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HTBLA Kaindorf/Sulm
Höhere technische Bundeslehranstalt
Abteilung INFORMATIK

Diploma Thesis
Business Process Management
Extended Game

Auftraggeber:

CAMPUS 02 Fachhochschule der Wirtschaft GmbH

CAMPUS 02 GRAZ FACHHOCHSCHULE DER WIRTSCHAFT

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Paul Polak Stefan Pacher Manuel Rebol Florian Kager Hannes Prassl

Kaindorf/Sulm, 20.03.2014

Abstract

Understanding and analyzing the different business processes within a company is essential for people in higher management positions. Companies put lot of effort into the analysis and improvement of business processes.

The aim of this research paper was to find a way to simplify business processes as well as modeling them since this topic is very complex and students usually find it difficult to understand.

In order to explain how business processes in a company might look like, a board game was developed, in which the player learns, while playing the game. The game teaches the different business processes of an e-bike rental company.

Result showed that the idea of explaining business processes by using a board game is quite efficient and learners do not only notice how business processes might look like, but also had a lot of fun playing the game.

There might be challenges and chances in the future in the sector of business processes, because the trend is that companies try to operate business processes not only efficiently, but also sustainably and economically. Business processes should run as "green" as possible.

Contents

Prolog

Nowadays, similar goods and services are offered by companies worldwide relying on comparable technologies. As a consequence, companies frequently bank on business processes in order to differentiate themselves against competitors. It can be said that organizational processes have emerged as resources which are difficult to imitate and therefore act as a source for competitive advantage.
Especially at the beginning of the educational training the topic of business process management is frequently rather abstract and difficult to grasp. Against this background, the project team set itself the task to plan a playful and hands-on access by means of a business game. That way, it was tried to make the theme more comprehensible and easy to learn for, above all, pupils and students, but also people unfamiliar with the subject matter. The staff of the degree programme Information Technologies & Business Informatics of CAMPUS 02 University of Applied Sciences supported the team in an advisory capacity. Business process management represents one of the central pillars on which the degree programme is based. The resulting Business Process Management Extended Game (BPMX) approaches the case of an e-bike rental service. Within weekly cycles single (standardized) task of every day's life are simulated by the players. By taking appropriate measures the processes should be optimized. It is thereby necessary to make considerations regarding the number of locations already at an early stage as it enhances the logistic complexity. Opportunities for interaction between the players (competing e-bike companies) are provided enabling for instance gambling. In addition, chance events make the game more difficult to foresee. In its entirety the board game covers both the strategic and the operative process management. As business informatics is composed of the two disciplines "business" and "informatics" also the BPMX has a technical component. It can therefore be classified as hybrid game. Key elements of the game such as player account administration or calculations exhibit software support.

Dr. Stefan Grünwald


DI Doris Weitlaner

CAMPUS 02 University of Applied Sciences

The Partner Company

Our partner company and so our client is the FH CAMPUS02 University of applied science. In detail the degree of Programme Information Technologies & Business Informatics with their headquarter in Graz. The degree of Programme Information Technologies & Business Informatics and so our persons in charge, Dr. Stefan Grünwald and DI Doris Weitlaner, are dealing a lot with business processes and all things related to that topic. They had the problem that is quite hard for students to understand all the relations between certain processes and certain topics within the world of business processes. So there was the idea to develop a board game (hybrid game) to close that gap. A very important task in our diploma thesis is to have lot of knowledge transfer within the work and to have a base to stick to when dealing with business processes.

CAMPUS 02 GRAZ
FACHHOCHSCHULE DER WIRTSCHAFT

Figure 1Campus Logo

Figure 2 Photo Polak

Paul Polak

Project Leader/Organizer, Process Modeler, Systems Engineer, Game Design

Product Owner

Scrum Master

Project Management (SYP)

"To write a Diploma Thesis and in combination to that to work on it for many hours, doing a summer job at the partner company, wasn't an easy task for all of us! As the project leader at first I want to thank all the people who supported us and all project members who did a great work. Another big shout out to our project teachers who supported us in an outstanding way! The danger of not thinking about the size of such a work, lets you have a lot of extra hours not really calculated, but if the topic is the right one and everyone is standing behind it those extra hours make the difference from other projects. That's what we all were thinking about a lot and so our project developed in a wonderful and respectable way. Some things were harder to do and some are not, but overall I am just happy that I was a member of such a great team and I am proud of our progress and especially the huge knowledge transfer we are enabling to everyone else.

Figure 3 Photo Pacher

Stefan Pacher

Process Modeler, Systems Engineer, Game Design

Process Management (SYP)

My task was to model several notations (like process maps, BPMN and other well-known notations), outline theoretical knowledge concerning business processes and I was also responsible for the game development. In my mind the task evaluation itself was one of the biggest challenges. It was a great experience to develop something new. .
Another very challenging part was to understand what business processes are, this diploma thesis brought me a lot benefits. I could work with a fantastic team, got in touch with a very interesting topic, gained a lot of knowledge and had the opportunity for new insights of the Campus02.

Figure 4 Photo Rebol

Manuel Rebol

Company Concecpt Artist, E-Bike Company Structure Analyst, Game Design

Business Administration & Management (BWM)

The main tasks which I had to do, were the development of the Business Process Management Extended (BPMX) Game and the creation of a business plan for an e-bike rental service in Graz. The most difficult part was at the early stages of development, when we had no idea about how such a board game might look like. Sprint after sprint the game became better and better and the development started becoming great fun. A lot of new ideas came into our minds each meeting and my job was to structure these ideas and include them into the BPMX Game in a clever way. The biggest challenge for me was to keep the game simple while delivering as much information about business processes as possible.
The business plan is an important work to understand how the branch works with its challenges and opportunities. The information gathered by creating the business plan was a great help in designing a realistic board game. In order to make good estimations about how much the e-bike rental business will cost and how much it will return, research was done on companies, which already exist.
All in all, the work on the project was really interesting and I learned a lot which will definitely help me in the future. It was also enjoyable and a pleasure to work with such enthusiastic colleagues.

Figure 5 Photo Kager

Florian Kager

E-Bike Company Structure Analyst, Game Design

Business Administration & Management (BWM)

In the beginning of the project my main task was to manage the project as a project leader. I was responsible for the project development and I had to arrange appointments with our partner CAMPUS02. My favorite part as a project leader was to motivate my awesome team. I really enjoyed the progress of our project, both on the large and small scale. Of course, there were also some bad moments during our project, but the whole team managed to get through them.

After the first big project step I passed my role to Paul and I became responsible for the business sector within the project together with Manuel. We build a business plan for our project to get a better knowledge about the business itself. It was a lot of work, but I think

the business plan became an important part regarding the case study of the E-bike rental service.
Overall, the project work was really fascinating and informative. I gained lots of experience during the project and I am pretty sure I will use it someday. I am glad that I was able to work together with such a good team.

Hannes Prassl

Figure 6 Photo Prassl

Software Developer

Programming (POS)

In the earliest stage of the project I was heavily involved in the development of the BPMX board game itself. At the very beginning it was rather easy to come up with new ideas and develop the game flow, but as the game became more and more complex we soon faced a game flow with a lot of variety and numerous options. Fortunately we were able to develop a game that that gives the player a sense of why business processes are important and why he should try to optimize them.

As our board game reached a stage at which we were satisfied with the basic concept and it only needed minor adjustments to improve the gaming experience for the player, I dedicated myself to develop a supporting software that takes away some of the complexity of the game, in order to relieve the player, so he does not need concentrate on unnecessary things, but can follow the effects of process optimizations in his own "business".
At first I started to develop a program using the .NET framework, but soon we discovered that the availability of such a program is very limited, since the player needs to have PC or Laptop by him. So the decision how the supporting software should be deployed fell on HTML using CSS and JQuery in order to provide a Web App that is easily accessible regardless of what device you are using.

All in all the work on the BPMX game was certainly a educational experience for our whole BPMX team.

The Beginning

Initial Situation

"First there was nothing."

Our Diploma Thesis started on a white sheet of paper. Dr. Grünwald from FH Campus02, which is a partner of our school, was asking for a project concerning an idea of him for a learning game. The idea was to set up a game, for almost everyone, to learn and understand the important topic of business processes and the influence on a system or company they can have. At the beginning we knew that there are some comparable games like the "Beer Game" or some similar games and methods to learn something about how a business works and how processes have to mesh with each other.

But we wanted to create something new and more innovative as well as a little bit more fun and attractive. So we were thinking a lot about the possibilities we have to include the learning aspect of how micro and macro processes and the whole functional part of a business works.

After a lot of Brainstorming and discussions we born the idea of using the quite interesting model of a E-Bike rental shop for our game and to make a hybrid game out of our game. An E-Bike rental shop includes a modern and innovative business model that includes some quite complex, but also some easier processes, furthermore it was important for us to choose a concept that isn't just something totally standard, which we also would achieve making a hybrid game (a game with a supporting software, in our case useable on a mobile device). We wanted to have something catching and interesting in our game and the E-Bike Shop totally meets our expectations and to have a digital part to seemed to be the perfect way.

Problem-Setting – Goals – Specifications

So our task was to build up a total new game for persons who want to gain knowledge in that part of system engineering and business models and to have a game that shows the practical aspects of business processes in a business and how to manipulate and change them to have more success and to see the impacts of such changes and manipulations. The supporting software should be a helping part for the game itself to avoid complex calculations and to be able to have an overview of what was done and to manage every player's player account.
The game should include a fun factor so that the player wants to play it and also automatically learns something while playing the game. He or she should understand the backgrounds of processes and the functionality of them and how to affect them.

The knowledge transfer in our work is a very important point too. The work shouldn't just include the learning game it should also include a big theoretical part that the player also has some sort of backup material when he wants to get deeper into the topic. In that part we mainly covered two subjects, SYP and BWM. In SYP we are covering a big part of

systems engineering where everything from BPMN to a V-Model and the "Grazer Ansatz" of process modeling is included and worked out. In BWM we are covering the whole topic of business models and combined with that making business plans and to formulate a business plan including all calculations and theoretical things that could happen, being included, to build up an E-Bike rental shop.

Structure of the work

Our work consists out of 5 main points:

- Theoretical part
  - Project management
  - Process management
  - business model
  - Software Engineering

- Our case study – E-Bike rental shop
  - In the case study all analyses are done and everything about the E-Bike rental shop is checked and the base for our business model and game is build.

- Business Model of the E-Bike rental shop
  - Here the business aspect of the project is picked up and formulated. The E-Bike. rental shop as real shop could be build up after the business model we made.

- BPMX Game
  - The most important part of the project. The game is the practical part of our diploma thesis.

- Software
  - The software functions as a supporter for our game and makes a hybrid game out of it.

Structure of our Work in a Bubble Chart

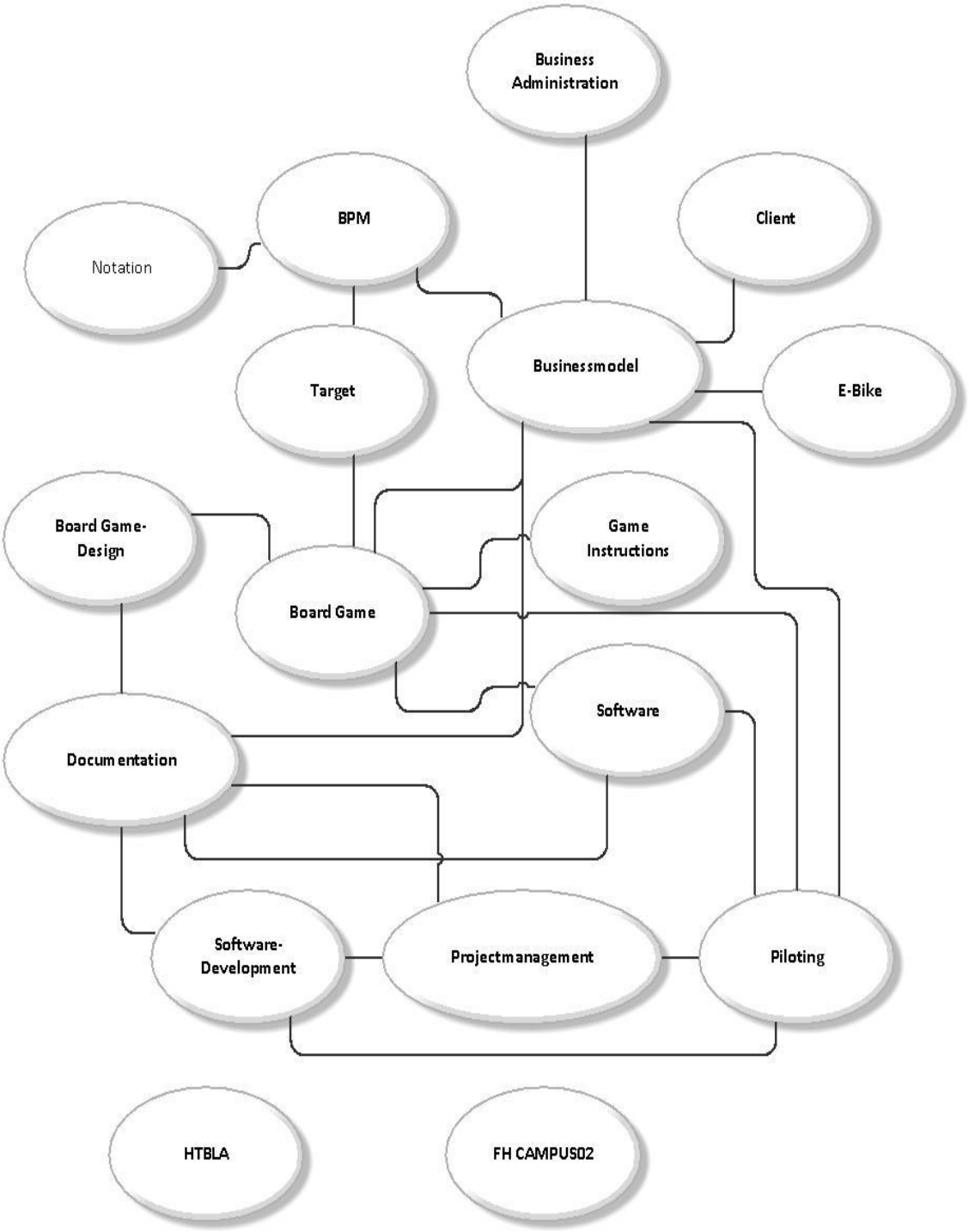


Figure 7 Bubble Chart Project Structure

Scope Statement

Goal definition

The main goal of the project is to develop a hybrid game which describes and includes the topic of business processes and everything included in that topic. The player should gain knowledge during playing the game, supported by a web application.

FH Campuso2 should be able to use the game and the software for there students to have a platform for learning and dealing with the topic of business processes.

Must Criteria

Game

- The game has to deal with the topic of business processes
- The game must include a supporting software (hybrid game) which does calculations for the user and show his actual state.
- The software has just to SUPPORT the game, the game has to be a board game
- The project must include theoretical parts for all functional parts mentioned in the game and the project, so that the player/user can understand all relations and functionalities within the game.
- The project has to include a description of the initial situation the idea and the concept and structure of the implementation
- The project has to include an analysis of the process management and it has to be included in the game, including BPMN
- The game must implement a business model – E Bike rental shop – and a formulate it
- A case study of the concept of an E Bike rental shop has to be described
- A hardware board game has to be implemented and be playable

Quality Goals

Goal	Very important	Important	Average	Not important
Reliability		X		
Correctness	X			

User friendly	X			
Efficient			X	
Portable				X
Compatibility	X			
Maintainability	X			

Table 1 Quality Goals

Development Environment

- Software
  - Scrum related tools
  - Notepad++
  - FileZilla

- Hardware
  - Laptop
  - Board Game Developing Tools
  - LEGO
  - Smartphone
  - Testserver

- Orgware
  - MS Office
  - Dropbox

- Design (Game & Project)
  - Adobe Photoshop
  - Aris Express
  - Bizagi
  - Gimp
  - iWeb

Project Management Proceed Model (SCRUM)

Scrum is a model, which is especially used for projects done by small groups. The project time gets separated in short time periods, so called "Sprints". The time of such sprints is not fix in general. It could be varied and is flexible, but should not be too big. At the beginning and the end of each sprint a meeting is held.

The content of a Sprint meeting should be:

- Sprint Review (control if the sprint backlog is done totally)

- Sprint Reflection (reflect the sprint, demonstrate possible improvements that could be done)
- Planning of the next sprint

Important terms for SCRUM

Product Backlog

The term, product backlog, is understood as a list of functions, which the finishes product should include (Backlog Item). During the planning of a sprint some backlog items are taken out of the product backlog and put into the sprint backlog. The works are defined as user stories. A user story is a need a user has concerning the product and it is formulated to see what the product has to be able to do.

Backlog Item

A backlog item is a special task, which was formulated as a user story. A backlog item stands for a whole working package, which, if possible, includes certain functionalities, which are not dependent from other backlog items.

Sprint Backlog

A sprint backlog means all the tasks, which have to be done within a single sprint.

A Task

All the backlog items included in a certain sprint have to be divided in smaller segment works, called tasks. A task should always just include a portion of part tasks, which could be done by a person per day.

Sprint Backlog – Sprint Documentation

1.Sprint
Date: 25.10.2012

- Campus 02 is describing the project the information flow the goals and the important things for the second meeting (1. Sprint)
- General thoughts about the project
- basic idea + Brainstorming

2. Sprint
Date: 29.11.2012

- Project group is presenting first steps (process map, game concept)
- Further goal development and achievements for next meeting.

3. Sprint
Date: 24.01.2013

- Presentation of the first real game concept (how the game could work + descriptions)
- Presentation of the BPMN document + discussion about improving
- Tips and improvements are discussed further goal setting for the next meeting.

4.Sprint
Date: 15.03.2013

- Presentation of the further ideas and extensions for the game (image,....)
- Detailed discussion about the development process and further goals
- Decision that from now on empirical values will be created through foreign players and people testing the game and giving feedback
- Clearing details for the visit at the servtec and further ideas

5. Sprint
Date: 18.04.2013

- Servtec visit – milestone defintions, clearing things for project management and holyday internship

Sprints during the internship

6. Sprint
Date: 24.06.2013

- Begin of the internship – organizational things
- Design and Modeling of the game Logos
- Further Milestone definition and description
- Software Requirements (Prassl) definition with Software Developers of Campus02
- Feedback sheet for the foreign test users
- Working on the presentation for diploma thesis presentation at HTBLA Kaindorf
- Literature (Bubble Notation, Systems Engineering)

7. Sprint
Date: 01.07.2013

- Webdesign including implementing a website for public relations and markting concept and to spread the idea of the game
- Social Media appearance (Facebook,Twitter) -> marketing / publicity
- Game development / Brainstorming
- Bug fixing
- Process map
- Literature Andreas Sutter
- V Model including the ordering the activities after there main processes

8. Sprint
Date: 08.07.2013

- Game testing + Improvements
- further Activity Analysis + V Model
- Further Webdesign and Software Requirements
- Game testing + bug fixing
- Functional Design Game Board

9. Sprint
Date: 15.07.2013

- Action cards design and implementation
- Web App testing + improvements
- Game testing with Dr. Grünwald + Bug fixing + new ideas
- Concluding everything of the internship

10. Sprint
Date: 19.10.2013

- Definition of the open tasks and last demarcation for the end of the project
- bug fixing and demarcation for the functional and design requirements of the board game

- demarcation of the project management part and the software part
- game testing
- first tests with software + game = HYBRID

11. Sprint
Date: 04.12.2013

- finishing process maps and process design (Grazer Ansatz, BMPN, …)
- Improvements on the board game
- Software improvements
- Documentation
- Game design including the design of all game related cards, the board, …

12. Sprint
Date: 01.02.2014

- Finishing the process modeling part
- Software – Game interaction bug fixing
- Game testing + Improvements
- Gaming Rules
- Game structure

13. Sprint
Date: 05.03.2014

- Finishing game functionality
- Game design
- Documentation
- Software design
- Documentation guidelines

Time Management

Time Management for all sprints

P… Plan Time
R … Real Time

Summary of all sprints	Polak		Pacher		Rebol		Kager		Prassl	
	P(h)	R(h)	P(h)	R(h)	P(h)	R(h)	P(h)	P(h)	P(h)	R(h)
1. Sprint	32	32	32	31	32	32	32	32	32	30

2. Sprint	32	33	32	30	32	32	32	32	32	32

Name	Sprint Time (h)		Meeting Time (13 Meetings a 1 h)	Time Complete
	Soll	Ist		
Paul Polak	347	357	13	370

3. Sprint	16	16	16	18	16	17	16	15	16	16
4. Sprint	16	18	16	17	16	15	16	19	16	18
5. Sprint	16	17	16	19	16	16	16	18	16	17
6. Sprint	40	41	40	41	40	40	40	40	40	41
7. Sprint	40	42	40	40	40	40	40	40	40	41
8. Sprint	40	39	40	40	40	40	40	40	40	42
9. Sprint	40	40	40	41	40	40	40	41	40	40
10. Sprint	25	24	25	26	25	24	25	24	25	26
11. Sprint	20	20	20	21	20	22	20	22	20	21
12. Sprint	10	14	10	13	10	11	10	11	10	12
13. Sprint	20	21	20	20	20	21	20	22	20	20

Table 2 Time Management

Time Management for the whole project

Stefan Pacher	347	357	13	370
Manuel Rebol	347	350	13	363
Florian Kager	347	356	13	369
Hannes Prassl	347	356	13	369

Table 3 Whole Time Management

The product owner

In our project our project manager also had the role if the product owner and was cooperating with the stakeholders and the surroundings.

The role of being a product owner is almost the most important role within a project. The product owner is responsible for the success of the project and for reaching the project goals.

Tasks of the product owner

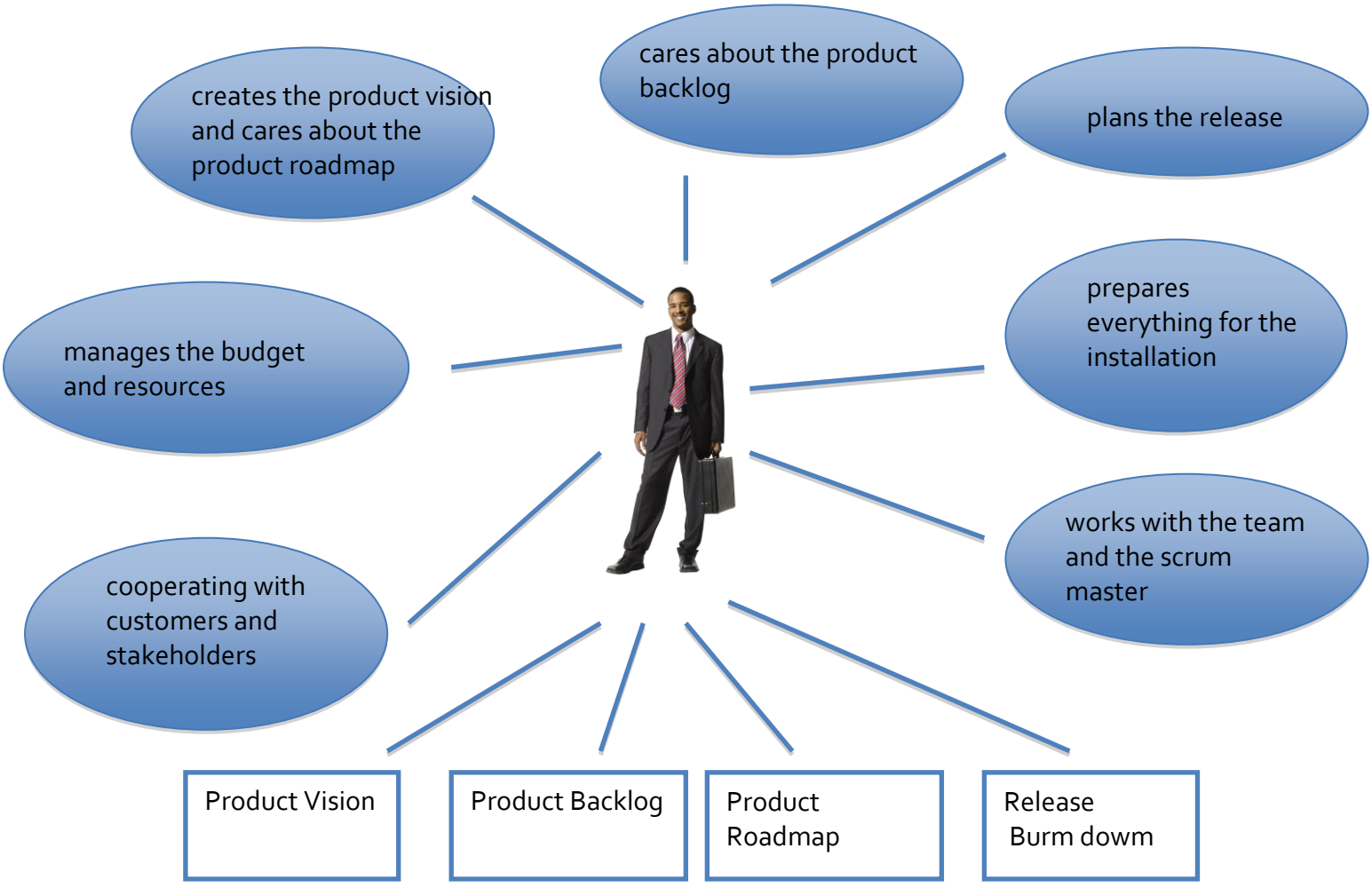


Figure 8 Tasks of the product owner

The product owner can have many roles in a project:

- Product Marketing Manager
- Product Manager
- Project Manager

- Business Analyst / Requirements Engineer

Product Owner in a Project Constellation

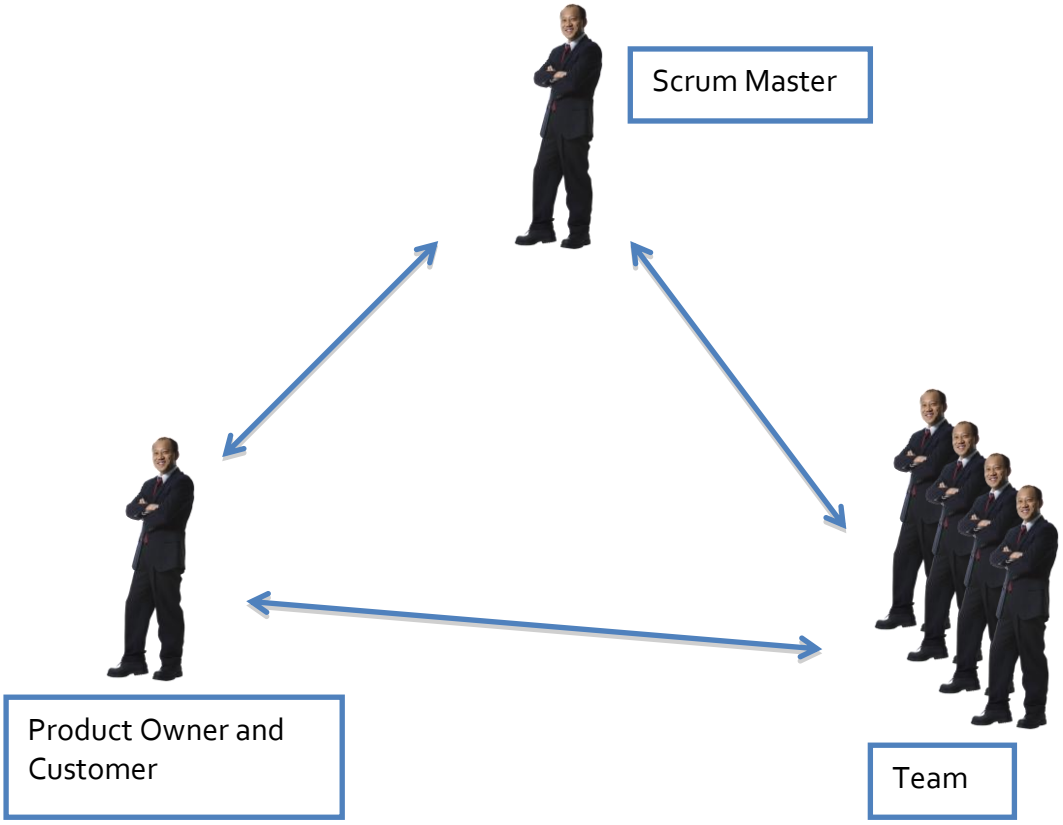


Figure 9 Product Owner in a Project Constellation

Product Vision & Product Roadmap

The product vision describes who the customers are, what customers need, and how these needs will be met. It captures the essence of the product – the critical information we must know to develop and launch a winning product, which is successful.

Developing an effective product vision is possible through the asking important questions:

- Who is going to buy the product?
- Who is the target customer?
- Which customer needs will the product address?
- Which product attributes are critical to satisfy the needs selected, and therefore for the success of the product?
- How does the product compare against existing products, both from competitors and the same company?
- What are the product's unique selling points?
- What is the target timeframe and budget to develop and launch the product?

Answering these questions also gives us the information to create a business case. It allows us to decide if and how the project should proceed.

The product vision board

The board helps to describe the most important aspects of the product:

- target group
- needs of customers and users
- the product
- economics

Vision Statement (Phrase or sentence that sums up the vision)			
Target group Which market segment, customers and users the product is addressing?	**Needs** Which added value does the product generate for the customer and user? Which emotions does it bring up in the user	**Product** What are the most important features for the success of the product? how should the product look like? Which technologies and architectures should be used?	**Economics** How does the product help the business? What are the income sources and selling channels? What is the selling price?

Table 4 Product Vision board

The product roadmap

The product roadmap is a planning tool that describes the development of the product in versions. It is very effective to use a product roadmap, because the medium terminated planning is one of the most effective ones. And that's exactly what the roadmap is doing.

The information for the road map:

- Version description
- planned market launch
- the 3-5 most important features

The product backlog

The scrum product backlog is simply a list of all things that needs to be done within the project.

It replaces the traditional requirements specification artifacts. These items can have a technical nature or can be user-centric e.g. in the form of user stories.

The owner of the product backlog is the product owner.
The scrum master, the scrum team and other stakeholders contribute it to have a broad and complete To-Do list.

Working with a Scrum Product Backlog does not mean that the Scrum Team is not allowed to create and use other artifacts. Examples for additional artifacts could be a summary of the various user roles, workflow descriptions, user interface guidelines, storyboards, or user interface prototypes. However, these artifacts do not replace the Scrum Product Backlog but complement and detail its content.

The Scrum Product Owner uses the Scrum Product Backlog during the Sprint Planning Meeting to describe the top entries to the team. The Scrum Team then determines which items they can complete during the coming sprint.

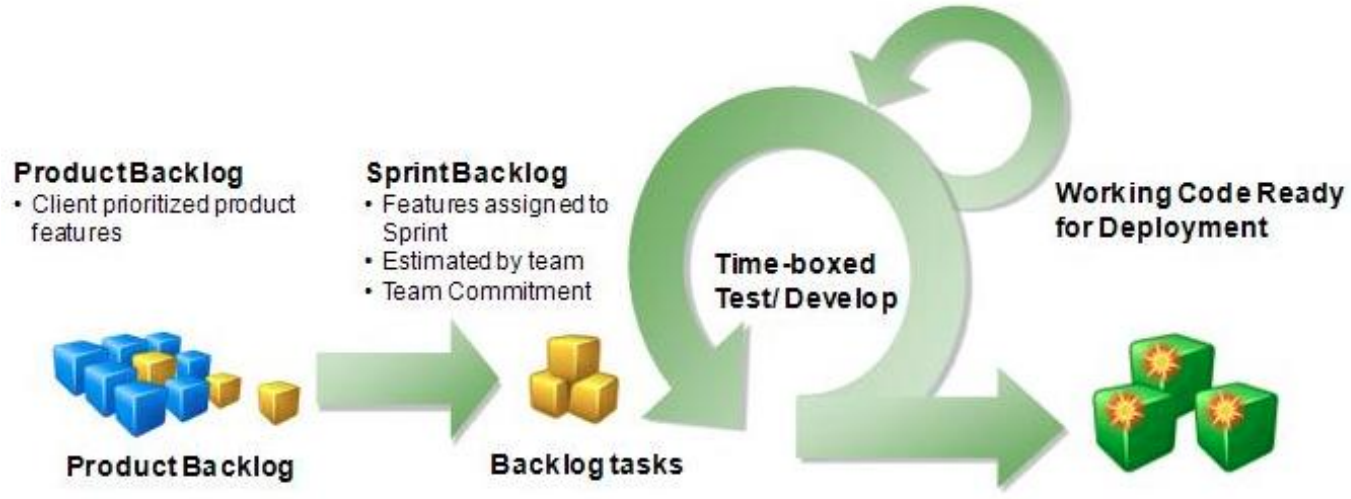


Figure 10 Product Backlog Workflow

Each Scrum Product Backlog has certain properties that differentiate it from a simple to-do list:

- an entry in the Scrum Product Backlog always add value for the customer
- the entries in the Scrum Product Backlog are prioritized and ordered accordingly

- the level of detail depends on the position of the entry within the Scrum Product Backlog
- all entries are estimated
- the Scrum Product Backlog is a living document
- there are no action-items or low-level tasks in the Scrum Product Backlog

Dynamic Product Backlog

The Scrum Product Backlog is changed throughout the whole project. If needed, new requirements are added and existing requirements may be modified, defined in more detail or even deleted. Requirements are no longer frozen early on. Instead the final set of requirements within the Scrum Product Backlog is also developed iteratively, together with the resulting software. This is different to traditional requirements engineering but allows maximizing customer value and minimizes development effort.

The backlog needs regular attention and care - it needs to be managed carefully. At the start of the project the Scrum Team and its Scrum Product Owner start by writing down everything they can think of easily. This is almost always more than enough for a first sprint.

After this initial setup, the Scrum Product Backlog has to be maintained in an ongoing process that comprises the following steps:
As new items are discovered they are described and added to the list. Existing ones are changed or removed as appropriate.
Ordering the Scrum Product Backlog. The most important items are moved to the top.
Preparing the high-priority entries for the next Sprint Planning Meeting
(Re-)Estimating the entries in the Scrum Product Backlog
The Scrum Product Owner is responsible for making sure that the Scrum Product Backlog is in good shape this is a collaborative process. When using the Scrum Framework about 10% of the Scrum Teams total time should be reserved for maintaining the Scrum Product Backlog (discussion, estimation etc.).

The collaborative maintenance of the Scrum Product Backlog helps to clarify the requirements and creates a buy-in from the Scrum Team.

The Release Planning

Conveys expectations about what is likely to be developed and in what timeframe
Feeds into other strategic planning activities
Helps the Product Owner and whole Team to determine how much MUST be developed, and how long that will take before they have a releasable product

Figure 11 Release Planing

Serves as a guidepost towards which the project team can progress
Allows iterations to combine into a satisfying "WHOLE"
Shows a team's current expectation of what is probable

Time – Cost – Functionality

Time, cost and functionality are the most important points in a project and especially in a release. Thoughts have to be made if which things in relation to the factors time, cost and functionality can not be let unattended.

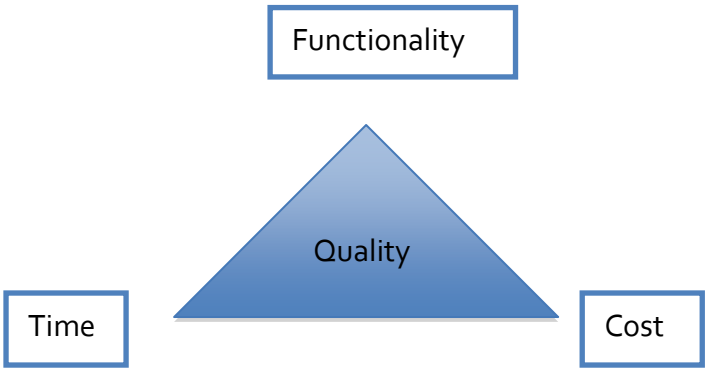


Figure 12 Time - Cost - Functionality

To create a Release Plan the following things have to be available:

- A prioritized and estimated Scrum Product Backlog
- The (estimated) velocity of the Scrum Team
- Conditions of satisfaction (goals for the schedule, scope, resources)

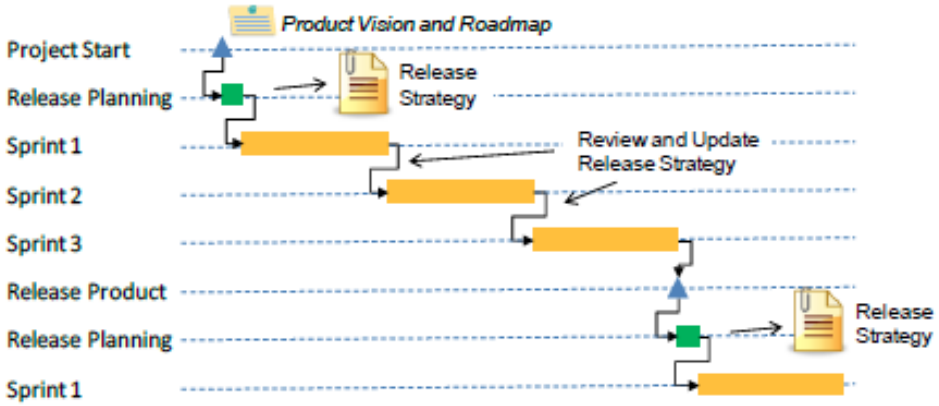


Figure 13 Creating a Release Plan

Depending on the type of project (feature- or date-driven) the release plan can be created in different ways:

If the project is feature-driven, the sum of all features within in a release can be divided by the expected velocity. This will then result in the number of sprints needed to complete the requested functionality.

If the project is date-driven we can simply multiply the velocity by the number of Sprints and we'll get the total work that can be completed within the given timeline.

Like the Scrum Product Backlog the Release plan is not a static plan. It will change during the whole project when new knowledge is available and e.g. entries in the Scrum Product Backlog are changed and re-estimated. Therefore the Release Plan should be revisited and updated in regular intervals, e.g. after each Sprint.

Cause and Effect Analysis

The cause-and- effect analysis and diagram is now used mainly to analyze and show cause-and- effect relationships and is quite easy to represent graphically.

The cause-and- effect diagram is quite similar to a mind map. It is suitable for the processing of problem areas within a workgroup. In complex problems the method is

extensive and confusing. Cause-and- effect relationships can be graphically not shown so clearly and interactions and temporal dependencies not be easily captured and modeled.

The method is preferred for system optimization and analysis of causes of errors.

Logical relationships between the causes and the derived effects can be illustrated simply.

The application of the " Ishikawa " method is easy to learn. It is put into practice quite simple and requires little effort. The method offers the problems and causes very systematically and completely visualize them and so users can understand it. It forms an excellent basis for working with teams, promotes better understanding of problems and their wide range of causes within a system.

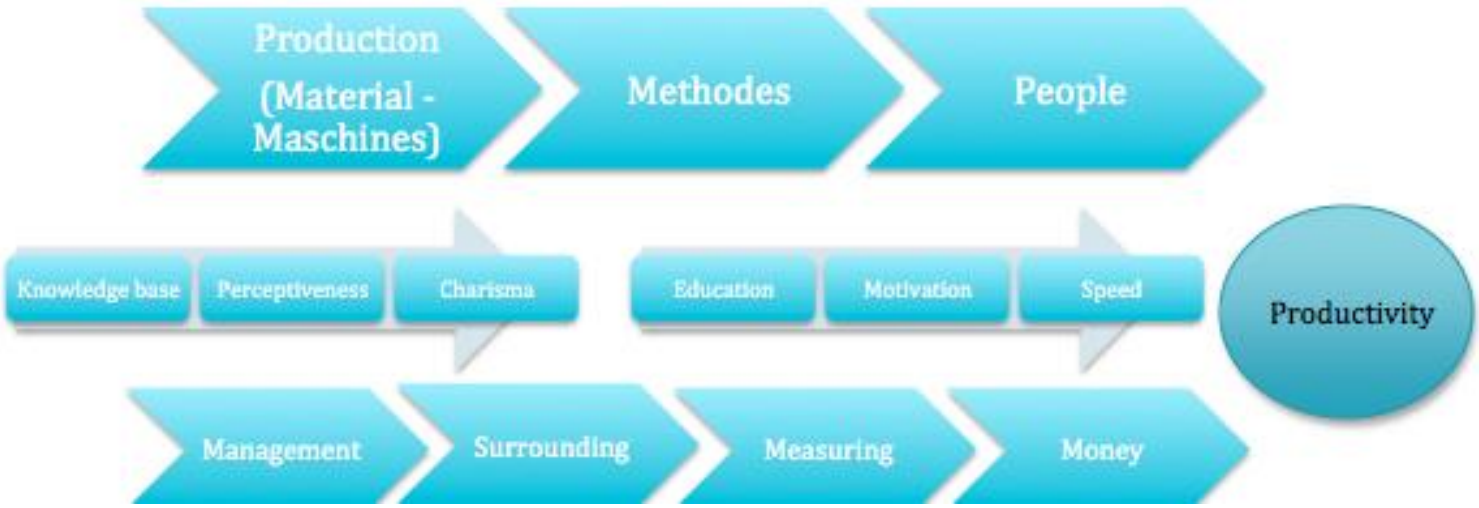


Figure 14 Cause-Effect Analysis

Input for a Cause-Effect Analysis

A list of data elements and the relevant parameters for it.

Steps in a Cause-Effect Analysis

1. Choice of the parameters used for sorting e.g. the amount of errors per error category.
2. Counting of the elements in each category.
3. Calculating the percentages of each category in relation to the whole amount.
4. Descending sorting of the categories in fact of their appearing percentage
5. Showing the sorted data in form of a histogram.

Interpretation of a Cause-Effect Analysis

- Depends on the sort of the displayed data
- In general the elements on the outer left side should be concerned the most and should be cared most.

-

Process Model – RUP – Rational Unified Process

We were also using elements out of the concept of the rational unified process. RUP elements were used in the Software Engineering part as well as in the development part of the game including hardware development of the game and functional development of the game.

A Business Process

A business process is a proper logical sequence of operational activities or activities with the aim of clearly defined outputs to generate customer value.

The business process includes:

- a specific scope of services,
- Is determined by a defined, measurable input and output, is repeatable,
- Adds customer value added to process objects,
- Has a consistently responsible process owner

and additionally:

- has all the necessary resources and information.

What is RUP?

The rationale unified process is a object oriented process model. It bases on use cases and includes an iterative development of the product (often software products). RUP is also connected to the unified modeling language (UML) and supported by it. RUP is a product of Rational which is owned now by IBM now.

Features of RUP

- it is use case oriented and the use cases build the base for the requirements
- The whole project process is divided into 4 main parts, at the end of each phase there is a clearly defined mile stone
- for reaching the project goal there are clearly defined Workflows needed, Workflows run parallel at the same time with different amounts of intensity
- Every workflow includes WHO is going to do WHAT with WHICH approach
- within the development phases there are short cycles – so called iterations, the work in an iteration is concentrating on the milestone achievement within the phase
- At the end of every iteration there should be a runnable pre version to test
- Rup is providing a general view on the whole architecture of the developed system in many presenting ways, supported by UML

The RUP iteration cycle

At the beginning of every iteration is the iteration plan. It describes the tasks, goals and general conditions.

The iteration plan includes:

- a detailed description of the tasks to do
- role definitions for that iteration and possible artefacts
- description of the exact goals and criteria to reach them and for measuring them
- Beginning and Ending time and deployment date of the iteration. the duration depends on the project and team size

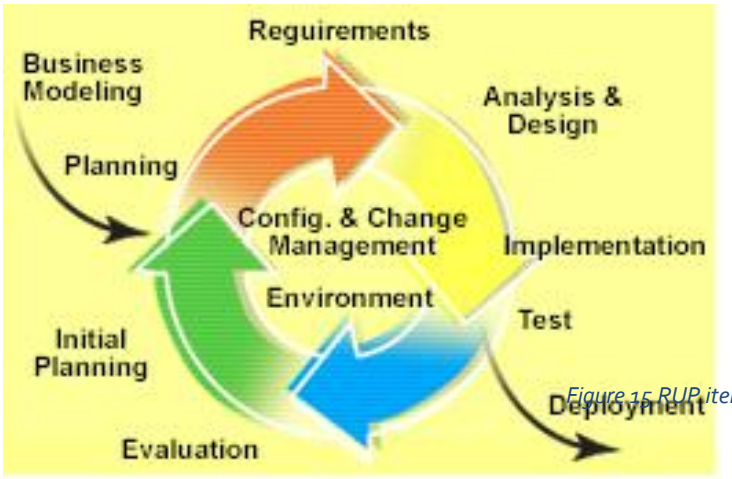


Figure 15 RUP iteration cycle

One of the most important features of an iterative development is the pre product existing after each iteration often called build. A build is executable and can be tested. With that Build being created the stakeholders of the project can check if the project is running in the direction they want it to have. The team can also learn a lot about the project behavior through that builds and can take risk out of the project.

Pros of the iterative approach:

- early recognition and prevention of risks
- changes are easier controllable
- learning effect for the development team
- whole improvement of quality
- improved reusability

The Late Design Breakage

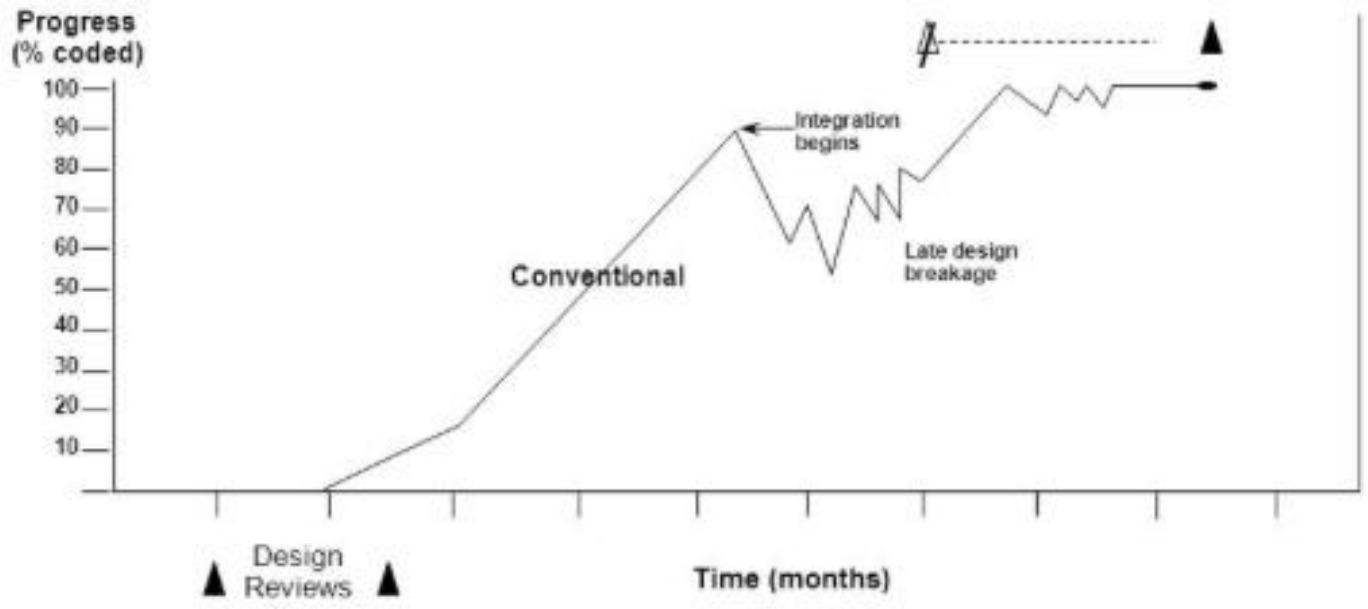


Figure 16 Late Design Breakage

Another thing that can be prevented with iterations and especially with short iterations is the "Late Design Breakage". In comparison to other process models like the waterfall model there are requirements defined at the beginning of the project and specifications made. There is never a whole view of the system. So just at the end of the project where the deployment and integration of the developed project is happening and then bugs are detected and nearly can't be fixed at the end and so the design or the functionality has to be changed in the end of the project which is a very difficult thing and destabilizes the whole project and slows the whole project down.

Phases during the RUP

Every phase during the RUP has a clearly defined task and is closed by a milestone. The milestone measures the success of reaching the phase goals. If the phase goal is reached the release of the next phases is possible. If the phase goals are not reached certain actions has to be taken. At the first 2 Phases a project can be canceled if the milestones are not reached.

The Inception Phase

The inception phase does the demarcation of the project scope and description of the essential business cases. Feasibility and economy of the project has to be analyzed. Expenditure and costs have to be valued and the project expiration is fixed roughly.

Result: LCO (Lifecycle Objective Milestone)

The Elaboration Phase

The elaboration phase is the most important phase of the project. At the end of that phase the decision has to be made in which way the product / project is done. (''Point of no Return'') In that phase the developed product has to be analyzed fully and maybe a first build could be running. Architecture, requirements, planning and the effort estimation have to be brought in a stable state and possible risks have to be minimized.

Result: LCA (Lifecycle Architecture Milestone)

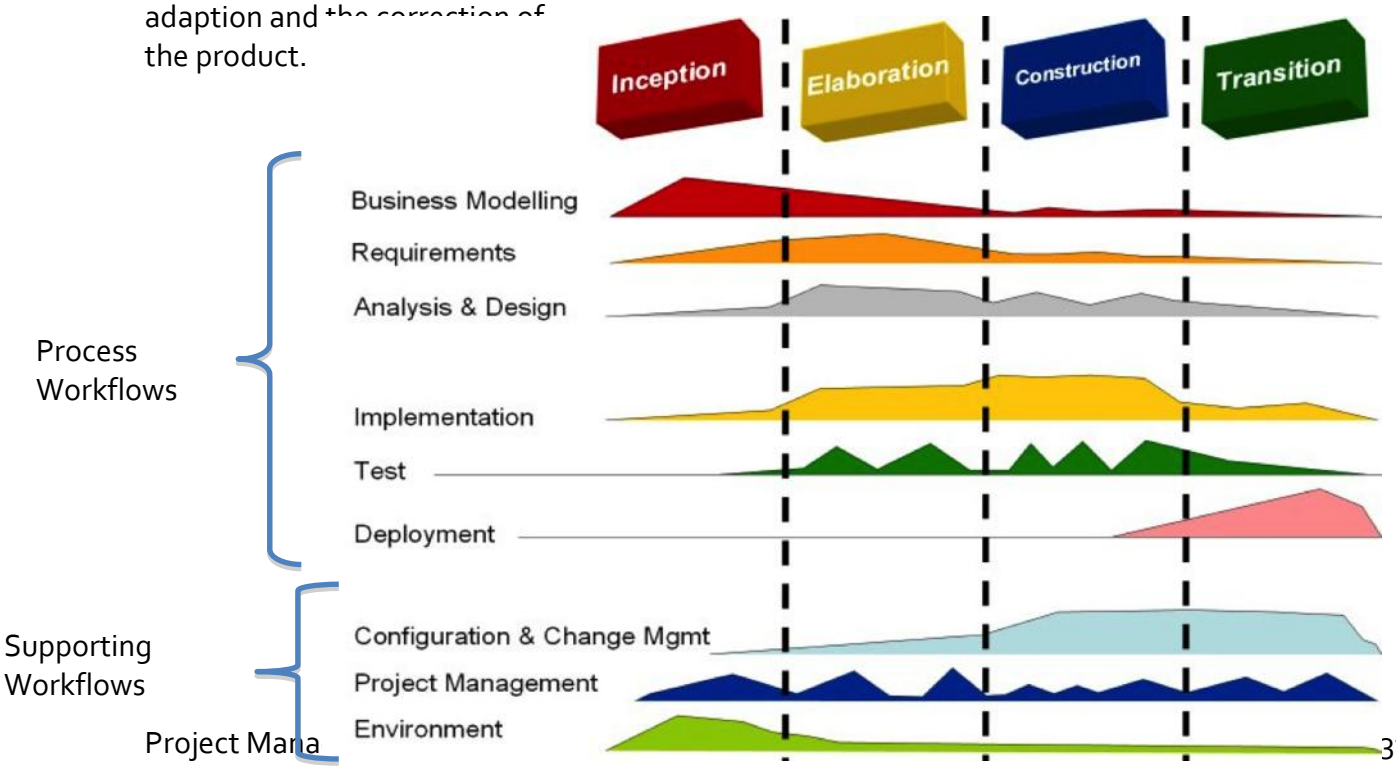
The Construction Phase

During the construction phase the actual production of the product is done and also the development and testing of all the components and the completing of the end product.

Result: IOC (Initial Operational Capability Milestone)

The Transition Phase

The phase starts when a product version (''Baseline'') exists that runs as stable that the customer can get it in combination with a good documentation. The main tasks are the adaption and the correction of the product.



The Duration and Expenditure of a Phase

Figure 17 RUP Phases

The duration and the expenditure of a phase can be different from project to project, but in the most projects with a standard project running the Inception takes 5%, the Elaboration 20%, the Construction 65% and the Transition 10%, but for projects with special content or special requirements the duration of the phases can be different.

Our duration and expenditure diagrams:

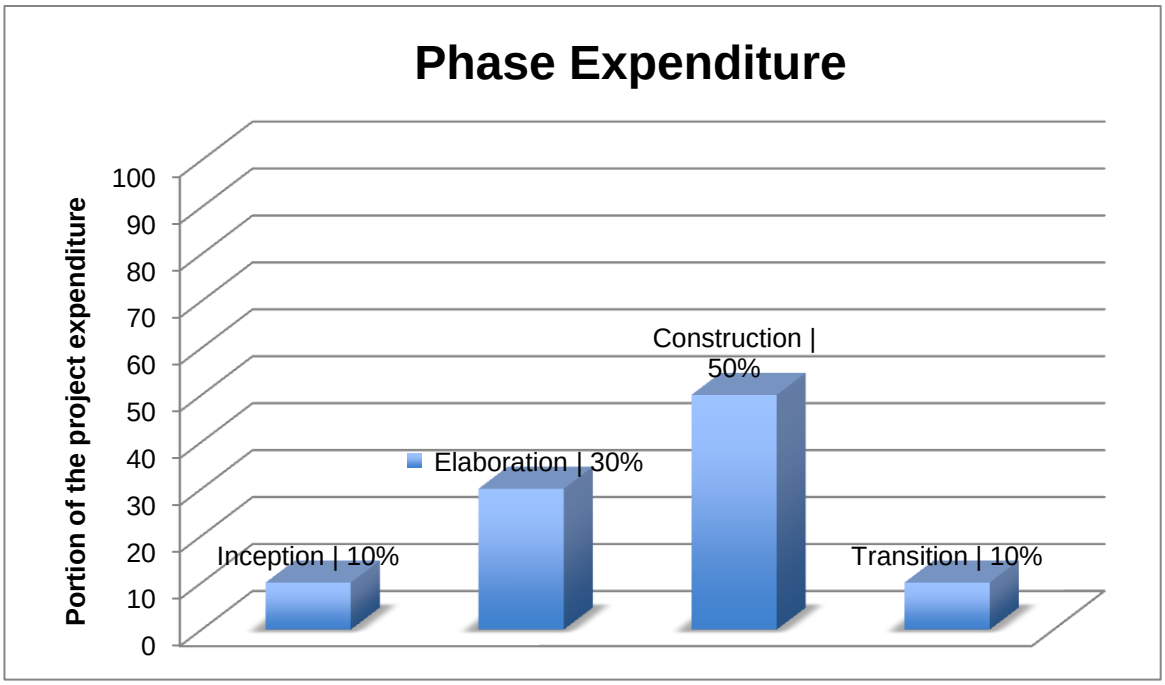


Illustration 18 RUP Phase Expenditure

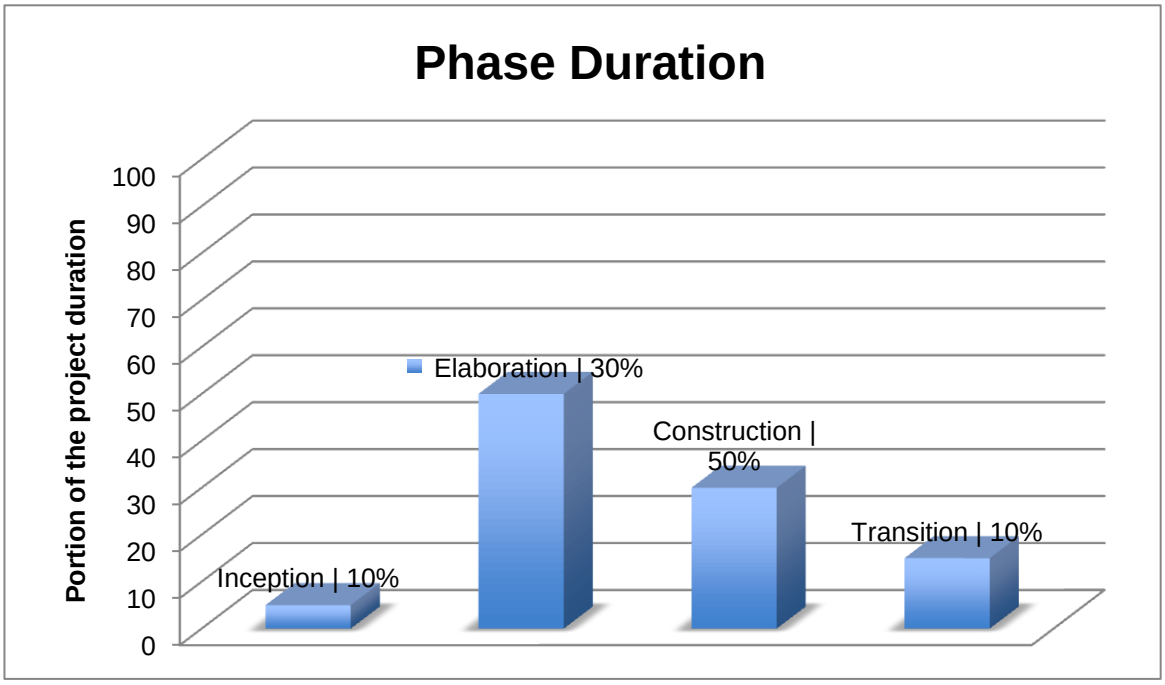


Illustration 19 RUP Phase Duration

Our Phases Overview

First Phase

In our project the first phase the inception phase was quite important, because the demarcation of the project and the project size, also including the amount of requirements was very difficult. The problem was that developing a board game and a supporting software is a never ending task, because if one bug is fixed another possibility which would be nice to have appears and so the demarcation of the project and the specification was quite difficult.

Second Phase

The second phase the elaboration phase was a almost the most important phase in our project, because in that phase we had to decide which way for our solution we want to choose if we even want to develop a hybrid game and if how should it look like. In that phase some difficult questions were occurring in our project. One of the most difficult was to fully analyze the system of a hybrid game of even a complex board game, which is an important task in that phase to the fulfilled for the next phase. So we were fixing to idea of making a hybrid game, beginning with nothing.

Third Phase

The third phase the construction phase was way easier in our project than in others, because when the concept was standing and the demarcation was done we know what we had to do and were working with a lot of creativity to find good solutions for our problems with bringing the world of business processes into our diploma thesis. The amount of time needed wasn't that much, but it makes the most of the material of our work in comparison to the elaboration phase which is not making that much amount of material, but took a lot of time to do.

Last Phase

The last phase the illustration phase was a quite average phase in our project. In fact we were working with the principles and guidelines of RUP the error correction in the end and the adaption works weren't so much, because we were fixing bugs during the project and improving problematic parts as early as possible in our work.

Workflows in RUP

Processes are not directly connected to a phase in the RUP they are reaching over the whole project with different intensities. Every process is described through a sequence of activities, most time displayed by a UML-Activity-Diagram, as well as through persons, activities and events.

Elements of the Workflows

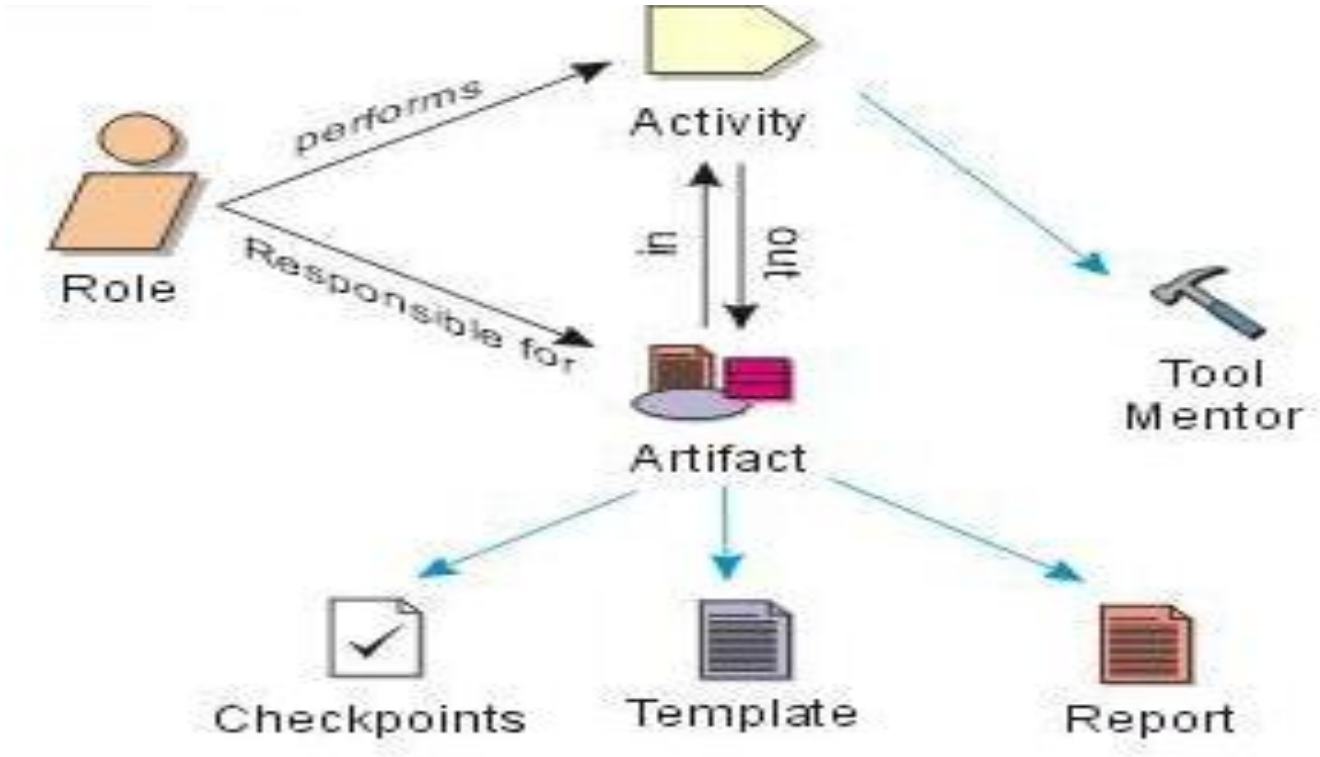


Illustration 20 Workflow Elements

Worker

Persons have certain activities to do during a certain process. They are having a role. A certain person can also have more than one roles during the project. Rup itself defines a lot of roles, but roles can be created and adapted as needed.

Activity

Could be compared with a work package. An activity has to be totally fulfilled to return a useful output.

Result: At the end of an activity there is an Artifact.

Artifacts

An artifact is a piece of information or a piece of output that can be produced, modified or used from a process. It underlies the version management. An artifact can also be a model, a part of a model or a document. Artifacts are combined with certain processes. All artifacts of a process build a ''Set''.

Process Workflows

Business Modeling

The business model builds an overall view over the business processes, for which the supporting product is going to be created for. It also describes the operational surrounding and offers a more global view which is not just limited on the project scope. Generating a business model is optional in general, but in our case it was a must have and very important for our work.

Requirements

The goal of the requirements is to come up with all the requirements and describe them detailed in a way which is providing the possibility so that developers and stakeholders can communicate about that information. For that reason ''Actors'', which are users, and further systems get identified and the system behavior is described in use cases. Most time they are shown in use case models which are the base for all further developing activities.

Analysis & Design

In the analysis and design workflow the system draft is worked out, which builds some sort of building plan for the product. The resulting design model offers a full view of the system, structured in subsystems, packages, components and classes. The goal is the design of a robust architecture, which is easy to implement and which is fulfilling all requirements concerning functionality, robustness, performance, testability, ...

Implementation

Is the implementation of the design – so the implementation of everything planned in the design, like the implementation of components or subsystems of the product. Output of the implementation is a running system with (during the project running) growing functionality.

Test

The test workflow is present during the whole project with growing intensity at the end of the project. Tests in RUP should be made automatically to avoid errors and to have a constant testing. Preparing tasks of that workflow are planning, design, and implementation. Fulfilling tasks of that workflow are integration tests, system tests and test evaluation.

Deployment

The deployment workflow works with the question : ''How does the soft ware come to the customer.'' It includes the generating, spreading of releases and versions, support during beta testing and migrations from existing systems to new systems. Also the formal inspection is included in the deployment workflow.

Supporting Workflows

Configuration & Change Management

The goal is to manage access to the project's work products. This includes not only tracking versions over time but also controlling and managing changes to them.

Critical activities of this workflow include:

- Managing change requests
- Planning configuration control
- Setting up the CM environment
- Monitoring and reporting configuration status
- Changing and delivering configuration items
- Managing baselines and releases

Project Management

The goal is to direct the activities that take place on the project. This includes managing risks, directing people (assigning tasks, tracking progress, etc.), and coordinating with people and systems outside the scope of the project to be sure that it is delivered on time and within budget. Practically the classical project management.

Critical activities include:

- Initiating a new project
- Managing project staff
- Enhancing the relationship with external teams and resources
- Risk management
- Estimating, scheduling, and planning
- Managing an iteration
- Closing out a phase or project

Environment

The goal is to support the rest of the effort in terms in ensuring that the proper process, guidance (standards and guidelines), and tools (hardware, software, etc.) are available for the team as needed. The critical activities of this discipline are:

- Tailoring the process materials for an individual project team
- Identifying and evaluating tools
- Installing and setting up tools for the project team
- Supporting the tools and process throughout a project

-

RUP Dictionary

RUP English	RUP German
Activity	Aktivität, Arbeitspaket
Analysis and Design	Analyse und Entwurf
Artefact	Artefakt
Business Modeling	Geschäftsprozessmodelierung
Change Management	Änderungs- bzw. Konf. Management
Construction	Konstruktion
Deployment	Auslieferung
Elaboration	Ausarbeitung, Entwurf
Environment	Umgebungs-Workflow(Werkzeugausstatung)
Implementation	Implementierung (Umsetzung)
Inception	Beginn, Konzept, Vorbereitung
Iteration	Iteration
Process Workflows	''produzierende'' Arbeitsabläufe
Project Management	Projektmanagement
Requirements	Anforderungsdefinition
Support Workflows	Unterstützende Arbeitsabläufe
Testing	Test
Transition	Übergang, Einführung
Worker	Rolle

Table 5 RUP Dictionary

Business processes through the ages

In the past, the description of business processes was one of the central tasks in an enterprise. In the recent present, however, the sole documentation is no longer sufficient. Rather, the task today is to respond quickly to market changes and if necessary, adjust its own business processes to the new circumstances. The change in our business processes, including the adaptation of the underlying business structures to sameness has become an important challenge in today's time. The aim of the modeling is to model the one hand, the professional (business) processes and refine those step by step for the specification of the business system. Preferably both worlds should be able to be mapped within a system.

What is Business Process Modeling

All information relevant to a company's business processes are described and stored with performance data. The centrally stored process descriptions must be made available to all on this process having relevance. For the process involved a simplified view of the tasks should be created in the process.

General Guidelines for business process modeling

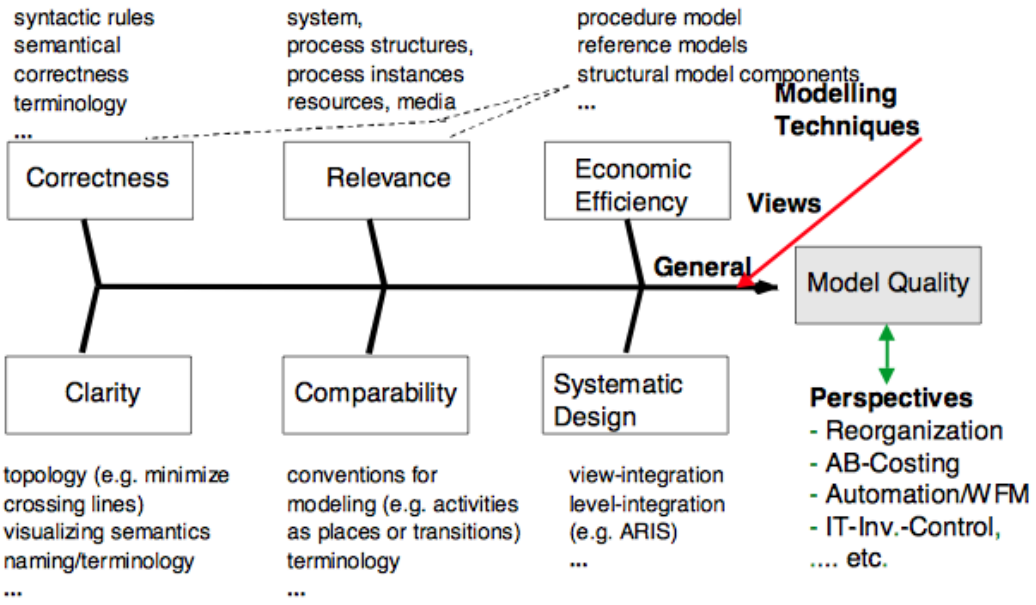


Figure 21 Guidelines for process modeling

Classification of basic models

Process models and quality models are often overlapping at a production process. In fact of that those to are cared about together in the classification. The models can be classified through different criteria.

In process models there are 4 different levels:

- The enterprise or the organization level
- project level
- team level
- employee level

Other criteria:

- Frame models or reference models vs. executable models meaning models describing how to do something
- pure process models vs. pure quality models
- fine models vs. coarse models
- customizable vs. rigid models
- monumental models vs. agile models
- software specific models vs. general models
- models for developing of individual products vs. models for the development of product families
- models for development in a team vs. models for development in spread teams

The criteria is not really ordered and are overlapping a lot.

2 Developing directions

Frame models & Reference models

Describing goals, but not determine how they are reached executable seen.

Monumental models

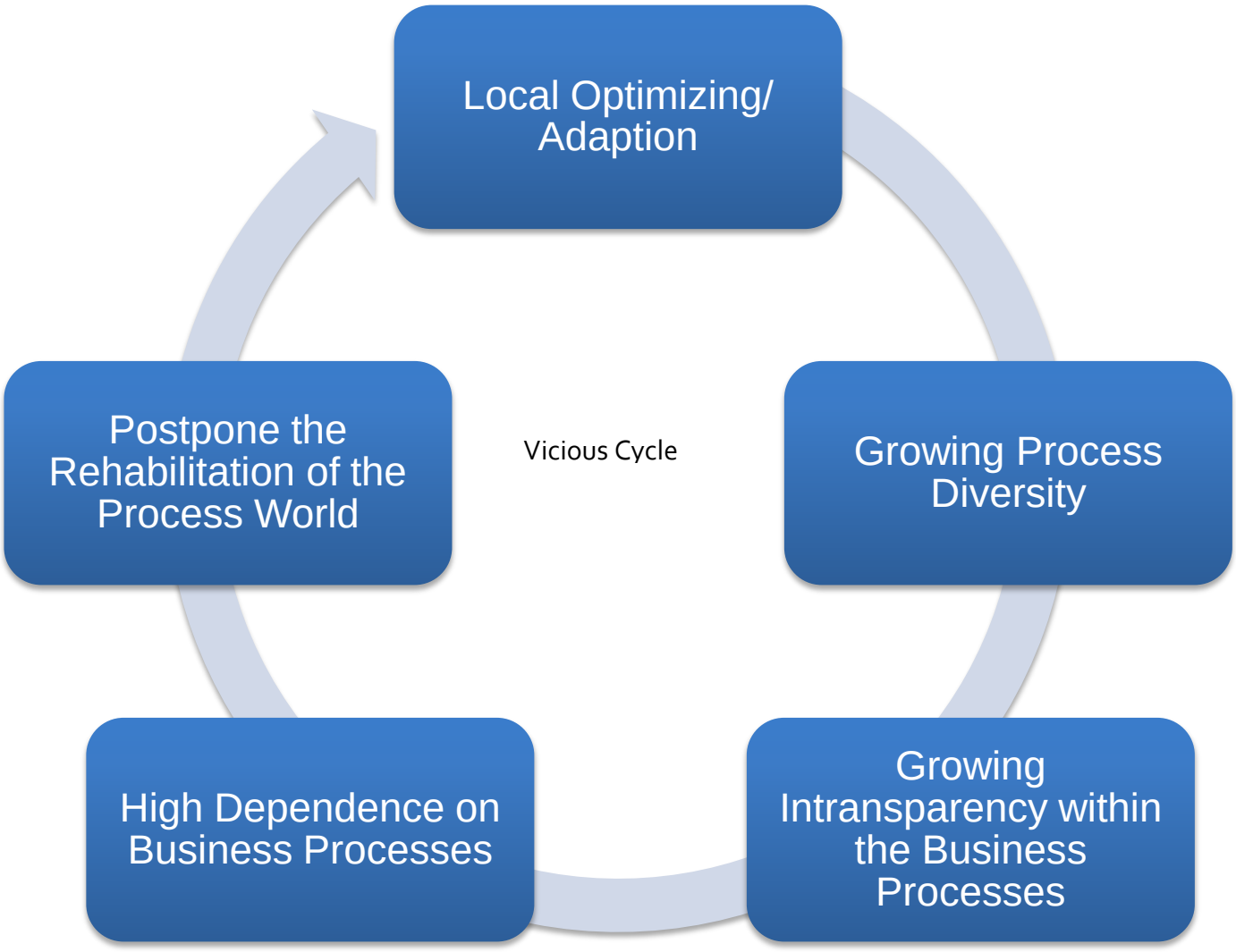
Are detailed models for ''to dos'' and the processes included in a monumental model are heavy / important processes.

Alternative method

Agile models

In agile models the look through the project is way easier than in monumental projects. The processes in a agile model are called light processes and are not so important cause the revision cycles are shorter and so an error in a process is not as bad as in a monumental model.

The vicious cycle of business processes



Dealing with business processes isn't often an easy topic, and also the reason why there are so many approaches for supporting business processes and optimize them and display them. The vicious cycle of business processes shows the cycle in which many companies and projects stuck related to there business process world. The most important thing is to jump out of that cycle and not to be a part of it.

Business process Macro- and Micromodelling

Macro- and micromodelling is needed for a consequent implementation of business strategies. There are two ways how you can realize it.
Either you do a rough business modelling (Macromodelling), resulting in a business process model and a resulting organogram, which should be written down in a more detailed form of process modelling (Micromodelling).

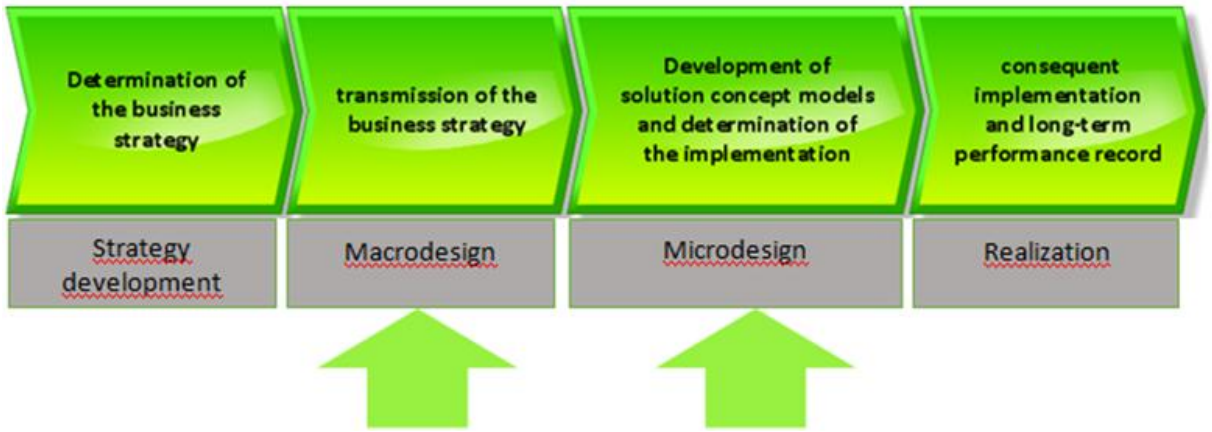


Figure 1-Macro-MicroDesign

What is Macromodelling?

In general macromodelling means a systematic abstraction, figure and composition of a company in a certain scale, which identifies the most essential business processes and tries to reach the intended market output. It adjusts on the competition decisive factors of success and critical net product elements.
So you can say that macromodelling is the interface between business strategy and the organization

When do you need a macromodel?

Basically when a small company has a constant growth, and wants to stay successful. The advantage of a small sized business is that the most organization structures are very flexible, but if the critical business size is reached, there has to be a clear organization structure.

Tasks of a macromodel:

- To ensure the most efficient workflow
- To identify unsuitable structures and interfaces and find an optimization
- To disburse the resources on the business strategy

Use

A macromodel makes it possible for stakeholders to have an insight of the company. It is also a solid base for the organization structure.
The Model itself simplifies business processes, whereby the logic is in the foreground. Therefore it represents the business strategies of a company.

Macromodel

Synonyms of the macromodel:

- Macroprocessmodel
- Process maps
- Enterprise Process Model
- Enterprise Process Map

The macromodel contains every business process of the company in every business segment and the interaction with the processes. In addition to that it is also describing the basic business organization.
A completed macromodel consists of value defining, value making business processes and also the management and support processes.

Classification of Business Processes

Value defining processes:

They have a long lasting effect on the company, for this reason it is not for the extern market. As for example, product and process innovation and also research and development processes.

Management processes:

Research new business strategies and also manage the realization. They control and coordinate the management and the development of employees and provision of resources.
It is also an important interface concerning business processes.
Examples: Finance-planning-, budgeting- processes

Support processes:

Support processes contain every performance needed for value defining processes and also management processes. Without support processes would not be a valuable performance.
Examples: Communication- and information-technologies.

Macromodel Notation

With the classification above, similar processes will be summarized in clusters. These clusters differ not simple with the temporary effectiveness, they also be separated in their level of detail, iteration length and the frequency of the processes. That makes it possible to choose the right level of detail for the Micromodelling.

Advantages

- Person in charge for the products
- optimized product introduction time
- high innovation rates customer oriented

Difference between one- and multi-level (Cascade model-Grazer approach)

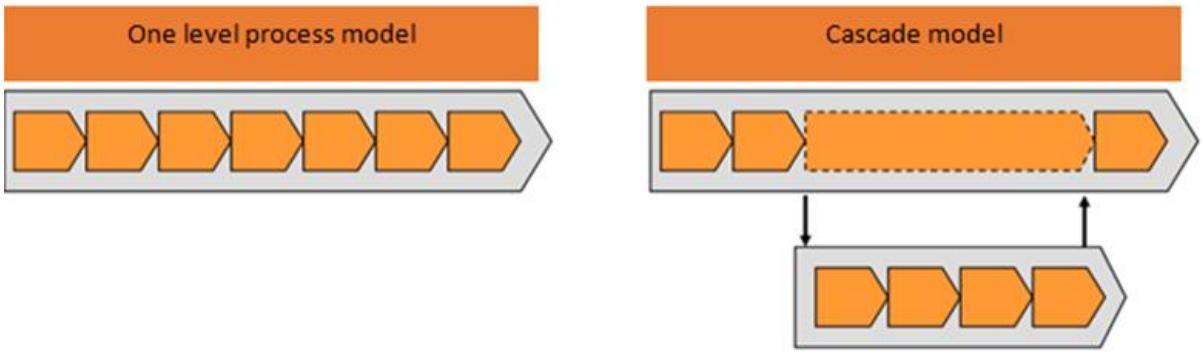


Figure 2-Grazer Approach

V-Model

One responsibility	Cascade responsibility
No detail of aggregate value	Detailed separation of aggregated value
No process interfaces	Process interfaces

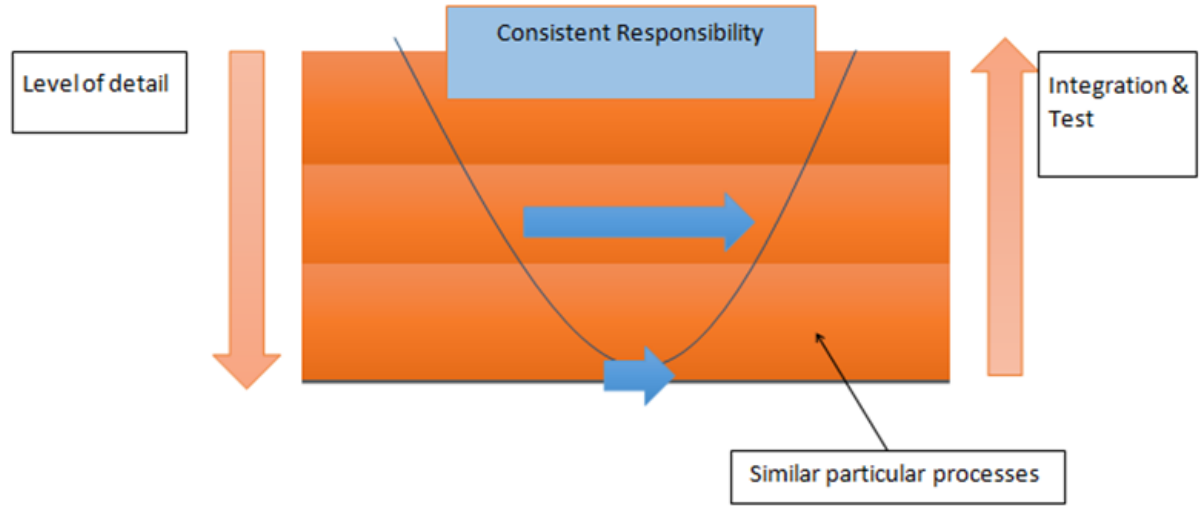


Figure 3- V-Model

General

The V-model graphical represents the system development lifecycle. It summarizes the main steps to be taken including the aspect of the level of detail, the factor time and the testing and integration process to fulfill the requirements and specification.
The V-form represents the sequence of steps in a project life cycle development. It describes the activities to be performed on the beginning side and the results that have to be produced during product development on the end side, the directions is shown by the arrows or some other specific flow symbol.

Objectives of the V-Model

The V-Model provides guidance for the planning and realization of projects. The following objectives are intended to be achieved by a project execution:

- Minimization of Project Risks
- Improvement and Guarantee of Quality
- Reduction of Total Cost over the Entire Project and System Life Cycle
- Improvement of Communication between all Stakeholders

The left side

The left side of the "V" represents the requirements and so the creation of the system specifications. Validation of the specification can also be partly done on the left side.

The right side

The right side of the V represents integration of parts and their validation for right functionality. To claim that validation only occurs at the right side may not be correct.
The easiest way to conclude this is to say that the verification process is always against the requirements and the validation always against the real world problems and the resulting user needs.

How to express validation & verification

- **Validation:** "Are you building the right thing?"

- It assures that a product, service or in our case system fits the needs of the customer or other possible stakeholders. Acceptance and suitability are important things especially in combination with external stakeholders.

- **Verification:** "Are you building it right?"

  - Verification proofs that a product, service, system or even a process is in order to fulfill the requirements and specification. It often happens internally.

In practice, the usage of these terms varies. Sometimes they are even used interchangeably.

V – Model E-Bike

Overview Model

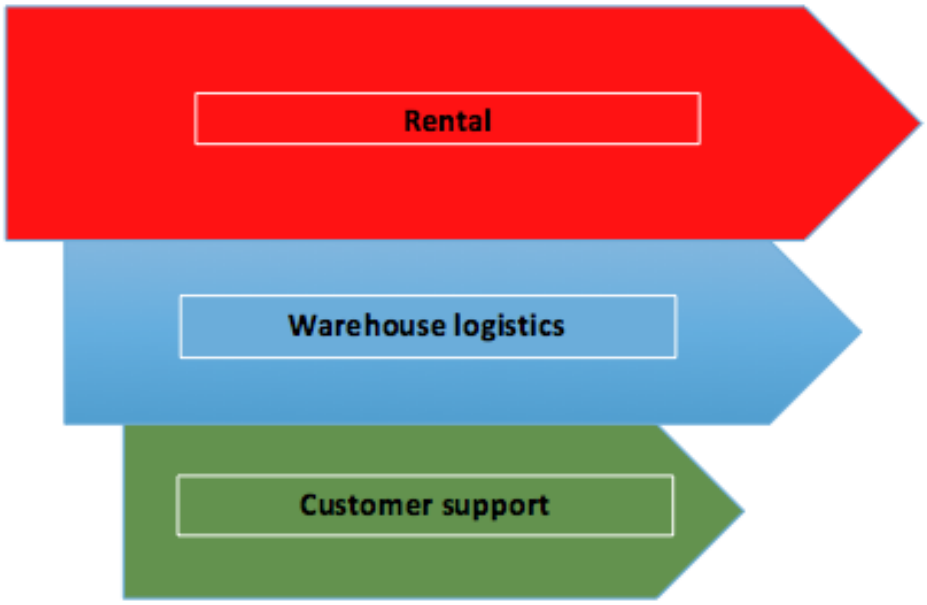


Figure 4-Bike V-Model

Description of the E-Bike Model

In our V – Model of our E-Bike rental shop the whole rental system process is described in form of a V-Model. For us this was important to see which part process needs what part process when the customer gets the bike and when the customer brings the bike back. So the verification and validation process, which part processes were needed and what could be problems, was done in that way.

Steps of the V-Model E-Bike:

Red = Rental
Blue = Customer support
Green = warehouse logistics

Left Side

1. Client registered
    1.1 To register client
2. Evaluating client needs
3. Check availability
    3.1 inform about resource shortages
4. Check offers
5. Prepare handover
    5.1 Send the client in the handover room
    5.2 Get the bikes out of the warehouse and customize them
        5.2.1 Assemble additions, if needed

6. Tender the rental contract
7. Enrollment
8. Overhanding

---------- **Bike at the client** ----------

Right Side

9. Take back
10. Prepare payment
    10.1 Bring customer to the payment area
    10.2 Visual control
        10.2.1 Estimation of damage
            10.2.1.1 Store the bikes away
                10.2.1.1.1 Warehouse
                10.2.1.1.2 Service center
11. Write bill
    11.1 calculate damage
12. Customer pays

This could be taken as a basic description of the system process, of our E-Bike rental shop, to borrow a bike.

What is Micromodelling?

General

Micromodelling is the analyses and new notation of business processes, information flow and setting roles for the person in charge.
In micromodelling, which represents the detailed form of the macro design, bottom up perspective is used. Technical systems and applications like PPS, CRM and so forth will be first taken into account at this model. After the accomplishment of the notation you can find out which tool is the best to support you.
A lot of companies often use supporting tools in a too early phase. So they will have to re-implement another tool. So the realization of macro and micro-model are essential for avoiding errors

Use

Process flow:

The base of a successful micromodel consists of a macromodel with the result Project shown in the figure. The business architecture should be fully acquired and should make the base for the micromodel.
In the micromodel the existing processes should be analyzed and the target processes should be adjusted to the performance specification. This should be notated and be implemented and piloted in the Perform phase.

BPMN Theory

Diagram Elements:

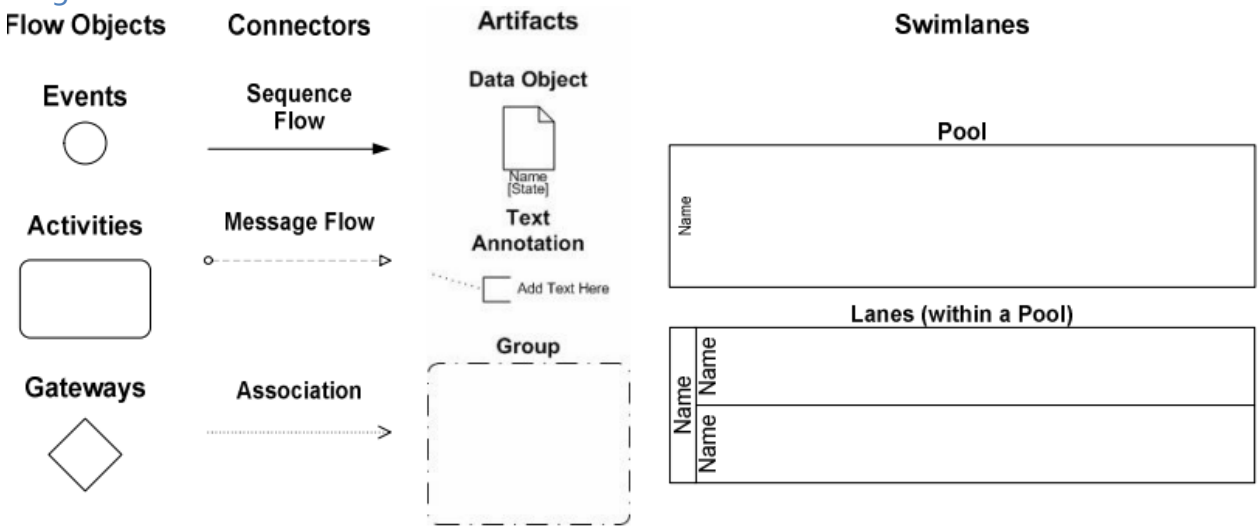


Figure 5-Diagram Elements

As you can see on Figure – Diagram Elements, there are 4 basic categories of elements:

- Flow Objects
- Connecting Objects
- Swimlanes
- Artifacts

Flow Objects

Events:

An Event is something that "happens" during the course of a business process. These Events affect the flow of the Process and usually have a trigger or a result. They can start, interrupt, or end the flow.

START EVENTS

- Start Events indicate where a process will begin.
- There are different "triggers" that indicate specific circumstances that start the process.
    - None Start Events are used to mark the start of Sub-Processes or when the start is undefined
    - Link Start Events
    - Any one of the triggers included in a multiple start event will start the process

Figure 6- Start Events

Intermediate Events

- Intermediate Events occur after a process has been started and before a process is ended
- There are different "triggers" that indicate the specific circumstances of the Event
- They can be placed in the normal flow of the process or attached to the boundary of an activity

Figure 7-Intermediate Events

Intermediate Events-Normal Flow

- They can represent the creation of the event
- They can represent the response to the event
- Events that are placed between two activities show things that happen during normal operations of the process

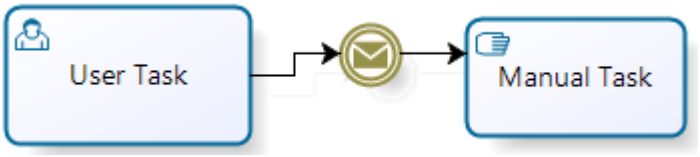


Figure 8- Normal Flow

Intermediate Events-Attached to Boundary

- Events that are on the boundary of an activity indicate that the activity should be interrupted when the Even is triggered
  - It is also possible to attach it on sub processes
- They are especially used for error handling

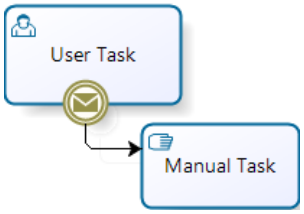


Figure 9-Boundary Event

End Events

- End Events indicate where the process will end.
- There are different results that indicate the specific circumstances that end an process
  - Non Start Events are used mark the start of sub processes or when the start is undefined
  - Link end Event

Figure 10-End Events

DESCRIPTION OF THE EVENTS:

Figure 11-Message Event

Message Events inform a role about something.

Figure 12- Timer Events

Timer Events indicates how long the task will last.

Figure 13-Link Events

Link has no significance related to content

Figure 14Compensation Events

Compensations retrieve to the processes origin

Figure 15-Escalation Events

Escalation shows communication between parent and sub-processes

Figure 16- Conditional Events

Conditional events indicate what conditions activities need to be executed

Figure 17-Parallel Events

Parallel event uses AND semantics

Figure 18-Multiple Events

Multiple events several events with a single symbol.

Figure 19-Signal Events

Signal are similar to messages, the essential difference is that there is no certain receiver. Everyone who receives it can react to it.

Figure 20- Error Events

Error events are used if you expect an error or even want one

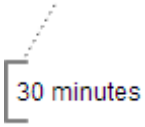


Figure 21- Termination Events

Termination tells you how long a activity is allowed to last. Sometimes a circle is used as a symbol

Activities:

An activity is work that is performed within a business process. An activity can be atomic or non-atomic (compound). An activity is used when the work in the Process is not broken down to a finer level of Process Model detail.

There are 3 types:

- Task
- Sub-Process
- Looped Task

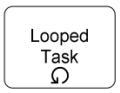


Figure 22-Activities

TASKS

Are an atomic activity that are used when the work in the process is not broken down to a finer level of the process model.

Manual Task:

Is done without any IT support

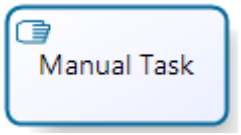


Figure 23 Manuel Task

User Task:
Is done with IT support

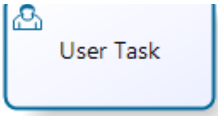


Figure 24-User Task

Service Task:
Is automatically done, from the technical point of view it is an invocation of an operation.

Figure 25 - Service Task

Business Rule Task:
Is evaluating a result or a decision.

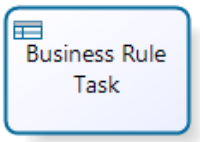


Figure 26-Business Rule Task

Script Task:
Runs a script, direct in the process-engine.

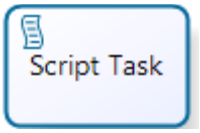


Figure 27-Script task

Send Task:
Sends a message

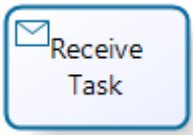


Figure 28- Receive task

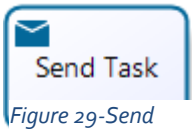


Figure 29-Send Task

Receive Task:
Receives a message

Marking of activities:

You can indicate certain details on processes with some indicators.

Figure 30-Subprocess

This activity indicates a subprocess.

Figure 31 Loop

The loop will be repeated as long as the condition is compiled

Figure 32 Parallel

Parallel multiple performance of objects

Figure 33 Sequential

Sequential multiple performance of objects

Figure 34 Compensation

Compensation, retrieving the origin

Figure 35 Ad hoc

Ad-hoc: the amount of execution is measured by the user

Gateways:

Gateways are modeling elements that are used to control how Sequence Flows interact as they converge and diverge within a Process.

Exclusive Gateways (Decisions)

- Are locations within a business process where the Sequence Flow can take two or more alternative paths.
- Only one of the possible outgoing paths can be taken when the Process is performed.
- The Gateway (Decision) creates alternative paths based on defined conditions

Figure 36 Exclusive Gateway

Inclusive Gateways:

- One or more paths are valid

Figure 37 Inclusive Gateway

Parallel Gateways:

- Are places in the Process where multiple parallel paths are defined
- The "+" marker is used to identify this Gateway
- Every paths has to be proceeded

Figure 38 Parallel Gateway

Complex Gateways:

- Has complex conditions which have to be symbolized through this gateway

Figure 39-Complex Gateway

Event-based Gateway:

- After a certain event this gateway is proceeded

Figure 40 Event Based Gateway

Instancing:

Is needed for automated processes.

Figure 41 Event based exclusive

Event based – exclusive: After a certain event occurs, just one path is available any more

Figure 42 Multiple Start Event

Multiple start event: The process can be instanced by a lot of events

Figure 43 Event based parallel

Event based-parallel: If some events have the same result you use this symbol

Figure 44- Parallel multiple start event

Parallel multiple start event: Every event needed, has to be executed, afterwards the process can go on

Connectors

Sequence Flow:

A Sequence Flow is used to show the order that activities will be performed in a Process. A Sequence Flow is used to show the order that activities will be performed in a Process.

Figure 45 Sequence Flow

Message Flow:

A Message Flow is used to show the flow of messages between two entities that are prepared to send and receive them. A Message Flow connect to the boundary of the Pool or to an object within the Pool. Message Flow are not allowed between objects within a single Pool.

Figure 46 Message Flow

Association:

An Association is used to associate data, information and artifacts with flow objects. Associations are used to show how data is input to and output from Activities.

Figure 47 Association

Standard Flow:

Will be executed after a gateway is finished.

Figure 48 Standard Flow

Conditional Flow:

Allows conditions without the use of any gateways

Figure 49 Conditional Flow

Artifacts

Artifacts provide the capability to show information beyond the basic flow-chart structure of the Process

Groups:

Are represented by a rounded corner rectangle drawn with a dashed line. The grouping can be used for documentation or analysis purposes, but does not affect the Sequence Flow. Groups are not constrained by restrictions of Pools and Lanes.

Data Objects:

Data objects are artifacts that are used to show how data and documents are used within a process. The saved data of the process, can only be used for within the process.

Figure 50 Data Object

Data Object Types

- **Data input**

Figure 51 Data Input

This shows some data input during the process

- **Data output**

Figure 52 Data Output

This shows that an activity gives some data output

- **Database**

Figure 53 Database

The database can give data input, data output and save data over a longer period of time.

- **Data association**

Figure 54 Data Association

The connection between an activity and a data object

Text Annotation

Text Annotations are a mechanism for a modeler to provide additional information about a Process. You can write nearly everything in this annotation.

Swimlanes

BPMN uses the concept known as "swimlanes" to help partition and/organize activities. Collaborations of lanes and pools is a necessary.

Pool:

Pools represent Participants in an interactive Business Process Diagram. A Participant may be a business role. Sequence Flow cannot cross the boundary of a Pool. Interaction between Pools is handled through Message Flow.

Lanes:

Lanes represent sub-partitions for the objects within a Pool. They often represent organization roles, but can also symbolize single persons. Sequence Flow can cross Lane boundary.

Process Map Theory

What is Process Mapping:

Structural analysis of a process flow, by distinguishing how work is actually done from how it should be done, and what functions a system should perform from how the system is built to perform those functions. In this technique, main processes and management processes, are depicted as a figure, with different colored process-levels.
This graphic representation allows an observer to 'walk-through' the whole process and see it in its entirety.
Process Mapping is the technique of using flowcharts to illustrate the flow of a process, proceeding from the most macro perspective to the level of detail required to identify opportunities for improvement.

Need of a Process Map:

You need process maps for the workflow management, to create transparent processes that can be easily assessed and adjusted to increase efficiency. Process maps are important in managing positions as an optimization tool to have a quick overview and to create a higher performance on their processes.
Process mapping allows a team to picture the work itself outside of the organization's hierarchy. Process maps help us picture the work itself, not the organization, which is important for developing new processes.

Where Do You Need a Process Map:

Every company needs to depict their processes for their production, services and so forth. Process mapping is one of the best ways to create such an overview. Every company uses it to get highest performance and best efficiency as possible.

Advantages of Process Maps:

- show unexpected complexity, problem areas, redundancy, unnecessary loops, and where simplification and standardization may be possible
- compare and contrast the actual versus the ideal flow of a process to identify improvement opportunities
- allow a team to come to agreement on the steps of the process and to examine which activities may impact the process performance
- identify locations where additional data can be collected and investigated
-

Creating a Process Map:

Basically you divide your processes into smaller processes, till there is no more possibility to decompose it. As a result you have many levels of processes. For a better overall view you color the different stages of the processes.

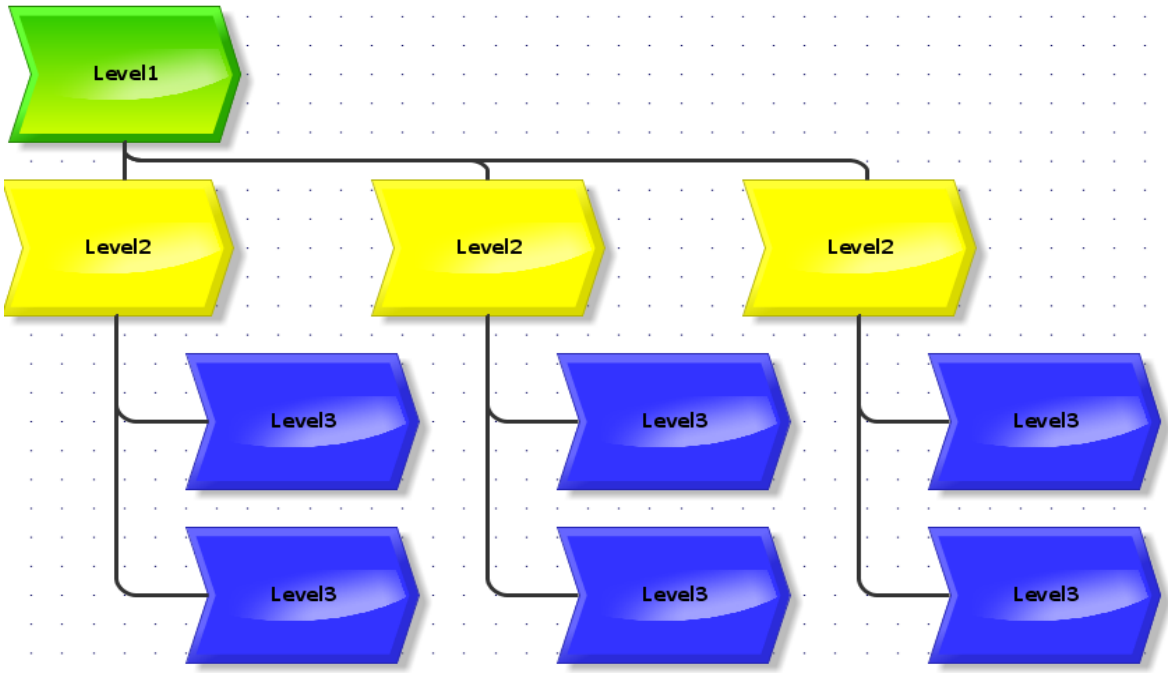


Figure 55 Process map Creation

I made Figure Process map Creation by way of illustration, how it works. There are no standard colors in a process map. As you can see, without colors it would be very confusing too identify which process is on which level.
The reason why it should be clearly identifiable is that if you have processes on the same level, you can sometimes outline them, which makes a process, in some cases, more efficient.

Main Processes:

The primary processes are called "main processes" and are the superior processes of the smaller ones, called "sub-processes".
The main processes can only be evaluated by the company itself, because every company has their own processes.

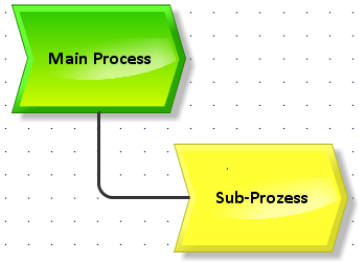


Figure 56 MainSubprocess

In Figure MainSubprocess, there is shown one main process and one sub-process.

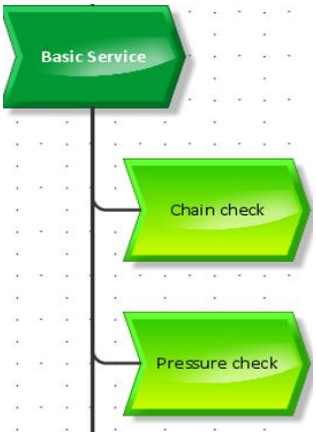


Figure 57 Basic Service

As you can see on Figure Basic Service for example, there is one main process and two sub-processes.
The two sub-process 'Chain Check' and 'Pressure Check' have nothing in common, except that they have the superior processes 'Basic Service'. They are in no sequence.

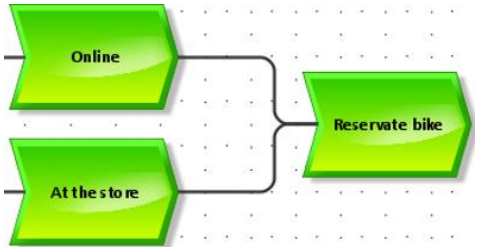


Figure 58 Reservation

In Figure Reservation you can see that one sub process can have even more than one superior process. 'Reservate Bike' has 'Online' and 'At The Store' as superior processes.

Management Processes:

Every company has beside the main processes, management processes. This management process are ancillary processes, which are essential for the administration concerning a company. Typically you have 3 important superior processes in the management.

Resource management:

Is the process of using a company's resources in the most efficient way possible. These resources can include tangible resources such as goods and equipment, financial resources, and labor resources such as employees. Resource management can include ideas such as making sure one has enough physical resources for one's business, but not an overabundance so that products won't get used, or making sure that people are assigned to tasks that will keep them busy and not have too much downtime. So it is essential for every firm. The goods and services differentiate from each business.

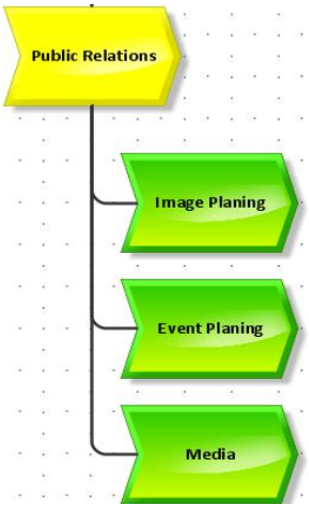


Figure 59 PR

Public Relations:

The profession or practice of creating and maintaining goodwill of an organization's various publics, just slightly depends from each company. So the sub-processes are most likely the same.
On figure PR you can see how a usual segment of process map concerning public relations looks like.

Marketing:

Marketing is based on thinking about the business in terms of customer needs and their satisfaction. Despite that every marketing strategy is different, they all have the same processes. Therefore you can use the processes in nearly every company. As seen on Figure Marketing.

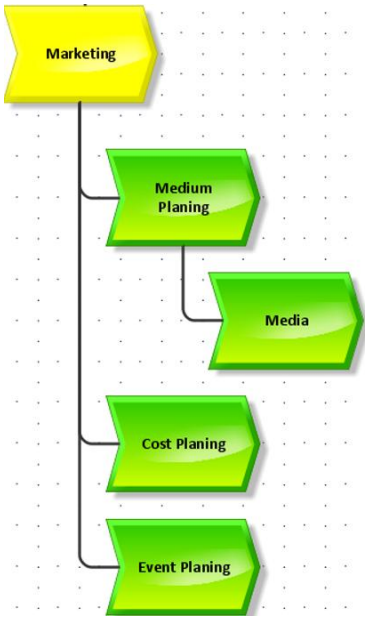


Figure 60 Marketing

Introduction to the Business Plan

The reason for developing a business plan is to provide financial and business information for the BPMX board game. The idea is to get a view of how the business would work when starting a real company instead of just playing the board game.

The business plan helped a lot in designing the price and the whole financial structure for the board game. Fixed and variable costs could easily be included into the game after doing the research for the business plan. Fixed costs included for example the rent that has to be paid for a premise. Other costs include the salary for the employees.

Another aspect that the business plan shows is how much money an e-bike can bring in on a single day and how many customers can be expected. Those basic things were really essential to make the BPMX Game as realistic as possible.

It is also interesting to see how the different financial operating numbers would look like after a few years and when the company would break even.

The business plan was a great idea to learn and understand how such a company would work in real life and it also improved the board game a lot.

Figure 61 - The Business Plan as Basis for the BPMX Game

2014

Business Plan E-Bike Rental

Manuel Rebol & Florian Kager
HTBLA Kaindorf
06.02.2014

Table of contents

Executive Summary

Company

Idea

The idea of the company is to rent electric bicycles (e-bikes) to the customers. The rental can last for a period of just a few hours up to a few days. After that time, the bicycles must be returned to the place they were rented.

Team

The "E-Bike-Graz GmbH" consists of two members, Florian Kager and Manuel Rebol. Both have a degree at the HTBLA Kaindorf with good skills in business administration and IT. Although it is their first launch of a company, they have collected practical experience during their holiday internships.

Florian Kager manages the marketing, distribution, logistics and HR department, while Manuel Rebol is responsible for company management, finance and accounting.

Business environment

Since e-bikes have become popular just a few years ago, the branch is very new and innovative. The usual bicycle rental business has also be taken into account, because the difference to e-bikes is little.

Due to the fact that the rental is located at the central station in Graz, there will be a lot of customers who travel to work by train and want to be fast and green. There might also be children, seniors and tourists who will be attracted by our product.

The e-bike rental gives the people the opportunity to ride an e-bike, without the need of acquiring an expensive e-bike. They can rent bikes cheaply and profit from advantages like protecting the environment and being mobile and fast.

The big advantage of the "E-Bike-Graz GmbH" in comparison to other bike rentals is, that the company only focuses on renting e-bikes. Therefore, they offer cheap service and detailed consulting.

The e-bike rental generally inspires people to use green means of transportation and help protecting the planet by reducing CO_2 emissions.

Finance

One third (€ 10,000) of the financial demand is provided by own resources, while two thirds (€ 20,000) are financed with outside capital.

The launch of the company will be in spring 2015, when the owners have finished their education and the bike season starts.

It is planned to acquire 20 e-bikes for € 1,000 each, in the first year. Adding the costs for business equipment, repair parts and replacement batteries results in total investment needs of € 25,000 in the first year. A second location including new e-bikes in the fourth year will cost € 10,000.

Assuming an occupancy rate of 67 % in spring and summer and 20 % in fall and winter the revenue would be € 43,000 in each of the first three years. The revenue after the expansion in year four would be € 64,800.

The goal for the first year is to avoid negative numbers. Due to the rising awareness, earnings for year two and three should be € 5,000. In year four earnings between € 15,000 and € 20,000 are estimated.

The Company

Company profile/Founder profile

The business concept

The "E-Bike-Graz GmbH" should give people, who travel to Graz by train, the chance to reach any destination, fast, cheap and ecofriendly. The service is for those, who are too lazy to use a traditional bike and for those who are unhappy with the heavy traffic which affects going by car and public transport.

Services sector

This company offers services in a special type of the bike rental branch. It should only rent e-bikes and become an expert in this sector.

Legal form/Company name/Business formation

The legal form is the limited liability company (LLC) with two co-owners.
The name of the company according to the Austrian right is "E-Bike-Graz GmbH". The name should indicate the service sector in which the company operates.
The company launch is on the 01.04.2015. There should be enough time to make the required decisions.

Ownership structure

The owners of the company are the shareholders Florian Kager (50 %) and Manuel Rebol (50 %).

Location

The HQ of the "E-Bike-Graz GmbH" is located in Austria, Graz 8020 near the main station. At this place all bikes are stored and repaired if necessary. In the future mobile stations could be set up everywhere in Graz, but none of them will require business premises.

Support

As the members of the company have never run a business before, they need support from former CEOs. They also need financial and ideational support from investment bankers. The financial aid should be about € 20,.000.

The team

The company management including Florian Kager and Manuel Rebol has good business administration skills and it has also theoretical knowledge about start-ups.
Florian Kager is good at project management and sales, while Manuel Rebol´s strengths are economic law, product development and finance. He is also an expert in mathematics.

Corporate objectives

The business plan is the first step of the business formation. Business competition and chances have been analyzed.

The objective of the "E-Bike-Graz GmbH" is that after three years, the company is known by 90 % of travelers, that go to Graz by train. Furthermore, the occupancy rate should be at least 75 % during summer in year 2020.
The vision of the company is to become the largest bike rental service in Styria in 2025. This would give the company the chance to expand to other cities.

Looking into the future, the business should grow steadily and settle down all over Europe. The slogan would be: "Car away - e-bike stay"!

The main factor of success depends on how much customers are attracted. Most importantly, customers need to become aware of the advantages that e-bikes offer over usual bikes and public transport.

The Service

Customer benefit

The E-Bike-Graz GmbH offers the customer an e-bike rental with consulting from Monday to Sunday. The rental is situated directly at the main station in Graz. All different kinds of e-bikes can be rented for a time period of an hour up to a month.

The e-bike rental addresses young people as well as older one. Teenagers benefit because they do not need a driving license to go to meet friends at the cinema and other places. Business man avoid traffic jams and polluting the environment when riding the e-bike. Older people benefit as they need less power by driving an e-bike than they would need by driving a usual bike. Therefore, they can do their shopping and rambling more easily.

	Hard Customer Benefit	Soft Customer Benefit
Teenager	+ fast transport without driving license	+ eco-friendly
Working Person / Commuter	+ independent of delays of public transport + huge distance in less time + avoidance of traffic jams (Rush-hour)	+ eco-friendly
Retiree	+ reaching places which other means of transport can´t (door-to-door) + no physical effort needed	+ eco-friendly + no noise pollution + no hustle in public transport

Figure 62 - Business Plan - Customer Benefit

Currently there are two competing companies in Graz. On the one hand, "Grazbike" which rents usual bike at 13 different locations in Graz. Grazbike is also situated at the main station, but they do not rent e-bikes at all.
One the other hand, "VeloVital" which is located at Bürgergasse 5, 8010 Graz. This company rents e-bikes for €19,50 a day.

Phase of development

The development of the service is at the early stage. It is determined which type of and how many e-bikes are purchased.

The service should outstand by a special customer advice and process optimized rental processing. The reservation and payment should work fast and straightforward through an online platform.

The idea of an e-bike rental is innovative in many ways:
- eco-friendly and social benefit (no CO_2 emission)

- efficient use of energy (bike)
- use of renewable energy sources (electricity)
- taking the origin of the used products in the business into account (KTM Austria)
- flexibility and fast movement (mobile location)
- services for young/old men and women (saddle change, baby seat)

There are no similar products currently available on the market, because the demand for e-bikes is little. By pointing out the advantages through marketing, the demand would increase dramatically. Furthermore, costs of alternative means of transport (car, public transport, motorbike,...) are rising, which also brings in new customers. Meanwhile, e-cars are getting cheaper. Another huge milestone in becoming successful could be the development of fuel cell batteries.

The huge advantage of the E-Bike-Graz GmbH over the rivalry is the perfect location at the main station and the special focus on e-bikes.

The e-bike rental is not a reinvention, because there are already existing companies. No patents and license agreements are needed. The idea of the e-bike rental is not patented by a competitor.

Production/Creation

The service should include the following:
- e-bike rental
- online reservation
- online payment
- e-bike enrollment
- consulting when selecting the right bike
- route planning
- claim settlement

Needed resources:
- e-bikes (20 items)
- internet domain name + server (www.e-bike-graz.com)
- credit card/PayPal/bank wire
- homepage
- competent staff (2x part-time + substitute)
- tools for repair of damage
- Tablet to plan routes

The service has positive social affects, because people like e-bikes as they are environment-friendly.
The main investing are the e-bikes. 20 of them would be acquired for a price of € 1,000 each. Additionally, it is important to rent premises at the main station in Graz.
The need of input-factor is quite high, because the e-bikes are expensive.

The e-bikes and the IT-equipment would be bought from third parties. Usually the price of those acquisitions is declining while the time increases. The premises are rented and the price is predicted to rise slowly over the next few years (3 % per year).
It would be possible to start with a small number of e-bikes to be able to buy more e-bikes if the price drops. Then it would also be possible to expand the capacities.

To be sure that all customer wants are covered, an online platform would be established, were all customers can give feedback. Despite that, the staff is told to get a quick response of all customers. The management has always direct contact to the staff.

The e-bikes are stored at the premises. Customers should see the bikes when they are stored to get attracted. During night, the bikes would be covered through a blanket in order to avoid burglary.

Sector (Branch) & Market

Sector analysis

Sector general

The E-Bike rental outlet sector is changing very dynamically. A few years ago the amount of e-bikes on the market was really low, not the demand is very high. The technology plays a major role in this market change. E-bikes where the battery only lasts a few kilometers are uninteresting. The development of the battery life will also play a major role in the future. It is also important to produce the lightest possible bikes and batteries.

The Total revenue and total sales in the industry are very low, because only a few e-bike rental companies exist and the demand is manageable. The price for the service has declined in recent years because the acquisition costs were also lower. It is on average €20 for a day.

The development of the industry is affected by many factors. It depends on whether the area is biker friendly, or how many trails are available. Furthermore, the e-bike industry is dependent on the costs of alternative means of transport and thus of oil prices similarly, economic and legal guidelines such as CO_2 tax or driving bans in cities.

Growth is determined by how many people are willing to upgrade to new, alternative transportation.

The return expectations are very low, as there is no rush expected and a full occupancy throughout the year is unthinkable.

The e-bike Graz GmbH sees itself as a revolutionary in this industry. The Image of the e-bike should be extended by the well elective location and present the e-bike as an alternative means of transportation with many advantages.

Sector analysis

There are no entry barriers that could hinder the company.
The similar products (bicycles, motor scooters) are not high threat for the e-bike hire, because they appeal to different customer groups.
There is a dependency to rail customers. Without them, the facility would be worthless. However, a relocation of the central station due to the current renovation is unlikely.
The rivalry between the competitors is pretty strong, because there is an existing monopoly in this industry in Graz. In addition, the small number of customers is highly contested.
In recent years, there was only one e-bike rental outlet in Graz. The number of competitors will also be higher due to the increasing demand in the future.
The plan is to apply for a promotion for the purchase of e-bikes in the city of Graz and the Province of Styria. Partnerships with other companies are active in the field of "Green-Economy" for the future.

Market analysis/Market segmentation/Target customer

The market for e-bike rental offers tremendous potential for the future. Due to rising fuel costs and more and more guidelines for combustion vehicles, the electronically powered vehicles will become increasingly important.
In a further increase in the cost of public transport, the market could grow within a year by 50%.
A general market trend in e-bikes is the always longer lasting battery. This could also affect positively the inquiry for the E-bike rental company, because the plug socket must be visited more seldom.

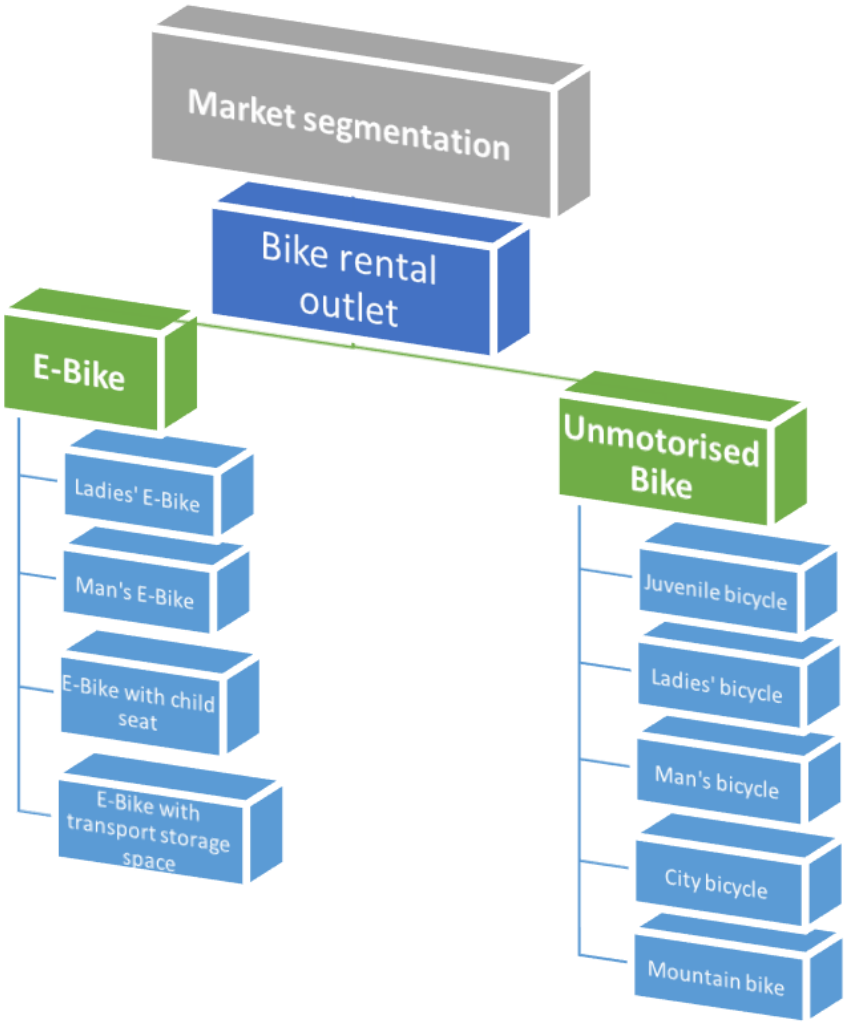


Illustration 22: Market segmentation

The company aims to market shares for the e-bike rental. Within this market all the different types are offered to appeal to a broad customer mass. Since there is still no e-bike hire, a regional USP can be achieved in this part of Graz.

The target customer groups are young people, students, commuters, tourists and retirees. An electric bike can already be of interest to young people, as they can quickly bring long distances behind without a license. For students / commuters it can be helpful without a big effort, to get to university / work quickly as a flash.
For tourists, who want to explore Graz and not be familiar with the public transport, the E-Bike rental is intended. Other interested parties are older people whose physical condition does not allow any more to advance a conventional bicycle.

In the first four years, a turnover of € 50,000 is expected. It is estimated that the annual profit of the E-Bike GmbH Graz is in this period at € 5,000 - € 20,000.
Today, no e-bikes will be rented at the main station, but in the future, the sales volume is estimated to be about 3,500 rented bicycles a year.

An important sale decisive factor is the rental price to the price for public transport. At least as important is that the transfer and the return are quick and uncomplicated.

The E-Bike-Graz GmbH aims at customer groups of every age with the interest of renting an E-Bike.

The company is specifically dependent on people who go to work every day. Without this customer segment, the business would come to a standstill.

Competition

The strongest competitor, which also offers the same service, is VeloVital. The advantage of the e-bike Graz GmbH towards VeloVital is the central location and the focus solely on e-bikes. The advantage of VeloVital is both, the name, which is already known and is associated with environmental awareness, as well as the experience in e-vehicles. Through the existing label of VeloVital the market power of the company is very high.

A new development of the E bike accumulator is expected. Even longer accumulator terms and even shorter loading times can be reached by fuel cells.

The big difference of the E-Bike GmbH Graz to other companies is that they focus exclusively dedicated to e-bikes and may become an expert in this topic.

The competitors will react to the market entry with a fall in prices, because otherwise they will not draw customers with the overpriced services. The reaction of the E-Bike GmbH Graz is a better customer service, which could not be reached by the competitors so therefore an advantage is managed.

Facility analysis

The company's headquarters is located in Graz, close to the main train station. This location is very central and has good strategic reasons of advantage, because a business office must not be rented separately. The big advantage is the proximity to the transport hub central station, which can serve as trip possibility for larger distances. The renting of other premises of the facility can be increased at any time if necessary.

Marketing

Market entrance

The homepage will be online one month before business opening. At this point we already made advertising in the main station. In addition, advertising on the various targeted customer groups is done on social networks. Also planned is a newspaper advertisement for the elderly and Internet disgruntled customer groups.

The first milestone includes all organizational procedures to start a business and should be reached until 31.12.2014. On 01/03/2015 the business office is set up and all Internet services will be available. The opening of the business premises is scheduled for 01/04/2015. From this date customers may demand the service.

Marketing-/Sales plan

The advantage factor of the E-Bike GmbH Graz is the low price because of the lower costs. There is also the advantage of the most conveniently located location and specialization in e-bikes.

It is planned to rent the e-bike in the spring and summer months for 15 € per day. Due the declining demand in the fall and winter months there is a price reduction to € 10 per day. No discount is provided for pensioners / students.

The company's goal is to perform 3,000 rentals per year. In the summer months, an average of 14 customers is expected daily.

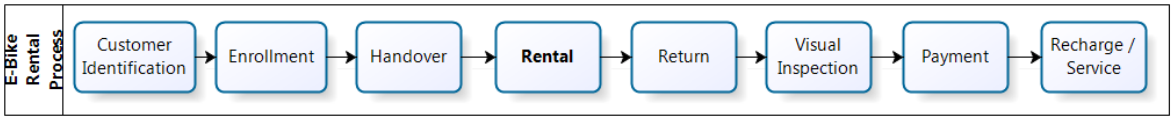


Illustration 23: Typical Process of a Service Sale

The e-bike Graz GmbH will try to reach the target groups through different distribution channels. The students and workers are addressed by Internet advertising and advertising on social networks. The commuters who travel daily in the work to the Graz main station will be recruited with posters and flyers. The elderly group is reached by advertisements in local newspapers (Kleine Zeitung, Der Grazer).

The idea of e-bike rental outlet has seen an ecologically positive long-term advantage. E-bikes are economically and ecologically because they transport people quickly and eco-friendly. This selling point is of course also used in all marketing campaigns.

Sales promotion

The Internet and local newspapers are used as an advertising medium. Furthermore, the customers are directly aware of our service at the main station.

It takes a lot of time and money to inspire the customers for our product, because many are not yet aware of the benefits of e-bikes. Also very important is the maintenance and service of e-bikes. The customer is only convinced by a good looking product. In addition, it is also important that the customer is equipped with a perfectly functioning product, because that is the best way to form a good corporate image.

To the customer it is guaranteed that the rented E-bike is working properly, is optimally tuned to the user and that the accumulator is completely charged. Furthermore all wheels must be equipped according to the directives agreed in the Highway Code.

The regional specific feature of the city of Graz is that it is also known as a student town. On account of the big number to student is tried to enlist also this customer group. To attract a bigger customer group, shop assistants are searched, who are able to speak many East European languages.

The payment of the service usually takes place after the return and calculation of the rental time. The company will provide a discount for longer borrowed e-bikes.

Management and Key Personality

The incorporator team

The team consists of the two dedicated visionaries Manuel Rebol and Florian Kager. They both graduated from the computer science department in the HTBLA Kaindorf with the organization working language of English. To the coronation they wrote in cooperation with the advanced technical college campus 02 a dissertation in the area of Commercial process management. Manuel Rebol could collect experience, in addition, in a summer job at the companies Joanneum Research, Micros Retail and Apus. Now, the two colleagues are planning the implementation of the e-bike Graz GmbH.

The incorporator team consists of:

Manuel Rebol (19 years old)

Manuel Rebol assumes responsibility for the management, financing and the head of Accounting & Controlling.
His expertise lies in the areas of business law, product planning and finance. He also has good math skills.

Florian Kager (19 years old)

Florian Kager will be active in the areas of marketing, sales, logistics and personnel. The strengths of Florian lie in project management and sales.

The founding team has theoretical knowledge of business start-up. The people involved are to study in Graz next to the company management. The key positions are divided and occupied.

The organizational structure

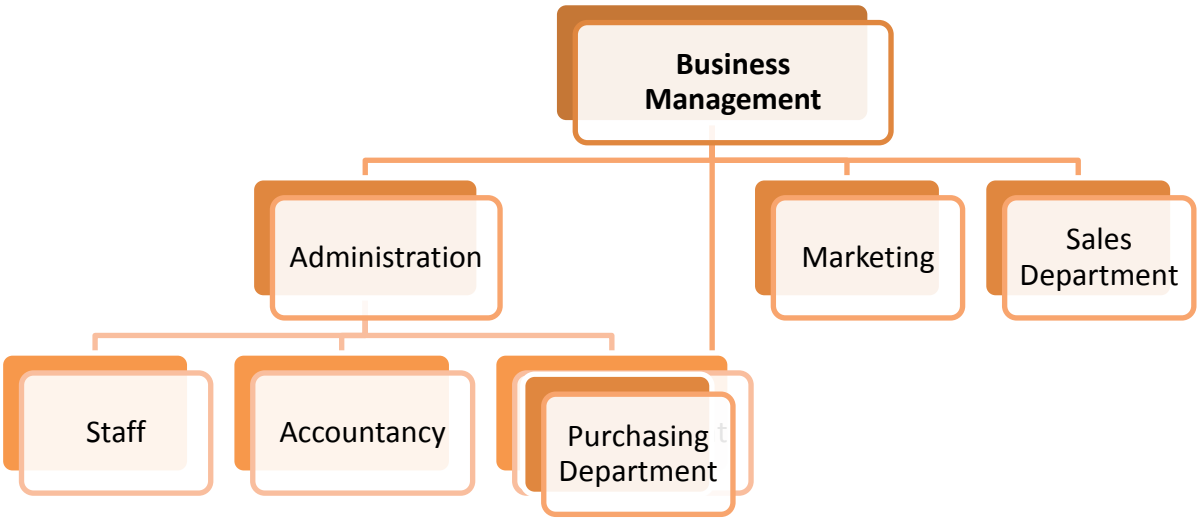


Illustration 24: Organizational structure

The task distribution within E-Bike GmbH Graz is done depending on expertise. In addition, each assumes full responsibility for the respective mandates.

Every major and business-related decision is made only by mutual agreement.

Lack of experience

Unfortunately, the founding team is still missing experience in corporate management, but there is at least theoretical knowledge available.

The Compensation system

It is planned that the two part-time employees in sales receive in addition to their salary, a bonus for each customer served. This incentive should have the effect to win as many customers as possible.

Outsourcing of business sectors / Contacts

The marketing activities are outsourced and promoted by third parties. There are already some contacts to marketing companies. In addition, there are contacts with excellent web designers and software developers.

The General Management

Quality assurance in management functions by means of the 4-eyes principle. Main objectives and strategies are decided at monthly meetings of the Board.

Effects

The environmental impacts from the use of e-bikes are very positive. It caused no pollutants and noise is very low. When passers-by recognize the benefits, maybe they will switch to his mode of transport.

Implementation planning

Milestones

The first milestone is that all the documents to start a business should be submitted until 31.12.2014.

Then the second milestone, the establishment of the business premises that must be achieved to 01.03.2015.

In the period up to 01.03.2015 all Internet services must be available and the website should be finished.

The opening of the business premises is scheduled for 01/04/2015. The market entry takes place. From this date customers may demand the service.

From 03.01.2015 to 31.10.2015 the advertising is starting online via social networks and other methods to potential customers. During this period, items are connected in regional magazines.

Up to 31.12.2017 at least two other locations in the Graz arise to still attract more customers and to enable the collection to other areas.

Dependency

To start, the company successfully on 01.04.2015 is very important to fill formalities. In addition, the business office must be set up and the online reservation / payment function.

In order to make the location extension to 31/12/2017 an appropriate customer base must be available. In addition, regarding to this work marketing efforts need to be made.

Critical path

The milestones that are located on the critical path are: submission of written communications to start a business, setting up business premises and market entry.

The establishment of a website need not be mandatory to enter the market, because the homepage is not primary necessary. Similarly, the marketing activities are not necessarily before the launch. The extension to multiple locations is also optional and can only be used later.

Chances and Risks

SWOT-Analysis

	Helpful	Harmful
Internal origin	• e-bikes are new and the technology is at the state of the art • great number of different e-bikes • perfect location • vast knowledge in IT and social networks	• no experience in corporation management • type of business is unknown • technology is always moving on
External origin	• batteries with longer distances • lower costs of e-bikes • rising prices of public transport • regulations for vehicles with combustion engines	• rival VeloVital has a good image in Graz • customers are not open for this kind of service • bike-theft increases

Figure 63 - Business Plan - SWOT-Analysis

Internal origin (attributes of the organization)

Strengths
One of the strengths is the perfect choice of the geographic location. This enables the opportunity of having many customers because 30,000 people pass the main station a day and it is also a central place for tourists.

Weaknesses
The team does not have practical experience in corporation management, therefore help would be requested.

External origin (attributes of the environment)

Opportunities
E-bikes are new products at the market and there is definitely an interest by the people. This mean of transport is still under development and there might be better products in a few years. Today, e-vehicles are the most innovative and interesting things in this branch.

Furthermore, e-bikes are seen as revolutionary mean of transport for the future. They are innovative, green, quiet, fast and easy to use.

Threats

One threat are competitors like VeloVital, which already have know-how. They are well-known in the area of Graz, which is also an advantage.

Risk management

To avoid bike-theft during the rental, every customer gets a high-security-lock with his e-bike. Also during enrollment, staff tells the customer about the risk of theft. If any damages occur, the customer has to pay for it.

In the premises video surveillance is installed to avoid burglary.

Cyber-attacks on our online payment system would be prevented by our IT-specialists.

If only few people are interested in the services of the "E-Bike-Graz GmbH", marketing actions would be started. These marketing actions show people the advantages of e-bikes over other means of transport.
If these measures fail, people with tickets for public transport would get reductions. This would cause people to rent an e-bike instead of using public transport.
At worst, the price must be cost-covering, so that at least customers are won.

Security-Policies would be installed to reduce risks.

Adjustment

If damage or theft occurs regularly, an insurance would be acquired. These additional costs would be considered in the e-bike rental costs. The customer would also benefit, because he would be sure too.

Less demand would cause the start of marketing plans. If needed, additional reductions would be offered.

Scenario

Best Case

The "E-Bike-Graz GmbH" is able to strengthen promotion due to the high profits and the popularity is rising rapidly. The company has a very good image and wins customers from rivals. Negotiations with politicians of Graz resulted in the creation of the bikeways in the area around the main station of Graz.
The best case after four years would be, that the company has three to four locations with 20 e-bikes each, and an annual occupancy rate of more than 50 percent.

Worst Case

The Worst-Case-Scenario is, that after a year, the "E-Bike-Graz GmbH" has little popularity and the annual occupancy rate is under 10 percent. The publicity is still very bad and the competitors have a better image in Graz. Several marketing actions do not improve the situation and the company fails.

Plan for upcoming years of business

Human resource planning

In the first four to five years, two people are working part-time at the company. Everyone works 30 hours a week. A third employee substitutes if someone is ill or on holiday. This would allow the following opening hours:

Day	Morning	Afternoon
Monday to Friday	07:00 - 11:00	01:00 - 06:00
Saturday	08:00 - 12:00	02:00 - 07:00
Sunday	08:00 - 12:00	02:00 - 04:00

Figure 64 - Business Plan - Opening Hours

The monthly management labor costs are € 1,500. This would lead to a sum of € 27,300 including extra costs over a year.

Investment and depreciation/amortization planning

To be able to make revenues, it is necessary to acquire 20 e-bikes. The costs for these are approximately € 20,000.

For the future, it is necessary to additionally acquire mobile locations. The costs for one mobile location including 5 e-bikes are € 10,000. This investment is planned for year four and should continue yearly if the demand is adequate.

E-bikes have an asset depreciation range of 4 years. The depreciation record is 25 percent which means the yearly depreciation is € 5,000.

Plan profit and loss account

It company want be able to make profits in the first year. After rising demands in the second year, the break even is possible.

Further information could be taken out of the performance budget on the following page.

Performance budget 2015

(in EUR)	January	February	March	April	May	June	July	August	September	October	November	December	Sum
= sales revenue	0.00	0.00	0.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	1,200.00	1,200.00	1,200.00	39,600.00
+/- changes in inventories	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
= operating performance	0.00	0.00	0.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	6,000.00	1,200.00	1,200.00	1,200.00	39,600.00
- material costs	0.00	0.00	-3,000.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-100.00	-3,900.00
- staff expenses	0.00	0.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-2,275.00	-22,750.00
- depreciation/amortization	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-416.67	-5,000.00
- other expense	0.00	0.00	-770.00	-770.00	-770.00	-770.00	-770.00	-770.00	-770.00	-770.00	-770.00	-770.00	-7,700.00
= revenue from ordinary activities	-416.67	-416.67	-6,461.67	2,438.33	2,438.33	2,438.33	2,438.33	2,438.33	2,438.33	-2,361.67	-2,361.67	-2,361.67	250.00
- tax of income	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-41.67	-500.04
= accumulated profit/loss	-458.34	-458.34	-6,503.34	2,396.66	2,396.66	2,396.66	2,396.66	2,396.66	2,396.66	-2,403.34	-2,403.34	-2,403.34	-250.04

Performance budget 2015 - 2019

(in EUR)	2015	2016	2017	2018	2019
= sales revenue	39,600.00	43,200.00	43,200.00	64,800.00	64,800.00
+ / - changes in inventories	-	-	-	-	-
= operating performance	39,600.00	43,200.00	43,200.00	64,800.00	64,800.00
- material costs	- 3,900.00	- 300.00	- 300.00	- 300.00	- 300.00
- staff expenses	- 22,750.00	- 27,300.00	- 27,300.00	- 27,300.00	- 27,300.00
- depreciation/amortization	- 5,000.00	- 5,000.00	- 5,000.00	- 6,250.00	- 6,250.00
- other expense	- 7,700.00	- 9,240.00	- 9,240.00	- 11,240.00	- 9,240.00
= revenue from ordinary activities	250.00	1,360.00	1,360.00	19,710.00	21,710.00
- tax of income	- 500.04	- 500.00	- 500.00	- 500.00	- 500.00
= accumulated profit/loss	- 250.04	860.00	860.00	19,210.00	21,210.00

Liquidity planning

Finance plan 2015 - 2019

	(in EUR)	2015	2016	2017	2018	2019
I. Cash-flow of continuous business activity						
	annual surplus/deficit	- 250.04	860.00	860.00	19,210.00	21,210.00
+/-	depreciation of fixed assets/attributions	5,000.00	5,000.00	5,000.00	6,250.00	6,250.00
=	Cash-flow of the outcome	4,749.96	5,860.00	5,860.00	25,460.00	27,460.00
+/-	claims of supplies and deliverables	- 900.00	- 900.00	- 900.00	- 900.00	- 900.00
+/-	commodities and consumables	- 3,900.00	- 300.00	- 300.00	- 300.00	- 300.00
+/-	semi- and finished products	-	-	-	-	-
+/-	liabilities of supplies and deliverables	- 200.00	- 200.00	- 200.00	- 200.00	- 200.00
=	Cash-flow of continuous business activity	- 250.04	4,460.00	4,460.00	24,060.00	26,060.00
II. Cash-flow of investments						
+/-	investments	- 20,000.00	-	-	- 30,000.00	-
=	Cash-flow of investments	- 20,250.04	4,460.00	4,460.00	- 5,940.00	26,060.00
III. Cash-flow of finance operations						
+/-	Equity/shareholder loan	30,000.00	-	-	-	-
=	Cash-flow of finance operations	30,000.00	-	-	-	-
Sum of Cash-flow		9,499.92	8,920.00	8,920.00	18,120.00	52,120.00
		surplus	surplus	surplus	surplus	surplus

Finance requirements

The financial requirements are approximately € 30,000.

The financial source are investment bankers, who are impressed by the business idea and who also trust the management.
The accounting of the "E-Bike-Graz GmbH" is done software-assisted.
The company founders are responsible for the accountancy.

Plan balance sheet

	(in EUR)	2014	2015	2016	2017	2018
A	Capital assets					
	tangible assets	15,000.00	10,000.00	5,000.00	23,750.00	17,500.00
	Sum capital assets	15,000.00	10,000.00	5,000.00	23,750.00	17,500.00
B	Circulating assets					
	commodities + consumables	3,900.00	300.00	300.00	300.00	300.00
	claims of deliverables	900.00	900.00	900.00	900.00	900.00
	cash assets a. bank balance	10,149.96	19,609.96	25,469.96	25,929.96	53,389.96
	Sum circulating assets	14,949.96	20,809.96	26,669.96	27,129.96	54,589.96
Sum ASSETS		29,949.96	30,809.96	31,669.96	50,879.96	72,089.96
A	Equity	30,000.00	29,749.96	30,609.96	31,469.96	50,679.96
	accumulated profit /loss	- 250.04	860.00	860.00	19,210.00	21,210.00
	Sum equity	29,749.96	30,609.96	31,469.96	50,679.96	71,889.96
B	Liabilities					
	Liabilities deliveries	200.00	200.00	200.00	200.00	200.00
	Sum liabilities	200.00	200.00	200.00	200.00	200.00
Sum LIABILITY		29,949.96	30,809.96	31,669.96	50,879.96	72,089.96

References for the Business Plan

Source	Note
sport12.at	front picture
wirtschaftslexikon.gabler.de	business expressions
wikipedia.org	example SWOT-Analysis
Business-Plan RE-Design	suggestions
Beurteilungsleitfaden bzw. -fragen Businessplan Dr. Matthias Ruhri - www.i2b.at	structure
www.immmo.at/suche	premises search
derstandard.at	premises search
www.e-steiermark.com/aktionen/velovital/	e-bike rental in Graz
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www.google.at/#q=ebike+kaufen	e-bike types + costs
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www.radhaus-erwin.at/media/Verleih/Erwinverleihpreisliste.pdf	e-bike rental
www.mikes-bike.at/rader.html	e-bike rental
www.abc-ebikes.at/verleih/	e-bike rental
www.enzosbistro.at/radverleih/	e-bike rental
www.neusiedlersee.com/de/themen/sport/rad/service/ebikeverleih/	rental corp at Neusiedlersee
www.graz.at/cms/beitrag/10116350/2337193	bike parking at main station
www.gb-elektrofahrrad.at/e-bike-sharing.php	mobile location
www.eduhi.at/dl/Kontenplan_V.pdf	detailed chart of accounts
www.sportstern.at/download/Kontenplan_HAK-HAS_I-1.pdf	overview: chart of accounts
www.dict.cc	dictionary
dict.tu-chemnitz.de	dictionary
dict.leo.org	dictionary
Cambridge online dictionary	dictionary
www.khanacademy.org/economics-finance-domain/	Business English
CNBC	Business English

Dictionary

English	German	Explanation
own equity	Eigenkapital	
equity	Kapital	
assets/liabilities	Aktiva/Passiva	
inventory	Vorrat	
equipment	Ausstattung	
debt	Schulden	
gross profit	Rohgewinn	= Erlöse - Aufwände
expense	Aufwand	
revenue	Ertrag	
depreciation and amortization (D&A)	Abschreibung (-und Wertminderung)	depreciation: Materielles (Auto,..) amortization: Immaterielles (Lizenz,..)
operating profit	Betriebsgewinn (operativer Gewinn)	Gewinn vor Steuerertrag/aufwand (=Rohgewinn - sonst. Aufwand)
EPS	earnings per share	net income / number of shares
pre-tax income	Bruttoeinkommen	
net income	Nettoeinkommen	
written off	abgeschrieben	
historical cost	Anschaffungswert/kosten	
fair value=market value	Zeitwert	= Anschaffungswert(=Buchwert) - bisherige Abschreibung + Wertkorrektur
accounts receivable (A.R.)	Forderungen	
accounts payable	Verbindlichkeiten	

BPMN-Implementation on the E-bike rental

This notation should show the typical behavior, how a client orders an E-Bike and all the associated processes. The BPMN was done by with BIZAGI, an open source program.

The entire model:

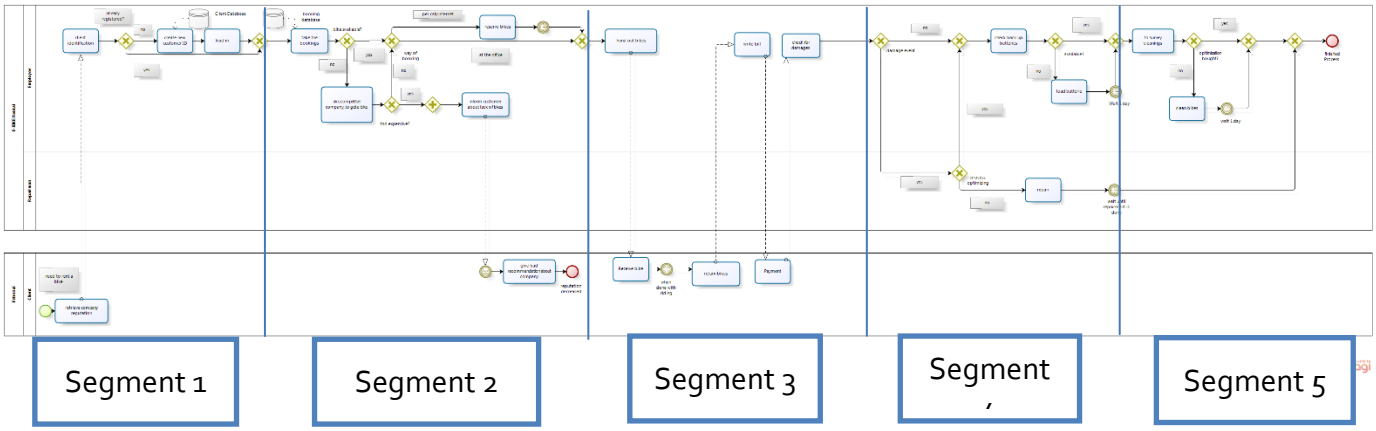


Figure 65 BPMN EBIKE

I segmented the entire model into 5 parts, for a better overview of the model. There will be a detailed description what happens on each segment.

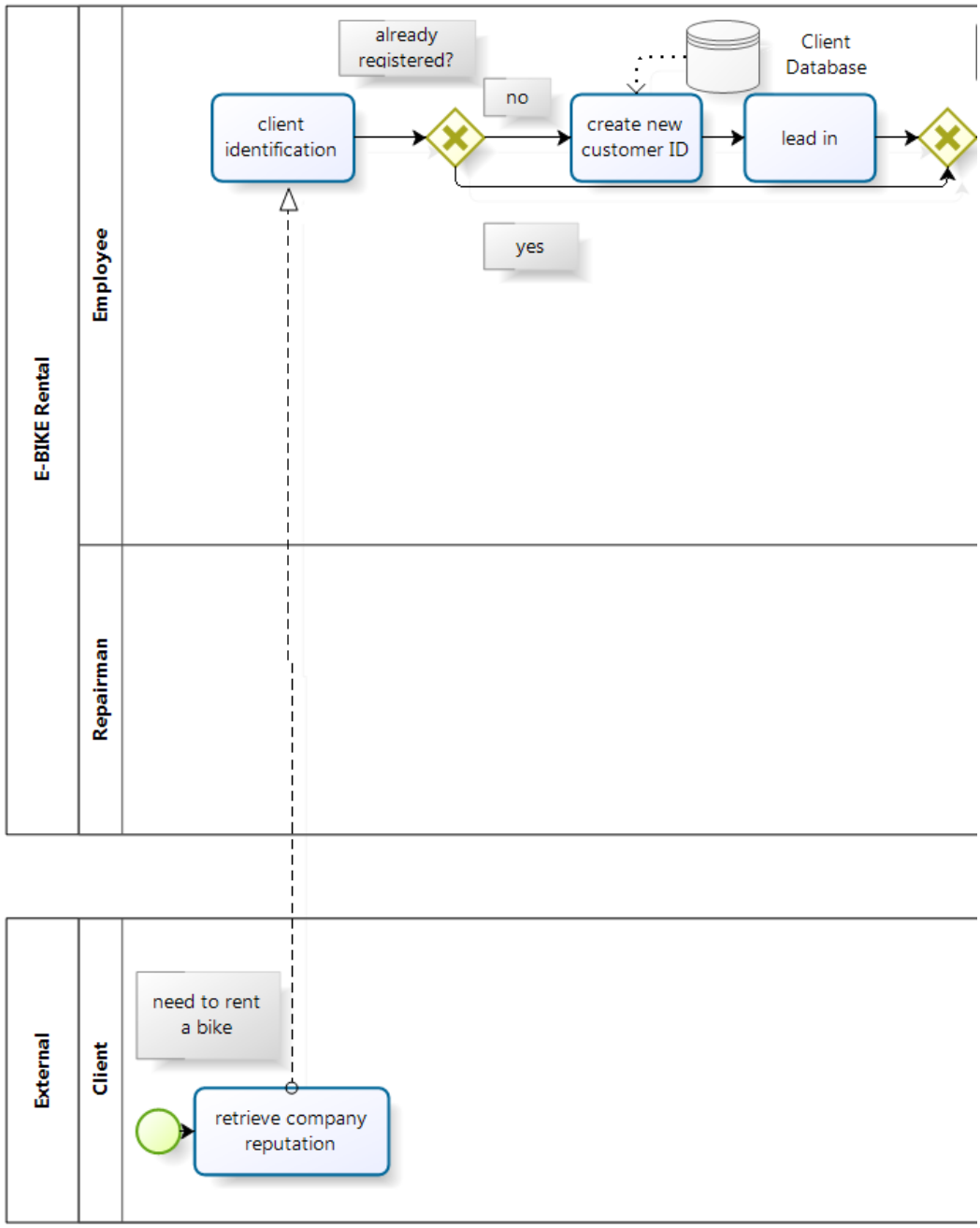


Figure 66 Segment 1

Segment 1:

This segment shows the client request to the E-bike rental. First of all the company has to check if the client is already registered and this is solved through an if-node. As you can see the customer will be created in the database.

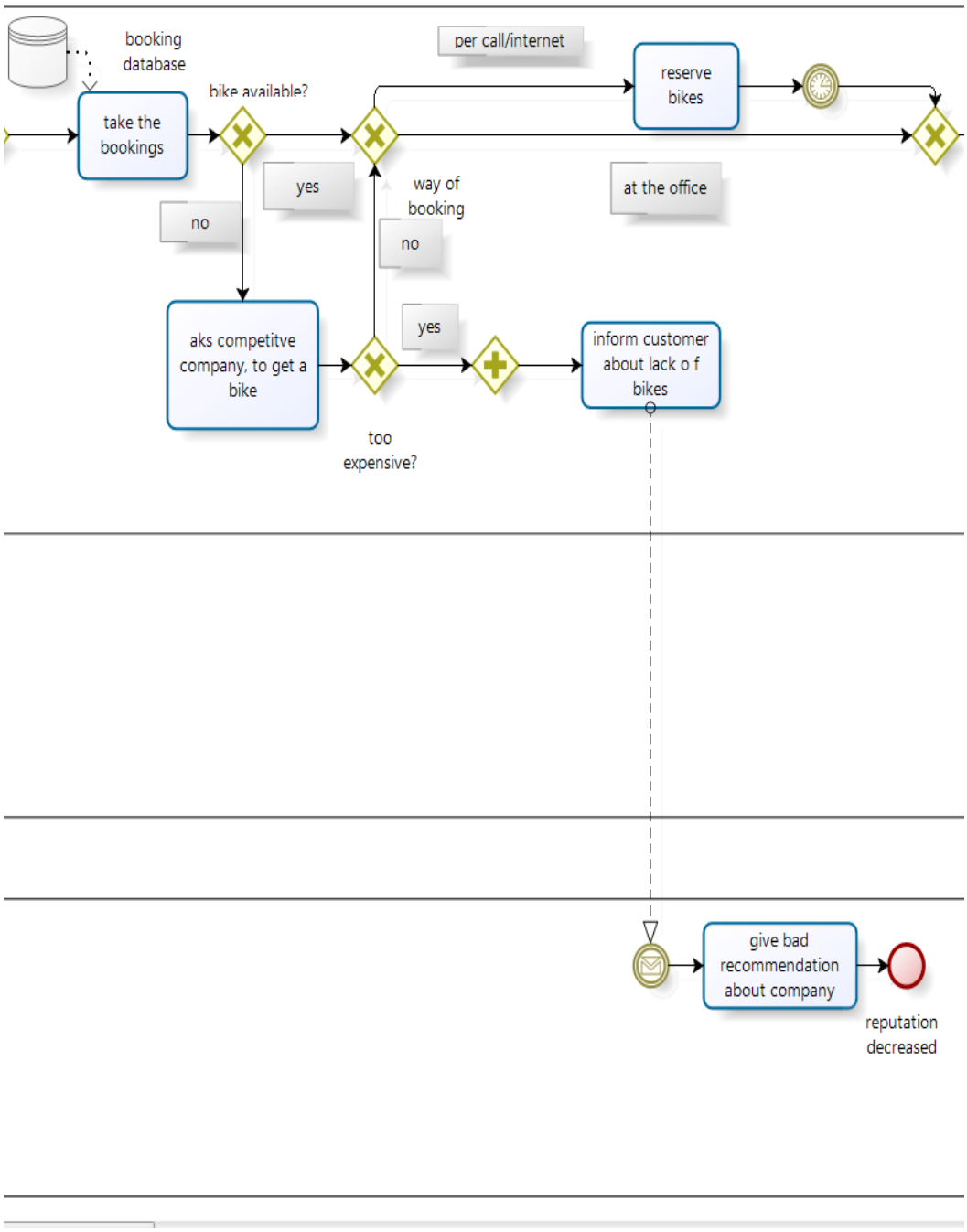


Figure 67 Segment 2

Segment 2:

In segment 2 the company will receive the client´s booking and the rental company has to check if right amount of bikes is available. There is again an if-gateway which tells the 2 possibilities. If it is not available, the company asks a competitor if it they have the right amount. In the case that they have enough bikes they reserve them, in any other case, the company is losing reputation.

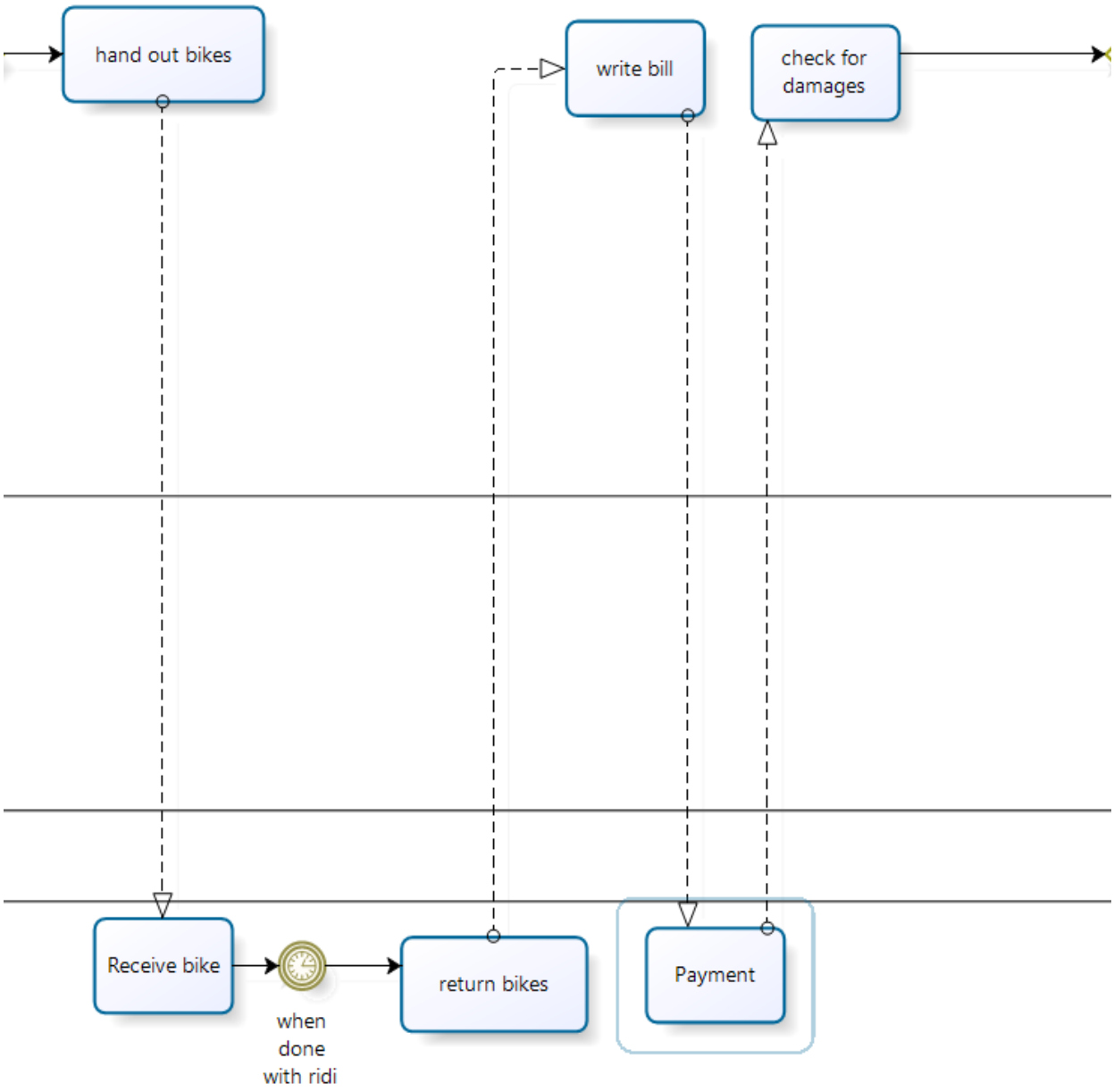


Figure 68 Segment 3

Segment 3:

This segment is about trading. E-bikes for payment.

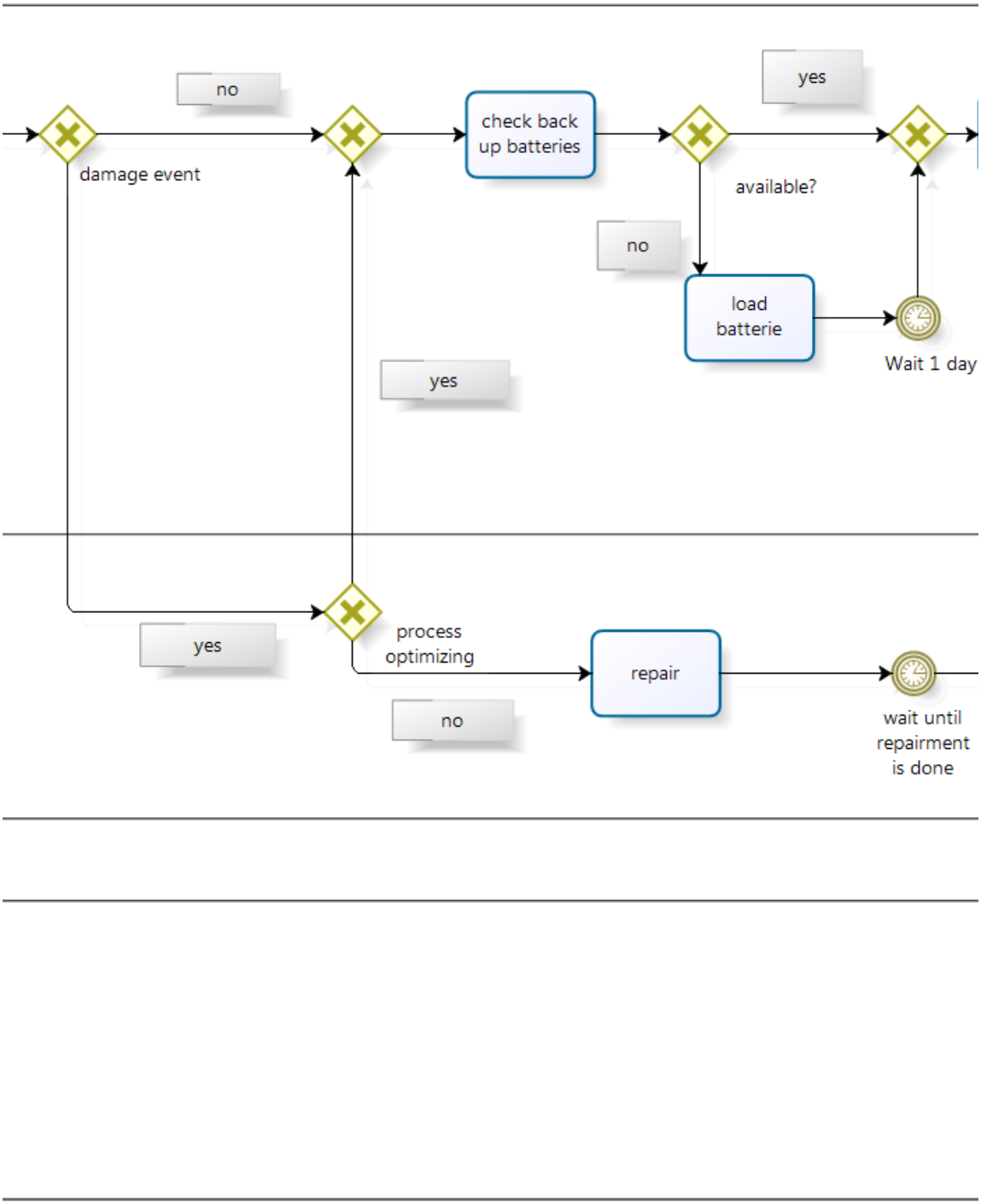


Figure 69 Segment 4

Segment 4:

In segment 4 the company is maintaining the bikes. In these processes you also take in account several optimizations. There are also several decisions, symbolized through the gateways.

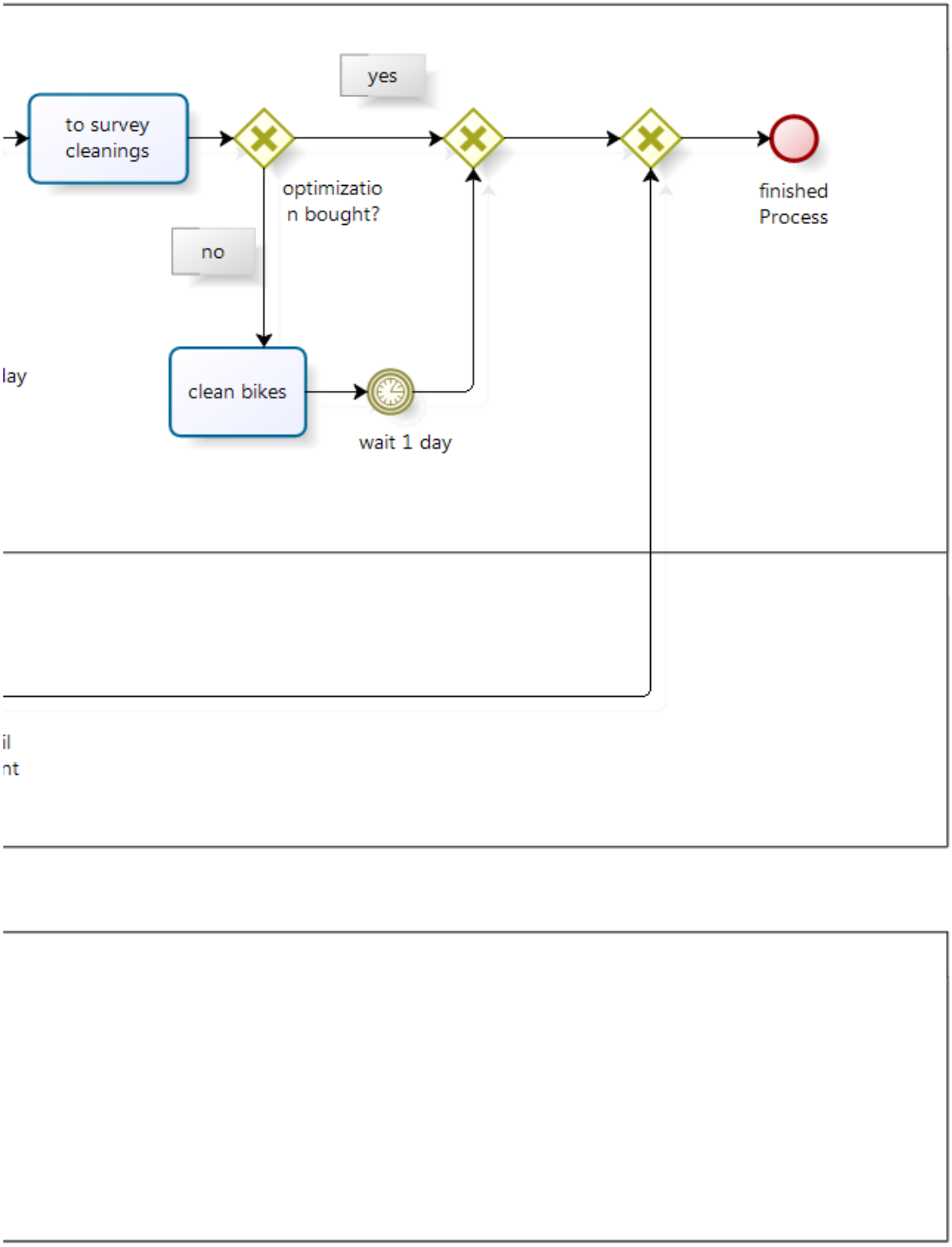


Figure 70 Segment 5

Segment 5:

When everything is fine for the company the process will end in this sector. There is as in sector 4 a check if you have some process optimizations bought beforehand.

Process Map

Evolution of the Process maps

Figure 71 Version 1

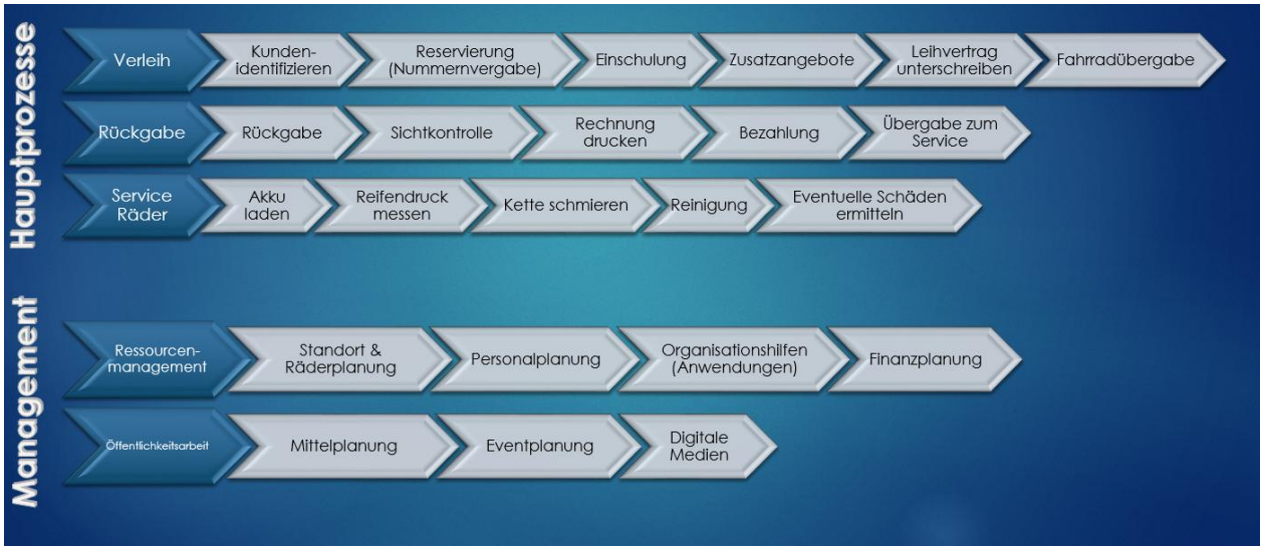


Figure 72 Version 2

The latest and finished process map, was done with an open source program named ARIS.

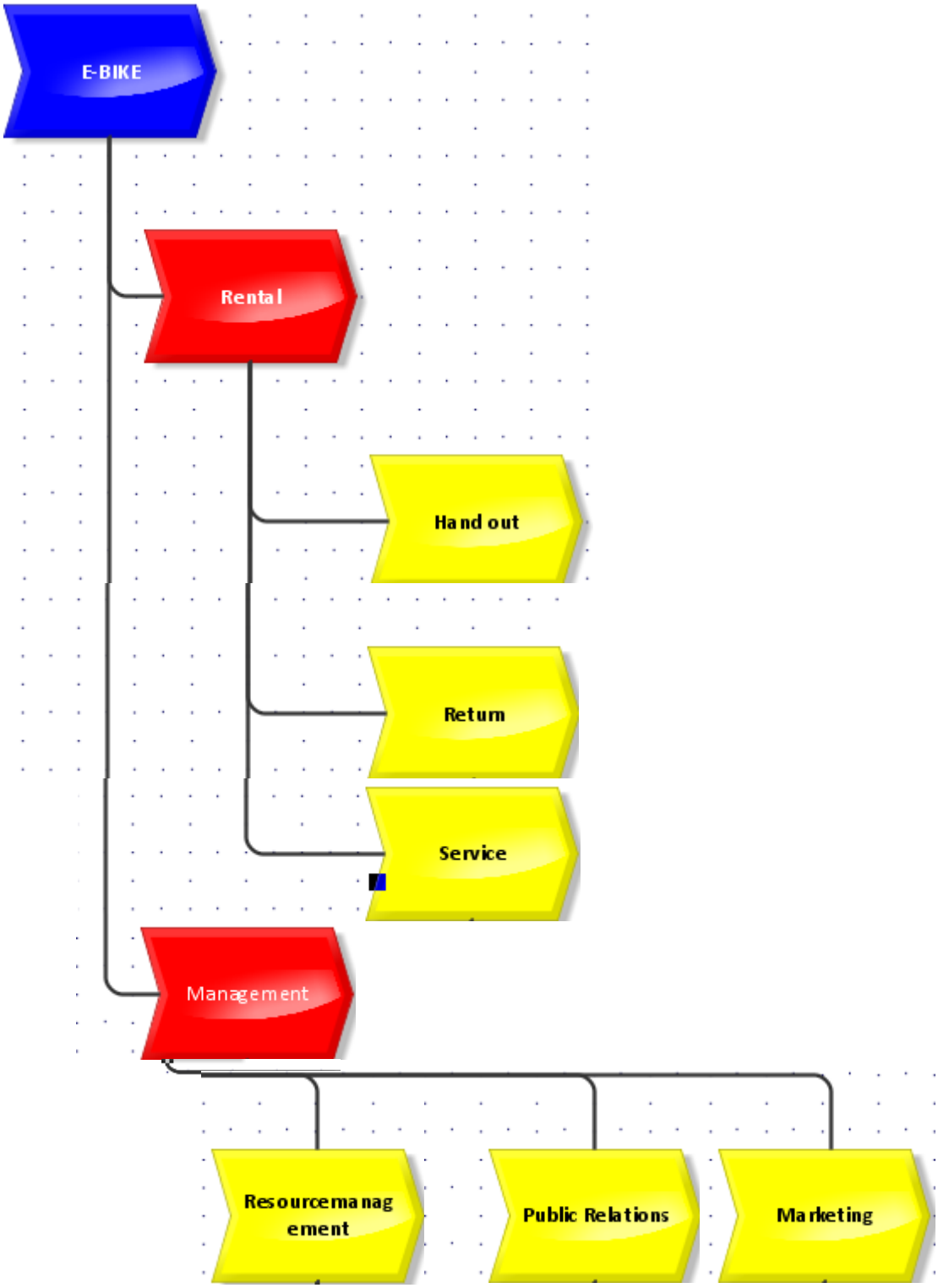


Figure 73-Process Map Overview

The entire E-bike store is symbolized through the blue field on figure Process Map Overview. You have to think that a normal store is separated into two main process areas. The main processes and the management processes.

Description of the *Rental* processes of the store

The main process of the E-bike store is the rental process.
The rental service is divided in **three sub processes:**

- **HANDOUT**
- **RETURN**
- **SERVICE**

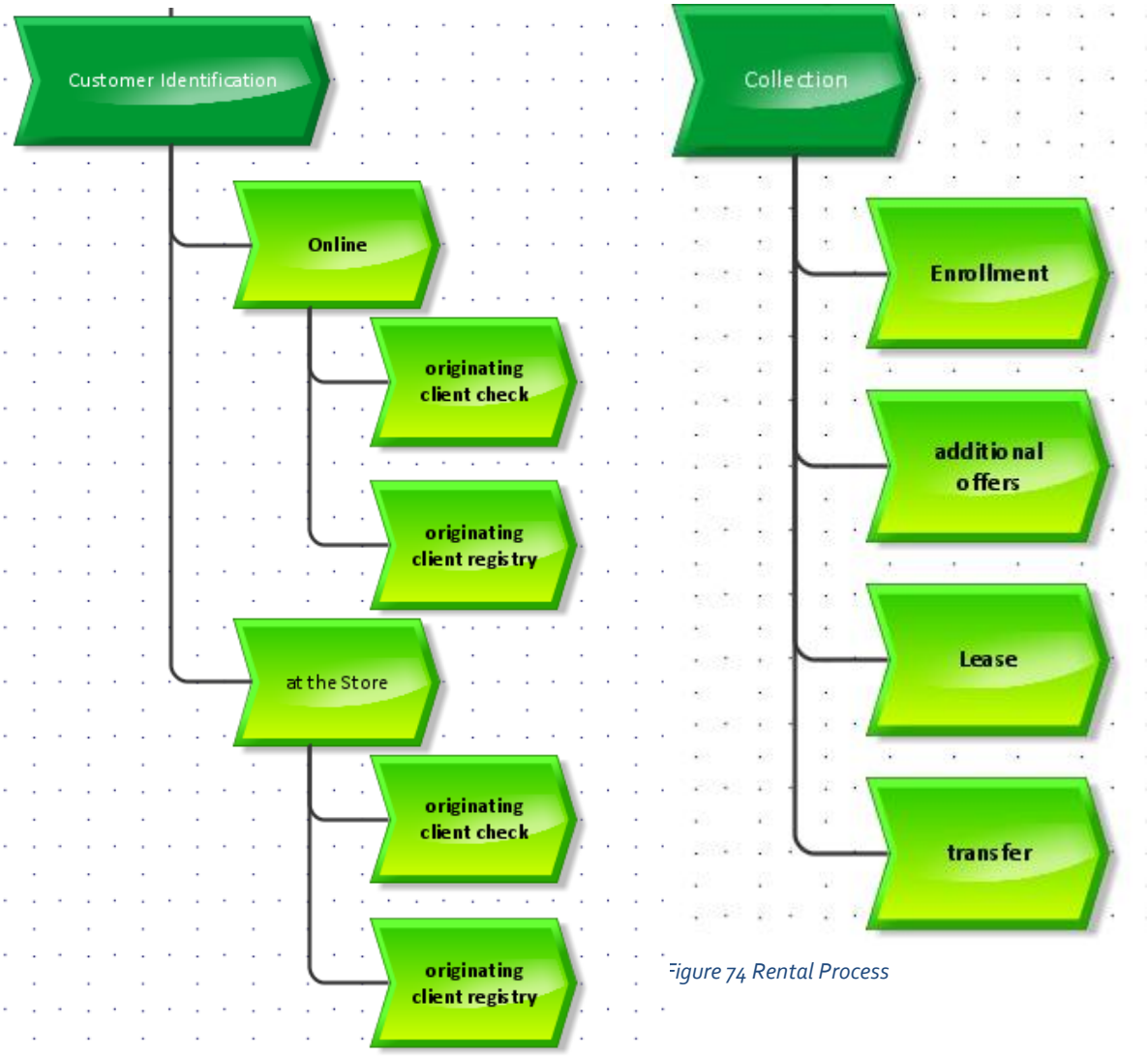


Figure 74 Rental Process

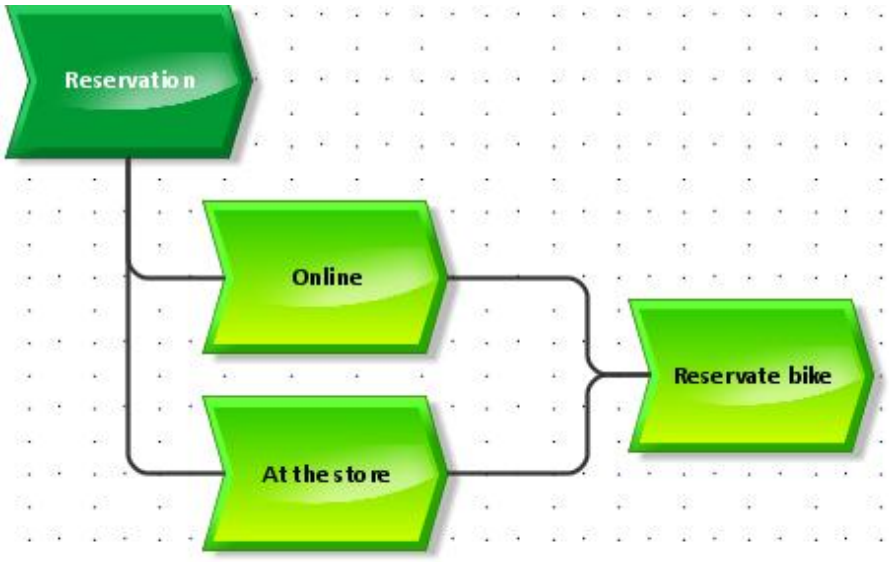


Figure 76 Reservation Process

On figure Rental Process and figure Reservation Process the sub-processes of the ***HANDOUT*** process are
shown. As you can see there are three essential processes for it.
The ***Customer Identification*** is basically for finding out where the client reserve the bike and if the customer is already registered, which is important for the optimization.
The ***Collection*** in contrast is not really important for the optimization itself. This is just part of the usual handover of the bikes.
On figure 3 the ***Reservation*** is you can see how the reservation problem is solved. This has no impact on the game, but is an essential part of the e-bike store.

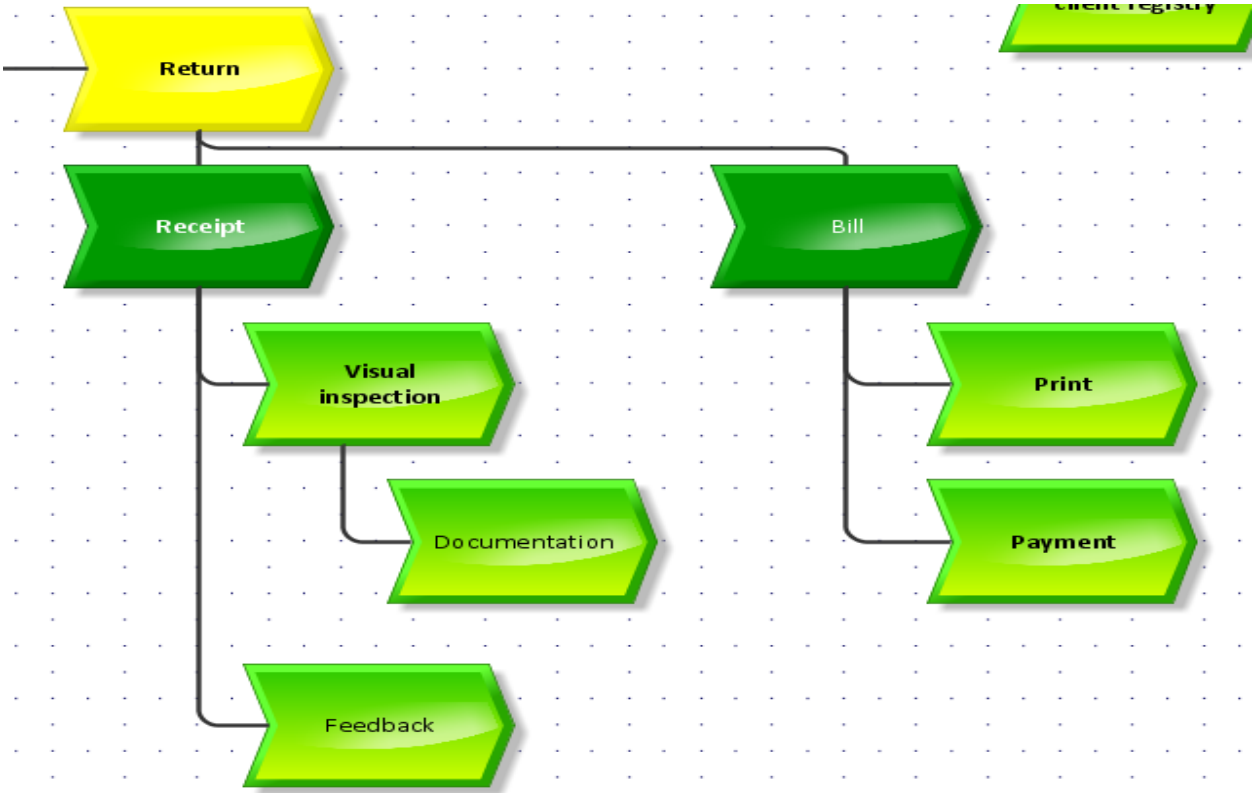


Figure 77 Returning Process

Figure Returning Process sets the focus on the ***RETURN*** process of the E-bike store. This process is divided in 2 main processes, ***Receipt*** and ***Bill.***
Receipt is segmented in *Visual Inspection* and *Feedback*. Part of the *Inspection* is the *Documentation*, which is important for the board game and therefor the ***Bill***
Bill stands for the transaction process and gives the customer the printed form of the bill and then the customer has to pay for it, which is symbolized through the *Payment* tag. Both fields do not have any impact on the game itself.

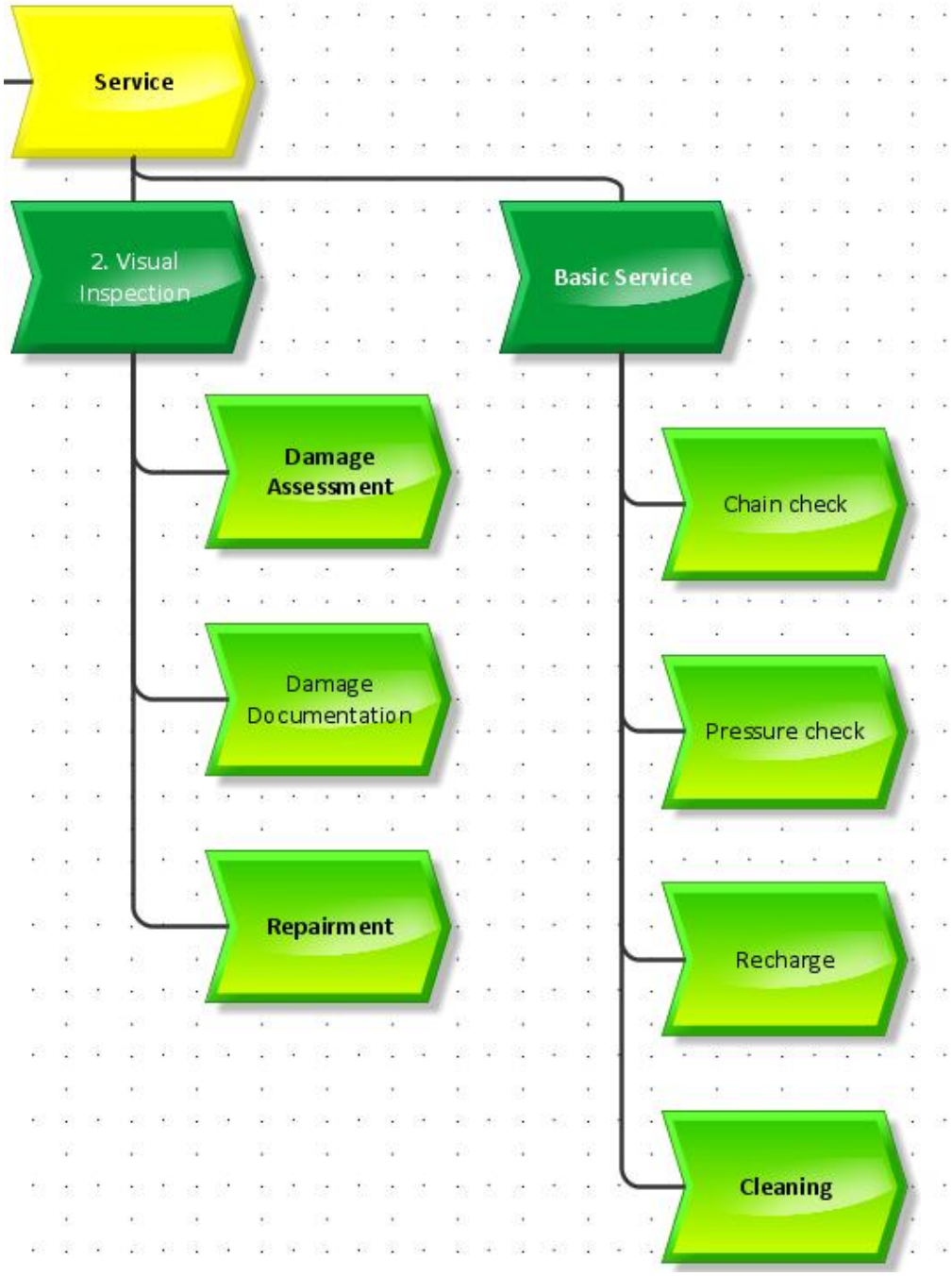


Figure 78 Inspection

On figure Inspection the focus is on the service process, there are two sub processes which should be taken into account. ***2.Visual Inspection and Basic Service*** are really needful for the board game.

2.Visual Inspection is needed for the damage survey, as a consequence there will be a less win for the company. This also has an effect on the availability, this also causes some impact on the client reputation.

Basic Service is also essential for the game. We implemented several optimization cards which cause some saving of time.

Description of the *Management* processes of the store

The management process of the E-bike store is the rental process.
The rental service is divided in **three sub processes:**

- **RESOURCE-MANAGEMENT**
- **PUBLIC RELATIONS**
- **MARKETING**

Going on with the ***Management*** processes, which are often underestimated in and not taken into account.

Resource Management

This concerns ***Location Planning***, ***Bike Planning***, ***Finance Planning*** and ***Application Planning*** as you can see on figure 6.

Location Planning Bike Planning :

Also essential for our game. It stands in relation to the bike planning. You can either focus on the location or the bikes. This element differs this game from the most board games. It makes a appropiate mixture of planning and good luck.

Finance Planning:

The decision wheter you invest in locatons or bikes is job of the finance planning.

Application Planning:

This concerns the support app we made for the board game.

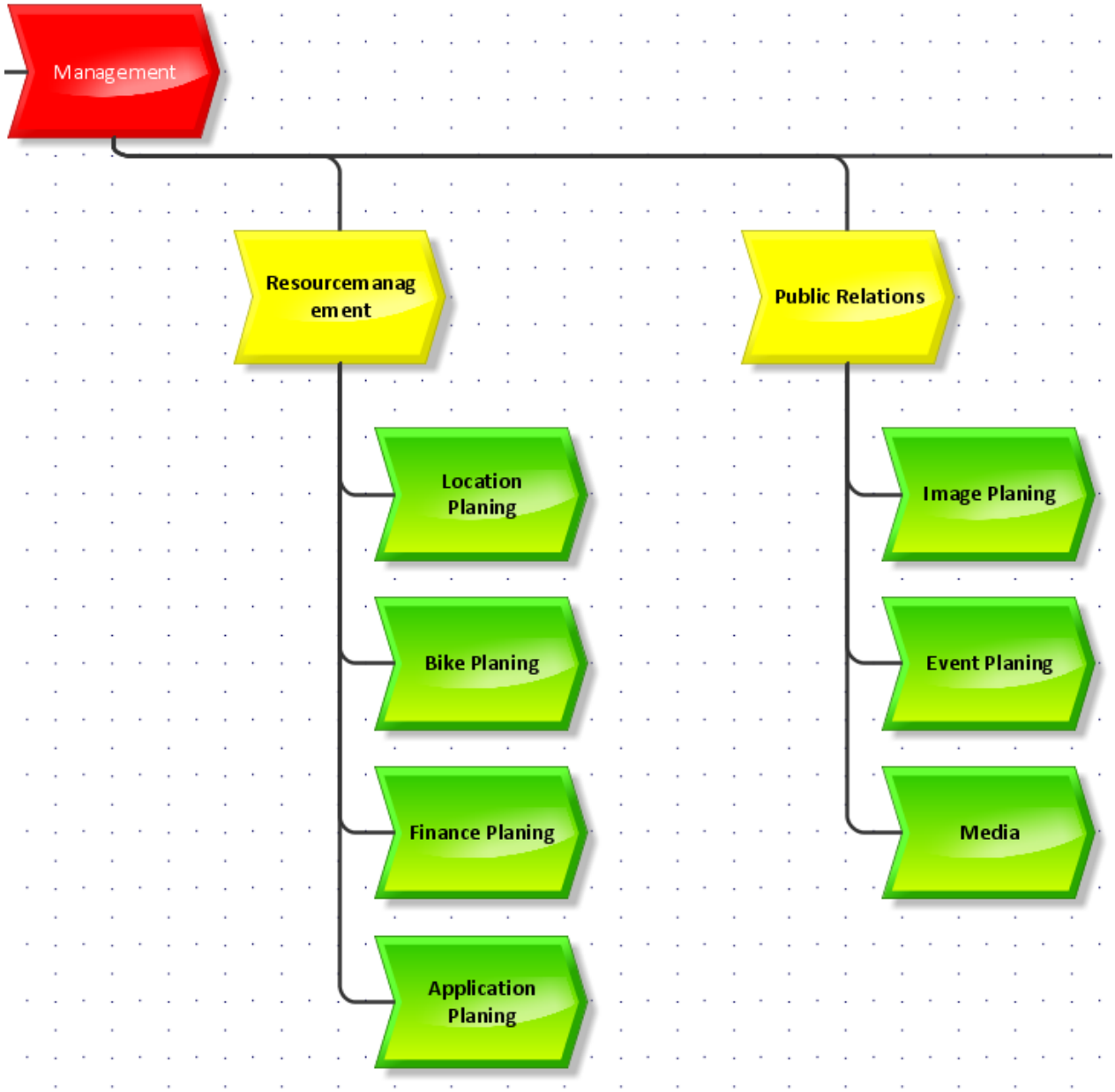


Figure 79 PR Map

Public Relations

The main task public relation has to deal with is the image of the company, how you can improve you image and also without means.

Image Planning is important for the board game. In the board game the image influences the amount of customers. So you can say that is also an important factor of the game.

Even Planning and Media:

Event Planning is not taken into concern in the board game.

Media is mentioned in the game, and is kind of an image improvement option. The media just tells how much your image will rise.

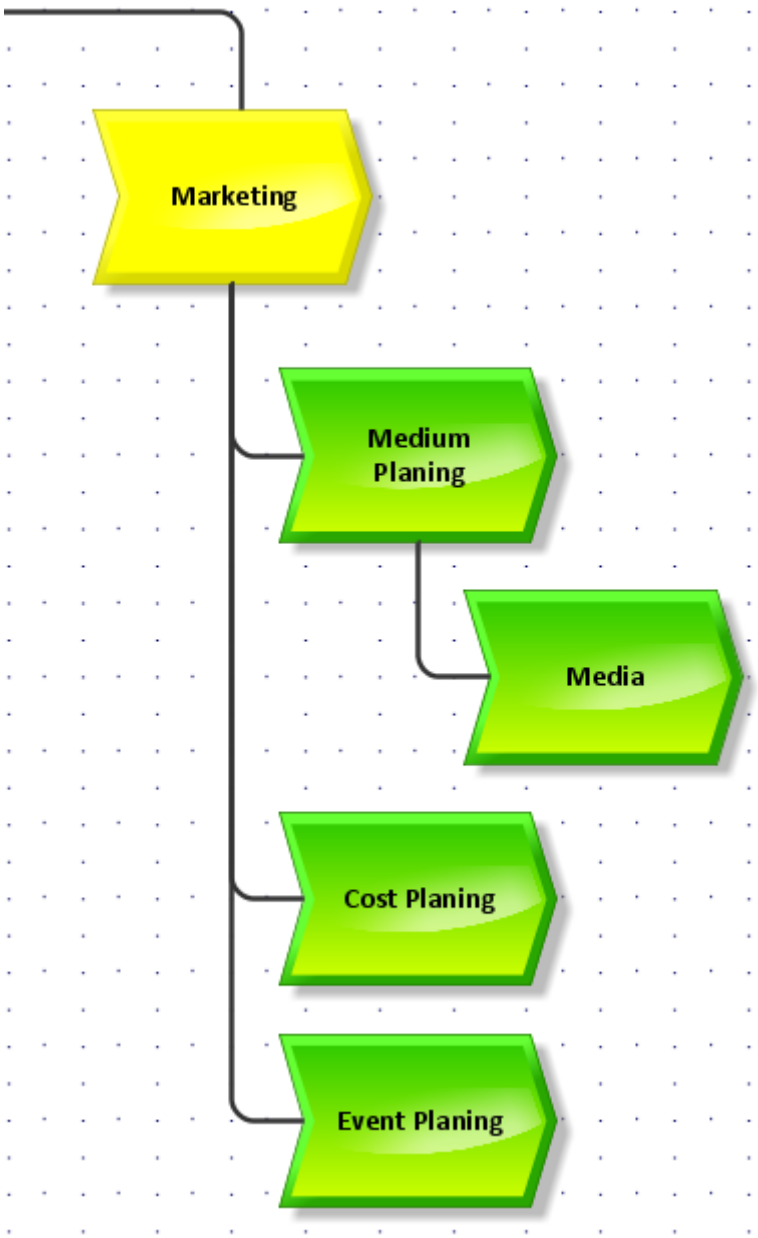


Figure 80 Marketing Map

Marketing

Marketing is the general use to make your company more popular. It is responsible how much budget the Public Relation field has. So therefore is the Cost planning. The Event planning is very similar to the Event Planning on the Public Relation sector.

Board Game printing process

The final BPMX Game was printed by the print office Moser & Moser GmbH. The company is located in Lieboch and was therefore the nearest place for us.

We used a good quality multi-layer paper for the board game and strong paper for the game cards (action cards, process optimization cards, theme cards).

The investment was good, because we got a marvellous final version of the whole project which was not that expensive.

We can recommend this print office for further print jobs concerning the BPMX Game.

Print job
Invitation to bid

Table of contents

1. Subject of the bid

We need a print job for our board game and playing cards. The board game is created to be a learning game. The board game has to have a high quality and the colors and the dimensions of the playing cards must comply with the files.

2. Contact

Florian Kager
Oberberg 23
8151 Hitzendorf
0664 / 12 345 67
Kagflc09@htlkaindorf.at

For any questions please contact the contact person listed above. Preferred is telephone contact, otherwise email.

3. Deadline: **End of March 2014**

4. Procurement procedures

The choice from the given services is carried out by our purchasing specialists. The selection will be carried out completely objective and impartial. After a selection is made, we need a test print to the information given to verify. Only then can the final choice be made.
Remuneration for tenders is excluded.

5. Notes on the evaluation of the test print job

The test print job is subjected to the usual requirements of a test situation, and then the quality of the print job is analyzed.

6. Information about the company

The project team consists of 5 students of the HTBLA Kaindorf. We need this print job for our Diploma Thesis.

7. Task Overview

The task is to provide good quality games that can be used in school.

8. Specification

8.1. Functional requirements

Layers	3 Layer
Lamination	Laminated
Profile form	A3 for the board game, A4 for the game cards
Cut	Every single game card
Paper	Special quality paper (solid board)
Colour Printing	Yes
Quality	High Quality
Thickness	600 g/m²board game, 190 g/m²game cards

8.2. Quantity structure

Product	Amount
Board games	5

8.3. KO Criteria

- No colour (black & white)
- Wrong colour (Colour different to the PDF files)
- Wrong paper format (Board game A4)
- Board Game Thickness < 600 g/m²

9. Schedule

- Submission of tenders: at the end of March 2014
- Supplement: mid-April 2014
- Start: beginning of May 2014

10. Safety and Services

10.1. Response & reaction time

For support, the company should respond within 48 hours and provide a solution within two business days. If a board game completely fails within the warranty provided, a replacement for the period of 7 working days must be provided.

10.2. Consequences of non-fulfillment of contract conditions or unsatisfactory quality

If the specified properties are not achieved in the devices, appropriate changes must be made to the contract to fulfill. Otherwise the contract is invalid with immediate effect and the business will be canceled.

10.3. Warranty

If a warranty is available we would ask for at least 1 year warranty on all components.

11. Acceptance conditions

The delivery occurs to the given address. The carriage is taken over from us.

Florian Kager
Oberberg 23a
8151 Hitzendorf
Österreich – Austria

12. Commercial conditions

12.1. Price Breakdown

Upon reaching the minimum requirement, the price per board game has to be below 30 €. If the minimum requirements are exceeded by far a price of 40 € is acceptable. However, the maximum price of 50 € per board game must not be exceeded, since the own budget is too low.

12.2. Discount

Since it is a larger order a quantity discount of 20% on the list price is expected.

If necessary framework agreements can be agreed.

12.3. Delivery / Payment

It must be guaranteed a delivery time of more than 3 weeks after receipt of the payment, because the games are used for this year's school year. The money will be paid by bank transfer.

12.4. Warranty

It is very important that the warranty comes into effect immediately from the date of invoice. There must be a legal protection available to be secure financially.

12.6. Additional Services

For additional services such as design consultancy or various cutting jobs hourly rates must be offset under 15 €.

13. Requirements for the bidder

13.1. References

We kindly request you to provide references to give an insight into customers, with which the company has previously worked together and how these customers describe the relationship.

14 Price Breakdown Sheet

Print job			
Name	*Model/Type*	*excl. VAT.*	*incl. VAT.*
Paper			
Colour			
Quality			
Thickness			
Layers			
Lamination			
Profile form			
Cut			
value-added service			
∑ Print Job: (0-80 €)			
Discount:			
∑ (incl. Discount):			
Other:			
Guarantee / Warranty Extension			

Entire amount			
After tax (20% VAT.)			
20% VAT.			
TOTAL:			

The Board Game - BPMX Game

The devolvement stages and the final version of the BPMX Game are shown in the following sections. Since the board game is the most important outcome of our diploma thesis, a lot of effort went into the development in order to make it as perfect as possible.

Development of the Game

The whole development of the game has taken more than two years. It started when we first met our advisors and ended with the last meeting at the Campus 02. The development of the game was the main subject of every meeting.

The Business

What we had to do first, was deciding on a branch in which we could use for explaining the purpose of business processes and how those business processes work within a company.

It was quickly noticed that it would be perfect if the company offers a service and is not a production company. After thinking a of innovative service, the e-bike rental came into our minds and we chose this branch to build our game on. There were other ideas, like car sharing, but the simplicity of the e-bike rental service was genius.

Figure 81 - E-Bike Rental Service - Source:bikester.at

First Idea

The first prototype of the game was actually done by our teacher. His idea was to include hourglasses into the game, that show how long processes take and when the e-bikes are available again. The problem with his approach was that it needed a lot of different materials we were not able to afford. Furthermore, this idea was not business related enough in our perspectives. We wanted to include money into the game and not only process management.

The Name of the Game

One of the hardest challenges was to find a good name for our board game. Weeks in which we did brainstorming went by, but the right name was not found. Then, out of the sudden, we had the idea of naming the game "Business Process Management Extended Game" (BPMX Game). The idea was based on the Business Process Management Notation (BPMN), which we also had to do within our project.

BUSINESS PROCESS MANAGEMENT EXTENDED GAME
BPMX GAME

The Logo

The logo was designed soon after the decision for the name of the game. It was a quick process, since not many drafts were needed.

Figure 82 - The Logo

The Challenge

The hardest thing during the whole development was to keep the balance between teaching the player something and still keeping the fun of playing the game. Sometimes this balance was extremely hard to find. In most cases the fun got lost, because we focused too much on explaining business processes as detailed as possible.

The Game Developer

A truly great help, were the ideas of a game developer, who took his time to help us improve our game. Actually the feedback was quite positive, but of course he had a lot of new ideas.

Other Game Ideas

Another idea how to create the game was to use the game "snakes and ladders" as basis. All ladders should represent the processes that worked perfectly. Snakes, one the other hand, occur if something goes wrong, like a damage on an e-bike for instance. Other events are represented using action cards.

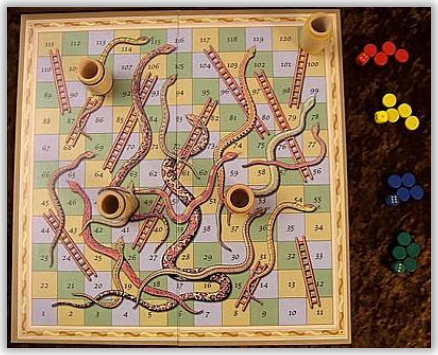


Figure 83 - Snakes and Ladders

Basis for the Development of the Game

Later we decided to develop our game based on "Monopoly" and "Das kaufmännische Talent (DKT)". The big advantage was that we were able to represent a business month on a playboard and the whole game was more realistic and business related.

Figure 84 - DKT - Source: www.dkt.at

The Flow of Play

The most important thing when playing a board game is that it does not getting boring. Doing the same actions over and over again makes people stop playing the game. We tried to make the single business days as exciting and short as possible. Therefore things develop much more quickly than they would do in real life.

The Development of the Business Board

The piece of the game that changed most often through the different development phases, is the business board, which is the main playboard.

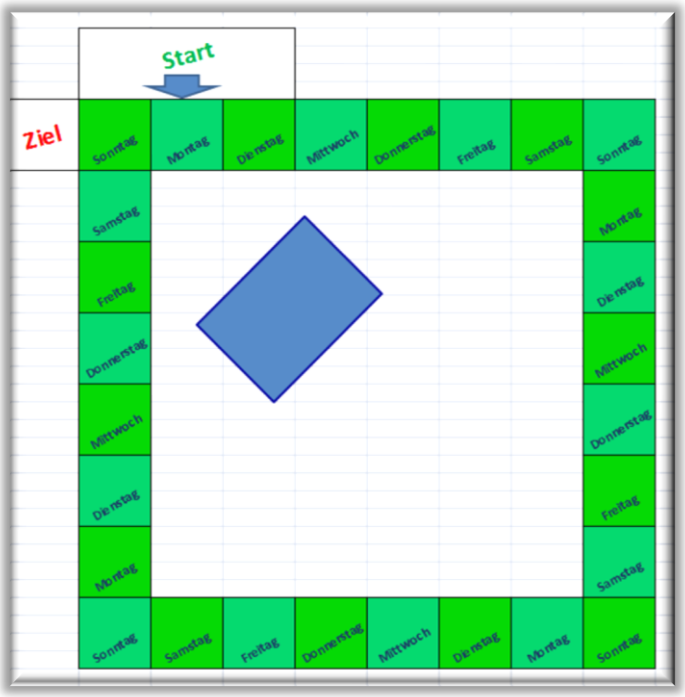


Figure 85 - Business Board V1

The first business board was quite simple. It represents a business month with 4 weeks and there is also a place for the action cards. The problem was that the fields for the different business days were far too small.

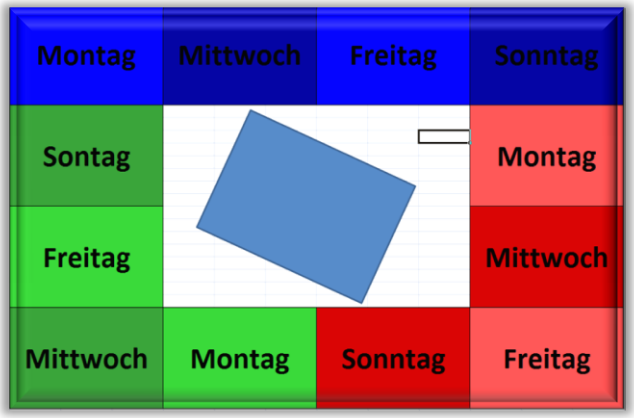


Figure 86 - Business Board V2

The solution to the problem with the small field was a product which did not include every day of the week. This board also supported better flow of game, since business weeks went faster. Nevertheless the business board designing phase was not at end at all.

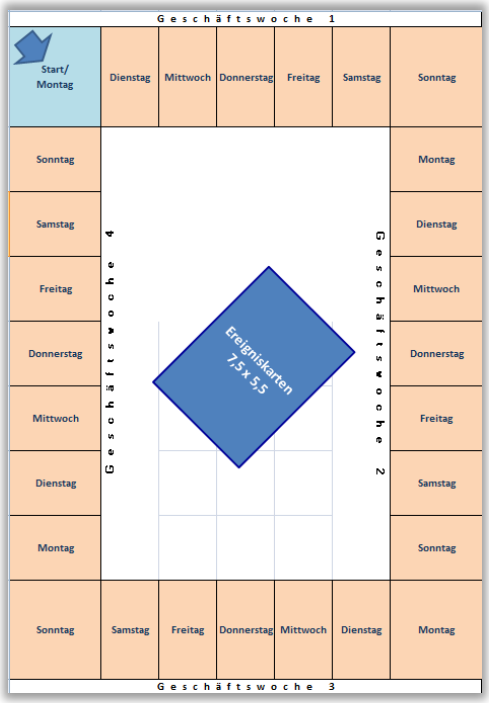


Figure 87 - Business Board V3

The third version was a compromise between the first and the second. Fields were bigger and the business weeks included all 7 days. This approach was already like a first draft of our final business board.

Figure 88 - Business Board V4

After the third version it became clear that the perfect format for the business board would be DIN-A3. Version 4 already had the exact dates of the business month which was necessary because of reservations. It also had a QR-Code, which directly links to the mobile app which supports the board game. A new invention was to wheel to decide if the weather on the business day is good or bad. It turned out that this feature destroys the flow of play.

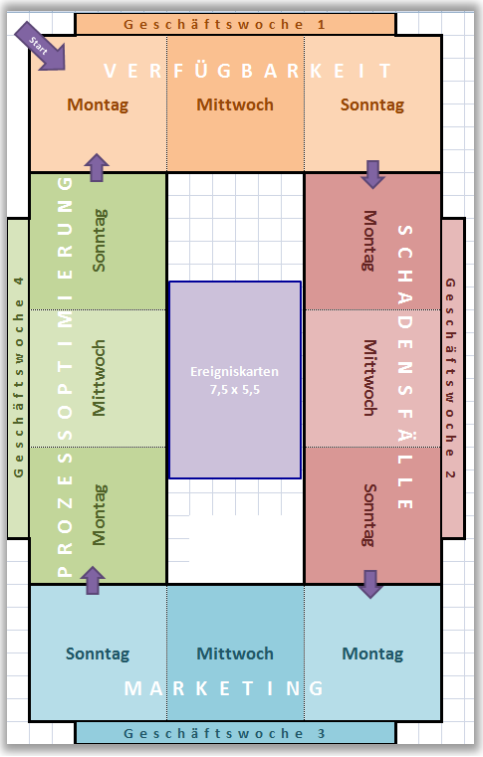


Figure 89 - Business Board V5

The version number 5 was the first draft with the implementation of themes for each week. This idea helped to improve the flow of game a lot, but it turned out, that the themes could be more dynamic without the use of theme weeks.

Figure 90 - Business Board V6

The business board version 6 has an own field where the process optimization cards can be placed. The only thing that had to be improved was the design. Function wise, this version is already the same as the final version.

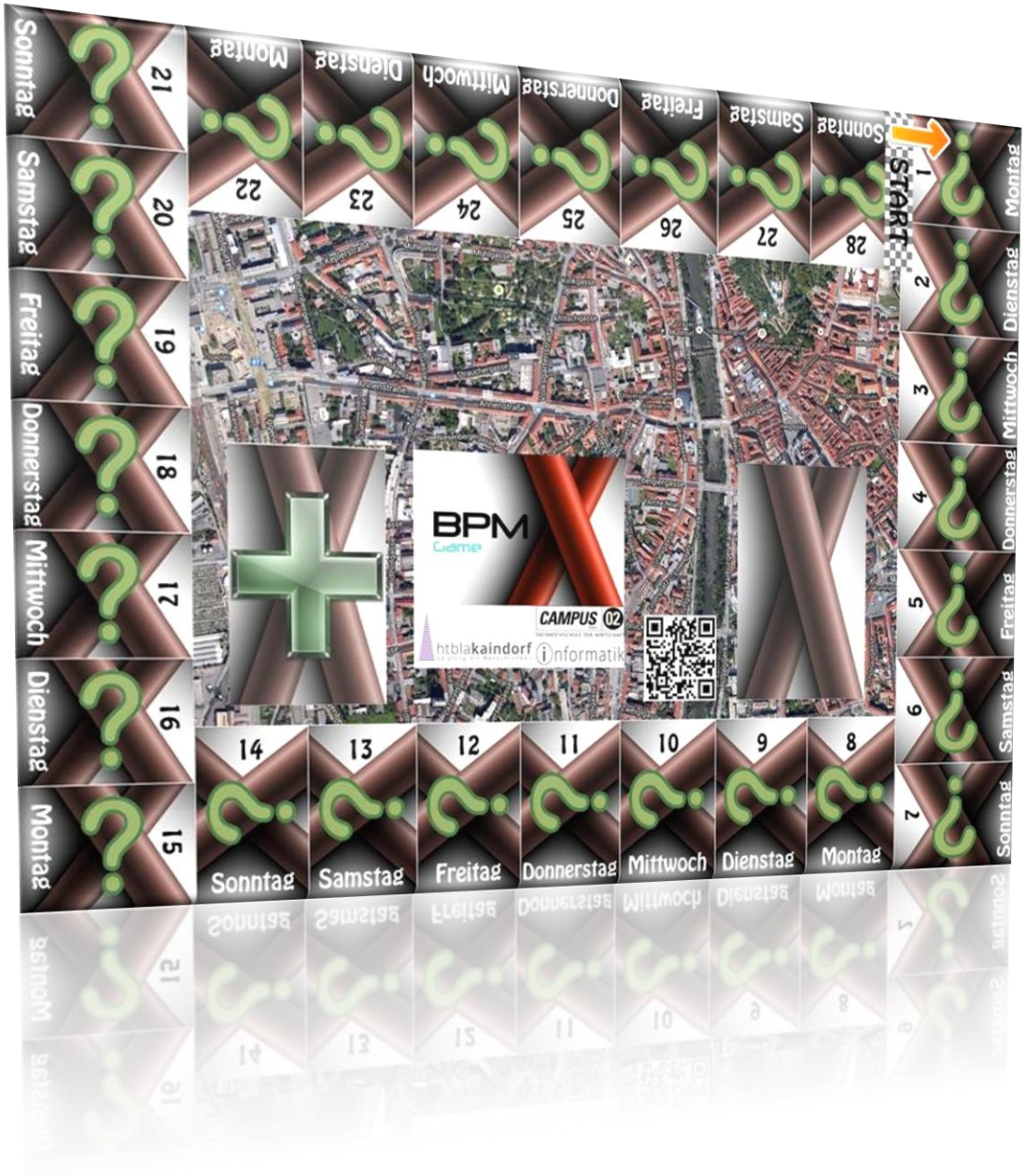


Figure 91 - Business Board V7/Final Version

The final version of the business board combines functionality with perfect design. The background shows the city of Graz. Around the city of Graz, the 4 business weeks with the symbol of the theme card each day In the center, the logo of the game with the logo our partners, 2 placeholders for the 2 stacks of cards and the QR-code with the link to the mobile application.. It took quite a while to finally agree and create this design.

The Development of the Process Board

The process board is more like the teaching aspect of the BPMX board game. Its main purpose is to inform the player about the different processes that happen in the e-bike rental during daily business.

The process board development was not that complicated as the business board was, but there were still a few challenges. The design was implemented using Microsoft Office Excel. It was the best tool to design a structured board with clear instructions.

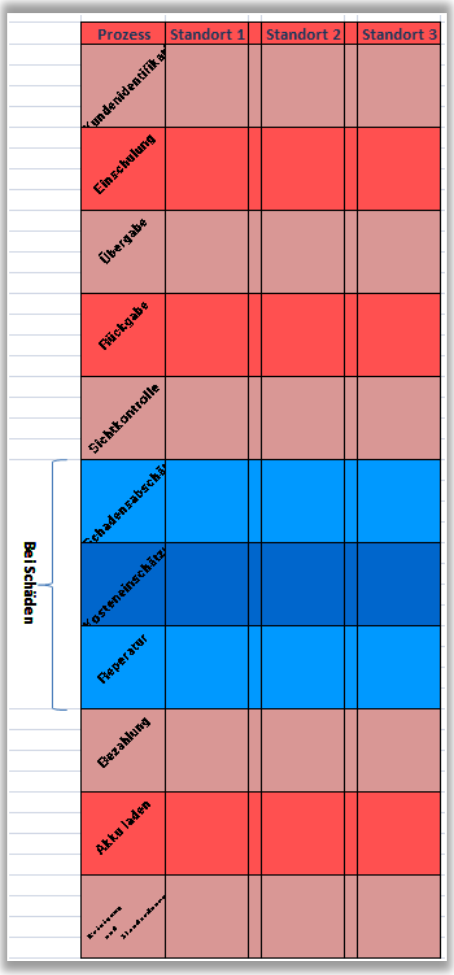


Figure 92 - Process Board V1

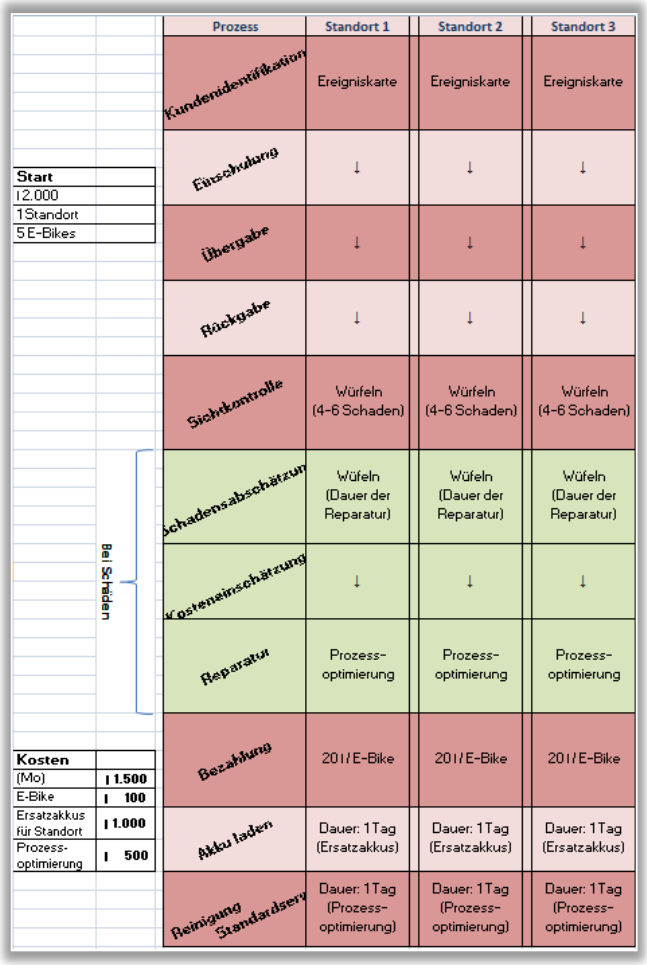
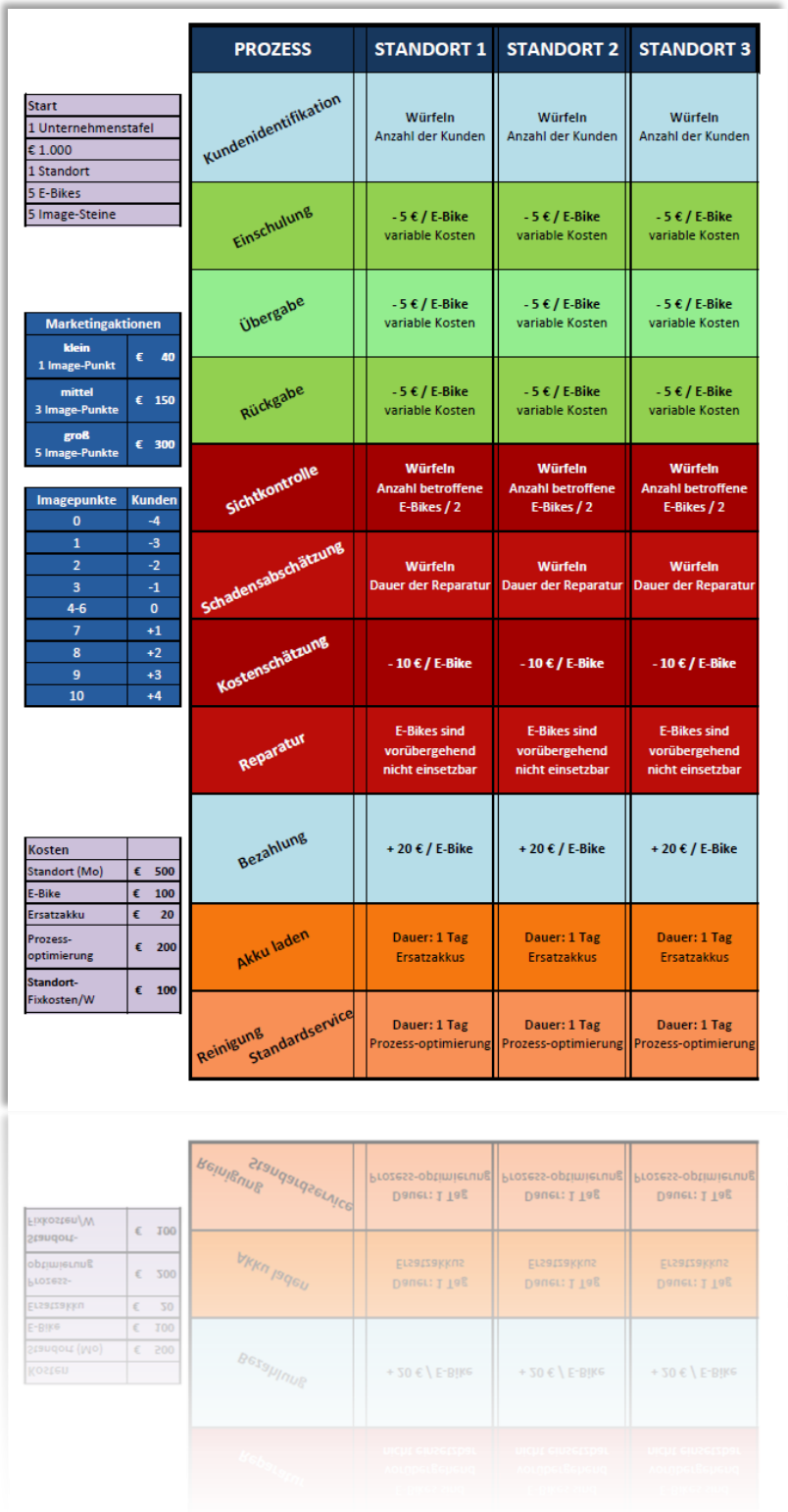


Figure 93 - Process Board V2

The first draft of the process board already includes the main aspects of the business process board. It mentions all the business processes that were analyzed beforehand. It showed that the business processes are the same at all the different location. Another thing which already was present in the first draft is that damage occurs not always and therefore this path is optional. This was represented in blue.

The second draft is quite different to the first one. This board has more detailed information about what is going on in the processes. Unfortunately some processes have an arrow which means they are useless and will be skipped. This was improved in the next version. The second draft also includes information about important game rules. It notifies the players about start capital and the costs for investments.



Start
1 Unternehmenstafel
€ 1.000
1 Standort
5 E-Bikes
5 Image-Steine

Marketingaktionen	
klein 1 Image-Punkt	€ 40
mittel 3 Image-Punkte	€ 150
groß 5 Image-Punkte	€ 300

Imagepunkte	Kunden
0	-4
1	-3
2	-2
3	-1
4-6	0
7	+1
8	+2
9	+3
10	+4

Kosten	
Standort (Mo)	€ 500
E-Bike	€ 100
Ersatzakku	€ 20
Prozess-optimierung	€ 200
Standort-Fixkosten/W	€ 100

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Kundenidentifikation	Würfeln Anzahl der Kunden	Würfeln Anzahl der Kunden	Würfeln Anzahl der Kunden
Einschulung	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten
Übergabe	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten
Rückgabe	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten	- 5 € / E-Bike variable Kosten
Sichtkontrolle	Würfeln Anzahl betroffene E-Bikes / 2	Würfeln Anzahl betroffene E-Bikes / 2	Würfeln Anzahl betroffene E-Bikes / 2
Schadensabschätzung	Würfeln Dauer der Reparatur	Würfeln Dauer der Reparatur	Würfeln Dauer der Reparatur
Kostenschätzung	- 10 € / E-Bike	- 10 € / E-Bike	- 10 € / E-Bike
Reparatur	E-Bikes sind vorübergehend nicht einsetzbar	E-Bikes sind vorübergehend nicht einsetzbar	E-Bikes sind vorübergehend nicht einsetzbar
Bezahlung	+ 20 € / E-Bike	+ 20 € / E-Bike	+ 20 € / E-Bike
Akku laden	Dauer: 1 Tag Ersatzakkus	Dauer: 1 Tag Ersatzakkus	Dauer: 1 Tag Ersatzakkus
Reinigung Standardservice	Dauer: 1 Tag Prozess-optimierung	Dauer: 1 Tag Prozess-optimierung	Dauer: 1 Tag Prozess-optimierung

Figure 94 - Process Board V3/4

The third and the final draft of the process board are very similar. The processes have different color which indicates in which theme they are played. The light blue processes are played during all themes except the damage theme (red). The green processes are played during the process optimization theme and the orange ones are played during the availability theme.

The additional information that is shown on the left hand side also includes the image system which was added at the very end of the game development. Marketing actions can be set playing the marketing theme which has the color dark blue.

The Representation of the Company

One of the hardest challenges during the game development phase was to find a good way to represent the e-bike company with all its different location plus e-bikes.

The first idea was to use sheets of paper that have symbols like e-bikes and replacement batteries on it. The problem with this idea was that still very difficult to see how many e-bikes a player has and how successful the company is.

Later, it turned out that LEGO bricks are perfect to present a company in an abstract way. The huge advantage is that it's possible to grab the company with all its e-bikes and image points. The player has something which he can see and touch.

Each player has a LEGO plate in a different color (white, black red) which represents the company. On the company plate, the blue tower represents the image of the company. Each company starts with a neutral image of 5 blue bricks. The tower with the player´s color represents the e-bikes of the company. The game starts with 5 e-bikes on one location. If the player invests in a new location, the e-bikes can be separated into two towers. If there are three towers of e-bikes on a single company, it means that the player has already bought the maximum of 3 locations.

Figure 95 - The E-Bike Company represented using LEGO Bricks with Symbols

The Action Cards

The action cards came into the game in an early stage of development. It was clear that something was needed to represent the daily coincidences. The main reason of them is to show that the business is not the same every day, but it changes from one day to the other.

Touristengruppe kommt zu Standort 2. (+1 Würfel für Standort 2)	Aktionstag bei Konkurrent (-1 Würfel bei Standort 1)	Problem mit EDV (Gesamteinnahme am Tag - 50 %)
Touristengruppe kommt zu Standort 3. (+1 Würfel für Standort 3)	Aktionstag bei Konkurrent (-2 Würfel bei Standort 1)	händische Kundenidentifizierung verursacht Verzögerung (Gesamteinnahmen Standort 1 - 50 %)
Touristengruppe kommt zu Standort 3. (+1 Würfel für Standort 3)	Problem mit EDV (Gesamteinnahme am Tag - 50 %)	händische Kundenidentifizierung verursacht Verzögerung (Gesamteinnahmen Standort 1 - 50 %)
Schlechtwetter! (-1 Würfel je Standort)	Problem mit EDV (Gesamteinnahme am Tag - 50 %)	händische Kundenidentifizierung verursacht Verzögerung (Gesamteinnahmen Standort 1 - 50 %)
Schlechtwetter! (-2 Würfel je Standort)	Schlechtwetter! (-1 Würfel je Standort)	Problem der öffentliche Verkehrsmittel (+1 Würfel je Standort)

Figure 96 - Action Cards V1

The basis for the action cards was a list with all the different actions that might happen at an e-bike rental service. The second exercise was to estimate how these actions would affect the company and the player in the game.

After the list was completed a first draft was created in which the data from the list was transformed into cards format. Since the cards were just prototype, no special design was added. The cards were created using Microsoft Office Excel.

Figure 97 - Action cards V2

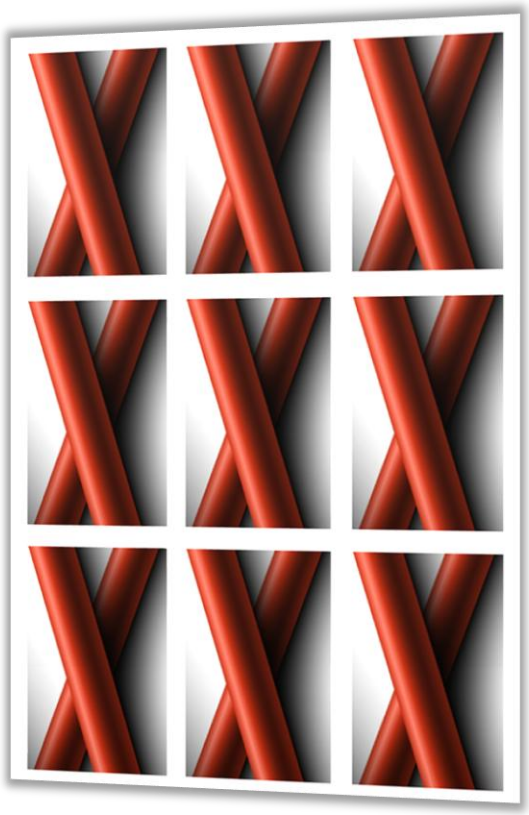


Figure 98 - Action Cards V2 Back

The final draft of the action cards was designed using Adobe PhotoShop. The content just change a bit in comparison to the earlier version. The focus was on the design. On the back of the cards an abstraction of the game logo is printed. The front page shows the event with an e-bike in the background. The front page is surrounded by a dark red frame which has nothing to do with the damage theme.

The Process Optimization Cards

The process optimization cards were developed later than the action cards, since process optimization was not a concern in the early stages of the board game development.

The basic idea of these cards is to show how the business processes, that the company runs through every day, can improved. Process optimization is an important factor in the real economy, therefore these optimization cards are also quite helpful to become successful in the BPMX Game.

Neuer Datenbankserver: Kundenidentifizierung digital (Aktionskarte)	Automatisches System zur Nachbestellung der Ersatzteile in der Werkstatt (Reparaturzeit -2 Tage)	Automatisches System zur Nachbestellung der Ersatzteile in der Werkstatt (Reparaturzeit -2 Tage)
Neuer Datenbankserver: Kundenidentifizierung digital (Aktionskarte)	halb-automatisiertes E-Bike-Service für 1 Standort (E-Bikes schon am nächsten Tag einsatzbereit)	halb-automatisiertes E-Bike-Service für 1 Standort (E-Bikes schon am nächsten Tag einsatzbereit)
EDV-Backup-System: Kein Verlust bei EDV-Problemen (Aktionskarte)	halb-automatisiertes E-Bike-Service für 1 Standort (E-Bikes schon am nächsten Tag einsatzbereit)	halb-automatisiertes E-Bike-Service für 1 Standort (E-Bikes schon am nächsten Tag einsatzbereit)
EDV-Backup-System: Kein Verlust bei EDV-Problemen (Aktionskarte)	Ankündigung eines Ausfluges(7 Räder)	

Figure 99 - Process Optimization Cards V1

Prozessoptimierungskarte Verfügbarkeit	**Prozessoptimierungskarte** Schadensfall	**Prozessoptimierungskarte** Schadensfall
halb-automatisiertes E-Bike-Service für 1 Standort	Automatisches System zur Nachbestellung der Ersatzteile in der Werkstatt	Automatisches System zur Nachbestellung der Ersatzteile in der Werkstatt
E-Bikes schon am nächsten Tag einsatzbereit	Reparaturzeit -2 Tage (für alle Räder)	Reparaturzeit -2 Tage (für alle Räder)
Prozessoptimierungskarte Verfügbarkeit	**Prozessoptimierungskarte** Verfügbarkeit	**Prozessoptimierungskarte** Verfügbarkeit
halb-automatisiertes E-Bike-Service für 1 Standort	halb-automatisiertes E-Bike-Service für 1 Standort	halb-automatisiertes E-Bike-Service für 1 Standort
E-Bikes schon am nächsten Tag einsatzbereit	E-Bikes schon am nächsten Tag einsatzbereit	E-Bikes schon am nächsten Tag einsatzbereit
Prozessoptimierungskarte Schadensfall	**Prozessoptimierungskarte** Schadensfall	**Prozessoptimierungskarte** Standardprozesse Teil 1
Kostenminimierung durch Verkleinerung des Lagers weil Lieferung Just-in-time	Kostenminimierung durch Verkleinerung des Lagers weil Lieferung Just-in-time	Anlegen eines Stammkundenverzeichnises => Einschulung nicht nötig
Kosteneinschätzung: 5 € / Rad	Kosteneinschätzung: 5 € / Rad	Würfeln wieviel Stammkunden => keine variablen Kosten bei Einschulung

Figure 100 - Process Optimization Cards V2

Like it was with the action cards, the basis for the development of the process optimization cards was also a list with the different optimizations and the affects when investing in the optimizations.

The first draft was just to get an overall understanding what these optimizations do and how they affect the companies daily rental processes. Both, the first and the second draft were designed with Microsoft Excel.

The second draft of the optimization cards was designed when the different themes were developed. The different colors make it possible to quickly see which process optimization can help in which theme. For instance, the red optimization cards improved the processes played in the damage theme. The second draft of the cards also included new and updated optimizations.

Figure 101 - Process Optimization Cards V3

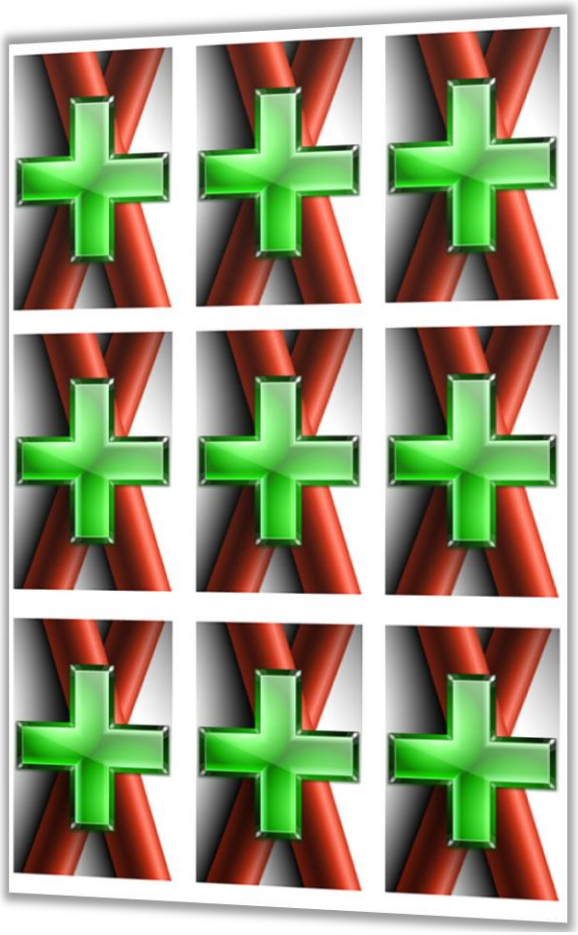


Figure 102 - Process Optimization Cards V3 Back

The final version was the first version designed in landscape. This version again brough updates and new optimization. The design is totally new. At the back the cards have the game logo with a plus sign in the foreground. This sign allows the players to quickly notice that this is an optimization card.
On the front side the information about the process optimization is printed. The cards are framed in different colors depenting on which theme it belongs to. The colors were just updated from version two.

The Interaction

The interaction is one of the highlights of our game. Players can interact in many ways. They can share bikes, replacement batteries or simply money. The idea came up at one of the last of our meetings with our stakeholders. The interaction with other players make the game even more realistic and unpredictable. Interactions are generally allowed in every phase of the game. There might be situations in which the transferring of e-bikes with other players is more useful, than in others. Obviously, the whole idea makes just sense with at least 3 players playing the BPMX Game. Interaction might be possible with two players as well, but the problem is that there is no competition going on.

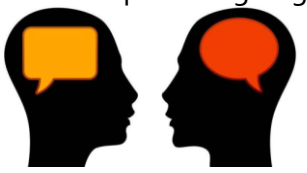


Figure 103 - Interactions - Source:metrics.net

The Theme Days

The creation of the theme days began, because it was too boring to play the same bike rental process every business day. The dice has to be thrown too often and the players had to went through every step of the process board. A way had to be introduced, which make it possible to just play a part of the whole process board.

This problem was solved using themes. It was hard to decide on the names for this themes. It was easy to decide on the themes damage and availability. Marketing and process optimization were more difficult to create.

The first idea was to play every business week in another theme. Later, it turned out that this way is static and predictable, therefore the suggestion was to play a different theme every day.

Figure 104 - Theme Cards

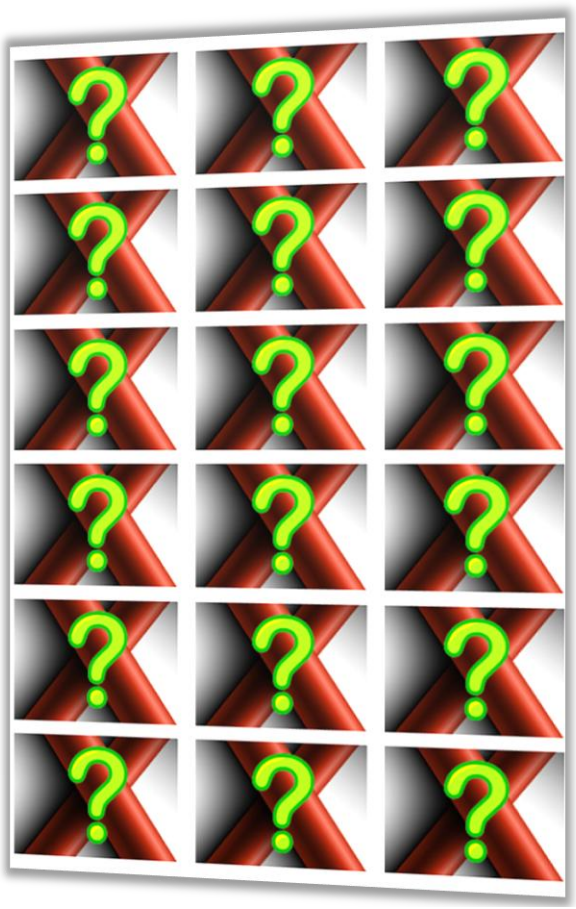


Figure 105 - Theme Cards Back

Every theme card has its own color. There are also symbols that indicate what the theme is about. Another thing that gives a good overview is the description of the business processes that are played with this theme.

At the back, the cards have a question sign, because player usually does not know what them will be played next. This mechanism also makes the game feel more alive. In the background, the logo is placed.

The Image System

The most complex system to develop was the image system. There were many prototypes that worked quite well, but the problem always was that the image was hard to calculate. The calculation was not possible without the assistance of the mobile app.

Finally, at the very last phase of the game development, a good way of representing the e-bike rental companies image was found.

Image Bricks	Customer Impact
0	- 2
1-2	- 1
3-7	+/- 0
8-9	+ 1
10	+ 2

Table 106 - Image System V1

First, the image made only little impacts on how many customers go to the e-bike rental. Later it turned out, that the impact was too little and a new design was developed.

Image Bricks	Customer Impact
0	- 4
1	- 3
2	-2
3	-1
4-6	0
7	+1
8	+2
9	+3
10	+4

Table 107 - Image System V2

The image system and the marketing actions to improve the company's image are displayed on the process board at the left center.

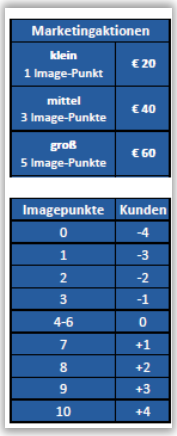


Figure 108 - Image System on Process Board

Testing

Testing was by far the most important tool the improve the BPMX Game. Every time after new update was added to the game, the testing was the indicator which quickly showed if the changes applied were useful.

Testing was not only done by project members, but also by other people who have not played the BPMX Game before.

Creating the Game

Beside the development of the design, the board game also needed to be produced physically. A lot of effort was necessary to built the game. Materials like cardboard, LEGO bricks and play money had to be organized. The game box also needed to be created and the boards had to be printed in a print shop.

The Box

The box was created using an existing one from a compendium of games. This box was taken and redesigned using the BPMX Game logo. The logo was printed in the A4 format and then positioned at the center of the front side on the box. The background was painted with spray colors.

Figure 109 - The Box

The Lego Bricks

The initial idea was to use Lego Serious Play to represent e-bikes, replacement batteries and the processes in an user-friendly was. The problem was that not enough resources were provided to be able to afford a Lego Serious Play kit. A simple starter kit would have cost more than € 100, which was too much for our partners. Without the support of others it wasn´t possible to buy that.

Plan B was to use ordinary Lego bricks to represent the company, the image of the company, the e-bikes and the batteries. With a little imagination and the help of symbols it was also possible make the design user-friendly.

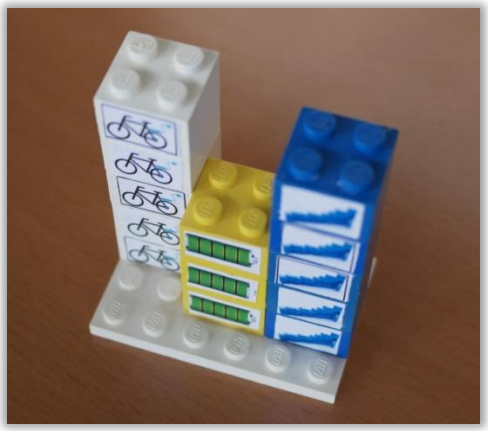


Figure 110 - The Lego Bricks

The Boards

The business and the process board were brought to a print shop, where the design was printed on a appropriate sheet of paper in the DIN-A3 format. In order to finalize the boards, cardboard was cut in the right size and glued on the back of the boards. At the very end the business boards was folded in order to be able to fit into the game box.

Figure 111 - Creating the Boards

The Cards

The production of the game cards was nearly the same as it was with the gaming boards. Instead of using cardboard, the front and the back of each card were just printed out using stiff paper and then the two sides were glued together.

Figure 112 - Creating the Cards

Dice & Money

First, the idea was to design the play money on our own. Later, it turned out that Monopoly money was an alternative that needed less effort.
Finally, it was decided to use 'DKT' money, because the original euro design makes the game more realistic. Dices from another game were used in the BPMX game, since it is unnecessary to produce own dices.

Figure 113 - The Play Money

Playing the Game

This section provides an extremely detailed description of all possible situations that can occur when playing the BPMX Game.

The game is presented using photos of example situations and different scenarios.

A quick guide with pictures of how the game works can be found in the gaming rules section.

Introduction

The BPMX Game is made for 1-3 players. Playing alone is only recommended for teaching purposes. The game is design to be fun and informative at the same time.

Contents

1 Business Board
1 Process Board
2 Dice
28 Theme Cards
30 Process Optimization Cards
45 Action Cards
3 Company Plates (1 red,1 white, 1 black)
90 E-Bikes (30 red, 30 white, 30 black)
40 Replacement Batteries (yellow)
30 Image Points (blue)
40 200 Euro
40 100 Euro
40 50 Euro
40 20 Euro
40 10 Euro
40 5 Euro

Figure 114 - Contents

Setup

1. The action card stack and the process optimization card stack are shuffled and placed on the business board.
2. The theme cards are also shuffled and each of them is placed upside down on a business day.
3. The process board lays next to the business board.
4. If the mobile app is used in the game, the QR-Code can be scanned in order to start the game.

Figure 115 - Setup

5. Each player receives € 1.000 as start capital.
6. Each player also receives 1 company plate in the color of his choice with 5 e-bike bricks and the start image of 5 image bricks.
7. The remaining money, e-bikes, replacement batteries and image points are placed in the bank, next to the business board.

Figure 116 - Start Capital

The start capital is also printed on the process board:

Start
1 Unternehmenstafel
€ 1.000
1 Standort
5 E-Bikes
5 Image-Steine

Figure 117 - Process Board - Start Capital

Start

1. At the beginning, the theme cards of the first business week needed to be turned around. The other theme cards remain upside down.

2. All players place their company plates on Monday of the first business week, which is located right next to the start flag.

3. The player who throws the highest dice score starts first. The other players follow in a clockwise direction around the board.

Figure 118 - Start

The Goal

The winner of the game is the player that has the highest capital after one business month. Capital is counted by building the sum of cash, e-bikes, batteries, locations and process optimizations.

It is also possible to play more months, if all players agreed on it beforehand.

Beside trying to run the company as successful as possible, another goal is that the players realize how business processes work within a company. The object of the game is to teach the understanding of business processes.

Playing the Game

The player, who has its turn, always has to complete the same 4 stages:

1. **Action Card**: The player takes the first card of the action card stack, lays it down next to the stack and reads it out loud. Every player of the game is affected by the special event on that business day. Action Cards are not played on damage theme days.

2. **Business Processes**: Depending on which theme card is currently active, the e-bikes on all locations, of all players, have to run through the particular business processes on the process board. When the e-bikes have run through all the processes, the business day is over and the e-bikes jump back to the company plate on the business board.

3. **Interaction** (optional): After completing the three mandatory processes the player, who has its turn, has to option to trade e-bikes and batteries with other players.

4. **Investments** (optional): At the end of the turn, the player that has its turn has the option to invest his money in
   - locations on Mondays,
   - e-bikes/ replacement batteries during availability theme,
   - process optimizations during process optimization theme and
   - marketing plans during the marketing theme.

   All players have the opportunity to invest in new locations on Monday.

After the players have completed the 4 stages, the company plates move on to the next business day.

On each Sunday, all players have to pay € 100 fix costs for each location they have. If a player has the process optimization **Automated Accounting**, he only has to pay € 50 fix costs for each location.

The game ends when the players have completed the last business day of the last round.

The 4 Stages Explained in Detail:

Action Card

The purpose of the action cards is to make the players aware of the random events that happen during daily business.

Action cards are played in every round except on damage theme days.

Figure 119 - Playing an Action Card

The action card is read by the player who has its turn. The action card effects all players in the game. After the action card is played, it is returned upside down at the bottom of the stack.

Action Card	Action	Explanation/Effect
	Two customers used the online portal to make reservations for the 9th of the current business month.	This card will be laid down next to the specific business day on the business board. The next time the players play this day, additional bikes will be required. If the day was already went by this month, the will take effect in the next month.
	A thief has stolen one of our e-bikes.	Every player has to return one e-bike of his company to the bank.

	The IT causes troubles. We have to give a discount of 50 % on this business day.	The earnings are reduced by 50 %. If a player makes € 50 profit, he will only get € 25.
	The customer identification is done by hand and causes delays. We have to give a discount of 50 % at location 1.	The earnings are reduced by 50 %. If a player makes € 50 profit, he will only get € 25. If a player has the corresponding process optimization, the earnings are not reduced.
	One of our competitors near Graz Hauptbahnhof launches an action day.	All players lose two customers at location 1.
	A tourist group arrives at the main square Graz.	Two dices have to be thrown at location 2. The sum represents the customers on location 2. If the current theme is damage this might have negative effects, because more e-bikes are defect.
	Public transport in Graz has some delays.	Two dices are thrown at each at location a player is present. The sum represents the customers on that location. If the current theme is damage this might have negative effects, because more e-bikes are defect.
	Bad weather in Graz!	Each location loses 2 customers on that business day. If for example a 5 is thrown, only 3 customers actually come.

Figure 120 - Explanation of the Action Cards

Business Processes

The heart of the game are the business processes shown on the processes board next to the business board. Since it would be boring to play all business processes each day, only the ones that belong to the current theme are played.

First of all the current theme has to be identified. This is indicated by the theme card on which the company plate are standing.

Example: This player is currently playing an availability theme day, because his company plate is placed on the availability theme card.

Figure 121 - Example: Availability Theme

The Different Themes Explained in Detail:

Marketing

Figure 122 - Marketing Theme Card

The marketing theme gives only the player that has its turn the opportunity to improve the image of the company!

Depending on the satisfaction of the customers, the image of all players will change!

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Kundenidentifikation	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)
Bezahlung	+ 20 € / E-Bike	+ 20 € / E-Bike	+ 20 € / E-Bike

Figure 123 - Marketing Theme Processes

The processes played on the marketing theme days are:

1. **Customer Identification**: Explained in the section Common Processes.

2. **Payment**: Explained in the section Common Processes.

After the processes are finished, the e-bikes are returned to the company plate on the e-bike stack.

Depending on whether all customers were served, the **image** of all companies change:

- If a player had enough e-bikes to serve all customers, his image will increase, adding another image brick (blue) from the bank to the image stack.
  If the player already has the maximum of 10 image points, no more brick is added.

- Otherwise, the image will decrease and the player has to give one image brick back to the bank.
  If the player already has the minimum of 0 image points, no brick can be given back.

During the investment stage, the player that has its turn has the opportunity to improve the image of his company using marketing actions.

The different marketing options are shown on the process board:

Marketingaktionen	
klein 1 Image-Punkt	€ 40
mittel 3 Image-Punkte	€ 150
groß 5 Image-Punkte	€ 300

Figure 124 - Process Board - Marketing Actions

Marketing	Action	Price	Effect
Small	Flyers are handed out on the Hauptbahnhof.	€ 40	1 image brick can be added to the company´s image stack.
Medium	An advertisement is placed on the social network platform Facebook.	€ 150	3 image bricks can be added to the company´s image stack.
Large	An advertisement is placed in the local newspaper Kleine Zeitung.	€ 300	5 image bricks can be added to the company´s image stack.

Figure 125 - Marketing Actions

Process Optimization

Figure 126 - Process Optimization Theme Card

The player that has its turn has the chance to optimize his processes to operate more effective. Process optimizations have many advantages, for instance, they reduce cost.

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Kundenidentifikation	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)
Einschulung	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Übergabe	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Rückgabe	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Bezahlung	+ 20 € / E-Bike	+ 20 € / E-Bike	+ 20 € / E-Bike

Figure 127 - Process Optimization Theme Processes

The processes played on the process optimization theme days are:

1. **Customer Identification**: Explained in the section Common Processes.

2. **Instruction**: The customers need to get instruction on how to correctly use the e-bike and the equipment.
   Each player has to pay € 5 variable cost for each for e-bike, except he has the process optimization card: **Regular Customer Directory**.
   It is advised to accumulate and subtract the costs when each player receives the customer payment.

3. **Handover**: The e-bike needs to be handed over using staff.
   Each player has to pay € 5 variable cost for each for e-bike, except he has the process optimization card: **Automated Check-In/Out**.

4. **Return**: The e-bike needs to be returned to the staff.
   Each player has to pay € 5 variable cost for each for e-bike, except he has the

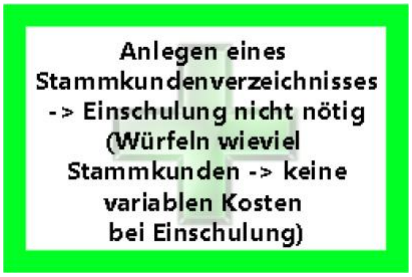
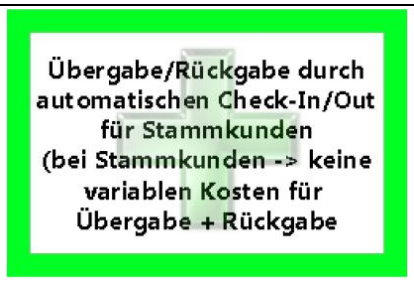
process optimization card: **Automated Check-In/Out**.

5. **Payment**: If the costs where accumulated and the player had no process optimization the return would be € 5 for each e-bike. Exact explanation in the section Common Processes.

After the processes are finished, the e-bikes are returned to the company plate on the e-bike stack.

During the investment stage, the player that has its turn has the opportunity to improve the processes in his company buying process optimizations.
If a player decided to invest in a process optimization, he can look through all cards on the process optimization stack and decide which one he wants to take. He has to lay this card in front of him on the table, that all other players can see it.

The process optimizations with the green frame affect the process optimization theme, the ones with orange frame affect the availability theme, the red framed cards affect the damage frame and the cards with purple frame generally effect the game.

Process Optimization Card	Action	Explanation/Effect
	A regular customer directory is created. Customers no longer need to be instructed.	The player does not have to pay € 5 variable cost for each e-bike.
	Handover and return are enforced using an automated check-in/out for customers. Staff is no longer needed.	The player does not have to pay € 5 variable cost for each e-bike during the handover and return process. He saves € 10 for each e-bike in total.
	Semiautomatic e-bike service for one location.	The e-bikes are available on the next day, if enough replacement batteries are available too.

Automatisches System zur Nachbestellung der Ersatzteilein der Werkstatt (Reparaturzeit -2 Tage für alle Räder)	Automated system to reorder e-bike replacement parts.	If damage occurs, the e-bikes will be available 2 days earlier than expected
Kostenminimierung durch Verkleinerung des Lagers weil Lieferung Just-in-time (Kosteneinschätzung: 5 € / Rad)	Cost reduction through shrinking the stock. The shrinking is possible because of just-in-time delivery.	Only € 5 each e-bike are needed for repair.
Automatische Abrechnung (Standortfixkosten / Monat 50 € (= -50 €)	Automated accounting.	Only € 50 fixed cost have to be paid on the Sundays for each location.
Neuer Datenbankserver: Kundenidentifizierung digital	New database server: customers are identified digital.	No more problems with the action card **Customer Identification by Hand**. 
EDV-Backup-System: Kein Verlust bei EDV-Problemen	An IT backup system is bought.	The player has no more problems with the action card **IT Problems**. 

Figure 128 - Process Optimization Cards

Availability

Figure 129 - Availability Theme Card

During the availability theme, the player that has its turn has the chance to reach high availability by investing in e-bikes and replacement batteries.

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Kundenidentifikation	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)
Bezahlung	+ 20 € / E-Bike	+ 20 € / E-Bike	+ 20 € / E-Bike
Akku laden	Dauer: 1 Tag (Ersatzakkus)	Dauer: 1 Tag (Ersatzakkus)	Dauer: 1 Tag (Ersatzakkus)
Reinigung Standardservi	Dauer: 1 Tag (Prozess-optimierung)	Dauer: 1 Tag (Prozess-optimierung)	Dauer: 1 Tag (Prozess-optimierung)

Figure 130 - Availability Theme Processes

The processes played on availability theme days are:

1. **Customer Identification**: Explained in the section Common Processes.
2. **Payment:** Explanation in the section Common Processes.

3. **Charging Batteries**: The e-bikes that do not have a replacement battery need to be charged and therefore are not available on the next business day.

4. **Cleaning and Service**: The e-bikes need to be prepared for the next customer which will take the next day, if the player does not have the process optimization card **Semi-automated Service.**

The e-bikes may only be returned to the company plate on the e-bike stack, if the player has both: enough replacement batteries and the process optimization card.

If the player does not have the process optimization card, the e-bikes want be available on the next business day. He has to place the e-bikes not on his company plate, but on day on which day are available again. This day is two days ahead, because the e-bikes cannot be used on the next day.

If the player has the process optimization card, but not enough replacement batteries (yellow bricks) the e-bikes without replacement battery will be unavailable the next day.

Example: Because player white has the process optimization card and enough replacement batteries (5) for all e-bikes (5), he is able to put his e-bikes back on his company plate, after he finished the business day on the process board.

Figure 131 - Example: Availability

Damage

Figure 132 - Damage Theme Card

The nightmare of every e-bike rental service!
Damage occurs!
E-bikes need to be repaired!
They become unavailable!

The damage theme is the only theme in which the identification and the payment process are not played. It is also the only theme, where the player that has its turn, has not the possibility to make individual investments. Nevertheless, trading is allowed.

The damage theme is the only one on which no action card is played!

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Sichtkontrolle	Würfeln (Anzahl der betroffenen Räder)	Würfeln (Anzahl der betroffenen Räder)	Würfeln (Anzahl der betroffenen Räder)
Schadensabschätzung	Wüfeln (Dauer der Reparatur)	Wüfeln (Dauer der Reparatur)	Wüfeln (Dauer der Reparatur)
Kostenschätzung	- 10 € / Rad	- 10 € / Rad	- 10 € / Rad
Reparatur	Räder sind vorübergehend nicht einsetzbar	Räder sind vorübergehend nicht einsetzbar	Räder sind vorübergehend nicht einsetzbar

Figure 133 - Damage Theme Processes

The processes played on damage theme days are:

1. **Visual Inspection**: Throw the dice for each location. The result divided by 2 represents the number of e-bikes damaged (i.e. 6 or 5 => 3 e-bikes; 4 or 3 => 2 e-bikes; 2 or 1 => 1 e-bike).

2. **Damage Estimation:** Throw the dice again for each location. The results shows how many days it will take until the e-bikes are available again.
   Players with the optimization card "**Automated replacement part ordering system**" can subtract 2 days of the total repair time.

3. **Cost Estimation**: The repair costs € 10 for each e-bike.
   Players with the optimization card "**Cost reduction through small stock**" only have to pay € 5 for each e-bike.

4. **Repair**: The e-bikes are placed on the business day on which they are available again.
   Example: If the damage occurs on Monday and the repair time is one day, the damaged e-bikes are placed on Wednesday, because then they are available again.

If the damage can be repaired on the same day, the e-bikes will be returned immediately to the e-bike stack on the company plate.

No special investments are possible on a damage day. Trading with other player is possible, of course.

The Common Processes:

1. **Customer identification**:

a) Throw the dice! If all players of only one location the dice is thrown once. If one or more players have 2/3 locations, the dice has to be thrown twice/three times. The result of the throw represents the number of customers that rent an e-bike on that day. The first throw represents the number of customers on the first location, the second throw represents the number of customer on the second location and so on...
Every player has the same amount of basic customers on that business day.

b) The total number of customers for each player depend on the company's image. Customers might be added or subtracted.
How the number of image bricks impacts the number of customers that come every business day, is explained on the process board:

Imagepunkte	Kunden
0	-4
1	-3
2	-2
3	-1
4-6	0
7	+1
8	+2
9	+3
10	+4

Figure 134 - Process Board - Image

The minimum of 0 image bricks means that 4 customers go away on each location each business day. On the other hand, if a player has 10 image points, on each location 4 additional customers will rent an e-bike each business day.

c) Now each player puts the stack with the number of e-bikes required on the field. If a player has two locations and one location has too less e-bikes he can quickly transfer the e-bikes from one location to another.
If a player has too less e-bikes not all customers can be served.

Example: It is the turn of player black. Since player red has already 2 locations, player black throws the dice twice.
The first time he throws a 2. Because all players have 7 image bricks, everyone adds one customer. Each player puts 3 e-bikes on the customer identification location 1 field.
The second throw shows 4. Because only player red has bought location 2 only he is allowed to put 5 e-bikes on the customer identification location 2 field.
Player black does not have to throw the dice a third time, as no player has bought location 3.

Figure 135 - Example: Customer Identification

2. **Payment**:
Each player receives € 20 from each customer on each location.

Example:
Three customers rent e-bikes at location 1, two rent e-bikes at location 2. Since only player white has bought location 2, only he will receive money from the customers that were at location 2.

Player red gets 3 x 20 € = 60 €
Player white gets 3 x 20 € + 2 x 20 € = 100 €

If they currently play the marketing theme, all players will be allowed to add one image brick to their company image stack, because all customers are satisfied.

Figure 136 - Example: Payment

Interaction

The idea of the interaction is to make the game feel more realistic and exciting.

The interaction phase starts at the end of the day, when the business processes were completed. The player that has its turn is the one who has the possibility to start trading. No other players are allowed to trade anything.

It is basically allowed to trade everything, except image points. The price is set by supply and demand, like it happens in real economy.

Investments

At the end of the turn, the player that has its turn has the option to invest his money.
Depending on the current theme and weekday, different inventions are possible.

During the marketing theme the player can buy marketing actions for a price starting at € 40 up to € 300 to improve the company´s image.
During the process optimization theme, process optimizations can be bought for € 200 each.
During the availability theme additional e-bikes (€ 100) and replacement batteries (€ 20) can be bought.
The damage theme provides no special investments.

On Mondays, all players have the opportunity to invest in new locations. This is the only day where not only the player that has its turn, is able to make investments. Up two 3 location can be bought. A single location costs € 500.

The Investment costs are printed on the business process board in the bottom left corner:

Kosten	
Standort (Mo)	€ 500
E-Bike	€ 100
Ersatzakku	€ 20
Prozess-optimierung	€ 200
Standort- Fixkosten/W	€ 100

Figure 137 - Cost of the different Investments

Scenario

The game was tested with player that used different strategies. In one test, player black tried the quantity way and invested in new locations and e-bikes. Player white preferred the quality way and bought process optimization cards and marketing actions. After two business month the result was quite similar. Both ways had their advantages and disadvantages. The capital of both players was nearly the same.

Feedback

Another interesting and also important aspect was the feedback from our test players:

Michael, "Nice! I already have the idea to plan my on startup with an e-bike rental service. I believe I know the processes in this business really well. Tomorrow I will go and rent an e-bike in Graz, because I want to see if it really works this way. The only thing I criticize on the game is that I have to throw the dice that often. This should be improved, as it drives me mad."

Raphael, "What I like about this game is that the course of the game is based on my decisions. In many situations I had to ask myself if I should invest in this or that. Should I buy an e-bike now or the next round? What I think is confusing is are the gaming rules. They need to be explained once more in detail."

Rules of the Game: Quick User Guide with pictures

Amount of players: 1-3
Beginning:

- Budget: € 1.000
- Subsidiaries 1
- Amount of Bikes: 5
- Image: 5

Open the WebAPP

Goals:

The fundamental use of this game is to see how simple actions can affect the tendency of your business.
The goal of this game is to find out how your way of gaming influences, the budget, the amount of customer, the amount of subsidiaries and the image of your E-Bike Rental Service.

Game Flow:

1. First of all you have to arrange the amount of rounds you want to play among one another, we would recommend that you play at least 4 rounds.
2. Then one player has to place the process optimization cards for one week. There are no rules for it, except that there has to be exact one card on one field.
3. Then you have to invest your budget, it is your personal choice where you spend your money on. This is your first decision in the game, because either you invest in bikes or in locations.
4. You are also allowed to trade, lend bikes from other players. The price is decided from you.
5. Place your business meeple on the field "START".
6. At the beginning of your turn:
    a. You have the choice to buy new bikes, subsidiaries and process optimizations
    b. Afterwards you have to pick the action card on top. The action card tells you what to do.
    c. Then you have to cast the dice for each subsidiary. The pip of the dice show you the amount of clients you get for this date.
    d. If you have less than bikes than amount of the clients, you lose some image. (See at the extra declaration point "Image")
    e. Afterwards you come to the process board. You use the amount of bikes you need, for each subsidiary, and put the bikes on the process map
        i. Follow the instructions written on the board.
7. Insert your data in the WebApp.

Image:

You start with a neutral image of 5. This means you have to gain some, to get a more customers. There are 2 possibilities, how your image increases.

- You can buy image on certain marketing campaigns.
- Or receive some if you have good luck with your action cards.

But you also can also some image, which has a negative effect on your potential clients.

The Game Flow Explained with Pictures:

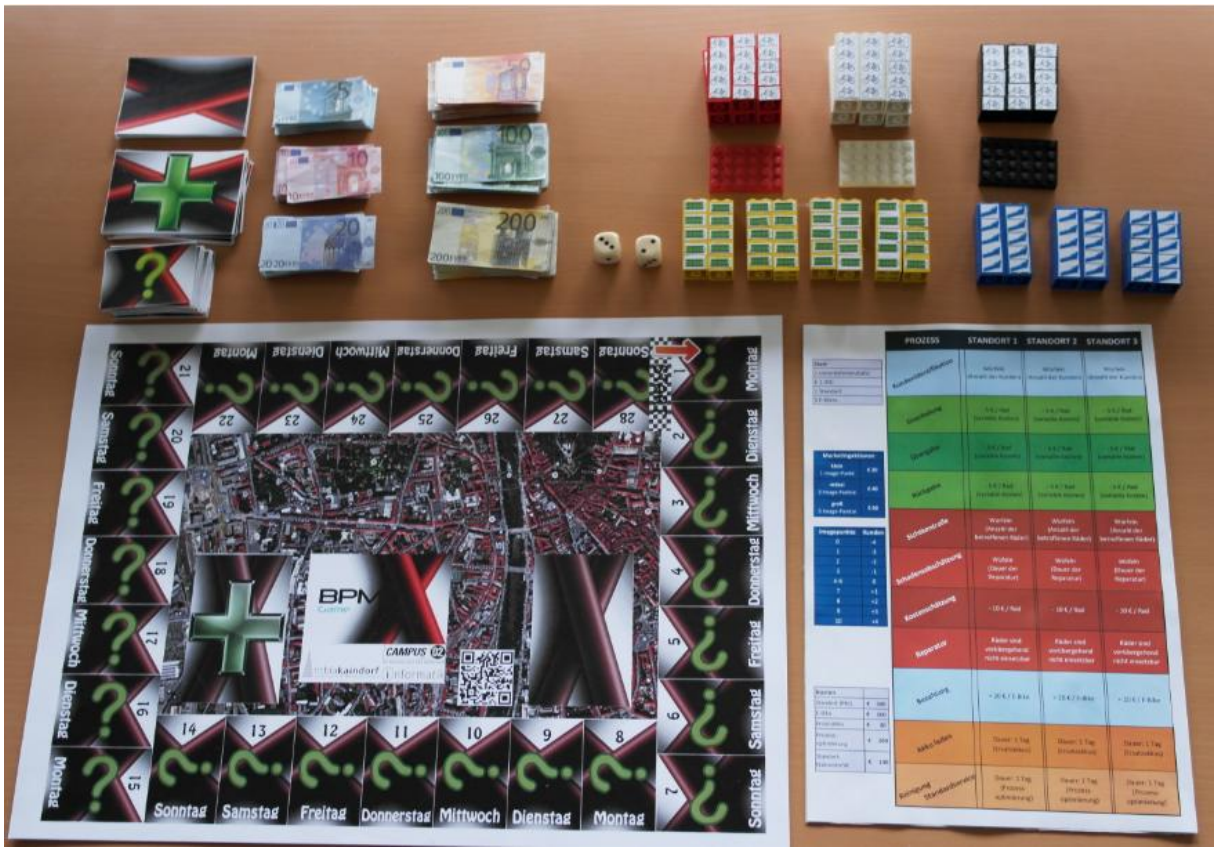
1. 

Figure 138 Board

2. 

Figure 139 Board with Theme Cards

3. 

Figure 140 Players

4.  FOR 

5. 

Figure 141 Start

6. Further
    a. You can trade money for some objects, explained above

b. 

Figure 142 First action

c. 

Figure 143 Dices

d. for each subsidiary; in this case you get 5 clients for the one subsidiary
e. Image symbolized on the app

f.

Figure 144 Process Board

i.

Figure 145 Payment

7.

Figure 146 Webapp

Meeple Description:

All meeples can have any color.

Figure 147 Subsidiary

: Symbolizes 1 subsidiary

Figure 148 1 Bike

: Symbolizes 1 bike

Figure 149 Business

Symbolizes your business

Figure 150 battery

: Symbolizes one battery

Board Description:

Action Cards: Follow the action, which is written on the card, (an example)

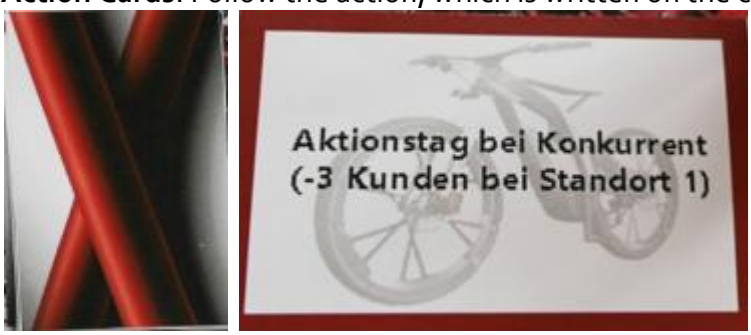
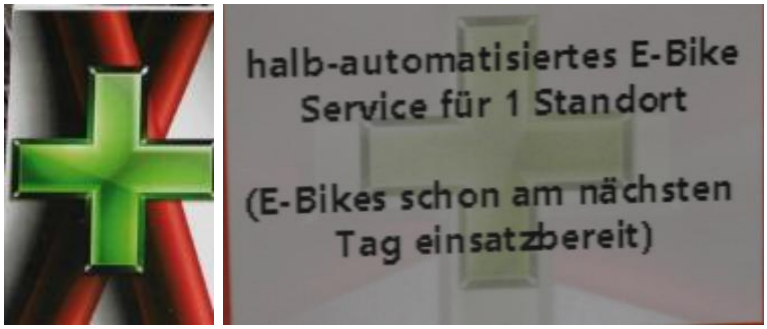


Figure 151 ActionCard

Main Board:

Process Optimization Cards:


halb-automatisiertes E-Bike
Service für 1 Standort
(E-Bikes schon am nächsten
Tag einsatzbereit)

Process Board:

Start
1 Unternehmenstafel
€ 1.000
1 Standort
5 E-Bikes

Marketingaktionen	
klein 1 Image-Punkt	€ 20
mittel 3 Image-Punkte	€ 40
groß 5 Image-Punkte	€ 60

Imagepunkte	Kunden
0	-4
1	-3
2	-2
3	-1
4-6	0
7	+1
8	+2
9	+3
10	+4

Kosten	
Standort (Mo)	€ 500
E-Bike	€ 100
Ersatzakku	€ 20
Prozess-optimierung	€ 200
Standort-Fixkosten/W	€ 100

PROZESS	STANDORT 1	STANDORT 2	STANDORT 3
Kundenidentifikation	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)	Würfeln (Anzahl der Kunden)
Einschulung	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Übergabe	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Rückgabe	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)	- 5 € / Rad (variable Kosten)
Sichtkontrolle	Würfeln (Anzahl der betroffenen Räder)	Würfeln (Anzahl der betroffenen Räder)	Würfeln (Anzahl der betroffenen Räder)
Schadensabschätzung	Würfeln (Dauer der Reparatur)	Würfeln (Dauer der Reparatur)	Würfeln (Dauer der Reparatur)
Kostenschätzung	- 10 € / Rad	- 10 € / Rad	- 10 € / Rad
Reparatur	Räder sind vorübergehend nicht einsetzbar	Räder sind vorübergehend nicht einsetzbar	Räder sind vorübergehend nicht einsetzbar
Bezahlung	+ 20 € / E-Bike	+ 20 € / E-Bike	+ 20 € / E-Bike
Akku laden	Dauer: 1 Tag (Ersatzakkus)	Dauer: 1 Tag (Ersatzakkus)	Dauer: 1 Tag (Ersatzakkus)
Reinigung Standardservice	Dauer: 1 Tag (Prozess-optimierung)	Dauer: 1 Tag (Prozess-optimierung)	Dauer: 1 Tag (Prozess-optimierung)

Web App Usage

The BPMX Web App supports the BPMX Game in numerous ways and generates a statistic for your gaming session based on your concluded business days, bought resources and optimized processes. However, this is only possible if you know in which cases and how to use the web app in order to generate a meaningful. Therefore the use cases of the web app during your gaming session are now explained.

Business Day

At the beginning of a business day you gather the information which is necessary to successfully conclude it which are:

1. business day theme
2. available bikes
3. estimated number of customers
4. reservations for the business day
5. action card action

Note: On damage event (Schadensfall) business days you do not evaluate the number of estimated customers, but the number of damaged bikes of the business day. Furthermore action cards are not used on damage event (Schadensfall) business days.
After you gathered all this information you navigate the business day (GeschäftstagI tab in the web app.

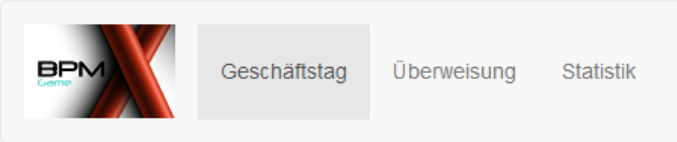


Figure 152 Navigation Bar

Figure 153 Business Day Screen

1 Firstly you select the theme of the business day which is done by opening the theme (Thema) dropdown menu and selecting the determined theme.

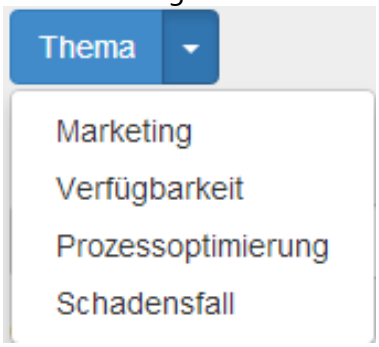


Figure 154 Theme Selection

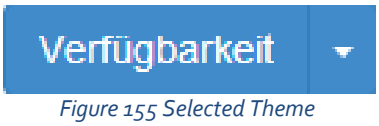


Figure 155 Selected Theme

2 After selecting the day of the theme you write the number of available bikes of your business into the number of bike (E-Bike Anzahl) text field.

3 Furthermore you write the number of estimated customers into the estimated customer (erwartete Kunden) text field

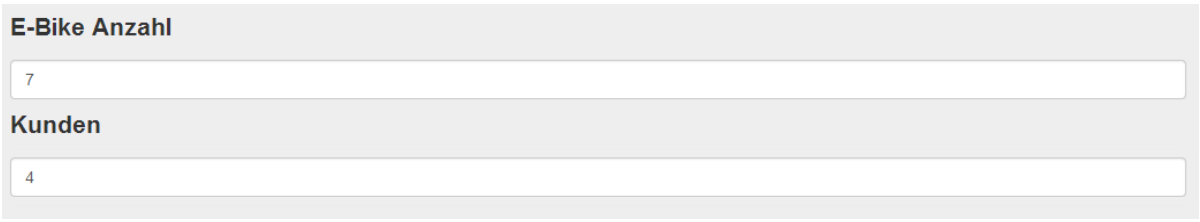


Figure 156 Input Fields

4 The next step is to check the reservations for the business day which were previously placed by an action card.

5 After that you write the action of the action card drawn for the current business day.

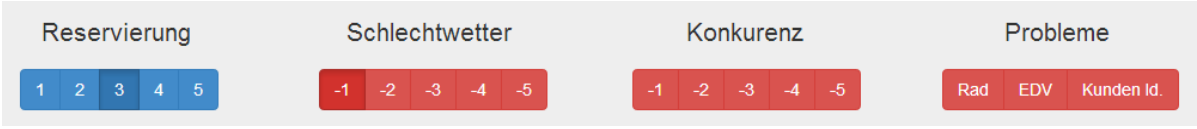


Figure 157 Action Selection

Note: Some action card actions do not affect the business day they are drawn on. Therefore it is now necessary to select an action on every business day.

6 Lastly you click the start business day (Geschäftstag starten) button.

After clicking the button the web app starts to calculate the actual amount of customers (Erschienene Kunden) based on your image, reservations, weather condition and competitors.
With the actual amount of customers (Erschienene Kunden) and the number of bikes (E-Bike Anzahl) the app calculates your satisfied (Zufriedene Kunden) and unsatisfied customers (unzufriedene Kunden).
Furthermore it calculates the profit or loss of the business day depending on the theme of the business day, your process optimizations and the number of satisfied customers (Zufriedene Kunden).

Figure 158 Result Fields

Now you can either save the result of the business day by clicking the end business day (Geschäftstag beenden) button which updates your statistic based on its results or you change your input and restart the business day by clicking the start business day (Geschäftstag starten) button again, if there was a mistake.

If you conclude your business day you are presented a new form to input the new business day information or the business day information for one of your subsidiaries for the current business day.

Transactions

In order to make transactions you navigate the transaction (Überweisung) tab in the web app which then shows you the all the possible transactions. You can issue transactions for paying resources our issue a transaction with a custom amount.

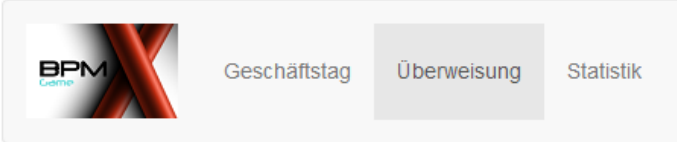


Figure 159 Transaction Tab

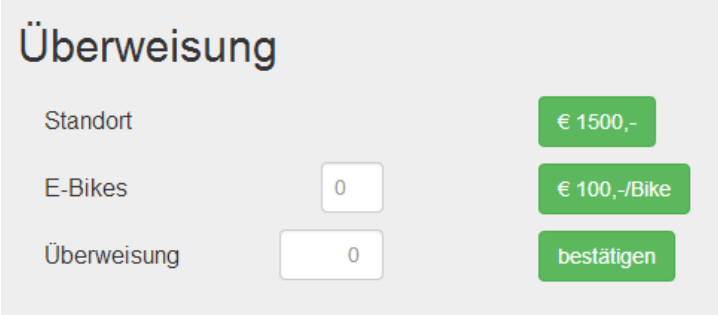


Figure 160 Transaction Screen

Note: If the current business day has the theme availability (Verfügbarkeit) you also have the possibility to acquire spare batteries.

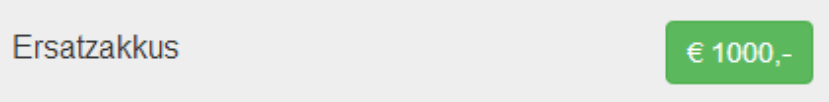


Figure 161 Transaction Option

Following all the available transactions are explained:

Subsidiary Site: In order to by a new subsidiary site you simply click the button representing the price of the new site.

E-Bikes: When you are intending to buy new bikes you write the desired number of bikes into the text field next to the description of the transaction. After that you buy them by clicking the button representing the price per bike.

Transaction For a transaction you need to provide the value of the transaction in the text field and then click the confirm (bestätigen) button to issue the transaction

Spare Batteries The spare batteries can only be bought on availability business days by simply clicking the button representing their price. Since you only need to buy spare batteries once the button's appearance changes and it says bought (gekauft).

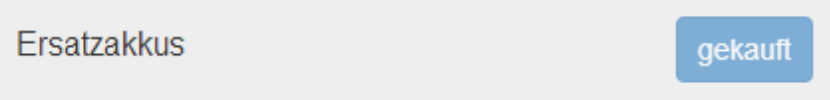


Figure 162 Bought Spare Batteries

Once you acquire new resources or you balance changes, because of a transaction you statistic is updated.

Statistic

You can display your current statistic, in order to evaluate you business' current development or to view you current balance, image, issued marketing campaigns or process optimizations.
For viewing the statistic you simply navigate to the statistic (Statistik) tab.

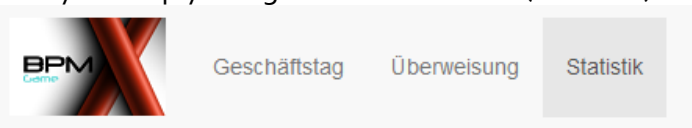


Figure 163 Statistic Tab

Process Optimization

The process optimization (Prozesse optimieren) tab is only available on availability business process days.

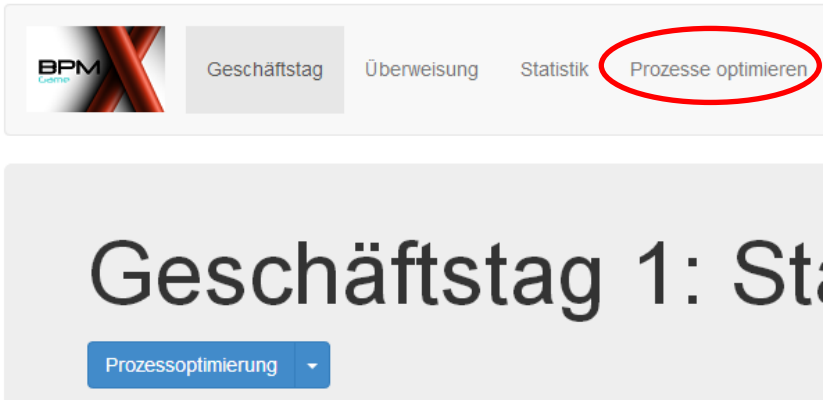


Figure 164 Process Optimization Tab Available

By clicking on it you navigate to the process optimization screen. On this screen you can see which process optimizations are available and what business day theme work flow they will affect. Now you can optimize processes by clicking on the button presenting the price next to the description of the optimization.

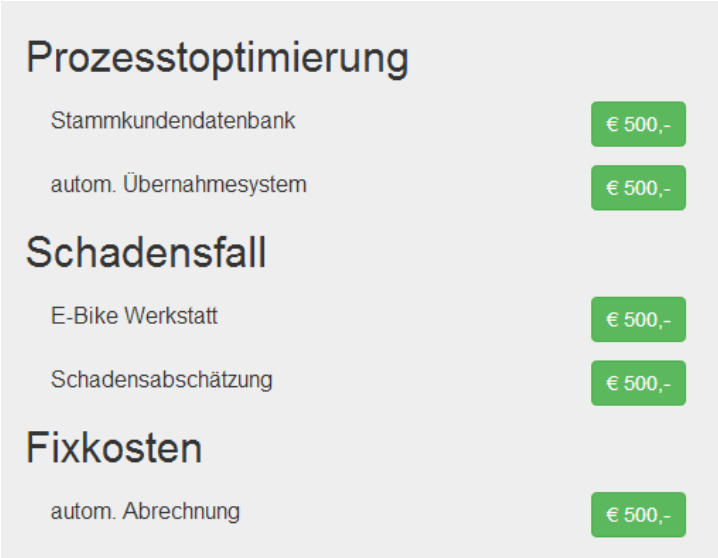


Figure 165 Process Optimization Screen

When you click this button you pay for the process optimization, it is recorded in your statistic and the business day theme work flow is affected by the optimization.

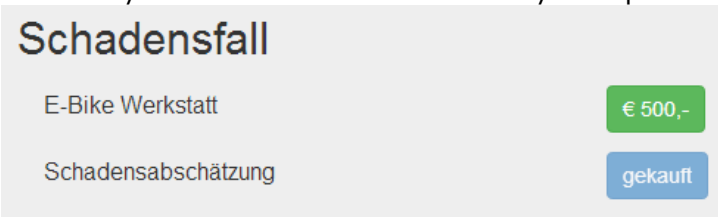


Figure 166 Process Optimization Bought

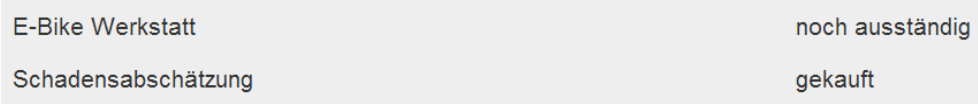


Figure 167 Process Optimization Statistics

Marketing

On a marketing business day the marketing (Marketing) tab is available.

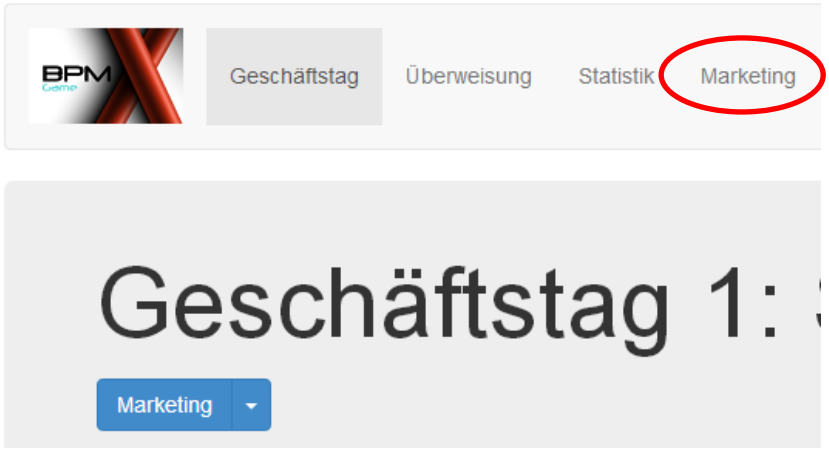


Figure 168 Marketing Tab Available

On the marketing screen, which you access by clicking the marketing (Marketing) tab, you can start small, regular or large marketing campaigns in order to improve you image. The amount of money you spend on the campaign determines its impact on your image.

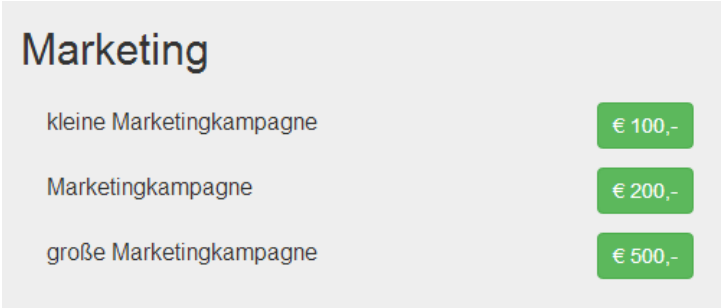


Figure 169 Marketing Screen

You start the campaigns by simply clicking the button representing their price. Once you click a button your statistic is updated in terms of started campaigns and image.

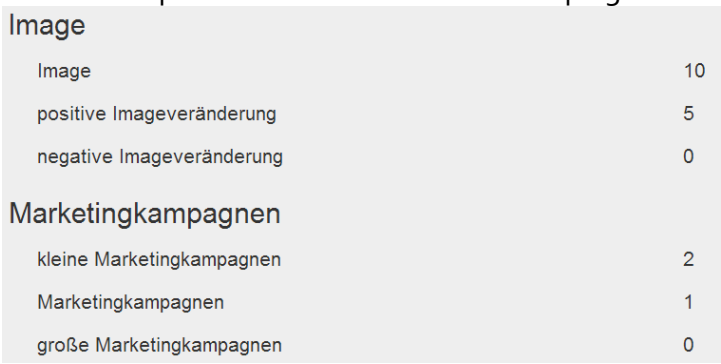


Figure 170 Image & Campaigns Statistic

Web App

We decided that we want to have software supporting our board game, in order to take away some complexity and tedious calculations from the game in order to improve the playing experience. Furthermore it takes away all the need to take notes
These arguments are the main reasons why we have coincided on the development of supporting software.

Requirements

General

A web app should be developed that supports the board game and allows the player to keep track of the development of his business. It should be accessible from any device with an internet connection and browser.
The app should eliminate the need to write something down or calculate, in order to minimize the resources needed for playing BPMX.

Start of the Business

Every player starts the game with a business site and five bikes. Furthermore he also has a base balance of € 2000,-.
With these resources the player needs to successfully run a business that rents out bikes to customers. In order to do so he needs to manage his bikes on business days and optimize his processes in order to create a better workflow and reduce costs.

Business Day

The business day describes one turn in the game, in which the players distribute their bikes and serve customers.
Firstly the estimated number of customers gets evaluated and an action card is drawn, which are basic information for a players turn. The number of actual customers however can differ from the evaluated estimation. This is due to the reputation of the player's business and the action of the drawn action card which influences the number of customers.
Despite evaluating the estimated number customers and the drawing of the action card, the theme of the business day is determined. This theme, which is evaluated out of four possible, is the same for each player and influences the work flow of the business day the most.
After 28 business day the business has to pay overhead costs of € 200,-.

Process Optimization

On a process optimization business day gives the players the opportunity to optimize their processes (e. g. installing a customer database). However they are still obliged to serve their customers. For each satisfied customer (a customer who rented a bike) the player earns a certain amount of money. The amount he actually receives depends on his businesses process optimizations. The minimum earnings per bike is € 5,-, whereas the maximum is € 20,-. Furthermore the player gains reputation if he is able to serve every customer, but he also loses reputation if he is not able to do so.
Each bike which was used to serve a customer needs to be maintained. Therefore it is not available on the following business day. The player can however buy spare batteries in order to make his bikes available on the following business day.

Availability

On an availability business day the player simply serves customers. On these business day he always receives € 20,- for each successfully served customer. If every customer was satisfied on this business day the player's business yet again gains reputation. Otherwise he loses reputation.
Again the used bikes need to be maintained. Their availability on the following business day again depends on the availability of spare batteries which enables the player to use his used bikes on the following day.

Marketing

The marketing business days are similar to the availability business days, since the player also receives € 20,- for every satisfied customer. His reputation develops based on the satisfied customers. So the player's business' reputation grows in case he has successfully served every customer on a marketing business day, otherwise it decreases.
After the business day there is the need to maintain the used bikes which availability on the following day depends on the availability of spare batteries.

Damage Event

The damage event business day differs from the three other business day types. Firstly the player does not evaluate the amount of estimated customers on the business day, but the amount of damaged bikes on this particular day. Secondly the player evaluates the amount of days these bikes will be unavailable.
For every damaged bike the player needs to spend money for the reparation. This amount depends on the degree of his process optimizations for the damage event business days. Furthermore he can speed up the repair process by improving his processes.
Other than on the other three business day themes the player does not lose or gain any reputation on damage event days.

Transaction

Regardless of the theme of the day the player can make certain transactions. However there is one transaction which can only be done on availability business day.
There are some which have a predefined value whereas some have to be negotiated.

Subsidiaries

The player can expand his business by opening new subsidiaries. For every new subsidiary site he needs to pay € 1500,-, but other than the starting site, these subsidiaries do not have any bikes available.
Now every turn the player also needs to handle the work flow of a business day at the new subsidiary site.

E-Bikes

Of course the player can increase the amount of available bikes by buying new ones. Each new E-Bike costs € 100,-. The newly bike can be distributed across the renting sites as the player wishes, in order to keep the availability at a high degree.
This higher availability can be achieved with spare batteries too.

Spare Batteries

On availability business days the player is also able to buy spare batteries for his business. This improvement costs € 1000,- once.
These spare batteries enable the player to make the used bikes of a business day (except damage event business days) available on the following day resulting in an efficient business although he does not own that much bikes.

Marketing

The player's image is not only determined by the times he is able to satisfy all the customers on a business day (except damage event business days). On marketing business day the player is given the possibility to star marketing campaigns in order to recover a previously damaged image or improve his already considerable image
There are three possible marketing campaigns the player can launch. Each will positively affect his business's image differently, based on its costs.

Process Optimization

On process optimization business days the player is able to optimize his processes in order to improve his business' efficiency. There are optimizations for the business day themes process optimization and damage event.
The process optimizations for the process optimization theme enable you to improve your work flow by e. g. installing a customer database. These improvements take away some of the costs produced during this workflow and therefore raise your profit on process optimization business days.
On the damage even business days the player can improve the repair time by establishing a bike workshop, which repairs damaged bikes faster than a third party company, since it takes away the commissioning and delivery time to these companies.
Since all those costs are no longer a factor the player can improve his bikes for a lower price. Furthermore there is the possibility to hire a damage assessor, who can give a quick and specific statement about what part of the bike is damaged, which reduces the repair time and makes the bike quicker available.

Statistics

In order to evaluate the consequences of the player's action during the gaming session he needs to keep track of all his acquired resources, performed process optimizations and generated income, since the purpose of the game is to show the player that business process optimization nowadays is one of the most important processes in a business.

Analysis

Use Case Model

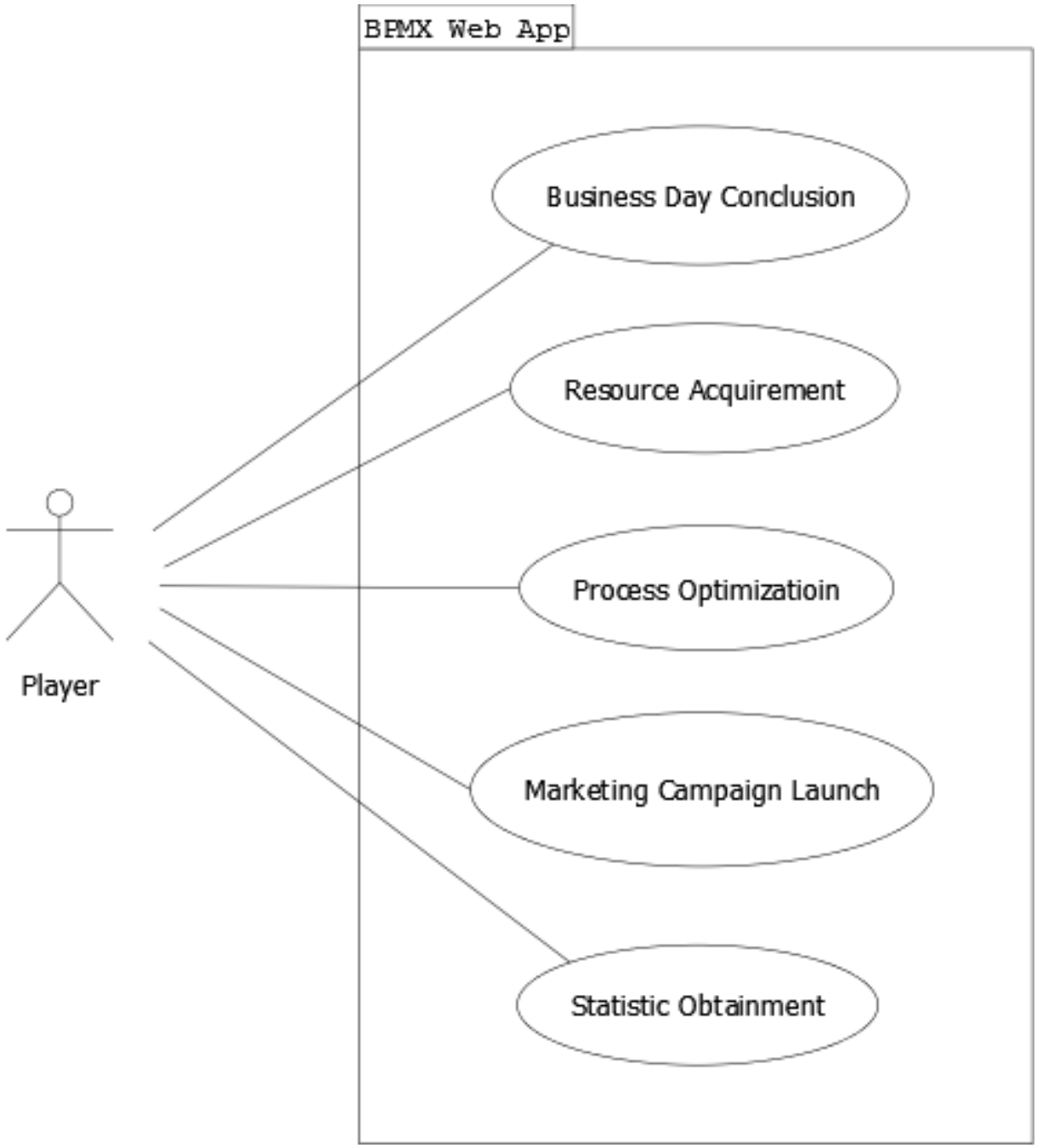


Figure 171 BPMX Web App Use Case Model

Use Cases

Business Day Conclusion

Description

In order to successfully conclude a business day the player first needs to evaluate the available bikes and the estimated number of customers and draws an action card. With this information he can start his business day by inputting it.
Then the work flow for the business day is handled according to the evaluated theme. After the work flow is completed the statistic of the player gets updated in terms of satisfied and unsatisfied customers, profit and loss, and his image development.

Use Case Flow

Initial Condition: The player wants to conclude a business day
Pre-Condition: The player evaluated the estimated number of customers and has drawn an action card
Post-Condition:

1. Success Business day ended and statistic got updated
2. Fail Work flow is not handled

Actors: Player
Main Success Scenario:

1. Player (P) wants to start the business day and inserts necessary information
2. The web app (WA) processes the information and handles the workflow
3. The statistic gets updated according to the result of the business day

Alternative:

1. WA inform P about the missing information

Resource Acquirement

Description

In order to enlarge his business the player needs more and more resources, whether it is a new subsidiary site, new bikes or renting bikes form competitors. When the player intends to acquire these resources he needs the mandatory means to do so. If these are available he can simply buy them.
Since some acquirements have variable costs the player also needs to know the exact price and provided it as input for the web app

Use Case Flow

Initial Condition: P wants acquire resources for his business
Pre-Condition: P negotiates the price if necessary
Post-Condition:

1. Success: P successfully acquired new resources
2. Fail: No resources are acquired

Actors: Player
Main Success Scenario:

1. P negotiates the price of the resources (optional)
2. P selects the resources he wants to buy in WA
3. The resources statistic of the WA is updated

Alternative:

1. WA inform P about missing mandatory means

Process Optimization

Description

Besides buying resources in order to successfully run his business the player also needs to optimize his processes to reduces costs, shorten repair times etc. The optimization of processes is only available on process optimization business days.
To optimize the processes the player simply selects his desired optimization, provided that he has the necessary mandatory means to buy it.

Use Case Flow

Initial Condition: P wants to optimize his processes
Pre-Condition: The current business day needs to have the process optimization theme
Post-Condition:

1. Success: P successfully optimized his business' processes
2. Fail: The business' processes were not optimized

Actors: Player
Main Success Scenario:

1. P decides which processes he wants to optimize
2. P selects the desired optimizations in the WA
3. The WA updates the statistic in terms of process optimization

Alternative:

1. WA informs P about missing mandatory means

Marketing Campaign

Description

Other than satisfying customers on business day, the player can also improve his image by starting marketing campaigns that make potential customers aware of his business.
There are different types of marketing campaigns which all have a different impact on the image, depending on the price the player pays for them.

Use Case Flow

Initial Condition: P wants launch a marketing campaign
Pre-Condition: The current business day needs to have the marketing theme
Post-Condition:

1. Success: P successfully launched a marketing campaign
2. Fail: The marketing campaign was not possible

Actors: Player
Main Success Scenario:

1. P decides which marketing campaign he wants to launch
2. P chooses the corresponding campaign in the WA
3. The WA updates the statistic in terms of marketing campaigns and image

Alternative:

1. WA informs P about missing mandatory means

Statistic Obtainment

Description

In order to visualize how successful a player is running his business he needs to have a statistic about the development of his business and the actions he took to influence this development.
The statistic is also used to obtain information that is important for the player currently, like the amount of bikes and subsidiary sites he owns or how his balance looks like.
The main goal of statistic is to give the player a sense for how important process optimization is for businesses by visualizing how effective constantly expanding businesses are and how effective process optimizing businesses are.

Use Case Flow

Initial Condition: P wants obtain information from the statistic
Pre-Condition: -
Post-Condition:

1. Success: P obtained the statistic successfully
2. Fail: -

Actors: Player
Main Success Scenario:

1. P navigates to the statistic tab of WA
2. P obtains information from the statistic

Alternative:

-

Used Technology

Requirements

We wanted the game supporting application to be easily accessible without being platform depended. The point about the easy access eliminated the choice of developing a program which needs to be installed. Furthermore this program would be very platform depended. Therefore an implementation of this program for each currently used operating system whether it for mobile devices or for PC.
Our final decision was that we wanted to have web application, since it is accessible from any device that has access to the internet. Furthermore you can customize the appearance

of the application based on the device it is displayed and therefore give every player an easy to handle application.
For the implementation of this web based application the following technologies were used.

HTML

Figure 172 HTML Logo

HTML stands for Hyper Text Markup Language and is the foundation for websites which are displayed on the internet. It is a text based descriptive markup language to define the structure of the website by using tags. The current version of HTML is 4.01. The HTML is refined by the World Wide Web Consortium (W3C) and the Web Hypertext Application Technology Working Group (WHATWG).

A HTML document consists of three essential parts the DOCTYPE, HTML Head and HTML Body. Within the head and the body you use the already mentioned tags to structure you website. Once your HTML file is finished, uploaded to a file space and accessed over the internet its content is parsed which is basically the translation of your file's content so it can be displayed in a browser.

HTML Tags

```
<html></html>
```

HTML tags are the components you use to structure your file. Each tag is consists of its name and the enclosing angle brackets. Most of the tags need a closing tag which very similar to the opening tag. The only difference is a forward slash before the name and after the opening angle bracket.

A tag can be enclosed by another tag and or can enclose several other tags itself. The root tag is the <html> tag. The opening and closing HTML tag contain all the HTML tags of the file.

Each HTML tag stands for a HTML element that is displayed when the file is parsed and rendered in the browser. In order to access these elements using a script language (explained later on) you need to give them an id. The id of each element is unique for each element.

```
<input id="inputID"></input>
```

In order to style your HTML elements you usually assign a class to your tag, which can be used to styl it with a Cascading Style Sheet (explained later on). A HTML element can have multiple classes or none at all

```
<input class="inputClass"></input>
```

DOCTYPE

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
```

The DOCTYPE as the name suggests defines the type of the document that is written. The tag begins with an opening angle bracket and an exclamation mark followed by the tag name DOCTYPE. HTML PUBLIC indicates that this document uses a publicly available document definition type.
As you can read in the URI it is provided by one of the refiners of HTML, W3C. It is HTML version 4.01 in the transitional variant, which means that you can style your HTML elements in the file itself, whereas with STRICT you would have to write separate Cascading Style Sheet

HTML Head

```
<head></head>
```

In the head of a HTML file you can provide meta information or provide resources like Cascading Style Sheets (CSS) or script files like JQuery (booth are explained later on). Furthermore you can define the title of your HTML file in the head.

HTML Body

```
<body></body>
```

The HTML body defines the looks of the file that will be rendered using your HTML file. Here you can distinguish between block and inline elements that can be used. While the block elements demand their own line and interrupt the text flow, the inline elements go with the text flow and can be displayed with other inline elements and or text.

Structure

The first tag of a HTML file is the DOCTYPE followed by the root tag <html>. In the root tag first there is the head and then the body.

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN">
<html>
    <head>
        <title>My HTML File</title>
    </head>
    <body>
    </body>
</html>
```

CSS

The Cascading Style Sheet (CSS) is used to style the elements of your HTML file. You can specifically select one or more elements using a selector and then style them.

Figure 173 CSS Logo

Styling

In order to style elements you first need to select them using a selector (explained later on) followed by curly braces. Within those curly braces you can now style your elements simply write the name of the property you would like to change followed by colon and the desired value.

```
selector {
    width: 70%;
    margin-left: 30px;
}
```

Selectors

Selectors are used to identify the elements that should be styled. There is wide range of selectors and with CSS 3, the current version, you can select elements very specifically. However these are not used as much as the most common ones.
Of course you can chain different types of selectors in order make your selection more specific.

Type Selector

The type selector selects all the elements which are of certain type, which is indicated by their tag name.
You use it by simply writing the name of the elements you want to select.

```
input{
        ...
}
```

Class Selector

With the class selector you can select all elements that share the same type of class. In order to do so you need to assign the class to all the elements you desire to style.
You use the class selector by writing a period followed by the name of the class.

```
.inputClass{
        ...
}
```

ID Selector

The id selector enables you select one specific HTML element by providing its name. Therefore you should provide an id for each element that you intend to style individually.
The id selector is used by writing hash followed by the id of the element you want to style.

```
#inputID{
     ...
}
```

Media Query

Since the introduction of Media Queries you can write CSS files that distinguish between mobile devices like smartphones and tablets and PCs or Laptops.
You use a Media Query by writing @media followed parentheses. Within these parentheses you write the properties that should be checked and the values that properties need to have in order to style HTML elements according to the following styles.

```
@media (min-width: 30em) and (max-width: 60em)
```

Incorporation

You can use CSS with your HTML file in two different ways, you either include it in the head of the HTML file or you write it externally and then incorporate it by referencing to it.
In order to directly write your CSS into the head of your HTML file you need a style tag in which you define the type of the style which is "text/css". Now you can use selectors within the opening and closing style tag to style your elements.

```
<head>
    <title>My HTML File</title>
    <style type="text/css">
        ...
    </style>
</head>
```

Alternatively you can also use the style attribute of HTML elements and change their style properties directly.

```
<input id="inputID" style="..."></input>
```

If you intend to write your CSS file externally and include it into you HTML page you need to use a link tag in which you specify the type and the rel attribute. The type attribute defines the type of file that is included and the rel attribute defines the relationship your HTML file has to the included file. The most important attribute of the link tag is the src attribute which specifies the path of your CSS file.

```
<head>
    <title>My HTML File</title>
    <link type="text/css" rel="stylesheet" src="filename.css">
</head>
```

JQuery

JQuery is a free JavaScript library written by John Resig. With the incorporation of JQuery you can make your website responsive.

Compared to JavaScript itself JQuery provides an easier way for selecting HTML elements whether it be using its type, element or class. The selection method is similar to that of CSS.

Figure 174 JQuery Logo

Selector

You can select elements of you HTML file by using the JQuery selector which is a dollar sign followed by parentheses. Within these parentheses you use your selector enclosed by quotation marks.

```
$("#inputID")
```

With these selectors you can now define what happens if a certain event of this element happens. For example if you click your input element you want to perform some action in your JQuery file, you would use the **.** operator and select the event you want to respond to, which is click. As a parameter you provide a function that describes what action should happen.

```
$("#inputID").click(function() {
        ...
});
```

AJAX

JQuery also gives you the opportunity to use AJAX to asynchronously load content into your website. AJAX stands for Asynchronous JavaScript and Xml and can be used by writing a dollar sign followed by period and the key word "ajax". Within the parentheses following this statement you write your request again enclosed by curly braces. The information you need to provide for your request are the url of the file you want to retrieve, the type of that file and the transaction type which can either be POST or GET.

```
$.ajax({
    url: "Website.html",
    type: "GET",
    dataType: "html",
});
```

Incorporation

Similar to the incorporation to the CSS file you include a JQuery file by using a tag in the head of your HTML file. This time it is the script tag and simply set the src attribute to the path of your JQuery file.

```
<script src="..."></script>
```

As source you can either use a JQuery library you previously uploaded onto your web space or you use the library provided by Google or some other provider that hosts a JQuery library.

```
<script src="ajax.googleapis.com/ajax/libs/jquery/1.11.0/jquery.min.js">
</script>
```

Twitter Bootstrap

Twitter Bootstrap is an open source framework provided by Twitter. It provides CSS templates, HTML classes and JavaScript functionality which you can use to create good looking responsive web site.

Figure 175 Bootstrap Logo

Incorporation

You simply incorporate the provided CSS and JavaScript file using the link and script tag.

```
<script src="js/bootstrap.js"></script>
<link href="css/bootstrap.css" rel="stylesheet">
```

Solution

Initial Approach

We want to use the technologies described previously in order to develop a web app that provides supporting functionality for our board game as well as easy handling for the user regardless of which device they are using.

File Description

index.html

The index.html file is the initial file that you access when you first access the web app. It contains the tabs for navigating between the sites for business days, transactions, statistic etc. Furthermore it provides the div container for the content that is loaded depending on which tab of the file you select.

bootstrap.css

The bootstrap.css file provides all the already predefined classes and styles of the Twitter Bootstrap framework.

bootstrap.js

The bootstrap.js file provides the functionality for certain controls provided by the CSS file of the Twitter Bootstrap framework.

webapp.js

The webapp.js file is responsible for making the website responsive. It loads content into the website depending on which tab selected using AJAX and then binds handlers for the events of the HTML elements that are loaded.

webappcss.css

The webappcss.css file is responsible for slight changes to the bootstrap.css that way we can easily update the Twitter Bootstrap framework we use to a newer version and simply use this file for modification rather than edit the original bootstrap.css

businessday.html

The businessday.html file provides the structure of the div container of the index.html when the business day tab is selected.

transatction.html

The transaction.html file provides the structure of the div container of the index.html when the transaction tab is selected.

statistic.html

The statistic.html file provides the structure of the div container of the index.html when the statistic tab is selected.

processoptimization.html

The processoptimization.html file provides the structure of the div container of the index.html when the process optimization tab is selected.

marketing.html

The marketing.html file provides the structure of the div container of the index.html when the marketing tab is selected

Functionalities

Business Day

The business day (Geschäftstag) tab is the first tab the player navigates to. When he clicks it the handler for the click event of the control is called and loads the content for concluding a business day.

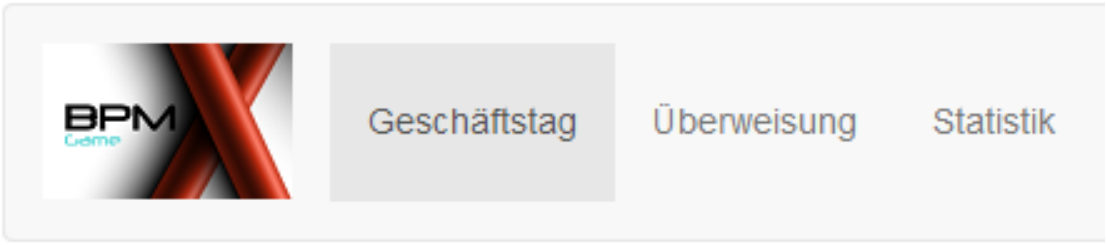


Figure 176 Web App Navigation Bar

```
$("#gtTab").click(function() {
    var request = $.ajax({
        url: "Pages/businessday.html",
        type: "GET",
        dataType: "html",
        cache: false
    });
    $(".mTab, .active").removeClass("active");
    $(this).addClass("active");

    request.done(function (msg) {
        $("#mainContent").html(msg);
        gtBind();
    });
});
```

An AJAX request is created with the type, data type and the URL of the file which content that should be loaded. Once the request is created it starts to load the content from the provided URL. Furthermore we remove the active class from the tab that is currently set as active if there is one and set the active class for the clicked control using the $(this) selector which corresponds to the control which handler is called.

When this request is done the handler for this event is called and takes the return value of the request and sets it for the mainContent div in the app. That is done using .html() which sets the value for the div. The difference to .text() is that this value is handled as HTML which means that tags are parsed and rendered, which changes the structure of the HTML page.

After that the function gtBind() is called which binds the handler for the controls of the loaded content. This needs to be done, since the controls cannot be bound and set or accessed before they are even loaded into the displayed HTML file. Therefore a function needs to be called that contains the definition for all the handlers of the loaded controls and sets them.

```
function gtBind() {
    $("#gtHeader").html("Gesch&auml;ftstag " + tagegesamt + ": Standort " +
                        standort);
    checkThema();
    checkGT();

    $("#btStart").click(function () {
        if(thema == "Thema")
        {
            alert("Bitte wählen sie ein Thema für den Gschäftstag");
        }
    });
    ...
}
```

Figure 177 Web App Business Day Screen

Now the player can insert the information he evaluated previously in his turn. Firstly he selects the theme of the business day by clicking the theme drop down menu (Thema) and

selecting the theme. By selecting a theme the player rebinds the handler for start business day button (Geschäftstag starten), since the work flow of a business day is based on its theme. This rebinding is done by determining what value the drop down menu has set as soon as it was changed. Based on its value the corresponding function for binding the start business day (Geschäftstag starten) button is called.

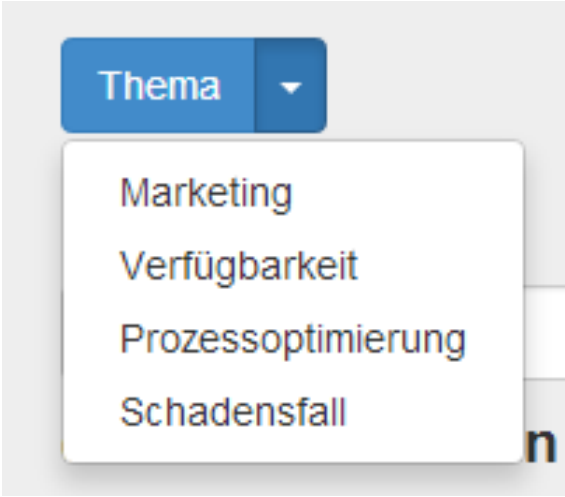


Figure 178 Web App Theme Selection

```
function checkThema() {
    $("#btThema").html(thema);
    switch(thema)
    {
        case "Marketing" : bindMarketing();
            break;
        case "Verfügbarkeit" : bindVerfuegbarkeit();
            break;
        case "Prozessoptimierung" : bindPO();
            break;
        case "Schadensfall" : bindSchadensfall();
            break;
    }
}
```

Secondly the player inserts his available bikes and the number of estimated customers on this business day.
Lastly the player selects the action that is determined by the action card he previously drew in his turn. He can select how many reservations were issued for this particular business day at this particular subsidiary site. Furthermore he can select the negative influences of the weather and his competitors as well as problems within his own business.

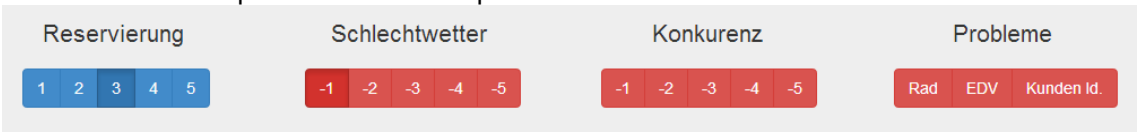


Figure 179 Web App Action Selection

When an action is clicked the handler for its click event is called and marks it as active by adding the class active to the clicked control. This is done by using the class selector $(".gtRButton") which retrieves all controls with the gtRButton class. On all these control you remove the active class using the removeClass() function. Now no control is set as active and the web app uses the $(this) selector, which selects the element which event

called the handler, and set this control as active using the addClass() function. If the control however, already has the class active it is removed from the control using removeClass().

```
$(".gtRButton").click(function() {

        if($(this).hasClass("active"))
        {
            $(".gtRButton").removeClass("active");
        }
        else
        {
            $(".gtRButton").removeClass("active");
            $(this).addClass("active");
        }
        return false;
});
```

The return false prevents the app from trying to focus the clicked control which would result in scrolling to the top of the app, since the app cannot focus the it.

When the player has inserted all this information successfully he can start his business day by clicking the start business day button and the app handles the work flow according to the business day theme the player selected.
Otherwise the app would inform the player about the missing information for the business day.

Figure 180 Web App Unstarted Business Day

When the button is clicked the web app gathers the information the player inserted by using the selectors for the controls and .val() which returns the value of the control. Since some values are needed for calculations it is necessary to convert them to numbers. For this the web app uses the parseInt() function which accepts one parameter which tried to be converted to a integer value.

```
bikes = parseInt($("#tbBikes").val());
```

Once the necessary information is gathered the actual number of customers is calculated based on the image the player's business has and the actions he selected

```
kunden = parseInt(ekunden) + parseInt(imageInfluence()) + parseInt(zusatz);
```

The number of satisfied customers is the number of customers the player could serve. Whereas the number unsatisfied customers is the number of customers that could not be served.
The profit of the business day is calculated based on the profit per bike determined by the theme of the business day and the process optimizations the player bought for the theme. Furthermore it is affected by the action of the turn, which might be a problem action resulting in reduced profit.
After that the app removes the hidden class from the divResult div and sets the values of its controls using the evaluated data during the function that was called when the handler for the click event of the start business day (Geschäftstag) button was called.

```
function setDivResult() {
        $("#labErschienen").text(kunden);
        $("#labZufrieden").text(zufrieden);
        $("#labUnzufrieden").text(unzufrieden);
        $("#labEinnahmen").html(einnahmen);
        $("#divResult").removeClass("hidden");
}
```

The reason all of the controls' values are set using the text attribute except one that uses the html attribute is that a value that contains a euro sign is set on this control. You write a euro sign in HTML using € and if you would set it using the text attribute it would be displayed as € whereas with the html attribute it is displayed as an actual euro sign.

Figure 181 Web App Started Business Day

If the results are correct the player can end the business day by clicking the end business day (Geschäftstag beenden) button. Then the app updates the player's statistic by adding his profit of the business day to his balance, keeping a record of satisfied and unsatisfied customers and evaluating the image development. Furthermore tab that were made available by the theme of the business day theme are hid again
However, if some of the input was wrong the player can simply change his input and restart the business day using the start business day (Geschäftstag starten) button.

After finishing the business day the player either proceeds to the next business day or to the next subsidiary on the current business day. This is determined in the handler for the click event of the end business day (Geschäftstag beenden) button which uses the statistic to check whether the player has another subsidiary in which he needs to conclude the business day or not.
According to this determination the header of the business day is set.

```
if(standort < standorte)
{
    standort = standort + 1;
}
else
{
    tag = tag + 1;
    tagegesamt = tagegesamt + 1;
    standort = 1;
}

$("#gtHeader").html("Gesch&auml;ftstag " + tagegesamt + ": Standort " +
                    standort);
```

Before the business day is finally concluded the web app checks if the current business month is over. If this happens to be the case the web app automatically pays the players fixed costs, but first it checks for process optimizations that reduce the amount that needs to be paid.

```
if(tag == 28)
{
    if(poAbrechnung)
    {
        betrag = betrag - 150;
    }
    else
    {
        betrag = betrag -200;
    }
    tag = 0;
}
```

Transaction

The player accesses the transaction screen by clicking the transaction (Überweisung) tab. The handler for the click event of the control then initializes the AJAX request for loading the data of the transaction screen. Once the loading process is done the handlers for the loaded controls are loaded.

```
$("#uwTab").click(function() {
    var request = $.ajax({
        url: "Pages/transaction.html",
        type: "GET",
        dataType: "html",
        cache: false
    });
    $(".mTab, .active").removeClass("active");
    $(this).addClass("active");

    request.done(function (msg) {
        $("#mainContent").html(msg);
        uwBind();
    });
});
```

Now the player can either buy new subsidiary sites, bikes or make other transactions. On business days that have the theme availability he is also able to buy spare batteries for his business. The controls for buying spare batteries have the hidden class per default if the business day has the theme availability however, the hidden class is removed from the controls using the removeClass() function.

```
if(!uwErsatzakkus)
{
    if(thema != "Verfügbarkeit")
    {
        if($("#uwAkkusLab").hasClass("hidden") &&
           $("#uwAkkus").hasClass("hidden"))
        {}
        else
        {
            $("#uwAkkusLab").addClass("hidden");
            $("#uwAkkus").addClass("hidden");
        }
    }
    else
    {
        $("#uwAkkusLab").removeClass("hidden");
        $("#uwAkkus").removeClass("hidden");
    }
}
```

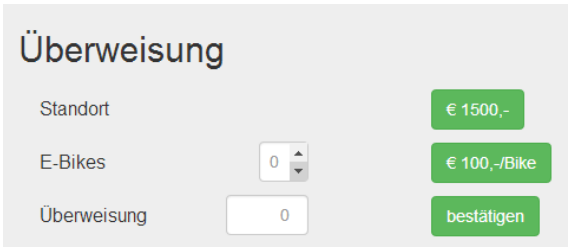


Figure 182 Web App Transaciton Options 1

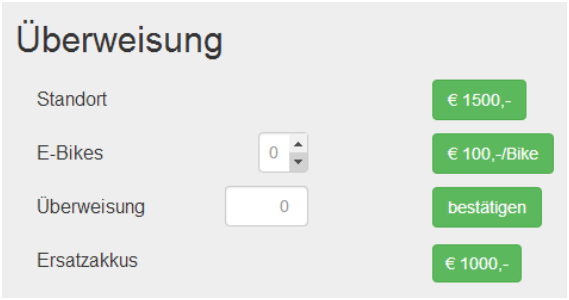


Figure 183 Web App Transaction Options 2

Resources are bought by clicking the button of the desired resource. When buying bikes the player needs to provide the number of bikes he wants to buy and when he issues a custom transaction he needs to provide the value of the transaction.
Once the button is clicked the statistic of the player is updated.

```
function getProzessoptimierung(id, name) {
        var input = $(id);
        if(balance >= 500)
        {
            input.removeClass("btn-success");
            input.addClass("btn-primary");
            input.html("gekauft");
            input.prop("disabled",true);
            changeBalance(-500);
            return true;
        }
        else
        {
            alert("Sie können sich die Prozessoptimierung " + name + "
                  nicht leisten.");
            return false;
        }
}
```

When buying spare batteries the appearance of the button changes too, since the player only needs to buy them once.

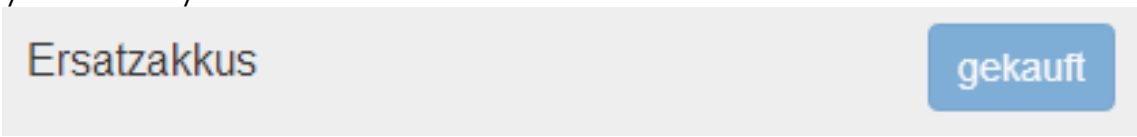


Figure 184 Web App Bought Spare Batteries

If the player does not have the mandatory means to acquire the desired resources he is informed about his lack.

```
$("#uwBikes").click(function() {
        var num = parseInt($("#tbAnzahlBikes").val());
        var total = num * 100;
        if(balance >= total)
        {
            changeBalance(total * (-1));
            ebikes = ebikes + num;
            $("#tbAnzahlBikes").val(0);
        }
        else
        {
            alert("Sie können sich nicht so viele E-Bikes leisten.");
        }
});
```

Statistic

The statistic content is loaded via AJAX when the statistic (Statistik) tab is clicked and the web app sets the values for all the controls on the statistic screen, using the information generated by the player's played turns, transactions and process optimizations.
The values are again set using the text or html function, based on whether the value contains a symbol that has a specific term in HTML.

```
function stBind() {
    $("#stGVermoegen").html("&euro; " + balance + ",-");
    $("#stPVermoegen").html("&euro; " + probalance + ",-");
    $("#stNVermoegen").html("&euro; " + negbalance + ",-");
    $("#stStandorte").text(standorte);
    $("#stEbikes").text(ebikes);
    $("#stImage").text(image);
    $("#stPImage").text(proimage);
    $("#stNImage").text(negimage);
    $("#stSmall").text(maSmall);
    $("#stMedium").text(maMedium);
    $("#stLarge").text(maLarge);
    $("#stDB").html(checkProzessoptimierung(poKundenDB));
    $("#stAUN").html(checkProzessoptimierung(poAutoUn));
    $("#stEBW").html(checkProzessoptimierung(poWerkstatt));
    $("#stAR").html(checkProzessoptimierung(poAbrechnung));
    $("#stSA").html(checkProzessoptimierung(poSchadenabschaetzung));
    $("#stEA").html(checkProzessoptimierung(uwErsatzakkus));
}
```

Figure 185 Web App Statistic

Process Optimization

The process optimization (Prozesse optimieren) tab is only available if the current business day has the process optimization theme. The player accesses the process optimization screen by clicking the process optimization (Prozesse optimieren) tab, which click handler then loads the content into the mainContent div using yet again an AJAX request and afterwards binds the necessary handlers for the loaded controls.

```
$("#poWerkstatt").click(function() {
        poWerkstatt = getProzessoptimierung($("#poWerkstatt"), "E-Bike
Werkstatt");
    });
```

When binding the controls, the web app also checks whether the player has already bought certain process optimizations. The already bought process optimizations are then made unavailable and are marked as bought (gekauft).

```
if(poWerkstatt)
{
    $("#poWerkstatt").removeClass("btn-success");
    $("#poWerkstatt").addClass("btn-primary");
    $("#poWerkstatt").html("gekauft");
    $("#poWerkstatt").prop("disabled",true);
}
```

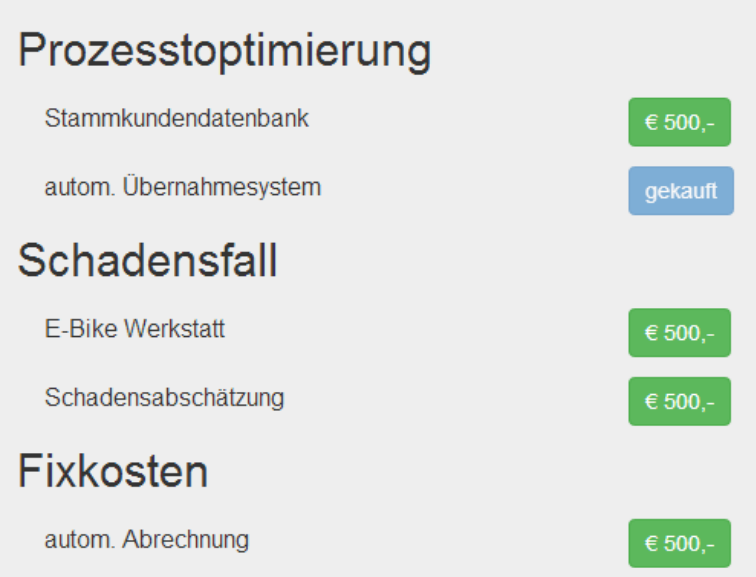


Figure 186 Process Optimization Screen

On this screen the player can optimize his processes by clicking the button displaying the price of the desired optimization. If he lacks the mandatory means to pay for the process optimization he is informed about this fact.

Once the button for one of the optimizations is clicked the statistic of the player in terms of process optimizations is updated and the button's text changes to bought (gekauft) and its appearance changes in order to indicate that the process optimization was bought.

```
function getProzessoptimierung(id, name) {
        var input = $(id);
        if(balance >= 500)
        {
            input.removeClass("btn-success");
            input.addClass("btn-primary");
            input.html("gekauft");
            input.prop("disabled",true);
            changeBalance(-500);
            return true;
        }
        else
        {
            alert("Sie können sich die Prozessoptimierung " + name + "
                  nicht leisten.");
            return false;
        }
}
```

The control that was clicked is passed to the function as parameter. This control can then be used by assigning it to a variable using the selector $(id). After the control was assigned to the variable input, it can be accessed and changed using the variable input.

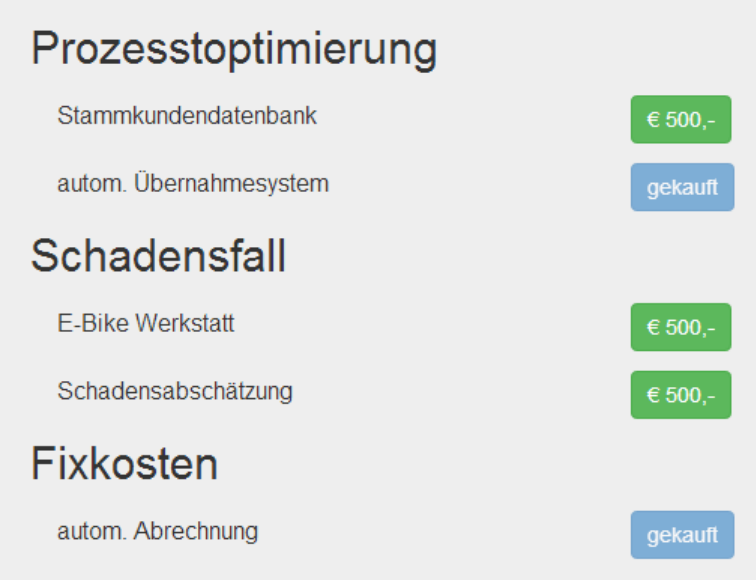


Figure 187 Web App Bought Process Optimizations

If you were to navigate to the statistic (Statistik) tab now you would also see that the statistic has updated your bought process optimizations.

Figure 188 Web App Process Optimization Statistic

Marketing

The marketing (Marketing) tab is made available as soon as the player starts a marketing business day by removing the hidden class using the removeClass() function. As the other screens the screen for the marketing (Marketing) tab is loaded into the mainDiv div using an AJAX request that loads the controls of the marketing.html file and returns them.

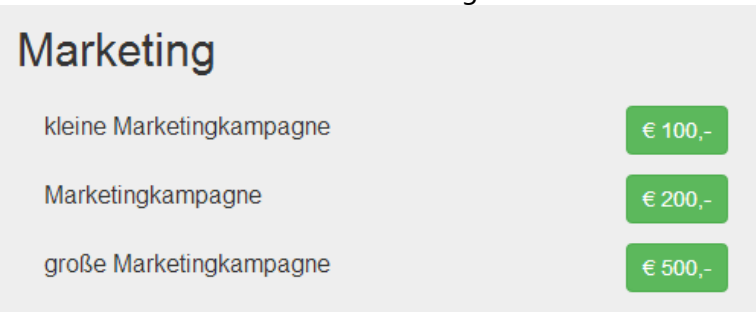


Figure 189 Web App Marketing Screen

The player simply selects which marketing campaign he wants to start and the web app updates his image in the statistic. If the player was able to pay for the campaign the price is debited from his balance, otherwise he is informed about his lack of mandatory means
If the player now looks up his statistic he can track his marketing campaigns and how his image developed.

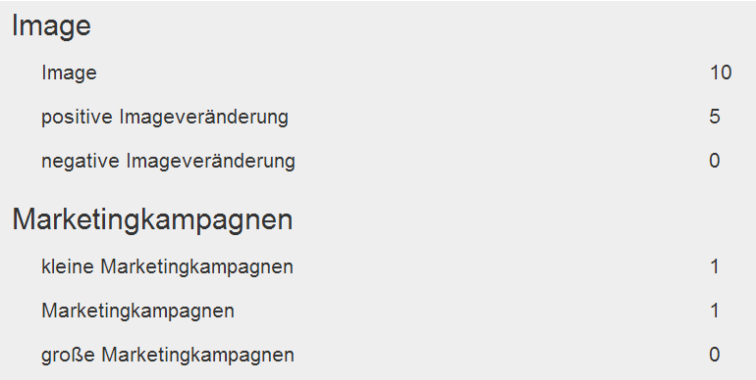


Figure 190 Web App Image & Campaign Statistic

If the player's image is already at the maximum of 10 he is informed about the fact that he cannot raise his image any more.

Mobile Version

The mobile version of the web app provides the same functionality as the regular web app and is accessed using a browser too. The only difference is the fact that the mobile version's appearance is adjusted to the smaller screen size of mobile devices using media queries that enable you to style your controls dependent on the screen size of the device they are displayed on.

```
@media (max-width: 600px)
```

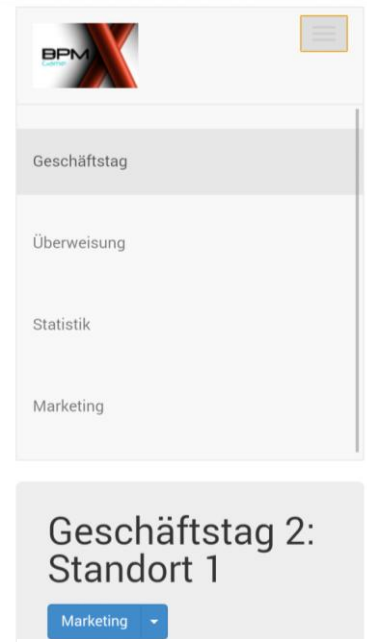


Figure 193 Web App Mobile 1

Figure 194 Web App Mobile 2

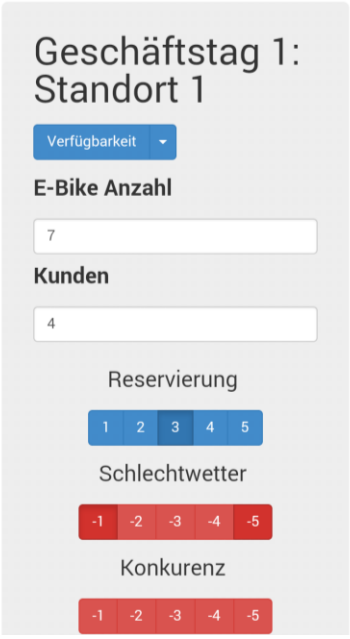


Figure 192 Web App Mobile 3

Figure 191 Web App Mobile 4

Illustrations Directory

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