Organizational Risk Management
The Balanced and Unbalanced Portfolio

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Effective Organizational Risk Management

The Problem

How to reflect very high-edge risky projects Vs. "more of the same" projects and "Mega" projects Vs. small ones, on the same scale?

The Common Practice in organizations

- **Financial and procedural risks on the organization level.**
- **Project Risk Management on the project level.**

A new methodology is suggested

- **Bottom-up approach for Organizational Risk Management.**
- **Giving management a unique view on one chart.**
- **Defining the norms in respect to which projects are**
  - **Within the "normal behavior" (Balanced Projects)**
  - **Outside the "normal behavior" (Unbalanced Projects).**

Constructing the Organizational Risk Management in a bottom-up approach

This methodology is dividing the risks into 4 categories: Technology Risks, Schedule Risks, Cost Risks, Programmatic Risks

The Problem

How to capture the Risk Management quantitative variance between different sized and different complexity projects.

Risk = Probability * Impact (in a monetary value fashion)

The outcome:

Management would focus on the most expensive risks (in an absolute value).

Is this the best strategy?

A new method can enable large organizations to handle risk management programs for large, medium and small projects, with an accurate focus.

Resources Vs. Complexity Model

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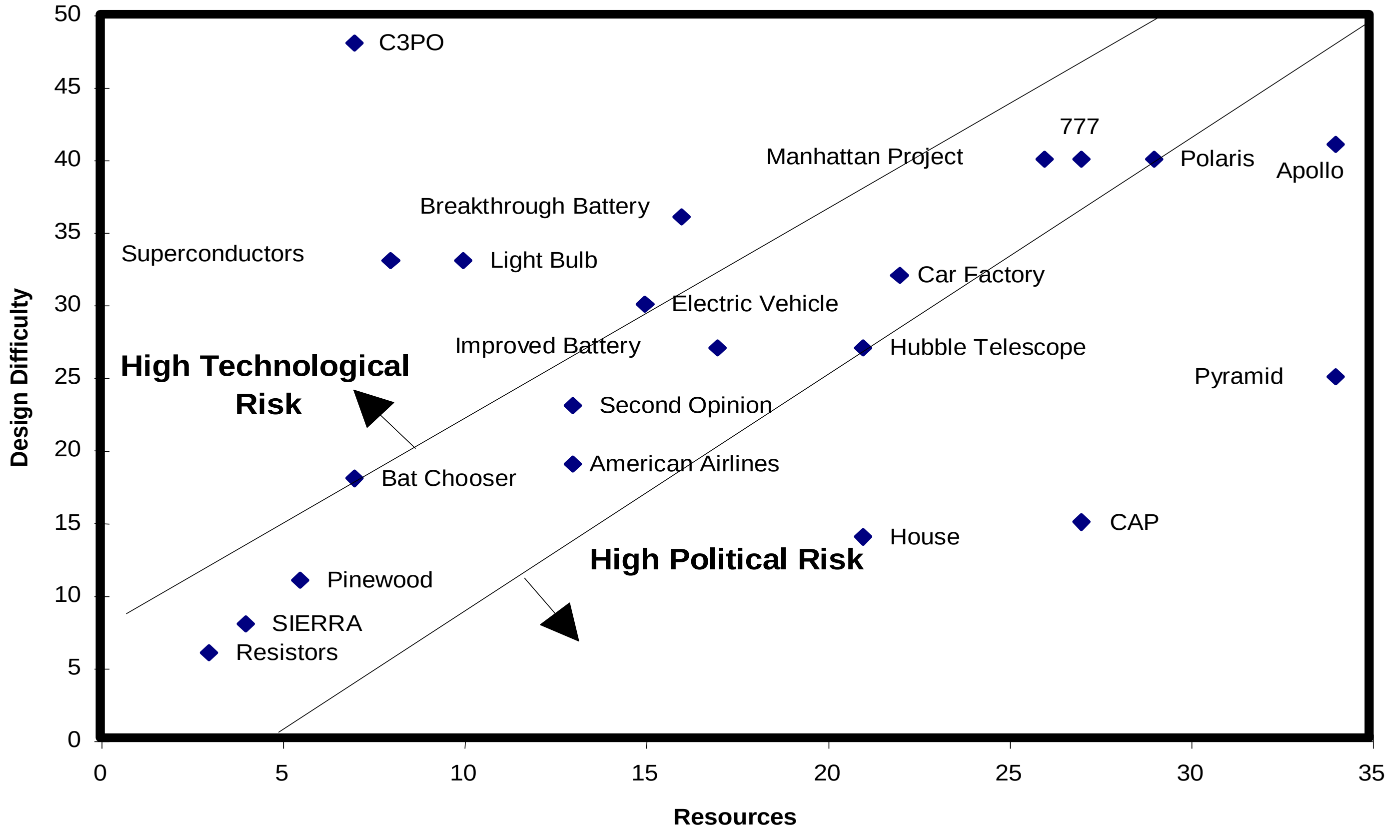
The Model of Moody [(1)]

- We have suggested to manipulate the problem to another domain by relating the Risk Management Model to the Resources Vs. Complexity Model.
- Complexity is represented by the Design Difficulty scale which includes six sub-metrics (not shown): Design type, Knowledge complexity, Steps, Quality, Process design, and Aggressive selling price.
- One such model is the Moody Model that positioned a wide range of organizations over many types of projects on the Resources Vs. Complexity chart.
- In most cases, we aim to evaluate many projects in ***one*** organization, hence, our model will focus on one large organization that runs many types of projects in parallel.
- The model also supports an overview of the riskier projects Vs. the more balanced projects on one chart.

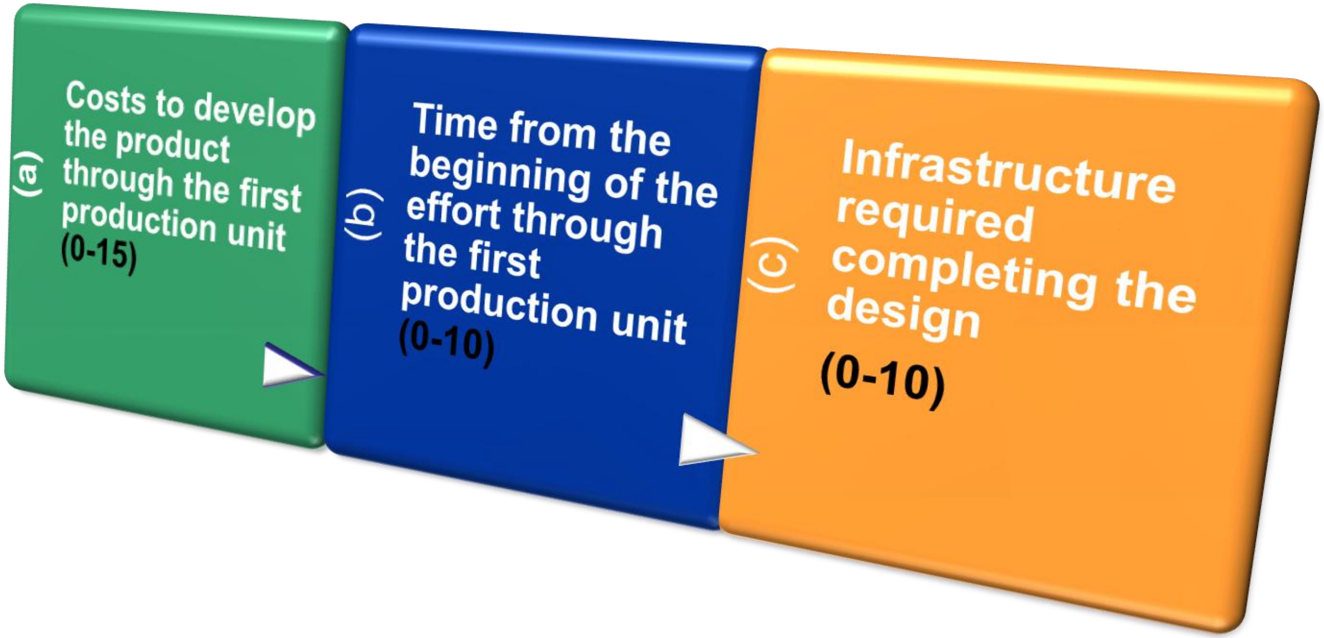
(1) Moody J. A. (et al.) 1997. Metrics and Case Studies for Evaluating Engineering Designs, Prentice Hall.

Moody Risky projects in the Design Difficulty Vs. Resources plane



The Resources Metrics

- The Resources metrics are a basis for the modification suggested.
- The scores of the horizontal axis of the Basic Chart represent a composite (sum) score of the following categories:



Cost Metric

- The amount needed to pay for development (salaries, utilities, suppliers, materials) through the first production unit.
- Cost in terms of the payer's ability to pay.

Points Range	Description
14-15	Massively expensive systems requiring major sacrifices
9-13	Very expensive systems that are rarely developed
3-8	Moderately expensive systems
0-2	Affordable systems

Time Metric

- The time spent from the beginning of the effort to define the customer's needs through the first production unit.

Points Range	Description
10	More than eight years
8-9	Five to eight years
4-7	One to five years
3	Six months to a year
2	Three months to six months
1	One to three months
0	Less than a month

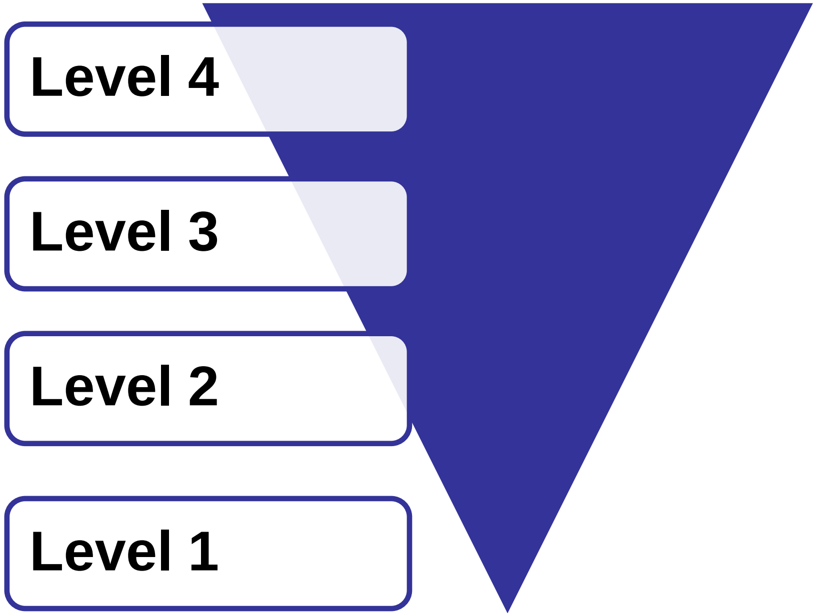
Infrastructure Metric

- **The physical resources needed for construction (tools, process shops, assembly workstations), transportation, communication, utilities, laws and legal protections, skilled managers, and the education and training system available.**

Points Range	Description
9-10	Massive infrastructure requiring major portions of the available labor force and available equipment
6-8	Large complex infrastructure requiring large portions of the cost of the entire project
3-5	Moderate infrastructure requiring people on the project to support it
0-2	A common, low cost infrastructure

The Bonen Scale (2)

- Preliminary analysis of the maturity of a system in R&D projects was first introduced by Bonen.
- Bonen Classified design modules into four categories by the level of maturity they represented:



(2) Bonen, Z. 1964. "On the Planning of Development Projects", Proceeding of the 3rd Conference on Operation Research.

The Bonen Scale (in details)

Level 4

The project needs a separate research effort before the project starts.
Implications: higher cost and more time spent, still not knowing if there is any viable solution

Level 3

There is a viable solution; still the project does not know how to reach there

Level 2

Project knows the solution; still a full R&D process is required

Level 1

Revisions are still required by the project

The Bonen Scale in R&D Projects

Level 1	Revision or Variant Design	Project team is familiar with the solution (which has already been accomplished in-house), small revisions are still required
Level 2	Eng. Gap Adaptive Design	Project team knows what to do and is familiar with the solution; a full R&D effort is required
Level 3	Orig. Design Viability Proof exists	Project team knows that a solution is feasible and technology exists; does not know how to attain such a solution, it had never been attempted before
Level 4	Research or No Viability Proof	Project team does not know whether or not a solution is possible or the technology available; research required

Balanced & Unbalanced Project Portfolio

- **New methodology is suggested, based on calculating for each project two factors (not the common single risk factor):** ***Resources Vs. Complexity.***
- **Calculating method have been suggested for each factor:**
  - ***Resources*** **measurement is based on the modification of** ***Moody's Model.***
  - ***Complexity*** **measurement is based on the** ***Modified Bonen Scale.***

Modifications of the Resources Metrics

Modified Cost Metric

The metric is normalized by default since there is one organization and not many

Modified Time Metric

The metric is normalized by the organization, based on its knowledge of what were the longest R&D effort and the common R&D effort (in terms of time-spent)

Modified Infrastructure Metric

The metric is normalized by the organization, based on the knowledge of what is a common, low cost infrastructure comparing to a large and complex infrastructure

Modification of the Bonen Scale (3)

The main disadvantage of Moody's Model is the complexity of the *Design Difficulty* scale itself:

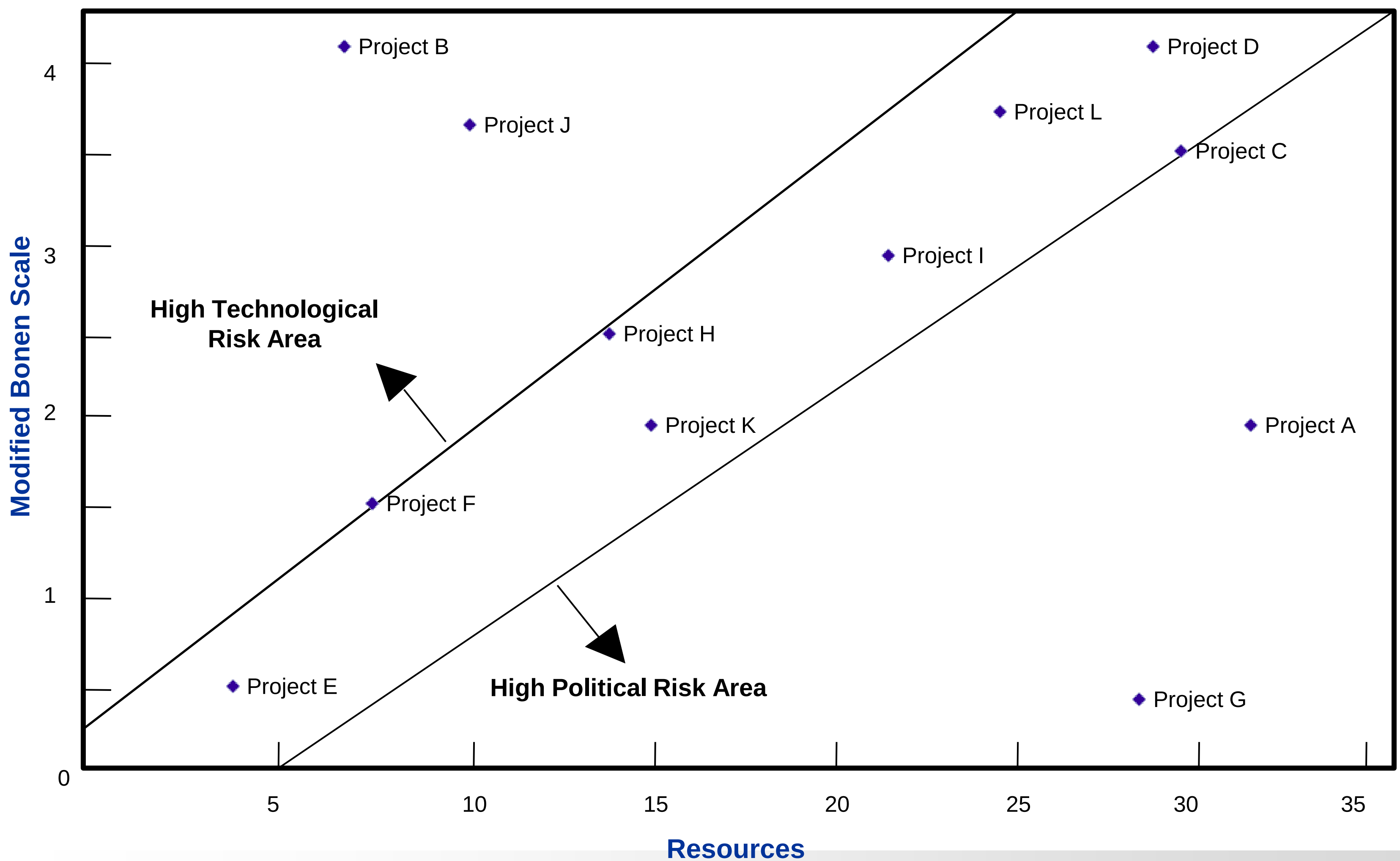
- ***Resources*** **scale includes only 3 sub-metrics (Cost, Time, and Infrastructure) that can be easily measured in the organization.**
- ***Design Difficulty*** **scale includes 6 sub-metrics (Design type, Knowledge complexity, Steps, Quality, Process design, Aggressive selling price).**
- **For this last scale we have suggested the use of the much clearer and easy to communicate *Modified Bonen Scale.***
- **The scale is divided into 5 categories; The extra category is *Level 0*, which stands for "no extra design needed“. In this level, the project team knows exactly what to do and what is the solution.**

(3) Hari, A., & Weiss, M. P. 2003. "Analysis of Risk and Time to Market During the Conceptual Design of New Systems", International Conference on Engineering Design ICED.

The Modified Bonen Scale in R&D Projects

Level	Definition	Description
0	No extra design needed	The project team knows exactly what to do and what is the solution
1	Revision or Variant Design	The project team is familiar with the solution (which has already been accomplished in-house), however small revisions are still required
2	Engineering Gap or Adaptive Design	The project team knows what to do and is familiar with the solution; however, a full R&D effort is required
3	Original Design or Viability Proof exists	The project team knows that a solution is feasible and that the technology exists, however the team does not know how to attain such a solution since it has never been attempted in-house before
4	Research or No Viability Proof	The project team does not know whether or not a solution is possible or the technology available, research required

The Balanced and Unbalanced Project Portfolio Model



The Balanced and Unbalanced Project Portfolio Model (cont.)

Two-dimensional chart - enables us to identify projects that are inside or outside of the organizational *norms*

Three areas that a project may be positioned in the chart:

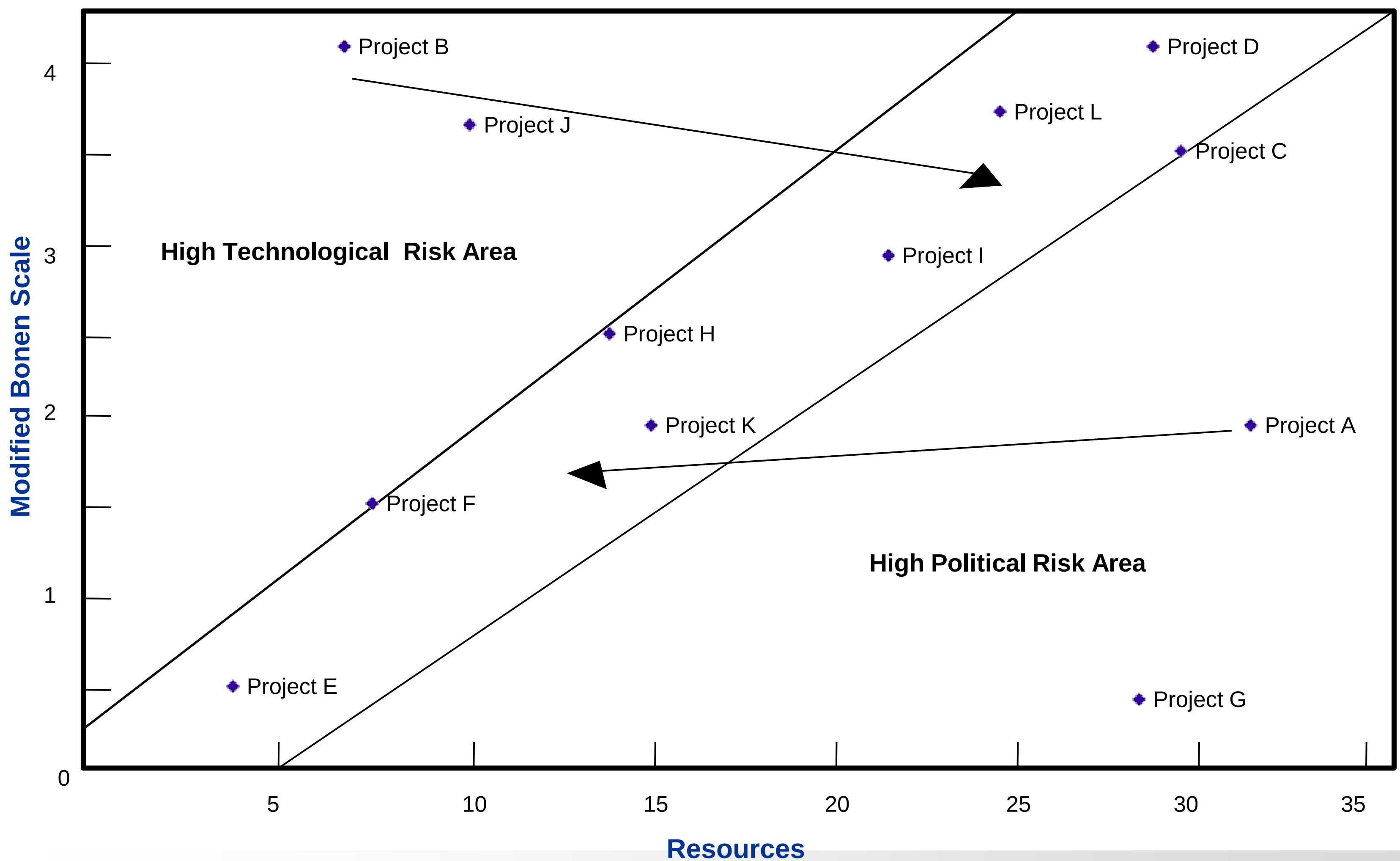
- **(a) *Balanced Projects Area* - The area within the two diagonal lines that represents the norms of the organization.**
- **(b) *Unbalanced Projects Area* - Increased Political Risks; Projects with too many or wrong resources and too little complexity.**
- **(c) *Unbalanced Projects Area* - Increased Technological Risks; Projects with too much complexity and not enough resources to accomplish.**

The Balanced and Unbalanced Project Portfolio Model (cont.)

This representation can handle all sorts of projects altogether:

- **Balanced projects are always in the main diagonal.**
- **Risky high technological projects are in the upper left corner.**
- **High political projects are in the lower right corner.**
- **It will also help defining the norms of that organization - which projects are within the "normal behavior" (Balanced Projects) and which projects are outside the "normal behavior" (Unbalanced Projects).**
- **This method can also help in the CMMI levels 4-5, which requires a measurement of this *Process Area* (i.e., Risk Management) in the organizational level against some organizational norms.**

Behavior over time



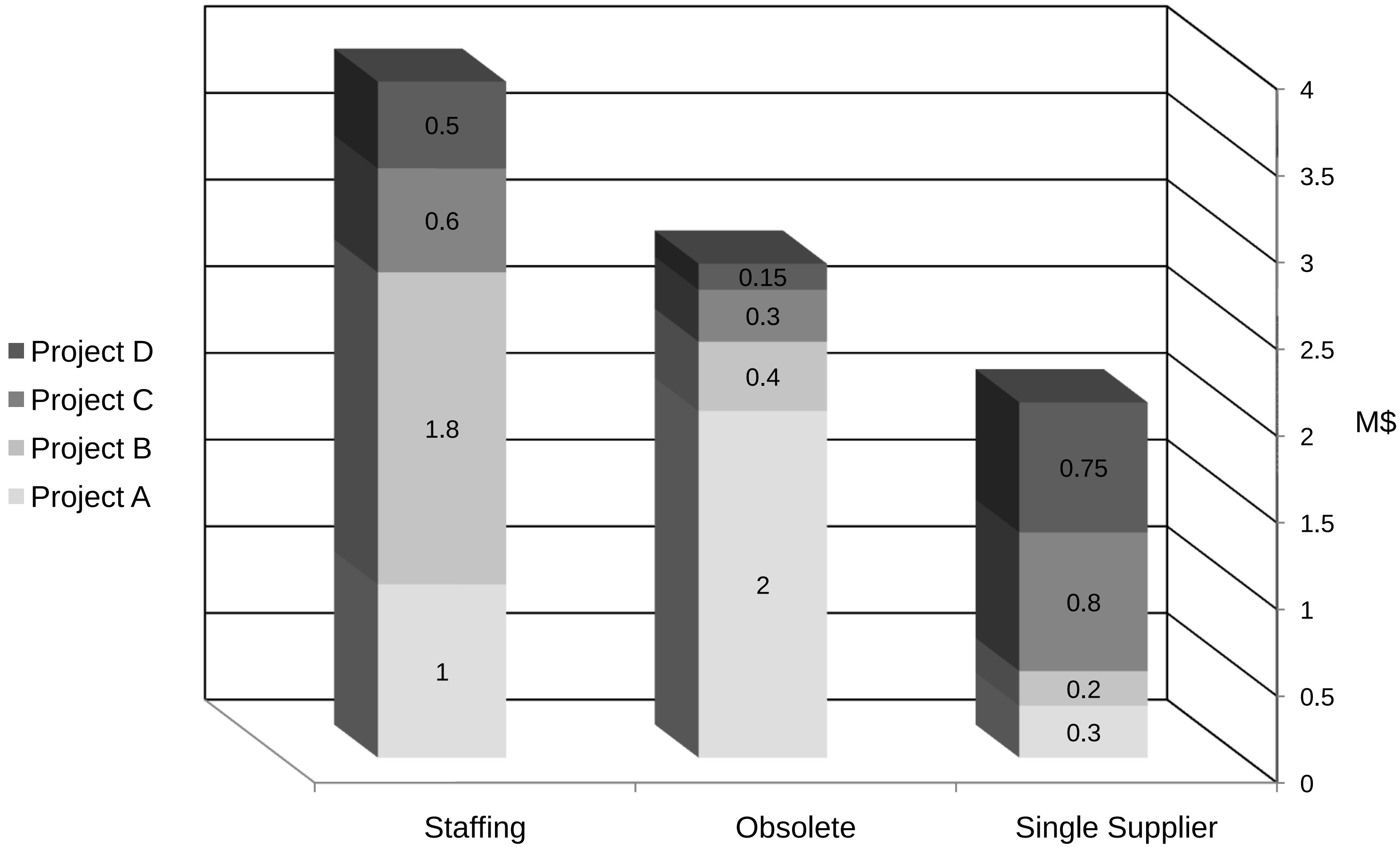
Programmatic Risks Management

- Risks that are beyond the level of the specific project, affect the project, and if necessary must be mitigated at the organizational level.
- Examples: staffing, single supplier, export permits, strikes, obsolete components, Government regulations, etc.
- Our model allows an analysis of the Programmatic Risks for each of the three areas:
  - Balanced Projects area
  - High Technological Risk Projects area
  - High Political Risk Projects area
- Programmatic Risks are being calculated for each area.

Programmatic Risks Management (cont.)

- **The data are displayed in the next chart according to the Programmatic Risk type (programmers staffing, obsolete components, single supplier, etc.).**
- **The normalized risk factor was calculated as Probability * Monetary Impact (in this case in M$) per project according to the common practice in the organization.**
- **Projects A, B, C, D are in the size of $ 100M, $ 50M, $ 10M, $ 4M, respectively.**

Programmatic Risks Management (cont.)



High Technological Risk Projects vs. Programmatic Risk Category

Programmatic Risks Management (cont.)

(a)

Project A is a "Mega" project compare to Project D. Still, it seems that in the *single supplier* category the monetary risk of the later is more than double compare to this risk in Project A.

By using this approach the focus on Project D is immediate.

(b)

***Programmers staffing* is the major Programmatic Risk (in absolute monetary value).**

It seems that many programmers that do coding are missing in many projects; the organization can try and solve the root problem by outsourcing all of its coding tasks, or train enough programmers in-house to do the needed job, instead of trying to solve the problem project by project.

Results

This method enables:

- **Focusing more thoroughly on the Programmatic Risks from the organizational level. Additional benefit: enables to observe and investigate the changes and trends in the programmatic risks histogram over time**
- **Identifying organizational resources that are still needed or wrong in the Unbalanced areas.**
- **Analysis of the information in different organizational levels, according to the organization size, type, and number of projects.**

Summary

- Such presentation of projects' risks in an organization is a beneficial and unique way to handle the complexity of the bottom-up approach
- This suggested model is flexible enough to allow the definition of a Risk Management model suited to the organization environment, and at the same time has the advantage of improved identification and handling of projects risks in the organization level, and back down to the project level in a top-down approach
- This strategy gives the organization a competitive edge at the current situation of many diverse risks in the world market.