Information Technology in Practice: Benefits, Costs, and Business Cases

ETH zürich

Dr. Marc Brandis

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MINDSET OF BUSINESS OWNER, BUSINESS MANAGER AND ENTREPRENEUR

Investor/ Business Owner

- How much value will I get from investing CHF 1 in this company vs. into other opportunities?
- How much risk is there that I will loose?

Managers/ Board of Directors

- How can we fulfill the expectations of the investors, maximizing the value (equity and RoE*)?
- How can we avoid “blowing up the business” (large risks)?

Entrepreneur

- How can I make enough money to pay my bills, incl. the salaries of my staff?
- How can I keep investing to stay ahead of the competition?

Decisions based on

- Benefits
- Costs
- Risks
- Strategic flexibility

* Return on Equity

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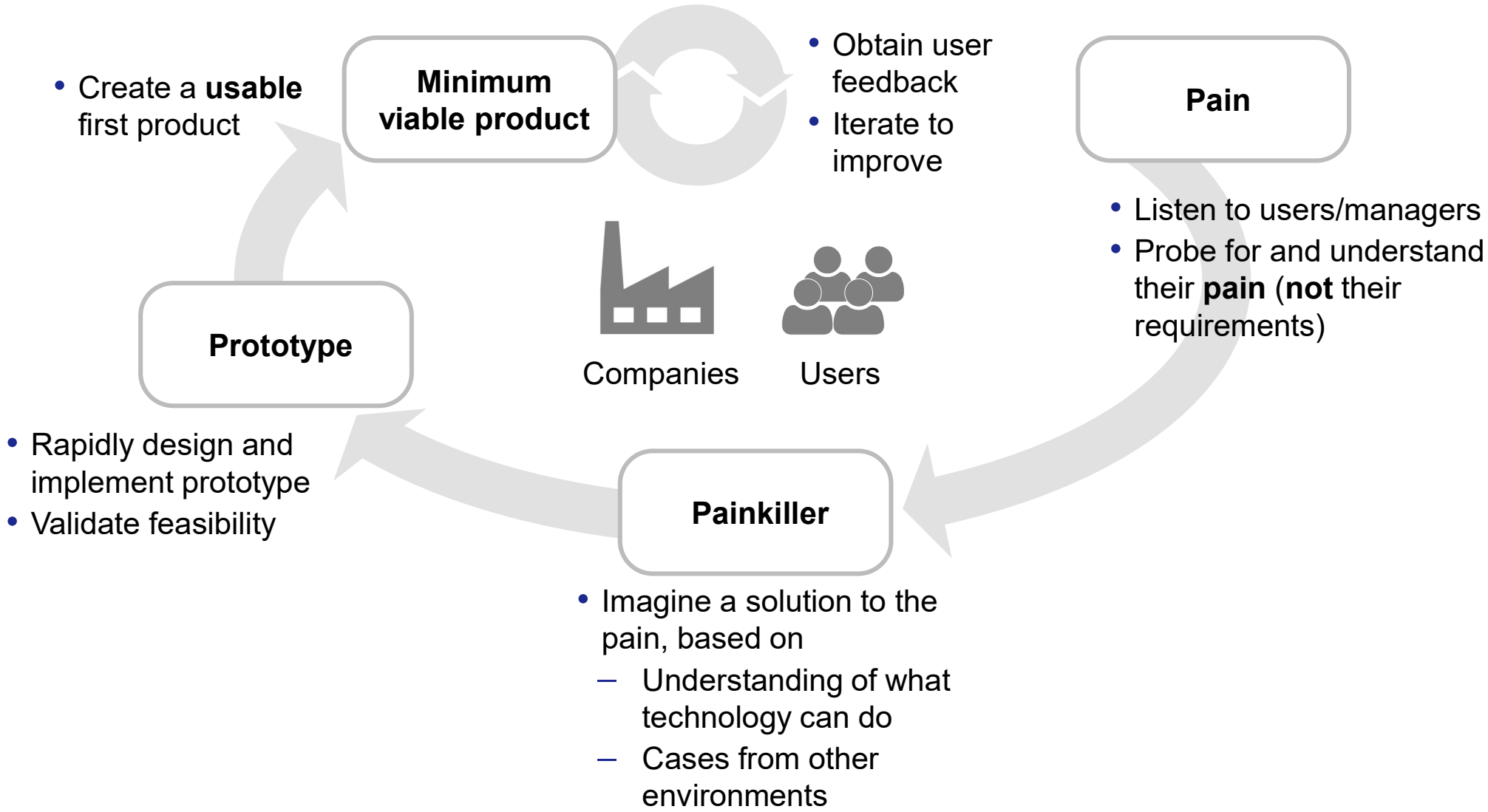
BROAD CATEGORIES OF BENEFITS OF INFORMATION TECHNOLOGY USE

	Examples
Improved products/ services	• Easier to use, more adaptive products • More efficient, resource consumption reducing products • New fields of product use due to improved products (e.g. as mobile devices, or with less skilled user(s))
Improved processes	• Faster turn-around times • More flexibility to adapt production to market demand • Improved decision making
New business models	• Shift from selling products to providing services • Highly configurable platforms challenging specialized products

- Concrete benefits are highly specific to industry, field of application, and technology
- Sources of inspiration include
  - Vendor presentations
  - Reports from other companies, incl. from other industries
  - Presentations from researchers

GENERATING BENEFICIAL IDEAS



Source: Case studies from Practice, ETHZ 2020; Willy Bischofberger; Zühlke engineering; dormakaba; Dr. Marc Brandis

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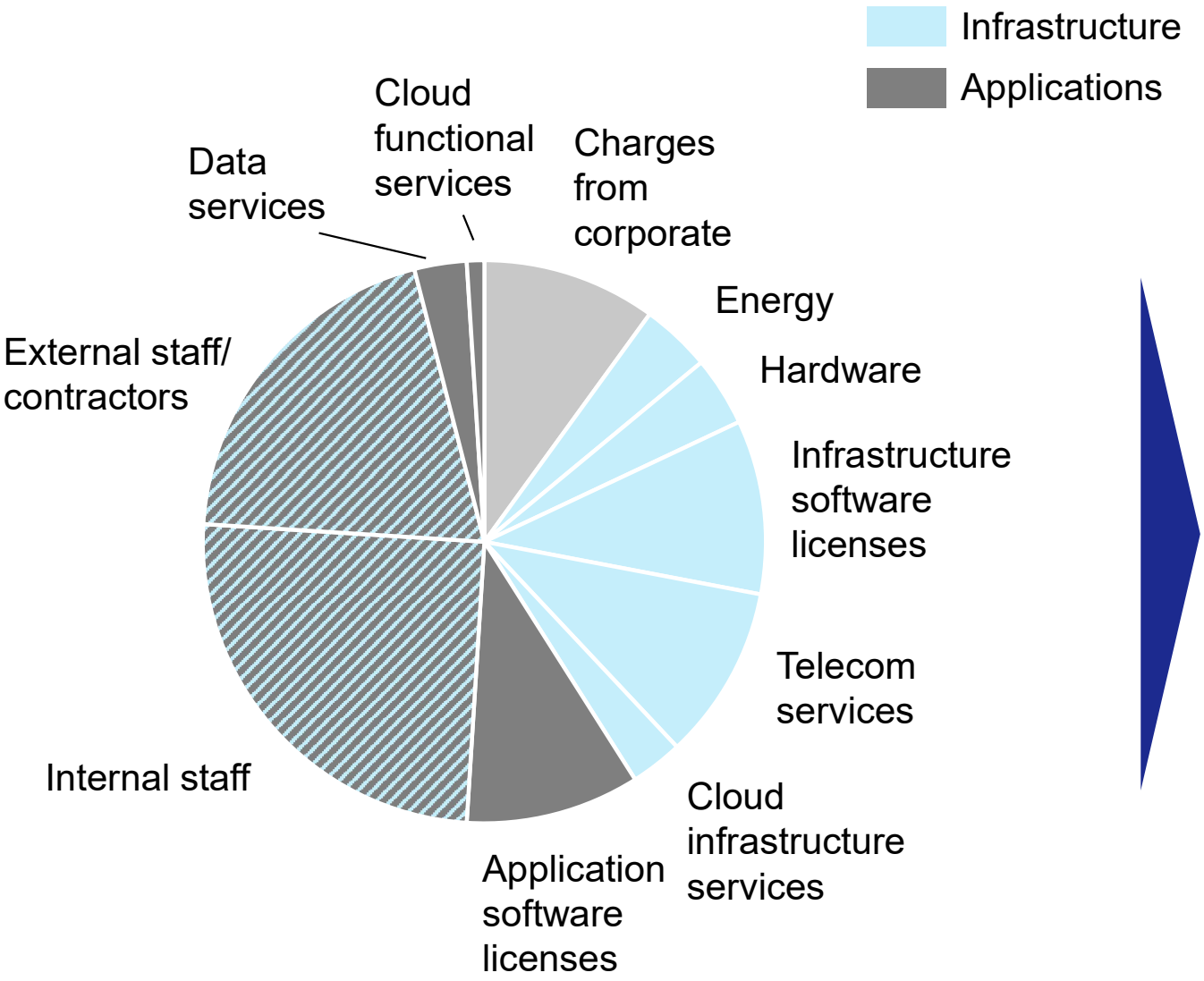
COST CATEGORIES IN TYPICAL IT BUDGETS*

ILLUSTRATIVE



- Broad range of different cost categories
- Main cost drivers are internal and external staff, followed by licenses, and services
- The services categories can be expected to grow with the adoption of more SaaS/PaaS (Software-as-a-Service, Platform-as-a-Service) offerings
- Licenses categories can be expected to grow with companies adopting more standard software, except when they use it in a SaaS-model

* Cash view; often some investments are activated and depreciated over subsequent years

ACTIVITIES IN THE IT DEPARTMENT

* Sometimes accounted for outside of IT budget
Source: Dr. Marc Brandis 2011, 2019

ACTIVITIES IN OPERATIONS

Infrastructure Provisioning	• Installing and configuring hardware, network, and infrastructure software (operating system, database systems, etc.)
Software Deployment	• Installing and configuring application software on the infrastructure • Distributing software to distributed devices (e.g. PCs, mobile phones, remote industrial devices)
Systems Manage-ment/Monitoring	• Monitoring running application and infrastructure software • Identifying issues and outages • Taking corrective actions
User Support/ Helpdesk	• Handling user questions and issue reports • Taking corrective actions for issues • Administering user access rights • Informing users about planned or unplanned unavailabilities

MAINTENANCE OF APPLICATION SOFTWARE

Changes to application software to improve maintainability or to reduce the likelihood of future problems

Changes to application software due to new requirements (functional or non-functional)

	Correction	Enhancement
Proactive	Preventive	Perfective
Reactive	Corrective	Adaptive

Removal of defects in application software

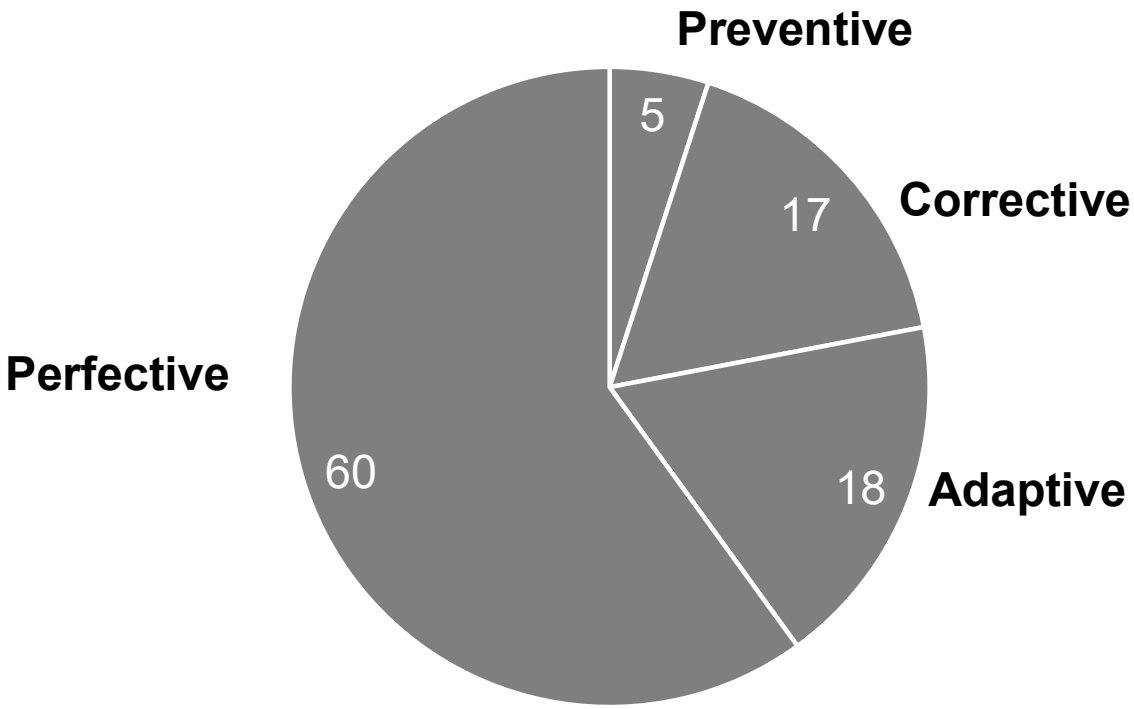
Adaptation of the application software to changes in infrastructure it is relying on or in applications it is connected to

Source: ISO 14764 Standard for Software Maintenance

SHARE OF CATEGORIES IN APPLICATION SOFTWARE MAINTENANCE

BACKUP

in %

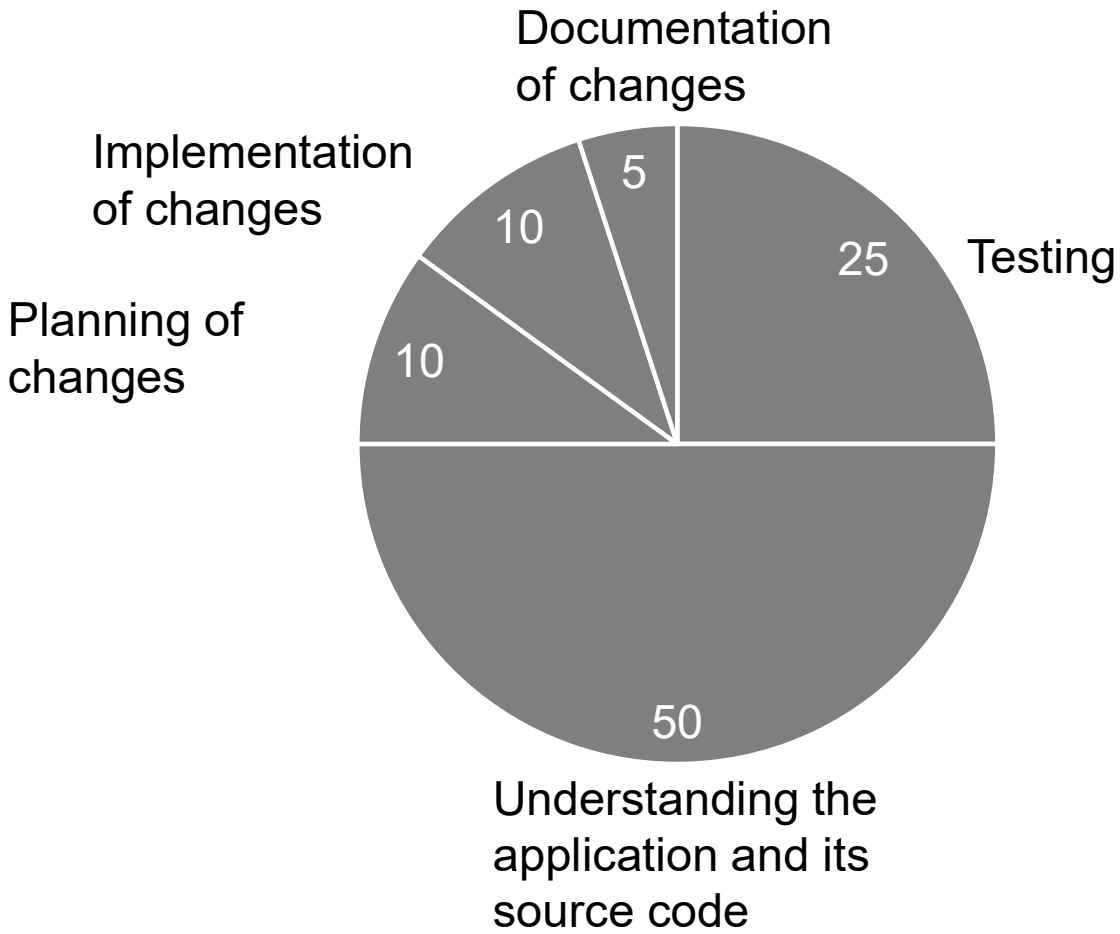


Source: Grubb & Takang, Software Maintenance – Concepts and Practice

SHARE OF ACTIVITIES IN APPLICATION SOFTWARE MAINTENANCE

BACKUP

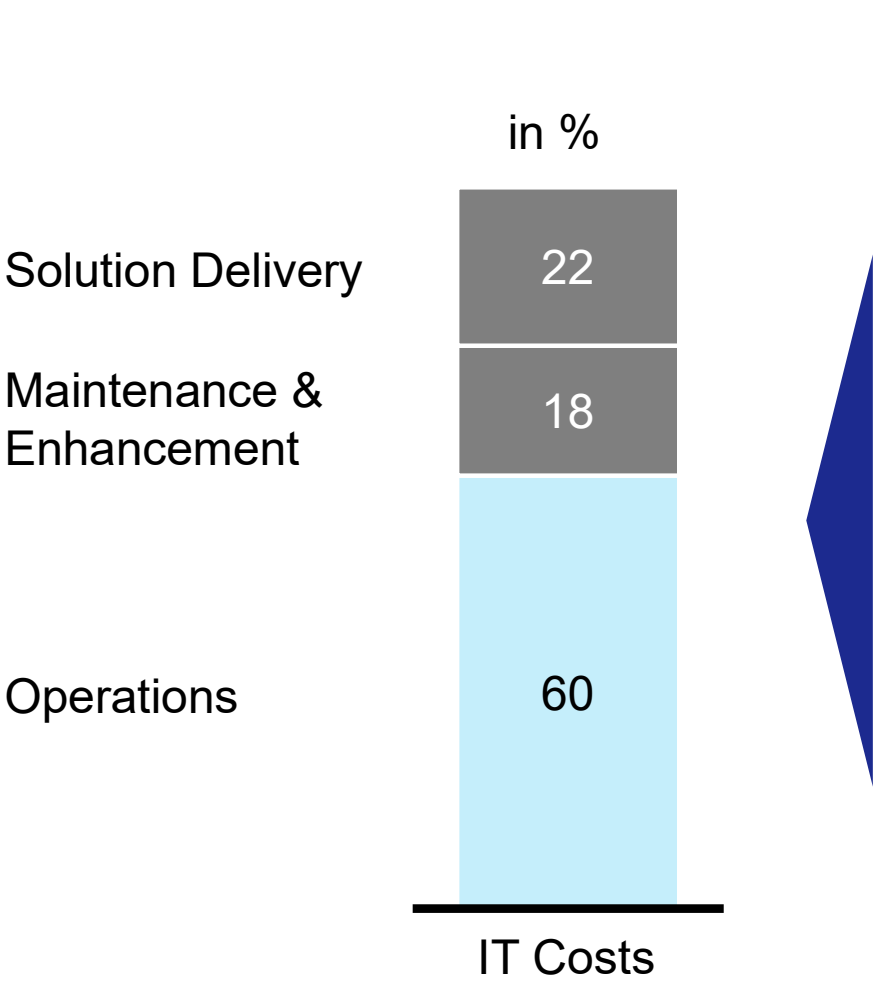
in %



Source: Grubb & Takang, Software Maintenance – Concepts and Practice

SPLIT OF IT COSTS BY ACTIVITY

BANKING EXAMPLE



- Operations is the largest cost block
- Typically, only half of software development capacity can be used for (new) solution delivery

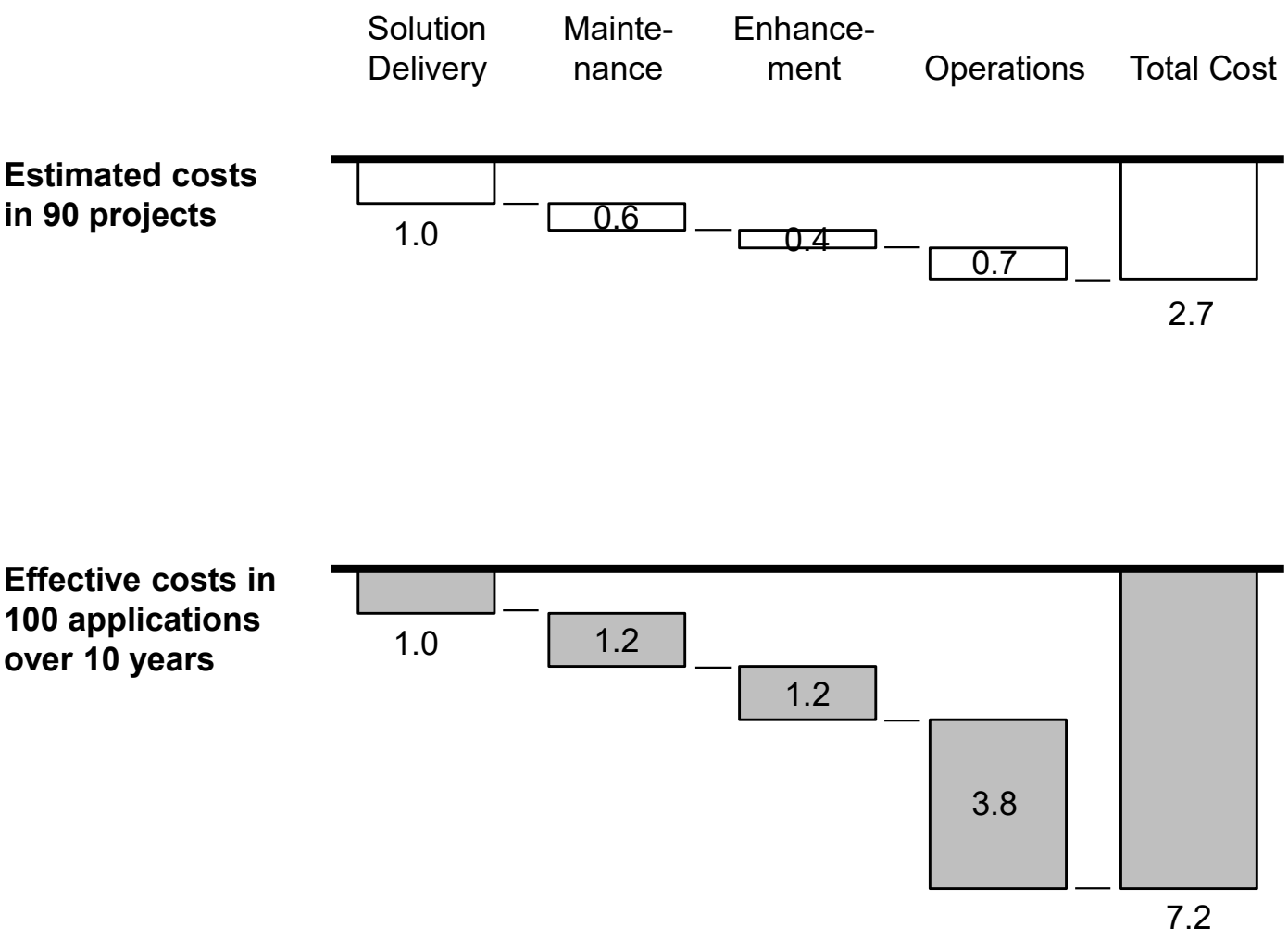
Source: Dr. Marc Brandis 2011

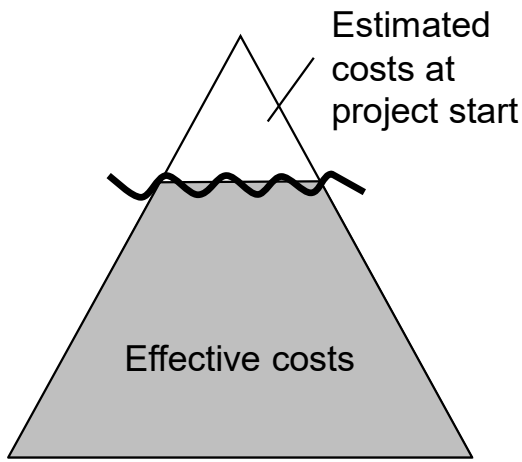
COROLLARY FOR IT INVESTMENTS

- The cost structure in IT is largely a reflection of past IT investment decisions, and very hard to change as long as you continue using respective applications
- If you decide to implement an application today, it is a given that you will have operations and maintenance costs when you use the application in the future, which are largely fixed
- A solid rule-of-thumb for estimating expected maintenance costs is 10-15% of original investment costs annually

LIFECYCLE COSTS OF APPLICATIONS OVER 10 YEARS

CLIENT EXAMPLE





Effective costs are underestimated by a factor 2.7*!

* 7.2 / 2.7 = 2.7

Source: Dr. Marc Brandis 2011

QUESTIONS FOR DISCUSSION

- Given the cost split on page 13, and given what you know about the relationship between solution delivery, maintenance, and IT operations cost, how would you expect costs to evolve in one year, or a few years into the future, under which assumptions?
- What happens if you cap the IT budget at current levels?
- An expert tells you that by adopting a new programming language, software development productivity can be increased by a factor of three and argues software maintenance costs will come down to 4-5% of initial investment costs. What do you think about this?

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BUSINESS CASE

- Enables the evaluation of whether a project or investment will overall be beneficial for the company
- Enables the comparison and prioritization of different projects
- Clearly describes benefits, costs, and risks of a project, both for the implementation phase and the subsequent ongoing use of the end product (application, system, business process, etc.)

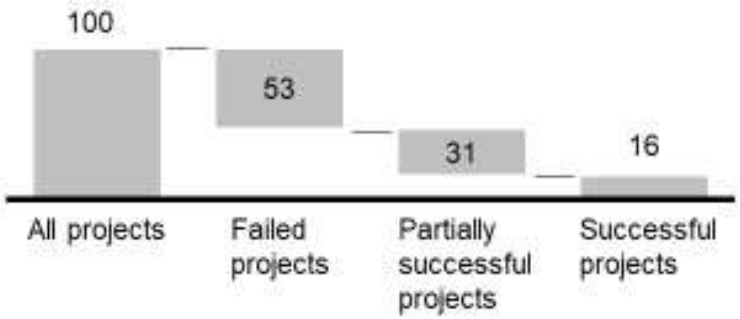
Best practices

- Aim to quantify all aspects of benefits, costs, and risks
- Ensure all benefits, costs, and risks are included
- Put the different benefits and costs on a timeline, distinguishing when they will be incurred
- If there are large risks or uncertainties, use ranges for the figures and perform a sensitivity analysis with best-case, worst-case and expected scenarios

WHY SHOULD YOU KNOW THIS?

IT PROJECT RISKS: SUCCESS RATE OF IT PROJECTS*

Evaluation of 500 projects of different types, in %



- Cost overrun on average 89%
- Time overrun on average 122%

Reasons for project failure

Incomplete requirements	13%
Insufficient user involvement	12%
Inadequate resources	11%
Unrealistic user expectations	10%
Insufficient management support	9%
Requirement changes	9%
Insufficient planning	8%

- Most reasons are at the interface business/IT

* See "Software Complexity" for further considerations on IT project risks
Source: Standish Group Survey

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Dr. Marc Brandis | September 2020 | Applied Information Technology: Linking Technology and Business
Slide 24

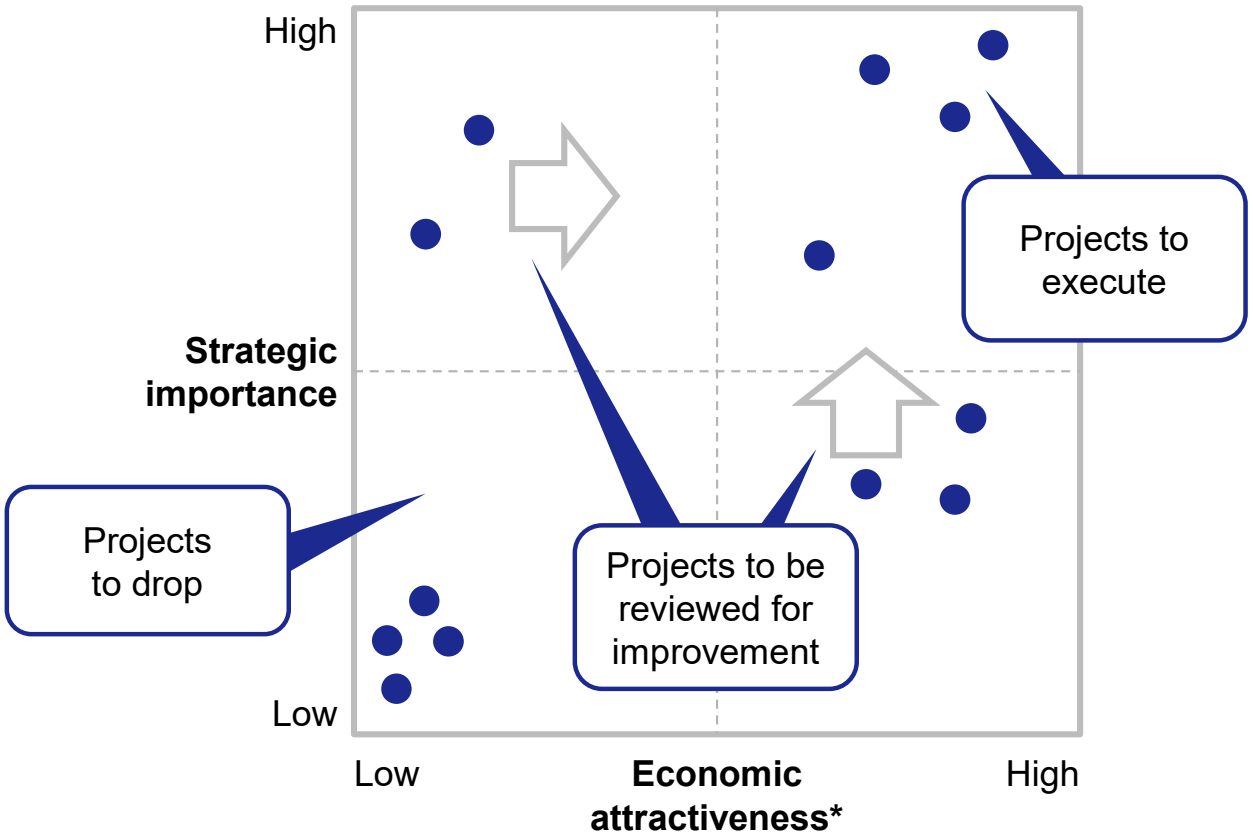
- There is a large number of failed projects
- In a significant number of cases, it was recognizable at the beginning, that the project has a large chance of failure
- You do not want to be part of a failed project

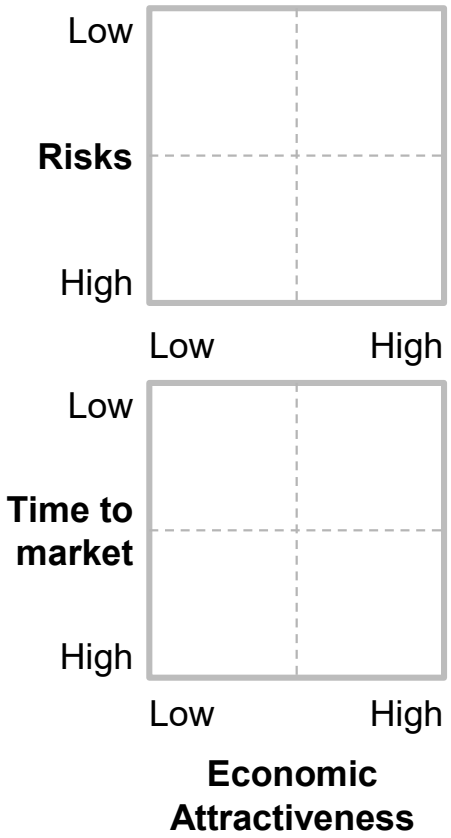
COMPONENTS OF A BUSINESS CASE

Benefits	• All benefits obtained when using the product resulting from the project or investment • Quantified and separated for every year in which it is planned to be used • Note that “cost reductions” are benefits
Costs	• **Project costs in business:** All costs incurred in the business for the project, e.g., project management, business analysis, user acceptance testing, training • **Project costs in IT:** All costs incurred to realize the project in IT • **Ongoing costs in business:** Some projects lead to additional business costs once in use, e.g., for staff using the product, or for advertising the new Services enabled by the project. Since all benefits are counted, also all costs need to be counted • **Ongoing costs in IT:** Costs to maintain and to operate the resulting application, once it is life
Risks	• **Project risks:** Risks that will endanger the project, incl. assessment of how it will impact benefits and costs described above • **Operational risks:** Specific additional risks in the business once the resulting application is life, incl. assessment how it will impact benefits and costs

USE OF BUSINESS CASES

- Establishment of approval thresholds: Projects/investments must meet minimal requirements to be approved (or be considered for approval), e.g. “pay-back < 5 years”
- Use in project/investment portfolio management





* Indication for how much benefit for how much cost

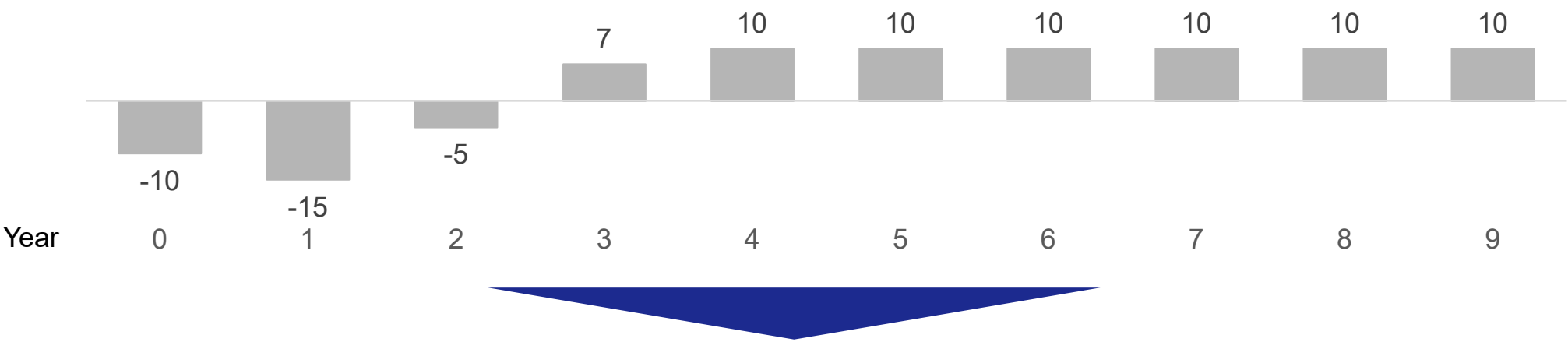
MEASURING ECONOMIC ATTRACTIVENESS

		Advantages	Disadvantages
• **Benefit/cost-ratio:**	$\frac{\sum \text{Benefits}}{\sum \text{Costs}}$	• Easy to calculate and to understand	• Does not distinguish between projects of different size and time to market
• **Payback-time:**	$\frac{\text{Project Costs}}{\text{Annual Net Benefits*}}$	• Easy to understand for simple projects	• Difficult to define for multi-year projects with varying benefits over time
• **Net Present Value (NPV):**	$\sum_{y = \text{years}} \frac{1}{(1+i)^y} \text{ X Net Benefit}_y$	• Captures many aspects of projects	• Relatively complex to calculate and understand • Used as such, favors large projects over small ones
• **Internal Rate of Return (IRR):**	i solved for NPV = 0	• Similar to NPV • Result relative to project size avoiding bias of NPV	• Complex to calculate and understand

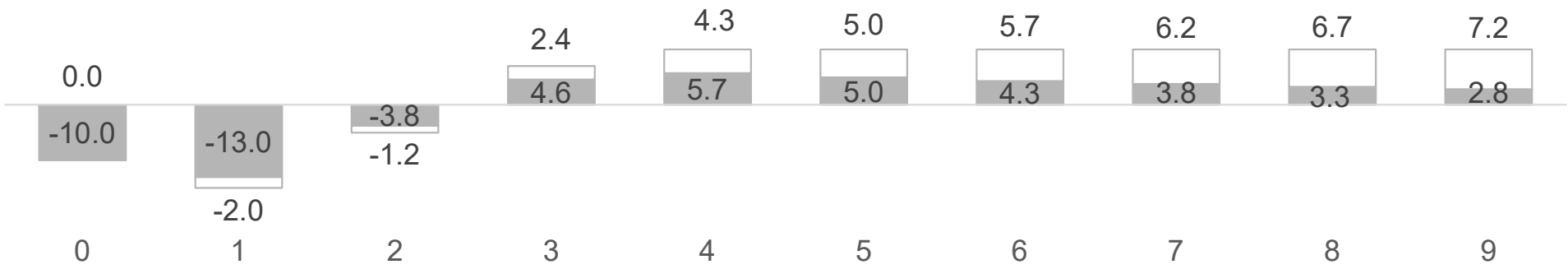
* Ongoing annual benefits – ongoing annual costs

NET PRESENT VALUE (NPV)

Net Annual Benefits (Benefits-costs)



Discounted Net Annual Benefits



DISCOUNTING OF CASH FLOWS/NET BENEFITS

SIMPLIFIED

Governing thought: Having CHF 1 today or in one year is not the same value to the owner. If the owner can choose, she/he takes it today (i.e., having it today is more valuable than in one year).

How much? If the owner gives our company capital, he/she expects a certain return, measured as "Return-on-Equity" (RoE), for typical large business, 15% or 20%.

CHF 1 capital today would thus be expected to be CHF 1 x (1+RoE), i.e., CHF 1.15 or CHF 1.20 in one year. The other way round, CHF 1 in one year would only have a value of CHF $\frac{1}{(1+RoE)}$ today to the owner.

NPV and IRR take this into account by discounting future cashflows with a discount rate *i*. An investment with a NPV > 0 or an IRR > RoE generates value, while one with NPV < 0 or IRR < RoE destroys value.

What is the right discount rate? For simplicity, many companies use the expected RoE for their business. It is not accurate for two reasons however:

- Investors expect a higher return if the risk is higher. As projects and investments are generally more risky than the ongoing business, the discount rate should be higher than the RoE
- Investments are not funded all from equity, but using a mix of equity and debt (e.g. bank credits). Such debt generally has a lower interest rate than the RoE, and the discount rate should accommodate for thus. Some companies use the "weighted average cost of capital" (WACC) calculated as

$$\frac{\text{Total debt x average interest on debt + total equity x RoE}}{\text{Total debt + total equity}}$$

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HOMEWORK EXERCISES: QUESTION 1

- Study the business case calculation in the provided spreadsheet, tab “Project A”. This is a correct (but not very detailed) business case for a project, to illustrate the mechanics to you.
- Once you have studied it, think through which changes to the underlying data (benefits, costs, timing) change the final result in which way. Note the following:
    - For the benefits/cost-ratio, a higher number is better
    - For the payback-time, a lower number is better
    - For NPV, a higher value is better
    - For IRR, a higher rate is better.

HOMEWORK EXERCISES: QUESTION 2

- Study the benefit, cost, and risk information in the provided spreadsheet, tab “Project B”.
- Calculate the economic benefits of the project as benefit/cost-ratio, payback-time, NPV, and IRR, with the given numbers. Does the project look attractive using all ratios?
- Consider what is being written regarding risks. How would the business case change if some or all of the mentioned things would happen? Based on your calculations and considerations, what should the company do? Use scenarios how the business case would change to justify your recommendation.
- What general learnings can you draw from these considerations?

HOMEWORK EXERCISES: QUESTION 3

- Study the business case in the provided spreadsheet, tab “Project C”.
- The project has been launched to automate some of the work of line managers evaluating the performance of asset managers reporting to them. Today, for each asset manager, they call up performance data of portfolios managed by them in the asset management system (Simcorp Dimension), consolidate some numbers, and enter them into the HR system (Oracle PeopleSoft) as justification for the performance rating of the employee and for the awarded bonus.
- The project shall automate this manual process, so that the performance data is directly available in the HR system. This will save roughly 1.5 hours in the quarterly evaluation of each relevant employee (total 900 employees, reporting to 90 managers).
- The project assumes that there will be no additional on-going costs, as both Simcorp Dimension and Oracle PeopleSoft will have to be maintained and operated anyway.
- Do you see flaws in the Business Case, in the sense, does it accurately reflect a realistic outcome? How would you realize the mentioned “benefits”? Can you achieve the described costs (do not challenge the project costs, but the ongoing ones)?
- Which general learnings can you draw from this example?