



Multidimensional Project Management Tracking & Control – Related Measurement Issues

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Agenda

- **Introduction**
- **Multidimensional Analysis in Project Management**
 - ✓ Why is it needed?
 - ✓ Some Multidimensional Models
 - ✓ What should be measured and analysed?
 - ✓ Which set of indicators to select?
- **BMP: Balancing Multiple Perspectives**
 - ✓ The proposed measurement procedure
 - ✓ An example using 4 dimensions
 - ✓ Measuring project performances from multiple views
- **Conclusions & Prospects**



Introduction

- Growing interest in Integrated Software Measurement...
 - ✓ E.g. BSC, EFQM, MBQA
- ...but still few documented industrial implementations
 - ✓ Usually **Time** and **Cost** dimensions used
- Other possible dimensions of analysis (eg: Quality, Risk, ...) are not often taken into account
 - ✓ **Q**: how much does it cost project monitoring & control?
 - ✓ **Q**: how many measures/indicators are usually tracked during the project lifecycle? And from which perspectives?
- Objective:
 - to optimize the cost for tracking & control projects, balancing the number of measures/indicators used by each perspective of analysis useful to the project



Multidimensional Analysis in PM

Why is it needed?

- Loss of project control is one of the most frequent causes of failure in Project Management
 - ✓ Prevention: detailed analysis of content and quality of project tracking
- Some basic questions:
 - ✓ Right number of perspectives?
 - ✓ Right number of indicators?
 - ✓ What about hypothesis of relationships among processes?



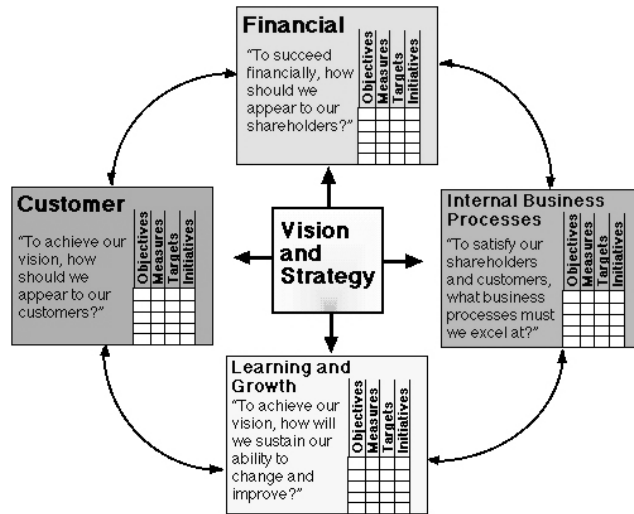
At least, 3 dimensions:

- ✓ Management
- ✓ Users
- ✓ Technical

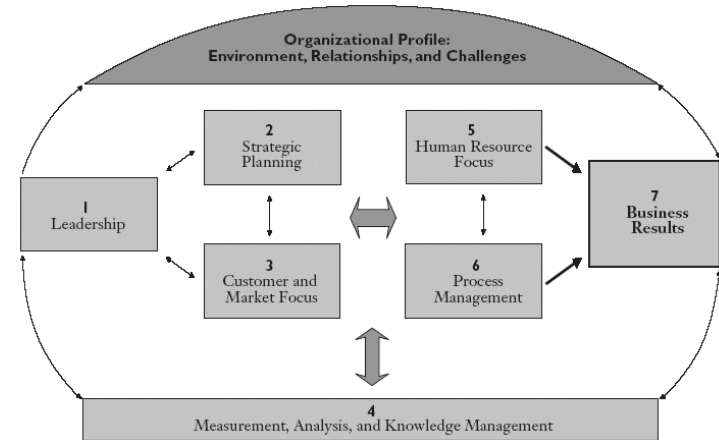


Multidimensional Analysis in PM

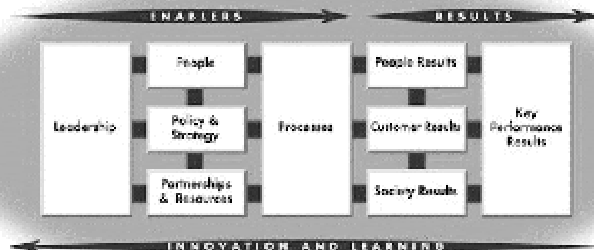
Some examples



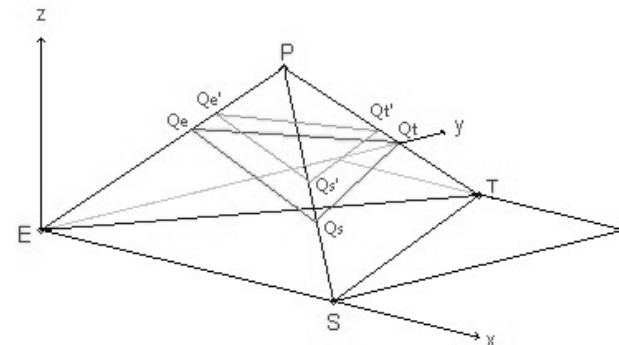
Balanced Scorecard



Malcolm Baldrige Quality Award



EFQM

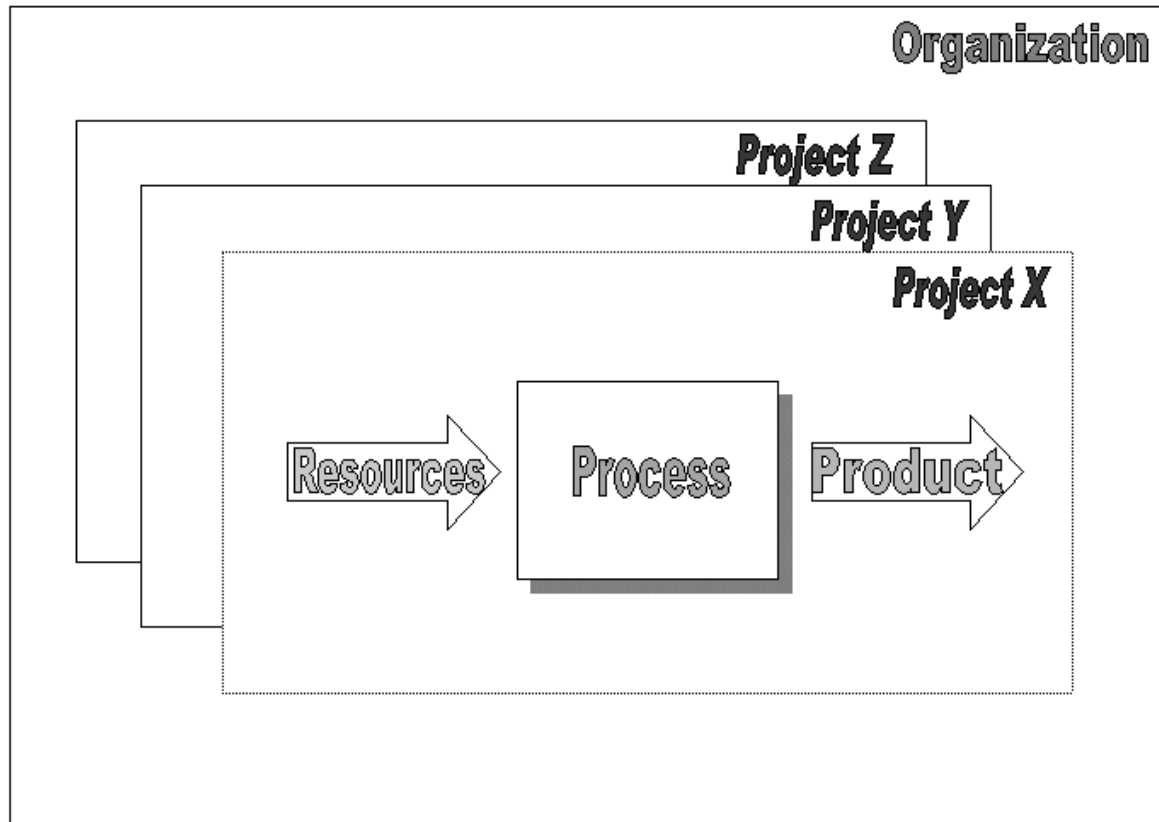


QEST/LIME



Multidimensional Analysis in PM

What should be measured and analysed?



STAR taxonomy: a broader view on Measurement & Analysis



Multidimensional Analysis in PM

Which set of indicators to select?

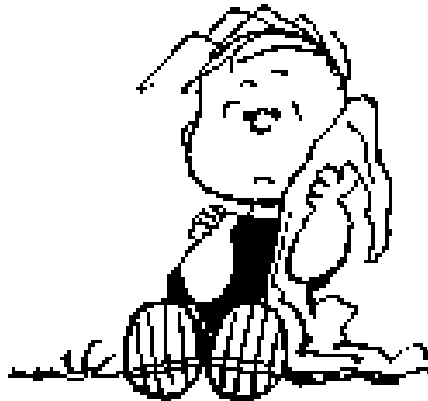
- **Q:** What is the right number of indicators to use?
 - The Miller's "magic number" 7 ± 2 ?
 - General suggestions to avoid the misbalance in selecting the measures critical to success, whatever the number
 - *"Select a small suite of key measures that will help you to understand your group's work better, and begin collecting them right away, measuring several complementary aspects of your work, such as quality, complexity, and schedule."*
- (Karl Wieggers)**



BMP: Balancing Multiple Perspectives

General issue

- **Q:** how can a proper balance of perspectives and indicators be selected when managing a portfolio of projects?



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The problem is **not** to reduce the cost of measurement, **but** optimising it against the informative value provided by the number of measures/indicators balancing them by each perspective of analysis



BMP: Balancing Multiple Perspectives

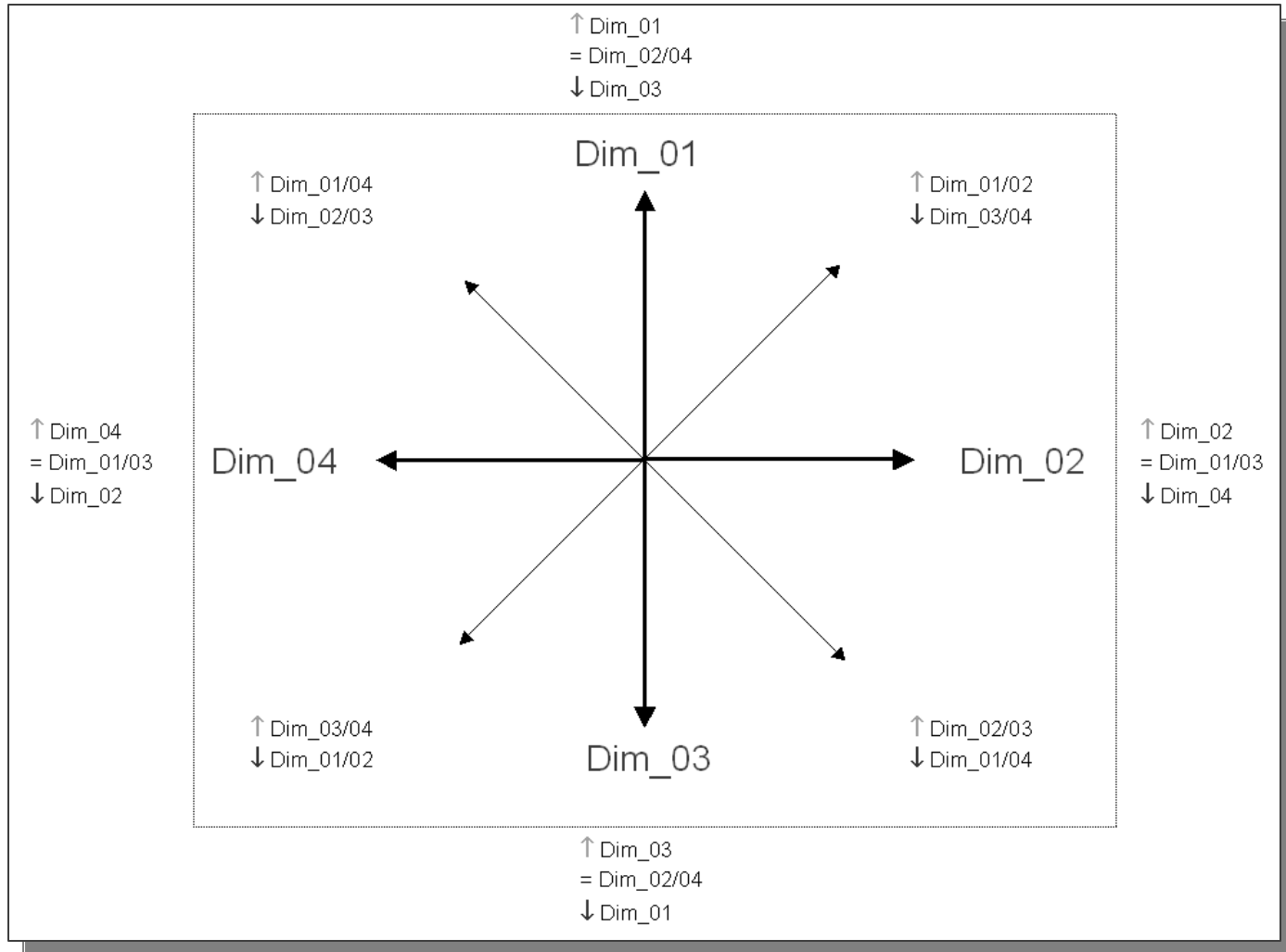
The proposed Measurement Procedure

- ① Determine the dimensions of interest in the project
- ② Determine the list of the most representative measures associated with each dimension
- ③ For each of the measures selected, identify which other control variables might be impacted negatively
- ④ Figure out the best combination of indicators and the causal relations between them in order to build a measurement plan for the project



BMP: Balancing Multiple Perspectives

A Generic four-dimensional BMP



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

① Determine the dimensions of interest in the project

A: Time, Cost, Quality & Risk



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

② Determine the list of the most representative measures associated with each dimension – **Note:** excerpt from the **PSM** Guide

Perspective/ Dimension	Indicators	Questions	Measures used to build related indicators
Time (T)	GT ₁ – Milestone Performance	<ul style="list-style-type: none"> • QT₁₁ – <i>Is the project meeting scheduled milestones?</i> • QT₁₂ – <i>Are critical tasks or delivery dates slipping?</i> 	<ul style="list-style-type: none"> • MT₁₁ – Milestone Dates • MT₁₂ – Critical Path Performance
	GT ₂ – Work Unit Progress	<ul style="list-style-type: none"> • QT₂₁ – <i>How are specific activities and products progressing?</i> 	<ul style="list-style-type: none"> • MT₂₁ – Requirement Status • MT₂₂ – Problem Report Status • MT₂₃ – Review Status • MT₂₄ – Change Request Status • MT₂₅ – Component Status • MT₂₆ – Test Status • MT₂₇ – Action Item Status
	GT ₃ – Incremental Capability	<ul style="list-style-type: none"> • QT₃₁ – <i>Is capability being delivered as scheduled in incremental builds and releases?</i> 	<ul style="list-style-type: none"> • MT₃₁ – Increment Content – Components • MT₃₂ – Increment Content – Functions
	GT ₄ – Personnel	<ul style="list-style-type: none"> • QT₄₁₁ – <i>Is effort being expended according to plan?</i> 	<ul style="list-style-type: none"> • MT₄₁ – Effort
Cost (C)	GC ₁ – Financial Performance	<ul style="list-style-type: none"> • QC₁₁ – <i>Is project spending meeting budget and schedule objectives?</i> 	<ul style="list-style-type: none"> • MC₁₁ – Earned Value • MC₁₂ – Cost



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

- ② Determine the list of the most representative measures associated with each dimension – **Note:** excerpt from the **PSM** Guide

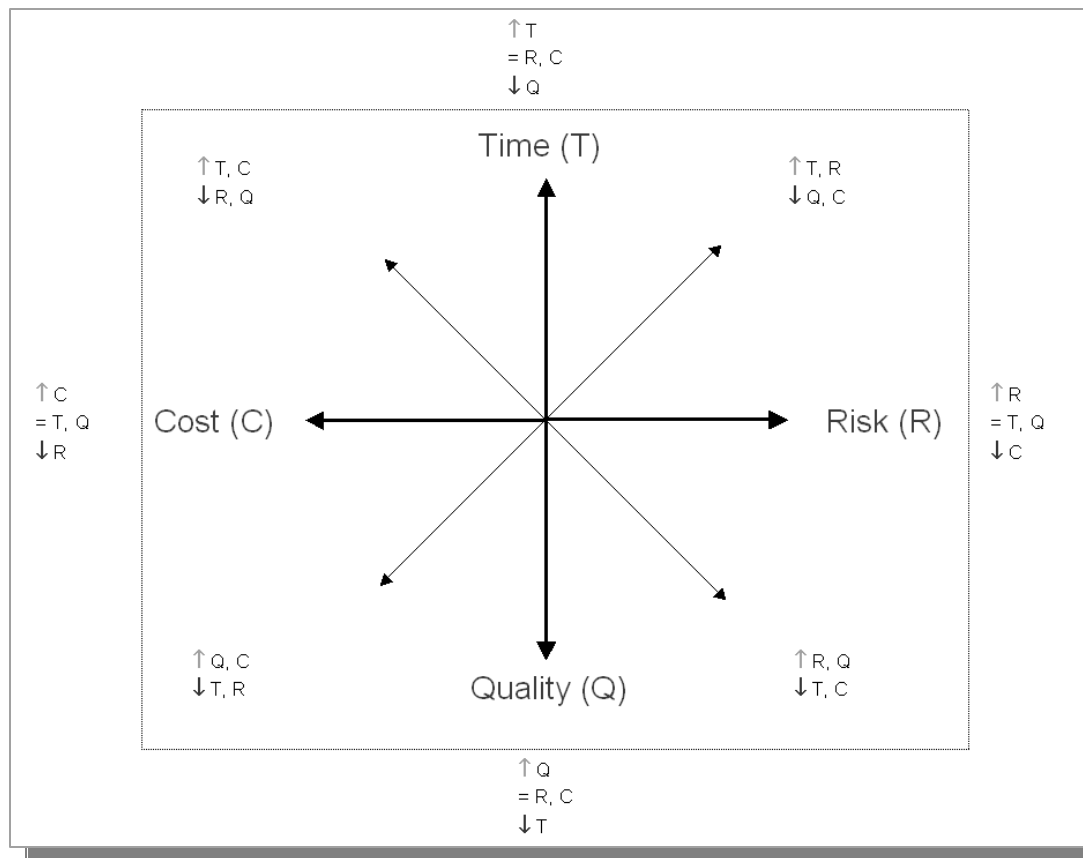
Perspective/ Dimension	Indicators	Questions	Measures used to build related indicators
Quality (Q)	GQ ₁ – Functional Correctness	<ul style="list-style-type: none"> • QQ₁₁ – <i>Is the product good enough for delivery to the User?</i> • QQ₁₂ – <i>Are identified problems being resolved?</i> 	<ul style="list-style-type: none"> • MQ₁₁ – Defects • MQ₁₂ – Technical Performance
	GQ ₂ – Process Effectiveness	<ul style="list-style-type: none"> • QQ₂₁ – <i>How much additional effort is being expended due to rework?</i> 	<ul style="list-style-type: none"> • MQ₂₁ – Defect Containment • MQ₂₂ – Rework
Risk (R)	GR ₁ – Personnel	<ul style="list-style-type: none"> • QR₁₁ – <i>Is there enough staff with required skills?</i> 	<ul style="list-style-type: none"> • MR₁₁ – Staff Experience • MR₁₂ – Staff Turnover
	GR ₂ – Functional Size and Stability	<ul style="list-style-type: none"> • QR₂₁ – <i>How much are the requirements and associated functionalities changing?</i> 	<ul style="list-style-type: none"> • MR₂₁ – Requirements • MR₂₂ – Functional Change Workload • MR₂₃ – Function Points
	GR ₃ – Environment & Support Resources	<ul style="list-style-type: none"> • QR₃₁ – <i>Are needed facilities, equipment and materials available?</i> 	<ul style="list-style-type: none"> • MR₃₁ – Resource Availability • MR₃₂ – Resource Utilization



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

- ③ For each of the measures selected, identify which other control variables might be impacted negatively



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

④ Figure out the best combination of indicators and the causal relations between them in order to build a measurement plan for the project

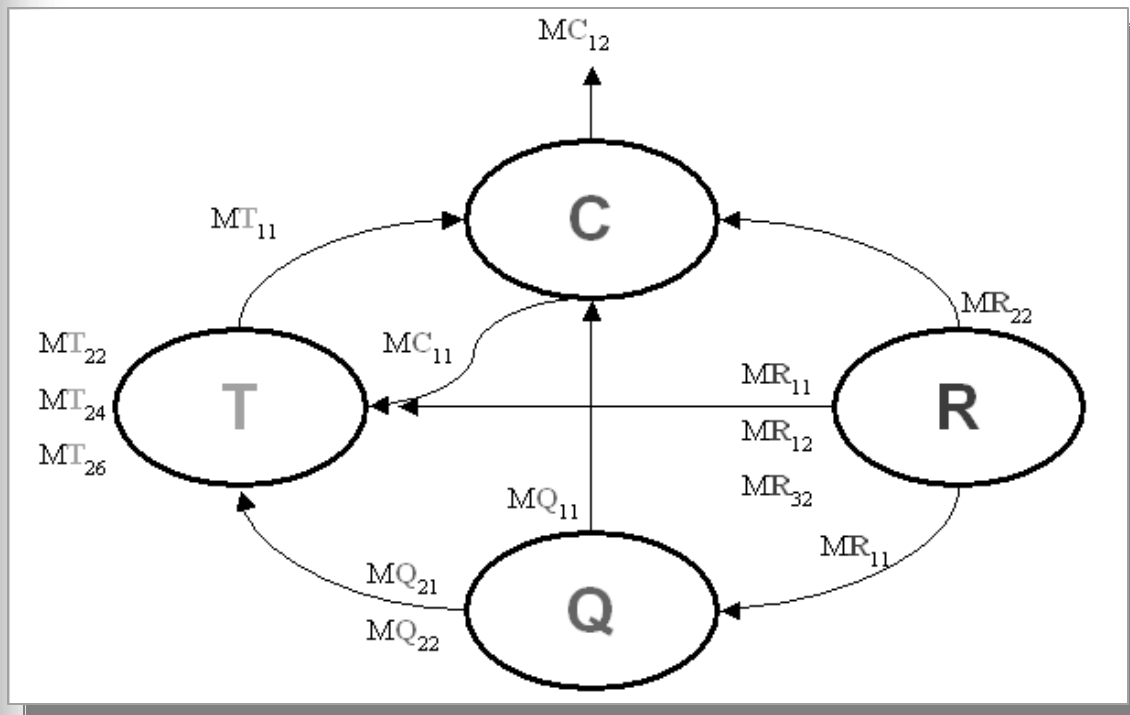
Time	<ul style="list-style-type: none"> • MT₁₁ – Milestone Dates • MT₂₂ – Problem Report Status • MT₂₄ – Change Request Status • MT₂₆ – Test Status 	<i>Referring to GT₁, the most important thing to track is respect for scheduled dates for the project, with an impact on Costs (C). The other three indicators selected are the main ones for determining the eventual amount of rework or additional work to perform, with an impact on scheduled dates and therefore also on the EV.</i>
Cost	<ul style="list-style-type: none"> • MC₁₁ – Earned Value • MC₁₂ – Cost 	<i>The Cost perspective, as in most BSCs, is the final dimension, where all the others converge.</i>
Quality	<ul style="list-style-type: none"> • MQ₁₁ – Defects • MQ₂₁ – Defect Containment • MQ₂₂ – Rework 	<i>The Quality perspective is usually associated with defectiveness and the capability of removing defects. Indicators on rework and reuse are therefore an input for planning (I) and for budgeting the effort (C) for the project.</i>
Risk	<ul style="list-style-type: none"> • MR₁₁ – Staff Experience • MR₁₂ – Staff Turnover • MR₂₂ – Functional Change Workload • MR₃₂ – Resource Utilization 	<i>The Risk perspective is a cross-influence perspective, since it provides input information on the probability of occurrence of several factors. The first two indicators relevant to us in this exercise concern the probability of staffing with the right people in terms of experience and with a proper turnover ratio. Looking at people issues, the % of resource utilization is also useful to the PM for allocating the proper amount of physical resources to the project for the Cost (C) dimension.</i>



BMP: Balancing Multiple Perspectives

An example with 4 dimensions

④ Figure out the best combination of indicators and the causal relations between them in order to build a measurement plan for the project



Time	<ul style="list-style-type: none"> • MT₁₁ – Milestone Dates • MT₂₂ – Problem Report Status • MT₂₄ – Change Request Status • MT₂₆ – Test Status
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BMP: Balancing Multiple Perspectives

Measuring projects' performances from multiple views

- **Q:** What about a possible usage of BMP for measuring the overall project value within a **BSC** logic?
 - **Pros:** BSC helps in managing multiple perspectives
 - **Cons:** BSC does not provide the integrated measurement results
- **A:** a joint usage of QEST nD model with BSC framework
- **A:** BMP can help as a tool for considering the counter-productive impacts of a possible control action in a project by each BSC perspective

Source: A.Abran & L.Buglione, *A Multidimensional Performance Model for Consolidating Balanced Scorecards*, International Journal of Advances in Engineering Software, Elsevier Science Publisher, Vol. 34, No. 6, June 2003, pp.339-349

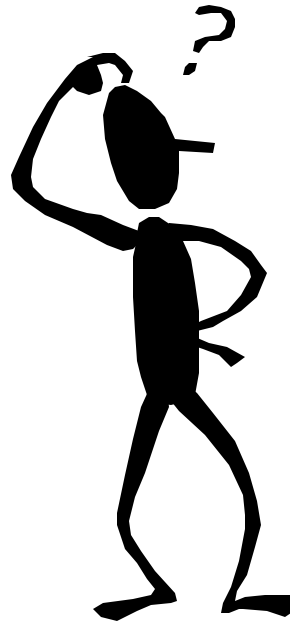


Conclusions & Prospects

- Project managers often considers only two dimensions for tracking & control of their projects (Time, Cost)
- At least, the Quality perspective should be also taken into account; further perspectives (eg: Risk) could be also be useful if considered from the planning phase on. Even challenging, a multiperspective approach – as in the BSC – is suggested
- It does not exist a “magic number” of indicators to track, but the goal is to optimize costs and informative value derived from that amount of indicators, establishing also the causal relationships among their related goals
- **BMP** (**B**alancing **M**ultiple **P**erspectives) proposes a 4-step procedure to select an appropriate balance of indicators from the various perspectives taken into account (e.g. Time, Cost, Risk and Quality) and focus on the core indicators from each of them, thereby helping the project manager in tracking and control activities
- Due to its inner multidimensional nature, future joint usages with methods, tools and frameworks taking into account concurrent dimensions (eg: QEST/LIME) will be investigated



Q & A



Thank you!



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