Project Management & Measurement

What Relationship?

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UFSC – Lecture @ INE5427 course on ‘Planejamento e Gestão de Projetos’
Florianopolis (Brazil), Sept. 16 2010
The first Italian ICT player
* more than 730 M/€ revenues
* 1000 clients
* 6,300 IT specialists

[Diagram showing the distribution of services and clients]
Goals of the presentation

G1. Discuss and provide evidence why Measurement is a distinct process than Project Management

G2. Help project managers and estimators to obtain better estimates using their own historical data

G4. Go into a deeper detail when gathering more granular data in your historical database, that help in consolidating CMMI ML2 goals and achieving faster ML3 ones with better PALs (Process Asset Libraries)

G5. Stimulate improvements in your organization supporting more and more experience by quantitative data
Introduction
- A bit of humour...
- IT project trends, Estimation Techniques

Measurement Process
- **PM Frameworks**: PMBOK, Prince2, P3M3
- **SwEng**: CMMI-DEV v1.2, ISO/IEC 15504
- **Standards**: ISO 9001, ISO 20000-1:2005, ISO 15939

Projects Repositories
- ISBSG r11
- Maturity Models and Historical Data

An Improvement Proposal
- Effort profiles
- ...and your own effort profile?
- Q-RCA on main results

Conclusions & Prospects

Q & A
Introduction

A bit of humour...

URL: www.dilbert.com
Introduction

A bit of humour...

**DILBERT**

*By Scott Adams*

---

**I NEED A COST ESTIMATE ON YOUR PROJECT.**

**I HAVE NO IDEA. I HAVEN'T EVEN GATHERED THE USER REQUIREMENTS.**

**DON'T WORRY. I WON'T HOLD YOU TO THE ESTIMATE.**

**YES YOU WILL. YOU WILL PUT IT IN THE PLAN. FORGET WE HAD THIS CONVERSATION, AND FIRE ME WHEN I GO OVER BUDGET.**

**GIVE ME A NUMBER OR I'LL FIRE YOU RIGHT NOW.**

**OKAY, IT WILL COST TEN MILLION DOLLARS.**

**THAT'S TOO HIGH.**

**IF YOU ALREADY KNOW THE COST, WHY ARE YOU ASKING ME?**

**SO YOU'LL FEEL LIKE YOU HAD INPUT.**

**IS INPUT SUPPOSED TO FEEL THIS BAD?**

---

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URL: [www.dilbert.com](http://www.dilbert.com)
Introduction

IT Project Trends

- **Projects failure: three (3) major causes**
  - ✓ Amount of Tracking & Control (T&C) resources
  - ✓ Lack of historical data
  - ✓ Limited ability of internal staff to estimate effort & costs

- **Several studies confirmed these trends along ten (10) years**
  - ✓ Chaos Report (Standish Group): figures from 1994 to 2008
Introduction

How to Control T&C Costs?

- Perspectives typically analyzed
  - Time & Cost
  - Typical PM approach
  - Other viewpoints?
  - Estimating (dis)ability: reskilling?

Q: so, which % of project budget for T&C process should be the proper one for improving results?
Introduction

How to Control T&C Costs?

Legend:

- CONQ = Cost Of Non Quality
- COQ = Cost of Quality
- QL = Quality Level

• Objectives: determine the right Break-Even-Point (BEP) by:
  ✓ Improving Estimation abilities:
    - Gathering & using historical data (e.g. CMMI PP, OPD), at least initially using external repositories for benchmarking purposes (e.g. ISBSG)
    - Do not using in a non-critical manner estimation models such as COCOMO or SLIM
    - Learn & apply Statistics (101-features!)
  ✓ Choosing & applying the proper number of measures for T&C process:
    - How many measures we use? Are the right one? Are they properly linked through the strategic map? How much do they cost (% of project budget)?
Introduction

Estimation Techniques

- Model Based Methods (A)
  - Generic Model Based (A1)
    - Proprietary
  - Specific Model Based (A2)
    - Not Proprietary
      - Data Driven
      - Composite Methods

- Non-Model Based Methods (B)

Introduction

Research Questions

• **RQ1**
  ✓ Is Measurement a distinct process than Project Management?

• **RQ2**
  ✓ If yes, how much does it cost?
Project Mgmt & Meas. | Agenda

- **Introduction**
  - A bit of humour...
  - IT project trends, Estimation Techniques

- **Measurement Process**
  - **PM Frameworks**: PMBOK, Prince2, P3M3
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  - Maturity Models and Historical Data

- **An Improvement Proposal**
  - Effort profiles
  - ...and your own effort profile?
  - Q-RCA on main results

- **Conclusions & Prospects**

- **Q & A**
**Measurement Process**

**PM Frameworks** – PMBOK v4

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**Evidences**

- 5 process groups
- No formal Measurement process
- Chapters 6.3/6.4 are about ‘duration’ and not ‘effort’

---

**URL:** [www.pmi.org](http://www.pmi.org)
Evidences

- **7 process groups** - No specific measurement process
- **PL** (Planning) contains an Estimation process
- As in PMBOK, measurement activities split across several processes (e.g. in **IP1** – Planning Quality; **IP4** – Setting Up Project Controls)

URL: [www.prince-officialsite.com](http://www.prince-officialsite.com)
### Measurement Process

**PM Frameworks – P3M3**

#### Level 1
- 1.1 Project definition
- 1.2 Programme management awareness

#### Level 2
- 2.1 Business case development
- 2.2 Programme organisation
- 2.3 Programme definition
- 2.4 Project establishment
- 2.5 Project planning, monitoring & control
- 2.6 Stakeholder management & communications
- 2.7 Requirements management
- 2.8 Risk management
- 2.9 Configuration management
- 2.10 Programme planning & control
- 2.11 Management of suppliers & external parties

#### Level 3
- 3.1 Benefits management
- 3.2 Transition management
- 3.3 Information management
- 3.4 Organisational focus
- 3.5 Process definition
- 3.6 Training, skills & competency development
- 3.7 Integrated management & reporting
- 3.8 Lifecycle control
- 3.9 Inter-group co-ordination & networking
- 3.10 Quality assurance
- 3.11 Centre of Excellence (CCE) role deployment
- 3.12 Organisation portfolio establishment

#### Level 4
- 4.1 Management metrics
- 4.2 Quality management
- 4.3 Organisational cultural growth
- 4.4 Capacity management

#### Level 5
- 5.1 Proactive problem management
- 5.2 Technology management
- 5.3 Continuous process improvement

### Evidences
- Firstly released in 2006, current version is 2.1 (Feb 2010)
- 7 process groups - no formal Measurement Process
- Enhancement of the OGC’s PMMM
- Self-assessment for determining the ML by questionnaire

### Measurement is in...
- 2.5 Prj Planning, Monit. & Control
- 4.1 Management Metrics
- 4.2 Quality Management

**URL:** [www.p3m3-officialsite.com](http://www.p3m3-officialsite.com)
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- **ML**: 5
- **PA**: 22
- **N.min PA**: ML1 (0)
- **N.max PA**: ML3 (13)

**Measurement is in...**

- ✔ Measurement & Analysis (ME) → ML2

URL: [www.sei.cmu.edu/cmmi](http://www.sei.cmu.edu/cmmi)
Evidences

- 3 main lifecycle process groups (primary, organizational, supporting)
- 9 process groups
  - Primary (ACQ, SPL, ENG, OPE)
  - Organizational (MAN, PIM, RIN, REU)
  - Supporting (SUP)
- 48 processes
  - Primary (22)
  - Organizational (16)
  - Supporting (10)

Measurement is in...

- MAN.6 – Measurement

URL: http://www.spiceusergroup.org
Measurement Process


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Measurement Process

Standards – ISO 20000-4

Process Categories

✓ Management System (§3-5)
  - MAN (7)
  - PLA (1)
  - PIM (2)

✓ Primary Process (§6-10)
  - SDE (6)
  - CON (2)
  - RES (2)
  - REL (2)
  - RLS (1)

Additional processes (app.C)

✓ Primary Process (§6-10)
  - SDE.7 – Service Catalogue Management
  - RES.3 – Customer Satisfaction
  - REL.3 – Service Request Management
  - REL.4 – Contracting
  - REL.5 – Contract Management
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- **Measurement is in...**
  - ✓ MAN.7 (Measurement)

- **Measurement is in...**
  - ✓ Clause 4.3 (Monitoring, Measuring & Reviewing)

Measurement Process

Scope of ISO/IEC 15939

Measurement is in... ✓ ...is the content of this standard

Legend

Activity → Data Flow  □ Data Store

Core Measurement Process

Requirements for Measurement

Technical and Management Processes

Information Needs

Information Products

Commitment

Plan the Measurement Process (5.2)

Planning Information

Measure the Measurement Process (5.3)

Evaluate Measurement (5.4)

Measurement Experience Base

Information Products

Information Products & Performance Measures

Information Products & Evaluation Results

Improvement Actions

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- **Measurement is in...**
  - ✓ ...not included, no KA on it, it’s only a ‘common theme’
KA11 – new (Software Measurement)

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- **Conclusions & Prospects**

- **Q & A**
**Project Repositories**

**ISBSG r11**

- The International Software Benchmarking Standards Group (ISBSG) is a non-profit born in 1997 for exploiting IT history data for improving estimates.
- Current version is r11 (June 2009), containing 5052 projects, periodically updated.
- 100+ attributes per project.
- URL: [www.isbsg.org](http://www.isbsg.org)

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**Schedule**

- Project Elapsed Time
- Project Inactive Time
- Implementation Date
- Project Activity Scope
- Effort Plan
- Effort Specify
- Effort Design
- Effort Build
- Effort Test
- Effort Implement
- Effort Unphased
**Project Repositories**

**MM and Historical Data - CMMI-DEV, ML2**

**MA – Measurement & Analysis**
- Measurement Data

**PP – Project Planning**
- Planning Data

**SG1**
- Establish Estimates

**SG2**
- Develop a Project Plan

**SG3**
- Obtain Commitment to the Plan

**REQM – Requirement Mgmt**
- An agreed-to set of requirements

**PMC – Project Monitoring & Control**
- Project Plans
Create Org. Process Assets

- **SP1.1** Establish Standard Processes
- **SP1.2** Establish lifecycle model description
- **SP1.3** Establish Tailoring Criteria & GL
- **SP1.6** Establish Work Env. Std

Make Supporting Process Assets Available

- **SP1.4** Establish Org. Meas. Repository
- **SP1.5** Establish Org. PAL

Repositories:
- Lifecycle models
- Org. Standard Processes
- Org. Measur. Repository
- Org. Library of Process Doc
- Tailoring Guidelines
Project Mgmt & Meas.  

Agenda

- **Introduction**
  - A bit of humour...
  - IT project trends, Estimation Techniques

- **Measurement in PM Frameworks**
  - PMBOK, Prince2, P3M3

- **Measurement in SwEng Frameworks**
  - CMMI-DEV v1.2, ISO/IEC 15504

- **Measurement in Standards**
  - ISO 9001, ISO 20000-1:2005, ISO 15939

- **Projects Repositories**
  - ISBSG r11
  - Maturity Models and Historical Data

- **An Improvement Proposal**
  - Effort profiles
  - ...and your own effort profile and meas.cost?
  - Q-RCA on main results

- **Conclusions & Prospects**

- **Q & A**
An Improvement Proposal  
Effort Profiles

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- Dery & Abran identified 32 ‘effort profiles’ from the analysis of the ISBSG r9 (2005) database, containing 3024 projects, focusing on the 2562 ones sized with IFPUG FPA method for a sake of consistency.

- They used the 6 main ISBSG SLC phases:
  - Planning, Specification, Design, Build, Test, Implement
  - + I don't know, Full lifecycle, Blank

- Q: ...but how much effort for Measurement?

1. Choose your own SLC phase/process taxonomy
2. Map your own processes to such schema
3. Re-classify your effort data on such schema
4. ...count!

- An example on ISBSG r11, choosing only projects with effort assigned (53), supposing to have to determine a proper % for **PM effort** in next projects, for IFPUG-based projects [ data expressed in man-hours (m/hrs) ]

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An Improvement Proposal

...and your own profiles and meas.cost?

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% Avg 100% 10% 11% 15% 44% 18% 5% 10%
% Median 100% 9% 9% 9% 46% 20% 2% 0%

- The answer would be: c.a. 9-10% → to deeply analyze variations for project clusters by homogeneous functional size
  - Small (1-449 UFP) [n=30] → confirmed 9-10%
  - Medium (450-900 UFP) [n=14] → reduced to 7% (both avg and median)
  - Large (901+ UFP) [n=9] → confirmed 9-10%
- An avg 10% value for unphased effort
  - to furtherly analyze to which tasks and related processes should it be assigned
    - Small (1-449 UFP) [n=30] → c.a. avg 4%
    - Medium (450-900 UFP) [n=14] → c.a. avg 19%
    - Large (901+ UFP) [n=9] → c.a. avg 31% (but just 1 outlier out of 9 projects)
- Next step: start gather your own effort data on Measurement!
An Improvement Proposal

Q-RCA on main results

- Example based on main evidences presented for PM
- Run a **Q-RCA** (Quantitative Root-Cause Analysis) till the right level of granularity (**5Why’s game**) for setting up an improvement plan
- On the main leaves put the main elements to analyze, running the 5Why’s game and derive the main control measures to (possibly) insert in your measurement plan


An Improvement Proposal

Q-RCA on main results

- no training courses received
- bad people habit
- Schedule = Effort
- people know, but don’t do it
- No historical data
- pre-assigned % level of PM effort
- confirmed by experience
- stable % of PM effort

- % PM Effort Analysis

- no standard WSS in the org
- too much appl domains
- too focused on the Build phase
- new learn
- problems with customer
- new hired
- new FM after covering another role
- unexperienced PM
- no training received
- % PM Effort Analysis

- partial loss of control
- missing core measures for managing the projects
- only standard measures applied
- missing gathered data for the defined measures
- team doesn’t gather data
- unproper tools for data gathering
- data gathered but not validated

- H: L of unphased effort in medium-sized proj

Project Mgmt & Meas.      Agenda

• Introduction
  – A bit of humour...
  – IT project trends, Estimation Techniques

• Measurement in PM Frameworks
  – PMBOK, Prince2, P3M3

• Measurement in SwEng Frameworks
  – CMMI-DEV v1.2, ISO/IEC 15504

• Measurement in Standards

• Projects Repositories
  – ISBSG r11
  – Maturity Models and Historical Data

• An Improvement Proposal
  – Effort profiles
  – ...and your own effort profile and meas.cost?
  – Q-RCA on main results

• Conclusions & Prospects

• Q & A
• **PM & Measurement**
  - They are two separated but strictly interrelated processes, with different natures
  - Any process should follow a PDCA cycle
  - A process must have an owner → measurement as an activity in many processes → too many owners → no coordinated actions → too many/too few measures → unbalanced and unpredictable cost for measurement, as well as its returned informative value for decision-makers

• **Measurement and PM Frameworks**
  - Measurement seen/perceived as ‘part of’ PM processes, as an activity
  - No framework/model has a formal ‘Measurement’ process defined
  - Questions: how much does it cost to measure? And the impact on COQ/CONQ?

• **Measurement and SwEng/Standards**
  - Here Measurement has been yet recognized as a process → more mature domain than PM?
  - “A measurement plan is more than a plan of measure” (S.L. Pfleeger)

• **Some lessons learned**
  - Gather your own project historical data (PHD) at the proper level of granularity, it’s one of the two real and valuable assets providing value to any organization
  - ...and the second one are people, the real ‘engine’ within any organization
  - Search and use tools for easy gathering and classifying of projects’ efforts
  - Refer to standard taxonomies for processes and activities, possibly external ones, in order to avoid misunderstandings and too subjective interpretations
  - ...put it live!

  **Analyze facts and talk through data**

  *(Kaoru Ishiwaka, TQM guru)*
Project Mgmt & Meas.  Creating ‘value’: learning from Comics

Obrigado pela sua atenção!
Thanks for your attention!
Further readings...

Misurare il software

Luigi Buglione

Misurare il software
Quantità, qualità, standard e miglioramento di processo nell’Information & Communication Technology
Franco Angeli, 2008 – 3ª edizione
Collana: Informatica ed Organizzazioni
pp. 380 -Volume 724.20

Luigi Buglione

www.semq.eu/leng/booksms.htm

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FISM (Fondazione Italiana Sclerosi Multipla)
Welcome

International Summer Research Symposium on Software Engineering Measurement 2010

July–August 2010, Montreal, Canada

The mission of the Software Engineering Research Laboratory (GELOG) is to develop, for our software engineering industry, the analytical models and measurement instruments to enable them to improve their decision-making processes in order to meet their business objectives.

In order to achieve its mission, this laboratory has set for itself a number of aims:

1. To collaborate with the software engineering industry to develop new knowledge to better manage software.
2. To collaborate with the software engineering industry in the technological transfer of this knowledge, adapting it to the various industrial contexts.
3. To train senior, qualified personnel for the software engineering industry, capable of introducing these new management technologies successfully in the software divisions.
4. To develop in Montreal a world centre of expertise in research and development in this specialized domain of software engineering.
5. To contribute actively to the development of international standards for the establishment of databases of performance measures for benchmarking purposes, in both software development and maintenance.

Further readings...

GELOG Library

www.geelog.etsmtl.ca
Thanks for your Attention!

We care of your problems and we have in mind a solution

Luigi Buglione

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