



# **What must be verified in an estimation process: Overview**

**(Chapter 4 – Software Project Estimation)**

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# Topics covered

1. Introduction
2. Verification of the inputs to the estimation process
3. Verification of the productivity model
4. Verification of the adjustment phase
5. Verification of the budgeting phase
6. Re-estimation & continuous improvement

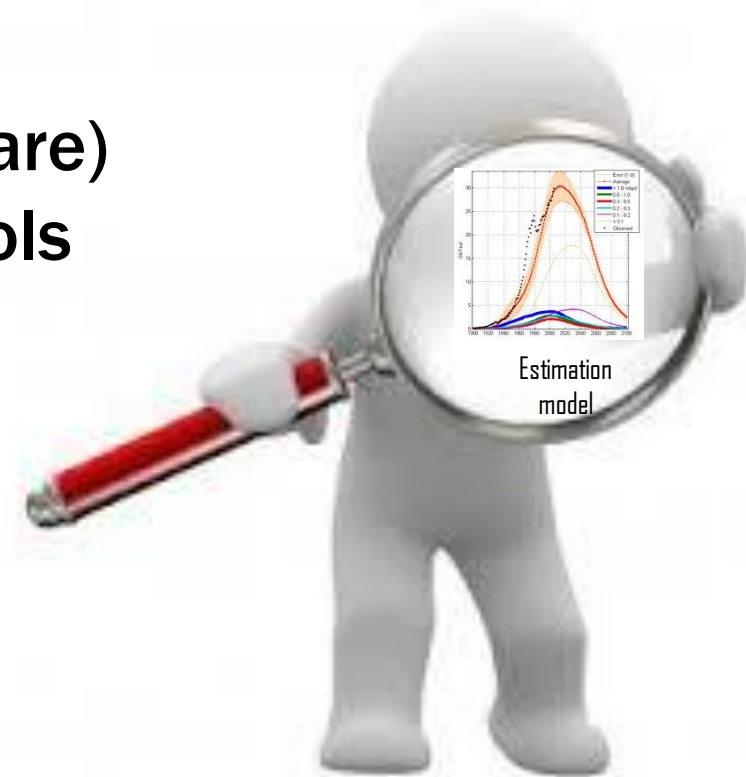
# 4.1 Introduction

This chapter presents an overview of the verification steps that should be carried out through out the estimation process.

The detailed verification activities will be presented in the subsequent 3 chapters of the book (chapters 5 to 7).

## Verify the quality & understand the limitations of these estimation models

- The Web (No-fee estimation software)
- Vendors of estimation software tools
  - (black box estimation software tools)
- Books & magazines,



## 4.2 Verification of the inputs

# Identification of the estimation inputs & of their quality as Inputs

What is their quality as inputs to and estimation process?

- Quantitative product information (for the independent variable).
- Descriptive process information (for the selection of a specific model).

# Product information

- The functional requirements
  - see next example.
- The non functional requirements:
  - are they detailed enough?
- The relationships between the system view and the software view:
  - have the functions to be allocated to software already been identified and corresponding software-hardware interfaces specified?

# Example: Are Function Points accurate as estimation input?

For projects to be estimated:

- A.** When all the requirements are detailed & available, Function Points can be measured quite accurately & used with confidence as inputs to an estimation process.
  
- B.** When not all the requirements are detailed: there are techniques for approximating candidate size ranges – see, for example, the ‘Guideline for Early or Rapid COSMIC Functional Size Measurement’ [To be released in Summer 2015 at [www.cosmic-sizing.org](http://www.cosmic-sizing.org)]

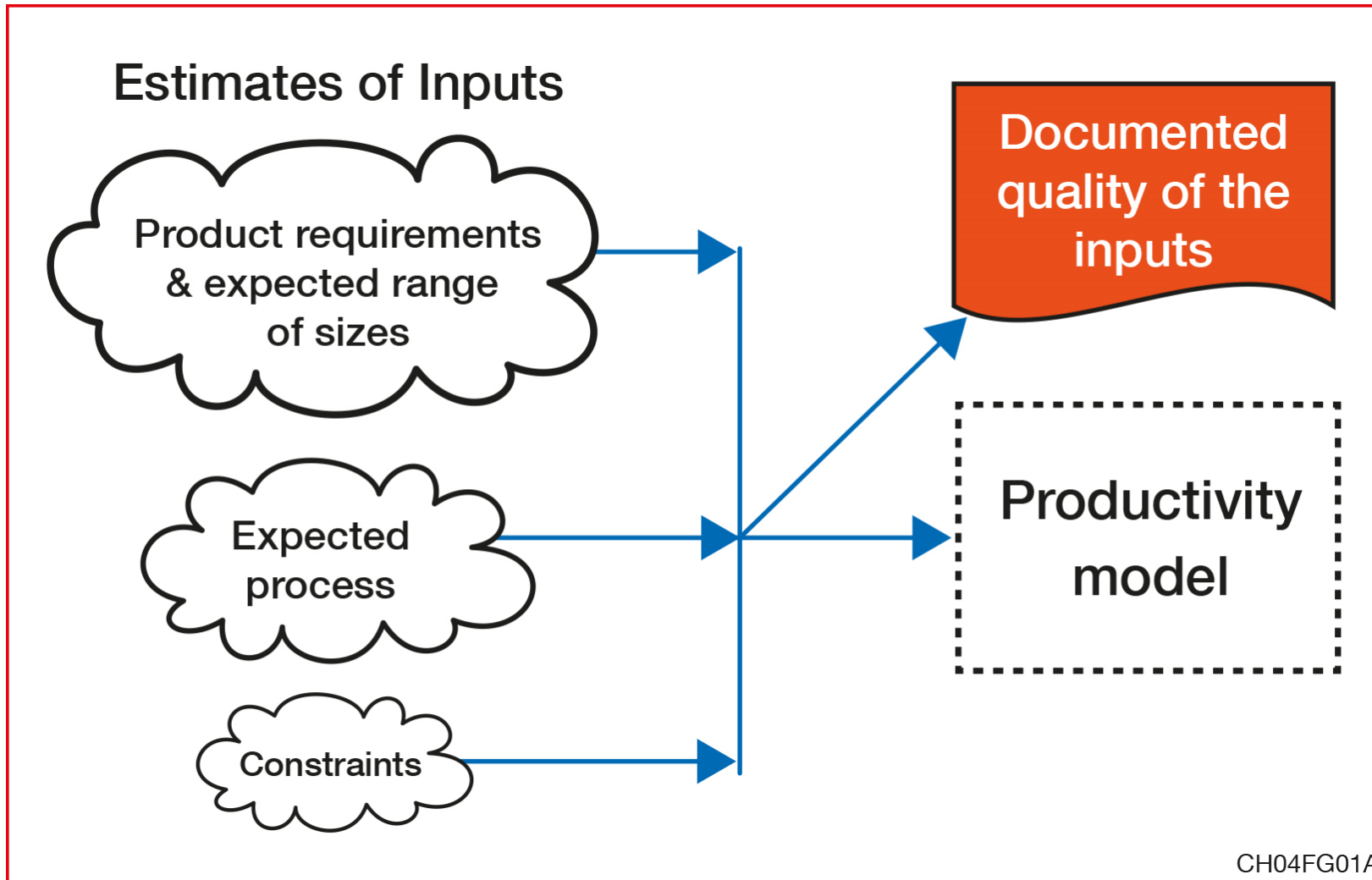


# Process information available?

- Expected characteristics of the development process & implementation platform.
- Known constraints: technical environment, such as DBMS, programming languages, programming standards, etc.



# Documenting the quality of the inputs



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# 4.3 Verification of the productivity model

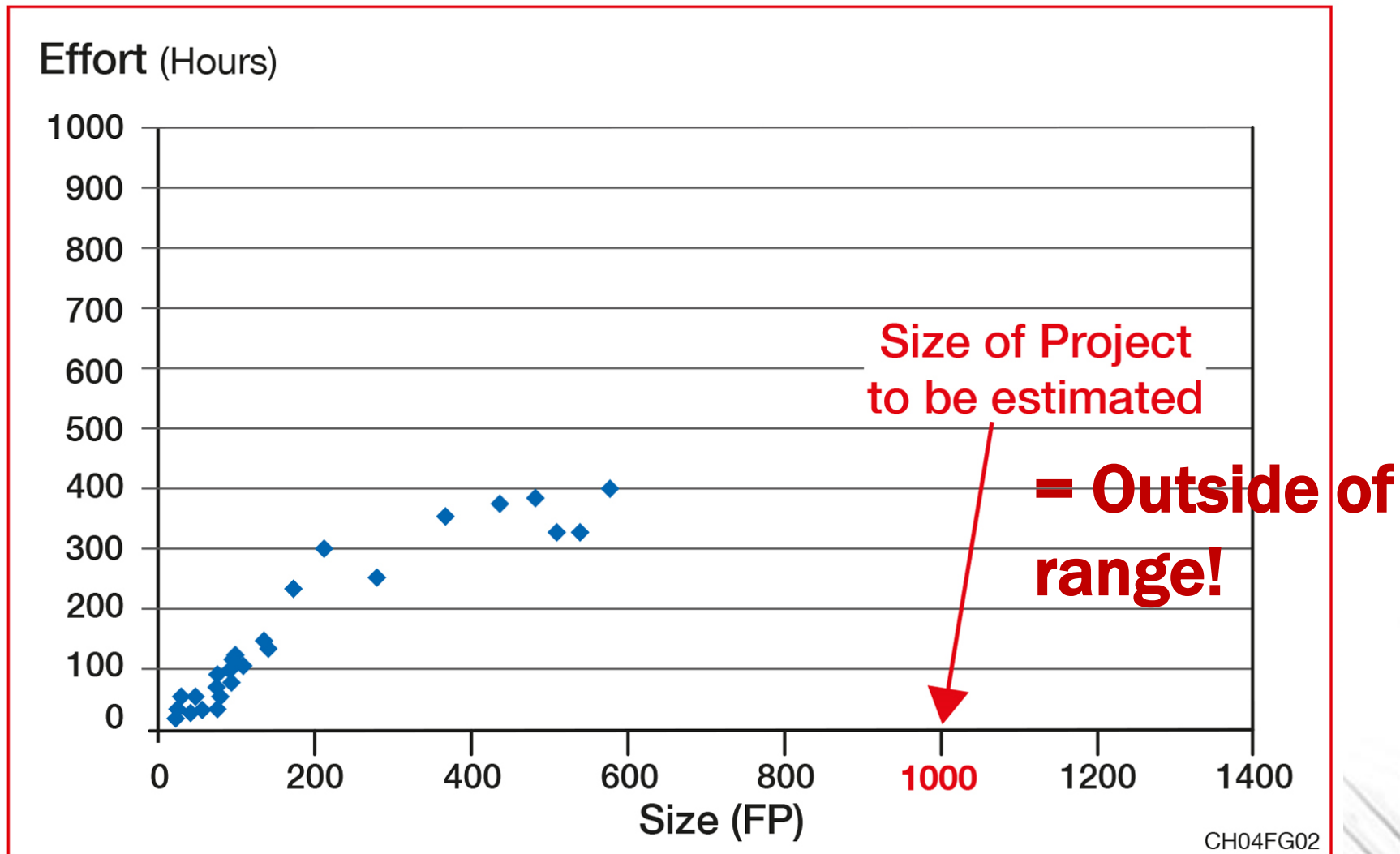


## In-house productivity models

These models are built:

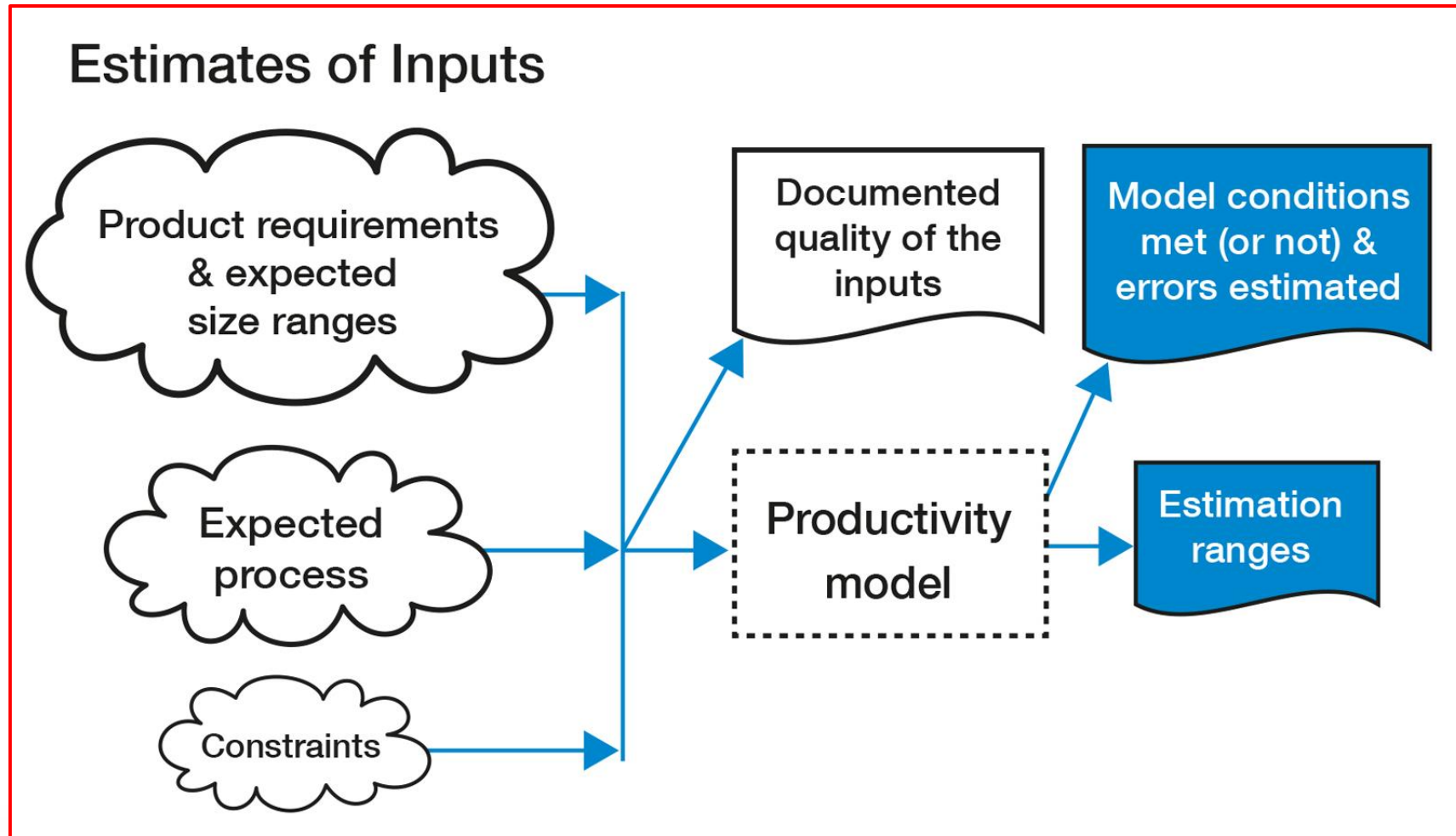
- ✓ Using the organization's own historical data.
  - The quality relies on the basis of such historical data.

# Representativeness & Population sample



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# Verification of the Productivity Model used in an Estimation context





## Externally provided estimation models

- Used when organizations do not have their own repository of completed projects.
- These models are:
  - Stored in repositories (e.g. ISBSG – see chapter 8)
  - Embedded within software estimation tools from vendors or from the Web.
  - Based on models & mathematical formulae from the literature (e.g. the COCOMO'81 & COCOMO'II models).

# Considerations for Using External Models

- Determine the predictability of the model for the organization usage.
- Calibrate the model to the business environment of the organization.
- Commit resources on the basis of the outcomes of the calibrated model.



# How to analyze predictability of an external model ?

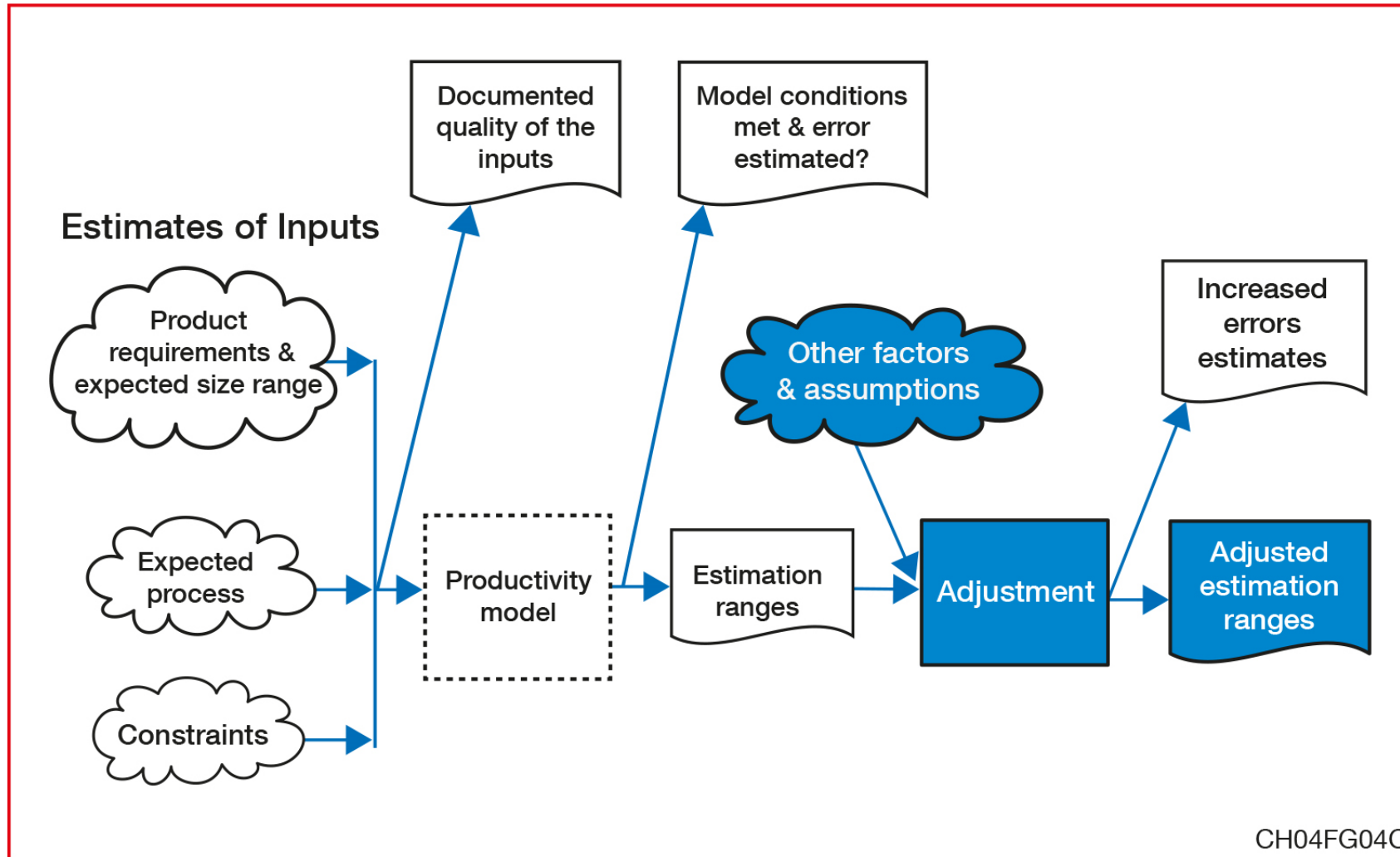
- Take information from one or more recently completed projects
- Use this information as inputs to the external model, and compare the results of the estimate against the actual effort.

**Compare**



# 4.4 Verification of the adjustment phase

# Verification of the adjustments



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## Verification of adjustments: Why ?

- To identify, document, & ‘size’ the additional variables, information & constraints.
- To prepare an assessment of the individual impact of the additional variables.
- To introduce the adjustments to the models used (in-house or external).

# 4.5 Verification of the budgeting phase



<http://www.fotosearch.com/illustration/consideration.html>

# Additional considerations

- **Technological**
  - A selected technology might not deliver on time.
- **Organizational**
  - Key employees availability.

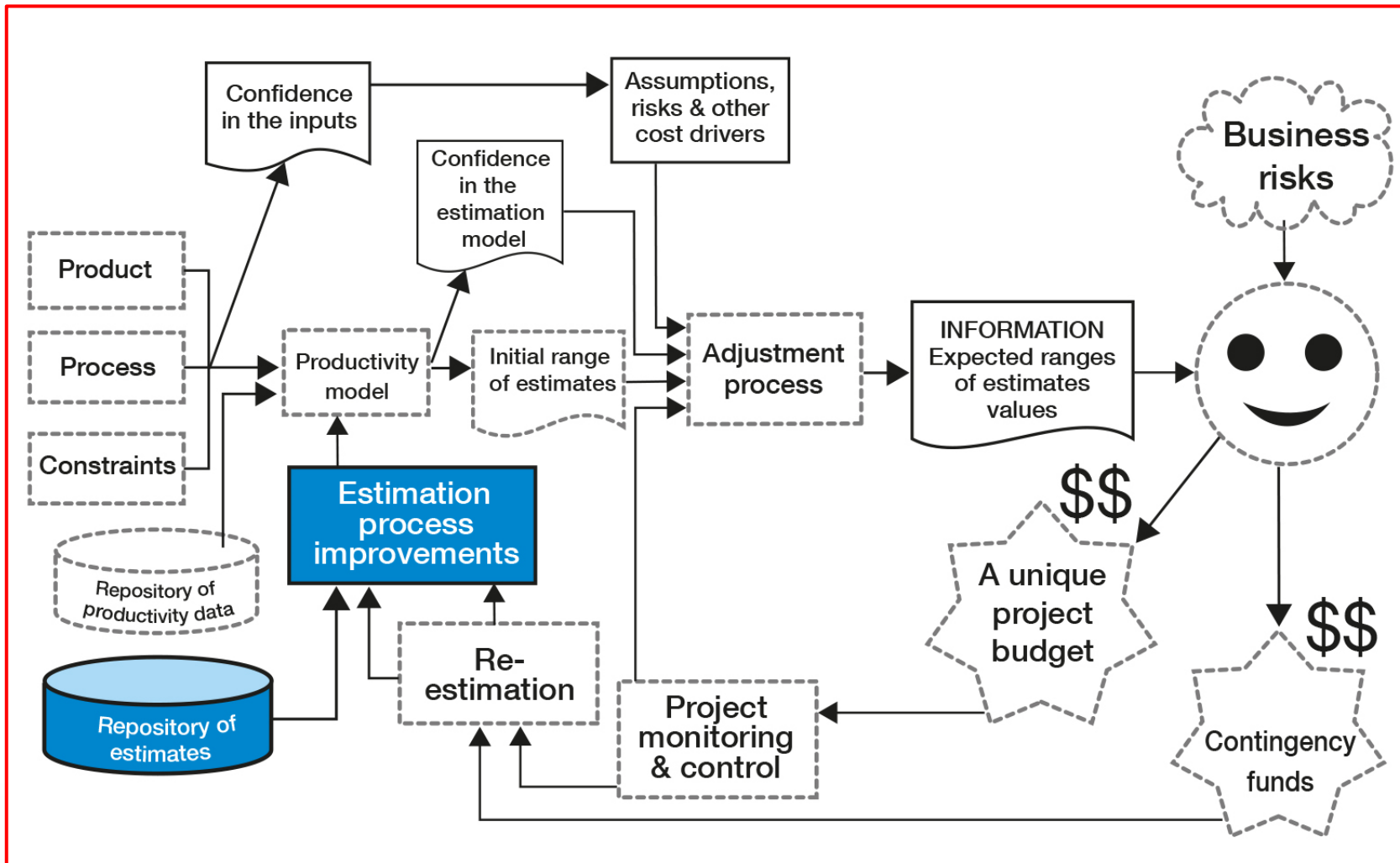
# 4.6 Re-estimation and continuous improvement

# What determines the improvement of the estimation process ?

- The data collected at the completion of a project (no uncertainty).
- The skills of the people integrating this information into the productivity models to be improved.



# Estimation Process Improvement



# Challenges faced to improve the models

- **There is rarely a single estimated budget.**
  - The project budget is often re-estimated a number of times over the course of the project's life cycle.
- **The information used as input to the estimation process is often not documented.**
  - The quality and completeness are neither recorded nor analyzed.
- **Assumptions made during the estimation process are not all documented.**
- **'Scope creep' during the life cycle is rarely measured or controlled**

# Exercises

1. Can all the aspects of verification be performed at the same time in an estimation process? What should the sequence of those aspects be?
2. What should be included in the verification of the variables in the inputs to an estimation process?
3. What should be included in the verification of the use of an in-house productivity model?
4. What should be included in the verification of the use of a vendor estimation model?
5. How can you verify an estimation model picked up free of charge from a book or from the Web?
6. What should be verified in the Adjustment phase of the estimation process?
7. What should be documented when a specific decision is made on a project budget?
8. What type of information must be kept to analyze the performance of project estimates and to make improvements to the full estimation process?

# Term Assignments

1. Document the quality controls in the estimation process in your organization.
2. Identify the strengths and weaknesses of your organization's estimation process.
3. Identify the improvement priorities for your organization's estimation process.
4. Propose an action plan to address the top 3 priorities.
5. Design a template for the quality assurance of a productivity model.
6. Design a template for the quality assurance of a full estimation process.
7. Select 3 estimation models proposed in the literature. Even though the authors may claim that their models are to be used for estimation, are those models based on productivity studies or on opinion? If the latter, what would be your confidence level using them for estimation purposes?

# Term Assignments

8. Compare the verification steps in Figure 4.6 with the verification recommended in the literature on software estimation. Comment on the similarities and differences. Identify strengths and weaknesses of the model analyzed.
9. What has been done in your organization over the past 12 months to analyze the quality of its productivity model and estimation process? Why? Is it because estimates are (or are not) important to your organization?
10. For estimation purposes, how would you handle cost drivers not included in the productivity model?
11. For estimation purposes, how would you handle risk factors not included in the productivity model?