Introduction to Function Points

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Introduction to Function Points

Credits:

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Agenda

• Introduction
• Why use Function Points
  – Managing Your Software
  – Managing Your Organization
  – Function Points vs. Lines of Code
• How to Count Function Points
• Questions
Objectives of Function Point Analysis

• Measures software by quantifying the functionality requested by and provided to the customer based primarily on logical design

• Measures software development and maintenance independently of technology used for implementation

• Measures software development and maintenance consistently across all projects and organizations
Function Points are a Unit of Measure

• Functionality as viewed from the user’s perspective
Why Use Function Points

- Managing Your Software
Software Development Challenges

- Size of Requirements
- Changes to Requirements
- Estimation Based on Requirements
- Measuring and Improving Productivity and Quality
Size of Requirements

- Requirements
  - Complete
  - Business Terms
  - Mutual Understanding
  - Document Assumptions
  - Size
Changes to Requirements

- Change Inevitable
- Trade-offs
- Customer Definition of Quality
- Size
Changes to Requirements

100 FPs
- State code input screen changed (3 FPs)
- Interface to N&A file added (10 FPs)
- N&A inquiry and state code inquiry added (7 FPs)

120 FPs

130 FPs
- New regulatory table added (10 FPs)

135 FPs
- Summary report added (5 FPs)

<table>
<thead>
<tr>
<th>Impact</th>
<th>100 FPs</th>
<th>120 FPs</th>
<th>130 FPs</th>
<th>135 FPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort</td>
<td>+ 1 month</td>
<td>+ .5 month</td>
<td>+ .25 month</td>
<td></td>
</tr>
<tr>
<td>Schedule</td>
<td>+ 2 weeks</td>
<td>+ 1 week</td>
<td>+ 2.5 days</td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td>+ $5 K</td>
<td>+ $2.5 K</td>
<td>+ $1.25 K</td>
<td></td>
</tr>
</tbody>
</table>
Estimation Based on Requirements

- Estimation Based on Requirements
  - Multiple Models
  - Weighted Inputs:
    - Language
    - Skills
    - Methodology
    - Risk Factors
    - Size
  - Historical Base
## Estimating Examples

<table>
<thead>
<tr>
<th>Function Point Size</th>
<th>Project Variables</th>
<th>Project Estimate Based on Historical Data and/or Vendor Tool</th>
</tr>
</thead>
</table>
| Project A – 100 FPs | • On-line/database  
• New development  
• C++  
• Highly experienced development staff | Effort = 5 months  
Schedule = 3 months  
Cost (@ $5K) = $25,000  
KLOC = 6  
Delivered Defects = 25  
Productivity Rate = 20 FP/Month. |
| Project B – 100 FPs | • Batch  
• Enhancement  
• Cobol  
• Average experienced development staff | Effort = 20 months  
Schedule = 6 months  
Cost (@ $5K) = $100,000  
KLOC = 10  
Delivered Defects = 100  
Productivity Rate = 5 FP/Month |
Measuring and Improving Productivity

• Every organization has an optimum size/productivity range
Why Use Function Points

• Managing Your Organization
Asset Management

Size = 50,000 Function Points
Replacement Cost = $300,000,000
Growth = 7% per year
Support Cost = $20,000,000 per year
Function Points and the CMM/CMMI

• Function Points are the metric of choice for many of the activities required in the SEI CMM and CMMI Level 2

• With CMMI, metrics becomes a Key Process Area in its own right
Improving Customer Relations

- Predictable Time scales
- Predictable Costs
- Predictable Functionality
Organizational Improvement

• Process Measurement

• Project Management Metrics
  – Estimates
  – Productivity
  – Defect Densities
  – etc.

• Benchmarking
Function Points & Metrics Help

- Evaluate current in-house and contractor performance
- Establish quantifiable expectations
- Demonstrate objectives for contract/outourcing are met
- Establish realistic commitments
- Determine fair compensation
- Establish “win win” relationships
Function Points vs. Lines of Code

- Technology and platform independence
- Available from early requirements phase
- Consistent and objective unit of measure throughout the life cycle
- Objectively defines software application from the customer perspective
- Objectively defines a series of software applications from the customer’s, not the technician’s perspective
- Is expressed in terms that users can readily understand about their software
What is Wrong with LOC?

• There is no standard for a line of code

• Lines of Code measure components, not completed products
  – Don't measure the panels produced; measure the number of cars assembled

• Measuring lines of code
  – Rewards profligate design
  – Penalizes tight design

• Positively misleading?
## Classic Productivity Paradox

<table>
<thead>
<tr>
<th></th>
<th>10,000</th>
<th>3,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lines of Code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function Points</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Total Months effort</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>Total Costs</td>
<td>$125,000</td>
<td>$75,000</td>
</tr>
<tr>
<td>Cost per Source Line</td>
<td>$12.50</td>
<td>$25.00</td>
</tr>
<tr>
<td>Lines per Person month</td>
<td>400</td>
<td>200</td>
</tr>
<tr>
<td>FPs per Person month</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>Cost per FP</td>
<td>$5,000</td>
<td>$3,000</td>
</tr>
</tbody>
</table>
How to Count Function Points
How to Count Function Points

Displays

Reports

Master Files

Control Files

Reference Files

Signals

Size

6.15%
Steps in FP Counting

• Determine Type of Count (3 Types)
  • Enhancement (Project) Function Point Count
  • Application Function Point Count
  • Development (Project) Function Point Count

• Identify Counting Scope and Application Boundary

• Count Data Functions

• Count Transactional Functions

• Determine Unadjusted Function Point Count

• Determine Value Adjustment Factor

• Calculate Adjusted Function Point Count
FP Overview: What Is Counted

- **EI**: Update Master File
- **EQ**: Master File Details
- **ILF**: Weekly Summary Report
- **EIF**: Reference File on another System
- **EO**: Weekly Summary Report

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Data Storage

- **Internal Logical File (ILF)**
  Logical group of data maintained by the application (e.g., Employee file)

- **External Interface File (EIF)**
  Logical group of data referenced but not maintained (e.g., Global state table)
Transactions

- **External Input (EI)**
  Maintains ILF or passes control data into the application

- **External Output (EO)**
  Formatted data sent out of application with added value (e.g., calculated totals)

- **External Query (EQ)**
  Formatted data sent out of application without added value
Functions are Weighted Based on Complexity

Data Element Types (DETs)
  - Number of user recognizable non-repeated fields
  - Applies to data and transactional functions

File Types Referenced (FTRs)
  - Number of files referenced, read, created, or updated
  - Applies to transactional functions

Record Element Types (RETs)
  - Number of data sub-groupings or unique record formats
  - Applies to data functions
# Functional Size (Unadjusted Function Size)

<table>
<thead>
<tr>
<th>Function Type</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI</td>
<td>x 3</td>
<td>x 4</td>
<td>x 6</td>
</tr>
<tr>
<td>EO</td>
<td>x 4</td>
<td>x 5</td>
<td>x 7</td>
</tr>
<tr>
<td>EQ</td>
<td>x 3</td>
<td>x 4</td>
<td>x 6</td>
</tr>
<tr>
<td>ILF</td>
<td>x 7</td>
<td>x 10</td>
<td>x 15</td>
</tr>
<tr>
<td>EIF</td>
<td>x 5</td>
<td>x 7</td>
<td>x 10</td>
</tr>
</tbody>
</table>
Value Adjustment Factor

• Based on 14 General System Characteristics (User Business Constraints Independent of Technology)
  – Examples: data communications, response times, end user efficiency, multiple sites and flexibility

• Adjusts FP count by up to + / - 35%
Questions ?