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# Development of the Portfolio Management Game

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## Master Project

UNIVERSITY OF ZURICH - DEPARTMENT OF BANKING AND FINANCE

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# 1. Motivation

The Portfolio Management Game is a simulation thought to.....

Both members of the project team work at the Department of Banking and Finance UZH as web developers parallel to their studies achieving their Master's degree in Informatics. Both interested in developing applications from scratch and analyzing the procedure of financial processes. By re-developing the application the Department of Banking and Finance wants to achieve a sustainable simulation of a typical portfolio management process. The simulation should help the students within their learning process by focussing on practical decision making, building up on their theoretical knowledge.

## 2. Project Description

The "Portfolio Management Game" was initially developed in 2001 by an external company for the Department of Banking and Finance at the University of Zurich. This simulation of a portfolio manager was being used from the DBF over several years by multiple seminars of their department. A course named "Advanced Portfolio Seminar" has given insights to the portfolio management process for Master students by playing the game in between different rounds playing the game. For the final seminar of the "Executive Education" the game was being played for two days on Uetliberg with all the executive students.

The game has been deprecated by its implemented technologies and after each round the supervisors had to collect a USB-stick where all decisions of the students have been saved to. The supervisors had to collect this data for each group on a central device with administrative access (on a windows native application) to calculate the result of the teams decisions.

## 3. Methodology

A first task was to understand the concept of a typical investment advisory process.

### 3.1. Requirements Engineering

User stories

### 3.2. User Interviews

Interviews with professionals and other people Understanding of the overall process

### 3.3. Observation of Game Execution

The game observation was separated in following parts:

- Executive Education Students Observation during their final seminar at the Uetliberg
- Observation of different knowledges in one room

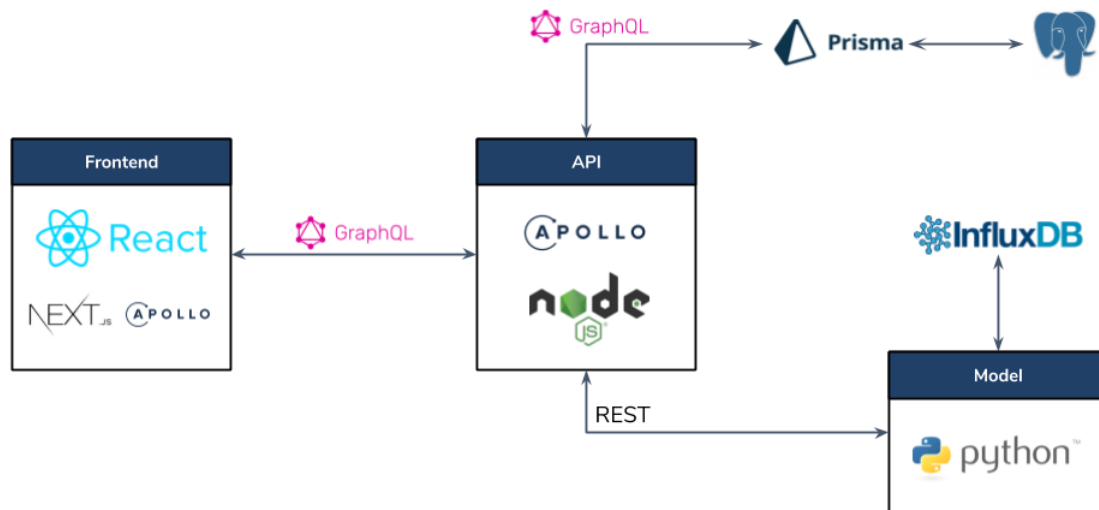
## 6. Application Overview

- Master Seminar: Advanced Portfolio Management Seminar

### 3.4. Design and Iterative Prototyping

...

## 4. Architecture



### 4.1. Frontend

We use the React Framework which is developed by Facebook. Based on NextJS.

### 4.2. API

Bla

### 4.3. Model

All calculations of the simulation are performed in a python-model which interacts with the time series data stored on an InfluxDB. A Restful service fetches the data from the model.

### 4.4. Continuous development

## 5. Market Model

## 6. Application Overview

For playing the game an administrator of a specified game and an infinite number of teams have to interact together for playing this simulation.

## 6.1. Administration

All administrative tasks will be described in this part.

### 6.1.1. Administrator login

An administrator needs to have a login for having all administrative functionalities. Therefore he has to provide his credentials on the following screen which he reach by following the instructions on the start page.

### 6.1.2. Game management

**Game overview** As landing page of the administrator the game overview exists. It serves as the control center of the game administration.

Portfolio Management Game - Administrator

pascal.zehnder@bf.uzh.ch

Users

Users

Games

Games

Entities

Assets

Asset Types

Currencies

Customer Types

Sectors

Game List

My Game

my

21.12.2018 13:04:38

★ Running (Period 0)

Details

Lustiges Game

pascal-game

21.12.2018 12:08:17

★ Running (Period 0)

Details

**Game creation** For creating a game the administrator needs to define some parameters for playing a game which are structured into three tabs. By pressing on the "next"-button the administrator will be leaded through the form. Some tooltips help users to understand the purpose of the provided input. After submitting the creation of the game, the user will be redirected to the game overview.

## 6. Application Overview

Portfolio Management Game - Administrator

Game Creation

Game Name \*  
Advanced Portfolio Management Seminar

Game Identifier \*  
apm19

Description  
HS19

Number of participating teams \*  
8

Next

**Game detail** The game detail for each game may be accessed over the game overview list. In this page a user can initialize period, start periods, having an overview about the teams submission and many other features, which will be described in this part:

**Game initialization** As the game creation may be done in advance we have splitted the game creation from the game initialization, such that last adjustments of the game may be done just before the start of the game.

Portfolio Management Game - Administrator

Game: "Advanced Portfolio Management Seminar"

Initial Customer Types  
Fixed Income

Initial Customer Count \*  
10000

Initialize Game

**Game start** By starting the game the students or teams are finally able to start with their period 0 decisions. Administrators are able to give them some help over messages which will be visible for the teams in their report section.

Portfolio Management Game - Administrator

Game: "Advanced Portfolio Management Seminar"

Game Identifier: apm19 Initial Customers: 10000 Simulation Type: Historical  
Period Length: 30 days Start Date of Period 0: 2000-01-01

Period 0 (SAA) || Period 1 || Period 2

Economic Outlook

Report  
To view the economic outlook for the upcoming period, view the report on...

Messages  
Add guiding or misleading messages to the economic outlook of each team (e.g., from the bank CIO or a newspaper).

Add now message

Start Period

**Team overview** For providing access for all teams an administrator has an overview about the team logins, which are generated automatically when initializing the game.

Portfolio Management Game - Administrator

Users

Users

Games

Games

Entities

Assets

Asset Types

Currencies

Customer Types

Sectors

pascal.zehnder@bf.uzh.ch

Team Overview - Advanced Portfolio Management Seminar

Team Name	Login	Password
Team 1	team1	5nd33qW
Team 2	team2	u2NivDOX
Team 3	team3	9FWegA74
Team 4	team4	hBPpcoMO
Team 5	team5	daUWamuD
Team 6	team6	YALRyRWE
Team 7	team7	hdTWwQJl
Team 8	team8	8OhvP1n4

**Running game** Overview about the submission state of all teams. The administrator is able to get an insight about the decisions of all submitted teams. The period can only be finished if all teams submitted and therefore the state of the teams has been green.

Portfolio Management Game - Administrator

Users

Users

Games

Games

Entities

Assets

Asset Types

Currencies

Customer Types

Sectors

pascal.zehnder@bf.uzh.ch

Game: "Advanced Portfolio Management Seminar"

Team Overview

Reports

Game Identifier: [apm19](#)

Initial Customers: 10000

Simulation Type: Historical

Period Length: 30 days

Start Date of Period 0: 2000-01-01

Period 0 (SAA)

||

Period 1

||

Period 2

Teams

✓ Julius Bull >

Last submitted: 21.12.2018 17:49

✎ Team 2

✎ Team 3

✎ Team 4

✓ Students Kantonalbank >

Last submitted: 21.12.2018 17:51

✎ Team 6

✎ Team 7

✎ Team 8

Finish period

**Initializing period** After completion of period zero the administrator has to initialize a period in which the team decisions will be compared to the other teams decisions and evaluated. Additionally new customer types for the next period and other settings could be defined in this phase of the game.

Portfolio Management Game - Administrator

Users

Users

Games

Games

Entities

Assets

Asset Types

Currencies

Customer Types

Sectors

Game: "Advanced Portfolio Management Seminar"

Team Overview

Reports

Game Identifier: [apm19](#)

Initial Customers: 10000

Simulation Type: Historical

Period Length: 30 days

Start Date of Period 0: 2000-01-01

Period 0 (SAA)


||

Period 1

||

Period 2

Initialize period

 pascal.zehnder@bf.uzh.ch

**Period start** By completing the simulation, respectively evaluation of the previous period, a next period may be started. If the game is still paused the teams cannot access the decisions site. The administrator can define some optional messages which will be displayed in the teams report page. Some adjustments to the simulation results will be edited in this phase of the game.

## 6. Application Overview

The screenshot shows the 'Portfolio Management Game - Administrator' interface. On the left is a sidebar with a menu: 'Users', 'Games', and 'Entities' (with sub-items: Assets, Asset Types, Currencies, Customer Types, Sectors). The main content area is titled 'Game: "Advanced Portfolio Management Seminar"'. It includes buttons for 'Team Overview' and 'Reports'. Below these are game details: 'Game Identifier: apm19', 'Initial Customers: 10000', 'Simulation Type: Historical', 'Period Length: 30 days', and 'Start Date of Period 0: 2000-01-01'. A timeline shows 'Period 0 (SAA)' as the active period, followed by 'Period 1' and 'Period 2'. The 'Economic Outlook' section contains a 'Report' area with a placeholder text, a 'Messages' section with a text input for 'Add guiding or misleading messages to the economic outlook of each team (e.g., from the bank CIO or a newspaper)', and a 'Content' area with a text input for 'Add new message'. There are also buttons for 'Delete current message', 'Start Period', and 'Add new message'.

## 6.2. Team View

### 6.2.1. Login

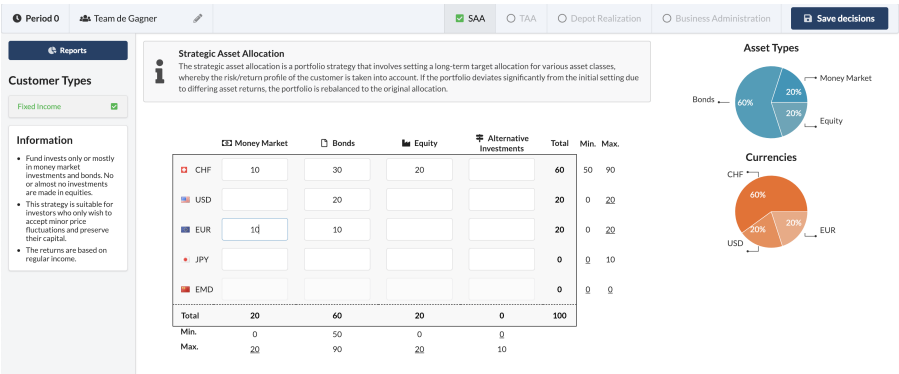
The screenshot shows the 'Portfolio Management Game - Team Login' interface. At the top is a header 'Portfolio Management Game'. Below it is a large illustration of a person sitting at a desk with a computer, a pie chart, and a stack of papers. The main content area has two login options: 'Student' (with a graduation cap icon) and 'Teacher' (with a person icon). The 'Student' option has a text input for 'apm19' and a 'Continue' button. The 'Teacher' option has a 'Login' button. Below the login options is a footer '© Department of Banking and Finance UZH'. At the bottom, there is a 'Team Login' section with a text input for 'Team 1', a 'Password' input with a masked password '\*\*\*\*\*', and a 'Submit' button. A note below the 'Submit' button states: 'There could be some inconsistencies if your team makes their decisions on multiple devices. Ensure that only one logged in user finally decides about the teams choices. Reports may be viewed on multiple devices without any problems.'

## 6.3. Period 0 decisions

In period 0 which represents phase 1 of the game, the teams define their SAA for all customer types which are enabled by the administrator of the specific game. The teams need to fulfill

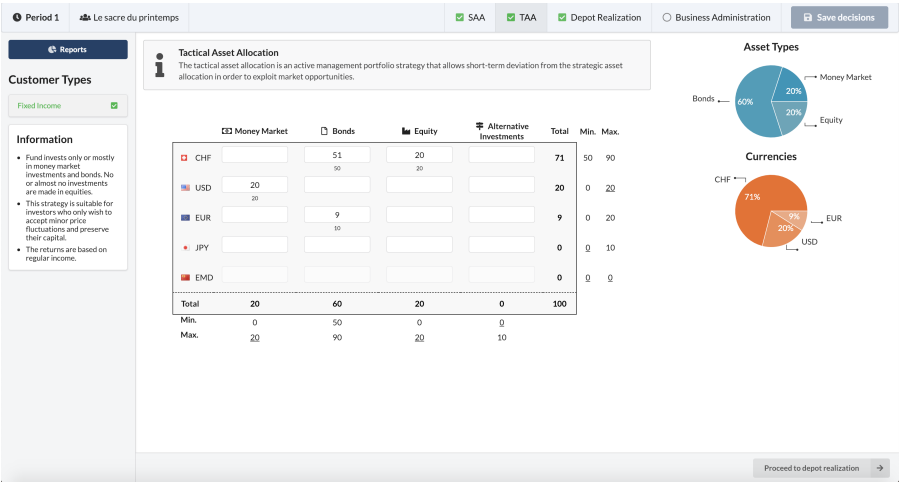


the ranges for all dimensions to submit their decisions. Supportive graphs in form of pie charts help the teams to decide about the share of the two dimensions. Additionally the players can name their team on the top left corner of the screen.

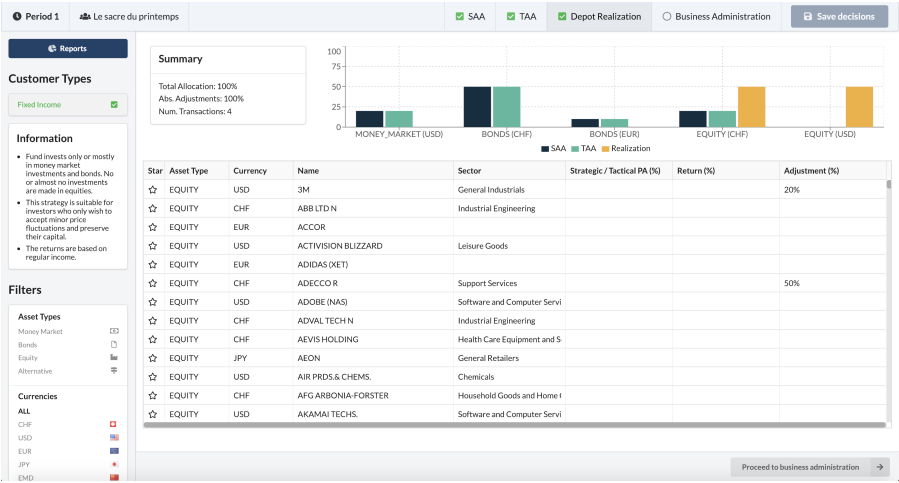


## 6.4. Other periods decisions

### 6.4.1. TAA



### 6.4.2. Depot Realization



## 7. Future Development

### 6.4.3. Business Administration

Period 1

Le sacre du printemps

SAA

TAA

Depot Realization

Business Administration

Save decisions

Reports

Conditions & Fees

Depot Management Fee (%)  
0.05

Money Management Fee (%)  
0.04

Human Resources

Hire/Fire Employees (+/-)  
100

Salary per Employee (CHF)  
90000

Education Days per Employee  
8

Logistics

IT Investments (CHF)  
100000

Profit Distribution

Payout Ratio  
0.1

Income Statement - Period 1

Operating income	---
Commission and service returns	---
Operating expenses	---
Personnel spending	---
Employee salary (including social services)	---
Temporary personnel expenses	---
Educational expenses	---
Recruitment expenses	---
Trading costs	---
Fixed trading costs	---
Variable trading costs	---
Infrastructure costs	---
IT depreciation	---
Costs for employees workspaces	---
Gain / Loss	---
Equity	---
Dividend payments	---
Equity after profit distribution	---
Price per share	---

LAST SUBMISSION  
27.12.2018 15:56

## 7. Future Development

## **A. Exemplary scenario**

Follwoing scenario should generalize an exemplary playing of the portflfo management game: