text{Cost Performance Index}$
- Budget at Completion: \$1,000,000.
- Cost Performance Index: .8511
- $EAC = \$1,175,000$

Estimate at Completion (EAC) Method Using Factors

- Assumption is cost performance to date has been negative and schedule cannot be altered (i.e., firm delivery date)
- **EAC = Actual Cost + [(Budget at Completion – Earned Value) / (Cost Performance Index x Schedule Performance Index)]**
- This formula is often used when schedule influences the estimate to completion costs (i.e., budget at completion minus earned value).

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Estimate at Completion (EAC) Method Using Weighted Factors

- Current CPI and SPI ratios are expected to continue for the duration of the project.
- The Cost Performance Index and Schedule Performance Index can be weighted differently in some instances (e.g., 60/40).

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Scenario 3: Estimate at Completion (EAC) Method Using Factors

- Your project management team is working on a construction project in Houston. Diesel fuel is a major cost in your project.
- The project will take 10 months.
- The first three months of the project cost \$300,000 (actual cost), which is as predicted.
- A hurricane appears in the Gulf of Mexico in August, and (as a result) the price of diesel fuel dramatically increases.

Scenario 3: Estimate at Completion (EAC) Method Using Factors (2)

- The hurricane does not do any damage to the refinery infrastructure, and the price of diesel fuel returns to its original price in September.
- BAC (original project budget) is \$1,000,000.
- At this point in the project (beginning of September), your project cost management plan says \$400,000 should have been spent.
- Cost remaining to finish the project is \$600,000.

Scenario 3: Estimate at Completion (EAC) Method Using Factors Cost Estimate

- The original total diesel fuel cost estimate for August for this project was \$25,000.
- Because of the hurricane, the total diesel fuel cost for August for this project is \$50,000 (\$25,000 *more* than originally projected).
- Hence, Actual Cost (AC) equals \$425,000 (\$400,000 as projected plus another \$25,000 to account for the increase in the price of diesel).

Scenario 3: Estimate at Completion (EAC) Method Using Factors Calculation

- You are at the end of month four.
- CPI = .94
- SPI = .9375
- $EAC = \$425,000 + [(\$1,000,000 - \$400,000) / (.94 \times .9375)]$
- $EAC = \$425,000 + \$680,851 = \$1,105,851$
- Note: If CPI and SPI were not used as factors, EAC would be \$1,025,000 (\$425,000 + \$600,000).

To-complete Performance Index (TCPI)

- TCPI calculates Cost Performance Index for remainder of venture and is based on a forecast from project management team
- What project must achieve (in terms of efficiency) to attain Budget at Completion or Estimate at Completion.

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To-complete Performance Index (TCPI) When the Original Budget is Valid

- If Budget at Completion (original budget) is still valid but the project is not on budget (e.g., due to mismanagement), use the following formula:
- $(\text{Budget at Completion} - \text{Earned Value}) / (\text{Budget at Completion} - \text{Actual Cost})$

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Scenario 4: Calculating To-complete Performance Index (TCPI)

- Your project management team is working on a construction project in Houston.
- Due to mismanagement, the project has cost more than planned at this point in time.

To-complete Performance Index (TCPI) Scenario 4 Cost Projections

- The project will take 10 months.
- BAC (original project budget) is \$1,000,000.
- The first three months of the project cost \$400,000 (actual cost), which is not as predicted.
- The project should have cost \$300,000 (earned value) during the first three months.

Scenario 4: Calculating To-complete Performance Index (TCPI)

- $TCPI = (\text{Budget at Completion} - \text{Earned Value}) / (\text{Budget at Completion} - \text{Actual Cost})$
 - Budget at Completion: \$1,000,000
 - Earned Value = \$300,000
 - Actual Cost = \$400,000
- $TCPI = (\$1,000,000 - \$300,000) / (\$1,000,000 - \$400,000)$
- $TCPI = 1.167$

Scenario 4 Notes:

To-complete Performance Index (TCPI)

- $TCPI = 1.167$. This means you must achieve a Cost Performance Index (CPI) of 1.167 over the remaining seven months.

Scenario 4 Check: To-complete Performance Index (TCPI)

- There is \$600,000 remaining in the budget (this must be your **actual cost** over the next seven months).
- You must achieve an **earned value** of \$700,000 over the next seven months (your current earned value is \$300,000).
- Cost Performance Index (CPI) = earned value/actual cost
 - Earned Value (target): \$700,000
 - Actual Cost (target): \$600,000
- $CPI = \$700,000 / \$600,000$ or 1.167

To-complete Performance Index (TCPI) When the Original Budget is Not Valid

- If Budget at Completion is no longer valid and must be replaced by an Estimate at Completion, use the following formula:
- $(\text{Budget at Completion} - \text{Earned Value}) / (\text{Estimate at Completion} - \text{Actual Cost})$

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Scenario 5: Calculating To-complete Performance Index (TCPI)

- Your project management team is working on a construction project in Houston.
- Because of a math error, the original budget was found to be invalid and was replaced.

To-complete Performance Index (TCPI) Scenario 5 Cost Projections

- BAC (original project budget) is \$1,000,000.
- EAC (new budget) is \$1,100,000.
- The first three months of the project cost \$400,000 (actual cost), which is not as predicted.
- The project should have cost \$200,000 (earned value) during the first three months.

Scenario 5: Calculating To-complete Performance Index (TCPI)

- $TCPI = (\text{Budget at Completion} - \text{Earned Value}) / (\text{Estimate at Completion} - \text{Actual Cost})$
- $TCPI = (\$1,000,000 - \$200,000) / (\$1,100,000 - \$400,000)$
- $TCPI = 1.14$

Scenario 5 Notes:

To-complete Performance Index (TCPI)

- The original budget (Budget at Completion) is replaced by a new budget (Estimate at Completion). This new budget is \$1,100,000.
- $TCPI = 1.14$. This means you must achieve a Cost Performance Index (CPI) of 1.14 for the duration of the project. In other words, if you achieve the same level of proficiency for the duration of the project, the project will finish on (the new) budget (i.e., \$1,100,000).

Scenario 5 Check:

To-complete Performance Index (TCPI)

- There is \$600,000 remaining in the original budget. You must add \$100,000 to account for the math error, which brings the new amount to \$700,000 (this must be your **actual cost** over the duration of the project)
- You must achieve an **earned value** of \$800,000 over the duration of the project (your current earned value is \$200,000).
- Cost Performance Index (CPI) = earned value/actual cost
 - Earned Value (target): \$800,000
 - Actual Cost (target): \$700,000
- $CPI = \$800,000 / \$700,000$ or 1.14

Forecasting Formulas Summary

- **EAC = AC + bottom-up ETC**
- **EAC = AC + (BAC - EV) (changes are temporary)**
- **EAC = BAC/CPI (changes are permanent)**
- **EAC = AC + [(BAC - EV)/(CPI x SPI)]**
- **TCPI using BAC = (BAC - EV) / (BAC - AC)**
- **TCPI using EAC = (BAC - EV) / (EAC - AC)**

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Questions?