

Requirements and Analysis Document for MonOOPPoly

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1 Introduction

Our primary goal with this application is to create a fun local multiplayer desktop game inspired by the board game Monopoly. In order for our game to stand out from the original, we decided to name all the spaces on the board after places around the Chalmers campus and make it possible to implement some new fun features that weren't included in the original Monopoly game.

A player wins by making sure all other players have no money left. This can be achieved by buying properties and building houses/hotels. Landing on another player's property forces you to pay them rent, the rent which is decided by what properties that player owns and the number of houses built on that property. If a player can't afford to pay the rent they will become bankrupt and lose the game.

The stakeholders for this project are the people seeking entertainment. People wanting to play a digital version of a Monopoly-like game taking place at their favourite campus.

1.1 Definitions, acronyms, and abbreviations

- **Bank**, the bank is an entity within the game. The bank owns all properties.
- **Property**, a property is a type of space on the board. Properties can be bought from the bank in exchange for in-game currency. A single property can only have one owner at a time.
- **Colour**, most properties have an assigned colour. Colours show which properties are related to each other.
- **Monopoly**, not to be confused with the game "Monopoly", is a term used for owning every property of a specific colour.
- **Rent**, if a player lands on a property owned by another player they are forced to pay a certain amount of rent to that player. Rent can vary for several reasons, for instance it can depend on what type of property it is assigned to and if that property is a part of another player's monopoly.
- **House**, a player can only buy houses on properties if that property is a part of a monopoly that they own. Houses are used to increase the rent of a property.
- **Utility**, a utility is a special type of property that doesn't have a colour assigned to them. Houses can't be bought on utilities.
- **Bankrupt**, a term used for describing a player that doesn't have any in-game currency left and can't afford paying rent. If a player becomes bankrupt they lose the game.

- **Start tile**, the space on the board where all players start at. Walking a full lap around the board and passing the start tile will reward the player with in-game currency.
- **Jail**, a special space on the board. If a player is sent to jail they are forced to skip up to three turns.
- **Tax tile**, a special space on the board. The tax tile forces a player to pay in-game currency to the bank.
- **Auction**, if a player decides to not buy an unowned property the bank will then start an auction. The player that places the highest bid will win the auction and receive the property.
- **Trading**, a term used when two players want to exchange properties and currency with each other.
- **Computer**, the computer can act as a player and play the game.
- **Chance card**, a chance card is a term to describe the card which is drawn in Monopoly where you have chance for something good/bad to happen.
- **Mini-games**, small games that can randomly start after drawing a chance card. Winning a mini-game will reward the player.

2 Requirements

2.1 User Stories

User stories are given the following format: *Story Name - ID*.

Roll the dice - US-1

Description:

As a player I want to be able to roll the dice so I can move forward and progress the game.

Confirmation

There is a random number generator that acts similar to a dice and generates a random number.

Functional:

- Am I able to roll the dice by pressing a button?
- Are these numbers able to be used for progressing?

Completed:

Yes.

Board with spaces - US-17

Description:

As a developer I want there to be a board with 40 spaces so that the board represents the original Monopoly game.

Confirmation

There should be a board with 40 independent spaces.

Functional:

- Is there a board containing 40 independent spaces?
- Is there a visual representation of the board?

Completed:

Yes.

Properties - US-2

Description:

As a player I want to be able to purchase properties I land in order to accumulate wealth.

Confirmation

Being able to buy a property when you land on a specific tile.

Functional:

- Is there an option to purchase property?
- Do others have to pay me when they land on it?

Completed:

Yes.

Where are my properties? - US-13

Description:

As a player I want to be able to see what properties I own so that's easier to keep track of what I own.

Confirmation

There is a visual confirmation that accurately portrays which properties a player own.

Functional:

- Is there an easy way to see what I own?
- Does this update when I purchase something new?

Completed:

Yes.

Rent system - US-20

Description:

As a developer I want there to be a system that calculates how much rent should be paid for each property so that some properties will be more valuable than others.

Confirmation

Each property has a system to calculate the specific rent that should be paid depending on how many of the same type of properties owned or amount of houses built on it.

Functional:

- Does each property have a table for how much the rent should be depending on how many houses built?

- Does the player know how much rent to pay after landing on a property?

Completed:

Yes.

Building houses - US-19

Description:

As a player I want to be able to build houses on monopolies I own so that I can earn more money.

Confirmation

Owning all spaces of a certain colour will allow the owner to buy and build houses on the spaces.

Functional:

- Does the game know if a player owns a full set of same coloured spaces?
- Does owning a monopoly allow the player to build houses?
- Is there a visual representation of houses?

Completed:

Yes.

Utility rent - US-18

Description:

As a developer I want to fix the correct rent for utilities so that players will think it's worth buying them.

Confirmation

Depending on the amount of utilities owned and the sum of the two dices rolled, rent should be determined.

Functional:

- Does owning two utilities give a greater benefit than owning one?
- Does landing on an utility owned by another player force the player to roll the dice?
- If owning one utility, is the rent determined by $4 * (\text{sum of the two dice rolled})$?
- If owning two utilities, is the rent determined by $10 * (\text{sum of the two dice rolled})$?

Completed:

Yes.

Starting wealth - US-14

Description:

As a player I want to start with a certain amount of money so that the game can start from the get-go.

Confirmation

Every player has a certain amount of money when starting.

Functional:

- Do I have money when I start the game?

Completed:

Yes.

Money tracker - US-12

Description:

As a player I want to be able to keep track of my money, so that I can see how much money I have and others.

Confirmation

There is a visual confirmation that accurately portrays a player's capital.

Functional:

- Am I able to see the money?
- Does this accurately reflect the players actual money?
- Does it update correctly when transactions are made?

Completed:

Yes.

Play against friends - US-5

Description:

As a player I want to be able to play against my friends locally in order to have extra fun.

Confirmation

There are independent profiles when starting a game that gives you the ability to play multiple people in the same game.

Functional:

- Can I choose how many players I want?
- Do these play separately from each other according to the game rules?

Completed:

Yes.

Turn-based - US-11

Description:

As a player I want to take turns playing so that each player/computer has a round to do their own stuff.

Confirmation

There is a turn-order that eventually allows everyone to play their turn.

Functional:

- Am I able to do all the stuff I should be able to do on each turn?
- Is there a way to end my turn when I should be able to?
- Is there a clear order when it's each player's turn?

Completed:

Yes.

Pieces - US-23

Description:

As a player I want each player to have their unique piece so that it's easier to identify who's who.

Confirmation

Each player piece should have an unique visual representation so that it's easy to distinguish who's who.

Functional:

- Does every player have an unique player piece?

Completed:

Yes.

Losing the game - US-15

Description:

As a player I want to be able to lose when becoming bankrupt so that the best player can win when everyone else is bankrupt.

Confirmation

I should lose everything I have when I lose and not be able to take more turns.

Functional:

- Does complete bankruptcy cause me to lose?
- Does losing not allow me to take turns anymore?
- Is the game properly able to calculate bankruptcy?

Completed:

Yes.

Start tile - US-7

Description:

As a player I want a tile to act as a start tile that gives me money when passed, so that I can get more money.

Confirmation

Passing the start tile gives the player money.

Functional:

- Is there a start tile?
- Do I get money when its passed?

Completed:

Yes.

Jailed - US-9

Description:

As a player I want a tile to act as a jail where I have to skip 3 turns before I can move again so that the game is more exciting.

Confirmation

I have to skip a maximum 3 turns when I am put in jail.

Functional:

- Does my turn get skipped 3 turns when I am put in jail?
- Are multiple people able to have their turns skipped?
- Am I able to move after 3 turns?

Completed:

Yes.

Jail transport - US-8

Description:

As a player I want a specific tile to transport me to another card which acts as a jail.

Confirmation

I transport to a specific tile when landing on this tile.

Functional:

- Does my player piece transport when landing on this tile?
- Is this tile the tile that acts as a jail?

Completed:

Yes.

Prison break - US-10

Description:

As a player I want to be able to escape jail early by rolling a double so I can reduce my disadvantage and I have some initiative to change my fate.

Confirmation

Rolling a double while in Jail allows me to move.

Functional:

- Am I able to roll a dice while in jail?
- Does a double release me from jail?
- Am I still allowed to move after 3 turns despite not rolling a double?

Completed:

Yes.

Tax tiles - US-16

Description:

As a player I want there to be some tiles that cost me money when i land there so there is some tension when i move.

Confirmation

There are tax tiles that cost money.

Functional:

- Are there dangerous tiles that cost money?
- Does the money go to the bank and not another player?

Completed:

Yes.

Draw cards - US-4

Description:

As a player I want to be able to draw cards that might give me advantages and disadvantages as it adds excitement to the game

Confirmation

When landing on specific tiles I want to be a given a card that affects the game in some manner.

Functional:

- Are there tiles that give out cards?
- Do these cards affect the game according to their description?

Completed:

Yes.

Auction - US-21

Description:

As a player I want to be able to bid on properties when somebody decides not to buy them so that the game becomes more competitive and strategic.

Confirmation

If a player lands on an unowned property and decides not to buy it an auction will be held for each player to place a bid on the property, highest bid wins and gets the property.

Functional:

- Does an auction start when a player decides not to buy an unowned property?
- Can players take turn bidding?
- Is it possible to pass on bidding?
- Does the last player not to pass receive the property?

Completed:

Yes.

Mortgage - US-24

Description:

As a player I want to be able to mortgage properties I own so that I have a way of getting money when I am in desperate need of it.

Confirmation

There should be a button to mortgage a property which allows the player to get some money in exchange for inactivating the property.

Functional:

- Is there a button to mortgage a property
- Is it only the owner of the property that can mortgage it?
- Can the owner buy the property back after mortgaging it?
- Does mortgaging a property give the right amount of money?

Completed:

Yes.

Trading - US-22

Description:

As a player I want to be able to trade with other players so that the game becomes more strategic and fun.

Confirmation

There should be a button to initiate a trade, where players can trade properties and capital with each other.

Functional:

- Is there a button to start a trade?
- Is it possible to choose who you want to trade with?
- Is it possible to accept or deny a trade?
- Does the trade work as planned?

Completed:

Yes.

Visual mortgage - US-25

Description:

As a player I want to see what properties are mortgaged so that I can easier know what property is mortgaged or not.

Confirmation

There a visual representation of each property that is mortgaged.

Functional:

- Is there a visual representation of a mortgaged property?

Completed:

No.

Face Computer - US-3

Description:

As a player I want to be able to play against the computer in order to play without having friends

Confirmation

The computer is able to handle all it's own actions without input.

Functional:

- Can the computer play independently?

- Does the computer play according to the rules?

Completed:

No.

Mini-games - US-6

Description:

As a player I want some of the cards to create mini-games for a challenge and extra fun.

Confirmation

Some cards start a small mini-game.

Functional:

- Does some cards start a small mini-game?

Completed:

No.

2.2 Definition of Done

For a user to be accepted the code needs to be reviewed by someone, it should pass all tests and it should be pushed to the master branch in GitHub.

2.3 User interface

The original sketch originated from the original Monopoly game's board, which was modified with Chalmers flavour to make it more interesting for the targeted audience.



Figure 1: Original game board

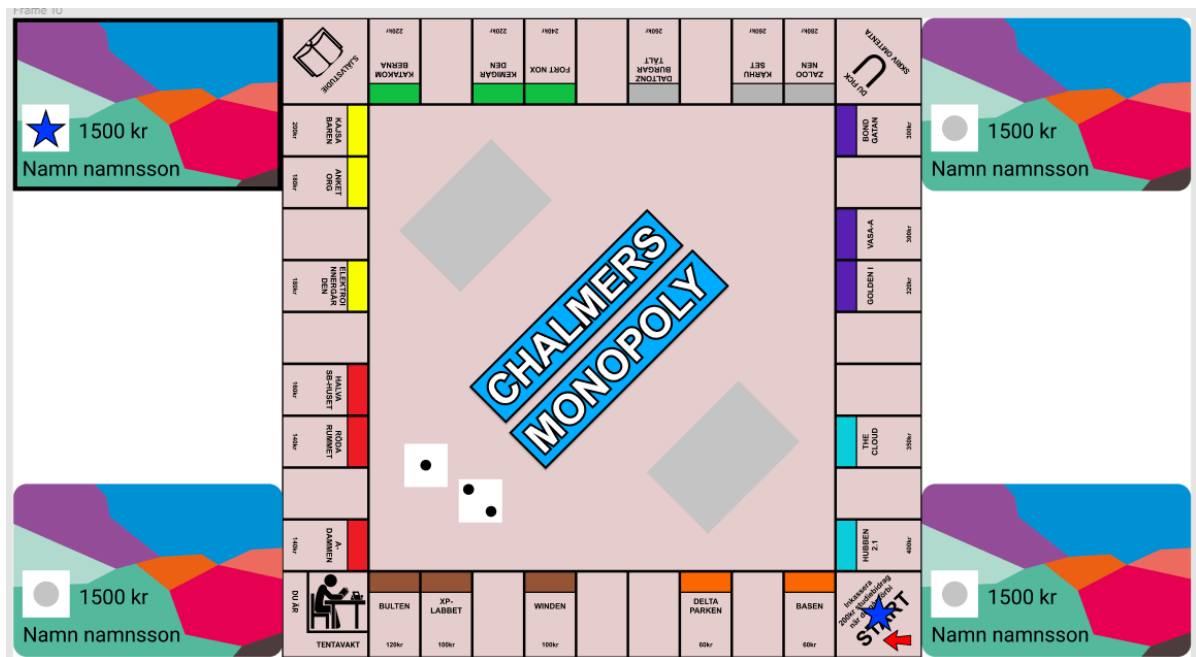


Figure 2: First mock up of board and player UI

Figures 3-8 depict the application. At startup the user is greeted by the start menu, which transitions to the setup screen when the "Start game" button is pressed. From

there the user can either go back to the start menu or, after specifying the amount of players, start the game and go to the board screen.

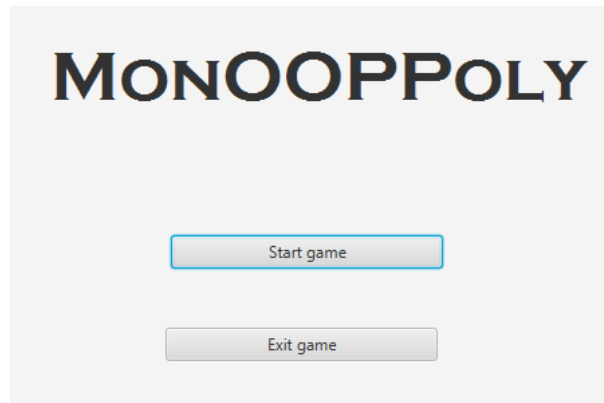


Figure 3: The start menu

The users can then select the amount of players for the game, along with each player's name.

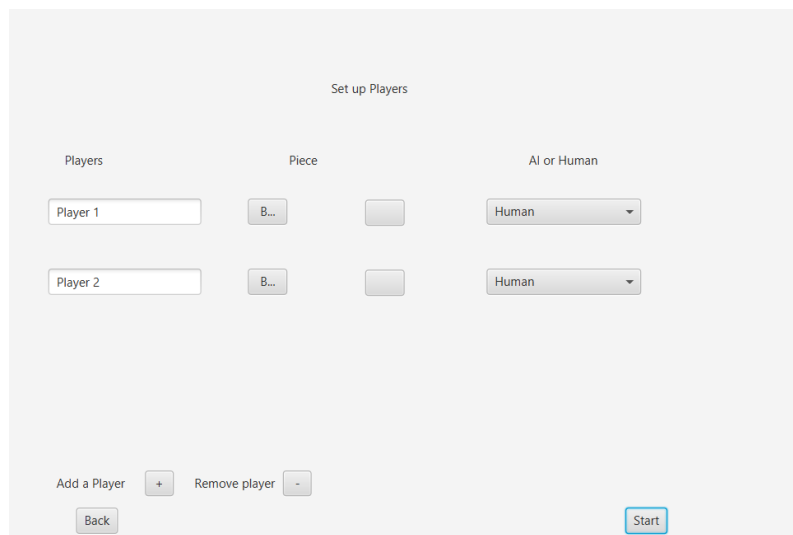


Figure 4: Setup screen

Once user has set up the game they will arrive at the game board. This is where most of the game takes place. Each player has their own player card showing their piece, color, username and capital. The player card highlighted in black depicts the current player.



Figure 5: Game board

When a player lands on an onowned property figure 6 will be loaded into the empty upper half of the game board. Allowing the player to either press the buy property button or choose to auction the property instead.

WINDEN	
Purchase Price	100kr
Mortgage Value	50kr
Rent	6kr
Rent with colour set	12kr
Rent with 1 house	30kr
Rent with 2 houses	90kr
Rent with 3 houses	270kr
Rent with 4 houses	400kr
Rent with 1 hotel	550kr
Houses cost	100kr
Hotels cost 4 houses + 100kr	

Buy Property

Auction

Figure 6: Unowned property screen

Starting an auction will replace figure 6 with figure 7. Users can here take turns bidding for the property. The current bidder is shown along with the highest offer. Players can use the buttons to either raise the bid or drop out of the auction.

WINDEN	
Purchase Price	100kr
Mortgage Value	50kr
Rent	6kr
Rent with colour set	12kr
Rent with 1 house	30kr
Rent with 2 houses	90kr
Rent with 3 houses	270kr
Rent with 4 houses	400kr
Rent with 1 hotel	550kr
Houses cost	100kr
Hotels cost 4 houses + 100kr	

Auction

Highest offer: 0kr

Current bidder: William

Bid 100kr

Bid 10kr

Drop Out

Figure 7: Auction screen

Clicking any property around the board will show figure 8. It allows players that own a monopoly of that locale color to build houses. There is also an option for property owners to mortgage their property.

ELEKTRO- INNERGÅRDEN	
Purchase Price	180kr
Mortgage Value	90kr
Rent	14kr
Rent with colour set	28kr
Rent with 1 house	70kr
Rent with 2 houses	200kr
Rent with 3 houses	550kr
Rent with 4 houses	750kr
Rent with 1 hotel	950kr
Houses cost	100kr
Hotels cost 4 houses +	100kr

Buy House

Mortgage

Figure 8: Screen for buying houses or mortgaging a property

3 Domain model

Figure 9 gives a high level overview of the application using an UML-diagram.

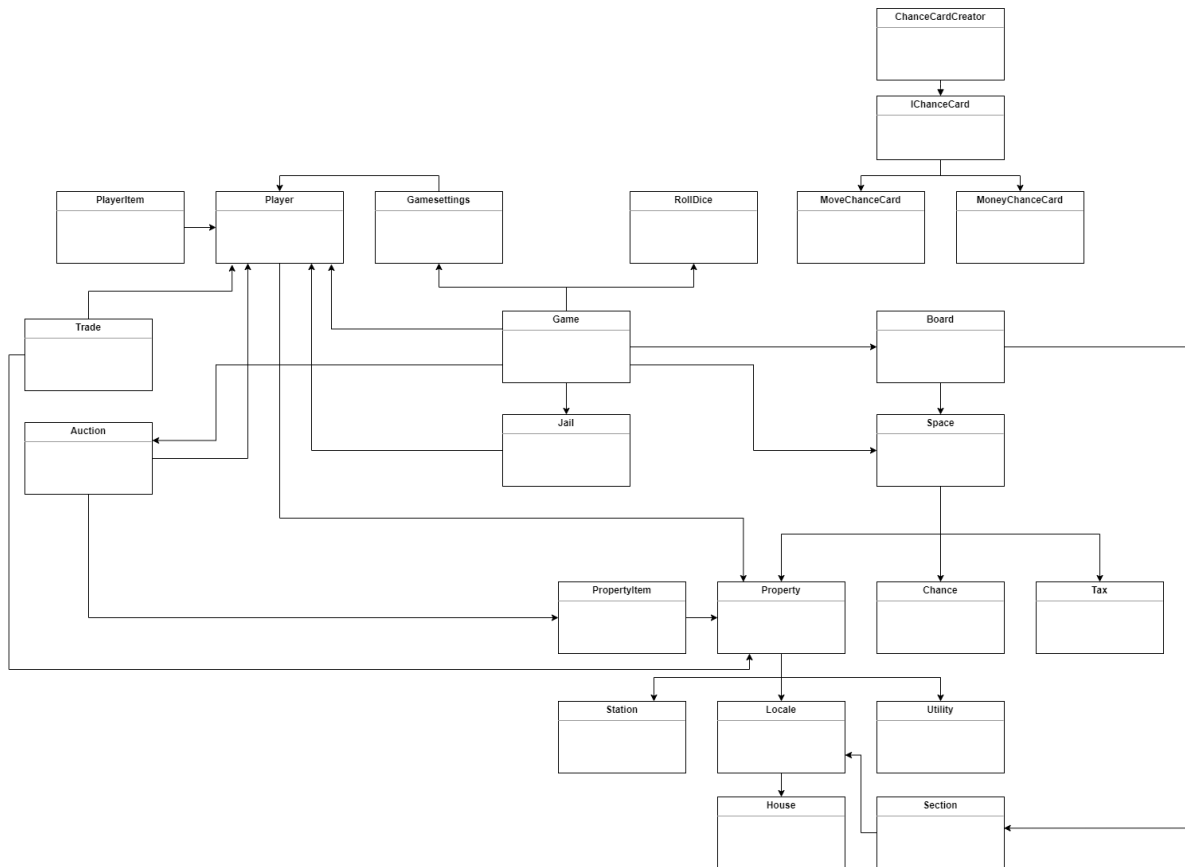


Figure 9: Domain model

3.1 Class responsibilities

Explanation of the responsibilities of each class presented in the diagram.

3.1.1 Monopoly

The Monopoly class functions as the main class or application class of the game. This class will make sure the game is able to run and gather all components necessary for that to happen.

3.1.2 Player

Player is a class necessary to store player information and handle the logic needed for the player to perform actions. It controls the players money, inventory and logic for movement and keeps track of where the player is located.

3.1.3 RollDice

This class simply serves as a random number generator in similar fashion to how a dice would act. When called on, write how many dices there should be.

3.1.4 Space and its subclasses

The Tile class acts as a super class for similar behaviour for how most subclasses of it should act as the entire board is made up of tiles that act differently.

Property, Chance and Tax all extends Space. Property will include all spaces which allows for you to buy and own spaces and which are sold in a normal way. The Chance class will give the player the ability to draw cards with different consequences and possibly play mini games and the Tax-space simply debts the player money each time they land on it.

3.1.5 ChanceCardCreator

Contains a list of every chance card in the game.

3.1.6 IChanceCard

An abstract class for every kind of chance card in the game, whether it moves the player och takes money from them etc..

3.1.7 MoneyChanceCard and MoveChanceCard

Different kind of chance cards which have different consequences. MoneyChance-Card either gives or takes a certain amount of money to or from the player. MoveChance-Card moves player to another space.

3.1.8 Property and it's subclasses

There are three classes which extends Property; Locale, Station and Utility. Locale is the classic colorful streets which are a classic signature of the monopoly game. You can buy houses and hotels on them if you own all spaces of a certain color. Station is a property which you cannot buy houses nor hotels on, you get a higher income from them by simply buying more stations. Utilities work the same as stations but are cheaper and gives less of an income.

3.1.9 Section

A class to coordinate the "spacegroups" i.e. the spaces with the same colors.

3.1.10 Board

Board contains a list of all the spaces that exist in the game.

3.1.11 Game

A class that makes dice, board, players and spaces cooperate.

3.1.12 GameSettings

GameSettings is a class responsible for handling whatever settings the player wants to use. In it's current iteration it's only to determine the amount of players, but might be expanded to include if the players are human or AI and other house rules. The game requires an instance of this class to be created.

3.1.13 Auction

Handles the auction-function in the game. When a player lands on an unowned property, it has to either buy it or set it up for auction so that other players can bid on it.

3.1.14 Trade

Handles the function of trading in the game. A player can trade money and properties with other players.

3.1.15 PlayerItem and PropertyItem

When trading, PlayerItem and PropertyItem makes sure that a player can offer money or a property.

3.1.16 House

Lets players buy houses on their owned property for a higher income when other players lands on the property. Also allows extension of the feature.

3.1.17 Jail

Jail is responsible for handling the functionality regarding jailtime. It makes sure that if the use lands on a specific space, that player is locked-out from moving.

4 References

List all references to external tools, platforms, libraries, papers, etc.

For the program we have used JavaFX for building up everything that is graphically visible. This together with an external tool called Scenebuilder. We have also used classic Monopoly-rules for the game and some cultural words and places for Chalmers University of Technology for naming different things.

JavaFX: <https://gluonhq.com/products/javafx/> Scenebuilder: <https://gluonhq.com/products/scenebuilder/> Monopoly: <https://www.hasbro.com/common/instruct/00009.pdf> Chalmers: <https://www.chalmers.se/sv/Sidor/default.aspx>