EARTO / EUROLAB Conference

Den Haag, 20 - 21 March 2003

Project Management in a CR Organisation

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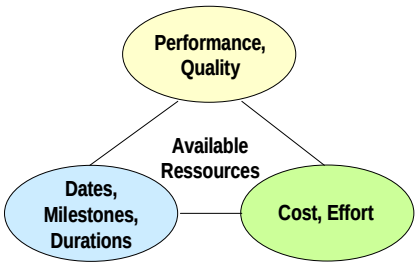
Definition

A project is defined by its uniqueness of its constituting conditions (which form a whole set of criteria, as are e.g.):



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Projects ...

... need **clear objectives** and targets, e.g. delivering well specified results

... are **limited in time**, **finances and resources**

... need their **own organisation** which is different from other existing organisational entities (The transient projects are “horizontal” versus permanent “vertical” organisational structures)

... are constituted above a **certain level of complexity**, i.e. are instrumental for managing complex enterprises

... are in competition for **resources** available in the contextual organisation within they take place

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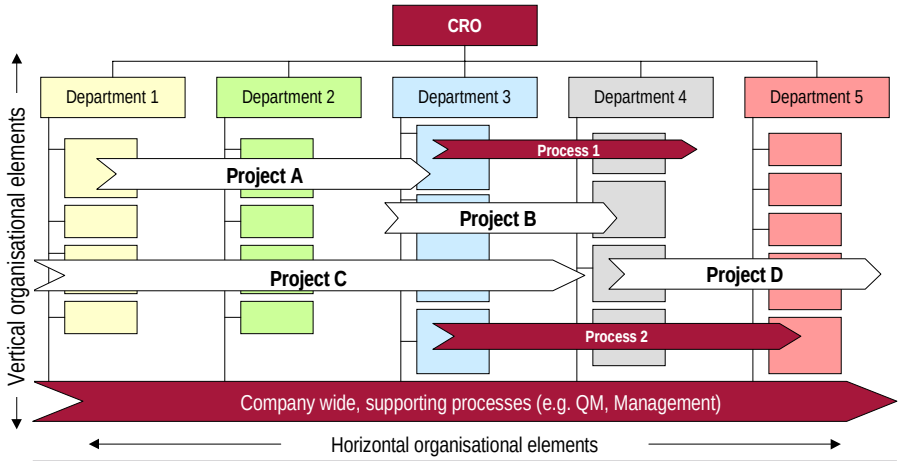
Organisation, Processes, Projects



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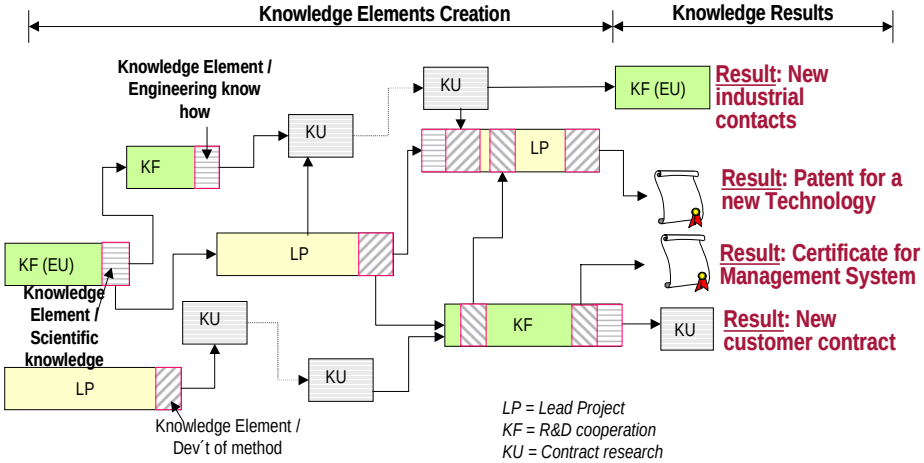
Example for processes: Development of knowledge results / products at ARC



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Significant issues for an R&D Project Management (PM) Organisation

PM is Management of ...

- ... cost
- ... time / duration
- ... quality
- ... human resources
- ... other resources
- ... scope
- ... procurement
- ... integration
- ... communication
- ... risk

* based on PMI standards

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Given a National CRO such as ARC ...

... with up to **200** internal R&D projects p.a.
... more than **150** projects funded from EU 5th Framework Programme, from national funds etc....

... and more than **900** contracted projects from customers from industry and public institutions

➲ **additional conditions must apply for „large quantity" Project Management!**

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Why „extra" Project Management in European cooperation projects are needed?

- multiannual & multisectorial R&D programmes
- multitude of (sometimes conflicting) goals
- multitude of critical paths
- **divergent risk assessments**

... **audited** by European Commission (w.r.t. competition law)
... **audited** by national auditors (justification of use of „tax payers´ money")
... internal & external **evaluation** (for scientific excellence)

- plus different organisational set-ups and **rules**, many imposed by customers
- plus specific national & regional R&D **policies**, innovation politics aspects etc.

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Differentiational (departmental or sectorial) accounting system used at ARC ...

... provides

in-depth **sectorial income analysis**
for “contracted research” and “independent research”

... is important for EU projects: Compliance required with

- EU regulations (competition, financing ..),
- in specific Commission Directive **80/723 / EEC of 25 June 1980, amended in July 2000**
  on the transparency of financial relations
  between the Member States and (their) public undertakings

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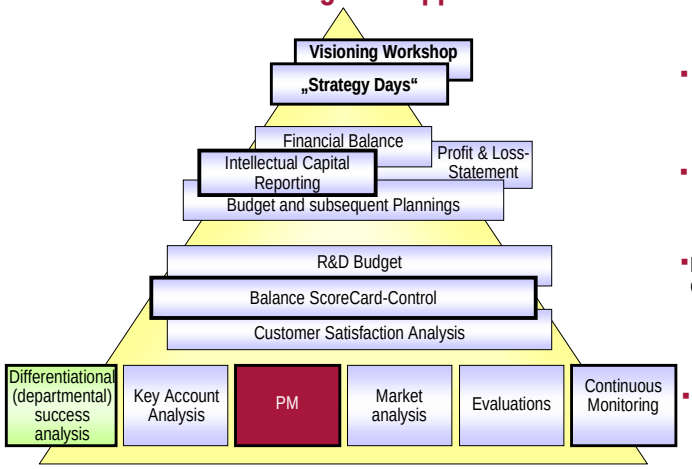
Instruments for Managing a CR-Organisation such as ARC: an integrated approach



- annual
- annual
- periodic, e.g. by quarters
- monthly

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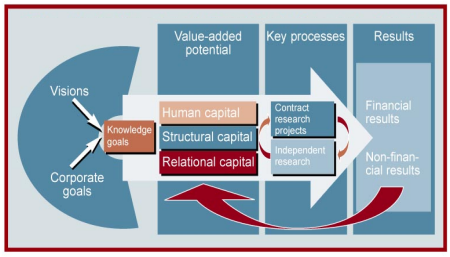
The Knowledge-Devoted R&D Organisation: driven & controlled by aggregating „Knowledge Capital“

Output orientierted value creation processes following the ARC Knowledge Capital Model (KCM)



RESULTS

- **Scientific publications**
- **Patents, IPRC**
- **Products**
- **Services (e.g. Laboratory)**
- **Creation of Spin-Offs**
- **...**

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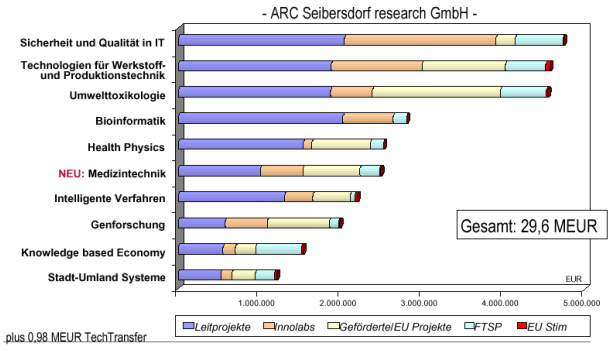
An Example of an annual R&D programme plan (2002) as a framework for projects

Programmes = „coagulations“ of projects within strategic lines of research



plus 0,98 MEUR TechTransfer

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Project Management

"Classical" Project Management

- **Planning & Control of ...**
  - Objectives
  - Cost
  - Milestones/Achievements
  - Personel
  - Resources
  - Quality
  - Deliverables
- **Technology**
  - Interfacing to other ERP systems such as SAP

Coordination Management for...

- **...large Scale Projects such as IPs in 6th FP**
- **...International Cooperation projects**
- **...Multi-dimensional Project Management**
- ...Consortium Contract Management

New and Modern Elements of Project Management

- **Management**
  - General Resource Management
- **Risk Management**
- **Portfolio Management**
- **Technology**
  - Open Standards & Interfacings to ERP-Systems

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Criteria for setting up R&D project Portfolios

- **Strategy** providing for (programme &) project **objectives**
- **Programmes form the strategic frameworks**
- **Strategic compliance** of any R&D project with overall framework programme
- Interdependencies with other programmes incl. **"interdisciplinary combinations"**
- Roles & **responsibilities** in projects
- Baseline and target **performance**, measured per project and per responsible unit / department
- (Fantasy on future) **business cases**
- **funding required** as at planning stage
- **Combined** programme management **+** project management
- **Policies, standards and rules applicable**
- **Quality Management**
- Implementation & integration processes: **"Making it work"**
- **Risk Evaluation**

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Risk Evaluation Techniques for Projects

- Probabilistic Risk Assessment
- Comparative Models
- Scoring Approaches
- Economic Models (**Real Options**)
- Decision Tree Analysis
- Hybrid Decision Tree Analysis and Real Options Approach
- Petri Nets
- Mathematical Programming Approaches

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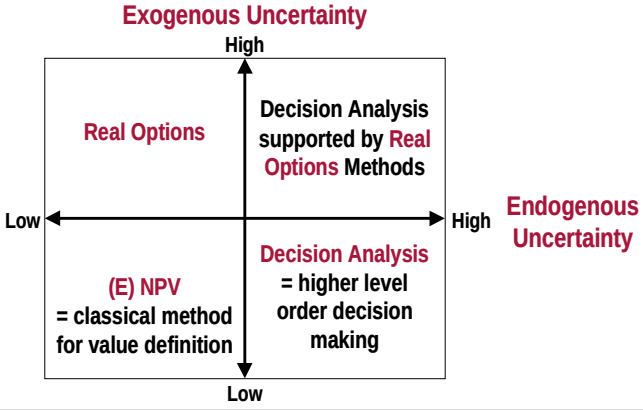
Methods for quantitative analysis of risks (measured by financial results)



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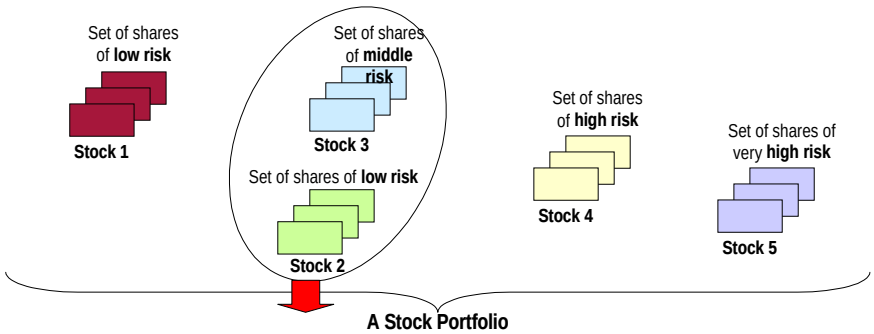
A definition for a Stock Portfolio is "stock diversification"



Portfolio Variance = $X_2^2\delta_2^2 + X_3^2\delta_3^2 + 2\,(x_2x_3\rho_{23}\delta_2\delta_3)$

(Covariance)

x_1 = percentage of contribution of Stock i

δi = percent of standard deviation of return for stock i

Objective: Construction of a portfolio with maximum return at lowest risk

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Option Pricing theory applied to R&D projects: What is the ideal R&D project portfolio?

- **Options** are one form of **derivative**: their value depend on an underlaying asset
- Any **R&D project** seen by its *result exploitation potential* can be considered as an object with an "**option price**"
- **Pricing of options** provides for the "calculation" of the "**value" of an R&D project**
- The art of managing a **multi-project-organisation** (as is ARC) is to analyse the "quality" of the **R&D project portfolio** under the assumption that the combination of risks and the potential returns provides for an **optimal selection of projects**

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The Knapsack Question: What is the optimal portfolio?

Question: Given a Knapsack of **Capacity C** (= limited resource, such as limited financial R&D budget) and **n Objects** (= "projects") regarded to be needed for achieving the end purpose (e.g.mountain climber arriving at the peak): What is the optimal set of objects to achieve a maximum of success (= profits)?

State of the practice in Risk Analysis: Usage of Hybrid Models

- Usage of the concept of **Real Options** (**RO**) and within their defintion: consolidate different judgements of various experts.
- Determination of uncertainty through variance of **experts´ judgements**.
- Use Multi Attribute Utility Analysis (MAUA) to gain a consolidated valuation from the valuation of the many different attributes.

Shortcomings of Real Options Approach

- Lack of underlying = **no existing "market" for R&D Projects**
- Therefore no volatility
- Main focus still only on economic aspects

⇨ Suggestion for Solution

- **Use of experts´ judgements to simulate a market**
- Hybrid Model to include multidimensionality in criteria

The value of a project shall not only be defined by monetary returns, rather than by ...

... efforts "invested" by including cost, duration, personel capacities (at certain qualifications),...

... extended financial terms, as are: payments lost, interest rates, returns, cash flow generated ...

and, in specific, in terms of...

... **utility** generated

... increase of **knowledge** (as a real and measurable value)

... **social impacts** (as an aspect to be valuated specificaly in (semi-)public CROs)

where the values in these categories need proper and large expert estimations.

Thank you for your attention !

And here are my "Encores":

„All growth is a leap in the dark, a spontaneous unpremediated act without the benefit of experience" *(Henry Miller)*

„He who doesn´t risk, never gets to drink Champagne" *(Russian Proverb)*

„And the trouble is, if you don´t risk anything, you risk even more" *(Erica Jong)*

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RESERVE

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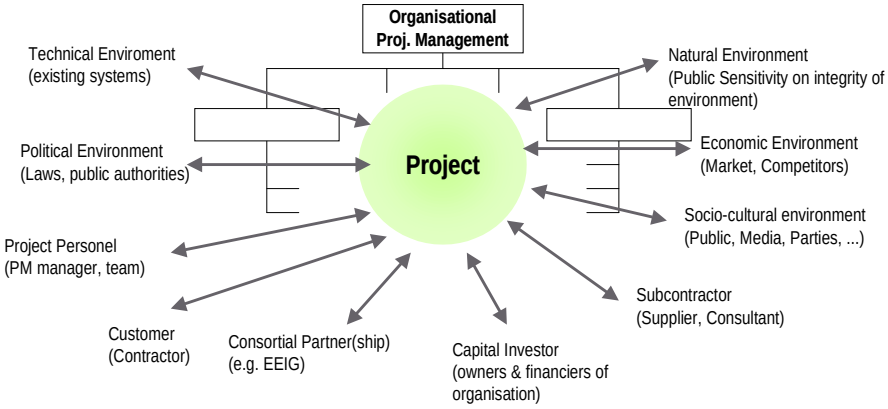
The Context of any project as a pattern of multi-dimensionality



Optimisation of an R&D Organisation w.r.t. its „Mission“ and its dependancies in networks

Mutual dependency of R&D & knowledge areas

Uncertainty of Mission or Objectives & Task

	low	high
high	**Permanent Revolution** Fragmented „Adhocracy“ = permanent change: Typical Project Organisation	**Innovation & Accumulation** Organic Organisation i.e. following the „model of life“: (Typical Advanced Project Organisation)
low	**Specialisation** Polycentric professional activity = Division into many professional fields using PM	**“Norm(ative)“ Scientific Research (under public financing & control)** „Integrated Science Burocracy“

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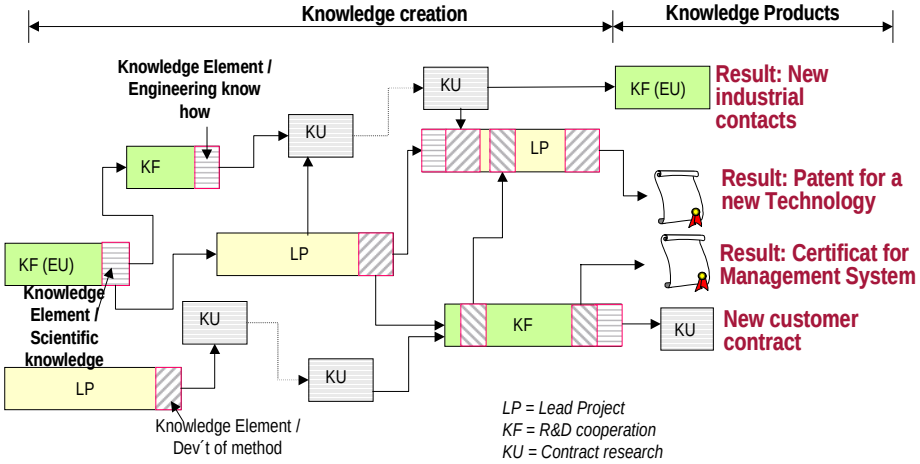
Example for processes: Development of knowledge results / products at ARC



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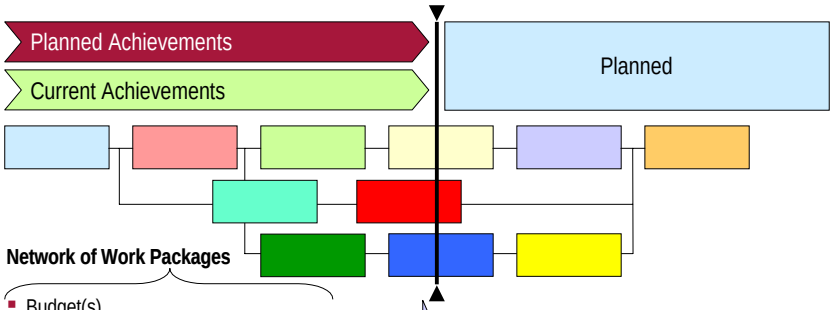
Project Management (PM) has its own organisational scheme

Observation of Current Status: Difference „Planned“ / “Achieved“



- Budget(s)
- Milestones, Resources, Cost
- Deliverable(s)
- Effort(s)
- Success: Comparison of Plan vs. Current status

- **Inflowing payments related to achievements**
- **Connecting Project Control Data to Enterprise contractual & financial data**

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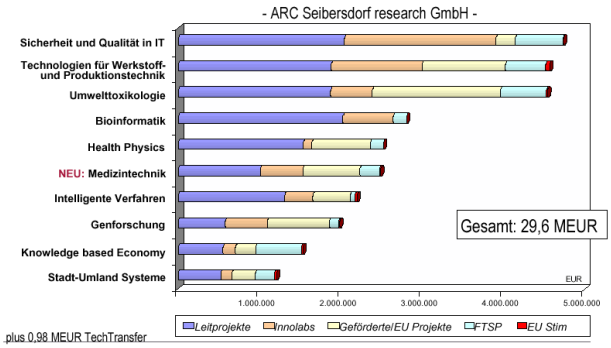
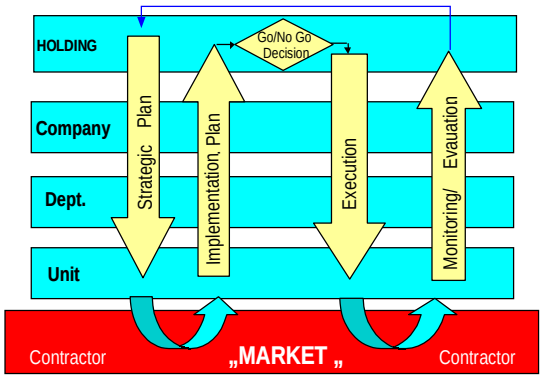


Processes for planning & control of R&D programmes at ARC



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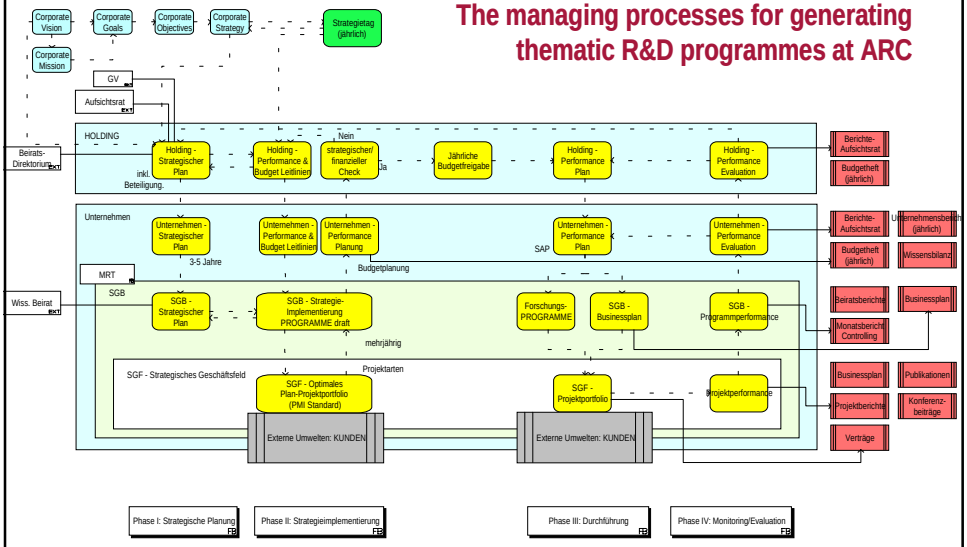
The managing processes for generating thematic R&D programmes at ARC



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Two kinds of risk

Unsystematic Risk:
Unique Risk

- Bill Gates might take early retirement from Microsoft
- A software component might not be (re)used
- Hewlett-Packard might not be able to develop a breakthrough framework technology that can be re-targeted to multiple domains
- etc.

- Inflation might increase
- the budget deficit might increase
- interest rates might rise
- real GNP may devline
- etc.

Systematic Risk:
Market Risk

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Unique Risk versus Market Risk

- **Unique risk** affects only the individual CRO or project
  - technical risk is an important type of unique risk. It is the kind of risk that engineers are most aware of
- **Market risk** affects all CROs and projects
  - „The rising tide lifts all boats“
  - It is „bedrock“ risk
  - it cannot be „diversified“ away