IT Solutions with Software Engineering in Practice
Profitability of IT

Course at TU Darmstadt

Dr. Jürgen Stein, 2015, April

TECHNISCHE UNIVERSITÄT DARMSTADT

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AGENDA

1. Introduction
2. Basics and definitions
3. Phases of a Business Case
4. Business Case and IT invests
5. Practical example
6. Literature

Dr. Jürgen Stein

- Study and Ph.D. of Physics at Phillips-Universität Marburg.
- 1994 – 2010 Software Engineer → Consultant
  → Business Unit Manager with Gapgemini / sd&m
- Since 2010 with msg systems ag
  - Division Manager Travel & Logistics in Frankfurt
  - Business scope: transport, traffic, tourism, logistics, aeronautics
  - Project work for large and midsize customers
- Focus on Custom Build Software.
- Responsibilities: Sales, Project Management, Leadership.
- Office in Eschborn.
- Several Business Case projects with different customers.

Private

- 50 years old, married, 2 kids
- Hobbies: Family, Astronomy

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Facts and figures …

- Size of IT budgets 1.5 to 15% of total revenue depending on industry – or 8.8% on average due to another study.
- IT Cost are mainly labor cost (50-60% of total effort).
- Main part of IT costs spend in companies – up to 80% – are associated with operations and maintenance.
- A study shows that lifecycle costs of 30 investigated IT applications are dominated by operations and maintenance cost – within a lifetime of 5 years 80% of spending are related to operations and maintenance(1).

(1) Lifecyle costs are defined by the overall costs of producing and using a product.

Source: Wirtschaftinformatik 3/2004: IV-Controlling, Computerwoche

Profitability of IT

IT investments

- IT portfolios and IT projects are often hudge investmenst for companies.
- Benefits are not clear, costs are high.
- Limited IT budgets require objective prioritization of investmens.

IT organisation

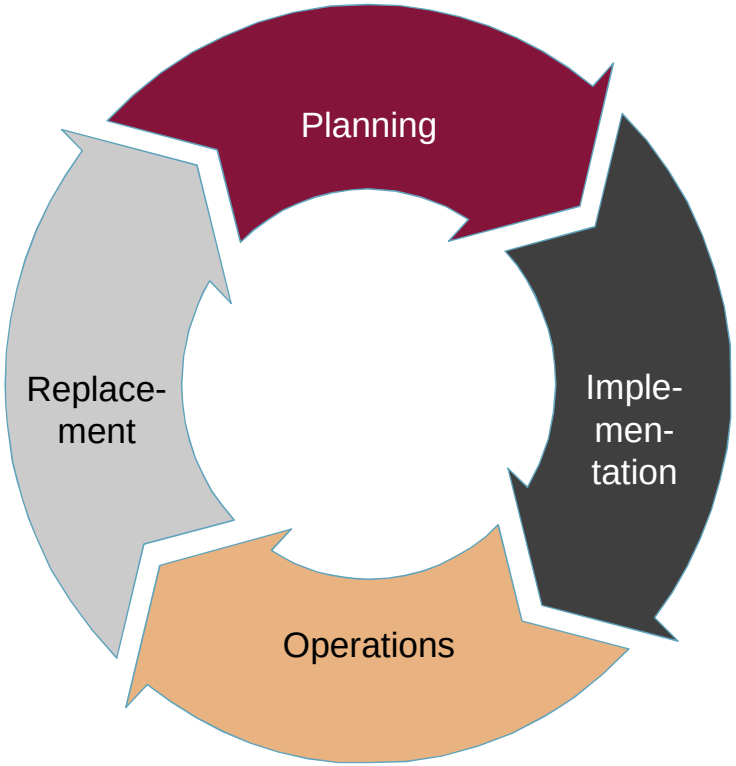
- Profitability is a central topic of each company.
- IT organization is seen as cost driver.
- In contrast to "classical" business functions IT is often a "black box" for decision makers – relation to profitability is not clear, benefits are often neglected.

Goal

- Mesurable, complete and sustainable cirtieria as baseline for managerial decisions
- Ongoing control of target achivements

$$\text{Profitability through IT} = \frac{\text{IT related Benefits}}{\text{Cost of IT}}$$

Phases of an IT investment



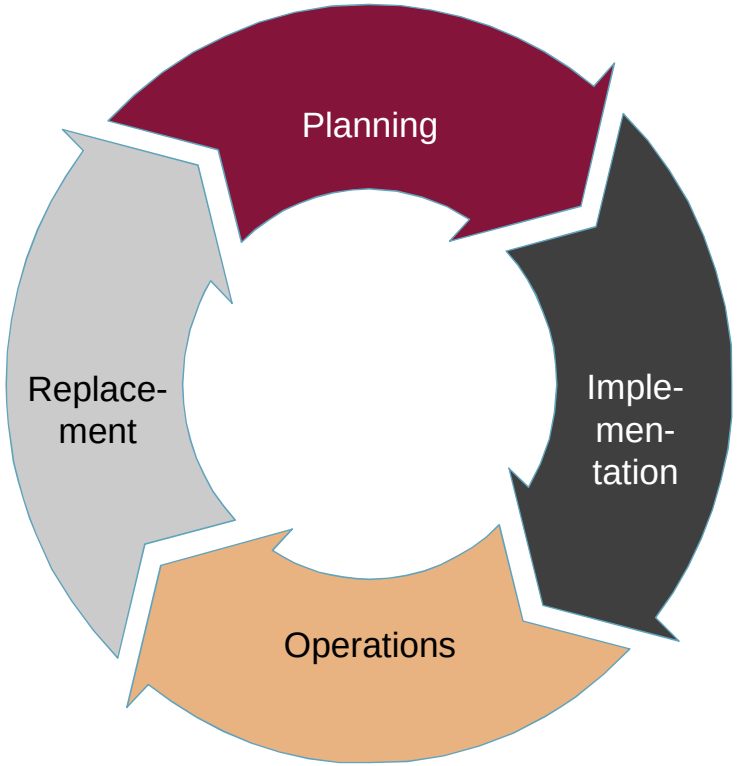
Cost drivers often neglected

Replacment

- Removal
- Backup
- Data migration

Operations

- Adaptions
- Maintenance
- Means of production
- Enhancements
- Deployment of releases



Cost drivers often neglected

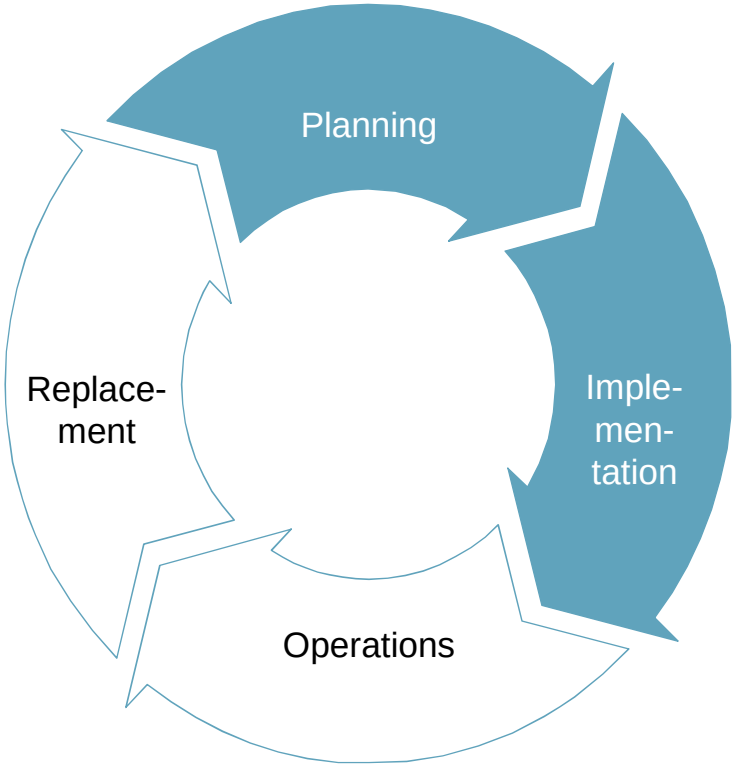
Planning

- Case study / Business case
- Concept / requirements analysis
- Make or Buy decision
- Business concept / technical concept, design

Implementation / Go-live

- Implementation / Customizing
- Test / Integration
- Hardware, Software
- SLA design
- Go-Live / Roll out
- Change Management

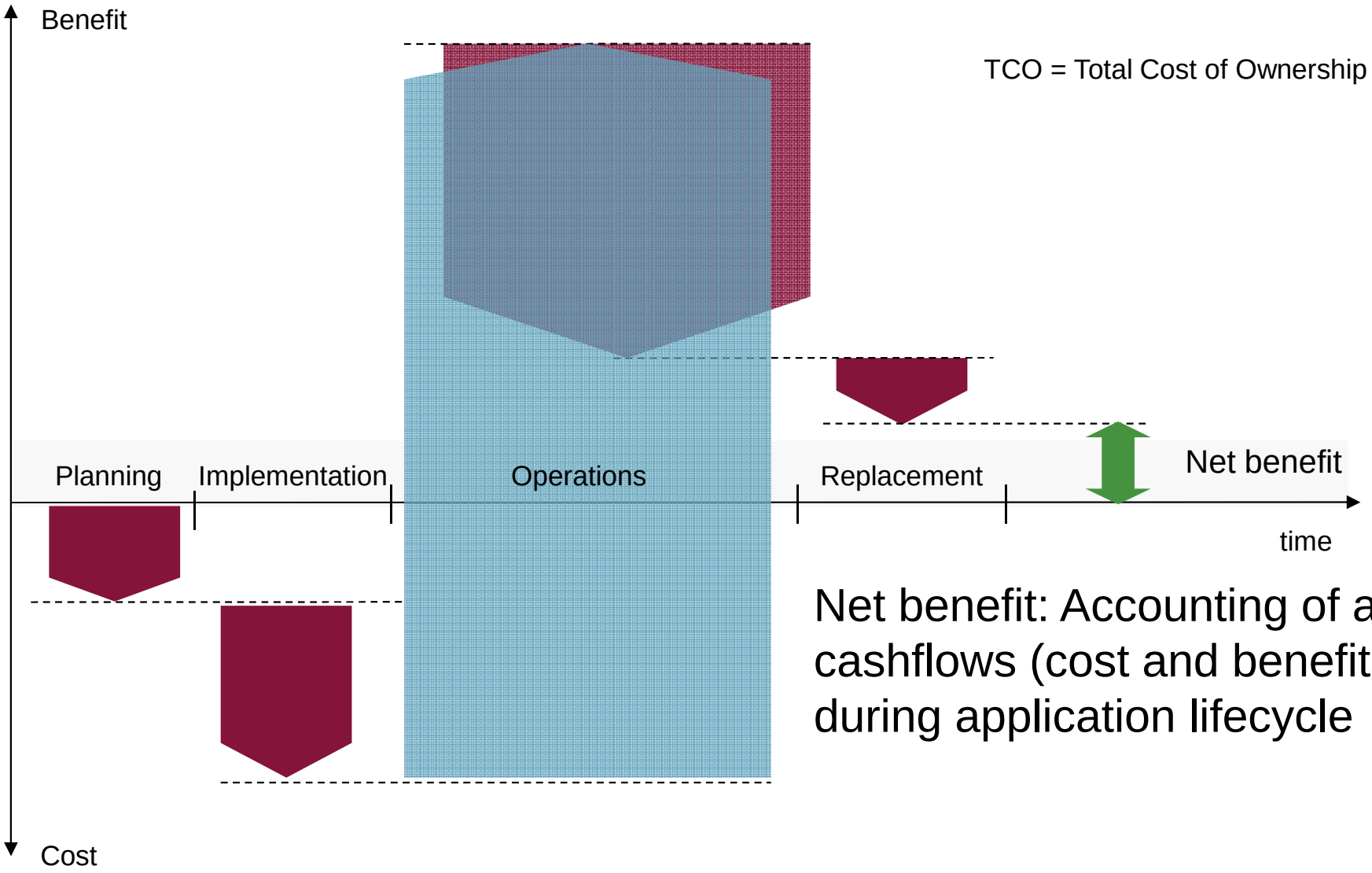
Distribution of costs of IT investments



Only **20-40%** of IT costs are due to implementation

60-80% of IT costs have to be spend during operations

Software lifecycle - costs and benefits



Net benefit: Accounting of all cashflows (cost and benefits) during application lifecycle

Overal comparison of TCO figures and cost analysis

- It is often difficult to provide uniform TCO figures and cost analysis for a company:
  Example: Enhancement vs. maintenance:
  - differentiation often based on effort estimation, e.g. maintenance tasks will always be in the range between 5 and 30 man days

  Example : Agile software development?
  - separation of cost drivers difficult

  Example : Effort of business units?
  - even if it occurs it is often not part of project budget.

  Example : Metric for the working unit of software developers?
  - not defined
  - includes different ratios for communications etc..

- Comparisons and benchmarks beyond companies' border are even more limited.

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Economics and IT projects – the Business Case

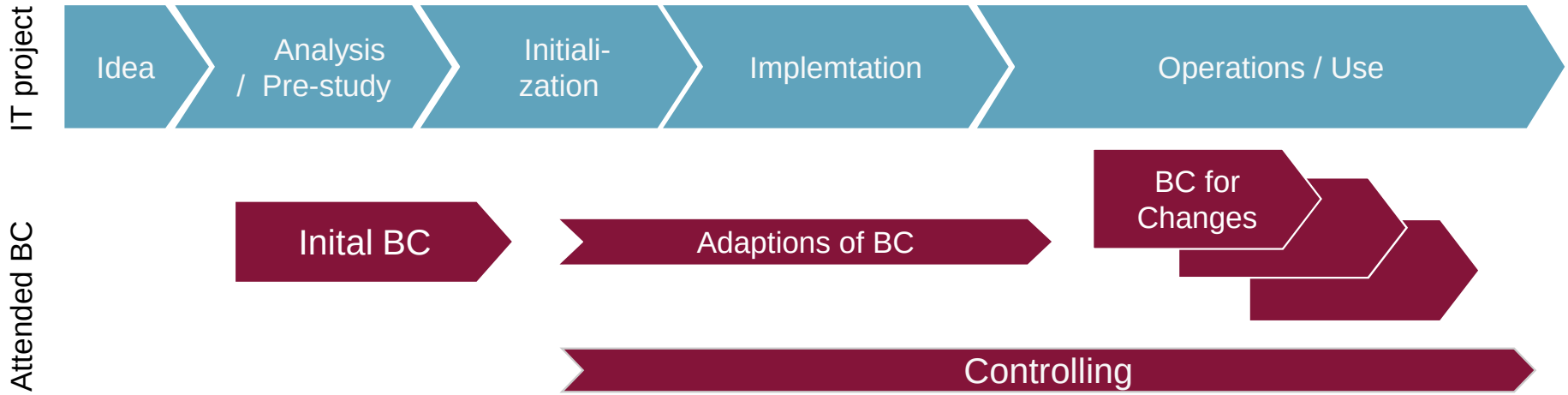
A Business Case summarizes all crucial aspects of an intended investment with the objective of:

- identify economical advantages and strategic conformity and
- enabling final management decision regarding execution.

[from: Brugger, Der IT Business Case, Springer 2005]

Profitability aspects in IT projects

Ideally Business Case runs in parallel to all phases of a project



- BC is focused on the initial analysis of profitability during analysis an initialization of the IT project.
- long-term achievement of the objectives is measured by the controlling function

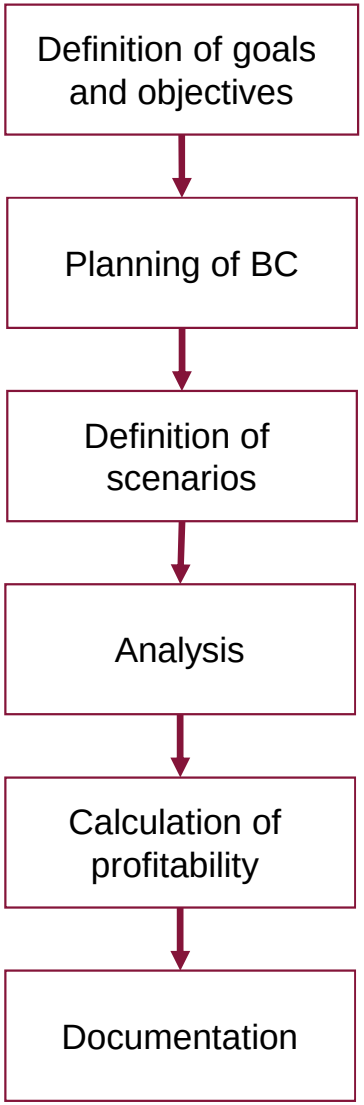
Overview of the BC

Classification:

- a BC is either a separate project or part of a pre-study.
- a BC has its own objectives, planning (milestones and deliverables) and is staffed with a project team.
- finally a BC will provide results – if required as part of the project's pre-study: reproducible documentation and management summary.

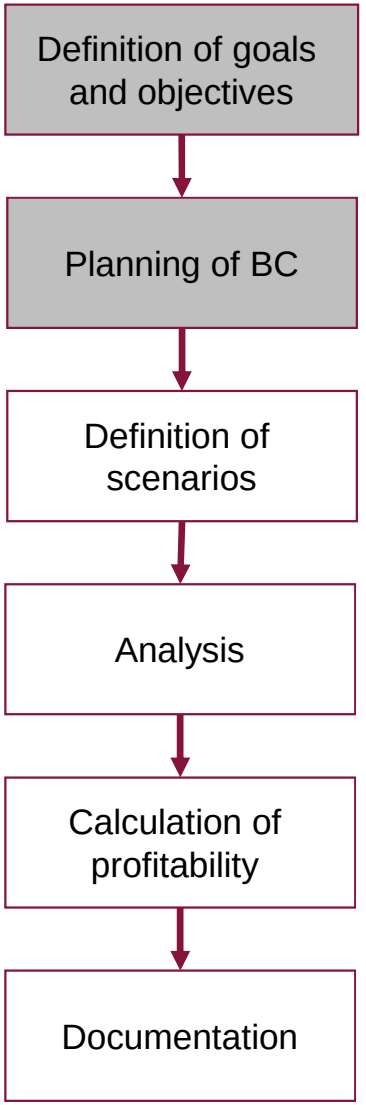
Frame conditions:

- a sponsor for the BC is required ("Probably the sponsor of the main project?").
- a stake holder analysis shall be done ("What will support the project?", "Do we expect an any opposition?").
- company rules have to be considered (e.g. involvement of controlling department).



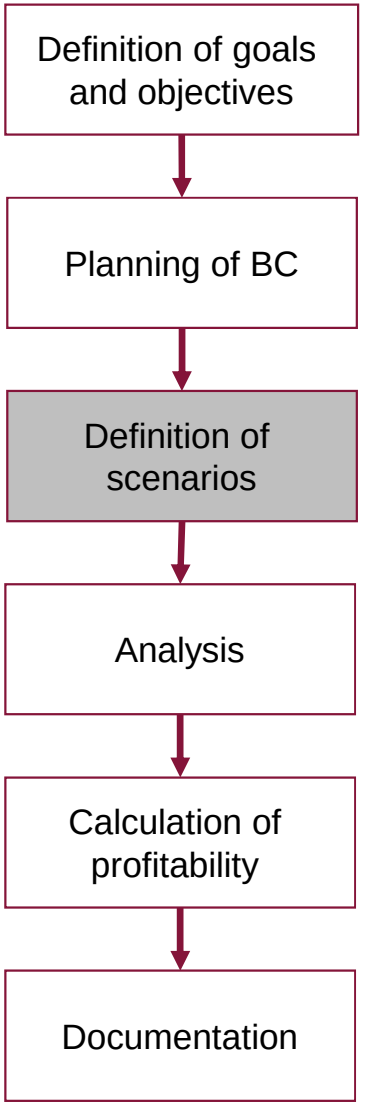
BC Analysis – Project definition and planning

- a BC requires a clear scoping
  - what are the goals?
  - which methods will be used?
  - what dependencies exist?
- goals IT project and related BC have to be aligned
- a skilled team is available
- project planning for the BC fits to the planning of the main IT project



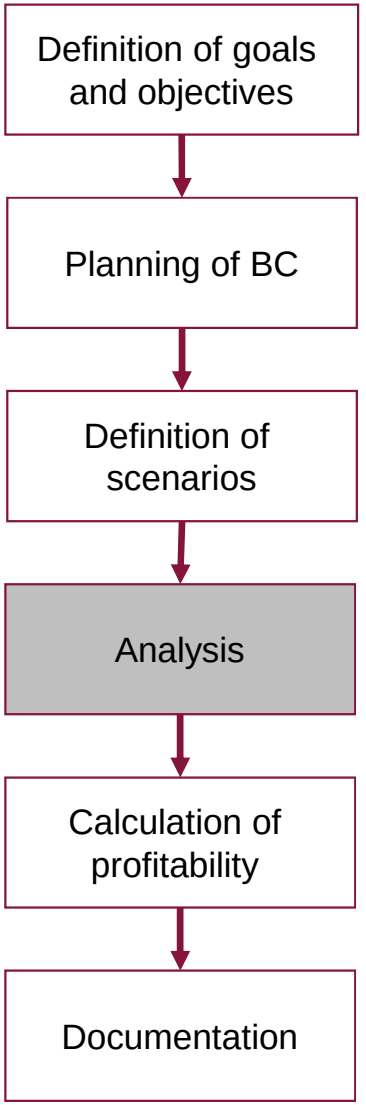
BC analysis – definition of scenarios

- a typical BC examines and compares several scenarios:
  - **baseline scenario:** expected evolution without change („Doing nothing“).
  - **solution scenario(s):** expected evolution when the planned investment is done
- terms like *increasing / decreasing costs* or *improved benefits* describe the delta between solution and baseline scenario
- more than one alternative solutions may exist (e.g. solution based on custom or package software)
- several variants of a solution scenario may exist (e.g. different assumptions on further development of turnover)
- Important: Keep the number of scenarios / variants as low as possible to reduce effort to be spent for the BC analysis

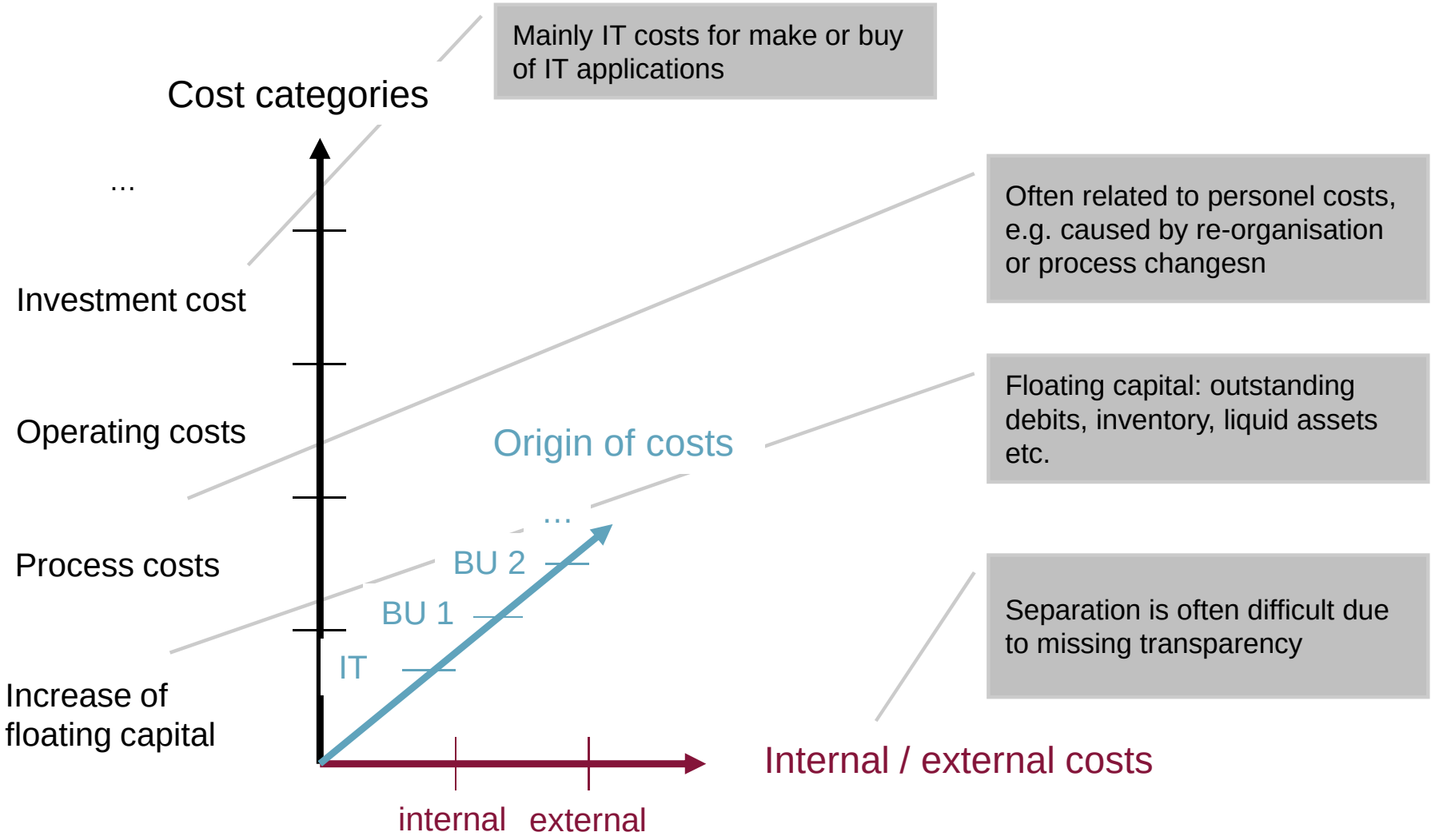


BC analysis – how to get costs and benefits

- analysis is main part of the BC and contains:
  - cost analysis
  - benefit analysis
  - risk assessment
- steps required for cost and benefit analysis:
  - identify cost / benefit „items“ and assign them to typical cost / benefit categories
  - check if an item is relevant for profitability calculation
  - quantify item
  - valuate item monetary
- risk assessment is focused on risks that may impact profitability



Dimensions of cost analysis



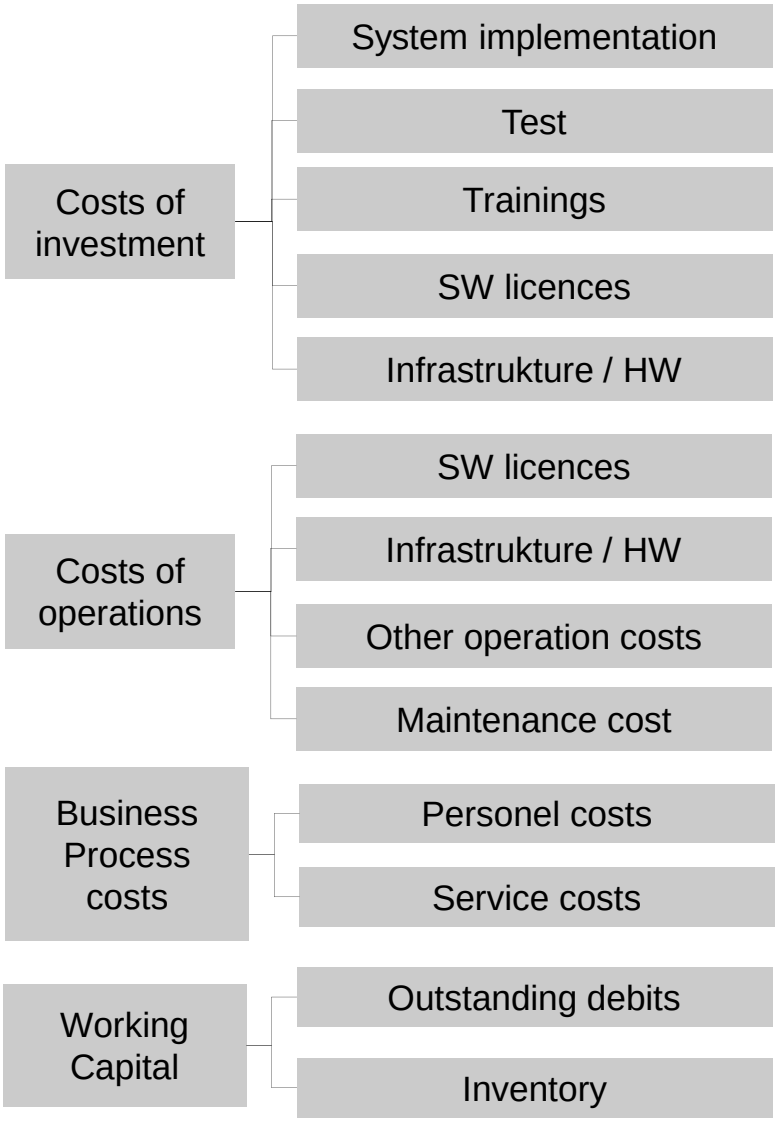
Mainly IT costs for make or buy of IT applications

Often related to personel costs, e.g. caused by re-organisation or process changesn

Floating capital: outstanding debits, inventory, liquid assets etc.

Separation is often difficult due to missing transparency

Examples for cost categories and associated cost items



Cost anlaysis of a BC

- there is no explicit correlation between cost items and cost categories
- cost items can occur in more than one category (e.g. SW license costs)
- important: differentiate between singular an repeated cost items
  - regularly singular costs before go-live will be accounted as investment.
  - maintenance costs and process costs are often repeated costs. They have to be considered normally once per year.

Categories of benefits and quantification of benefit

Typical categories

- increasing turnover
- increasing earning
- higher productivity
- reduction of floating capital
- reduction of costs – can also be seen as benefit (comparison of solution and baseline scenario)

Quantification of benefits

- It may be difficult to quantify benefits monetary so you have to separate between
  - benefits that can be expressed monetary directly, e.g. reduction of costs
  - benefits that can be expressed monetary indirectly, e.g. higher turnover due to higher customer satisfaction
  - Benefits that can not be expressed monetary e.g. better image of a company
- BC should concentrate on main benefits

Earning due to benefits will occcur mainly regularly after implementation.

You must be able to realize benefits i.e. reducing daily working effort for 5 min. per employee will not bring any effect.

Benefits are mainly related to business improvements. They must be quantified by resp. business units and can be supported by market studies and benchmarks.

Basic examples for quantification of costs and benefits

Category	Item	Quantification	Monetary valuation
Process costs	Effort for manual input of orders	5 FTE for processing, full cost 40,000€ per FTE	Personel costs: 200.000€ p.a.
Benefits of business	Increasing earning due to additional selling of a product	Additional selling of 1,000 items p.a., price 100€ per item	Additional earnings: 100,000€ p.a.
Operating costs	Operational costs are expected to increase 10% p.a.	Operation costs 1st year: 100.000€	Operating costs: 100,000€ (1st year), 110,000€ (2nd year) …
Investment costs	External costs to provide an new order management system	Estimated costs100,000€, additional buffer 20%	External Costs: 120,000€

FTE = Full Time Equivalent.

Overall figures of costs and benefits (example)

Singular cost items

Year of investment

Amortization period: 5 years

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Overall spending (costs)	**340**	**115**	**125**	**128**	**141**	**144**
Investment	270					
Operations		35	45	48	51	54
Personel		55	55	55	65	65
Marketing	50	25	25	25	25	25
Overall earnings (benefits)		**30**	**80**	**170**	**240**	**310**
Additional earnings		30	60	130	180	240
Earnings due to process improvements			20	40	60	70
Earnings – Costs	**-320**	**-85**	**-45**	**42**	**99**	**166**

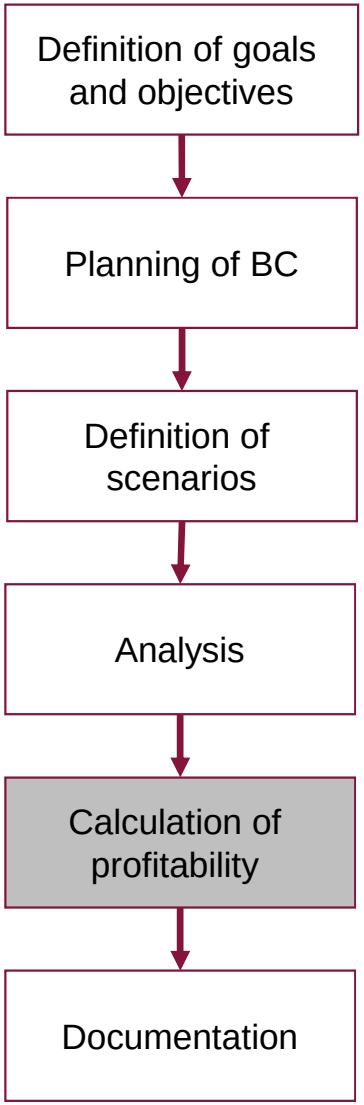
figures in K€

Repeated earnings

Repeated spendings

BC analysis – profitability calculation (WiRe)

- Goal of profitability calculation (pc): mathematical methods to find ratio of benefits and costs ("profitability") of an investments mathematical methods.
- Pc will provide key indicators to compare the planned IT investment with a (imaginary) financial investment.
- Pc is the most important result of a BC analysis and will provide the "hard facts" for a decision.
- Pcs have to be done for each scenario. Separate variants can often be considered by appropriate parameterization of the calculation.
- Calculation method and parameters are defined by the controlling department in most cases.



Methods of profitability calculation

Static methods

- Based on simple assumptions, e.g. average values for investments and spending / earning
- Not much relevant for IT projects

- Examples:
  - Payback period rule
  - Cost comparison method
  - Profit comparison method

Dynamic methods

- Characteristics: imputed interests are considered
- Mainly important for IT projects

- Examples:
  - net present value method
  - internal rate of return method
  - methods to consider risks

$$r_{int} = r_1 - K_1 \cdot \frac{(r_2 - r_1)}{(K_2 - K_1)}$$

$$K = \sum_{t=0}^{n} (E_t - A_t) \frac{1}{(1+i)^t}$$

Net present value method

Will the earning expected for the IT investment be larger than capital return based on a given interest rate?

$$C = \sum_{t=0}^{n} (I_t - O_t) \frac{1}{(1+i)^t}$$

C = capital return
I_t = pay-in at the end of period t (benefits)
O_t = pay-out at the end of period t (costs)
i = interest rate
t = period (t = 0, 1, 2 ..., n)
n = depreciation period of a property

- Future cash-flow will be discounted to date of investment. Motivation: Capital available today is more valuable than future capital.
- Interest rate *i* defines capital return. Motivation: Capital can be invested alternatively on capital market with interest of i%.

(in €)	*Year 0*	*Year 1*	*Year 2*	*Year 3*
Pay-in	***200.000***	***300.000***	***350.000***	***400.000***
Pay-out	***1.000.000***	***50.000***	***50.000***	***50.000***
Net payment	***-800.000***	***250.000***	***300.000***	***350.000***
Discount factor	***1***	***0,9524***	***0,9070***	***0,8638***

Result:

C=12.547€

Internal rate of return method

At which interest rate will capital return become zero?

$$C = \sum_{t=0}^{n} [(I_t - O_t) \cdot \frac{1}{(1+r)^t}] = 0$$

C = capital return
I_t = pay-in at the end of period t (benefits)
O_t = pay-out at the end of period t (costs)
r = interest rate
t = period (t = 0, 1, 2 ..., n)
n = depreciation period of a property

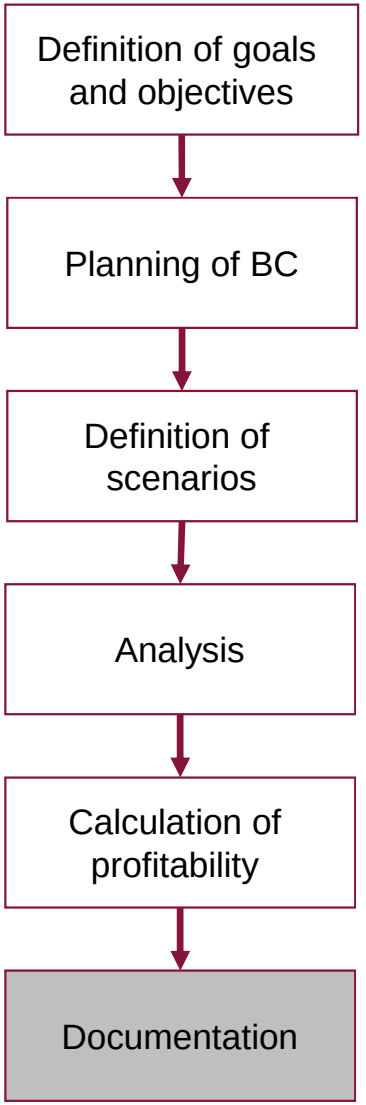
- Generally the equation has to be solved by means of an approximation method
  - Two interest rates r_1 and r_2 have to defined, where the related capital return C_1 and C_2 will be positive and negative respectively.
  - Internal interest rate can only be calculated approximately:

$$r_{\text{int}} = r_1 - C_1 \cdot \frac{(r_2 - r_1)}{(C_2 - C_1)}$$

- Example: with the figures on the last slide you will get r_{int} = 5,79% (set r_1 = 5%, r_2 = 6%)
- The internal interest rate is the required interest rate for a similar investment on capital market.

BC analysis – documentation

- Finally a BC should deliver an overall documentation of results containing:
  - clear and comprehensive description of relevant scenarios, well benefit / cost items and quantification of these items.
  - applied methods for calculation.
  - All hard and soft facts that are relevant for the investment.
- Key data have to be aligned with controlling department.
- Normally the key results of the BC analysis will be summarized for a Board decision.
- Not only hard facts will be important for the final note: in real live most decisions will not only be based on key figures but also on soft facts.



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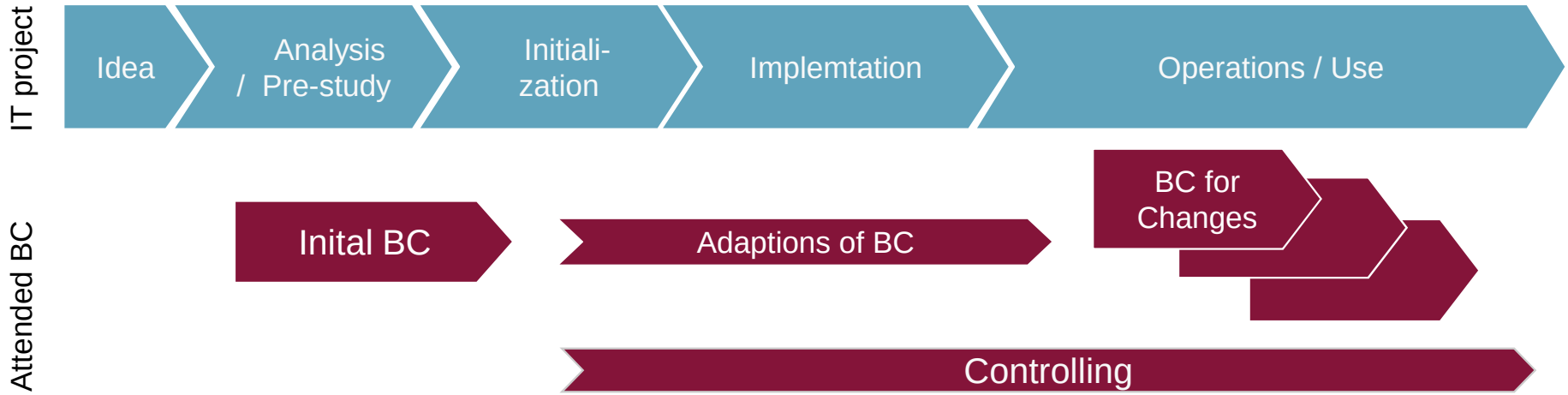
Profitability aspects in IT projects

Ideally Business Case runs in parallel to all phases of a project



- BC is focused on the initial analysis of profitability during analysis an initialization of the IT project.
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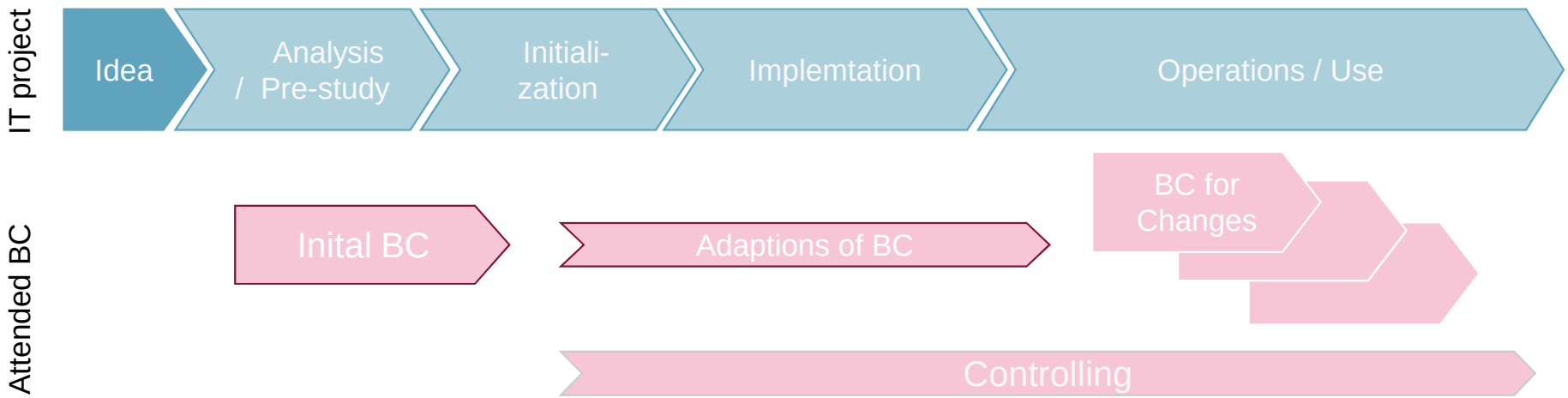
Profitability aspects in IT projects – vision



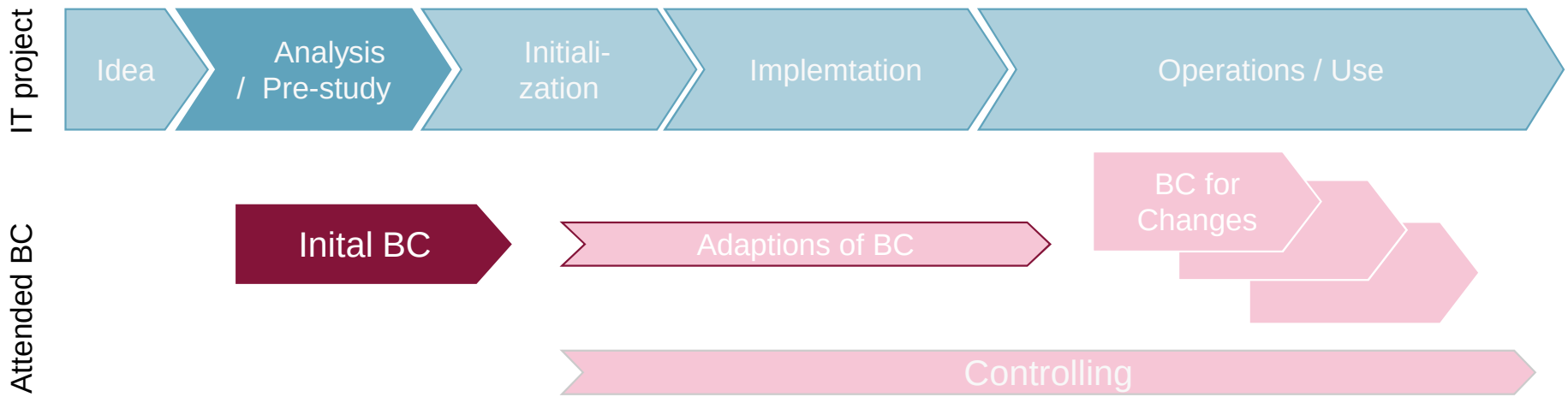
To-dos in the project

- define general goals
- align project scope with company's business strategy
- detail underlying business ideas

To-dos in the BC

- collect cost drivers and benefits
- analyze stakeholders

Profitability aspects in IT projects – vision



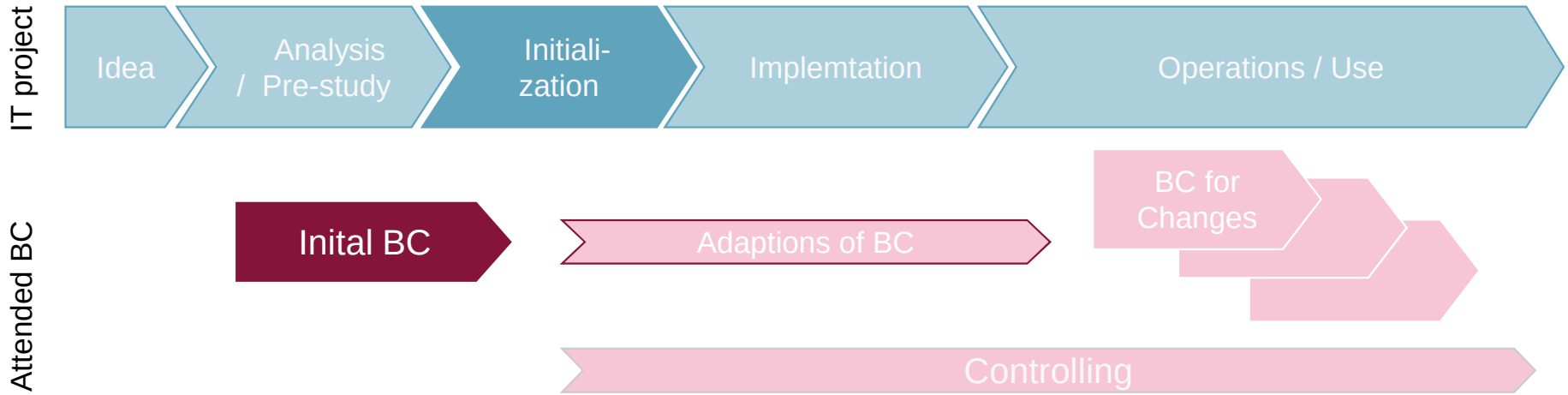
To-dos in the project

- detail goals
- analyze gaps
- perform feasibility study
- define alternative solutions
- provide decision paper

To-dos in the BC

- identify categories of costs and benefits
- rate and quantify categories of costs and benefits
- analyze alternative scenarios vs. Reference scenario
- perform profitability calculation

Profitability aspects in IT projects – initialization



To-dos in the project

- determine and prioritize decision criteria
- provide requirements and tender
- provide functional specification
- vendor selection
- conclude contract
- initialize project

To-dos in the BC

- rate decision criteria economically
- detail out solution scenarios

Example: Profitability in a call for tenders procedure

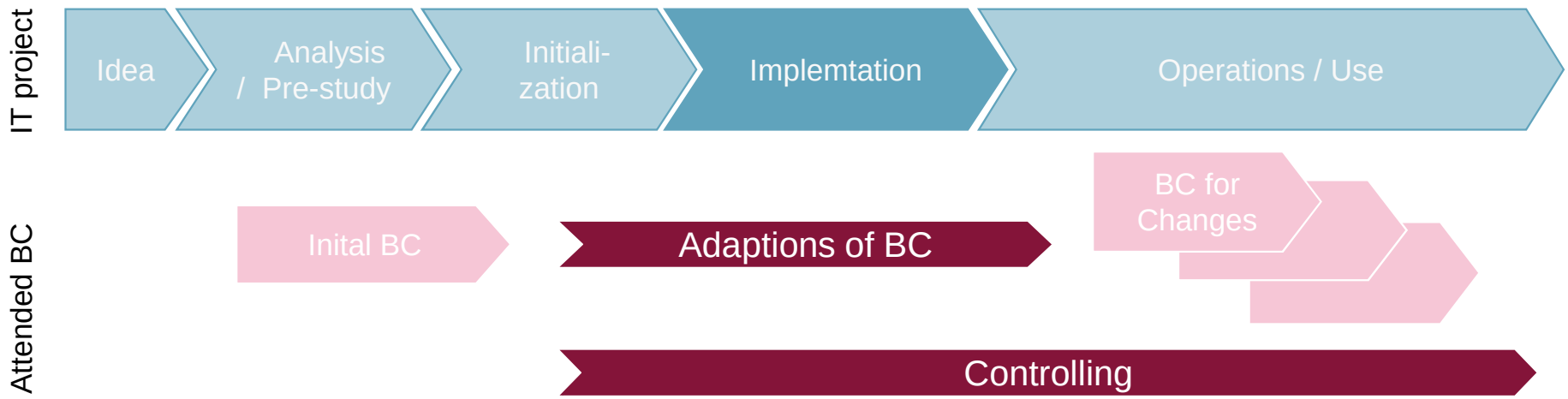
- Derive price performance ratio from a benefit analysis of deliverables
- Index for price performance ratio is defined as costs / benefit index
- An example for public tenders is the so called UfAB procedure („Unterlage für Ausschreibung und Bewertung von IT-Leistungen“ = base for tenders and benchmarking of IT deliverables)
  - Basis for granting of public tenders
  - Index for price performance ratio = Sum of all scores for deliverables / price
  - UfAB should provide transparent and objective rating of several vendors in a call for tenders
  - The provided method will not provide a strict measure for the profitability of the tendered project
- Comparable approaches are quite common in the non-public industry – but they are often less transparent and not standardized

Example: Profitability in a call for tenders procedure

	A1	A2	A3	A4
Excetion criteria	Not fullfilled	Fullfilled	Fullfilled	Fullfilled
Price P in €	120,000	105,000	100,000	98,000
Benefit score L	9.500	9.200	8.900	8.500
Index (L / P)	0.079	0.088	0.089	0.086
Rescaled Index (L / P * 1000)	79	88	**89**	86
Simplified price method				
Ranking	-	3	1	2
Extended „Richtwertmethode" (guide value method)				
Included in a range differing -5% regarding reference[1]	-	Yes	Yes (Reference)	Yes
Ranking based on performance	-	1		
Ranking based on price	-			1

[1)] Defined difference of -5% leads to a range of the rescaled index betwenn 89 and 85, basis is offer A3 with index 89

Profitability aspects in IT projects – implementation



To-dos in the project

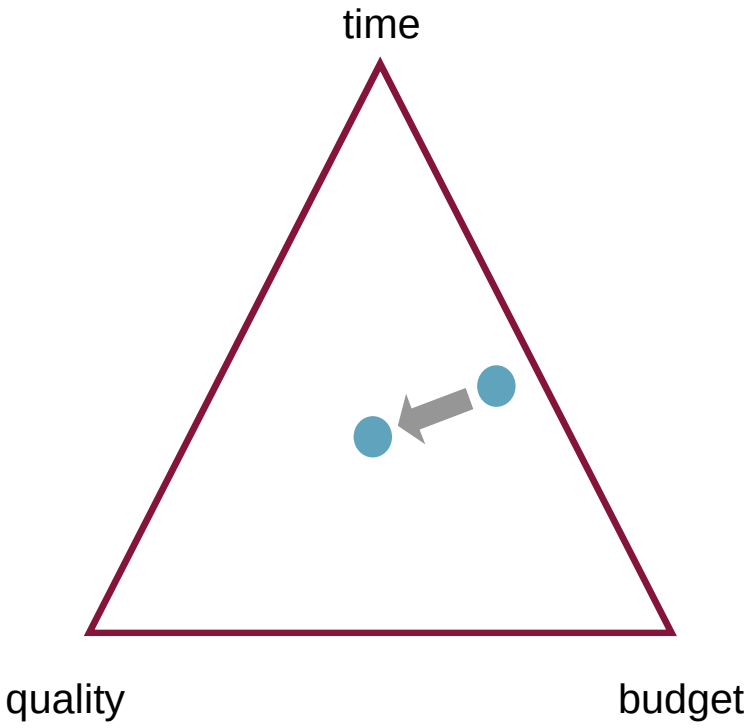
- implement project based on the selected methodology
- apply established principles of project management

To-dos in the BC

- adapt BC if required
- provide economic measures to support decisions on changes of frame conditions (budget, change requests etc.)
- start controlling

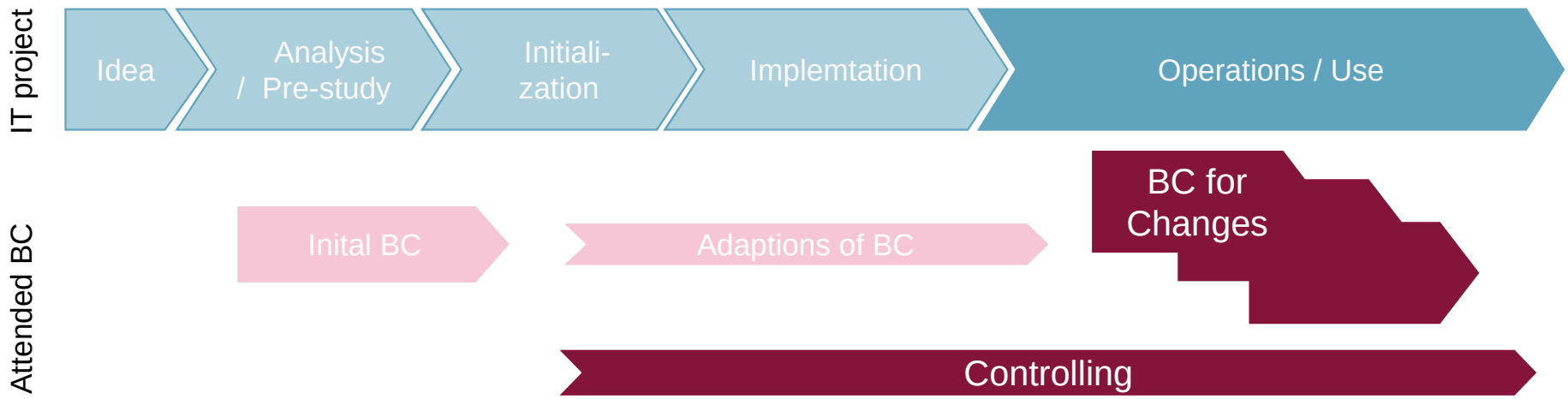
The art of project management

project management triangle



- proper project management assures that the project goals are reached in time, budget and quality
- there may be many changes during the lifetime of a project – nevertheless this balance of has to be preserved
- not only project budget will have an impact on the overall profitability – delivery time and quality will also effect costs and benefits

Profitability aspects in IT projects – operation / use



To-dos in the project

- operate and maintain the application
- implementation of new requirements and enhancements

To-dos in the BC

- adapt BC if required
- provide economic measures to support decisions on enhancements and new functionality
- perform controlling based on given indexes / figures
- provide measure for improvements and opimization

Ongoing controlling and alignment of objectives

- Controlling of the profitability of an IT investments starts with initialization of the project
- Controlling is part of the regular IT controlling
- It has to be measured continuously if a project is in budget, time and quality
- Controlling has to be continued after go-live. Ideally not only cost positions are considered but also the benefits realized with the new application.
- Deviations from the forecast require controlled measures to be taken
- It is also important to link the mid and long-term success of a project and the objectives agreements of the related managers.

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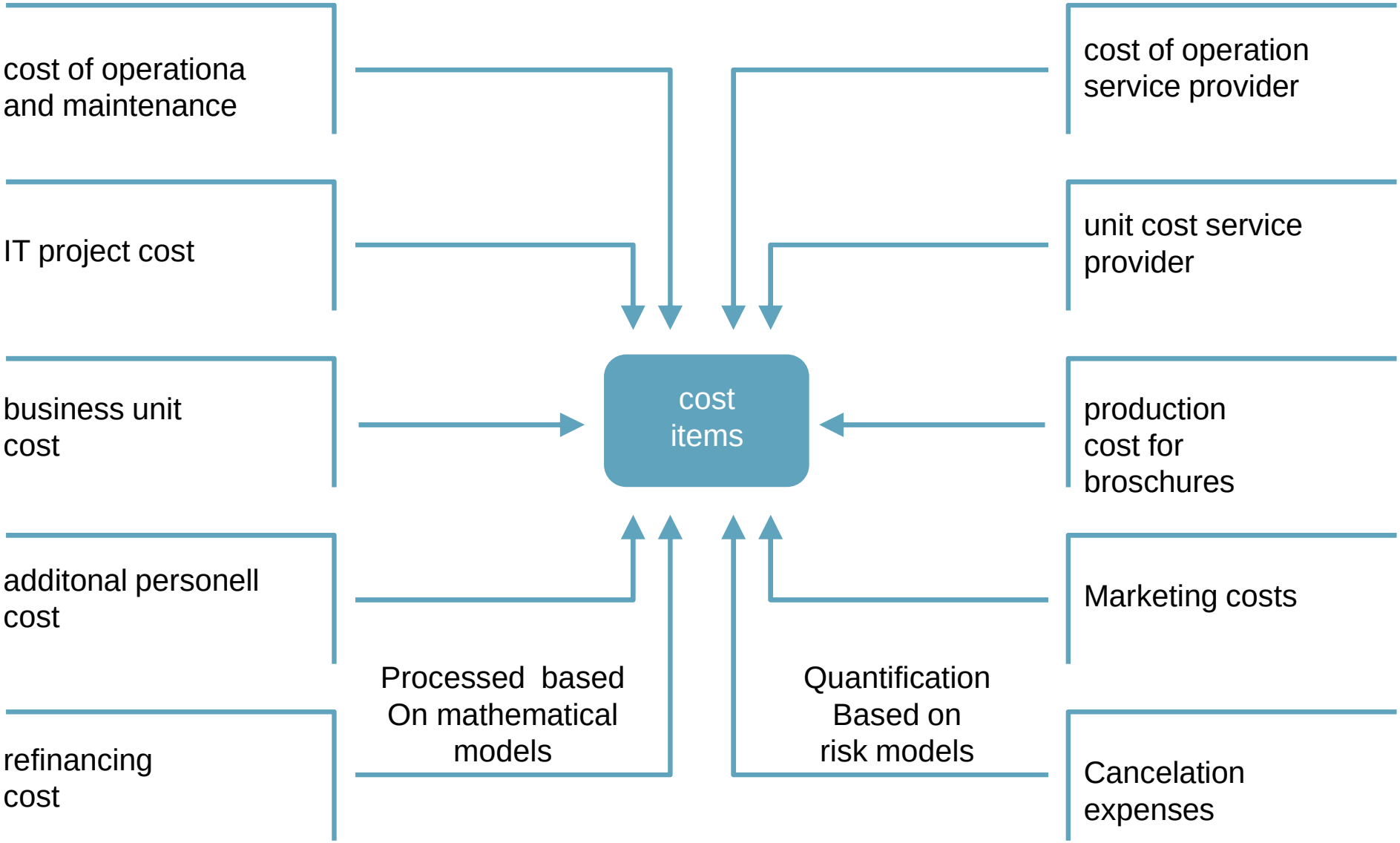
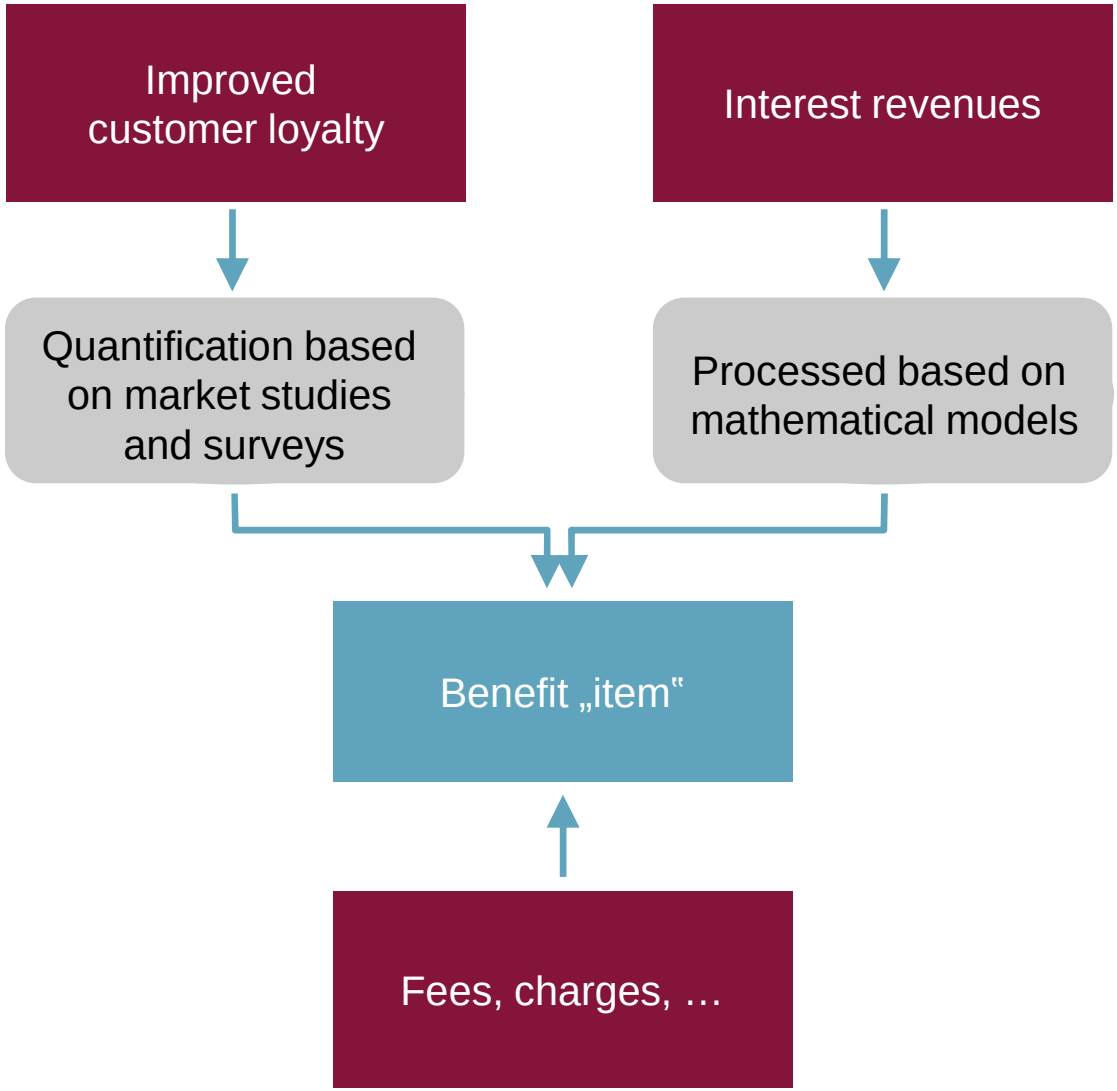
Loan funding of travels

- **Goal:** Provide a business process that supports loan finding of travels and support this process best possible by IT
- **Content of study / concept**:
  - Identify frame conditions for the implementation of this project
  - Provide rough concept
  - Identify costs
  - Identify benefits based on several scenarios of business development
  - Perform profitability calculation to provide basics for decision
    - Frame conditions and methods were given
    - Depreciation period 5 years
  - Provide decision paper
  - Implementation was done based on the rough concept after approval of the project
  - **Baseline scenario :** Do nothing

Loan funding of travels – cost items



Loan funding of travels – benefit items



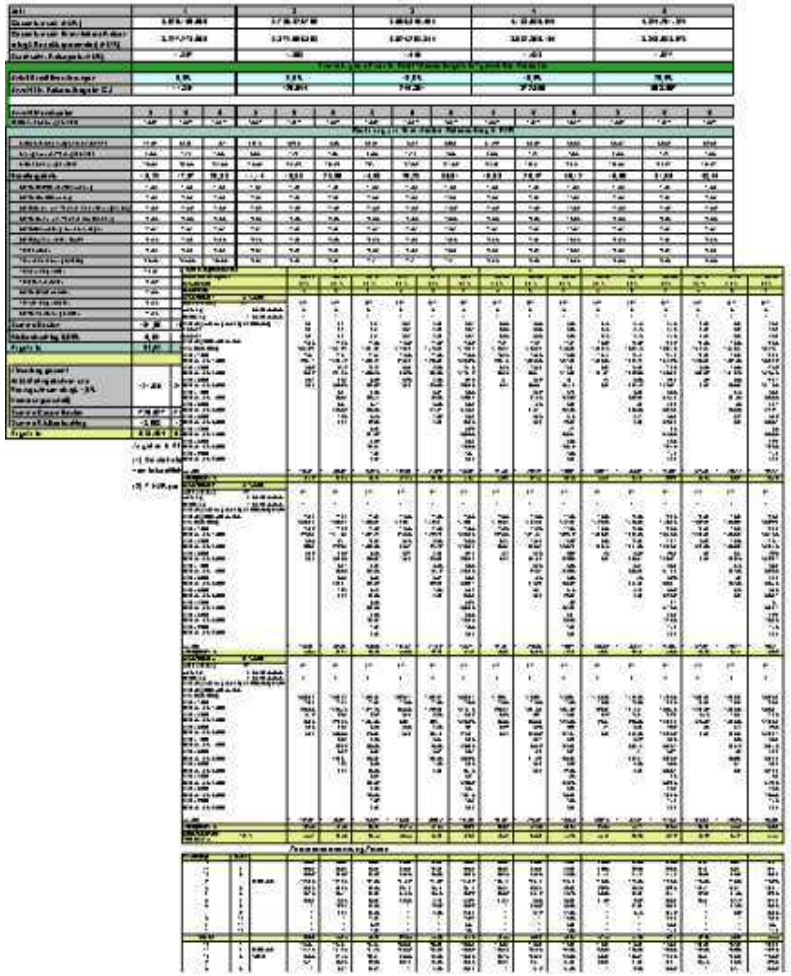
Business goals and benfits

- Main business goals are:
  - Additional revenue due to enhanced product portfolio
  - Improved customer loyalty / extended business
- Benefit „items“ help to quantify these goals for calculation of profitability

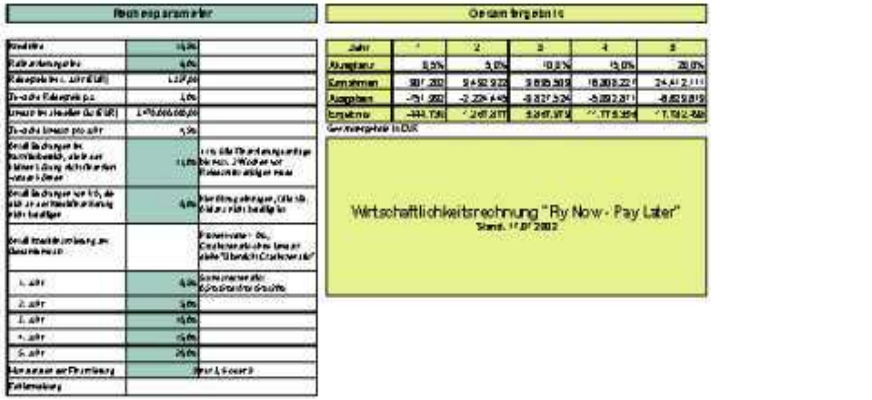
Loan funding of travels – results

Comparison of several scenarios will lead to the final result

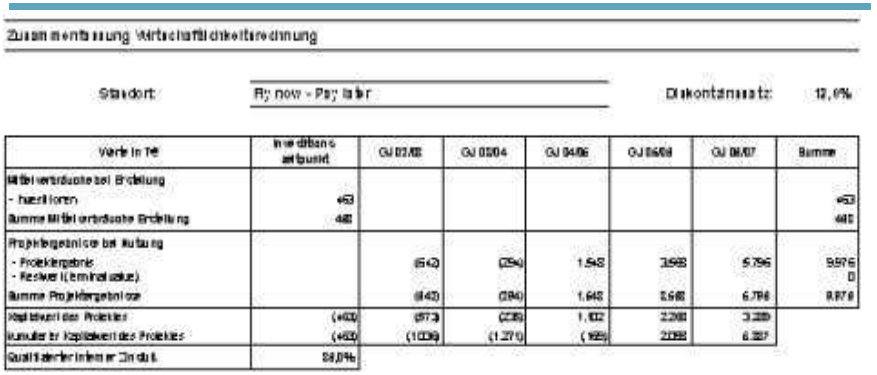
1 Calculations and simulations within profitability calculation



2 Variants and scenarios



3 Final result for decision paper



AGENDA

1. Introduction
2. Basics and definitions
3. Phases of a Business Case
4. Business Case and IT invests
5. Practical example
6. Literature

Literature

- Bernotat J., Stein J., "10 Tipps & Tricks zum Business Case ", GPM-Magazin PMAktuell, 2/2007, S. 43-47
- Stein J, "Mit dem Business Case Wirtschaftlichkeit von Projekten nachweisen – der Business Case sichert den Erfolg von IT-Projekten", GI/ACM-Regionalgruppe, Karlsruhe, 25.09.2007
- Brugger R., "Der IT Business Case", Springer, 1. Aufl., 2005

Thank you for your attention

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