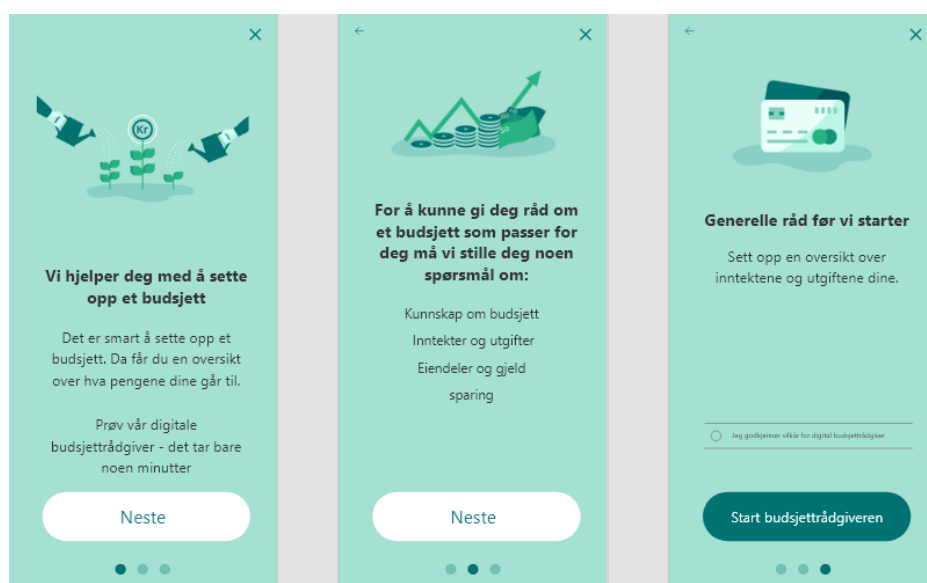
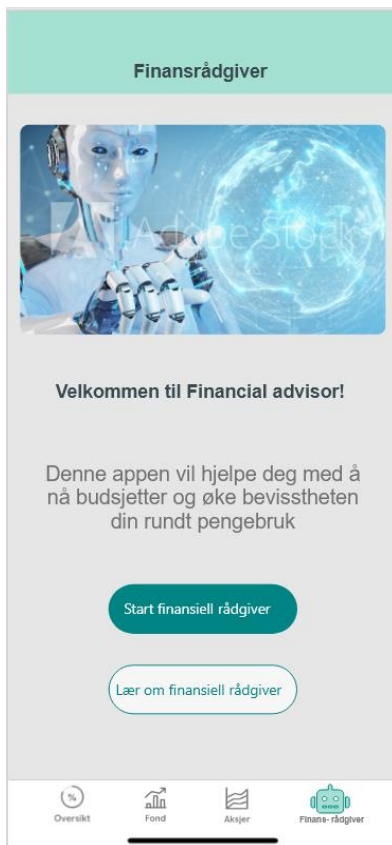


# DIGITAL FINANCIAL ADVISOR

EIRIK HØYHEIM, SEBASTIAN BECKER, ASLAK DJUPSKÅS



## SUMMARY

The purpose of this report is to obtain if it is possible to create a digital financial advisor for DNB customers. The financial advisor will help the customer with creating a budget, adhere to the budget, keep track of the user's expenses and praise the user if he shows economic health. The objective of the digital financial advisor is to increase the economic health of the user through inclusiveness.

Norway has long been one of the countries with the highest average dept. In the last years, Norway has had the highest average debt of all countries in the world (Iversen, 2019). From this, the group noticed a demand for a free digital financial advisor. The problem statement in this report is: How can a robot advisor provide financial health and inclusiveness to customers?

First, the group started working on finding a problem statement. The group ended up working on this problem statement: How can a robot advisor provide financial health and inclusiveness to customers? Further, the group created a prototype of the idea in Adobe XD. The prototype in Adobe XD was given to people to get feedback. Finally, an example of the product was made in python.

The key findings from the evaluation are people generally think the digital financial advisor is good. Many of the participants believed that the idea could have a positive impact on people struggling economically. Some of the feedback on improvements are that the design of the app could become more user friendly and that the automation of the app could be better. From the feedback there is a demand for a robot financial advisor.

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## BACKGROUND

There are approximately 2.4 million households in Norway and the average debt of a household is 1.4 million Norwegian kroner (Iversen, 2019). It may not come as a surprise that the Norwegian households have the highest average debt in the world (Iversen, 2019). The last few years there has been a frightening increase in consumer loans in Norway. In an article from the Norwegian economy- and business newspaper e24 from 2016, they compared Norwegian families saving relative to other countries. The conclusion is that Norwegian families are among the bottom of the “OECD countries” (Sagmoen, 2016). All these examples show that Norwegians would benefit from a Financial advisor. For the average person a financial advisor would be costly and not an achievable expense. It is also a paradox to pay a financial advisor a large sum to gain control of their finances.

Another article from e24 (Bugge, 2020), describes how the Norwegians are struggling with paying debts more than before. The struggle is not only because of the present difficulties connected to Covid-19. It is not on car- and house loans, but on objects like TV, electricity and daily groceries. However, the reason why they are not receiving Debt Collection on house- and car bills is because many people get instalment deferrals on these loans (Bugge, 2020). Hence, it is not unthinkable that people struggling with electricity bills will struggle with their house loan after their deferrals. There is clearly a demand for a product which can help people to gain control over their economic situation.

In a commercial from DNB, they ask people on the streets of their “new year goals” (dnb\_bank, 2021). The answers are diverse, but some people say that they want to be better at savings, get control on expenditures and to stick to their budgets. From this, the group got the idea that there is a demand for a free robot financial advisor, which can help with creating budgets, tips, warn you and praise you to keep your budget on track. The idea suited also the problem provided by DNB which is to create a robot adviser for providing financial health and inclusiveness to customers.

## WHAT IS A PERSONAL FINANCIAL ADVISOR?

An article from netinbag.com describes the tasks for a personal financial advisor. In general, it helps a person with its economy and in some cases the only task is to set up a budget. Regularly the advisors are contacted by people that are losing control of their economy and sometimes the financial advisor helps persons with investments (unknown). In an article from Nettavisen, a young adult used 180 000kr on McDonalds a year (Solberg, 2019). Persons like this, would appreciate financial advisors to prevent them from having unhealthy spending habits.

## FINANCIAL HEALTH

A short explanation of financial health is a scale of your awareness and planning of your economy. “Investopedia” are defining Financial Health as “a term used to describe the state of one's personal monetary affairs”. Hence, how aware an individual is of savings, retirement savings and how rusted you are to non-discretionary expenses (Kagan, 2020).

Also, financial health is “state and stability of an individual's personal finances and financial affairs” (Kagan, 2020). If a person with steady income and expenditures, growing investments and increasing cash flow, fulfils the demands of high financial health. To increase it further, one has to “assess your current net worth, create a budget you can stick to, build an emergency fund, and pay down your debts” (Kagan, 2020).

## PROBLEM STATEMENT

There are many people that may not know all the benefits and advantages of a personal financial advisor. However, hiring a financial advisor could be too expensive for many people. Therefore, the group wanted to create a free financial advisor- function integrated in the spare app, to give DNB customers the advantages that come with financial advisors. This could higher the financial health for the customers by helping them save as much of their salaries as possible. Additionally, it could make more people afford new and desirable things and experiences. The groups problem statement is:

How can a robot advisor provide financial health and inclusiveness to customers?

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## GOALS AND OBJECTIVES

The overall goal is to complement the DNB “spare”-app with a financial advisor. The main purpose of the extension is to make the process of creating and adhering to a budget more easily. In addition, the

extension will provide the user with feedback and tips for adhering their budget and increase the financial health of the user. Requirements for the product is that it shall be easy to use and require no prerequisite knowledge about budgets or finance. The limitations of the product are that you must be a DNB customer and use the “spare”-app. The target group are people between 16-65 who use the “spare”- app.

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#### PROJECT TEAM

The first member of the group is Sebastian Becker. He is 21 years old and started studying “Datavitenskap” at NMBU in 2018. Before the studies Sebastian played a lot of football. In his spare time, he likes to read and work out.

The second member of the group is Eirik Høyheim. He is 21 years old and started at NMBU on the study program “Frie realfag” in 2018 and switched over to “Datavitenskap” in 2019. Until recently, Eirik played ice hockey for “Stjernen U-21” and Ski Hockey. In his spare time, he likes to train and socialise with friends.

The last member of the group is Aslak Djupskås. He is 22 years old and started at “Datavitenskap” in Ås this spring. Before the studies, Aslak served military duty in Skjold in the northern part of Norway. In addition to data and programming, Aslak’s interests are football, FIFA and economy.

*Table 1, overview of the project team*

Name	Role & Contribution to the project
Sebastian Becker	Data Science, Business Analytics, project manager
Eirik Høyheim	Data Science, Business Analytics, head programmer
Aslak Djupskås	Data Science, Business Analytics, App designer

## STATE-OF-THE-ART ANALYSIS - TECHNICAL REVIEW

State-of-the-art analysis in this case is to compare the prototype with other similar apps and programs. The not surprisingly results were that this type of program already exists. Accordingly, there is an app called “**Lunar**” that automatically puts your expenditures and systemize it to increase your awareness and optimize your consumption. This will give the user an overview over their budgets and their margin to reach it, and you will get notifications continuously. Additionally, you can create your own goals, to spare money for something you wish to do. Nevertheless, you are forced to order a credit card to use the app. For some people, a credit card would not always be helpful if the goal is to save money and improve financial health. To get the best advantages, the user has to pay for the premium version. (Lunar, 2015)

However, the group’s financial advisor will not only function as a systemized overview of the expenditures but give concrete guidance to achieve saving goals. Also, the app will categorize your transactions in terms of importance. That will give you an overview of which purchases you could have avoided.

Additionally, the goal was to deliver a product that can be viewed as a financial advisor for DNB customers. The DNB app “Spare” does not have a cunning save function like this, so even though it exists similar apps, it would be more intuitive for DNB customers to add it in the “Spare” app.

However, the app does have a function for saving goals, but this program is hopefully an improvement of that. As Spare is today, you cannot create a budget, there are no tips for improved savings, and there are no buffer accounts that the app helps you with. However, there are tips on DNB’s homepage about savings and buffer accounts

Table 2, competitors to the prototype

Competitors	Pros	Cons
<b>Financial advisor (our idea)</b>	The app gives an overview of your budget, creating the budget automatically and gives tips along the way. It is easy to use for DNB customers with "Spare" on their phone.	The app does not exist yet.
<b>Lunar</b>	The app is very similar to the group's idea. It allows you to create a budget with categories and saving goals. The app gives you notifications containing your budget.	The app does not include in the spare app. You are forced to order a credit card to use the app. For some people, a credit card would not always be helpful if the goal is to save money and improve financial health. To get the best advantages, the user has to pay for the premium version. The notifications do not contain concrete guidance to achieve saving goals.
<b>Spiir</b>	You can create goals and the overview is very clear.	It is not possible to create a budget, or to get help reaching the budget.
<b>Spare</b>	It gives you an overview of your money and you can create saving goals.	You cannot create a budget, there are no tips for improved savings, and there are no Buffer accounts that the app helps you with. However, there are tips on DNB's homepage about savings and buffer accounts.



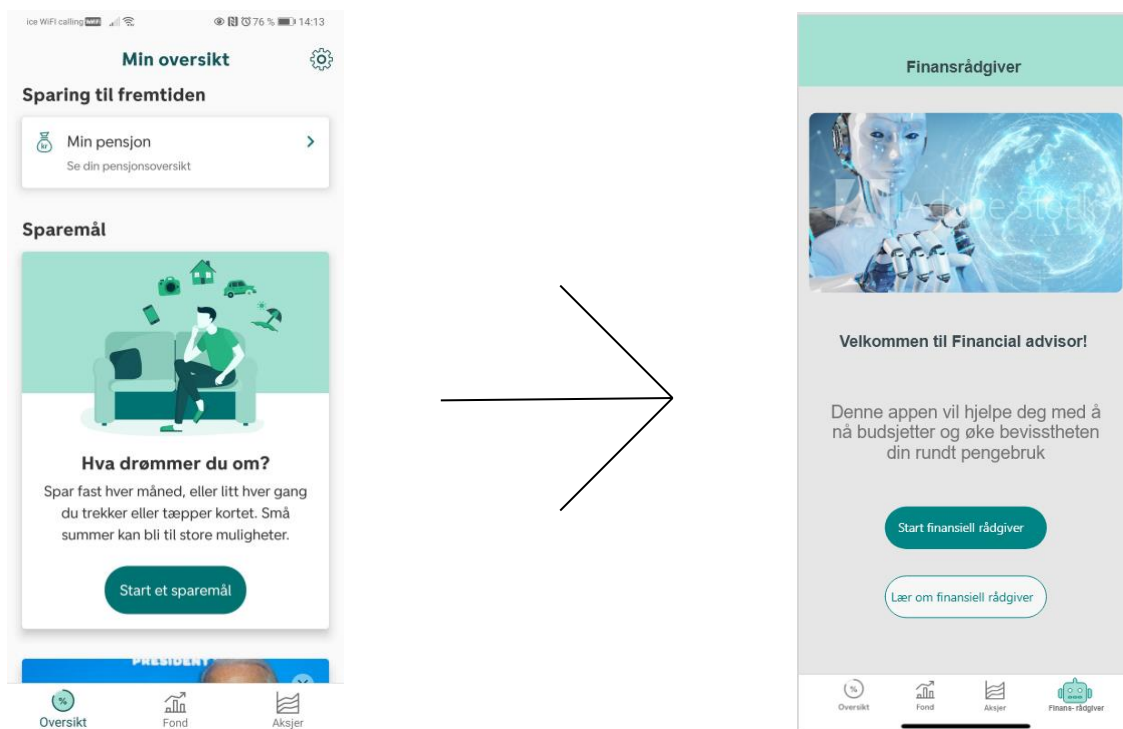
## DEVELOPMENT OF THE DFA SYSTEM

## Overview - Functionality of the app

The financial adviser will help DNB customers to generate a budget and adhere to the budget, by giving the user frequent feedback and tips. The goal is to increase the financial health of the user.

Adobe XD is used for creating the MVP (minimum viable product). Then the MVP is used to test the product to see if it was a proper solution for a digital Financial adviser. Adobe XD makes it easy to visualize the solution without spending much time designing it by coding. Further, the prototype was extended in python.

The solution is an extension of the DNB “Spare-app”. Therefore, the inspiration for the design is taken from DNBs “spare- app” and the exact same hues and layouts were used. Since the Financial Adviser is an extension of the “spare-app”, it is added as a new selection along with “Oversikt”, “Fond” and “Aksjer” in the menu at the bottom of the app. If the user clicks on Financial advisor the user will get two possibilities, either auto generate a budget or read more about the Financial advisor.



The concept with questions about yourself at the start of the app, is taken from the “Fond” section, where you get similar types of questions. This is to keep it simple, with as few new appearances as possible.

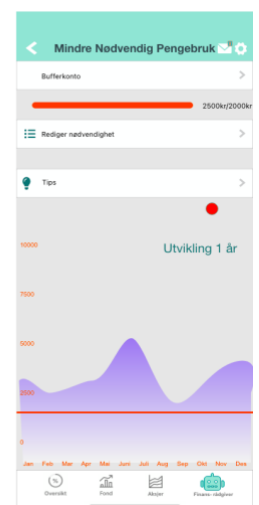
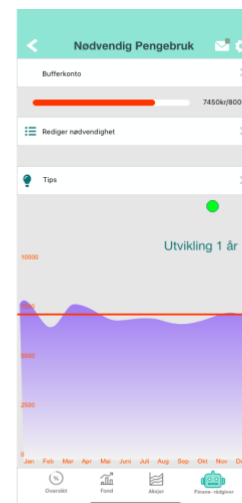
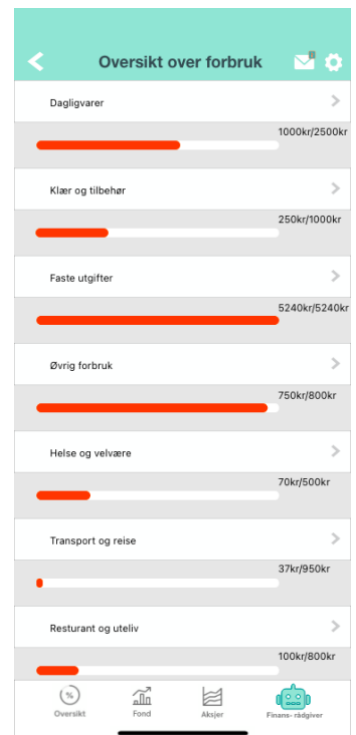
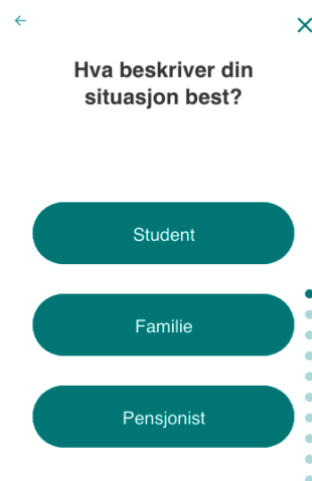
## FUNCTIONALITY OF THE APP

To visualize the expenditures of the month intuitive for the customer, the app registers all the transactions and adds it to its category. The user himself can change how much money he wishes to reserve on the different goods, if he disagrees with the suggestion from the robot. Additionally, an inbox icon was added in the top right corner, to make the customer updated on the latest tips from the app.

At first, the customer will receive some questions about their personal economy and private life. For instance, the monthly budget would be tighter for a student than a widow, or a mother with children would have a

different night live budget than some students. This information helps the robot create a customized budget to the user.

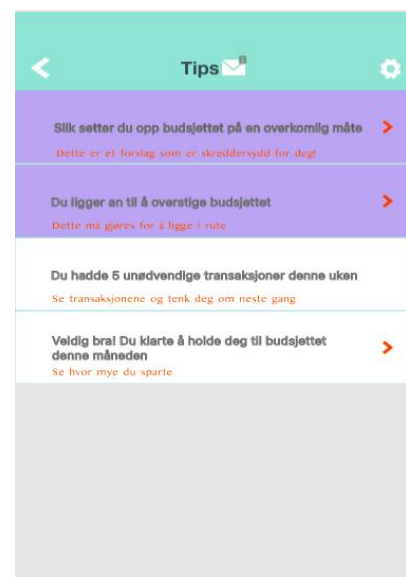
To help the customer along the way, the apps will guide with notifications containing praises and criticism. The expenditures get either in the category “necessary”, “less necessary” or “unnecessary”. In an ideal month there will only be necessary expenditures, so the robot will be the guidance to achieve this.



However, the customers are able to change categories for expenditures themselves, because the categories can be various to persons. For instance, a cup of coffee at a café in the morning could be crucial for some, and worthless for others. Therefore, some users would count the coffee as “necessary”, to prevent it from appearing in the category of unnecessarily. In the category “less necessary”, transactions on things you like, but do not *need* will appear. For instance, it is not always necessary to eat at a restaurant, but on the other hand, you cannot avoid restaurants forever because it is not necessary. In the end of the month, hopefully, the client’s expenditures are in equilibrium to the budget.

Then, the savings will be placed in an account for unexpected bills (buffer account), until the account reaches its maximum limit. The limit can be adjusted by the user, and when it is full, the user can decide where profit savings is placed. For this, the “spare” app has some useful functions from before, such as saving goals, funds and stocks. Additionally, there is a fund advisor that helps you choose funds fitting you.

Also, the financial advisor robot will use the categories of the expenditures to get an overview of how you can improve. Based on that, the app will give constructive feedback, such as how you are doing to achieve the budget, specific transactions you could have avoided, how you can set up a realistic budget based on your situation (if you wish to do it differently than the automatic budget that was created). In addition to these constructive comments, the robot will praise you with positive feedback if you are doing well during the month or manage to save at the end of the month.



## System implementation

To help with understanding what the digital advisor does, two programs that compliments the Adobe XD design were created, both implemented in Python. The first program helps the user to make a budget and saves the budget. The second program works as a substitute for a bank terminal.

## System architecture

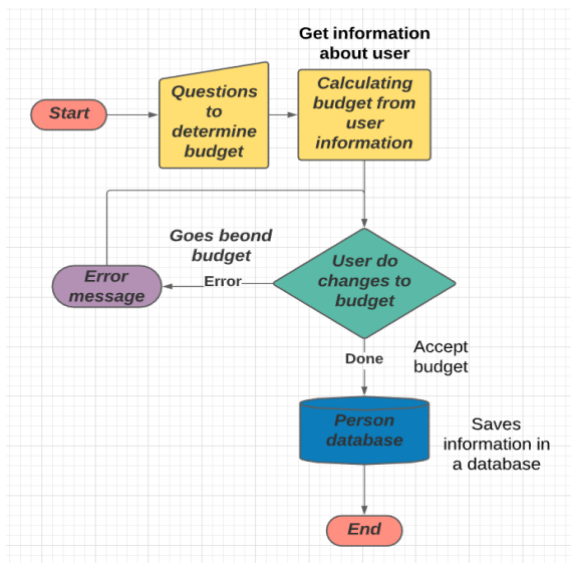


Figure 1: flowchart of how the budget app is developed.

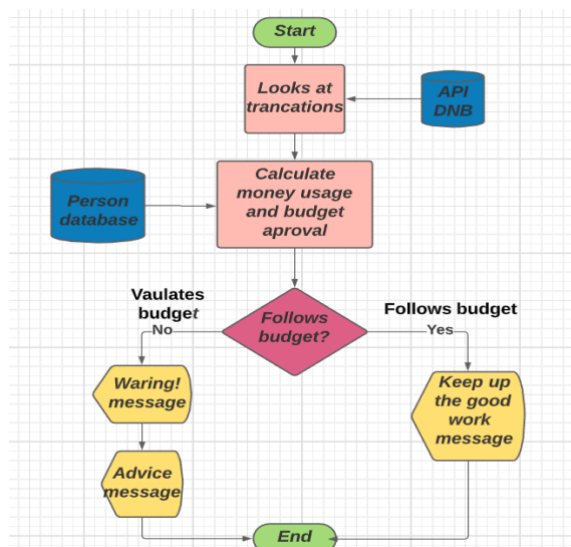


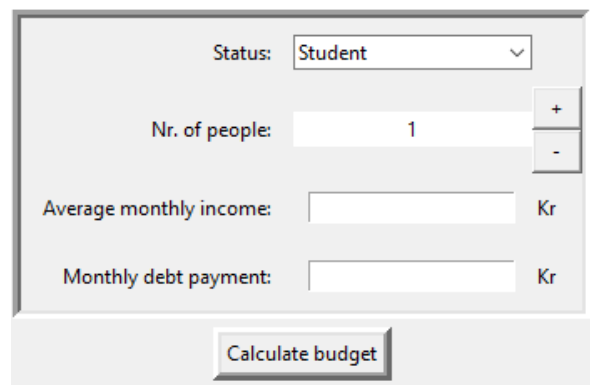
Figure 2: flowchart of how transactions will work.

Functionalities of an automated budget program can be unlimited, therefore the group had to set some limitations. These limitations are users should only input minimal information, the program should not include any advanced mathematical properties to calculate the budget and the frontend of the program must be minimalistic. With that starting point, the flow chart was drawn.

After planning the first program, the group began on the second program. This program is a visual example of how the user will experience “push notification” when using a card. This program is also minimalistic as it should be a representation on how users experience push notifications and a representation of what kind of feedback the user could get when purchasing different items. The group figured that the main goal for the program was to see how much the user had spent, see if the user had spent less than 25%, one week of a month, in one spending. If they had spent less, the program would give them positive feedback. If they spent more than 25% of the budget, they would get a warning message and a tip on how to spend money more wisely or a tip on some laws that may give the user an economical advantage.

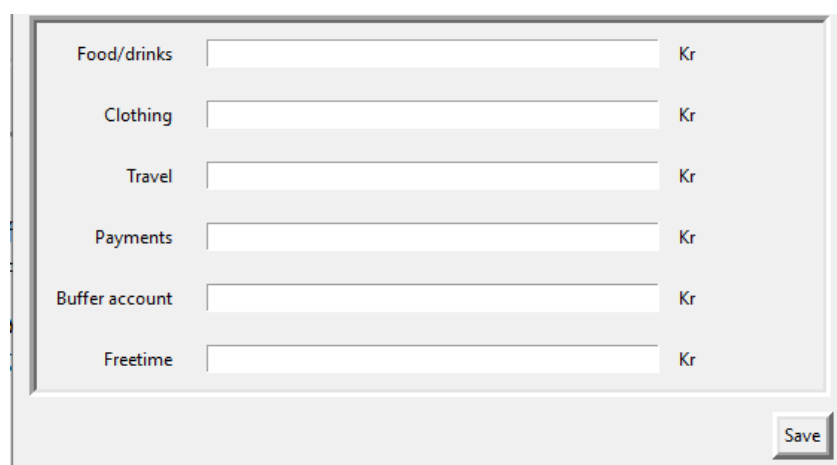
## Development of the DFA app

The next part is to integrate the suggestions into Python, beginning on the budget program. First, the user fills out some basic information that will be the basis when calculating the suggested budget. After all information about the user has been implemented, the user will press a button that will send all information to a separate program that will calculate a budget for the user.



A screenshot of a web form for the Digital Financial Advisor (DFA) app. The form is titled 'Status: Student' with a dropdown arrow. Below this is 'Nr. of people: 1' with '+' and '-' buttons. Then 'Average monthly income: [text box] Kr' and 'Monthly debt payment: [text box] Kr'. At the bottom is a 'Calculate budget' button.

The group came up with six different categories that will be filled up automatically when clicking a button. The budget is only a suggestion, therefore it will be easy for the user to edit each category. After the budget is written and the user is happy, he/she can save the information. The information will be saved in a database for easy access later.



A screenshot of a web form showing six budget categories: 'Food/drinks', 'Clothing', 'Travel', 'Payments', 'Buffer account', and 'Freetime'. Each category has a text input field followed by 'Kr'. A 'Save' button is located at the bottom right.

Putting these two elements together the program looked like this:

Information about user

Status:

Nr. of people:  + -

Average monthly income:  Kr

Monthly debt payment:  Kr

Food/drinks	<input type="text" value="6000.0"/>	Kr
Clothing	<input type="text" value="3000.0"/>	Kr
Travel	<input type="text" value="1500.0"/>	Kr
Payments	<input type="text" value="10000"/>	Kr
Buffer account	<input type="text" value="1500.0"/>	Kr
Freetime	<input type="text" value="3000.0"/>	Kr

Saved!

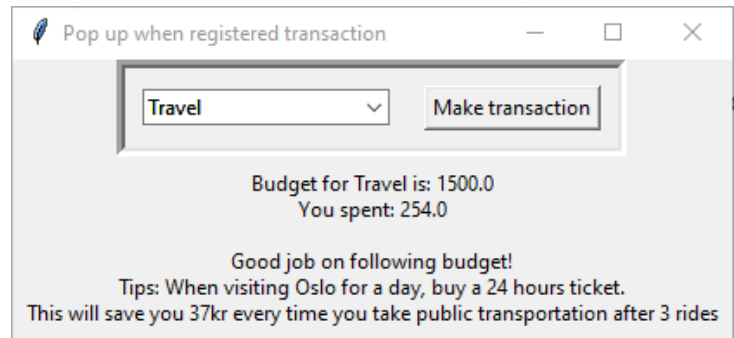
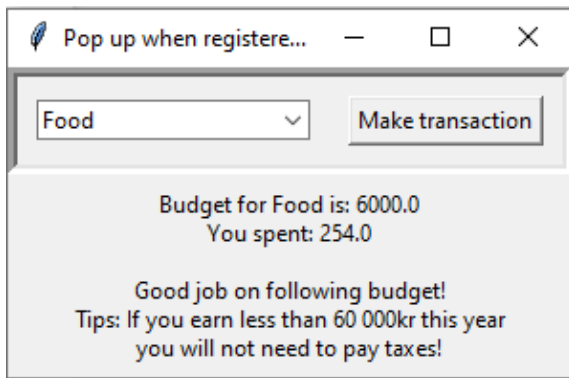
Now all information is saved and ready to use for the next program where the user spends money.

The second program will tell the user how they are doing in relation to their budget. The idea is that the program will recognize what type of store the user is spending money at and relate it to the user's budget.

The GUI only contains two sections; what budget type have the user spent money on and a button that says: "Make transaction". When clicking on the button, the program will look at the last purchase that the user made, then do some calculations to see if it was a wise choice or not.

Pop up when registere...

Welcome!



The idea is that this will appear on the phone after a purchase, so it is easy to see how much you have spent, how much of the budget that you have and give feedback to the user to inspire them to spend their money wiser.

#### Use of the app

To use the app, the user has to download the spare-app on his smartphone and fill out personal information. Then, the user can decide how often he would like to visit it, depending on how much help that is needed or how much time he wants to spend on it. The app can be used to read the tips, see your margin on the budget or see if a spending could have been avoided.

#### EVALUATION AND RESULTS

The final prototype consisted of 29 pages, whereas 19 of them were a part of registration and introduction. The remaining ten pages are a part of the menu and functions of the app. As the prototype was finished, the group were ready to test it. The way the testing was done, was by giving it to family and friends to get their opinion. There were some specific things the group wanted them to evaluate:

- Their thoughts of the idea
- If the menu contained of too many pages
- Their thoughts of putting transactions on categories of importance
- If they have a more user-friendly solution to the menu
- Tips of further development
- Anything else?

These questions were given along with the prototype, and the answers were given back to the group. The results could be useful to further development.

The results were various, and primarily the feedback on the idea was positive. Some thought the idea could have a positive impact on people struggling economically, and also that it would work as a motivator. An article from NRK says that unemployment in Norway is at its highest since world war two (Kalajdzic, 2020). Specially, after the economical struggle connected to covid-19, there could be crucial for many people to save money.

The design was simple and slipped well into the Spare-app, however, some said that it was convoluting to get back to the menu after the intro. This could be fixed by adding a menu- button at the page of the budget.

Another feedback was that the pictures could be different. A suggestion from both the group and some of the testers is to make similar pictures as the ones that already are in the Spare app.

Some also said that it was interesting that the app did everything for you such as creating a budget and giving you tips. Therefore, the suggestion of further work was to make the app do everything automatically. This could spare the app from some of the intro pages, because a robot would know your income and private life.

## REVIEW

The prototype has both positive and negative content. Firstly, the idea of a financial advisor that helps customers use money wisely and to create budgets, got positive feedback. This could help many people from preventing Debt Collections, to afford things or to experience things they previously doubted they could. Therefore, it is important to make the app intuitive for the customer. The results from the evaluation showed that the app was very easy to use, despite some small adjustments for the further work.

The group was proud of making a functional python-code that could generate a budget automatically and notice when your expenditures are getting too high.



## CONCLUSION AND RECOMMENDATIONS

The problem of the project was to “provide financial health to a customer through a digital financial advisor”. To do this the group created a goal: “to deliver a product that can be viewed as a financial advisor”. They believe that if they reach the goal, then the problem would be fulfilled as well.

With a program like this, a DNB customer would have more control of their economy and learn how to reach budgets. This would make them release more of their salaries to savings or unexpected expenditures or pay down debts. Additionally, the robot could help customers to increase their retirement savings, investments and cash flow. Overall, this could increase the financial health of DNBs customers.

## FURTHER WORK

To make the prototype complete, some adjustments are needed. Primarily, the design of the app could have more exact measurement, the pictures could be replaced with something that is fitting the app better, and the navigation on the app could be more user friendly. For instance, the icons in the “endre budsjett” section could be replaced in something more proper to the category. To make the navigation better, there could be a “menu” button on every page in addition to the “back” button. Additionally, a menu button could be added to the “budsjett” page after the intro pages.

Secondarily, to make the Python script seem with the layout, the design has to be coded in a script that can get connected to Python. Therefore, there is no interaction between Python and the design. This interaction would be the main task to make this prototype functional.

To improve the Python programs, it would be an idea to make the budget calculations more accurate with respect to the different groups and for how many people. It could also be more user friendly if it was possible to add another person, instead of just saying that it is x amount of people, as it is now. Implementing a way to detect what is a smarter purchase and what is a “dumb” purchase would also be beneficial for the user. For example, it is not wise to buy food for 100 NOK for one week. This would help the user to avoid small purchases and rather plan for the whole week. It would also be fun to try to implement machine learning to see if a user is continuing in a bad pattern and send more specified advice to this user. The program should also be able to place remaining money (money not used in other categories), should be placed in a buffer account or a savings fund.

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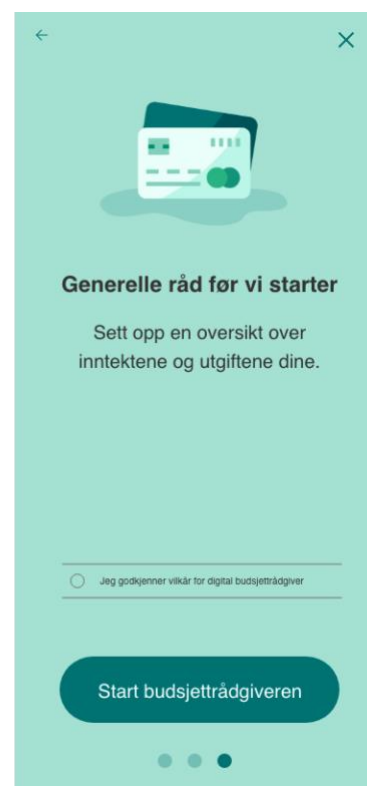
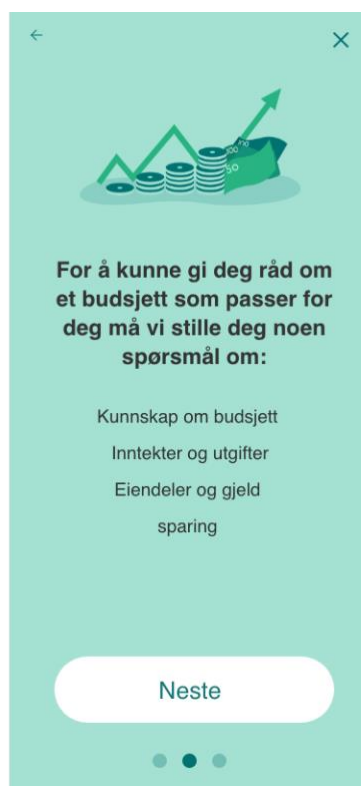
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## ATTACHMENTS

**Adobe XD prototype**

Adobe XD prototype can be found here: <https://xd.adobe.com/view/59770528-fdc1-412c-ba84-b3c6c3b6ac43-0c24/>

Pictures of the pages from Adobe XD:



←

×

Hva beskriver din situasjon best?

Student

Familie

Pensjonist

←

×

Startpunkt for budsjettet?

Dato for startpunkt

Tips

Fortsett

←

×

Hvor mange er det i din husstand?

Antall personer i husstanden

Fortsett

←

×

Omtrent hvor mye får husstanden utbetalt i måneden?

Dette får husstanden utbetalt

Fortsett

←

×

Hvor mye lån har husstand?

Samlet lån for husstanden

Fortsett

←

×

Hvor mye betaler husstanden i leie/lån i måneden?

Nedbetalning av lån eller leie

Fortsett

←

×

Hvor mye har husstanden i faste kostnader?

Faste kostnader

Tips

Fortsett

←

×

Hvor mye bruker husstanden på mat i måneden?

Mat kostnader

Tips?

Fortsett

←

×

Oppsett av bufferkonto

Start beløp for bufferkonto

Tips

Fortsett

←

×

Disponerer husstanden en bil?

Ja

Nei

Det lønner seg å starte budsjettet datoen man får lønning eller når måneden starter.

Tilbake

Faste kostnader er kostnader som påløper hver måned som f.eks husleie, strøm, forsikring, div abonnement osv.

Tilbake

I gjennomsnitt bruker en voksen person i Norge ca. 3000 kr på mat i måneden


Tilbake

Student: 5000 kr  
Ung med leilighet: 15 000kr  
Par med bil og hus: 30 000kr  
Enslig med barn: 20 000 kr

Tilbake

←

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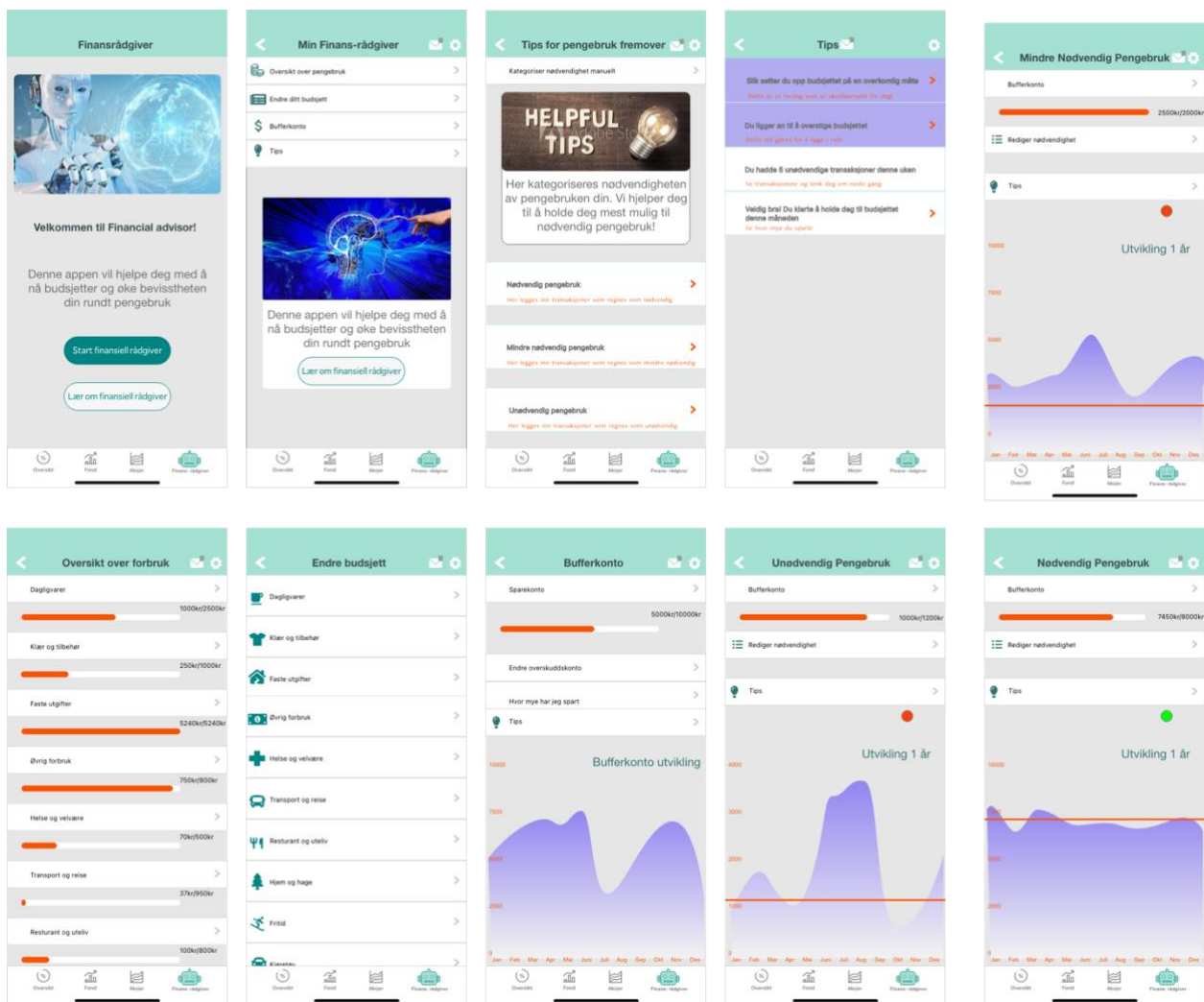
Generer budsjett

Få et budsjett tilpasset ditt behov

Generer budsjett

20





### Python code

All code can be found at [airihoyh/tin100\\_digital\\_advisor \(github.com\)](https://github.com/airihoyh/tin100_digital_advisor). The GUI folder contains the front-end part of the programs and the database while the backend\_code contains all backend code.