Personal Budget and Expense Tracker

- SW2 Group 2 -

Personal Budget and Expense Tracker

SW2 Group 2

Aalborg University
Electronics and IT

AALBORG UNIVERSITY
STUDENT REPORT

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A bigger program developed by a group

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Budget and Expense tracker

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Project Group:
SW2 Group 2

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Abstract:

Individuals with lower income must be cautious with their money, which may induce financial-related stress; a struggle relevant to most students. Getting a comprehensive overview could ease the intensity of the problem, and several budget and expense trackers are available, but most students do not tend to use any despite their money worries. In order to come forward with a feasible solution for this exact demography, the state of the currently available alternatives are researched, conclusions are drawn from analysing existing solutions, and a survey is conducted. Using all this data, a student-focused budget and expense tracking web-application is developed and tested.

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Preface

Aalborg University, May 24, 2022

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Chapter 1

Introduction and Motivation

This semester project is based on the subject *"A bigger program developed by a group"*. Therefore, this project requires a software solution and a report, that elaborates on both the program itself, the problem statement behind the topic of choice, "Personal Budget and Expense Tracker", and how a solution was gradually formed throughout the project. The nature of the software solution is a web-application, mainly written using HTML (with embedded JS), CSS and the programming language JavaScript. The solution provided is a prototype, which is created with focus on the core functionalities of the solution, and is not evaluated to be released as a marketable product. The deadline for this project is the 25th of May 2022, making the total duration of the project approximately 3,5 months.

The group's topic of choice is, as previously named, "Personal Budget and Expense Tracker". First of all, it is essential to understand what an expense and budget tracker is exactly. The following is a popular definition for encapsulating the fundamental goal of such a tool; *"Budgeting is the process of creating a plan to spend your money."*[61] After a budget has been drafted, it can be utilised to control and plan the spending of a private person or company - in the project, the group will exclusively be focusing on the private aspect of this branch. The most commonly mentioned purpose of a personal budget planner is to lower the risk of overspending that results in leaving a person with little to no money left on the remaining days or even weeks of the month. Furthermore, utilising such a tool is a way of prioritising a person's spendings, thus creating room for relatively larger one-time purchases, financing the payment of installments on debts, loans, and mortgages, or saving up for a vacation, festival, etc. A budget plan can span over several months or years, determined from personal preferences, to be able to forecast how much money will be necessary to save or borrow in order for allowing it to be used on a certain objective. Not long ago, from the 2000's to early 2010's, the only means of personal budget tracking were physical documents, Microsoft Excel sheets, and the software available at the time was far from optimal.[39] Today, however, tech companies such as Toshl Inc., Mint, and YNAB have attempted to answer the user demands, and created high-quality web and mobile applications for the purpose of tracking one's personal budget and expenses. Despite the great success of these applications, many niches of the field have not been covered yet, as these products represent rather universal solutions, than specifically targeted ones for individual demographics. Some examples for applications derived from highly saturated markets can be Crunchyroll [86], a streaming service primarily focused on steaming anime, manga, and prominently Asian-originated films and series, Discord [87], a gaming-focused communication service, or Grindr [88], a dating application for gay, bi, trans, and queer people.

1.0.1 The initial problem

The subject of personal finances proposes a plethora of potential problems, but for the sake of providing a viable solution, both the scope of the problem, as well as the target group of this project's solution must be narrowed down. Therefore, it was decided to start out by focusing on a low-income group, as they evidently perceive finances as a greater challenge, as well as a larger stress factor. As stated in this quote, "Financial stress is a state of worry, anxiety, or emotional tension related to money, debt, and upcoming or current expenses. Money is one of the most universal sources of stress." [14], financial stress can be a factor in a persons life. Like Eldar Shafir [13] who is a behavioral scientist at Princeton University, discusses this problem in relation to a relevant study on the topic.

"What's nice about these studies is we showed the low-income people do exactly as well as high-income people when they aren't worried about their finances," he says. "This is a clear way of showing it's not about being a poor person. It's about being in a moment of poverty."[40].

Taking inspiration from this study, the focal points of the problem to be looked at are somehow creating the feel of better financial stability amongst low-income groups, as well as potentially eliminating stress in this process. The same article quotes:

"When cognitive load is high and money is short, educational service offers are ill-timed (...)"[40].

Considering this, the solution of the project should not focus on fixing specific already existing issues in one's finances, or provide educational material, but rather create healthy habits and provide a service familiar and useful to someone who demands a better overview, and control over their finances.

It will be presented in the report as to how the group can deliver a functional and an adequate answer to the problem statement. It will be done by addressing qualitative and quantitative data, analysing the current landscape of solutions, completing at least one single iteration of the product, and at last providing further discussion of the subsequent tests and future potential.

Chapter 2

Methodology

In the following paragraphs, the methods used throughout the process of project planning, gathering and analysing data, as well as developing the product, will be described in conjunction with a discussion of the reasoning for using the various methods. Generally speaking, methods learned and used in the previous semester, from topics and own experiences, have been primarily used for mapping ideas, planning, and achieving the best teamwork for the project. New methods learned this semester has especially been utilised for the process of designing and developing the product.

2.1 Problem Based Learning

Problem Based Learning (PBL) is a topic learned the first semester, and for this project, the Gantt Diagram and the Back Casting Method have been very beneficial for a providing a best-effort, constantly evolving overview of the progress and plans.

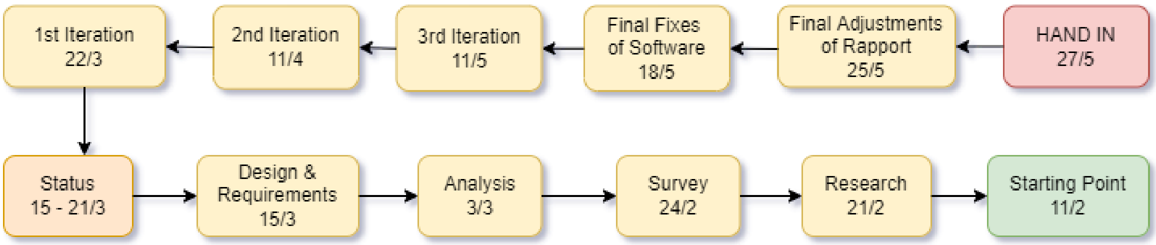


Figure 2.1: The group's implementation of the back-casting method.

Back Casting as seen in figure 2.1, is a method used for getting an overview of which tasks should be done to complete the project, assigning the time each task should take with dates, starting with the date of the deadline and moving backwards [71]. This way of planning instantaneously ensures that the available resources are distributed correctly according to how much time the group expects to be necessary for each task. This is way of planning was found to produce successful result from last semester, which is why it was decided to be used this semester.

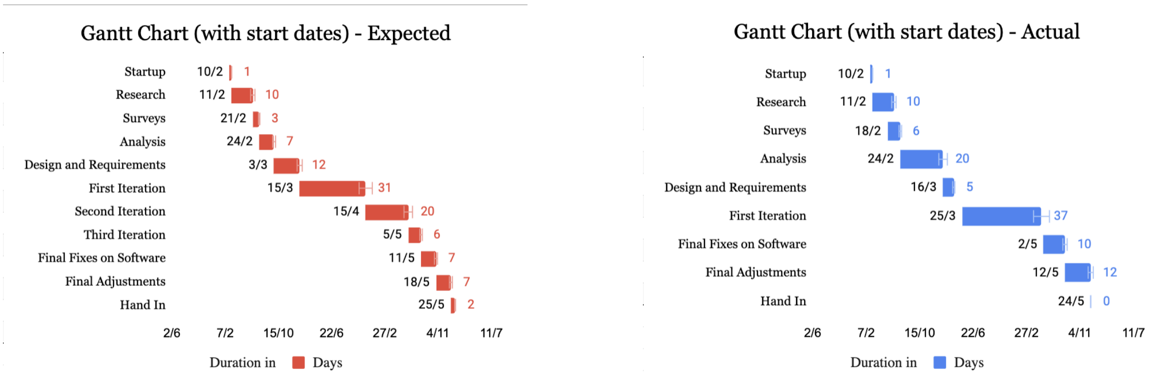


Figure 2.2: The progress of the project - expected and actual Gantt Diagram.

The Gantt diagram is used for visualising the tasks and their respective durations, providing an even more easy-to-understand overview of the tasks [72]. As in last semester, a Gantt diagram was created showing the expected progress in figure 2.2, and compared to a frequently updated Gantt, representing the actual progress of the group work in the same figure 2.2. This was, as the Back Casting method, practiced throughout the previous semester project, and, as everyone in the group experienced a clearer sense of manageability, the method was selected to be used for this project also.

For gathering information about the overall topic and realising how other similar products in the field work, along determining which demographics could be targeted, systemic information search was been done. With every group member having a grasp of what the topic entailed, an initial Mind map [73] was formed. The Mind map was used, as it is a great way of assembling the thoughts and ideas of all people involved in a simple and organised way, and delimiting the problem field.

For further exploration of the recipients of the solution, a quantitative survey was conducted. Inspired by previous experience, as well as the PBL methodology gathered from the PBL-book [73], the questions were almost exclusively multiple-choice or radio-button type, and to ensure accuracy, some questions with the same purpose were also included.

2.2 Internet and Web Programming Course and The Local Library Project

The course, Internet and Web Programming, was also a main source of inspiration for the product, with emphasis on the web programming part. The divide-and-conquer principle was central throughout the coding-process, and several aspects of Mozilla's *Local Library Project* [59] were used for better code-structuring and database-management. More specifically, a model-view-controller (MVC) [60] structure was used. This separation of concerns provides for a more pleasant division of work, smoother merging, easier bug-fixes and reduces the difficulty of scaling.

Some other basic principles used were the *camelCase naming protocol*, implementation of higher order functions and partials, and documentation of dependencies.

2.3 Supplementary Insights

For what an iteration includes, the traditional (simplified and non-secure) *Systems Development Life Cycle* (SDLC) was used displayed in figure 2.3. In this model, a single iteration must go through the following stages in this order; definition of requirements specifications, design, implementation, testing, and deployment. The final step is not included in this project. Although this project only goes through the first iteration, having multiple iterations should ensure a viable product.

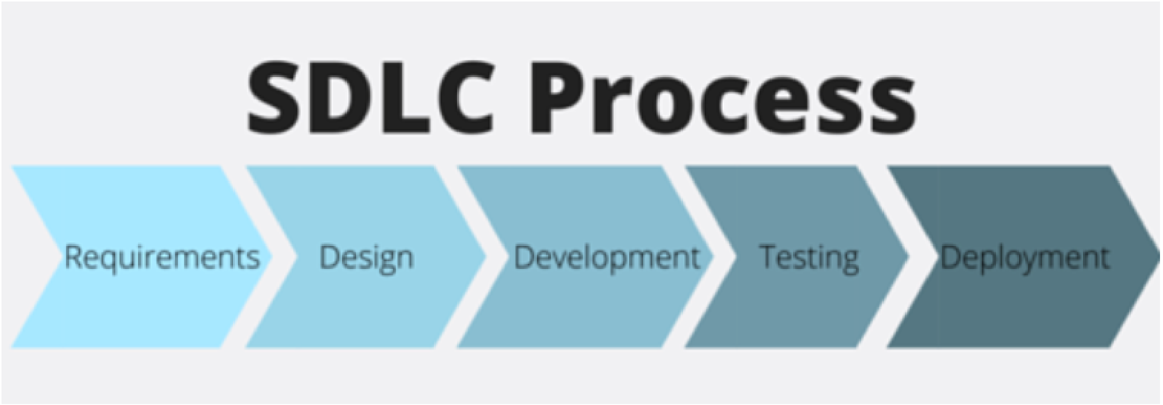


Figure 2.3: Systems Development Life Cycle.[12]

Chapter 3

State of The Art

Naturally, when looking into a problem field, in which none of the group members have extensive prior knowledge or experience with, it is crucial to lay down the ground-works for a basic understanding of the topic, and to provide motivation for a potential specification of the issue. This section is a brief walk-through of the current state of budget trackers, and today's understanding of what the word budgeting exactly stands for.

3.1 Budget and expense tracking and development of software

The practice of structured private budgeting itself is far from a new phenomenon. Irene S. Rubin, from Northern Illinois University argues, that it was already a prominent phenomenon in private households during the early 20th century.[68] Some of the obvious benefits of it, back in that time as well as today, were to be able to lead a sustainable lifestyle, and have a form of savings. In today's climate of Western capitalism, however, monthly spendings have become largely more infrequent. Impulse purchases, loans, monthly-subscriptions, medical bills, tax-returns, social benefits, etc. have made the difficulty of keeping track of one's expenses a lot more steep. When planning for a vacation, festival, or other large expenditures, it has now become almost impossible to plan without documenting the process, and calculating all sorts of partitions. Other than these special cases, there are also countless reasons to organise one's budget. Miriam Caldwell argues, that sticking to a budget does have positive psychological effects, and creates constructive patterns in one's life.[10] Nevertheless, the main point of motivation behind budgeting is meeting one's financial objectives. Whether it is achieving a sustainable lifestyle, making room for affording a one-time-expense, or indirectly reducing stress by creating a more stable personal economy.

Today's understanding of budgeting is a way of structuring one's money in a way such that each category of expenses are assigned a certain amount of money, available for spending within a given time period, in a way that gives the user a broad view of their personal finances and where they can save or spend more money.[27] As presented in Michigan University's "Money 2000 - Tracking Income/Expenses and Developing a Spending Plan", the recommended way of tracking personal expenses and creating a budget can be explained in four essential steps[39]. First step is to calculate one's "Net Monthly Income" - the total amount of money available each month from all sources of income. Secondly, an estimate of monthly expenses should be done. These expenses can be divided into three categories[39], "Fixed", "Periodic", and "Controllable" expenses.

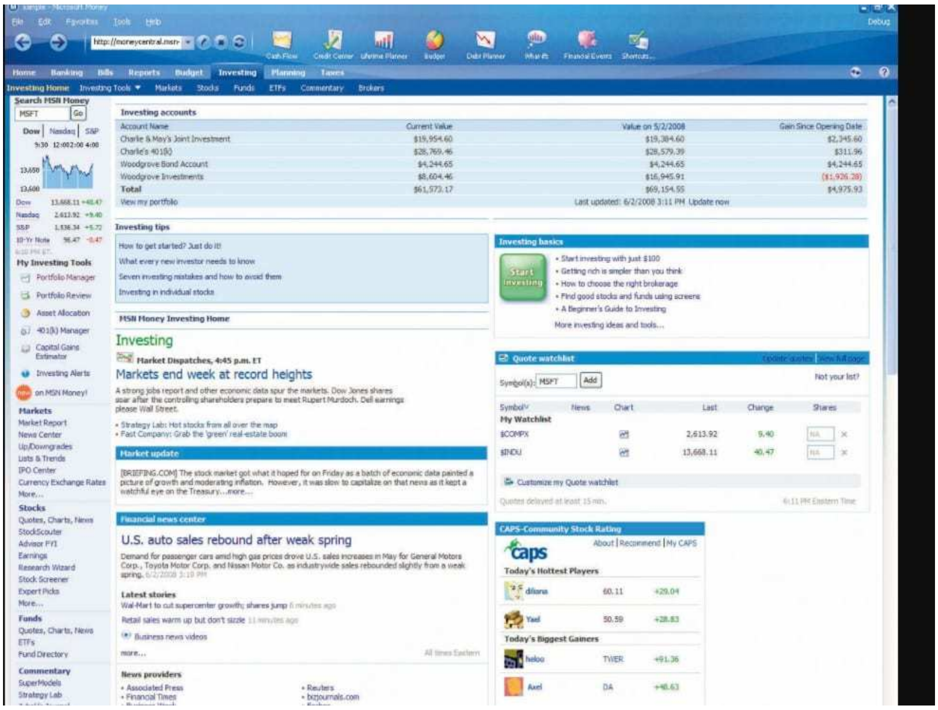
Fixed expenses are stable payments unlikely to change throughout months, such as rent or loans. Periodic expenses represent money paid at certain periods of the year, e.g. Christmas presents. Lastly, controllable expenses are money used on matters of which the individual has the power to control each month, for example, food, clothing, etc.[39]

Thirdly, when net income and expenses have been determined, the monthly “Balance” can be calculated, meaning monthly expenses subtracted from net monthly income. This results in an amount for the individual to evaluate and consider revising or keeping, depending on their desires [39].

The last step is analysing one’s financial situation and make necessary adjustments. This may include setting long-term financial goals to help determine various levels of spending for different budget categories, or how to manage the excess money after expenses have been paid, or conversely if expenses overshadow income and where to cut in the budget.[39]

Throughout history, various tools of undertaking the task of tracking and computing the above-mentioned calculations have been utilised. Even before software specifically designed for budgeting and tracking expenses existed, people were reviewing and organising their monthly spending in relation to their income. Without computers, one would manually track and calculate expenses comparably to the method mentioned above in account books, pocket notepads, or other similar non-digital ways.[39]

According to Matt Cone, product manager of Microsoft Money[66] (shown in figure 3.1), the breakthrough of mobile/web-application in this field was a very slow process. While tracking and calculations on expenses could be done in spreadsheet software like Excel (an option is still widely popular to this day), tools specifically developed for tracking expenses were also available, but less popular.[66] An example of this type of software would be early versions of "Microsoft Money", or "Budget" [27]. Generally, "Budget" and "Microsoft Money" made budgeting and tracking expenses easier by providing an overview and making calculations easier to do, like several other software at the time with akin features. Most users still accommodated to paper-form budgeting were most likely to opt into clean-sheet alternatives.
As people have become accustomed to mobile and web applications, and the level of application development has grown, the number of apps designed for tracking personal expenses and creating budgets has also increased accordingly. Today, a single Google search will provide a plethora of options available for helping users automate and simplify the process of tracking and budgeting on both smartphones and web-browsers. In the following sections, examples of today’s state-of-the-art budget and expense tracking software are presented.



Dow	13,668.11	+40.47
Nasdaq	2,613.92	+9.40
S&P	1,536.34	+5.72
10-Yr Note	96.47	-0.47

Investing accounts

Account Name	Current Value	Value on 5/2/2008	Gain Since Opening Date
Charlie & May's Joint Investment	$19,954.60	$19,384.60	$2,345.60
Charlie's 401(k)	$28,769.46	$28,579.39	$311.96
Woodgrove Bond Account	$4,244.65	$4,244.65	$4,244.65
Woodgrove Investments	$8,604.46	$16,945.91	($1,926.28)
Total	$61,573.17	$69,154.55	$4,975.93

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Symbol	News	Chart	Last	Change	Shares
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$COMPX			2,613.92	9.40	NA
$INDU			13,668.11	40.47	NA

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Today's Hottest Players

dilana	60.11	+29.04
Yael	50.59	+28.83

Today's Biggest Gainers

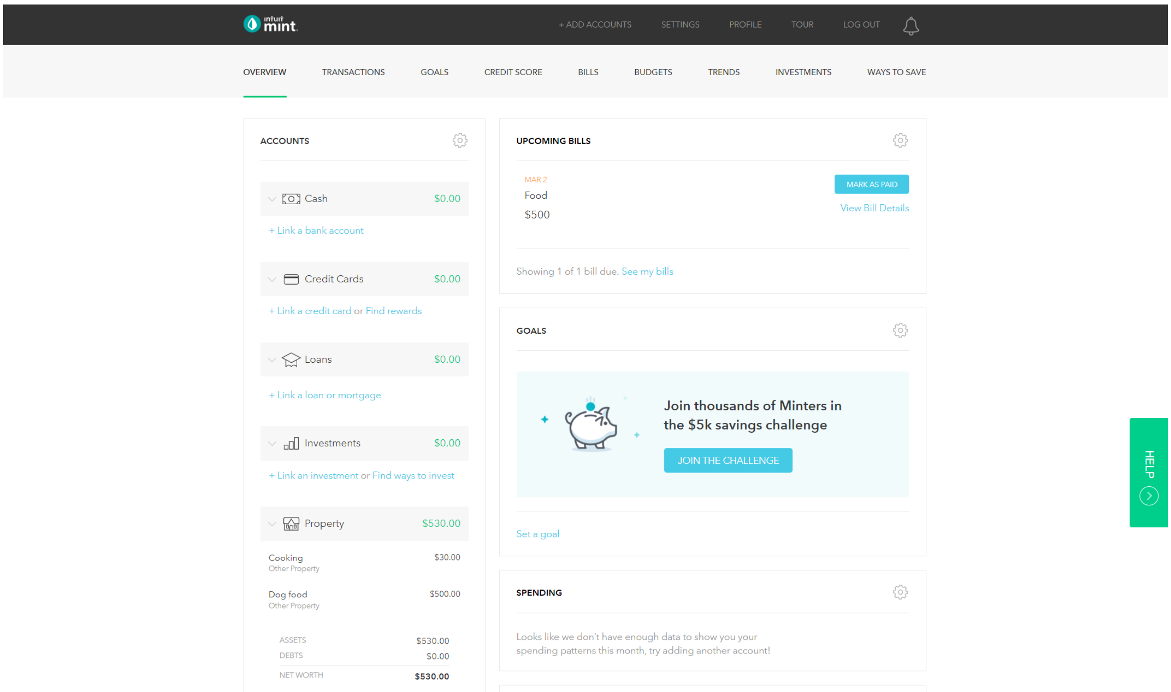
heloo	TWER	+91.36
Axel	DA	+48.63

Figure 3.1: The home page of Microsoft Money.[75]

3.2 Competitors on The Market

To get more insight on the market for budget tracking software, a thorough research of the market's competitors has been done. The information serves as an exposition, where one gets familiarised with the competitors being researched, namely: Mint, Goodbudget, YNAB (You Need a Budget), Toshl and standard Banking apps. These software solutions have been chosen due to their relevance, uniqueness, and differences in complexity/focus. Therefore, they can contrast one another, and give a diversified representation of the products currently available. Even though the mobile-versions of these products are more popular, due to the subject of this project the group focuses on the web-application version. A more in-depth analysis of each software will be will be documented in the next chapter.

3.2.1 Software: Mint



ACCOUNTS

Cash	$0.00
+ Link a bank account	
Credit Cards	$0.00
+ Link a credit card or Find rewards	
Loans	$0.00
+ Link a loan or mortgage	
Investments	$0.00
+ Link an investment or Find ways to invest	
Property	$530.00
Cooking Other Property	$30.00
Dog food Other Property	$500.00
ASSETS	$530.00
DEBTS	$0.00
NET WORTH	$530.00

UPCOMING BILLS

MAR 2
Food
$500

Showing 1 of 1 bill due. See my bills

GOALS

Join thousands of Minters in the $5k savings challenge

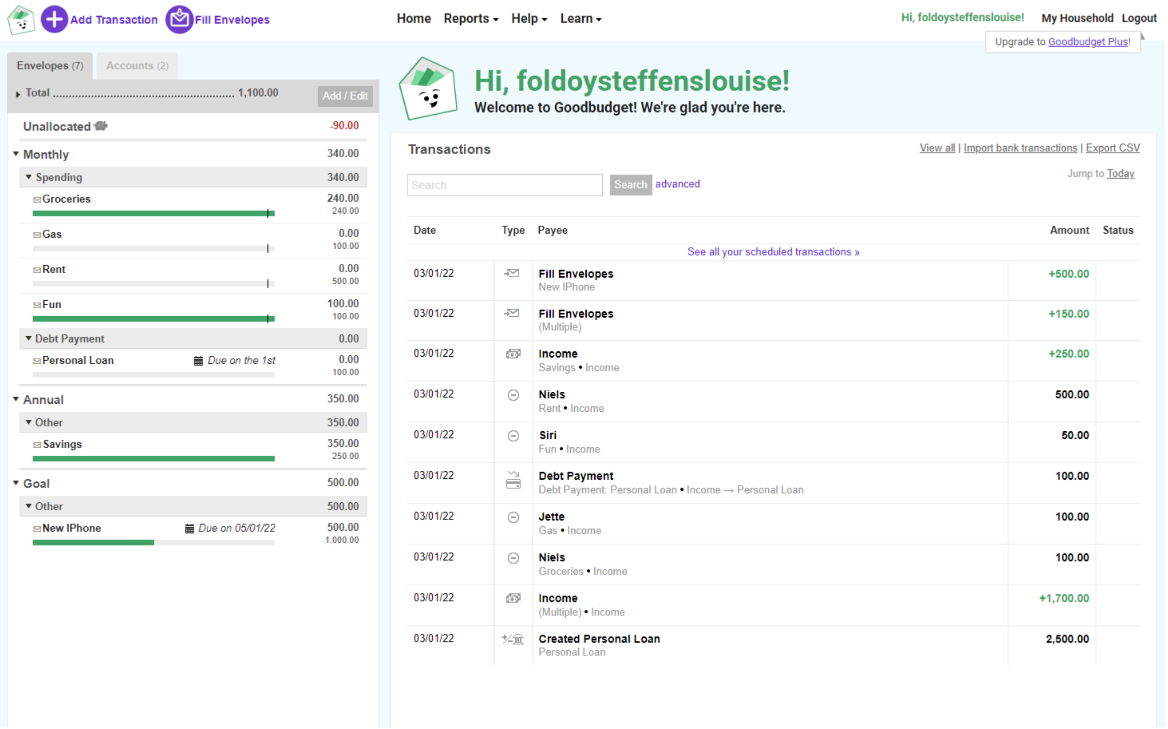
SPENDING

Looks like we don't have enough data to show you your spending patterns this month, try adding another account!

Figure 3.2: The overview page of Mint.

Mint is a software for personal use that automates and gives insight to all of one's finances, layout can be seen in 3.2. [56] Mint is made by the California-based tech-company, Intuit, which specialises in financial software for both personal and business use, and have an active user-base of over 100 million users across all their products.[28] Currently, Mint is region-limited to banks in the US and Canada, and is therefore almost exclusively used in these regions. The application is free to use (with ads), and has multi-platform availability. As the very limited range of manual features and the app's heavy dependence on third-party banking information suggests, Mint is an app prominently built prioritising automation over customisability. While the rich selection of functionalities provide an overall universally usable product, the personal-aspect of this product can be rather difficult to allocate, as nearly everything is based on current trends in spending and previous data gathered, rather than defined by the user themselves.

3.2.2 Software: GoodBudget


Add Transaction
Fill Envelopes
Home
Reports
Help
Learn
Hi, foldoysteffenslouise!
My Household
Logout
Upgrade to Goodbudget Plus!
Envelopes (7)
Accounts (2)
Add / Edit
Search
advanced
View all | Import bank transactions | Export CSV
Jump to Today
See all your scheduled transactions »

Hi, foldoysteffenslouise!

Welcome to Goodbudget! We're glad you're here.

Total		1,100.00
Unallocated		-90.00
Monthly		340.00
Spending		340.00
Groceries		240.00 240.00
Gas		0.00 100.00
Rent		0.00 500.00
Fun		100.00 100.00
Debt Payment		0.00
Personal Loan	Due on the 1st	0.00 100.00
Annual		350.00
Other		350.00
Savings		350.00 250.00
Goal		500.00
Other		500.00
New IPhone	Due on 05/01/22	500.00 1,000.00

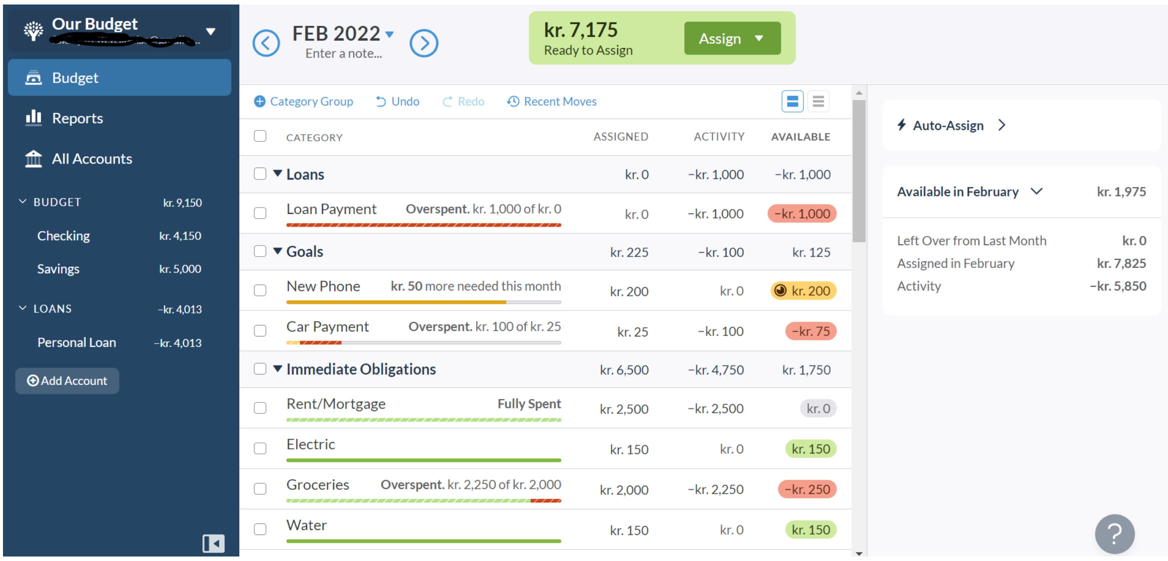
Transactions

Date	Type	Payee	Amount	Status
03/01/22		Fill Envelopes New IPhone	+500.00	
03/01/22		Fill Envelopes (Multiple)	+150.00	
03/01/22		Income Savings • Income	+250.00	
03/01/22	⊖	Niels Rent • Income	500.00	
03/01/22	⊖	Siri Fun • Income	50.00	
03/01/22		Debt Payment Debt Payment: Personal Loan • Income → Personal Loan	100.00	
03/01/22	⊖	Jette Gas • Income	100.00	
03/01/22	⊖	Niels Groceries • Income	100.00	
03/01/22		Income (Multiple) • Income	+1,700.00	
03/01/22		Created Personal Loan Personal Loan	2,500.00	

Figure 3.3: Goodbudget start page.

GoodBudget is primarily designed to sync and share a household's budget.[20] What this means is that a single profile can be used by multiple people in a household, which provides the possibility of creating and monitoring a mutual budget plan. The free version of the product comes with limitation for number of devices, budget categories etc. The premium version that lifts the limitations for 8$/month or 80$/year [19]. GoodBudget has both a web-version, and mobile ports for IOS and Android. Simply put, GoodBudget does not have a large variety of features, does not allow for syncing with one's bank-account, but instead provides a rather simple, and fairly customisable overview of a household's income, expenses, and budget plans.

3.2.3 Software: You Need a Budget (YNAB)



BUDGET	kr. 9,150
Checking	kr. 4,150
Savings	kr. 5,000
LOANS	-kr. 4,013
Personal Loan	-kr. 4,013

kr. 7,175
Ready to Assign

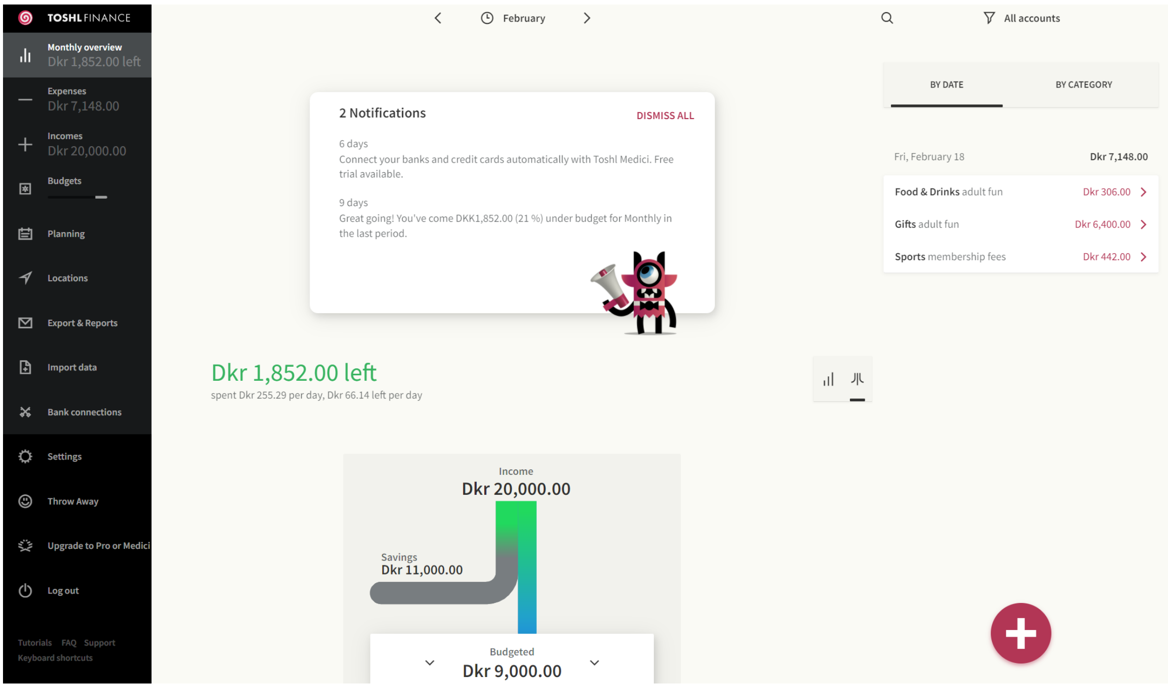
CATEGORY		ASSIGNED	ACTIVITY	AVAILABLE
▾ Loans		kr. 0	−kr. 1,000	−kr. 1,000
Loan Payment	Overspent. kr. 1,000 of kr. 0	kr. 0	−kr. 1,000	−kr. 1,000
▾ Goals		kr. 225	−kr. 100	kr. 125
New Phone	kr. 50 more needed this month	kr. 200	kr. 0	kr. 200
Car Payment	Overspent. kr. 100 of kr. 25	kr. 25	−kr. 100	−kr. 75
▾ Immediate Obligations		kr. 6,500	−kr. 4,750	kr. 1,750
Rent/Mortgage	Fully Spent	kr. 2,500	−kr. 2,500	kr. 0
Electric		kr. 150	kr. 0	kr. 150
Groceries	Overspent. kr. 2,250 of kr. 2,000	kr. 2,000	−kr. 2,250	−kr. 250
Water		kr. 150	kr. 0	kr. 150

Available in February	kr. 1,975
Left Over from Last Month	kr. 0
Assigned in February	kr. 7,825
Activity	−kr. 5,850

Figure 3.4: YNAB budget page.

YNAB is another software in the field of budget and expense tracking, which, according to the company's website [94], makes its unique selling point and shifts away from the competition by implementing a so-called YNAB-method. Its a interpretation of a "Zero based budgeting system", where all leftover money at the end of the month must be allocated into the different budgeting categories [97]. The software costs 14.99$/month or 98.99$/year, after a 34-day free trial (1 year free trial for students) [93]. YNAB is both available as a web or a mobile-app. As the motivational chapter on YNAB's introductory homepage [92] suggests, the main selling point of this product is their self-titled "YNAB-method". In practice however, this method makes little to no difference in comparison to other competitors, and can be considered a marketing-related afterthought. Syncing with one's bank-account is globally available, although it only works with larger banks, such as Bank of America or Barclays.

3.2.4 Software: Toshl



Monthly overview Dkr 1,852.00 left

Expenses Dkr 7,148.00

Incomes Dkr 20,000.00

2 Notifications

6 days
Connect your banks and credit cards automatically with Toshl Medici. Free trial available.

9 days
Great going! You've come DKK1,852.00 (21 %) under budget for Monthly in the last period.

Dkr 1,852.00 left
spent Dkr 255.29 per day, Dkr 66.14 left per day

Income Dkr 20,000.00

Savings Dkr 11,000.00

Budgeted Dkr 9,000.00

Fri, February 18	Dkr 7,148.00
Food & Drinks adult fun	Dkr 306.00
Gifts adult fun	Dkr 6,400.00
Sports membership fees	Dkr 442.00

Figure 3.5: Toshl monthly overview page.

Toshl is a globally-available budget tracking software, that brings forth both manual entry of transactions and automatic transaction sync by connecting one's bank account [83]. A free version is available with limitations for transaction data (no location, no labels, etc.), number of budget categories, etc. The 2 premium plans available remove limitations and enables automatic transaction sync with bank. Toshl also has multi-platform availability. In short, Toshl attempts to offer the best of both worlds, meaning that it both cherry-picks elements of automation and customisation without any hefty drawbacks. Furthermore, it has many functionalities that revolve around the enrichment of transaction data, and introduces a vast variety of unique representations to illustrate ones cash flow in different ways.

3.2.5 Other competitors

It is worth mentioning the market for budget and expense tracking is not only ruled by these individual software directly designed for this purpose, or old-school clear-sheet solutions, such as Microsoft Excel. The market-share is in fact also highly divided by the standard banking apps, which automatically provide the user with primitively categorised expense tracking systems. Even though it is primarily mobile apps, which is not related directly to the group's project, the features are still worth looking into. Observing Denmark specifically, some of the major banks that provide these services are: Jyske Bank, Danske Bank, Nykredit, Nordea, and Lunar Bank. These services mainly provide financial overviews based on the data stored in the database of the bank in question. Some of the banks mentioned are physical, but recently, virtual banks such as the formerly mentioned Lunar, and for instance Revolut, have also began heavily competing in this sector. Based on download statistics [3], the wast majority of people are in fact more familiar to this form of tracking in contrast to budgeting-focused alternatives, which have been previously described in this section. It is, however, essential to understand, that these apps have very limited features, as most users only use it to check their balance along with their income and expenses. Nevertheless, their popularity provides much clearer picture of the market, since it shows that tracking one's incoming and outgoing payments is no longer such an unaddressed problem, as creating a viable budget plan is.

Several screenshots of all of the mentioned web-applications can be found in the appendices B, C, D, E, F.

3.2.6 An overview of the functionalities

To summarise all of the relevant functionalities of the most popular products available, a colour-coded table 3.1 is used. On the top of this table, the most crucial competitors can be seen, and on the the left-hand-side, a selection of features can be located. The features were hand-picked based both on the scope of the group's problem, and overarching tendencies seen throughout previous research. The colours represent the following:

- Red: Feature is not included.
- Yellow: Feature is somewhat implemented, but clearly not flushed out.
- Green: Feature is included with attention to detail.

Although most items on the table are straightforward, there are some, which require clarification. "Transaction-tracking" stands for a chronological list of transactions, where general information of every transaction can be seen. "Budget planning" encapsulates the idea of breaking down one's income into categories, and assigning values to each. Budgeting goals and milestones are also similar, but it more specifically focuses on personal goals and their tracking. "Multiple users (same profile)" is, simply put, being able to have multiple individual budget plans under one account, similarly to having multiple profiles on streaming-platforms like Netflix or Disney+. "Monthly overview" is the possibility to look at one's finances, transactions, etc. on a strictly monthly basis.

Under this table, some specific implementations will be elaborated upon, and some conclusions will be drawn. Combining this overview with the group's survey and user feedback is expected to provide a good picture of what features should/should not be included in the group's solution. The word "automation" in this case refers to a program working with little to no human control in order to perform a task, which without the program would be a lengthier manual task for a user.

Features / Web-applications	Mint	GoodBudget	YNAB	Toshl	Lunar
Transaction-tracking	🟩	🟨	🟩	🟩	🟩
Transaction-syncing with bank-account	🟩	🟨	🟩	🟩	🟩
Manual input of transactions	🟨	🟨	🟨	🟩	🟥
Automatic transaction-categorisation	🟩	🟥	🟨	🟩	🟩
Manual transaction-categorisation	🟩	🟩	🟩	🟩	🟨
Individual tags for transactions	🟨	🟨	🟥	🟩	🟩
Budget planning	🟩	🟩	🟩	🟩	🟩
Budgeting goals and milestones	🟩	🟨	🟩	🟩	🟩
Savings account / Category	🟥	🟨	🟨	🟨	🟨
Loan-planning / tracking	🟥	🟨	🟩	🟥	🟥
Regular expenses	🟨	🟩	🟩	🟩	🟩
Investment-tracking	🟩	🟥	🟥	🟥	🟩
Personal profile	🟩	🟨	🟩	🟩	🟩
Multiple users (same profile)	🟥	🟩	🟥	🟥	🟥
Monthly overview	🟨	🟨	🟨	🟩	🟩
Graphs and other visual representation	🟩	🟩	🟩	🟩	🟩
Alerts	🟩	🟥	🟥	🟥	🟥
Tips & education	🟩	🟩	🟩	🟩	🟥

Table 3.1: Features table.

There are some tendencies, as well as interesting design choices that can be pointed out when taking a look at the table. It is clear that there are some fundamental elements, which almost all products include. These are transaction-tracking, budget planning, having a personal profile, graphs and other visual representation, monthly overview, and automatised input of transactions as well as categorisation. It is worth mentioning that the results should be interpreted with a grain of salt, since a lot of people use excel to keep track of their finances and budget, which grants them way less automation, but more freedom. Seeing automatic input and categorisation should therefore not necessarily mean that it is the best solution, but rather show that most current web-applications use this method. Another aspect worth pointing out is the lack of savings and loan-related features, even though creating a budget more often than not includes defining a viable savings-plan or keeping track of loan of e.g. house, car or consumer loan. The lack of monthly overview, implemented as a key feature, in some products is also a surprising discovery, as in mobile banking apps, is it nearly expected to be greeted with a screen featuring one's monthly use of money. The general lack or poorly implementation of labels for transactions is also interesting, as it can often lead to a headache when locating specific purchases. Lunar is quite unique out of the applications, because they implement this "all in one place" experience for the user by being a bank with automatic transaction-syncing and categorisation, having an investment-tracking feature, which only Mint also have, and ticking off every feature besides a few. The uniqueness continues over to GoodBudget by being the only application with the feature allowing multiple users, which is also the reason it is their unique selling point. As seen in the table, three out of five applications have automatic transaction categorisation, and four out of five have transaction syncing with bank accounts. These two features are considered fairly automatic. Manual versions of the mentioned features are also more widely used, where five out of five have manual transaction categorisation and four out of five have manual input of transactions implemented. It can be argued that the manual features are the standard of the industry and is required for such an application like a budget tracker. Thus, the automatic features are creating an edge over the other competitors.

A more specific walk-through of each product can be found in appendix G.

3.2.7 Sub-conclusion

By taking a collective look at the different competitors, some general points and tendencies can be deduced. Looking at more complex applications (primarily web-versions), each software appeals to the user by the use of visually pleasing design and models, which can result in the user having a less overwhelming experience whilst using the software. These solutions primarily have two different fundamental ways they approach how a budgeting system can work; they provide as much customisability as possible, creating a highly personal experience, or depend on giving a user-friendly presentation of numeral data, with considerably less wiggle-room for specific use-cases - thus highly depending on automation. Mint and Toshl revolve around an automatic budgeting system. Setting up a budget in Mint is done by connecting to a bank account and letting the software automatically put the transactions into categories - then the user selects the limit of each category. The same concept is used in Toshl. Though, Toshl is more customisable in the sense that the user is able to choose between automatic categorisation or manually adding transaction into categories. Creating a budget in GoodBudget is solely based on the household. The household together sets the limit of the categories (called envelopes) and then the transactions are to be defined by the individuals in the household. YNAB is based on single user budgets. Making a budget is done by manually placing money into categories following the "YNAB method", and spending from those categories. The only bank app that allows the user to create a budget is Lunar. The process of budgeting in Lunar starts with setting limits on categories and max spending. Then the app categorises the transactions into the categories and after each transaction, it announces to the user how much there is left in the category of the transaction. Generally, every design decision has both important advantages and and drawbacks depending on who the user is. A lot of inspiration can be taken from these competitors, but one must always be aware of what one's target group actually wants, as there are no universally correct answers.

3.3 Discussion of State of the art

In this section, the group looks deeper into the information found throughout the research, and performs a vastly more subjective walk-through of the information in comparison to the objective nature of SoTA 3. Some important points raised in this section will be used to conduct a survey exploring which already-existing features and common properties in a budget and expense tracker are genuinely relevant to the target group, which is moved-out danish university students (see target group analysis section 4.2 for more information concerning the target group).

The introduction section in the state-of-the-art chapter 3 describes how a viable budget can be planned. The method mentioned is thoroughly described in Michigan University's "Money 2000" [39] and is relatively old, as it was published around the year 2000. The fact that the article is more than 20 years old, does not necessarily worsen its principles; they are still useful to this day. For example, the fundamental steps of defining income, expenses, personal goals, and creating logical categorisation are all elements that must be included in the final product. To make this process easier for the user and providing a better alternative to a clean-sheet solution, pre-defined target-group-based recommendations and other presets can be considered.

As mentioned in the sub conclusion of the state-of-the-art section 3, some of today's top software such as "Mint" and "YNAB" rely on automation/simplicity, while others, like "GoodBudget" allows more customisability. To determine which solution should be weighed most and what appeals mostly to the demographic of this project's product, enquiring about this in the survey is a must.

The ratio of automation to customisability in the finished product will most likely not be dominated by one or the other. Both automation and customisability are broad concepts, and therefore more specific features within each product can be researched, to attain better data for determining which features within the two concepts should be implemented.

All of the software that was taken a look at provides the possibility of visualising expenses in graphs. The fact that most software use this feature indicates that it could be worth including in the final product, but to justify its relevance specifically to students, a question concerning this feature could be worth implementing in the survey.

Chapter 4

Analysis

This chapter includes an analysis of the following: the competitors, the target group, a quantitative survey, the problem statement and MoSCoW. The competitors section is a discussion of the other competing products. The target group analysis will take a deeper look into the target group, which the problem statement will be directed towards, and also incorporates an analysis of the group's quantitative survey. At last, the analysis will result in a clear overview of the issue at hand and a list of requirements solution of the project's problem statement.

4.1 Competitor / Product Analysis

In this section, a brief overview of current market and its most preeminent products will be presented with main focus on the following parameters: design and customer reviews. After presenting of the various aspects of these products, a sub-conclusion will summarise the empirical data gathered from the design and customer review sections in Analysis and the Functionalities 3.2.6 section in State of The Art. The choice of parameters presented in this section will shed light on the industry standard on the market for personal budget and expense trackers. Knowing the standard, how the products are designed, what features are in use, and what the customers thinks of the products, is expected to give the group a decent idea for how to design a suitable web-application. Therefore, getting acquainted with the good and the bad parts of each product will help obtaining the best possible results by a combination of looking into why the good parts are good, how the group can modify and implement the good parts, and lastly, later adding own original ideas to the group's design in the sub-conclusion. The focus is still on competitors from the state-of-the-art section, which are Mint, GoodBudget, YNAB, Toshl and various banking apps, in particular Lunar Bank.

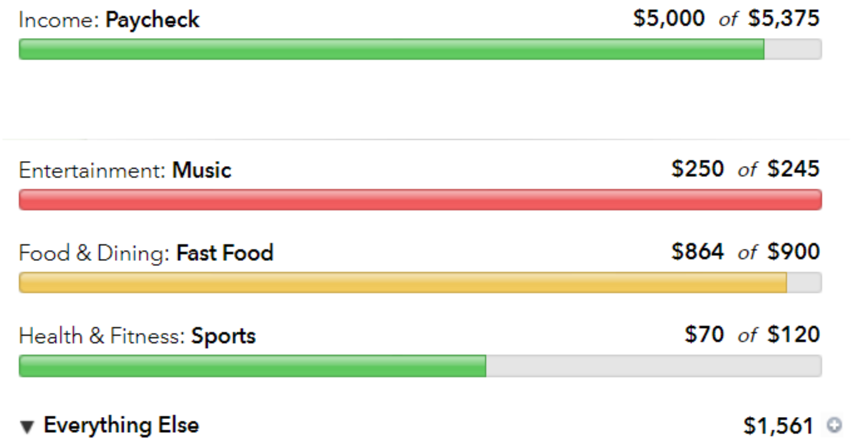
4.1.1 Design

An appropriate and user-friendly design and slick presentation are must-haves in today's market of any sort of website or application. When providing the best-possible solution to a problem it is worth nothing if only the creator of the solution understands it. Therefore, it is always a good idea to take a look at some others' solutions to similar problems, instead of reinventing the wheel and coming up with a unique and not necessarily user-friendly outcome. In this section, a collection of some of the most important observations will be presented in a bullet-point form, grouped into logical categories.

Colour-theory

- Primarily on Mint's home page, it was clearly shown that most websites use a very toned-down colour-selection, primarily consisting of shades of dark-grey, black and white - which all could be placed on a grey-scale colour-pallet. Non-monochrome, more vibrant colours are generally reserved to graphs, important numbers, and other elements of a web-page, where the developer wants the users to focus on.
- Green is often used to symbolise any income, and red is used for indicating a loss of money, expenses.
- Colours are often used for "digital-nudging" to get the user to complete a specific task, for instance create a budget or focus on a goal. These are achieved by creating greater contrast and using bigger, more colourful buttons or other interactive elements.

  A visual example on the mentioned colour-theory bullet-points can be seen in the following figure 4.1



Income: **Paycheck** **$5,000** *of* **$5,375**

Entertainment: **Music** **$250** *of* **$245**

Food & Dining: **Fast Food** **$864** *of* **$900**

Health & Fitness: **Sports** **$70** *of* **$120**

▼ **Everything Else** **$1,561**

Figure 4.1: Mint's progress bar.

Text

- The text presented in a software should be very clear and readable. The text size and font are very important since that is the first impression the software will have on the user.
- Lunar applies bold, all-caps white-on-black text, with a very plain and clean font. Especially Lunar's logo focuses on these traits, they can also be found in their soft-

ware's design. The first impression the user gets from these traits are amongst others professionalism and simpleness. This can be seen below in figure 4.2.

Figure 4.2: Lunar's logo depicted on a credit card. [36]

Navigation

- There is a fifty-fifty split in use of the top-bar and left side-bar navigation throughout the applications. From the previously researched competitors, Mint and GoodBudget uses top-bar, and Toshl and YNAB applies the left-hand positioned side-bar.
- In mobile applications, the bottom-navigation is more widely used.
- The general consensus in navigation is that the user must reach every action with the fewest clicks possible, but of course a cluttered page is not preferred.

Home page

- It is popular to greet the user with a summary of information, often grabbing specific elements from different pages, such as a pie-chart, the latest items in one's transaction history, or one's goal-progression.
- Providing a more personal experience, information is often presented with pseudo-personal remarks, such as "Great job, **Username*, you spent less on petrol last month!".

Progress bar

- Progress bars are commonly used amongst chosen competitors. A progress bar can be a very useful visual tool to show progress for example a goal rather than deciphering numbers.
- Progress bars are used a great deal in combination with the envelope method in GoodBudget. The progress bars for each envelope turns green when the given envelope is filled with a certain amount of money.

- Another good example of the use of progress bars can be seen in Mint. The app enables the user to create spending goals within a category, such as entertainment or Food & drinking. These goals have a progress bar attached to visualise the amount used within the goal. The progress bar first starts as a green colour and then changes to a yellow colour when it approaches the limit, when it crossed the limit of the goal it turns red. Again, looking at a bar filling up is much faster and requires less effort than comparing numbers.

Graphs

- Bar and pie-charts are the most essential forms of visual representation in the field of budgeting. Seeing the distribution of one's money is fundamental in creating an overview.

- Colour-coding graphs are also important, in order to create clear distinction between different fields. In some products, like YNAB, colour-coding is tackled with user-controlled values.

- Another idea with the graphs function could be using a hover feature with tool-tips. When hovering over a graph, a tool-tip could pop up with its name or category or anything related and explaining of the graph. This feature could make to the whole software more user-friendly and make it easier to understand the smaller things.

Savings account

- Savings is a rather vague term, and simply saving money in itself is not quite as interesting as saving up for something specific. In numerous products, an alternative to savings-account is savings-goals.

- As proven by the survey 4.3.2, saving money should be a main concern of the product-design. The design of the savings account should be easy to use, understandable and give the user feedback on the the progress. Individual savings goals can work really well with progress bars.

- In the GoodBudget, there is a "save for big expense feature" within their goal function. When the user adds a goal they can set the regularity of payments, and the volume of those payments. The goal setting window is somewhat small and straight to the point and shows very simply what input it needs from the user. The data for the goal can be edited or deleted at any time. Figure reference

- In YNAB, there is also a progress bar attached to individual goals, which potentially adds a feeling of progression and accomplishment for the user. That can be seen in figure D.2.

A more specific walk-through of each product can be found in appendix G.

4.1.2 A brief overview of customer reviews

It is of course also worth taking a look at what the current budget-tracker users think of the products available. To be able to do this, the group has decided to take a deep dive in user-reviews on the previously analysed products. The reviews in this section are handpicked out of thousands of reviews by the most recent date combined with its relevance to the topic. Naturally, the group also takes into consideration and are aware of that some of the reviews available could be biased, made by the company itself, or produced by bots - during the selection process, the group attempted to sort only legitimate reviews out of the bunch, to gather good and representative data. The main sources for the reviews are App Store and Play Store, as most users would post their opinions here, the information is kept brief and public, and there are a lot of comments to look through. Both the reviews and a more thorough walk-through of the results of the group's research are available to read in the appendix H.

One of the focal-points mentioned in many of the reviews were personal dissatisfaction with the ratio between automation and manual labour. As previously established, finding an appropriate ratio in this case can be incredibly challenging, and one must put a lot of thoughts into decisions about automation/hands-on-features, to get a mix that best suits one's target group. Other common themes were complaints wanting a simpler, more uniform sidebar-based design, with fewer sub-pages and less filler-content. Although beginner users might need some guidance, a budgeting-app is something to be used regularly. Therefore, it is worth keeping things simple and the most important functionalities at-hand, so the user does not have to uselessly navigate through filler-information. A useful web-design related tool here, which could both tackle beginner confusion and save space is tool-tips. Rather than having lengthy information-dumps and whole pages for specific functions, tool-tips can simply explain something on-hover. Furthermore, zero-based budgeting was a very popular feature, numerous users experiencing better progress when using this method. Some other important points discussed were not spreading the important things out to different corners of the web-page, but rather keeping a good oversight, and using tools already familiar to the user to manage new information - familiar shapes and buttons for a low-barrier of entry.

All of the customer reviews discussed in the previous paragraphs, and a more in-dept walk-through can be read in the appendices H and I.

4.1.3 Sub Conclusion

After taking a closer look at the products at hand, some thoughts about a minimum-viable-product can be made. Naturally, being able to create a budget broken down into income and expenses, as well as specific sub-categories of these two is something to be expected. Some quality-of-life additions worth considering here could be custom labels, colour-coding, and specifying the frequency of these budgets, so not only monthly, but perhaps annual expenses can also be added.

It is also worth considering splitting transactions and budgeting into two different sections, thus creating an in-depth transaction history, and simply adding the amount of all items under a specific category of transaction to the relating budget-category via manual categorisation. By doing this, book-keeping mistakes are much easier to spot and fix, and one can even look at what purchases make out the majority of one's spendings in a specific category. Having transactions by themselves also opens up a whole new field of possibilities as to what properties the user could add - although the ratio of manual labour and automation should still be optimised following user-demands. Some considerations here could be creating a time-frame-based overview, enabling filtered view, and adding custom labels for further specification.

In terms of visualisation, pie and bar-charts are the most popular options for understandable reasons. In a financial overview, most users wish for a quick overview of the distribution of one's income, and the possibility of side-by-side comparison. A third alternative could be a line-chart connecting data points (transactions), presenting one's spendings as one continuous evolution - this can for example be seen in the Nordea-app. Just like in many other apps, vibrant colours should be reserved for graphs and charts (also action buttons), to make them pop out in the otherwise rather monochrome colour-scheme of the website. Certainly, contrast is crucial to nudge the user in the direction of important visual elements and action buttons.

Due to a high-demand based on the survey, some important considerations to the savings-page also had to be made. Based on the target-group itself, the savings-feature should be based on larger one-time purchases, with a foreseeable end-date. Learning from customer-preference, progress bars would also be a highly requested feature, and, for further guidance, some sort of recommendations and tips.

Before further researching possible design and implementation of any of these features or design-decisions, a clear prioritisation of the requirements-at-hand must be laid down, and beforehand, the problem-statement itself should be revised to get a good grip on what it is exactly that has to be solved. By doing this, the group ensures that a minimum-viable product includes all the necessities to be a satisfactory answer, and a presentable prototype can be presented at the end of this project.

4.2 Target Group Analysis

During this project, largely due to social, and research-based limitations, as well as recognising a previously undiscovered target group for such a piece of software, moved-out danish university students were chosen as the primary recipients of the group's solution. Firstly, the group attempts to accurately describe the nature of an average danish student's financial possibilities, limitations, as well as their potential motivations and hindrances. There are countless reasons for pursuing higher education; learning new skills, experiencing independence, widening one's horizons, but for most, creating job security and expanding potential earnings seem to be the pivotal point of motivation. However, as students strive for financial growth and a stable economy, for years, they more often than not, find themselves with a tiny budget. Highlighting the same point of discussion, Jens Philip Yazdani from the danish newspaper Jyllands-Posten, argues that study benefits should be doubled, as over 100.000 young students live in relative poverty. *"Yes, that is right: and actually even worse. 111,804 students between the ages of 18 and 30 live below the relative poverty line set by the UN (United Nations). In Denmark, the limit is around 10,000 danish crowns a month after tax. And that's where over 100,000 young students fall below, corresponding to one in two!"*[89].

While selecting the target group, it was also essential to make sure that the delimitations applied make sense, and contribute to actually specifying the attributes of a group. Firstly, choosing moved-out students helped reduce the scope of the problem field. Students have vastly different problems and ambitions than for example people of similar age with full-time jobs, or people living with their parents, not studying or working, thus not receiving any form of income. Other than that, students must manage a very low income, which naturally comes with more threatening problems than having to manage average/above-average income. The aspect of being "moved-out" is mentioned, since in Denmark specifically, students who are moved out receive a lot more money in student benefits (SU) than those who are not, and moving out comes with its own set of new responsibilities, namely insurances, rent, savings, groceries, and managing one's impulsive purchases.

Students' living situations also vary a lot depending on the country they find themselves in. In some countries, for instance the United States of America, students must take even bigger risks than others to secure a future employment and comfortable living. According to CNBC, the US currently holds a record breaking debt of 1.73 trillion dollars in student loans.[26] In essence, even though economical instability seem to plague the lives of hundreds of thousands of students each day, the nature and magnitude of their problems are highly inconsistent. Making the decision to focus exclusively on danish university students largely impacts the weighting of many problem-sources, such as student-debt (would be a focal point of the project if it was about US-students), and financial precociousness (Denmark has a relatively low minimum working age (13)[16] considering EU-standards (15)[17], which results in young people getting used to earning money already as children, thus presumably rendering them less precocious of their expenses when moving out).

Although the idea of an average student's sub-optimal living situation is often romanticised in western culture, studies show that this lifestyle can take a serious toll on young people's mental health. "*According to the survey, more students are experiencing financial difficulties before starting their new studies. Almost one in five new students, according to the survey, has 'a great deal' of trouble making ends meet in the run-up to starting their studies.*"[37], states Jakob Rathlev, head of the Danish Evaluation Institute. The article also strongly suggests, that there is a presumable correlation between a student's financial balance and general stress levels. Clearly, financial instability in the case of moved-out danish university students is an preeminent real-life problem to be tackled. The relevancy of it is indubitable, considering both the group's personal connection to the issue, as well as the results of the group's research. It is worth mentioning that although the attributes of this target group have been chosen consciously to reduce the scope of the problem statement and solution, several results and conclusions of the group's research can be representative of a wider audience. These are, for instance, all European university students or generally people with financial issues.

During the design of the web-application, the average living-costs of a danish university student should definitely taken into account, specifically during the discussion and subsequent implementation of personal recommendations and tips [33]. For further research, it was also noted that budgeting and software related habits of the target group should also be looked into, mainly focusing on the results of a future survey 4.3.2. In particular, questions 3, 4, and 5, 4.3.2 are about the personal finance habits of the participants.

Looking at the features-table 3.1 from the state of the art section 3, preferences regarding automation and customisability can be considered wise to enquire about in the upcoming survey. A generally ignored / weakly implemented feature, which is very relevant for the group's target group, savings, should definitely be looked into, taking inspiration from competing products; progress bars, visuals, personal goals (based on the group's behaviour).

4.3 Survey

This section describes a survey conducted, exploring the target group's financial well being and which features they would value the most in a budget and expense tracking software. Moreover, the usefulness of the survey, what the various questions contribute with, as well an analysis of the data provided by the survey answers, is explained. Lastly, a conclusion based upon the results of the survey is presented.

4.3.1 The purpose and construction of the survey

The questionnaire-formatted survey was partially conducted to validate the relevance of the product in relation to the demographic discovered while researching the problem field. The demographic chosen to research further was namely, moved-out danish university students. Students were, as mentioned, chosen on the basis of information about problematic low-income demographics. In addition, the choice was based upon the group's own take on budget and expense tracking; all members of the group are students, and have agreed on the usefulness of a budget and expense tracker in their personal life. Moreover, conducting further research, testing, and arranging conversations with members of the target group is made much easier, as the group itself is based in this environment. The research was conducted using Google Forms, and was formatted as a mix of multiple-choice and linear scale questions, with optional comments. Text-based answers were willingly avoided to not make the questionnaire too overwhelming, and to give the group a statistically analysable overview of the data gathered. Naturally, a quantitative survey is, in contrast to an interview, not about gathering subjective, case-by-case data, but rather numeral information, that can be graphed, and in which tendencies can be discovered in a much more rapid fashion than through personal interviews.

The survey consists of questions exploring whether or not the individuals asked would actually consider using a budget tracker, if they appear to need a budget tracker. Motivating factors there that would make this specific target group more inclined to use such a tool is also investigated by asking about various features that the product could contain. These features were based on the most common features of the products explored in the state of the art section 3.2.6 and the discussion of that section 3.3.

Questions addressing status of residency and income, as seen in figure 4.3 and 4.6 provides data for determining if a budget and expense tracker would actually be relevant to the respondents; a person living at their parents would not have the same use for the product as someone living on their own, required to buy their own food, paying rent etc. Therefore, the following answers to the questions might deviate accordingly. Also, as previously researched, the student income is expected to be very low (compared to the EU poverty 3). It is however always beneficial to verify this information and consult with the target group itself, to get a more complex view of the range of income a danish university student might have.

In the surveys seen in figure 4.7, the students are also asked to communicate their worries and approximate their abilities of handling money. Answers on this, gives insight to the levels of necessity for a money managing tool; the relevance of a budget and expense tracking software. This data is elaborated on by asking about the possibility and importance of having a savings account while being a student on SU. When looking at these questions subsequently, some important tendencies can also be discovered, hinting at possible connections between stress and financial stability.

As presented in the *State-of-the-art* section, some of today's most popular personal budget and expense trackers currently on the market have been analysed. This analysis has been useful for constructing questions in the survey concerning which features students would deem helpful to them in the product. Thus, the questions researching product features - worded in different ways - were based on the key features of the software presented in the mentioned *State-of-the-art* section.

Other questions, also addressing product features though with other purposes, are used to obtain data about the target group's current use of budget trackers and the reasons behind the features making their current tracker good, or why they are not using any budget-tracking application. Data collected from these questions provides insight in pros and cons to consider, as well as which of the presented software 3.3 could be taken inspiration from, when designing the product. In line with this, preferences of the software's design is inquired about, which is useful for creating a software that students would be more inclined to use.

4.3.2 Survey results

The survey questions and their associated results are grouped in the following 4 main categories, in order to make their purpose more transparent, as well as provide an overall breakdown of the information gathered:

- Validation
- Personal finances and stress
- Product features
- User-trends

Therefore, in a numerical sense, the questions will not necessarily be discussed in the same order as they were presented to the participants. The deviation in sequencing is largely due to the focus being targeted on conversation-like continuity in the questionnaire, in contrast to the report's topic-based structuring.

Validation

- Question 1: Are you a student?
- Question 2: Have you moved out of your parents' house?
- Question 9: Would you use a personal budget and expense tracker?
- Question 16: If the requirements you previously entered were fulfilled would you then consider using the application in a real life setting?

Questions regarding validation largely contribute to confirming the relevancy of the questionnaire as a whole, the significance of the problem-at-hand, as well as the potential applicability of a web-application-based solution in this particular context.

Question 1: Are you a student?

Since the main target group of this survey is students, it has almost exclusively been sent out to students to answer. In case the participant is not a student, the very first question addresses this problem. If a participant answers that they are currently not studying, the survey will end at that point as their answer would have no further relevance to the survey. The results of this question shows that all 30 participants in this survey are students.

Question 2: Have you moved out of your parents' house?

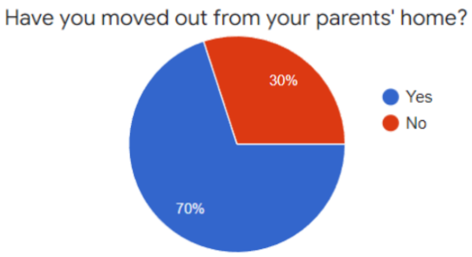


Figure 4.3: Results for Question 2.

Based on the results of the next question regarding housing-status seen in figure 4.3, it can be concluded that a larger amount of the survey participants have moved out of their parents' house. According to the survey 21/30 of the participants has moved out while 9/30 participants still live with a/several parent(s) or guardian(s). This can describe the participants' current living situation and therefore a bit about their economic status. Looking at this data in correlation with monthly income can also be used to verify some previous assumptions about the relation between one's monthly income and housing status. An average moved-out student can be expected to have a monthly budget between 5000 and 10.000 DKK, the majority located below the previously mentioned 10.000 DKK poverty line. When taking a look at question 4 regarding the general stress-level of the participant, having moved out seem to largely contribute to money-related worries, averaging a 4 on the 5 point scale.

Question 9: Would you use a personal budget and expense tracker?

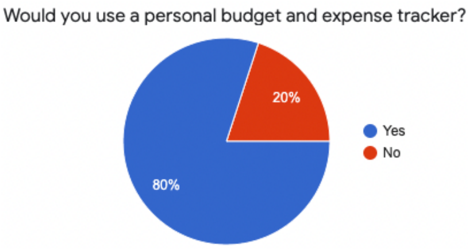


Figure 4.4: Results for Question 9.

To gain further validation regarding the demand for a solution in the case of this demography, the participants were asked if they would actually consider using a personal budget and expense tracker (a simple yes/no question) in figure 4.4. The results show that 24/30 participants answered yes and the remaining 6/30 participants answered "no". This means that there is clearly a demand for a budget tracker, 80% of the sample-size answering yes. The 6 participants who answered no to this question were discontinued from answering the remaining survey questions. This is why only 24 total answers are present in the following question results. A discussion of discontinuing the participants this way, can be seen in the sub conclusion of the survey.

Question 16: If the requirements you previously entered were fulfilled would you then consider using the application in a real life setting?

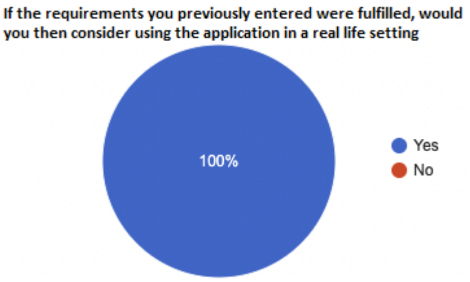


Figure 4.5: Results for Question 16.

At last, subsequently to the features-portion of the survey, the remaining participants were, again, asked if they would be willing to use a specific web-application-based budget tracker, if it satisfied their picks of the features offered in the survey in figure 4.5. This is a simple yes/no question, and from the results it appears that 24/24 participants answered yes. The 100% ratio indicates a clear interest in the product.

Personal finances and stress

- Question 3. Roughly, what is your monthly income (Kr. before tax)?
- Question 4. How much do you worry about your finances right now?
- Question 5. To what extent do you think you are capable at managing your money?

The information gathered in this particular section of the survey helps with getting a better overview of the economics of the average danish university student, as well as the correlation between one's financial confidence and stress.

Question 3. Roughly, what is your monthly income (kr. before tax)?

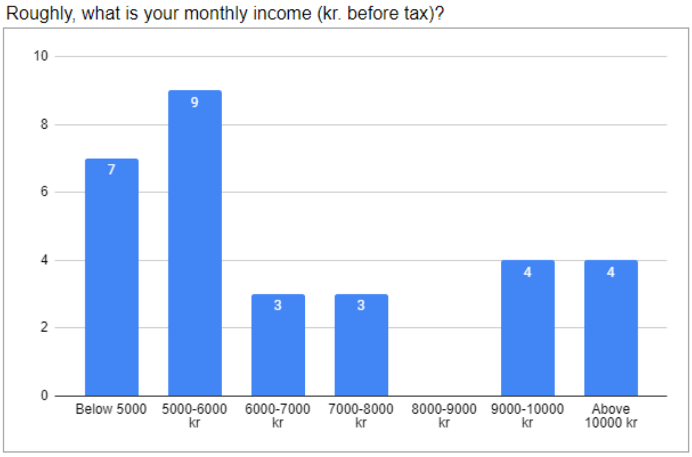


Figure 4.6: Results for Question 3.

in figure 4.6 the results show that the largest portion of the participants at 9/30 has an income between 5000-6000 DKK, the second largest group at 7/30 has an income Below 5000 DKK. As previously mentioned, when looking more specifically at those who moved out, the results are mostly spread between 5000 DKK and 10.000 DKK, 5000-6000 DKK being the most frequent answer - also the median and mode-number of the data-set. Later on, during product design, it is wise to create recommendations based on these numbers, in combination with the previously researched costs-of-living for a danish university student. Furthermore, using this information, the group can begin to assume the scale, and type of savings the user could consider doing, as well as confirming the hypothesis about students managing relatively low income.

Question 4 and 5 - How much do you worry about your finances right now? To what extent do you think you are capable at managing your money?

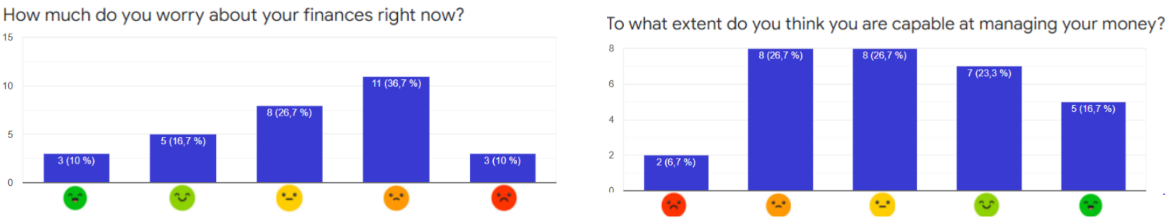


Figure 4.7: Results for Question 4 (Left) and 5 (Right).

The question regarding the participants' current scale of concern / worry in regards to their finances showed a clear sign of distress in figure 4.7, especially when observing moved-out participants. 11/30 people have answered 4 in the range of 1-5, and a total of 22/30 of all participants estimated their worries to be a 3, 4 or 5. It also made sense to ask the participants to estimate their own skills of money-management in order to be able to make some valuable comparisons in figure 4.7. In a range of 1-5, 1 being completely unable, 5 being completely in control, the majority at 18/30 participants have answered either 1, 2 or 3. When comparing individual answers for this question, with the question concerning the level of worry amongst the target group, it clearly highlights that those who feel less capable of managing their money are prone to being more worried.

Question 3 and 4 - Roughly, what is your monthly income (kr. before tax)? How much do you worry about your finances right now?

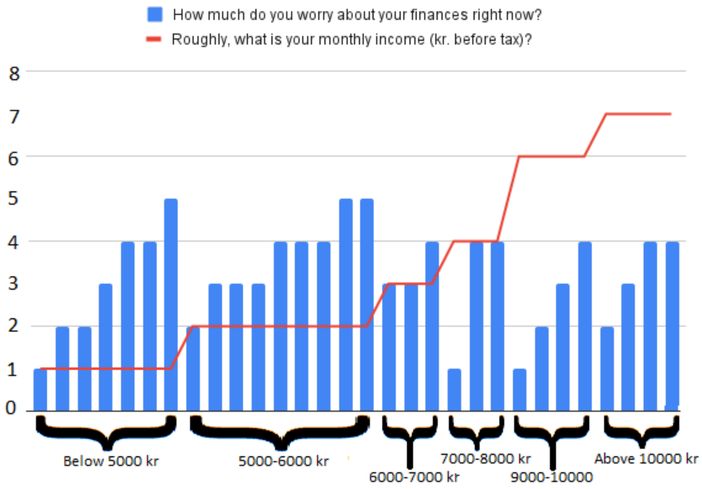


Figure 4.8: Comparison of Questions 3 and 4.

Here in figure 4.8, a comparison can be seen between how worried each person is about their money (scaled 1-5, 5 being the most worried, on the y-axis) and how much money they earn after tax each month (intervals marked on the x-axis). Although the results do not show a very clear tendency, all of those who answered 5, and 65 percent of the people who either answered 4 or 5 are located below the 6000 DKK mark. Looking at the average stress level of each interval, the highest one is 3.6, belonging to the 5000-6000 DKK interval. Considering all this, it can be concluded that living with a lower income is generally more stressful, but regardless of income, all students seem to experience a lot of financial stress.

Product features

- Question 6. Do you think a monthly overview of your finances could be a viable tool to reduce the stress and confusion surrounding your finances?
- Question 7. Do you think having a savings account is important?
- Question 10. What would you use a personal budget and expense tracker for?
- Question 14. Which would you prefer most in a budget tracker?
- Question 15. What do you think are the most important features in a budget tracker? (if you would like other features, please let us know)

Other than researching what features most users prefer in a budgeting-related web-application, it is also beneficial to ask the target group itself about their priorities. Other than genuine interest, another motivation for including this segment of questions was the lack of available information on the internet. The information gathered here largely contributes to the requirements set up for the prototype. The features surveyed upon in these questions are the ones deemed most essential, based on the comparison of the state of the art products 3.2.6.

Question 6. Do you think a monthly overview of your finances could be a viable tool to reduce the stress and confusion surrounding your finances?

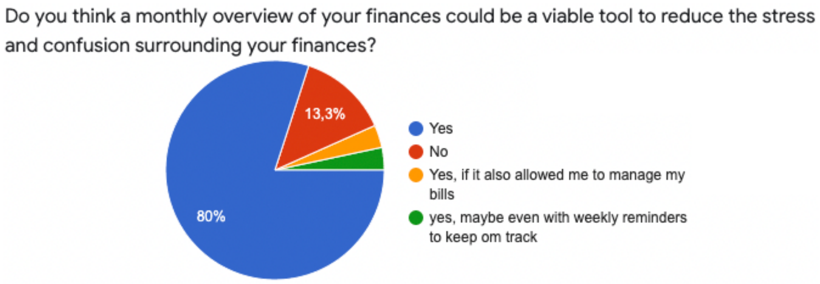


Figure 4.9: Results for Question 6.

A valuable, and certainly a one sided opinion that was made clear here in question 6 in figure 4.9 is that most (26/30 participants) find having a good-enough monthly overview with recent purchases, relevant graphs, and a breakdown of expenses a very useful feature. The answers further back the idea that greater transparency and a more clear picture of one's budget can greatly reduce stress and confusion. Although providing a monthly overview is almost considered an industry-standard, some of the comments also give good feedback as for what students wish for in general. For instance, for someone who is completely new to budgeting, recommendations on how to distribute one's income, or general tips are very much welcome.

Question 7. Do you think having a savings account is important?

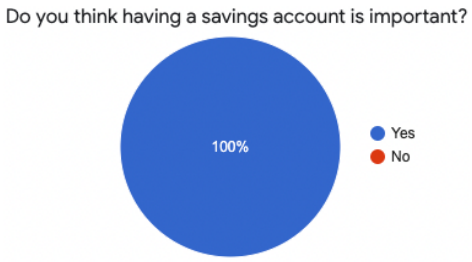


Figure 4.10: Results for Question 7.

During the research, one of the most difficult tasks for students seemed to be having a viable savings account. Saving money, however, is often considered to be one of the main motivations of budgeting. The survey also showed that savings is something students find crucial, arguably the most important aspect of budgeting as seen in question 7 in figure 4.10. 100% of the answers indicated that the participants find having a savings account important. As seen on the table summarising the features of the state-of-the-art 3.1 software, it is surprising to see that none of the presented products appear to have made it a higher priority.

Question 10. What would you use a personal budget and expense tracker for?

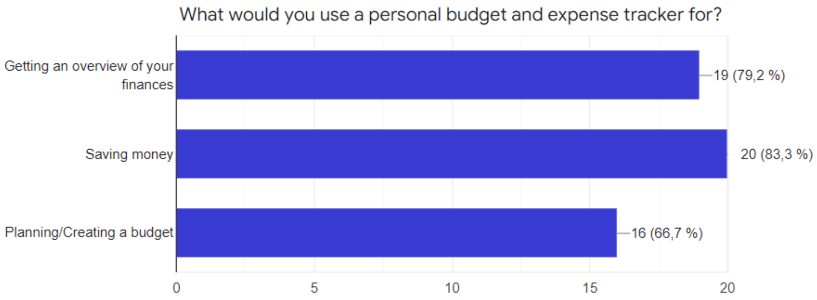


Figure 4.11: Results for Question 10.

Other than preferences in regards to the specific features, the group also wished to know about what it is exactly that students wish to have included in a budget and expense tracker, and what their main motivation would be in figure 4.11. Once again, saving money was the most popular answer (20/24 choosing it as their highest priority), further confirming the existence of financial struggle amongst students. Having a financial overview was also a popular choice, 19/24 people including it in their picks. Using this information, it is worth considering having the aspect of saving money as a point of reference to start with when constructing a budgeting component.

Question 14. Which would you prefer most in a budget tracker?

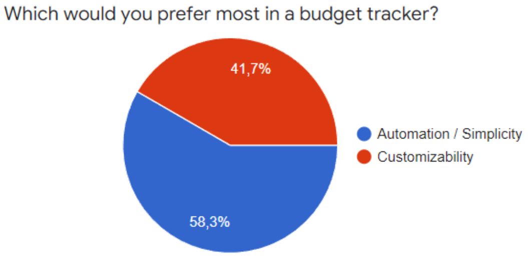


Figure 4.12: Results for Question 14.

Another great dilemma was the choice between personalisation and automation in figure 4.12. Looking at other products and their user-base, the scale between these two mutually exclusive options was a great deciding factor in the UX-design of the majority the current software out there. As in most cases, there are many pros and cons to both sides, and it also shows in the answers received. 14/24 participants expressed that they preferred automation/simplicity, while 10/24 participants preferred customisability. This topic seems rather divided, which also shows in competing designs. As in many aspects, the best of both worlds should be attempted to be included. The attempts of other competing products, which are further elaborated on in the design-segment 4.1.1, which will help the group make decisions regarding this rather inconclusive dilemma. For now, finding a healthy balance is key, perhaps attempting to sneak more personalisation into a largely automated user-experience, which most users are already familiar with.

Question 15. What do you think are the most important features in a budget tracker? (if you would like other features, please let us know)

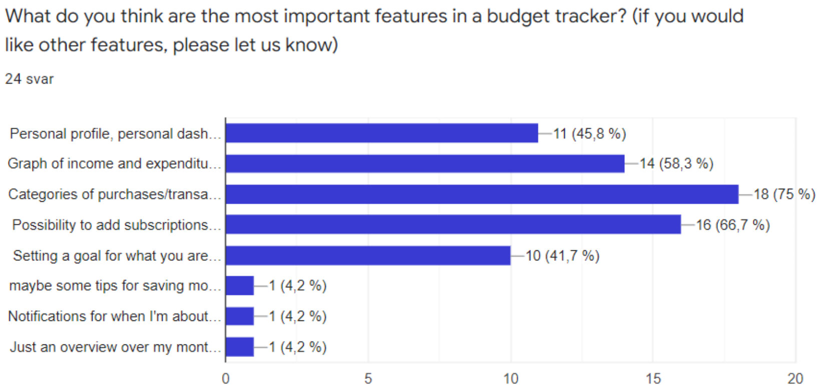


Figure 4.13: Results for Question 15.

At last, participants were asked to pinpoint the most important elements (more specific features) of a budget tracker seen in question 15 and figure 4.13. In this case, other than reinforcing the results of previous questions, participants were also allowed to add more things in case the group missed anything worth mentioning. The main takeaways here were, once again, being able to organise savings (18/24), being able to categorise purchases (16/24), and having a personal dashboard with graphs to provide a quick look at everything relevant. Some user-defined features were recommendation and tips, notifications, and alerts.

The options can be seen in figure 4.13, Additionally an option for adding other ideas for features was available and contributed the last three columns. The mentioned options are more elaborated on in the actual survey, but the essence of each option can be seen above. The actual options can be seen in appendix A, question 15. As previously stated, some backup-questions were included to make sure that some valuable information could be extracted elsewhere, if the participants did not feel inclined to elaborate on their answers - see question 12 in figure 4.16.

User-trends

- Question 8 - Do you think it is possible to have a viable savings-account while studying / being on SU?

- Question 11 - Do you use a budget tracker?
- Question 12 - If you do currently use a budget tracker, what is it called and why do you use it?
- Question 13 - If you do not currently use a budget tracker, why not?

This final category of questions are aimed to discover trends and potential already-existing preferences amongst the target group. Also, these results should answer as for what designs and complexity is the target group already familiar with, and what expectations they have. If some relevant competitors are named, then why reinvent the wheel, when another team of qualified developers have already presented a partial solution to the problem the group is attempting to tackle? Taking inspiration from the other software named here is certainly a consideration to be made during the upcoming design-phase.

Question 8 - Do you think it is possible to have a viable savings-account while studying / being on SU?

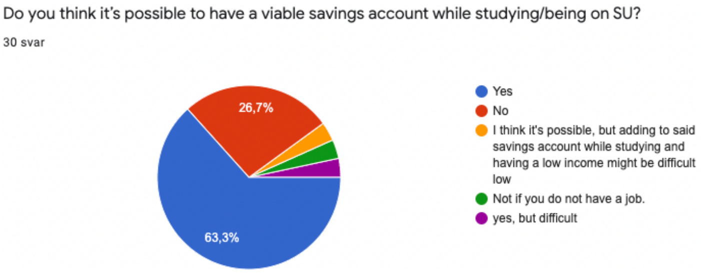


Figure 4.14: Results for Question 8.

Slightly relating to the features-section, but more generally, users were asked if they felt that it was even possible to have a viable savings-account while studying seen in question 8 in figure 4.14. The majority, 19/30 participants do think that it is possible, but in relation to a previous question, several of those who do not, could also use a helping hand in form of a budgeting software. In relation to the average budget of a participant, it is worth considering the zero-based method presented by GoodBudget. Although in their case, this practice focuses on people with low income who find themselves in debt, the idea of people with low income wanting to make regular payments into a savings-account is not all too different.

Question 11 - Do you use a budget tracker?

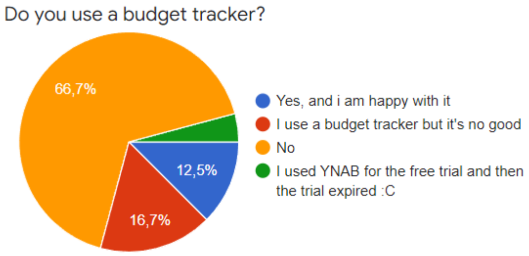


Figure 4.15: Results for Question 11.

Participants were also asked if they currently use a budget tracker in question 11 in figure 4.15 - the answer options also helping to identify if those who do are actually satisfied with their choice of software. The option to comment here was also included, in case a user felt that an important reason was worth mentioning. From the survey it can be seen that the majority of participants, 16/24 people, say they they not at the moment using a budget tracker, which hints that there are many who have either not fond of budget trackers currently available, or have not considered using a budget tracker to begin with. In relation to the previous question about the participants' willingness to use a budget tracker (100% answered yes), it does seem like there is simply no software solution that felt right to them. Even from those who do use a budget tracker, 5 of them are/were not happy with their experience. To reiterate, since the existence of a demand was previously established, the lack of actual usage paints a picture of a demography that has not been approached appropriately.

Question 12 - If you do currently use a budget tracker, what is it called and why do you use it?

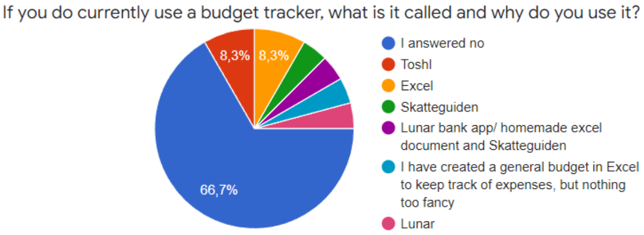


Figure 4.16: Results for Question 12.

Those who do use a budget tracker, were also asked to further elaborate on their choice in figure 4.16. 4 participants answered Excel, 2 Toshl, 1 Lunar, and 1 Skatteguiden. The mention of several previously researched products was of course a positive result, further confirming the relevance of the information stated above. Unfortunately, none of the participants elaborated on the reasoning of their application choice. Before constructing the questionnaire, we could, of course, not expect to get a lot of text-based answers, and other questions (mainly in the features-section) are therefore providing replacement the elaboration that was not received here.

Question 13 - If you do not currently use a budget tracker, why not?

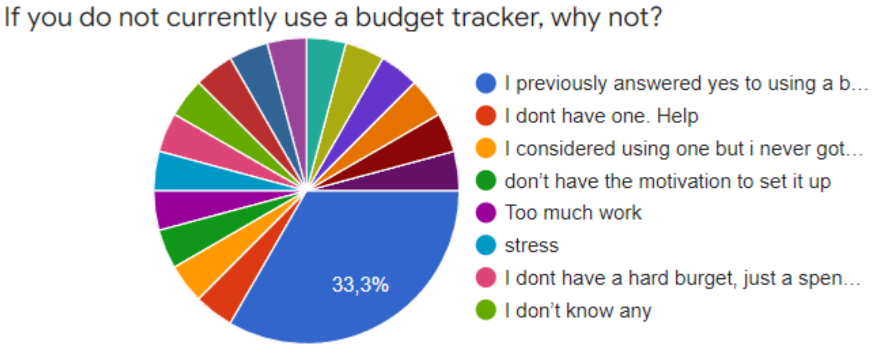


Figure 4.17: Results for Question 13.

Those, who do not use a budget-tracker, also provided their explanations for their choice in question 13 in figure 4.17. The blue section with 33,3% is for the people who are currently using a budget tracker. The rest of the colours represents the explanations of why the participants do not use a budget tracker. 8 out of the 16 answers were generally explaining that setting up the tracker was a task too inconvenient. 6 others explained that they did not know any budget and expense trackers; either none at all, or none seeming personally fitting to them. The full answers can be seen in appendix A..

All survey results can be found in the appendix.A

4.3.3 Sub conclusion to the survey

After presenting the results of the survey, and the considerations behind each question, conclusions on aspects of the final product can be made. Worth mentioning is, that the amount of people participating in the survey is relatively low with 30 participants. Luckily all respondents were students, but 6 never got to answer the last section of the survey, as they answered no to using a budget tracker and thus were discontinued from the survey. In hindsight, this may not have been the most optimal approach. The way this survey was conducted, the participants who initially answered yes to wanting to use a budget tracker in figure 4.15, are the only ones asked, if they would use a tracker with their preferences. This is might be the reason everyone asked this question said yes. It could have been a useful insight whether or not the individuals who initially answered no, would use a software fulfilling their preferences. Despite mentioned comments, useful conclusions can still be drawn, and these are presented in this section. As for the power of representation of the data gathered, a larger sample-size could have definitely given more nuanced, possibly more clear results.

Analysing the results of the survey, it can be concluded that a budget and expense tracker software would be relevant product for moved-out danish university students. Most participants do not live with their parents, and most have an income of 6000 or less each month. This data, along the facts that the majority worries about their economy and does not rate themselves as highly capable of managing money, validates the relevance of a money managing tool. Most would like a monthly overview of their money and find savings accounts important, confirming the statement further. In addition, the vast majority claimed that they would use a budget tracker.

A large percentage of the participants currently do not use a budget and expense tracker. Most explained the reason for this being an inconvenient process of setting up the applications, which should be considered when designing the product. The ones that did use these types of applications used Excel, Toshl or Lunar; another great insight to software worth taking inspiration from.

The level of importance for each of considered feature, can be listed from most to least important (as seen below). The list coincides somewhat with the most common features of the products analysed in the state of the art section 3.2.6:

- 1. Monthly overview of finances
- 2. Categories of purchases/transactions (pre-determined), add your own categories and tags (make your purchases more specific) inside categories that you enter yourself
- 3. Possibility to add subscriptions and planning of a savings account with automatic transfer of user defined amount each month
- 4. Graph of income and expenditure in month/months, future overview of spending via past transaction data and planning of future budgets (when going on holiday or having a big purchase)
- 5. Personal profile, personal dashboard (choose different widgets yourself), possibility of multiple accounts (personal naming) and personalised advice as for how you could save more money each month
- 6. Setting a goal for what you are saving money for, visualising progress; increasing motivation - e.g: phone, vacation, etc.

Worth nothing is the possibility of saving money. This was highly prioritised whenever the recipients were asked about it, but it was not included in the question concerning the list of features presented above. This would be great to implement, as none of the products from the state of the art section 3.2.6 provide a great way of doing this but is desired by the students.

Moreover other features that could be considered are tips for saving money, and getting notifications when nearing budget limits within the budget plan.

Based on the results, a prioritisation of certain features can be made. For the overall feel of the product, simplicity/automation triumphs customisabilty, though not by much; a middle ground between the two appears to be the best solution. Most would use a budget tracker with the purpose of saving money, second most for getting an overview of their finances and lastly for creating/planning a budget. The product should be designed with these prioritisation in mind.

4.4 Problem Statement

At this point in the report, the group has finished conducting the analysis, and explored a sufficient part of the introductory problem. Furthermore, the problem-field has been narrowed down, considering both its scope, means of solution and target-group. The final problem statement of this project can, thus, be formed by taking the most crucial points raised throughout earlier sections into consideration, as well as relevant snippets of information from previous sub-conclusions. From this point on, the core-assignment of this report is to provide a best-effort solution to this problem-statement. Some important elements in the problem-statement, such as specification of target group, means of solution, etc., which the group found crucial to be included are further elaborated on in the following paragraphs.

Firstly, the recipients of the solution must be named, as different demographics require vastly different solutions. Both in the target-group analysis, as well as in the survey conducted on danish university students, some crucial tendencies for this particular target group could be pinpointed. The relatively low income, unique unfamiliarity with budgeting as a whole, their main financial motivation being proportionately smaller savings-goals, unique choice of finance-related apps (or the lack there off), provides a solid base for defining a target group. The relevancy of putting the focus on this exact target group is further backed up by the information gathered in the SoTA 3 chapter, since no other product has been specifically designed for this demography.

Another important point raised during both the research and survey 4.3.2 answers was the financial stress amongst the target group, which after the survey results, can be presumed to be highly related to the lack of structure and overview of one's finances. Although it is difficult to follow up on and get a definitive evaluation of stress before and after the implementation of the group's solution, it is worth mentioning, as it tightly binds into the relevancy and reason behind the choice of this problem.

At last, it makes sense to name the formalities and requirements surrounding the solution itself, and including questions that enable a followup-procedure to determine if the solution actually works or not - also avoiding a wicked-problem. The solution itself must be a web-application in the realm of personal budget and expense tracking. No further specifications are necessary, although, it could be said that the term "web-application" also implies that the solution is to be designed for personal computers. The followup questions included in the problem-statement attempt to evaluate the effectiveness of the solution for being a useful tool for providing an overview and a service that works, and the degree of help provided to the underlying stress-related problem.

The problem statement is the following;

> *Providing a web-application for personal budget and expense tracking to moved out danish university students with a monthly budget of less than 10.000 DKK, how can the general degree of financial overview and sense of control be improved upon? Furthermore, how can this web application contribute to establishing a more stable economy and thereby reduce stress? To validate the group's answer, assess whether danish university students would consider the solution viable for everyday use, or a sensible alternative for other budgeting web-apps.*

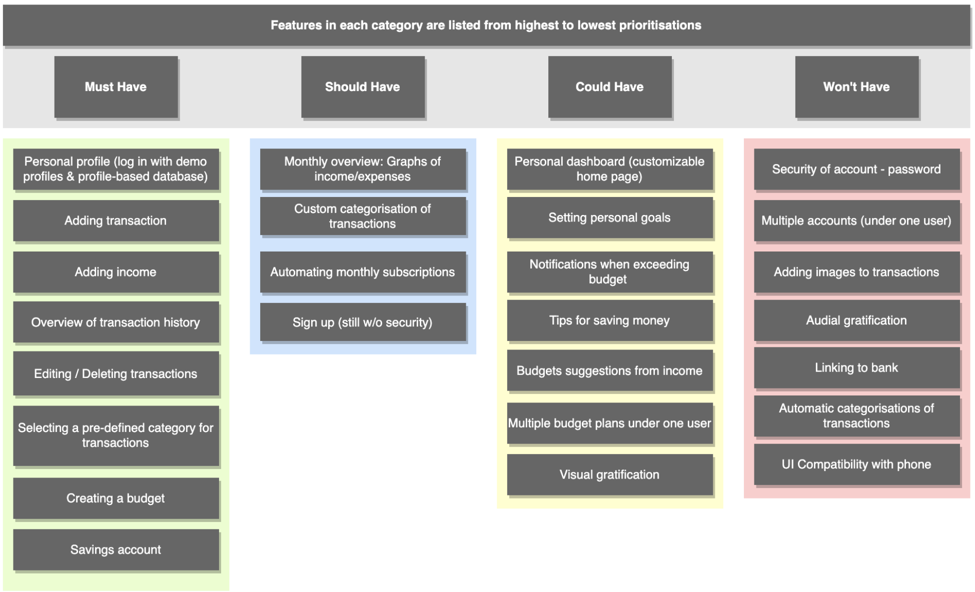
4.5 MoSCoW

Now that both the problem-statement and the potential features of the product are clear-cut, the prioritisation of all product elements must be determined. Beware, that this project only provides a walk-through of a single iteration - normally, a MoSCoW-model is to be frequently revised through each iteration of the product. For every feature considered to be added to the program, it has been considered if the feature is necessary and if it contributes enough to the final product to be implemented. Applying the MoSCoW method is a great way to manage the importance of these requirements, and make plans for different iterations of a product. Requirements are distributed into different groupings based off of their importance, added value, and difficulty-to-implement depicted in figure 4.18. Furthermore the requirements in each grouping are ranked from most to least important, by the previously conducted analysis & survey, and fulfillment of the following criteria: necessity, difficulty of development and implementation, and dependency on other functions. It is certainly worth mentioning that the development-team does not have a lot of experience with evaluating the difficulty of coding-tasks, nor pre-determining dependencies. Therefore, the actual sequence of implementation may deviate from the planned timeline, and prioritisation may be subject to changes.

A MoSCoW-model consists of the following groups: [65]

- Must Have - Mandatory features crucial for the product to function.
- Should Have - Non-vital features that can add significant value.
- Could Have - Nice feat features wit little impact if left out.
- Won't Have - Features that are not priority for this specific time.

A MoSCoW-model constructed to plan this project's product can be seen in figure 4.18. For a more clear and concise explanation of each requirement, see the list in the appendix J.



Features in each category are listed from highest to lowest prioritisations

Must Have	Should Have	Could Have	Won't Have
Personal profile (log in with demo profiles & profile-based database)	Monthly overview: Graphs of income/expenses	Personal dashboard (customizable home page)	Security of account - password
Adding transaction	Custom categorisation of transactions	Setting personal goals	Multiple accounts (under one user)
Adding income	Automating monthly subscriptions	Notifications when exceeding budget	Adding images to transactions
Overview of transaction history	Sign up (still w/o security)	Tips for saving money	Audial gratification
Editing / Deleting transactions		Budgets suggestions from income	Linking to bank
Selecting a pre-defined category for transactions		Multiple budget plans under one user	Automatic categorisations of transactions
Creating a budget		Visual gratification	UI Compatibility with phone
Savings account			

Figure 4.18: The group's MoSCoW model summarising all product requirements.

In this project, the group had made a clear effort to avoid as many preconceptions about what the product should resemble, as possible. Therefore, all requirements were either formulated from the group's analysis of competing products, industry standards, or the target group's wishes and tendencies. Naturally, the sequence of requirements not only depends on their importance, but at times also the group's limited experience with web-development, and time constraints.

Some of the previously mentioned "industry standards" of a budget and expense tracking web-app are having a personal profile, being able to add and manage transactions and income, and naturally, being able to create a budget. Unsurprisingly, these functionalities are all located in the must have category, since a viable solution without these aspects cannot exist. Another must haves is a savings account are a monthly overview - these were popular features in competing products, as well as highly requested options in the group's survey as seen in figure 4.9 and 4.10. a option for the possibility to choose an already created category for new transactions were also added to the must have section.

Various forms of graphical representation of income and expenses could also be considered something to be expected. It was however one of the lower-prioritised features by the target group as seen in figure 4.13, so it was moved to the should have category. As all of the products looked at in the state of the art section have some sort of graphs it should still be implemented 3.2.6. Some other should haves are subscriptions and custom categories, which are both located as our target groups two highest priorities, in the surveys question 15, seen in figure 4.13. These are both to be expected from a modern software solution, creating a much more pleasant user-experience. And the last thing in could have is the ability to sign up but still without security.

Motivation is also a crucial aspect of budgeting. Without tangible personal goals, saving money can often feel pointless. Therefore, a great deal of consideration went into pinpointing some of the central elements of motivation in competitors' products. From these, also looking at user feedback, the most appropriate ones were selected and put into the MoSCoW-model, mainly situated in the could have section. As mentioned, setting personal goals was an important consideration, as well as providing tips and notifications, and, if possible, a fully personalised dashboard for a more unique experience, but its not a top priority in the program since it is relatively low on the list of features that the target group wants based on the data in figure 4.13. All of the requirements included here can play great roles in providing a much improved user-experience, but are in no way essential for creating a functional prototype.

One of the most important and universally beloved aspects, which the group's product will unfortunately lack, is synchronisation with one's bank account. Simply due to difficulty and time-constraints, it was deemed to be categorised under won't have, even though it would significantly improve the automation aspect of the product. Some other requirements worth mentioning from this section are "UI compatibility with phone", and "Automatic categorisation". While striving for maximum responsiveness, it is a whole new challenge to make a mobile-friendly website, which will not be tackled due to time constraints. A successful implementation of automatic categorisation could certainly be considered a future quality-of-life update, which would greatly increase customer-satisfaction and save time. Like several other requirements in the won't have category, it is also deemed to be too time-consuming and not important enough for the solution.

An in-dept explanation of all items of the MoSCoW-model can be read in the appendixJ.

Chapter 5

The product

In the following sections, the basic design principles and thoughts behind the implementation of product requirements are discussed. For the design-part, an interactive visual prototype was created using Figma - note that this is not a real web page but a interactive designing website. During the implementation, these mock-ups served as guiding principle for how the page should look like. From implementation, the final product is presented with screenshots and guides for where the functionalities of the website are placed on each web page. Lastly, the user test is documented with the feedback for the final product.
This structure represents the SDLC 2.3 from the methodology 2 where the section starts with MoSCoW (Requirements), High-Level overview of the product design (Design), Implementation (Development) and User Test (Testing).

5.1 High-Level overview of the product design

In this project, a fully functional and dynamic web-application is to be developed. Some of the main elements of the solution should therefore be; a consistent design-pattern [30], an application framework, a server, a server-side run-time environment, a database, and a view engine. Firstly, the design-pattern ensures the structural consistency and logical segmentation of the code, and makes collaboration easier. Applying an application framework is always smart to use for web-apps, since the group does not want to reinvent the wheel, but rather create an app that works. Providing middle-ware elements, a framework can make server-client communication a lot easier. For securely saving information, a cloud-based database is a smart choice. Certainly, choosing one that pairs well with the nature of the data to be saved and the other languages used is a good idea and a big time-saver. Due to the highly dynamic nature of the website, implementing a view engine can also save a lot of trouble.

For the front-end part of the web-page, other than the Gestalt-laws [30] named below, responsiveness and dynamicity are also main focus-points. The page should look just fine on all computer and window sizes, so scaling should be implemented considering both placement and size of HTML-elements.

Primarily based on competing products and the survey results, the website was initially decided to be split up into the following pages; monthly overview, transaction history, savings, and budget. Since the target group's main motivation is saving money, several of these topics are built up to support this purpose. Using a money-saving guide created by Bank of America, the connection between each of these pages and the idea of saving money became very clear. Firstly, being able to record and categorise one's expenses is crucial to be able to get an overview of what the money is spent on. Subsequently, a budget is needed to set monthly goals, and when starting a savings-account, it must also be in one's budget. A heavily discussed functional-design-feature in budgets is recommending a budget, so someone who is completely new to budgeting has a helping hand to start out with - or a healthy example to be compared to. At last, when all of these things have fallen into place, viable savings-goals can be set. This product is planned to be designed to work better with relatively shorter-term goals, such as buying a new cellphone or going to a festival. Based on the reviews, it was decided that when implementing, the number of individual pages may vary, as it is more important to only have as much content on a page as necessary, rather than filling it up with more and ending up with long pages, as some other competitors do. Now that the basic idea behind the organisation of the pages are clear, the layout and other design-elements can be discussed.

Before even thinking about how the content itself should look, one must assess how the content should be reached. Therefore, the group relied heavily on Fitt's Law [30] when organising the main actionable targets. "Add"-buttons must create a clear contrast and be on the top of each page, and all of the actionable targets are either on the start-page, or only one click away, using the side-bar. The side-bar itself was also a conscious choice. Other than it being considered the modern standard for both macOS and Windows apps, the product's user-base is also most comfortable with side-bars based on average user-habits: YouTube, Twitter, Facebook, Spotify, etc. Side navigation is also proven to be more easily scalable and require less eye and cursor movement to navigate like shown in figure 5.1. [7]

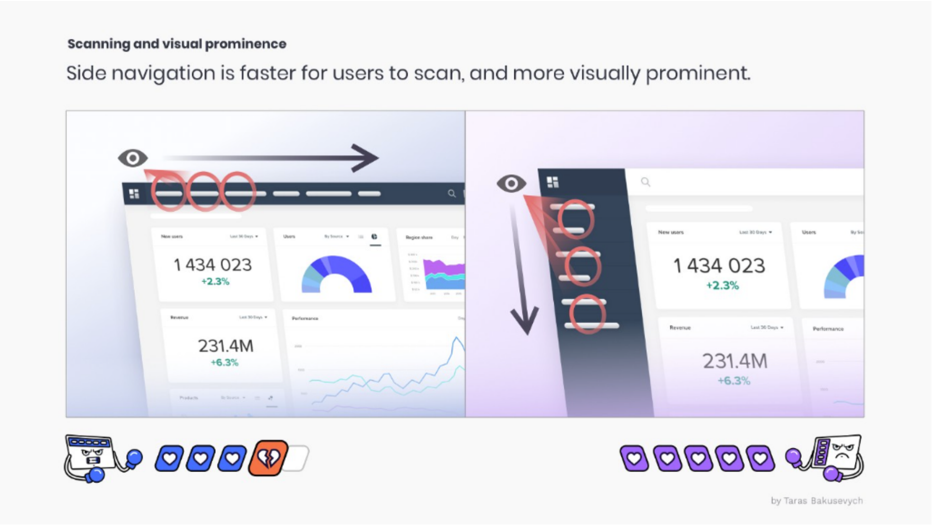

Scanning and visual prominence
Side navigation is faster for users to scan, and more visually prominent.
1 434 023
+2.3%
231.4M
+6.3%
1 434 023
+2.3%
231.4M
+6.3%
by Taras Bakusevych

Figure 5.1: Sidebar and top-bar comparison [7].

Several examples of Gestalt-psychology can also be discovered on the group's initial design. [30] Law of Pragnanz [30] was heavily applied when grouping information into simple structures - heavily based on what a bit more fancy Excel-sheet could resemble. The Law of Proximity also clearly shows when observing the placement of drop-down menus and adjustment of text. Later on, when building upon the bare-minimum product, Miller's Law of dividing content into smaller more easily digestible chunks will also be a main inspiration. Nevertheless, even with all of these laws in mind, the main focus must always be on the user-experience. If something works better in a non-traditional way, it should be considered to be kept that way. For instance, Hick's Law [30] of keeping users' choices to a minimum will be largely ignored for specifying transactions, as the lack of user-control in this field seemed to be an annoyance for most.

The main placement of graphs was chosen to be on the monthly overview screen 5.2. This was done, since graphs are mainly good to depict larger amounts of data in a brief, easily recognisable style, rather than going deep into details. The monthly overview (also home page) is planned to only have the most crucial information at hand. These graphs should, as a starting point, only depict the current months' data.

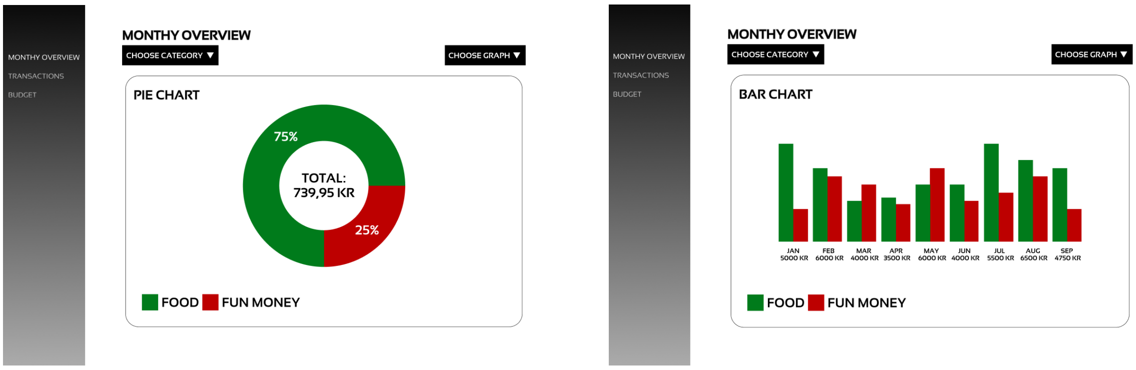
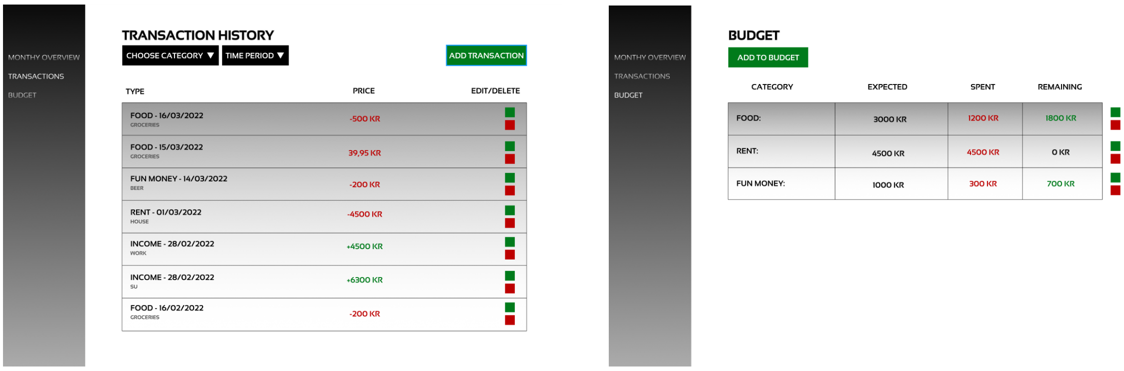


Figure 5.2: Monthly overview mock-up created in Figma.

The transaction history was quite straightforward to plan and can be seen left in figure 5.3. Other than the need to clearly differentiate income and spending, creating an easily readable layout was the only important problem to tackle. Taking heavy inspiration from Excel, a simple spreadsheet-look was decided on. Using this idea, simple colour-contrast and placements make for a readable list - character limits and possible duplication problems must also be accounted for in the future. As for now, the budget-page, to the right in figure 5.3 has a similar shape, but recommendations are also to be implemented, as well as graphs. For a start, a simple list is okay.

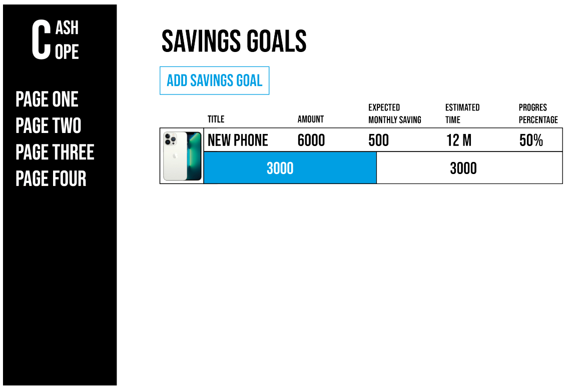


TYPE	PRICE	EDIT/DELETE
FOOD - 16/03/2022 GROCERIES	-500 KR	🟩 🟥
FOOD - 15/03/2022 GROCERIES	39,95 KR	🟩 🟥
FUN MONEY - 14/03/2022 BEER	-200 KR	🟩 🟥
RENT - 01/03/2022 HOUSE	-4500 KR	🟩 🟥
INCOME - 28/02/2022 WORK	+4500 KR	🟩 🟥
INCOME - 28/02/2022 SU	+6300 KR	🟩 🟥
FOOD - 16/02/2022 GROCERIES	-200 KR	🟩 🟥

CATEGORY	EXPECTED	SPENT	REMAINING	
FOOD:	3000 KR	1200 KR	1800 KR	🟩 🟥
RENT:	4500 KR	4500 KR	0 KR	🟩 🟥
FUN MONEY:	1000 KR	300 KR	700 KR	🟩 🟥

Figure 5.3: Transaction history and Budget mock-ups created in Figma.

For savings seen to the left in figure 5.4, progress-bars are used to indicate advance, and some recommendations based on the target group are also to be put into place. For simplicity and uniformity, the goals are simply represented by emojis. Generally, fonts are to be kept the same throughout the web-page. Consistency is key, and due to the lack of longer texts, clean sans-serif type fonts are to be used, which further underline the strict geometric characteristics of other page elements.



	TITLE	AMOUNT	EXPECTED MONTHLY SAVING	ESTIMATED TIME	PROGRES PERCENTAGE
	NEW PHONE	6000	500	12 M	50%
	3000			3000	

Figure 5.4: Savings mock-up created Adobe Illustrator.

5.2 Implementation

Following the thoughts behind designing the website, the implementation of the product is covered in this section. The overall structure along principles commonly used throughout the entirety of the code is explained. After clarifying these principles an explanation concerning the flow and connection of the various sub pages will be given.

Design Pattern

Moving on to structuring of the product, an MVC (model-view-controller) [60] design pattern is implemented (which can be seen in figure 5.5), as it is the basic pattern that Express.js is built upon, and is fairly popular for web-apps. Here, model defines the way data is organised (database), view defines what is shown to the user (templating engine), and controllers handle requests and responses (functions and routers). Express.js is a popular middleware/application framework, which goes hand-in-hand with Node.js, a server-side runtime environment. What this means, is all code is ran server-side, and using middleware-functions, requests and responses can be handles with ease, making online communication much more trivial than it otherwise would be. As for the database of choice, MongoDB Atlas [6] was chosen for this project, due to its fairly simple, document-based, JSON-like data-structures, good compatibility with Node.js and the incredibly user-friendly and simple lookup queries it has. Also, thanks to the good compatibility with Node.js, no resources are required for learning complex syntax. For the templating engine, EJS (embedded JavaScript) [15] was chosen, as the information shown on the web-page is planned to be highly dynamic. Other than providing an easy combination of HTML and JS, EJS does not require any serious language-learning either, since it is simply a mix of the two languages (markup lang. mixed with programming lang.).

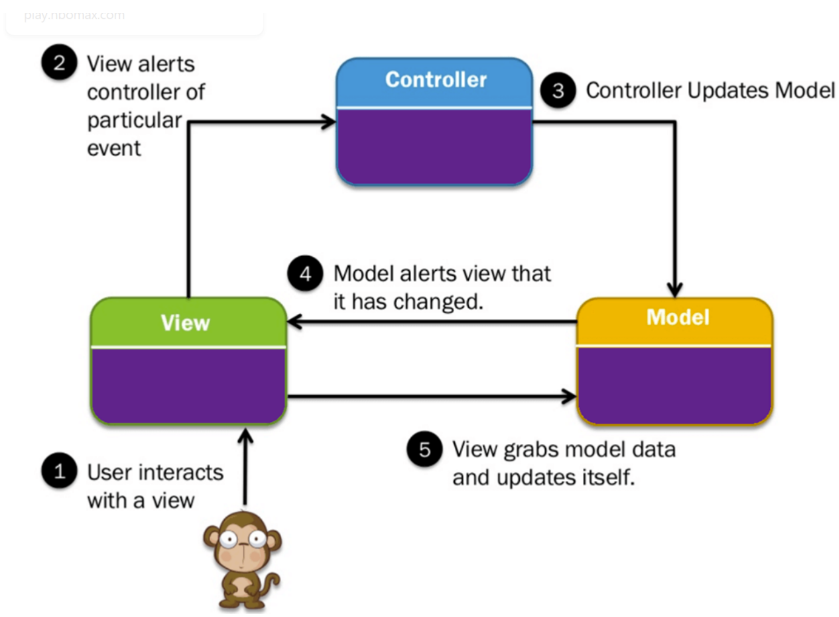

play.hbomax.com
2 View alerts controller of particular event
Controller
3 Controller Updates Model
4 Model alerts view that it has changed.
View
Model
5 View grabs model data and updates itself.
1 User interacts with a view

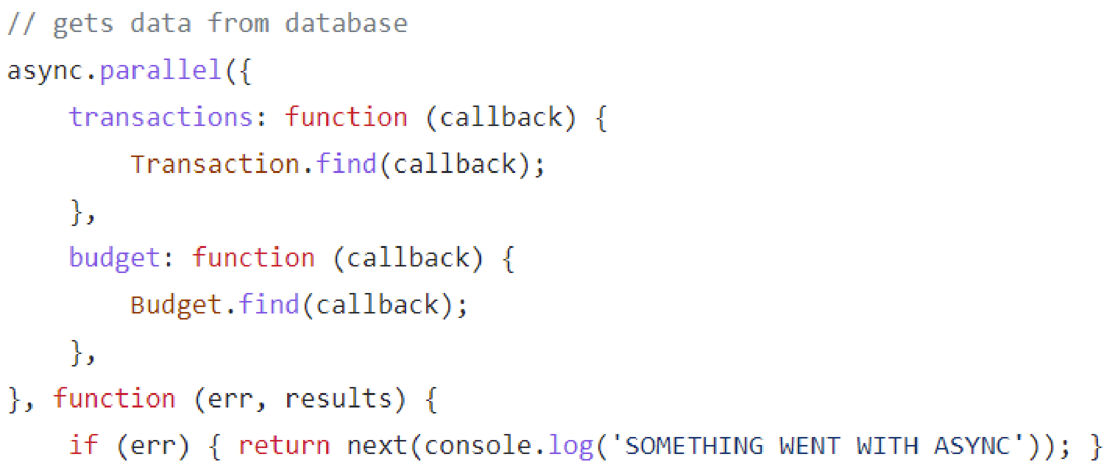
Figure 5.5: Model-view-controller Model [41].

Program structure

The product was created in node.js with the express framework. Express essentially simplifies many procedures by having a lot of useful features for creating a web application, resulting in a smaller amount of code. Instead of using plain HTML for creating every page, the view engine, EJS, was used. EJS was chosen, as it allows using HTML language for structuring a page, while displaying and modifying some data passed when the page is rendered. To keep the code organised, the program was separated into route, view and controller files. The routes indicates the path of every GET and POST request, the controllers contain the actual functionality of every route, and the views are the mentioned EJS files.

Database, Promises and Async parallel

The database used for this project is the NoSQL MongoDB Atlas Database. Several locations in the code, multiple collections from the database are fetched within the same route. This has been achieved in two different ways: "Promise.all" or "Async.parallel" like in figure 5.6. Both functions could have been swapped without any significant difference in the outcome. The use of one or the other is the product of multiple people working on the same project who found different ways of achieving the same goal.



```
// gets data from database
async.parallel({
    transactions: function (callback) {
        Transaction.find(callback);
    },
    budget: function (callback) {
        Budget.find(callback);
    },
}, function (err, results) {
    if (err) { return next(console.log('SOMETHING WENT WITH ASYNC')); }
```

Figure 5.6: Async Parallel.

5.2.1 Budget Page

The general idea about the budget page is based on the Must-Have requirement, Creating a Budget from the MoSCoW-model 4.18. The functionality of the page is made up by three views/pages: "budget", "add-budget" and "budget-edit". All of the view files in this project are EJS-files and every GET request has its own EJS-file to be rendered. The Budget page's GET and POST requests can be described as a flow, that the figure 5.7 displays. The components in the flow chart equal the idea of creating a budget and can be divided into the following parts:

Overview of Budget

The flow of using the budget page starts when the user is redirected to the entry point "/budget" when navigated from the sidebar link "Budget". It is executed as a GET-request, where data from the schemas "Budget" and "Transaction" from the MongoDB database [58] is fetched by using the asynchronous function, "async.parallel". When handling multiple schemas, an asynchronous function is a must - in other segments of the code, where only a single schema is imported, simpler promises are used instead. When receiving the GET request, if the amount of categories in the Budget database is zero, the function will create several prefixed categories recommended for danish students, which are based on the information located on a third-party website [33]. Following that, the Budget-data is used to calculate the "Total expected" and for viewing the budget categories with their expected amounts in a list form on the page and in the box with recommended categories. Here, the data from the Transaction-schema is used for populating the spent/received amounts of each specific category. It is also used for calculating the "Total income", "Total spent", and "%: Income vs spent". The remaining of a category and "Total remaining" of all categories

are determined by using the data from both Budget and Transaction schemas.
The default overview of the budget shows all expense categories. To view the income and savings categories, a POST request is made, where all of the same functionalities is implemented, and the user is directed to the URL "/budget/choices". It takes the value in the drop-down option and filters on three parameters. The first is if the transaction-category is marked as an expense category and the tag "Expense categories" is selected, then all expense categories are filtered and shown exclusively. The second parameter operates the same way but with income categories. The third, and last filter is on the savings category by checking if "savings" is included in the category name.

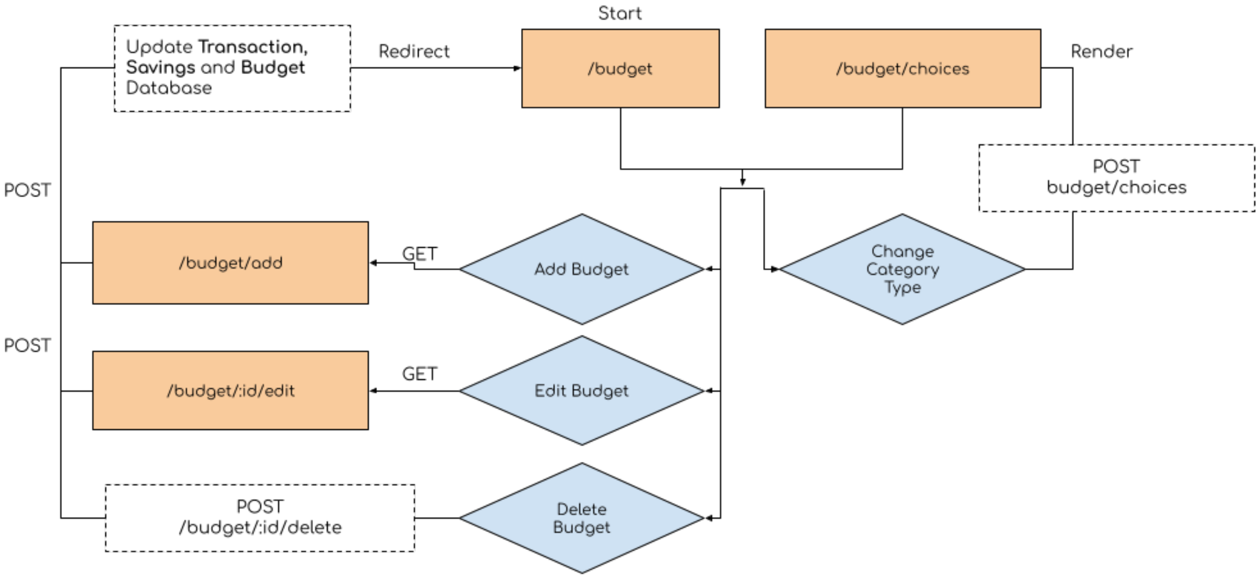


Figure 5.7: Flow chart of the Budget page.

Adding Budget

Add Budget is requested by using either the sidebar or the button on the budget page. When doing so, a GET request is sent and the user is directed to the "/budget/add" URL. Here, the user adds a budget, and a function is called by submission, that creates a new budget with a type of category (expense or income), category name, expected, and colour input, which is saved to the database in the Budget collection.
When pressing the submit button at the bottom of the page, a POST-request is made. Inside the POST request, the data in the input-fields on the page gets saved to the database if, and only if, there is no pre-existing category with the same name. The user is then redirected back to the URL "/budget" and, thus, starting from the start of the flow again with an updated page.

Editing Categories
The last part of the user flow is the functionality of editing and deleting a budget category. The only way of editing or deleting is by using the buttons "edit" or "delete" on the right side of the specific category. A GET request is being made when pressing the "edit" button for the URL "/budget/:id/edit". Here, the Add Budget template is presented to the user with the current category's values in the input fields. The user can then edit the values as desired. When pressing the submit button, a POST request is made and the data for the edited category is saved, overwriting previous entries. The user is then redirected to "/budget" and the budget page is then displayed with updated values.

Deleting Category
The deletion of a category only has a POST request for "/budget/:id/delete", thus, the user maintains the current flow of the page. In the POST request, the data from the Budget database of the selected category, by the id in the URL, is deleted. The request also finds the transactions from the Transaction-schema and deletes all transactions with the same name and the same principle with the savings data. Subsequently, the user is redirected back to "/budget". Since there is no GET request for deleting, the budget page is just updated.

5.2.2 Transactions

This section presents how the transactions page was created. From the MoSCoW 4.18, all must-have features have been implemented as well as half of the should have features, namely: "Custom categories of transactions", and "Graphs of expenses". In addition, though not defined in the MoSCoW, features allowing users to view transactions within a specific category and date interval have been implemented, as the group found it to improve user experience.

To make all functionalities work, four pages/EJS-files have been created: "transactions", "transactions-add-income", "transactions-add-expense" and "transactions-edit". The flow chart below 5.8 has been created with the purpose of getting an overview of how the mentioned pages are related.

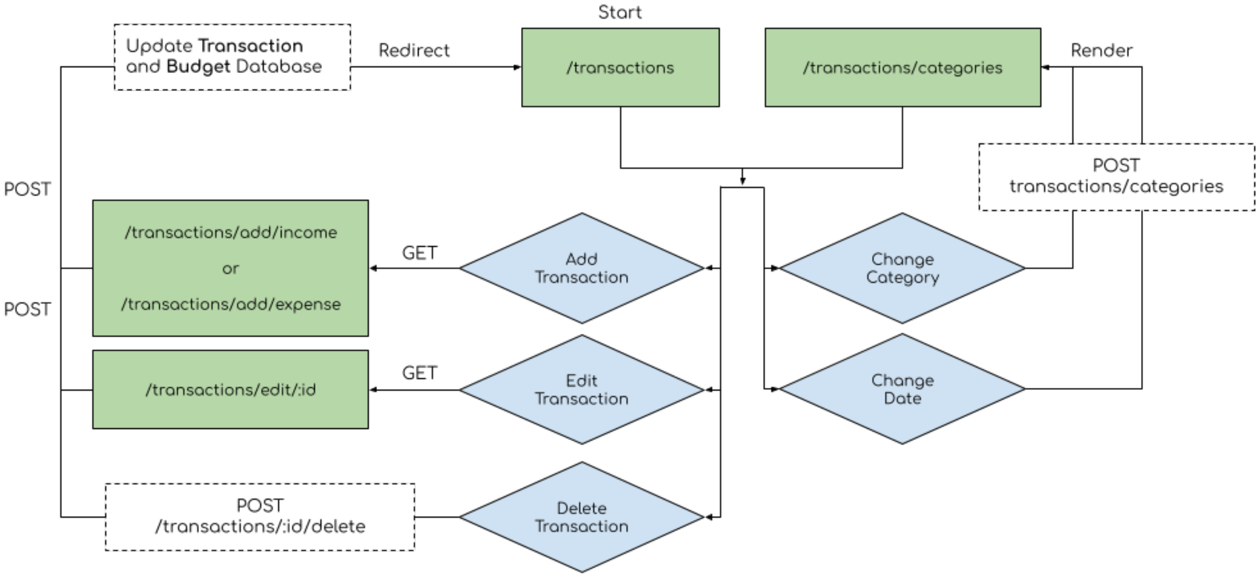


Figure 5.8: Flow chart of the Transactions page.

With the figure in mind, the implementation of core functionalities will be explained.

Overview of all transactions
When navigating to the transaction page the user is directed to "/transactions". This is executed the code within the respective GET request: All data from the Budget and Transactions databases are fetched. Each document in the Budget database collection represents a transaction category - this is used for viewing transactions within specific categories and adding/editing transactions. As no date interval or category has been specified, the EJS-file, "transactions", is rendered with an array containing all transactions created in the current month.

As visualised on the flow chart 5.8, the user now has five options (from "/transactions"). To begin with, the "Change category view" and "Change date view" options are explained.

Specifying views
For every change in the selection of a certain category, start - or end date is detected, a form submits a post request at "/transactions/categories" with the updated date and category values. The code at the respective POST request route is executed: Data from the Budget and Transaction database is fetched and filtered into an array matching the newly specified date and category constraints. Lastly, the same EJS-file is rendered with the new data, though at the URL "/transactions/categories".

Graphs were not created by any of the group members, but is an imported module, which is the reason for their lack of inclusion in the flow diagram 5.8 - it does not interfere with the routes and is mostly front-end JavaScript. The user can via a select switch between a doughnut chart of all income - or expense transactions.

The graphs always shows transactions of all categories (income or expense) but does respond to the selected date intervals. The graph uses data from the budget database, more specifically the colourInput and category values. Also the transaction database is fetched. For each category the prices of all transactions matching the specified date intervals are summed and added to an array as an object including the category name and colour.

As shown on the figure, the user is presented with the same five options as before, though at another URL. The user can keep changing category/date in an endless loop or pick one of the other three choices: "add transaction", "Edit Transaction", and "Delete Transaction".

Adding Transactions
At the actual transactions page of the product, adding a transaction is divided in two different buttons: an income - or expense transaction. The functionality of the two procedures are the same with the only difference being the choices of categories made available to the user. Either income - or expense categories. Tapping either of the button redirects the user to the "/transactions/add/income", or "/transactions/add/expense" URL. When this happens the relevant GET request is performed:

The Budget collection from the database is fetched, added to an array and rendered with the "transactions-add-income" or "transactions-add-expense" ejs file. A form is presented for the user to fill. In the two ejs files, the categories available to select are determined by the bool, "income", of each element in the array.

When submitting the data, both forms create a POST request at "/transactions/add". This request saves the newly created transaction in the transaction database and updates the spent amount in the budget database. After these procedures, the user is redirected to the "/transactions" URL, executing the earlier mentioned procedure.

Editing Transactions
On the page, every transaction table is assigned two buttons - edit and delete. The edit button is an anchor-tag, redirecting the user to "/transactions/edit/:id". The GET request received, fetches the correct transaction in the database by id and renders a page like the pages for adding transactions, but with forms filled with the current transaction data. Moreover, all categories - income, savings, expenses - are accessible. Submitting the form makes a POST request at the current URL, in which the transaction is found and updated by its id in the database, with the new input. The Budget database is updated as well, and the user is redirected to "/transactions"

Deleting Transactions
The delete buttons below the edit buttons on the page are all tiny forms. On click, a given form is submitted as a POST request at "/transactions/:id/delete". When this request is received, the transaction is found by the id provided in the URL and deleted from the database. As the other transaction modification procedures, the budget database is also updated.

Worth mentioning is, the redirection to "/transactions" following any of the transaction-CUD (Create, Update, Delete) features. As mentioned earlier the get request of this route is always going to have the date interval as all days of the current month, and the category view as all categories. This means that the category and/or date view selected before modifying a transaction is not maintained afterwards.

5.2.3 Savings

The savings page provides an overview of any savings goals the user has made. Each goal is visualised in a table displaying name, price of the saving (amount), expected amount transferred per month (epm), time estimated of achieving the savings goal (eta), an assigned emoji, how much currently has been transferred (progress percentage), an assigned colour, and lastly a progress bar.

The colour is not actually used in this page, but is useful in the doughnut chart on the transactions page. All of the above mentioned variables are stored in the database except progress and eta, which are calculated on the basis of amount and a progress number calculated from the fitting transactions. The remaining part of this section describes the workings of each route. To enhance overview a route diagram has also been created for this page 5.9:

Savings overview
Once the GET request for "/savings" has been called for, the transaction - and savings databases are fetched. for every savings goal the progress is calculated from all transactions with corresponding categories. The fetched data of all savings goals with progress values are added to an array. The "savings.ejs" file is rendered with this array as parameter and the necessary remaining calculations are made in the ejs file. As shown on the flow chart 5.9, a few options are presented at the user: "Add Savings", "Edit Savings", "Delete Savings". These buttons are located like the budget and transaction page to simplify user interaction.

Savings CUD
Looking at the flow chart 5.9, adding, editing or deleting a savings goal seems identical to

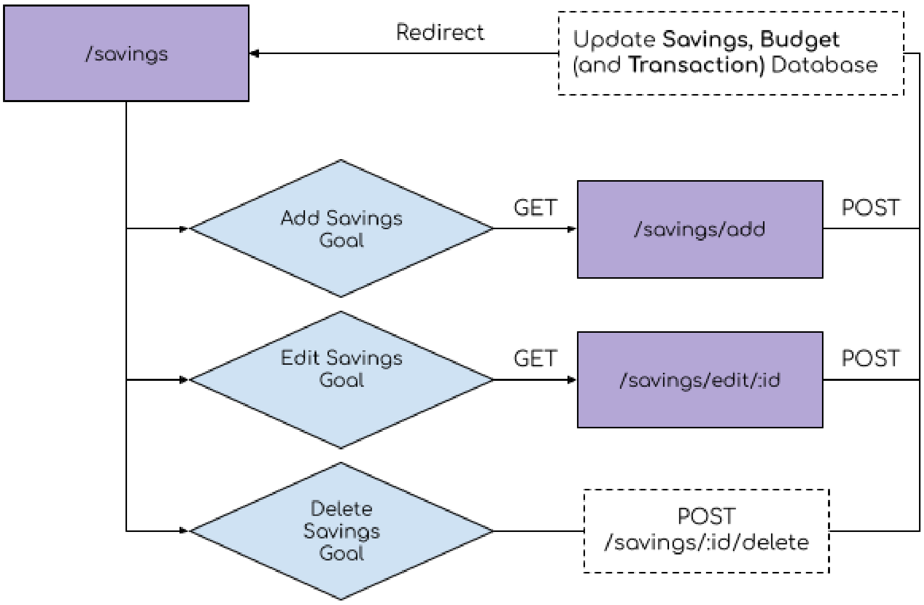


Figure 5.9: Flow chart of the Savings page.

flow of the transactions page and budget page - and it generally is. The only differences are the data passed around, the routes and the files rendered. Clicking the "add savings goal" button initiates a GET request at "/savings/add", rendering the "savings-add.ejs" file. A form is presented where name, amount, estimated per month, emoji and colour must be filled in. The available emojis are elements of a hard coded array passed as an argument in the ejs file. Submitting the form saves the savings goal in the budget and savings databases with the name entered + "(Savings)" and redirects the user to "/savings". The subtle addition to the name is used for differentiating between the different types of categories.

Editing a savings goal creates a GET request for "/savings/edit/:id", which fetches the savings goal desired to be modified via its id and renders "savings-edit.ejs" with the emojis (just like before) and the savings goal. Fetching the savings goal allows filling out the form with the current data, showing the user what the current values of the document is. When submitted the POST request updates the database: all transactions in the category are updated to the new name, the corresponding document in the budget database is updated, and lastly the savings database is updated.

Deleting a savings goal is also a similar procedure as deleting a transaction: tapping the delete button creates a POST request that deletes budget, savings and all transactions with the same name from the database. Moreover, the amount of money saved up is added as an income transaction with the main category, "Return".

5.2.4 Automatic features

As stated in 3.2.6, the industry relies heavily on creating a more automatic user experience to create a unique selling point. In this program, the group has tried to implement a few automatic features to comply with the industry trend.

One of the features is the automatic date settings of the graph on the Transactions page, where the current month is always the default setting. The user can edit the date interval, but when leaving the page and returning, the date interval is to be reset to the current month.

There are also two automatic features on the Budget page. When editing a category's name and there are existing transactions with the same transactions name, then the transactions names are automatically changed to the new category name. The other feature is the assignment of prefixed categories when the program deems a profile to be "empty" - this only occurs once, when a new user is redirected to the Budget page for the very first time. This function automatically creates a list of prefixed categories for the user compared to the recommended budget's categories.

Lastly, on the Savings page when deleting a savings, the money placed inside is must be returned to the user's budget somehow, so it is not lost. This is also an automatic feature, where the user gets the money returned into a category called Return like mentioned in the section Saving CUD 5.2.3.

5.3 The final product

The pages are marked with boxes and counters to navigate towards where the functionalities, as mentioned earlier in the implementation section 5.2, are located.

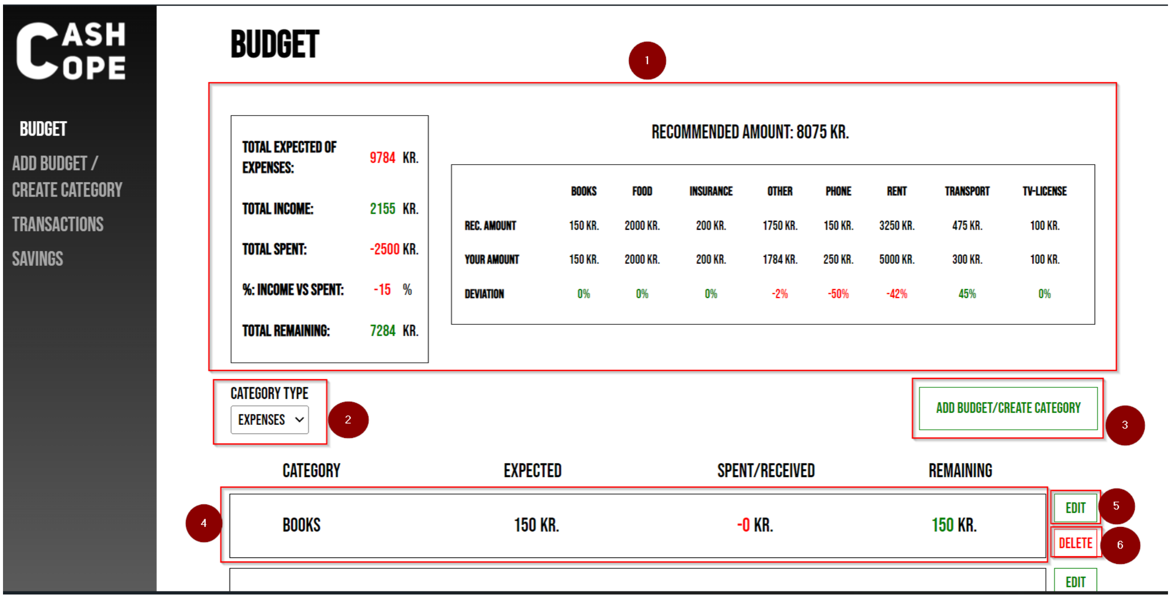
Budget Page
The Budget Page has shown six different functionalities. Starting at one, it is the box with total amounts and recommended budget for danish students. The left box is the total box, where Total Expected of Expenses, Total Income, Total Spent, %: Income vs Spent, and Total Remaining are calculated. The right box is the recommended budget. At the top of the box, is the total recommended for expenses, Recommended Amount, displayed. Inside the box, are the recommended budgets, the recommended expected for each category, the users expected for each category, and the deviation between the aforementioned shown.

The counter and box number two show the drop-down menu for selecting other categories than expenses. The page filters between the choices of expenses, income, and savings.

The third box is a button, which sends the user to the page 5.11 and is one of the two options to navigate to the Add Budget Page.

When displaying all the budgets in the Budget database collection, the page creates a tile for each category as shown in the box by counter four. Here, the name in the schema is placed under the title Category, and the expected of a category is also fetched from the same database collection. The Spent/Received and Remaining is from a calculation by data from both Budget collection and Transaction collection.

Counters five and six show the Edit and Delete buttons. Each category has its own Edit and Delete button with a unique link for respectively getting an edit page or deleting the category from the database.



BUDGET

TOTAL EXPECTED OF EXPENSES:	9784	KR.
TOTAL INCOME:	2155	KR.
TOTAL SPENT:	-2500	KR.
%: INCOME VS SPENT:	-15	%
TOTAL REMAINING:	7284	KR.

RECOMMENDED AMOUNT: 8075 KR.

	BOOKS	FOOD	INSURANCE	OTHER	PHONE	RENT	TRANSPORT	TV-LICENSE
REC. AMOUNT	150 KR.	2000 KR.	200 KR.	1750 KR.	150 KR.	3250 KR.	475 KR.	100 KR.
YOUR AMOUNT	150 KR.	2000 KR.	200 KR.	1784 KR.	250 KR.	5000 KR.	300 KR.	100 KR.
DEVIATION	0%	0%	0%	-2%	-50%	-42%	45%	0%

CATEGORY TYPE: EXPENSES

CATEGORY	EXPECTED	SPENT/RECEIVED	REMAINING
BOOKS	150 KR.	-0 KR.	150 KR.

Figure 5.10: Screenshot for Budget page.

Add Budget Page

The .ejs-file "add_budget" is rendered in the figure 5.11. There are three functionalities on this page. The first is the toggle bar, which allows the user the determined if the category they are adding should be an expense or income category. This is used in the Transaction Page, where it filters by expense and income category for the different graphs. The filter is done by a Boolean in the database, where it is false when standing on red (expense) and turns green when it is an income.

The second box is showing the input fields for the POST request, so the user's data can be saved into the database. The input fields are all required since all the data from them are not only for viewing purposes. The third box is the button, which triggers the said POST request.

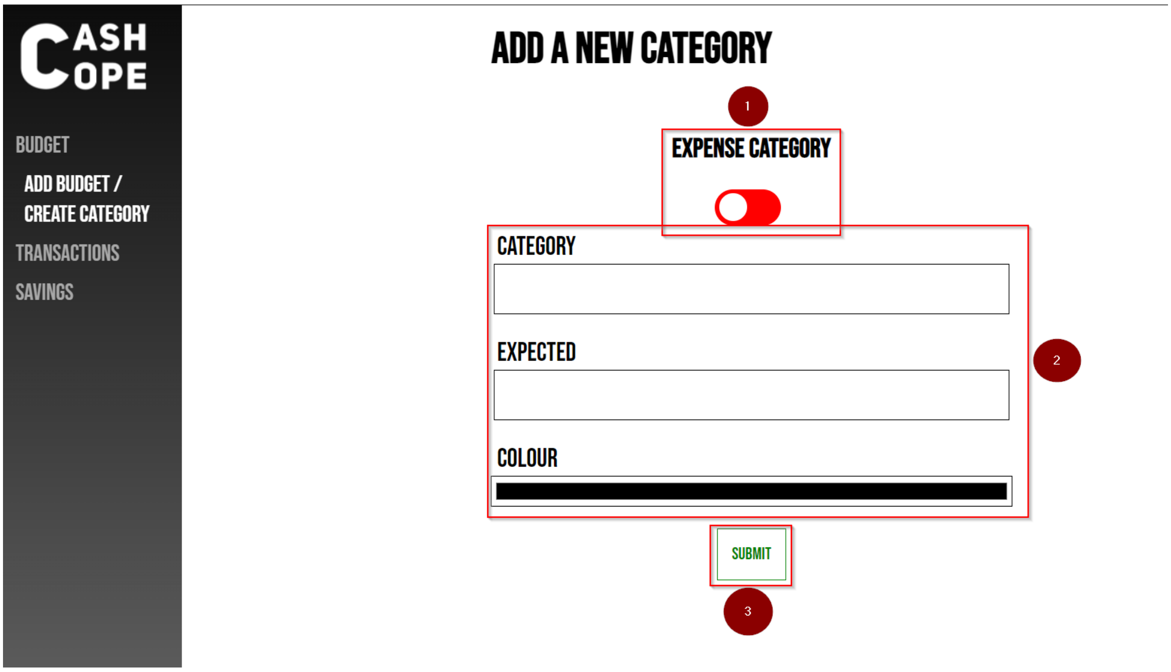


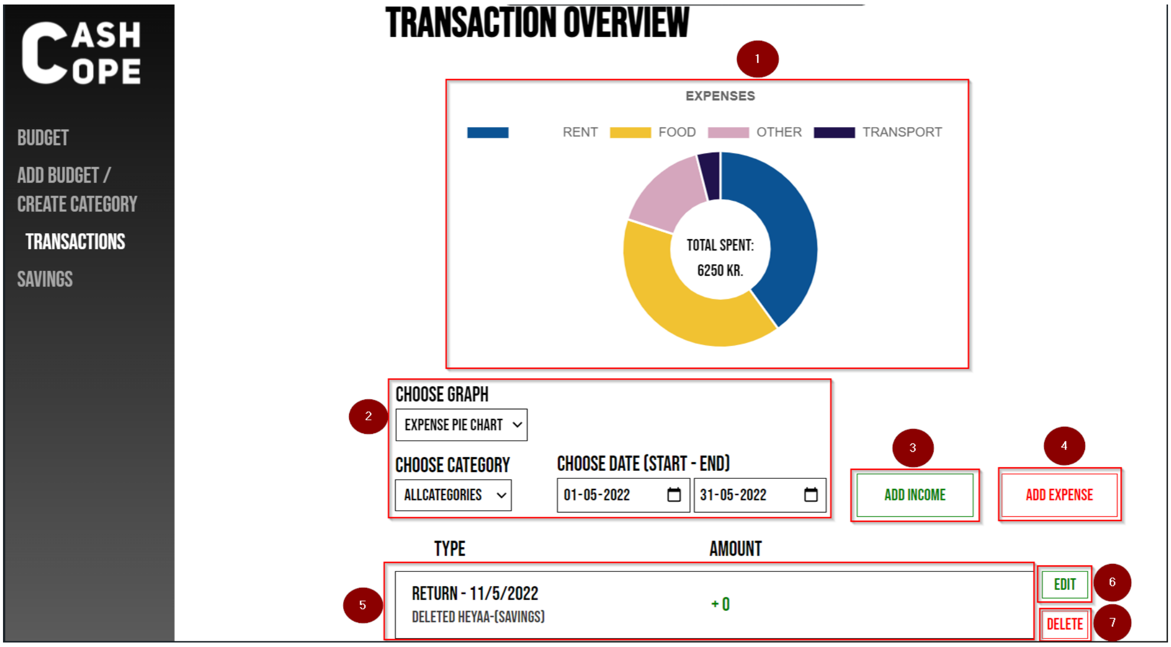
Figure 5.11: Screenshot for Add Budget page.

Transaction Page
The overview graph is displayed with the total spent (seen in the screenshot) or total income in the middle in the first box in 5.12. The second box is where the user can change the graph from expenses to income, change the view of categories to get all transactions in a certain category, and get the transaction between a selected interval of dates. The default for the date interval is a month since budgets are mostly based on months.

The third and fourth box is the buttons for assessing the Add Transaction Page, though filtered. That means, when pressing Add Income, then the user gets the Add Transaction Page, where only the income categories are shown. The same principle goes for the Add Expense button.

The transactions from the Transactions database collection are displayed in box five with the category name, date, and subcategory/tag on the left and the amount received or spent in the middle.

The buttons in boxes six and seven are the same as the buttons on the Budget Page. Here, it is created with the link for the transaction in the database and not the budget.



CHOOSE GRAPH: EXPENSE PIE CHART
CHOOSE CATEGORY: ALLCATEGORIES
CHOOSE DATE (START - END): 01-05-2022 31-05-2022

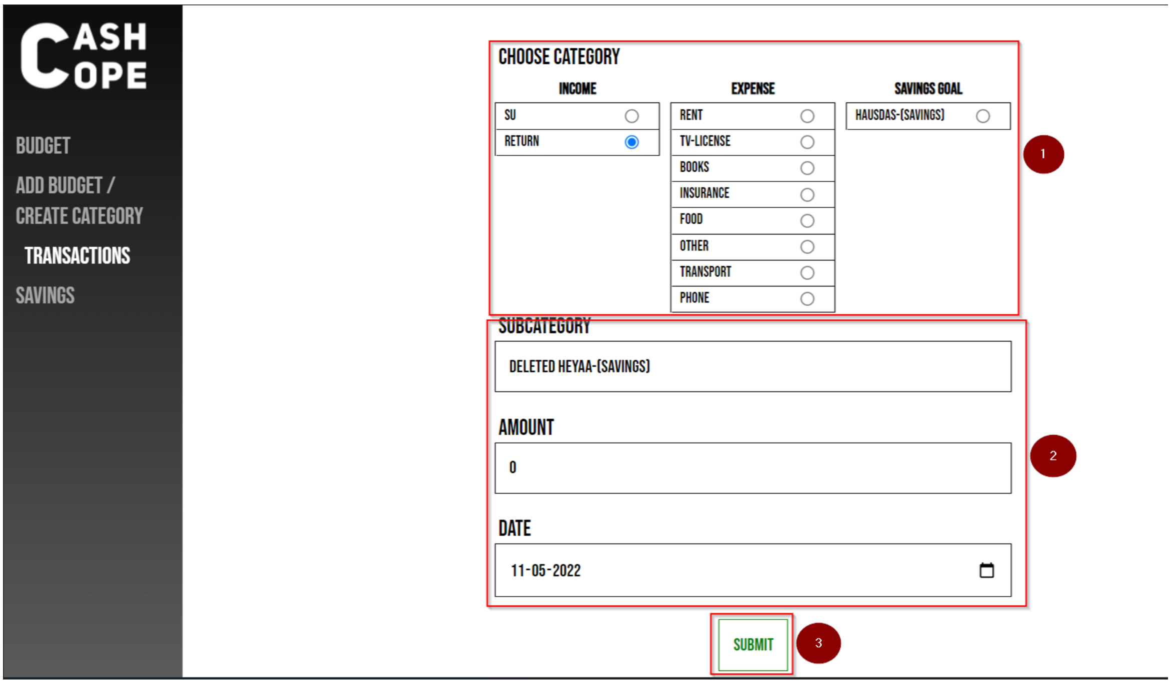
TYPE	AMOUNT
RETURN - 11/5/2022 DELETED HEYAA-(SAVINGS)	+ 0

Figure 5.12: Screenshot for Transactions page.

Edit Transaction Page

The Edit Transaction Page contains three boxes in 5.13. This page is very similar to the Add Income and Add Expense pages, where the difference is the empty input fields and only showing the right type of categories in the first box. The user can only choose to make a transaction from an already created category. When creating a new category, it will be added to one of the lists.

Box two is the input fields, which contain the current data from the selected transaction. When changing any value and pressing submit in box three, the data will be updated on the Transactions Page.



CHOOSE CATEGORY

INCOME	EXPENSE	SAVINGS GOAL
SU ○	RENT ○	HAUSDAS-(SAVINGS) ○
RETURN ●	TV-LICENSE ○	
	BOOKS ○	
	INSURANCE ○	
	FOOD ○	
	OTHER ○	
	TRANSPORT ○	
	PHONE ○	

SUBCATEGORY

DELETED HEYAA-(SAVINGS)

AMOUNT

0

DATE

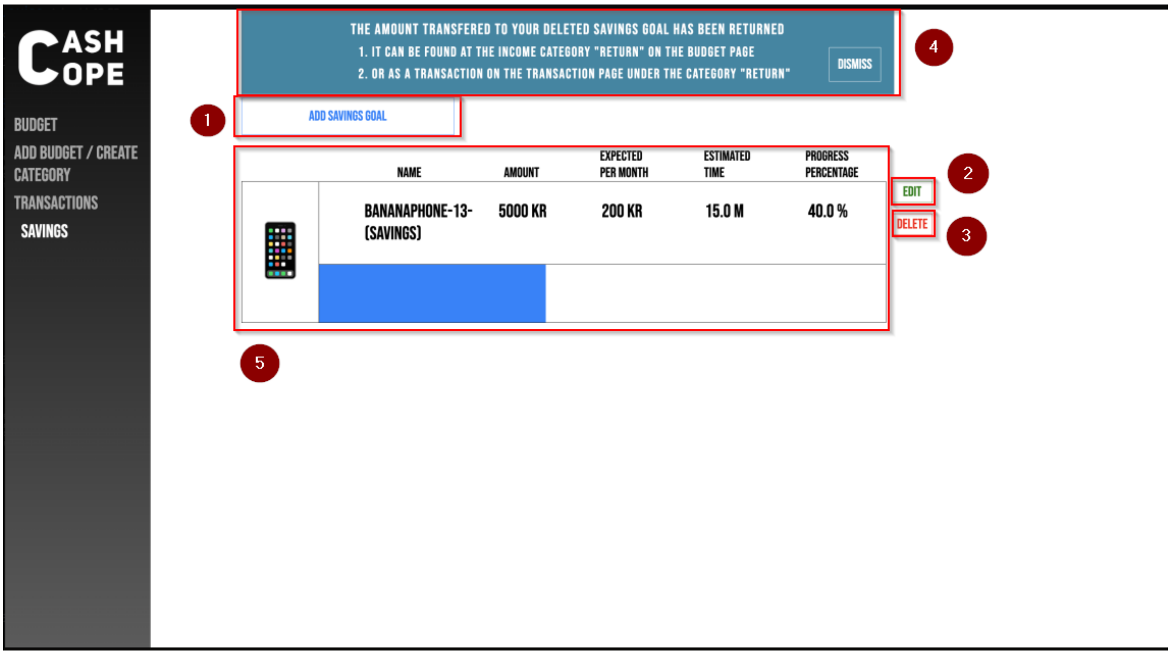
11-05-2022

Figure 5.13: Screenshot for Add Transactions page.

Savings Page

The Edit Transaction Page, in figure 5.14, contains three boxes. This page is very similar to the Add Income and Add Expense pages, where the difference is the empty input fields and only showing the right type of categories in the first box. The user can only choose to make a transaction from an already created category. When creating a new category, it will be added to one of the lists.

Box two is the input fields, which contain the current data from the selected transaction. When changing any value and pressing submit in box three, the data will be updated on the Transactions Page.



THE AMOUNT TRANSFERED TO YOUR DELETED SAVINGS GOAL HAS BEEN RETURNED
1. IT CAN BE FOUND AT THE INCOME CATEGORY "RETURN" ON THE BUDGET PAGE
2. OR AS A TRANSACTION ON THE TRANSACTION PAGE UNDER THE CATEGORY "RETURN"

NAME	AMOUNT	EXPECTED PER MONTH	ESTIMATED TIME	PROGRESS PERCENTAGE
BANANAPHONE-13-(SAVINGS)	5000 KR	200 KR	15.0 M	40.0 %

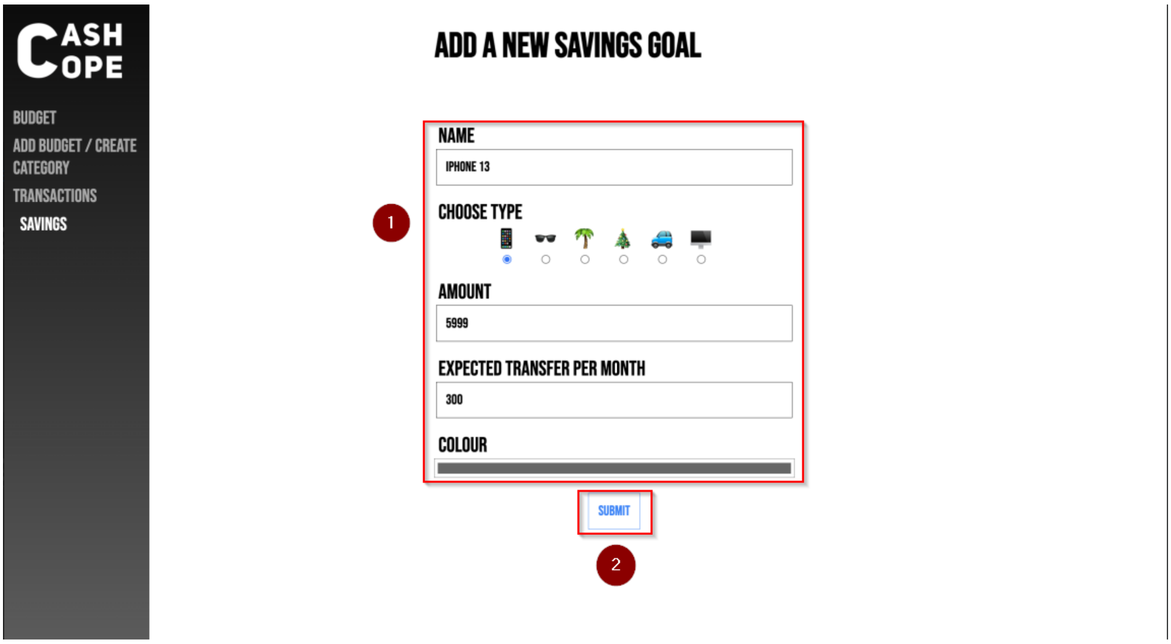
Figure 5.14: Screenshot for Savings page.

Add Savings Page

Figure 5.15, which can be seen in the earlier Add pages, has the same structure, functionality, and design. The input fields are in the first box, where an outlier is the ability to choose emojis otherwise it is very similar to the other pages. The submit button is the same as the other submit buttons beside the colour of it.

Remarks

When editing the user gets the add pages, the page depends on what the user is editing, with the current values of the selected. Then the user can edit the values and press submit to update the selected. The deleting is, as mentioned earlier, a POST request which deletes the selected and redirects to the same page. There are placed tool-tips on the different pages to make the website more intuitive for a user.



ADD A NEW SAVINGS GOAL

NAME
IPHONE 13

CHOOSE TYPE
● 📱 ○ 🕶 ○ 🌴 ○ 🎄 ○ 🚙 ○ 🖥

AMOUNT
5999

EXPECTED TRANSFER PER MONTH
300

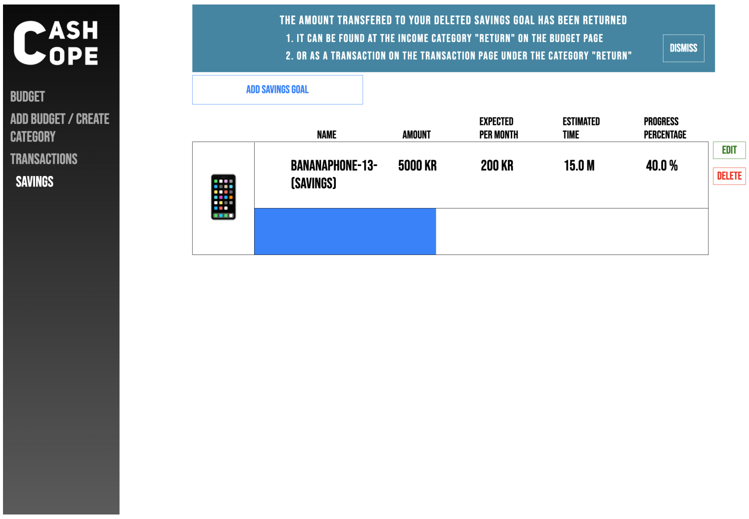
COLOUR

Figure 5.15: Screenshot for Add Savings page.

5.4 Testing

In order to complete a full iteration cycle, one must also test the product, and assess the feedback given by the participants. For this test, the group organised a collection of assignments in a way that should resemble a real-life situation. During these tests, the conductors were careful to document any noteworthy behaviour, confusion, or difficulty with assignments for the participants. The purpose of the feedback given is, mostly, to create good discussion points for the state of the product, and, if possible, implement some changes to better suit the target group.

The testing of the product was performed on three subjects. Due to time left in the project the test was performed on three of the group members' friends studying software bachelor. Based on this it is worth noting that the feedback given could be biased. Another source of bias could be the test subjects' difference of the idea of what the final product would resemble, as they were aware of the current product only being in a prototype-phase. It is also worth mentioning that evaluating the likeliness of using the software might not be as true when asking people who have not used any of this type of software before.



THE AMOUNT TRANSFERED TO YOUR DELETED SAVINGS GOAL HAS BEEN RETURNED
1. IT CAN BE FOUND AT THE INCOME CATEGORY "RETURN" ON THE BUDGET PAGE
2. OR AS A TRANSACTION ON THE TRANSACTION PAGE UNDER THE CATEGORY "RETURN"

NAME	AMOUNT	EXPECTED PER MONTH	ESTIMATED TIME	PROGRESS PERCENTAGE
BANANAPHONE-13-(SAVINGS)	5000 KR	200 KR	15.0 M	40.0 %

Figure 5.16: Screenshot of Savings page with alert.

The overall feel of the product according to the participants could be summed up as; straight to the point, easy to use, bare-bones, and logically coherent (with a few exceptions explained later). They deemed it useful - especially the savings goal feature. Those participants who currently experience financial stress found this product helpful in reducing this stress, although this statement must be taken with a grain of salt - for representative results, lengthier research is needed. Those, who do not experience financial stress, were mainly focusing on the overview of the budget they created, and other than some changes in layout, had many positive things to say about the prototype.

The aspect of the page that received most of the critique was the layout of the budget page, and the lack of guidance for complete beginners. The participants expressed that the tables containing recommendations could be better - one way this could be done was by displaying the data in graphs, or simply reworking the layout itself. Another issue was the lack of emphasis on important elements and some of the action-buttons. After gaining familiarity with the web-page, almost all assignments went very smoothly, and the segmentation of the content also made sense for every participant - for a complete newbie, however, getting to know the website could seem to have a steep learning-curve.

On the add budget page, the income/expense switch was generally intuitive but gave some confusion amongst the participants - the functionality of the switch was not instantly recognisable for all, and can at times seem out of place compared to the rest of the design.

On the savings page, there was some confusion surrounding the deletion of a savings-goal. The participants did not seem to understand the where the money goes, which of course means that it should be much clearer what happens to the money put into a savings-goal upon deletion. Other than that, also lining up perfectly with the survey, the savings-goals were by far the most liked feature.
Some overall pros and cons of the product quoted directly from the participants can be read here:

Pros:

- "It was easy to learn."
- "The savings-function is great, also that you can just manually add money to it."
- "I would mainly use this to control my savings."
- "Good overview of the budget."
- "Works good for what it does - no useless fluff."

Cons:

- "More explanation is needed."
- "There should be more emphasis needed on the important actions."
- "The budget is cluttered but works fine if you learn it."
- "The custom colours could be used a lot more, a bit disappointed that it only shows on the graphs."

Based on all the feedback given, these points would be crucial for further work:

- Improve budget page layout.
- Generally include more explanations, tool-tips are not enough.
- Implement subscriptions as a separate page.

- More utilisation of colours.
- More visuals - such as graphs.

Some of the recommended features from the user tests were successfully implemented. When deleting a savings goal, the money saved up is added to a category named "Return", and based on the tests it was not very intuitive to locate where this money went. To improve the intuition, a drop-down notification appears whenever a savings goal is deleted, explaining where to find the money. This was achieved by creating a boolean named "recentlyDeleted", which is accessible from every route of the software. As default this variable is set to false, but when a transaction is deleted it is set to true, triggering the popup on the savings overview route. Of course, global variables are generally avoided, but for a quick-fix, it was better than nothing.

Documentation of the tests can be seen in the appendix K.

Chapter 6

Discussion

This section encloses the discussion of the degree of realisation of the final product in relation to the MoSCoW requirements, product testing, potential future improvements of the final product, and lastly other remarks worth mentioning.

As for the stress-related part of the problem statement, the website itself does little to nothing in a direct fashion in order to address the issue, but rather tackles finance related problems, which could be considered the root of the issue itself. Verifying the problem statement is also very tedious, and calls for a lot of speculation, as lengthy studies would be required to confirm success / failure.

In relation to the features of other products, this is how the final prototype compares:

Features / Web-applications	Mint	GoodB.	YNAB	Toshl	Lunar	Cash C.
Transaction-tracking	🟩	🟨	🟩	🟩	🟩	🟩
Transaction-syncing with bank-account	🟩	🟨	🟩	🟩	🟩	🟥
Manual input of transactions	🟨	🟨	🟨	🟩	🟥	🟩
Automatic transaction-categorisation	🟩	🟥	🟨	🟩	🟩	🟥
Manual transaction-categorisation	🟩	🟩	🟩	🟩	🟨	🟩
Individual tags for transactions	🟨	🟨	🟥	🟩	🟩	🟩
Budget planning	🟩	🟩	🟩	🟩	🟩	🟩
Budgeting goals and milestones	🟩	🟨	🟩	🟩	🟩	🟨
Savings account / Category	🟥	🟨	🟨	🟨	🟨	🟩
Loan-planning / tracking	🟥	🟨	🟩	🟥	🟥	🟥
Regular expenses	🟨	🟩	🟩	🟩	🟩	🟥
Investment-tracking	🟩	🟥	🟥	🟥	🟩	🟥
Personal profile	🟩	🟨	🟩	🟩	🟩	🟥
Multiple users (same profile)	🟥	🟩	🟥	🟥	🟥	🟥
Monthly overview	🟨	🟨	🟨	🟩	🟩	🟩
Graphs and other visual representation	🟩	🟩	🟩	🟩	🟩	🟩
Alerts	🟩	🟥	🟥	🟥	🟥	🟨
Tips & education	🟩	🟩	🟩	🟩	🟥	🟨

Table 6.1: Features table with Cash Cope.

On this table, the group's focus on implementing manual actions rather than automation is quite clear. Some missing elements, such as personal profile and and regular expenses should have been green if the group was able to follow through on all requirements. Goals, alerts, and tips could also have been green if a next iteration was completed. Considering this, the group's product mainly focuses on flushing out fewer relevant elements instead of having a lot of half-though-out functions, which the target users would ignore.

6.1 The final product compared to requirements

In hindsight, implementing the general requirements for a personal budget and expense tracker was not an easy task for the group, which resulted in a less than optimal specification for the target-group at hand. Although personalised recommendations and preferences were taken into account, the product itself clearly lacks some elements which could emphasize the target-group's needs and demands. This, more or less, resulted in a solution, which is more of a bare-bones, functionality-focused prototype of something that could be tailored to a wide range of audiences.

The final product concluded in fulfilling all except one requirement in the MoSCoW's "Must Have" section, half of the requirements in "Should Have" section, a few requirements from "Could Have" section, and lastly none of the requirements from the "Won't Have" section. Largely due to the group's lack of experience of assessing difficulty and adequate time-estimates in the context of translating ideas to code, the sequence of implementation and prioritisation of the requirements did not always follow the MoSCoW-model 4.18.

6.2 Discussion of the product testing

The original plan with the product testing was to have a larger group of participants, as it would increase the trustworthiness and degree of representativity of the feedback. Unfortunately, the product testing did not turn out this way due to the strict time schedule and the deadline closing in. Instead, a smaller, one-day testing-session took place with three participants, however, as mentioned, these participants were three acquaintances of the group members. This could of course bring more bias into the picture, than if the participants were three strangers from the target-group. Product testing could also have been conducted more times at different time periods throughout the project to gain as much feedback and information as possible; several test sessions would make the test subject able to try the new features and give further feedback on these. Naturally, this suggests that several iterations result in a more polished and user-friendly product, which is absolutely right - the scale of our prototype could have been reconsidered to make room for two or even three iterations instead of only following through with one.

Despite the small number of the test subjects, a plethora of useful feedback and critique was received from the test. Some improvements derived from the feedback were implemented also in the software - UI adjustments and informative pop-up message. Surely, with more tests, more tendencies in the answers, thus common issues could have been derived, providing the group with a lot of valuable discussion-points.

The separation of budgets and individual transactions worked well, and almost every single action was intuitive with a few exceptions; for instance the income/expense switcher on the transaction edit page, or the subsequently fixed savings-deletion action. Combining generally liked aspects of the savings-functions other products out there also gave good results, several test-subjects praising this aspect of the product. Due to the majority of actions, navigation elements and button placements being designed and placed following web-conventions, the users' experience with the website was rather smooth and intuitive. Placement of information was mostly unproblematic, the budget-section being the only exception. This problem could have been a result of the lack of inspiration and guiding principles when designing the recommendation-table. Although, with some improvements, this element of the page could help a lot for new users. Custom colours got plenty of positive reactions, but, according to user feedback, a lot more could have been done with these, than just using them for constructing graphs.

An aspect, on which the group should have followed up on, but unfortunately did not, was the test-participants' opinions of the ratio between automation and manual features. The final prototype of the website is highly manual, with only a few automatic elements; graph intervals (automatically focuses on current month only, but can be changed), assignment of default categories and values to budget, universally editing all transactions, and returns (upon deleting savings). Based on some answers, adding default recommended values and categories is helpful, but the lack of syncing with one's bank account could be a demotivating factor in actively updating one's spendings. One user stated that they would almost exclusively use the budget and savings pages of the product, as it would still be helpful to get an overview, even without actively following up on real-time money use. The preconceived balance between automation and customisability was not achieved, but the majority of the decisions were received rather positively.

6.3 Future work

The final product only represents one iteration of the initially planned three iterations. This is a result of the group failing to realistically assess and allocate the time needed for each task of the project in relation to the amount of time that could be actually appointed, along with the fact of the group having overachieving ambitions towards the project.
The product has been largely based on our target group, and so, much of the information gathered through the survey and user testing has helped in shaping the product, however,

as mentioned previously due to lack of experience and time constraints, a great number of requirements and some user feedback has not been implemented in the current version. In short, the current prototype is more of a collection of relevant functions and a decent start-point for something to be, through further research, better adapted to the target group, and be made more coherent.

There are some functionalities in the program, which could have been improved or implemented. The budget page has categories, where the spentage in each category is viewed. The spentage do not reset automatically when the month changes or by the users choice. Since most budgets are either weekly or monthly, this missing functionality is contributor to the website being more difficult to use. The graph could have improved its functionality when changing to use a specific category's transactions from the drop-down menu. Instead of rendering the budget categories and its sizes, then the graph could be rendering all the transactions in the selected category and the transactions sizes in the selected date interval. Lastly, the recommend budget on the budget page is displaying values in a table form, which can be hard to read and understand. The values could have been displayed more visual for creating a better user experience for the user.

After conducting the user test, the feedback shed a light on the difficulties of understanding the process of deleting savings - this point was fixed rather quickly. Other features worth implementing were not, due to the deadline closing in at the time of receiving the feedback. these features were: the budget page being too cluttered, emphasising important elements on the page, colours should have been used more and the income switch should be more user-friendly. Lastly, more explanations for the user and a page handling subscriptions could have been created.

When it comes to future work, the current product should be run through multiple iterations whilst implementing the missing requirements, stated in 6.1 and user feedback. At the end of each iteration a new user test should be conducted and the newly gathered feedback implemented in the following iteration.

6.4 Other considerations

This section consist of other considerations that the group means are worth including but were not mentioned in the previous sections.

The group members used a vast amount of time during the process of creating the website on undefined errors. Undefined errors are errors, where the terminal displayed a message such as "The application has crashed" without referencing at what line the program failed. At the end of the project, it became clearer that undefined errors came from the EJS viewing files. With implementing automatic test from the start of the duration of the project, the time spent on these error could have been reduced and the time could have spent on the other features from MoSCoW 4.18.

Many errors could also have been avoided, if function were created to complete repetitive tasks instead of repeating code. It is time consuming to have the same code reused in many different places in the program. An example of this was the GET and POST requests for both the overview of transactions and budget. By implementing the drop-down option, there had to be if-else-statements to decide what content should be rendered on the page. The same code was placed inside both statements with only very few modification. By having these large amounts of code that basically do the same, more errors were made and way more time was spent on fixing these errors.

Lastly, the group had not been good enough to brief each other on the guidelines of coding. The guidelines of coding are how should the group members write code, like for example the use of camelCase, the use of functions Async or Promise, and implementing the larger chucks of code inside the controller files instead of route files. The group did not think of using or creating a guideline until the end of the project, where the inconsistency began to show itself. Thus, when working on a larger project and program, the creation of some kind of guidelines would have help the consistency of the code.

Chapter 7

Conclusion

The product developed throughout this project proposes a solution to the Problem Statement 4.4 defined as a result of the research done in the State of The Art 3 and Analysis 4 chapters. While designing the product, the target group consisting of relatively low-income danish students was in mind. Surveying this target group resulted in a list of the most valuable features - especially savings - to include in the final prototype. Letting three individuals test the product and answer some questions and provide feedback led to useful points regarding future work and evaluation. Moreover, the answers to these questions indicates that the product could help students get a financial overview and reduce finance related stress.

One of the main points of the problem statement was to improve the degree of financial overview and sense of control amongst the previously named target group. Based on the feedback, the solution provided provided several tools for this; a monthly overview of one's budget, income and expenses, and personal goals. Another crucial point of the problem statement was to find a way to provide a tool that can be help with creating a more stable economy and thereby reduce stress. Although giving an objectively correct evaluation is not possible, based on the feedback and similarity to other solutions, regular use of the group's website can lead to more systematic spending patterns and therefore eliminate a part of the main causes of finance-related stress.

Chapter 8

Process Analysis

Intro

The product of a process analysis is a reflection of the work process and used methods and techniques throughout a project. This process analysis is based on the P2 project made by Group 2 SW2. The Process analysis tool is heavily used at Aalborg University as a necessary process following each project.

In this project's process analysis, the group reflects on the following sections: Project Planning, Group Cooperation, Guidance Counselor Cooperation, Problem Statement and Report Structure followed by a conclusion. In each of these sections the group will be critical of what worked well, what went wrong and what could have been done to prevent it.

Project planning

Based on the group's experience with project planning tools in the previous projects, P0 and P1, the group has decided to reuse the Gantt diagram and Back-Casting method as the main tools for planning the P2 project. This was decided as these tool have worked very well and has been useful for the group prior to this project.
The back-casting method has been used to outline some general deadlines of the project. The method works by planning backwards, starting at the hand-in date. This made the group consider the length of each phase of the deadline, and how the phases should be prioritised. The group's back-casting model can be seen in Chapter 2, Figure 2.1 "The Back Casting method".

The Gantt chart has been used to visualise the project planning process by plotting every task with their respective dates onto a graph. Two Gantt charts were made: an "expected - Gantt chart" and an "actual - Gantt chart". It was decided to update the "actual" Gantt chart every week and compare this to the "expected" chart to maintain an overview of the entire project and its process.

The group experienced some difficulty keeping up with the expected plan during the Analysis phase. This can be seen in the Gantt chart figures in Chapter 2, Figure 2.2 "Expected and Actual Diagram" , in the Gantt chart - expected, the dates for the analysis was the start date being: 24th of February with this phase lasting 7 days, however in the Gantt chart - actual, it can be seen that this phase lasted 20 days. Due to this massive delay, a majority of the rest of the project had to be re-planned. Spare time was included from the beginning, as something like this was expected to happen. The mistake surrounding this problem was, that the group might have been to ambitious with the analysis phase when planning it.

Another consideration made while planning the project, was to always have at least one group member working on the report at all times. Some weeks of the project were set aside for the mainly working on the product. Each of these weeks one or two random group member(s) were assigned with working on the report alone or in pairs while the rest of the group focused on programming. The group decided this was a great idea, as the writing-momentum on the report was maintained. This worked well as it ensured that every group member got to work on the product as well as the report.

The group has also written agendas and logbooks for each day work was done on the project, this has also been done throughout the projects P0 and P1. The group found the use of agendas and logbooks effective and helpful in maintaining an overview of the process compared to the project plan. Furthermore this clarified which tasks should be done every day, and made maintaining discipline easier.

Group cooperation

Throughout the first study year the groups have been same, meaning that the group members have been together the previous projects: P0 and P1. Consequently the group members have been acquainted with one another for a extensive period of time, and all the group members' cooperation has generally improved in terms of contribution, activity, communication, leaving only a few minor aspects that could be better.

The group contract from the previous project P1 was proven useful and efficient, and was thus reused with some small alterations in meeting-hours and consequences. The meeting-hours became more flexible, changes have been made for more adaptability by taking into account the varying lecture schedules, motivation & exhaustion, and deadlines. Consequences have been discarded, because enforcement of consequences previously were inefficient as it was not actually used the last semester.

Good communication has been a key element in progression; when working on a larger piece of software on a six-people team, being up-to-date on everything can be very difficult. Meetings and regular check-ins were therefore crucial in keeping everyone in the loop. The group communication has vastly increased, group members have become more vocal by discussing and expressing their opinions, and therefore completion of tasks has become more efficient. A miscommunication occurred when the group did not brief before starting to code the product, therefore minor inconsistencies in the code were made, namely: inconsistencies with using camelCase and snake_case, and the code consisting of both Async & Promises. In this project "A bigger program developed by a group", to

correct the outcome of the small miscommunication it would take a lot of resources, and this kind of inconsistencies in the code would probably not be acceptable in a real world setting.
In the future the group should brief so we can establish expectations to nourish a more uniform code.

Guidance counselor cooperation
Throughout the P2 project, the group has organised regular meetings with their assigned guidance counselor, Andres Masegosa. The meetings were held with a one or two week gap between each meeting. At every meeting one group member was assigned with taking notes of the discussion points. As preparation for the meeting, the group wrote and sent an agenda of the contents of the next meeting. This would be sent a couple of days prior to the actual meeting.
The use and help of a guidance counselor have been extremely helpful throughout the project, the group's guidance counselor has contributed by giving feedback, critique and ideas for the project throughout the whole process.

Establishing expectations using a formal contract with the guidance counselor is a likely phenomenon in these types of projects. A contract can help clearing any expectations between the group and the counselor. However, for the P2 project the group has not made an official physical contract with the counselor, as it was not deemed necessary since the expectations between the group and counselor were verbally discussed during the first meeting. Furthermore, the group has not experienced any issues or miscommunications throughout the project, but only received very useful feedback and critique.

Problem statement
The goal of the P2 project is to create "A bigger program developed by a group". Within this title, the group originally desired the topic "Employee Scheduling Software" but was assigned the topic: "Personal Budget and Expense tracker". The group then had to create a problem statement based on this topic but also a product appealing to the title as well as the topic.

The group started briefing and discussing ideas, examples, sub-topics and in general what came to mind on the topic Personal Budget and Expense tracker. The group tried to find some focus points and what could be interesting to work with under this topic. From these discussions a general direction in the project was forming, and a rough problem statement was created. Throughout the P2 project the problem statement has been updated multiple times, so the original problem statement is not the final problem statement that can be read in the report. The problem statement has been updated via guidance counselor feedback and further work on survey results, analysis and the target group.

Report structure
The report sections selection was based upon experience and reflection on previous projects, leading to a discussion for creating a timeline via. the Back-Casting method containing tasks to be resolved, and a follow-up discussion on how and which sections would resolve the tasks. Nevertheless, during the project the group was wary of the selected sections, as to their relevancy and degree of contribution to solving the problem.

To ensure coherence throughout the report, the group regularly conducted meetings where the contents of the report would be discussed. Every time a member accomplished a task they would shortly inform the group about the solution, what they have done to accomplish it and how it contributes to the report as a whole, and lastly, the group occasionally read the report or latest sections before writing.

In previous projects, a template was provided for structuring reports and was, thus, used for this project. It was followed rather strictly which led to reordering of some sections while performing finishing touches on the report, ultimately resulting in work that could have been avoided. In future projects, the group should not follow a report template as strictly, and instead spend more time outlining relevant sections and their ordering.

Conclusion
Following the P2 semester project and this process analysis, the group has come to the end of the second semester. Since the group has had the same members throughout the projects P0, P1 and P2, the members have been accustomed to one-another. Within the group, the whole work process, from project planning to producing a final solution, has started shaping as a second nature ability. Everything the group members has learned together can be taken with them in the future into new groups.

Based on the experience gained in this project, the group has attained a wider horizon in terms of coding a larger program as a group, importance of good communication & miscommunication setbacks, and the importance of good project planning & time management.

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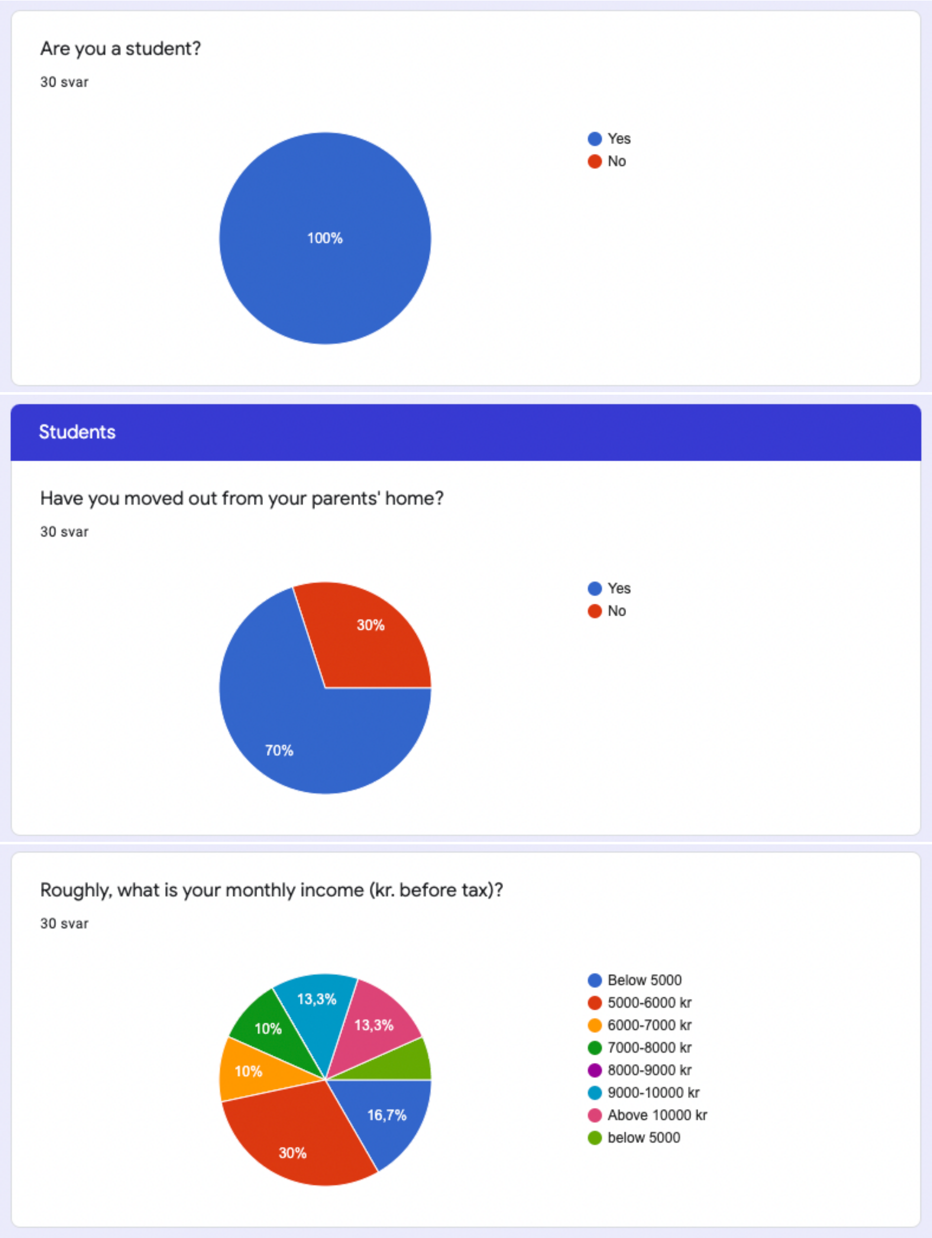
Appendix A

The survey

A.0.1 Questions 1-3



Are you a student?

30 svar

Students

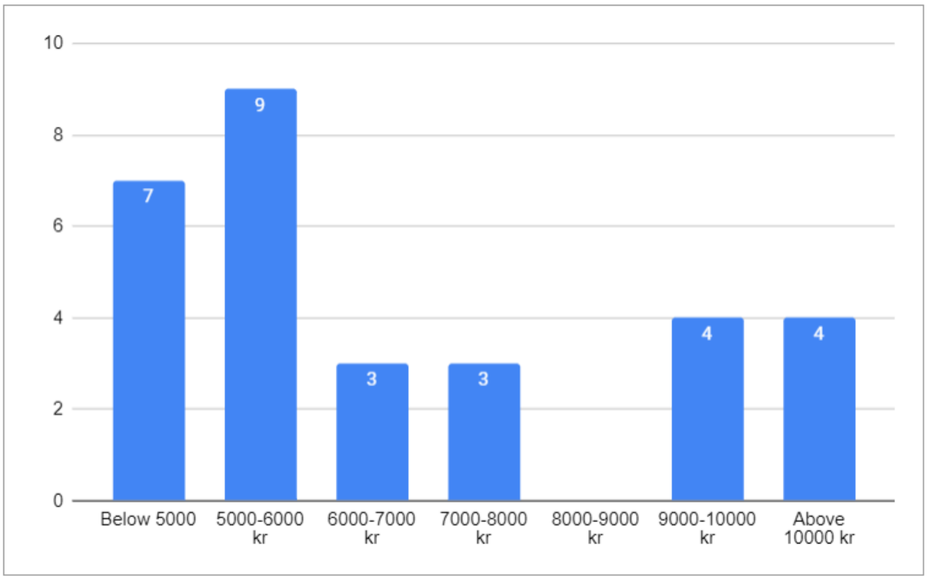
Have you moved out from your parents' home?

30 svar

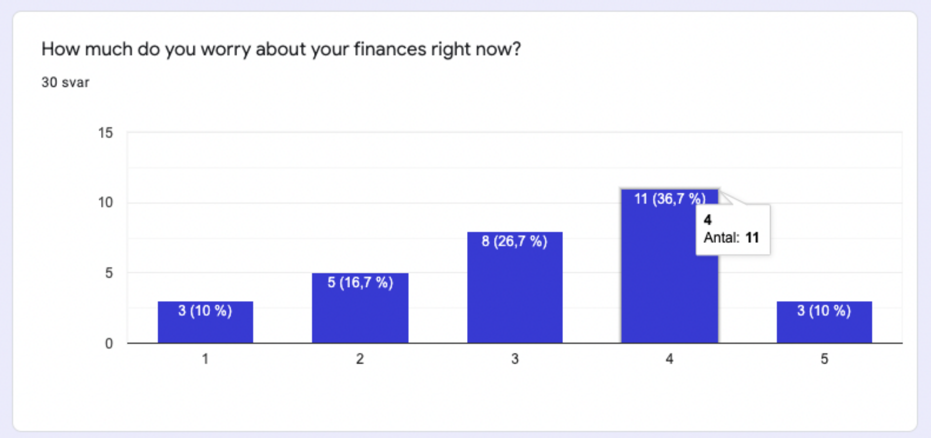
Roughly, what is your monthly income (kr. before tax)?

30 svar

An bar-graph over the previous survey question.

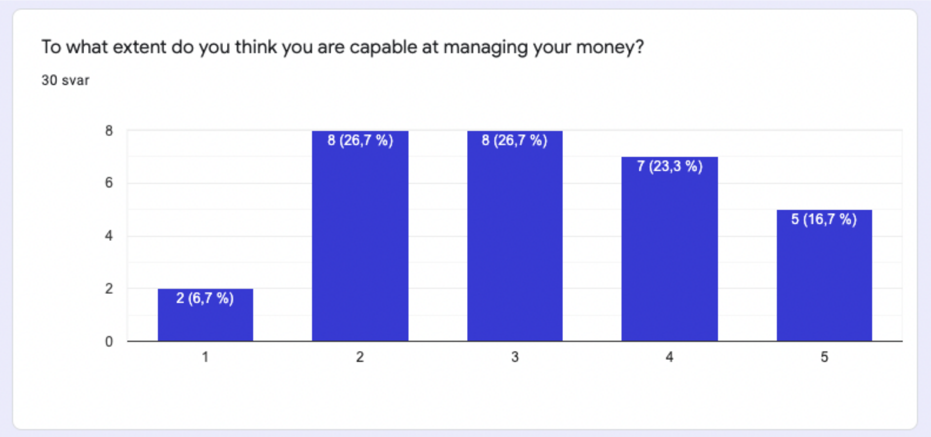


A.0.2 Questions 4-6



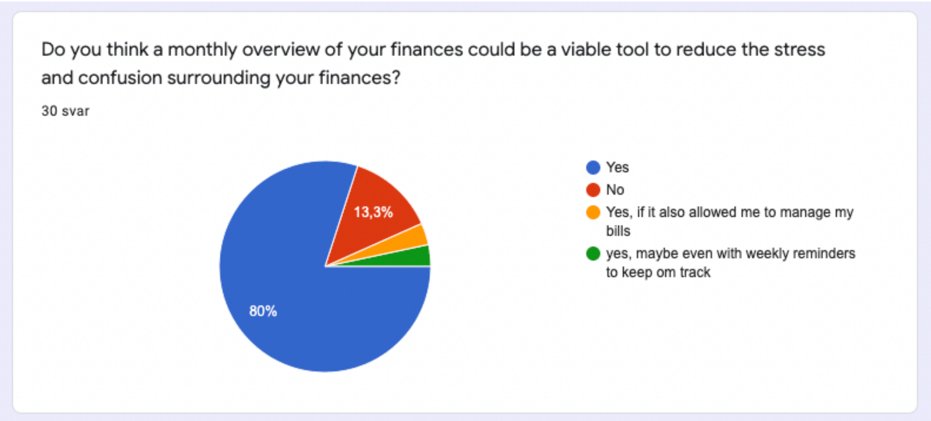
How much do you worry about your finances right now?

30 svar



To what extent do you think you are capable at managing your money?

30 svar

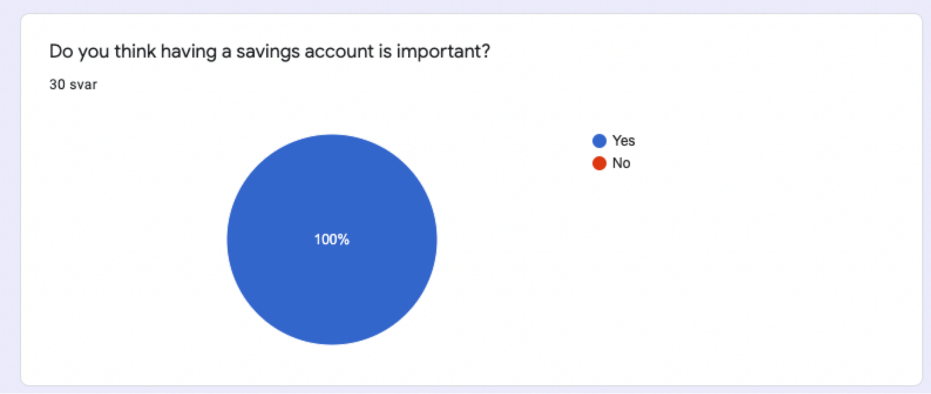


Do you think a monthly overview of your finances could be a viable tool to reduce the stress and confusion surrounding your finances?

30 svar

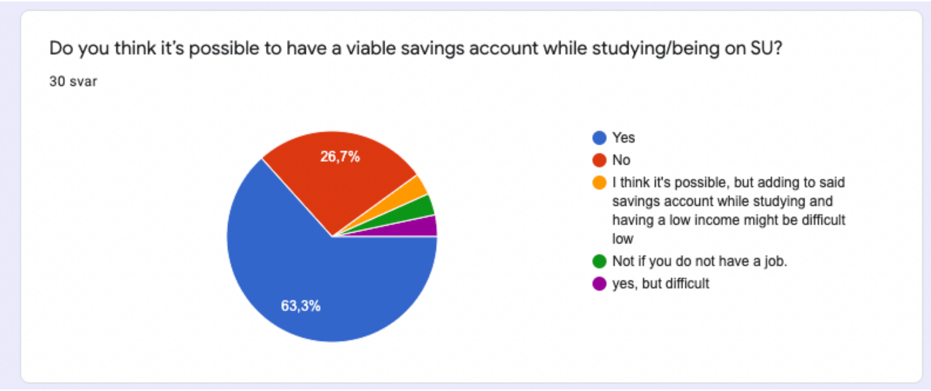
13,3%
80%
● Yes
● No
● Yes, if it also allowed me to manage my bills
● yes, maybe even with weekly reminders to keep om track

A.0.3 Questions 7-9



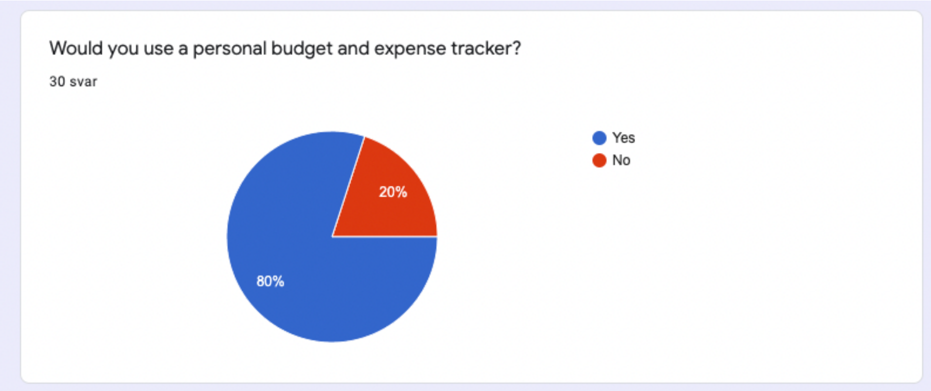
Do you think having a savings account is important?

30 svar



Do you think it's possible to have a viable savings account while studying/being on SU?

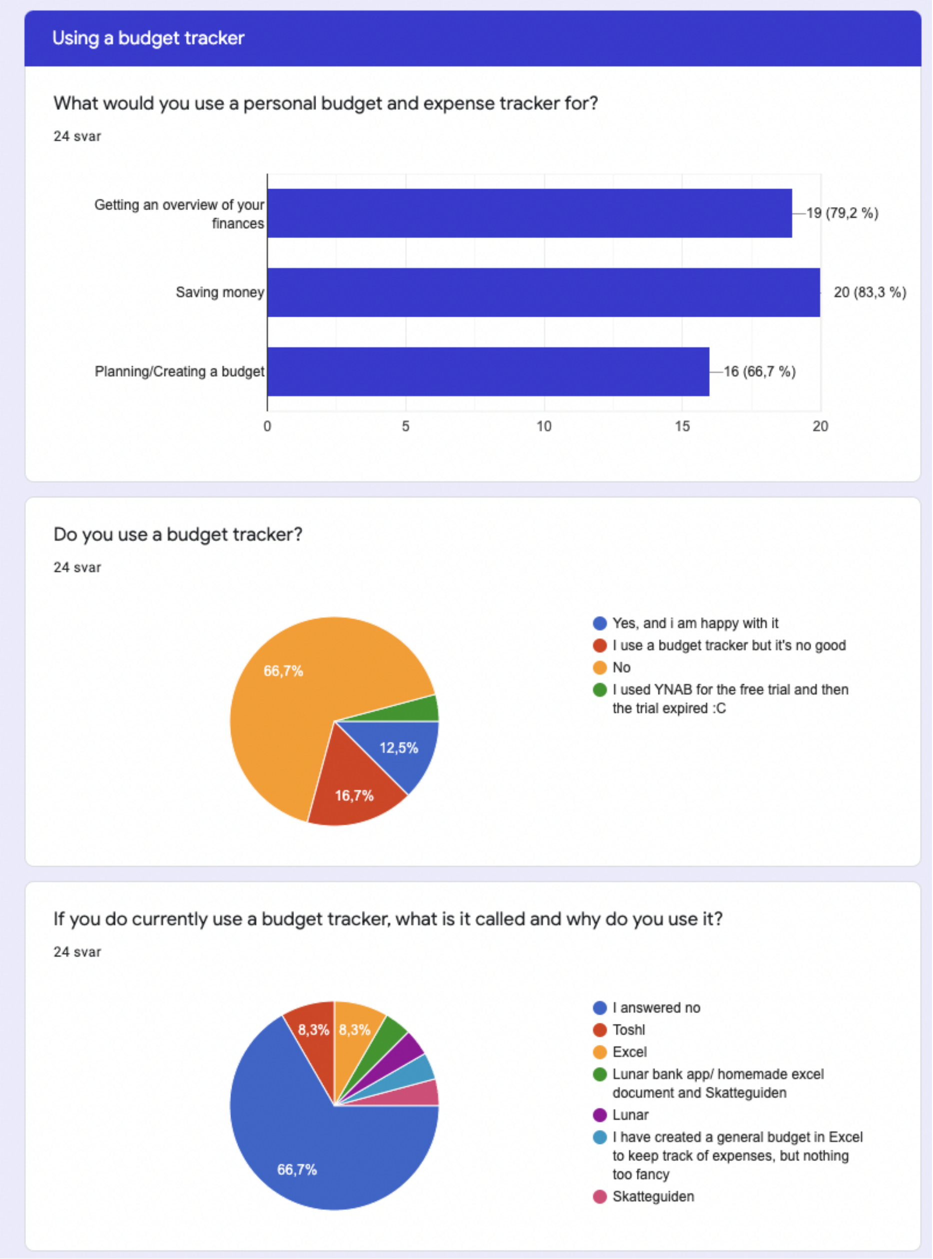
30 svar



Would you use a personal budget and expense tracker?

30 svar

A.0.4 Questions 10-12



Using a budget tracker

What would you use a personal budget and expense tracker for?

24 svar

Getting an overview of your finances
Saving money
Planning/Creating a budget
19 (79,2 %)
20 (83,3 %)
16 (66,7 %)
0
5
10
15
20

Do you use a budget tracker?

24 svar

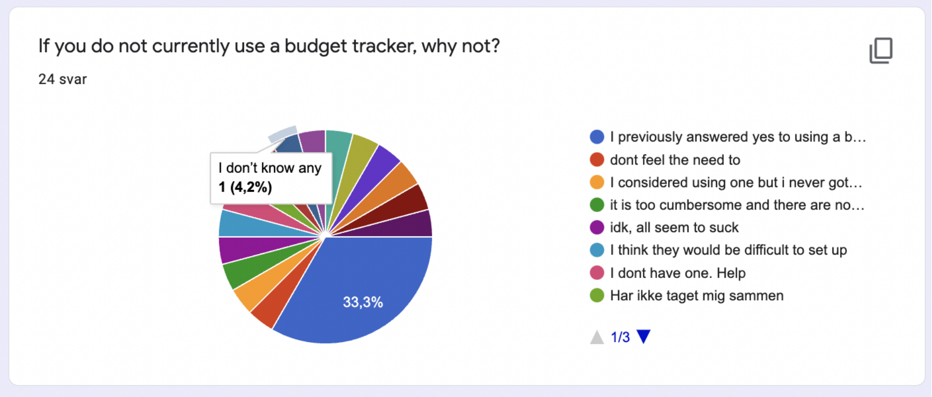
66,7%
12,5%
16,7%
● Yes, and i am happy with it
● I use a budget tracker but it's no good
● No
● I used YNAB for the free trial and then the trial expired :C

If you do currently use a budget tracker, what is it called and why do you use it?

24 svar

8,3%
8,3%
66,7%
● I answered no
● Toshl
● Excel
● Lunar bank app/ homemade excel document and Skatteguiden
● Lunar
● I have created a general budget in Excel to keep track of expenses, but nothing too fancy
● Skatteguiden

A.0.5 Question 13



If you do not currently use a budget tracker, why not?

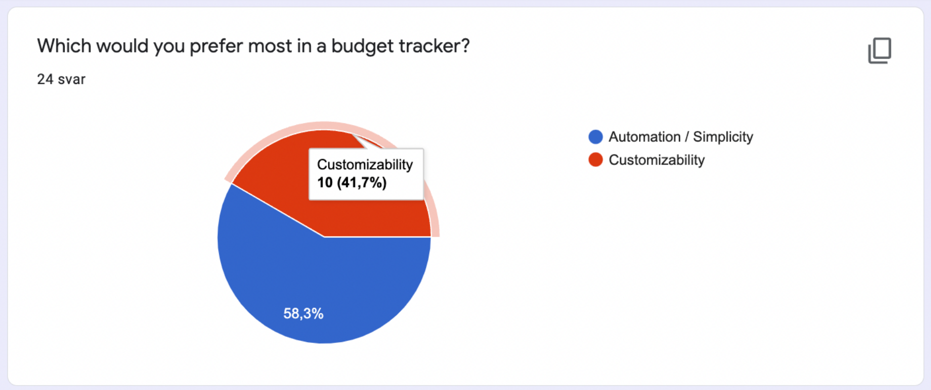
24 svar

I don't know any
1 (4,2%)
33,3%
● I previously answered yes to using a b…
● dont feel the need to
● I considered using one but i never got…
● it is too cumbersome and there are no…
● idk, all seem to suck
● I think they would be difficult to set up
● I dont have one. Help
● Har ikke taget mig sammen
1/3

All the answers to question 13 are displayed in the list below:

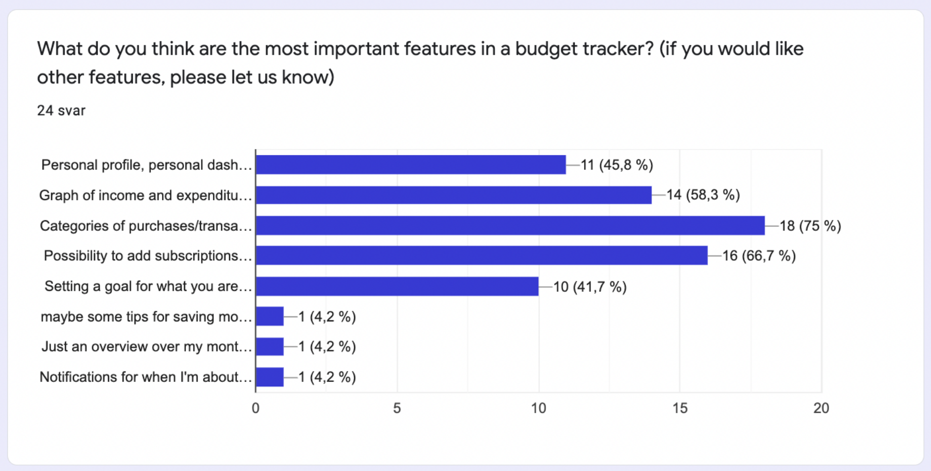
- I considered using one but i never got to signing up
- It is too cumbersome and there are not some I have found interesting
- I think they would be difficult to set up
- Har ikke taget mig sammen (EN: Have not pulled myself together)
- Too much work
- Stress
- Don't have the motivation to set it up
- I am lazy i guess
- Idk, all seem to suck
- Dont have one. Help
- there are no good one that fulfill my needs
- I don't know any
- Have never been introduced to one
- Haven't thought about it
- Don't feel the need to
- I don't have a hard budget, just a spending limit.

A.0.6 Questions 14-15



Which would you prefer most in a budget tracker?

24 svar



What do you think are the most important features in a budget tracker? (if you would like other features, please let us know)

24 svar

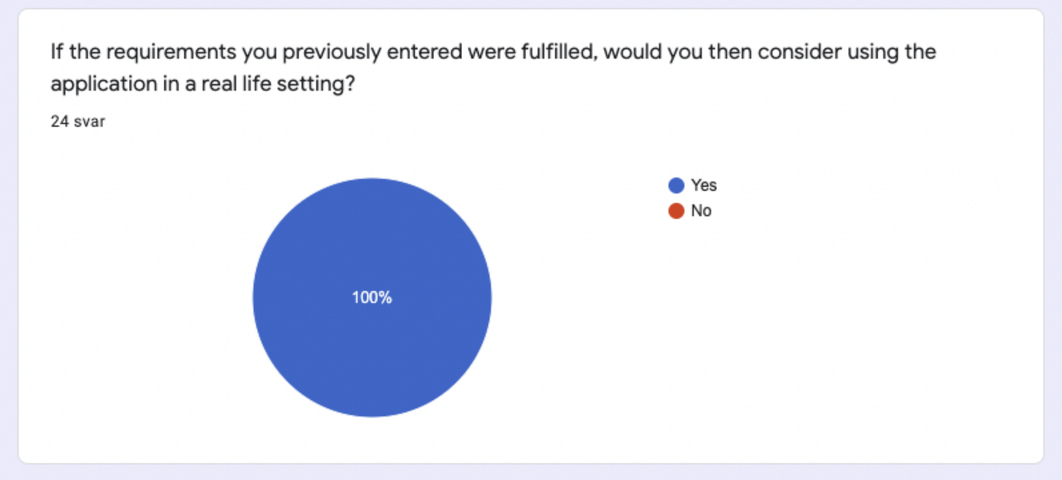
Personal profile, personal dash…
Graph of income and expenditu…
Categories of purchases/transa…
Possibility to add subscriptions…
Setting a goal for what you are…
maybe some tips for saving mo…
Just an overview over my mont…
Notifications for when I'm about…
11 (45,8 %)
14 (58,3 %)
18 (75 %)
16 (66,7 %)
10 (41,7 %)
1 (4,2 %)
1 (4,2 %)
1 (4,2 %)
0
5
10
15
20

- Personal profile, personal dashboard (choose different widgets yourself), possibility of multiple accounts (personal naming) and personalized advice as for how you could save more money each month
- Graph of income and expenditure in month/months, future overview of spending via past transaction data and planning of future budgets (when going on holiday or having a big purchase)
- Categories of purchases/transactions (pre-determined), add your own categories and tags (make your purchases more specific) inside categories that you enter yourself
- Possibility to add subscriptions and planning of a savings account with automatic transfer of user defined amount each month
- Setting a goal for what you are saving money for, visualising progress; increasing motivation - e.g: phone, vacation, etc.

Additional reply

- maybe some tips for saving money etc.
- just an overview over my monthly spendings and a way to manage my bills
- Notifications for when i´m about to exceed my budget for something specific. Like, "You´re nearing for your beer budget. Careful!"

A.0.7 Questions 16

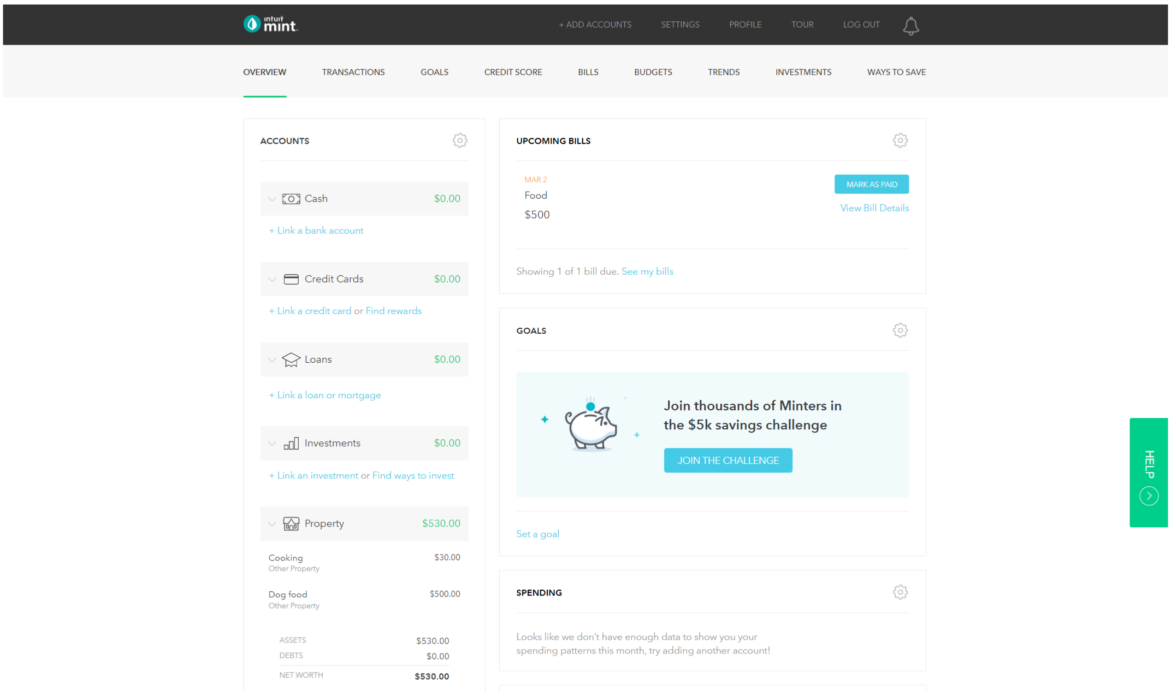


If the requirements you previously entered were fulfilled, would you then consider using the application in a real life setting?

24 svar

Appendix B

Mint



ACCOUNTS

Cash	$0.00
+ Link a bank account	
Credit Cards	$0.00
+ Link a credit card or Find rewards	
Loans	$0.00
+ Link a loan or mortgage	
Investments	$0.00
+ Link an investment or Find ways to invest	
Property	$530.00
Cooking Other Property	$30.00
Dog food Other Property	$500.00
ASSETS	$530.00
DEBTS	$0.00
NET WORTH	$530.00

UPCOMING BILLS

MAR 2
Food
$500

MARK AS PAID
View Bill Details

Showing 1 of 1 bill due. See my bills

GOALS

Join thousands of Minters in the $5k savings challenge

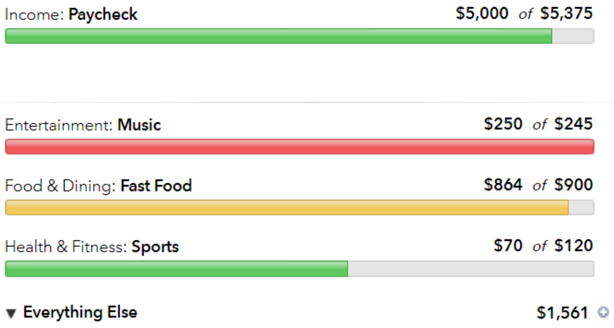
JOIN THE CHALLENGE

Set a goal

SPENDING

Looks like we don't have enough data to show you your spending patterns this month, try adding another account!

Figure B.1: Mint's Start Page. Website Design (stable release).



Income: **Paycheck** $5,000 *of* $5,375

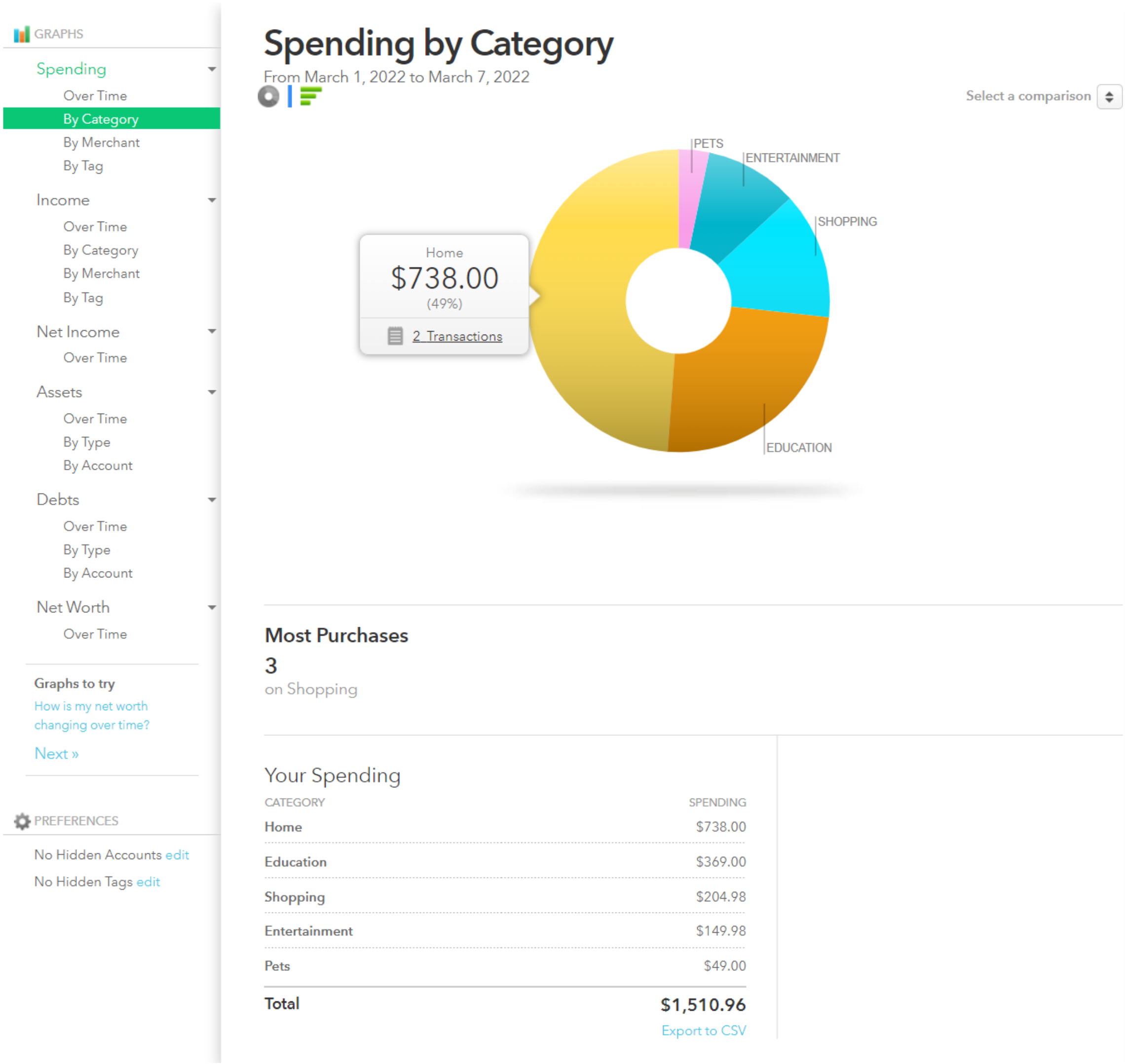
Entertainment: **Music** $250 *of* $245

Food & Dining: **Fast Food** $864 *of* $900

Health & Fitness: **Sports** $70 *of* $120

▼ **Everything Else** $1,561

Figure B.2: Mint's progress bar.



Spending by Category

From March 1, 2022 to March 7, 2022

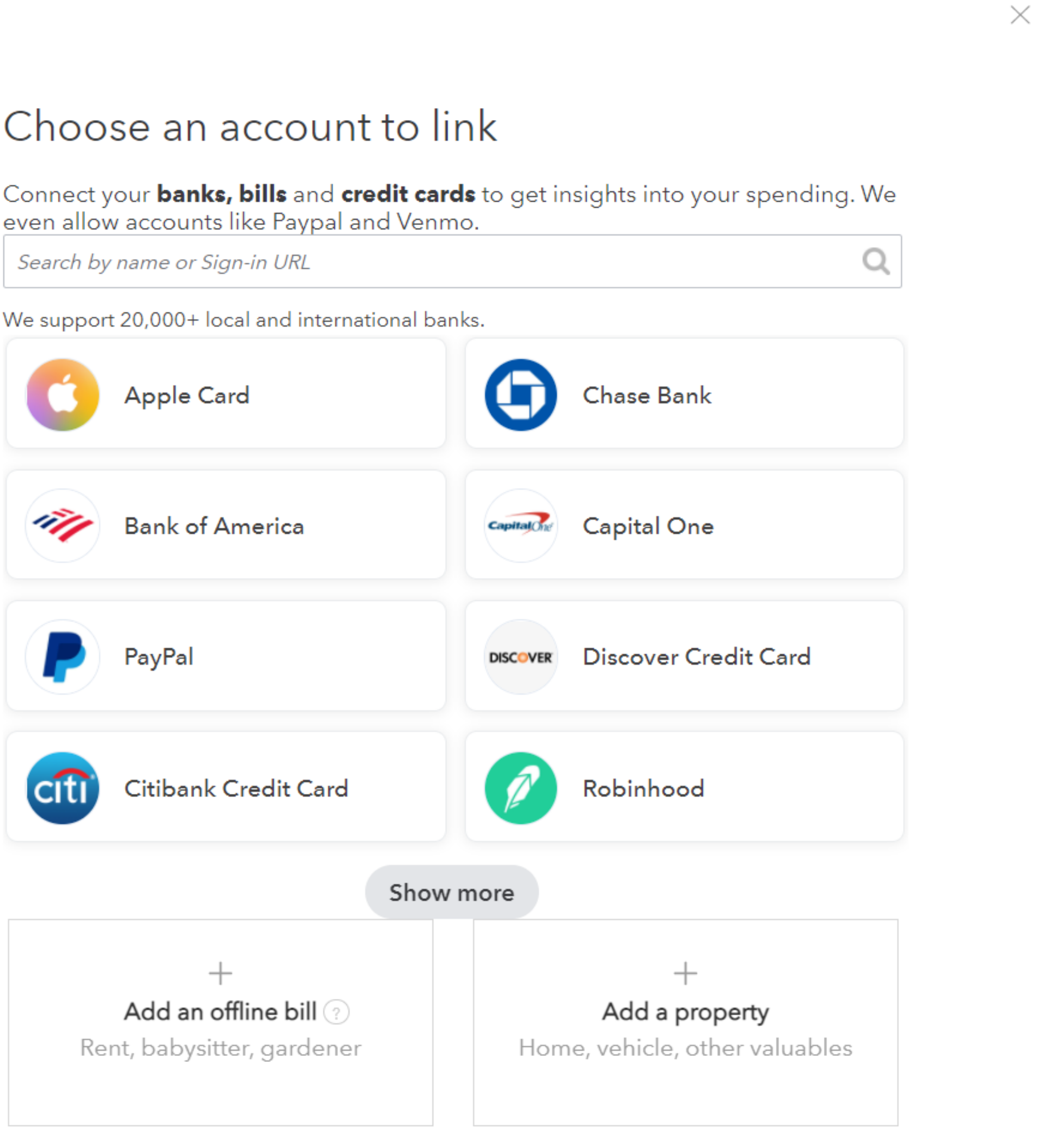
Home
$738.00
(49%)
2 Transactions

Most Purchases
3
on Shopping

Your Spending

CATEGORY	SPENDING
Home	$738.00
Education	$369.00
Shopping	$204.98
Entertainment	$149.98
Pets	$49.00
Total	$1,510.96

Figure B.3: Mint's pie-chart.

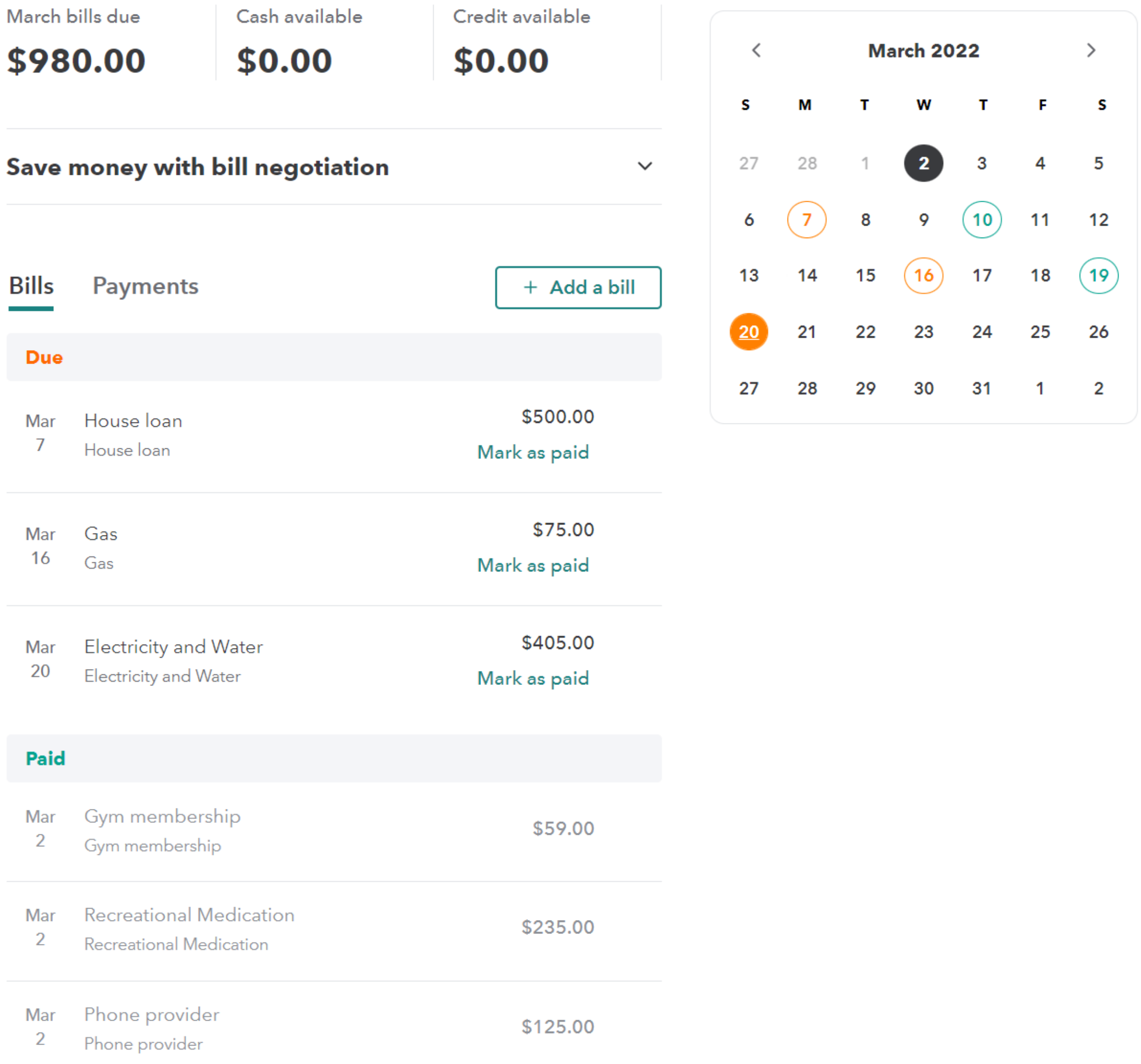


Choose an account to link

Connect your **banks, bills** and **credit cards** to get insights into your spending. We even allow accounts like Paypal and Venmo.

We support 20,000+ local and international banks.

Figure B.4: Mint's add account.



March bills due	Cash available	Credit available
$980.00	$0.00	$0.00

Save money with bill negotiation

Bills Payments + Add a bill

Due

Mar 7	House loan House loan	$500.00	Mark as paid
Mar 16	Gas Gas	$75.00	Mark as paid
Mar 20	Electricity and Water Electricity and Water	$405.00	Mark as paid

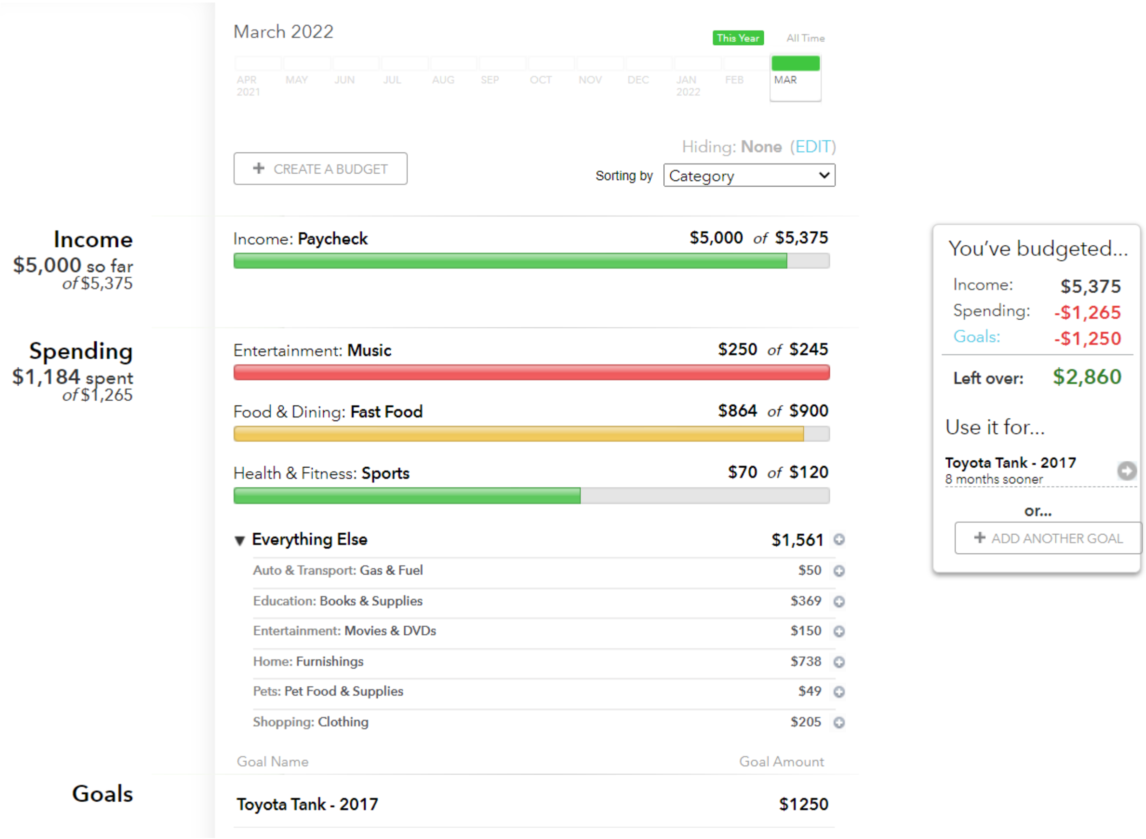
Paid

Mar 2	Gym membership Gym membership	$59.00
Mar 2	Recreational Medication Recreational Medication	$235.00
Mar 2	Phone provider Phone provider	$125.00

March 2022

S	M	T	W	T	F	S
27	28	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2

Figure B.5: Mint's bills.



March 2022

Hiding: None

Sorting by Category

Income
$5,000 so far
of $5,375

Income: **Paycheck** — $5,000 *of* $5,375

Spending
$1,184 spent
of $1,265

Entertainment: **Music** — $250 *of* $245

Food & Dining: **Fast Food** — $864 *of* $900

Health & Fitness: **Sports** — $70 *of* $120

▼ Everything Else	$1,561
Auto & Transport: Gas & Fuel	$50
Education: Books & Supplies	$369
Entertainment: Movies & DVDs	$150
Home: Furnishings	$738
Pets: Pet Food & Supplies	$49
Shopping: Clothing	$205

Goals

Goal Name	Goal Amount
Toyota Tank - 2017	$1250

You've budgeted...

Income:	$5,375
Spending:	-$1,265
Goals:	-$1,250
Left over:	$2,860

Use it for...

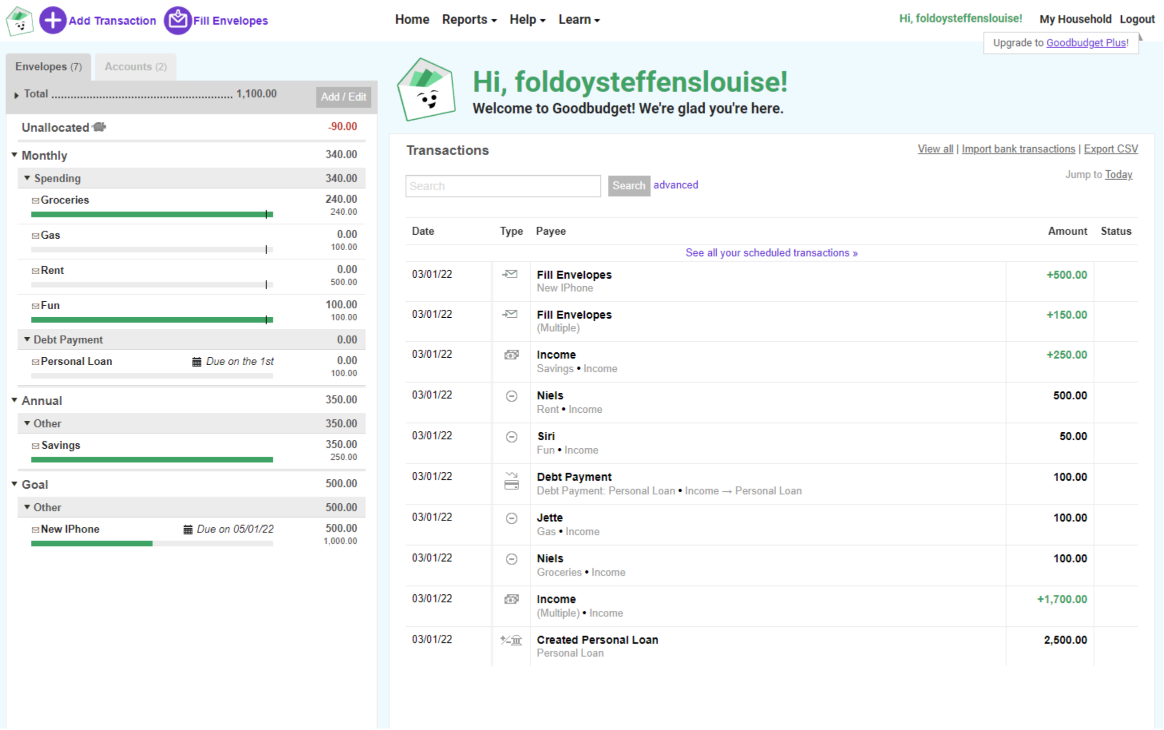
Toyota Tank - 2017
8 months sooner

or...

Figure B.6: Mint's budget.

Appendix C

Goodbudget


Add Transaction
Fill Envelopes
Home
Reports
Help
Learn
Hi, foldoysteffenslouise!
My Household
Logout
Upgrade to Goodbudget Plus!
Envelopes (7)
Accounts (2)
Add / Edit
Search
advanced
View all | Import bank transactions | Export CSV
Jump to Today
See all your scheduled transactions »

Hi, foldoysteffenslouise!

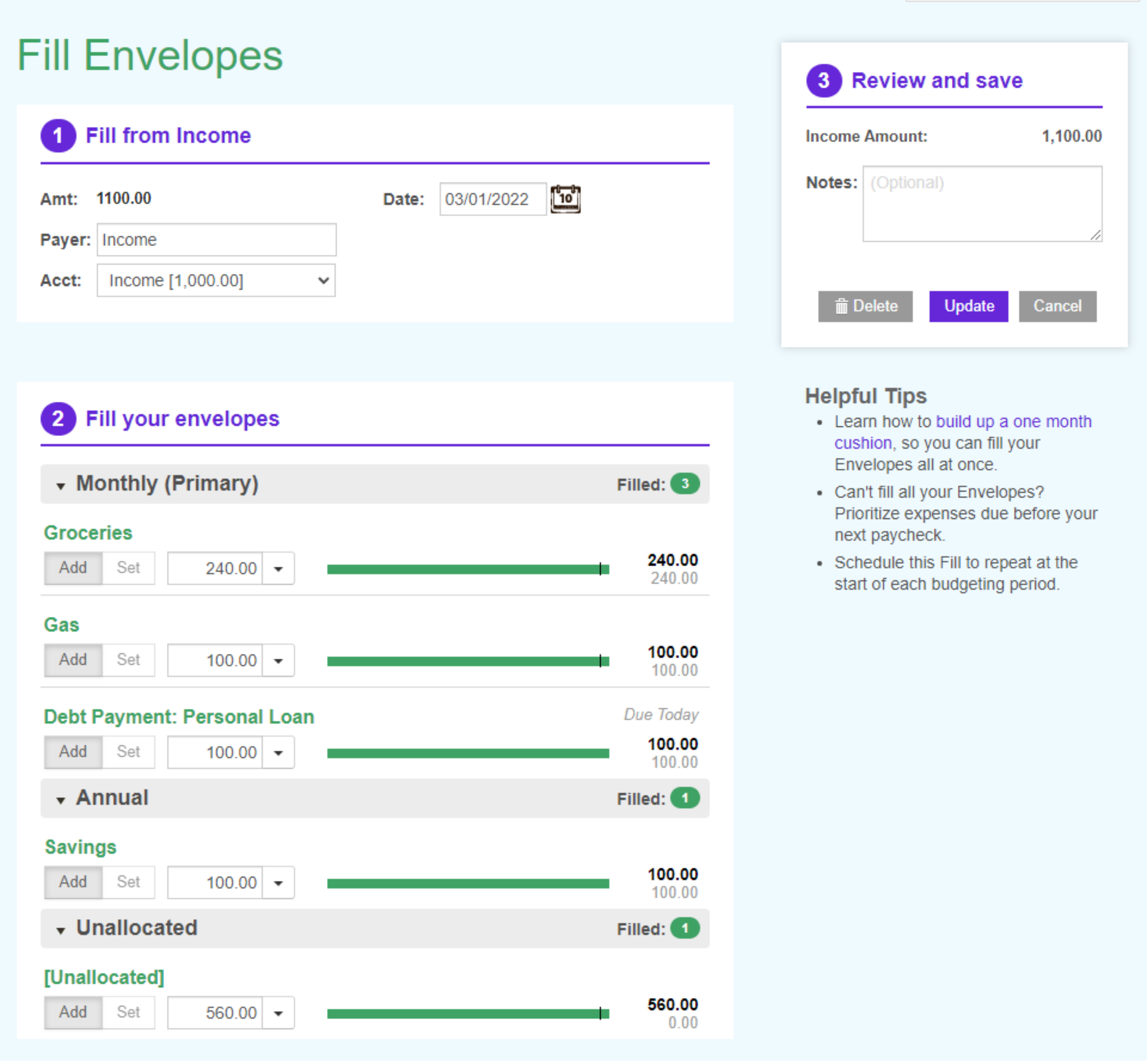
Welcome to Goodbudget! We're glad you're here.

Total		1,100.00
Unallocated		-90.00
Monthly		340.00
Spending		340.00
Groceries		240.00 240.00
Gas		0.00 100.00
Rent		0.00 500.00
Fun		100.00 100.00
Debt Payment		0.00
Personal Loan	*Due on the 1st*	0.00 100.00
Annual		350.00
Other		350.00
Savings		350.00 250.00
Goal		500.00
Other		500.00
New IPhone	*Due on 05/01/22*	500.00 1,000.00

Transactions

Date	Type	Payee	Amount	Status
03/01/22		**Fill Envelopes** New IPhone	+500.00	
03/01/22		**Fill Envelopes** (Multiple)	+150.00	
03/01/22		**Income** Savings • Income	+250.00	
03/01/22		**Niels** Rent • Income	500.00	
03/01/22		**Siri** Fun • Income	50.00	
03/01/22		**Debt Payment** Debt Payment: Personal Loan • Income → Personal Loan	100.00	
03/01/22		**Jette** Gas • Income	100.00	
03/01/22		**Niels** Groceries • Income	100.00	
03/01/22		**Income** (Multiple) • Income	+1,700.00	
03/01/22		**Created Personal Loan** Personal Loan	2,500.00	

Figure C.1: Goodbudget's homepage.



Fill Envelopes

1 Fill from Income

Amt: 1100.00

Date: 03/01/2022

Payer: Income

Acct: Income [1,000.00]

2 Fill your envelopes

▾ Monthly (Primary) — Filled: 3

Envelope	Amount	Filled	Budgeted
Groceries	240.00	240.00	240.00
Gas	100.00	100.00	100.00
Debt Payment: Personal Loan (*Due Today*)	100.00	100.00	100.00

▾ Annual — Filled: 1

Envelope	Amount	Filled	Budgeted
Savings	100.00	100.00	100.00

▾ Unallocated — Filled: 1

Envelope	Amount	Filled	Budgeted
[Unallocated]	560.00	560.00	0.00

3 Review and save

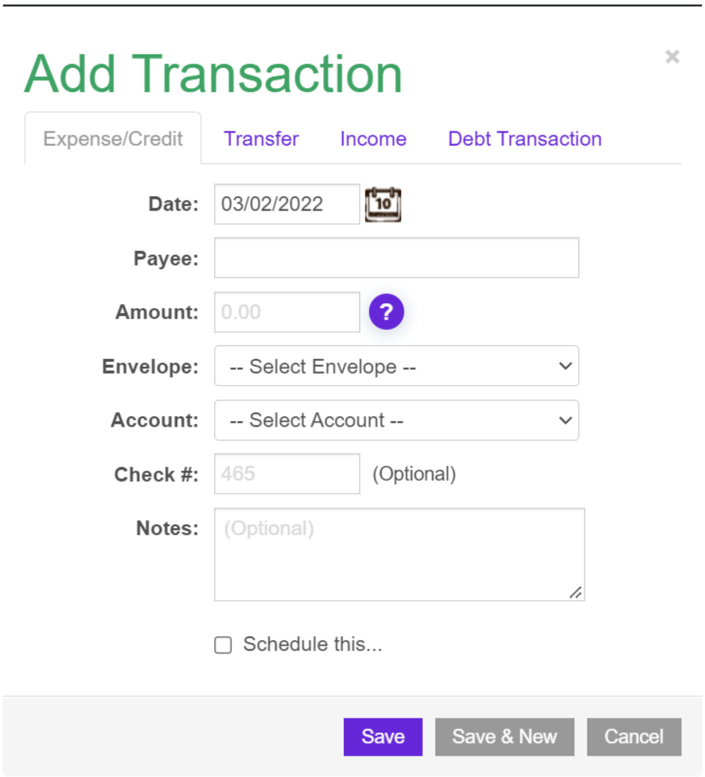
Income Amount: 1,100.00

Notes: (Optional)

Helpful Tips

- Learn how to build up a one month cushion, so you can fill your Envelopes all at once.
- Can't fill all your Envelopes? Prioritize expenses due before your next paycheck.
- Schedule this Fill to repeat at the start of each budgeting period.

Figure C.2: GoodBudget's Fill Envelope.



Add Transaction

Expense/Credit | Transfer | Income | Debt Transaction

Date: 03/02/2022

Payee:

Amount: 0.00 ?

Envelope: -- Select Envelope --

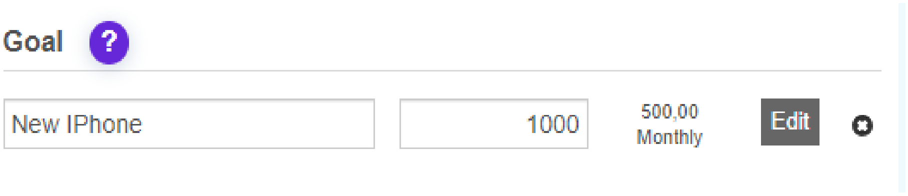
Account: -- Select Account --

Check #: 465 (Optional)

Notes: (Optional)

□ Schedule this...

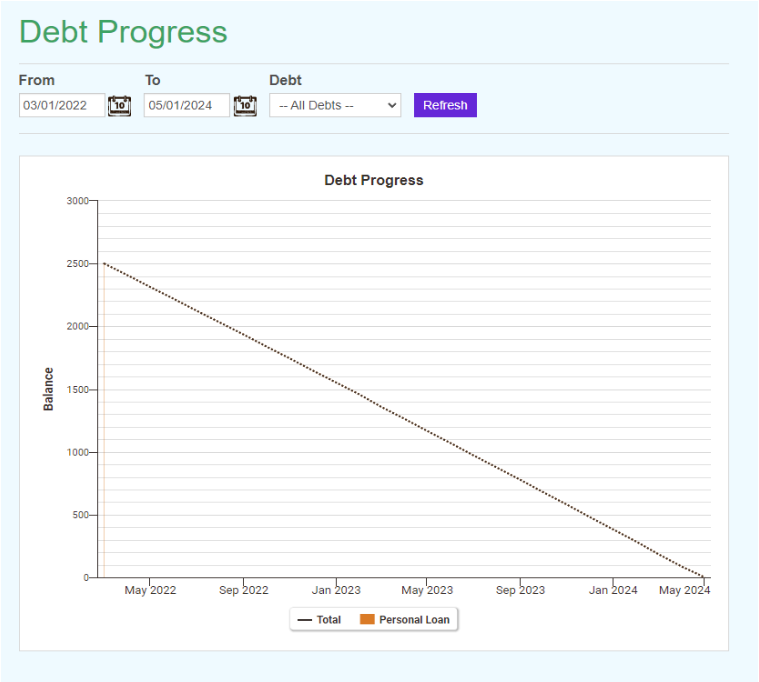
Figure C.3: GoodBudget's Transactions.



Goal ?

New IPhone | 1000 | 500,00 Monthly

Figure C.4: GoodBudget's Goal Tracking.



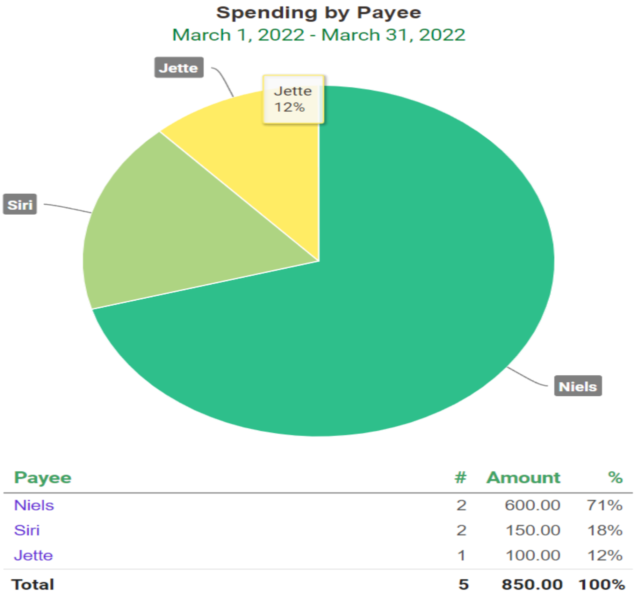
Debt Progress

From: 03/01/2022

To: 05/01/2024

Debt: -- All Debts --

Figure C.5: GoodBudget's Debt Progress.

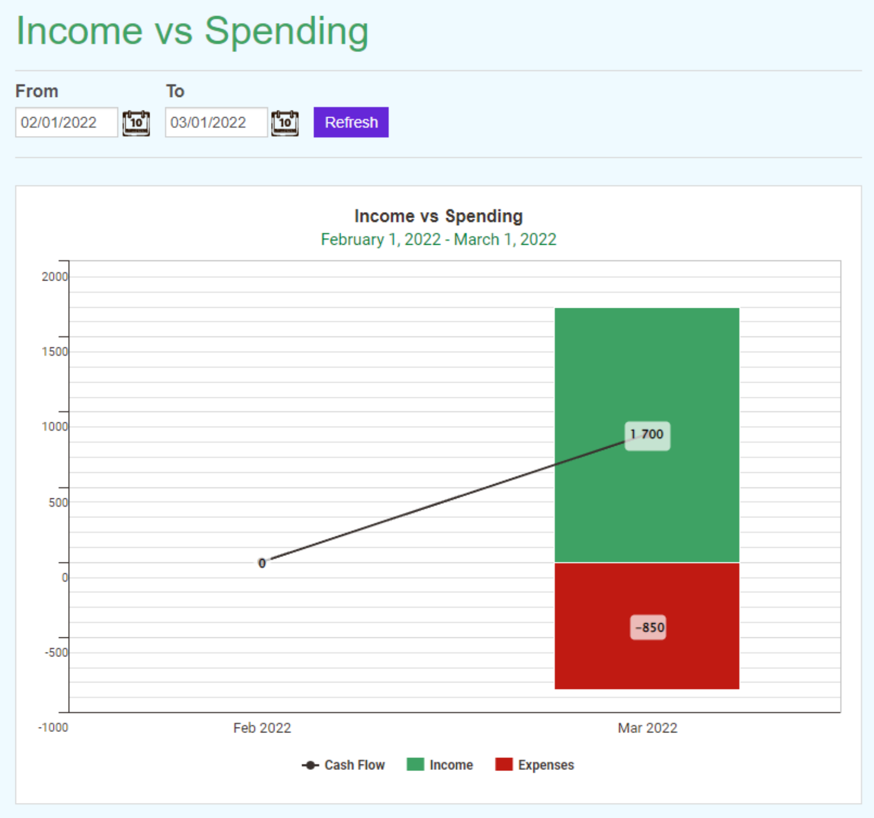


Spending by Payee

March 1, 2022 - March 31, 2022

Payee	#	Amount	%
Niels	2	600.00	71%
Siri	2	150.00	18%
Jette	1	100.00	12%
Total	**5**	**850.00**	**100%**

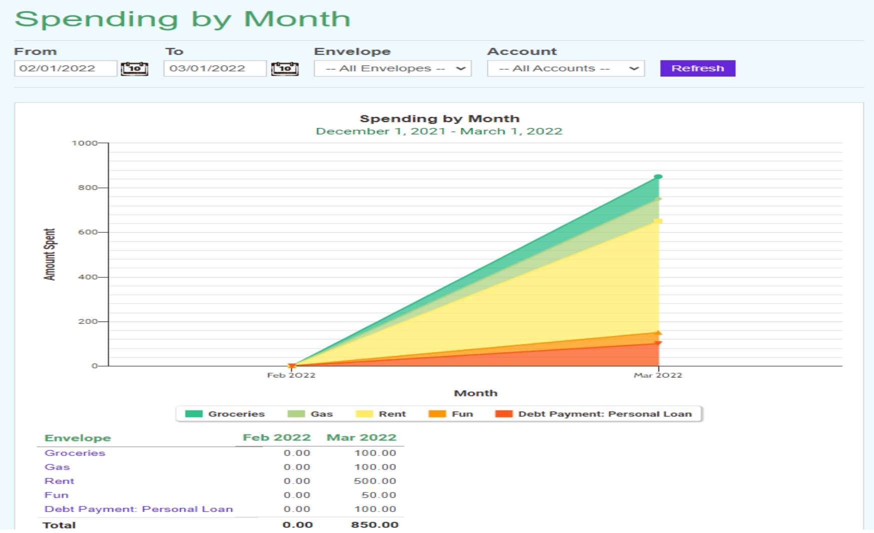
Figure C.6: GoodBudget's Spending by Payee.



Income vs Spending

From 02/01/2022 To 03/01/2022

Figure C.7: GoodBudget's Spending vs Budget.



Spending by Month

From 02/01/2022 To 03/01/2022 Envelope -- All Envelopes -- Account -- All Accounts --

Envelope	Feb 2022	Mar 2022
Groceries	0.00	100.00
Gas	0.00	100.00
Rent	0.00	500.00
Fun	0.00	50.00
Debt Payment: Personal Loan	0.00	100.00
Total	**0.00**	**850.00**

Figure C.8: GoodBudget's Spending by Month.

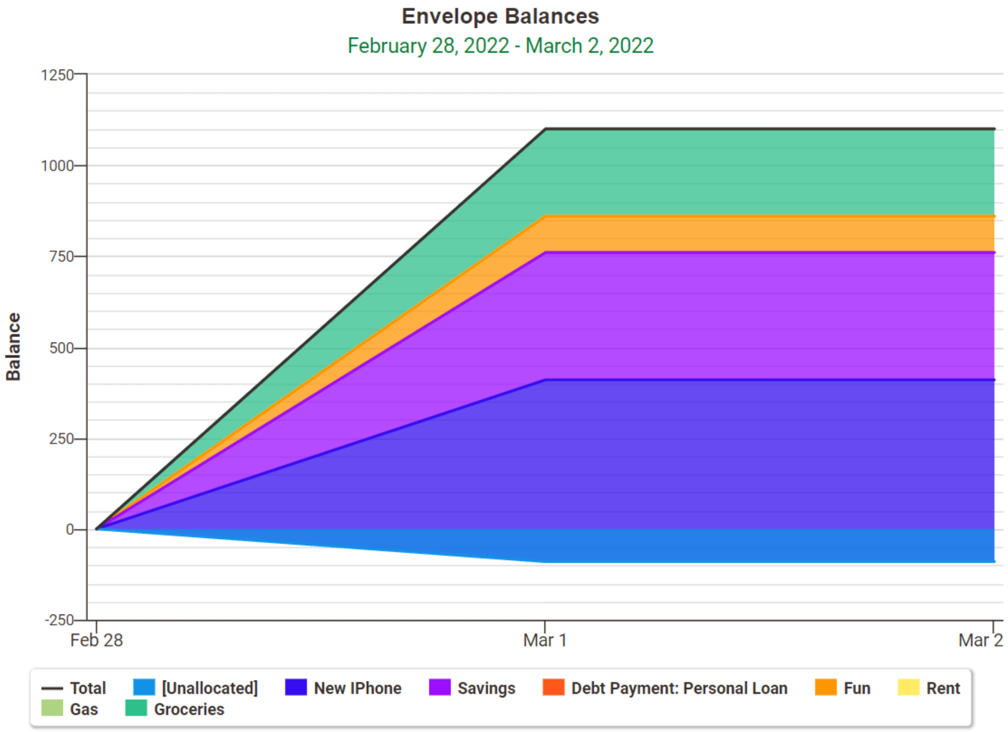
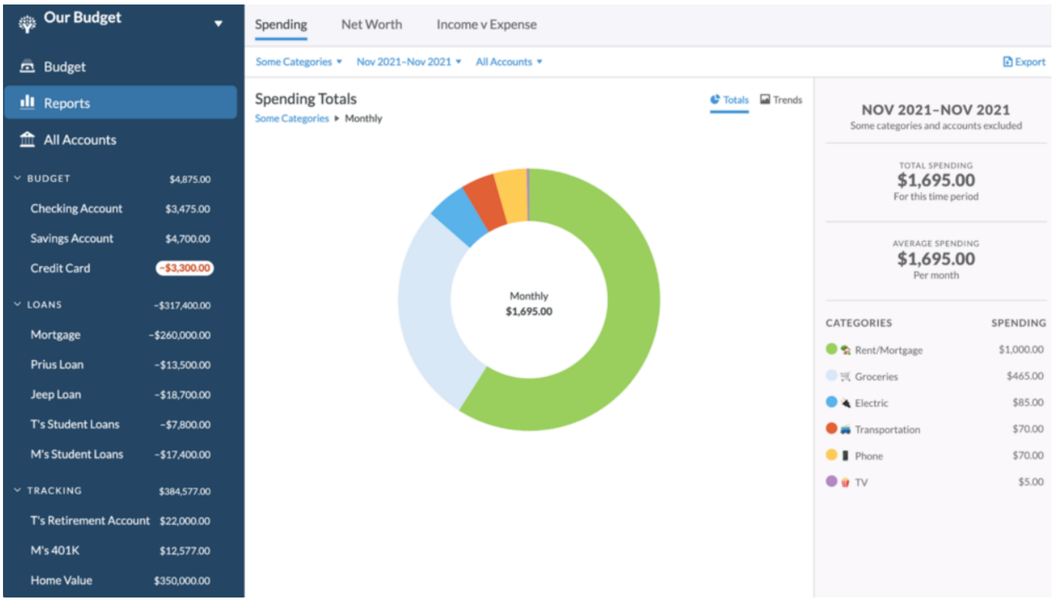


Figure C.9: GoodBudget's Envelope Balances.

Appendix D

YNAB



BUDGET	$4,875.00
Checking Account	$3,475.00
Savings Account	$4,700.00
Credit Card	−$3,300.00
LOANS	−$317,400.00
Mortgage	−$260,000.00
Prius Loan	−$13,500.00
Jeep Loan	−$18,700.00
T's Student Loans	−$7,800.00
M's Student Loans	−$17,400.00
TRACKING	$384,577.00
T's Retirement Account	$22,000.00
M's 401K	$12,577.00
Home Value	$350,000.00

Spending Totals

Some Categories ▸ Monthly

NOV 2021–NOV 2021

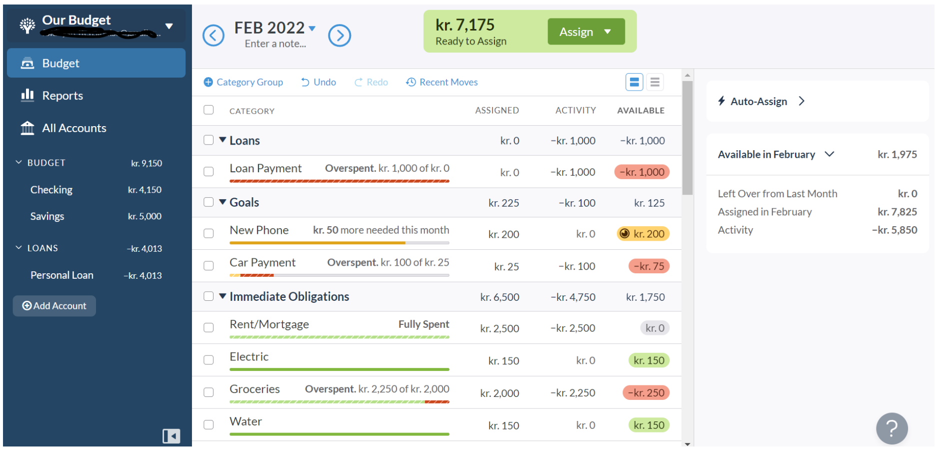
Some categories and accounts excluded

TOTAL SPENDING
$1,695.00
For this time period

AVERAGE SPENDING
$1,695.00
Per month

CATEGORIES	SPENDING
🟩 Rent/Mortgage	$1,000.00
● Groceries	$465.00
● Electric	$85.00
● Transportation	$70.00
● Phone	$70.00
● TV	$5.00

Figure D.1: Screenshot of YNAB Website Design.



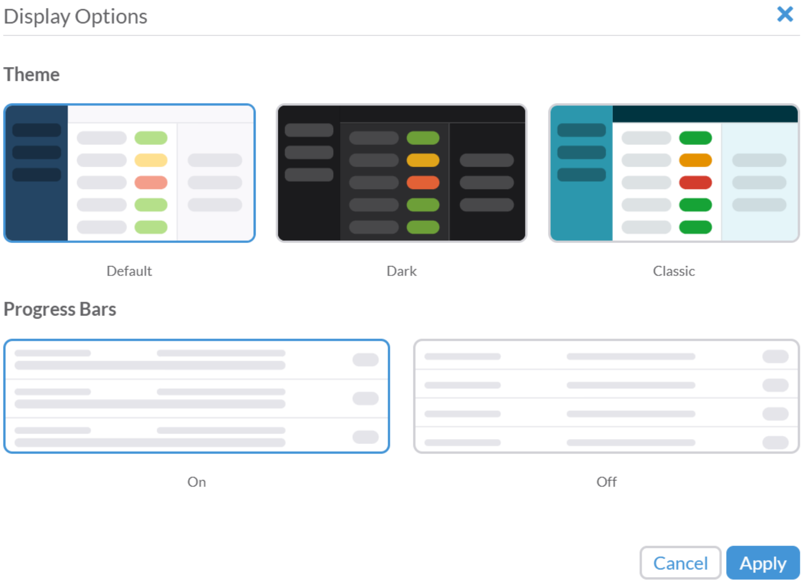
BUDGET	kr. 9,150
Checking	kr. 4,150
Savings	kr. 5,000
LOANS	−kr. 4,013
Personal Loan	−kr. 4,013

kr. 7,175
Ready to Assign

CATEGORY		ASSIGNED	ACTIVITY	AVAILABLE
▼ Loans		kr. 0	−kr. 1,000	−kr. 1,000
Loan Payment	**Overspent.** kr. 1,000 of kr. 0	kr. 0	−kr. 1,000	−kr. 1,000
▼ Goals		kr. 225	−kr. 100	kr. 125
New Phone	**kr. 50** more needed this month	kr. 200	kr. 0	kr. 200
Car Payment	**Overspent.** kr. 100 of kr. 25	kr. 25	−kr. 100	−kr. 75
▼ Immediate Obligations		kr. 6,500	−kr. 4,750	kr. 1,750
Rent/Mortgage	**Fully Spent**	kr. 2,500	−kr. 2,500	kr. 0
Electric		kr. 150	kr. 0	kr. 150
Groceries	**Overspent.** kr. 2,250 of kr. 2,000	kr. 2,000	−kr. 2,250	−kr. 250
Water		kr. 150	kr. 0	kr. 150

Available in February	kr. 1,975
Left Over from Last Month	kr. 0
Assigned in February	kr. 7,825
Activity	−kr. 5,850

Figure D.2: YNAB's Start Page.

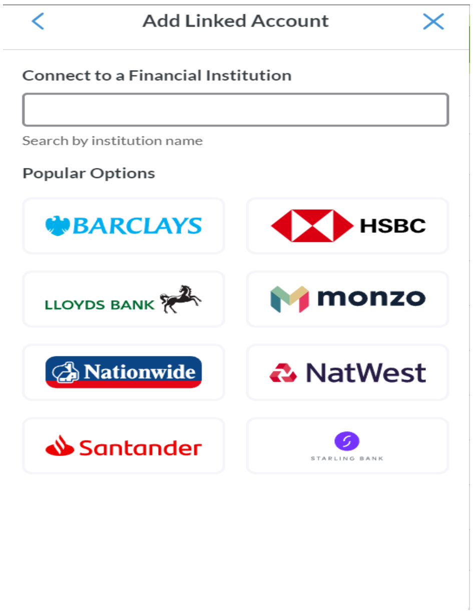


Display Options

Theme

Progress Bars

Figure D.3: YNAB's Display Options.



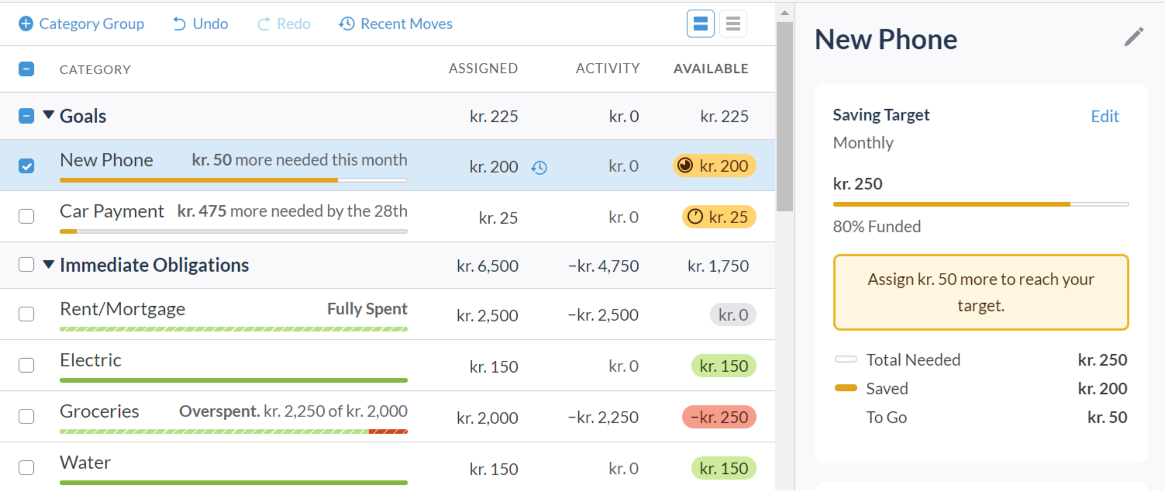
Add Linked Account

Connect to a Financial Institution

Search by institution name

Popular Options

Figure D.4: YNAB's Bank Connection.



CATEGORY		ASSIGNED	ACTIVITY	AVAILABLE
Goals		kr. 225	kr. 0	kr. 225
☑ New Phone	kr. 50 more needed this month	kr. 200	kr. 0	kr. 200
□ Car Payment	kr. 475 more needed by the 28th	kr. 25	kr. 0	kr. 25
Immediate Obligations		kr. 6,500	−kr. 4,750	kr. 1,750
□ Rent/Mortgage	Fully Spent	kr. 2,500	−kr. 2,500	kr. 0
□ Electric		kr. 150	kr. 0	kr. 150
□ Groceries	Overspent. kr. 2,250 of kr. 2,000	kr. 2,000	−kr. 2,250	−kr. 250
□ Water		kr. 150	kr. 0	kr. 150

New Phone

Saving Target Edit

Monthly

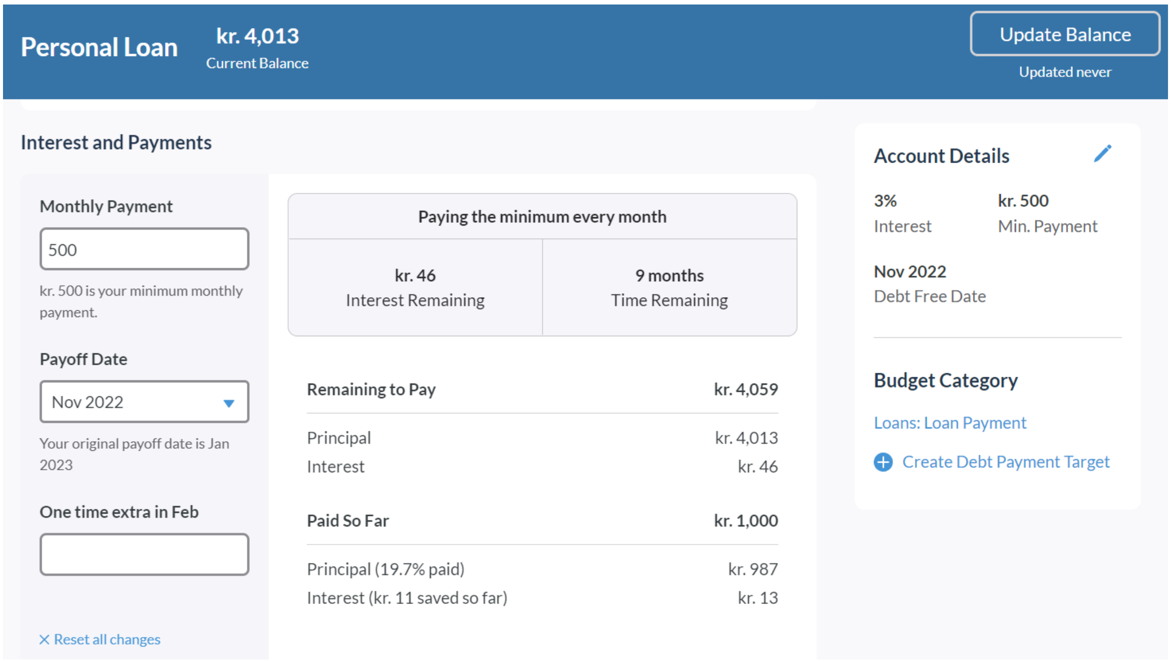
kr. 250

80% Funded

Assign kr. 50 more to reach your target.

Total Needed	kr. 250
Saved	kr. 200
To Go	kr. 50

Figure D.5: YNAB's Goal Tracking.



Personal Loan kr. 4,013 Current Balance

Interest and Payments

Monthly Payment

500

kr. 500 is your minimum monthly payment.

Payoff Date

Nov 2022

Your original payoff date is Jan 2023

One time extra in Feb

Paying the minimum every month

kr. 46 Interest Remaining	9 months Time Remaining

Remaining to Pay	**kr. 4,059**
Principal	kr. 4,013
Interest	kr. 46
Paid So Far	**kr. 1,000**
Principal (19.7% paid)	kr. 987
Interest (kr. 11 saved so far)	kr. 13

Account Details

3% Interest

kr. 500 Min. Payment

Nov 2022 Debt Free Date

Budget Category

Loans: Loan Payment

Figure D.6: YNAB's Loan Calculator.

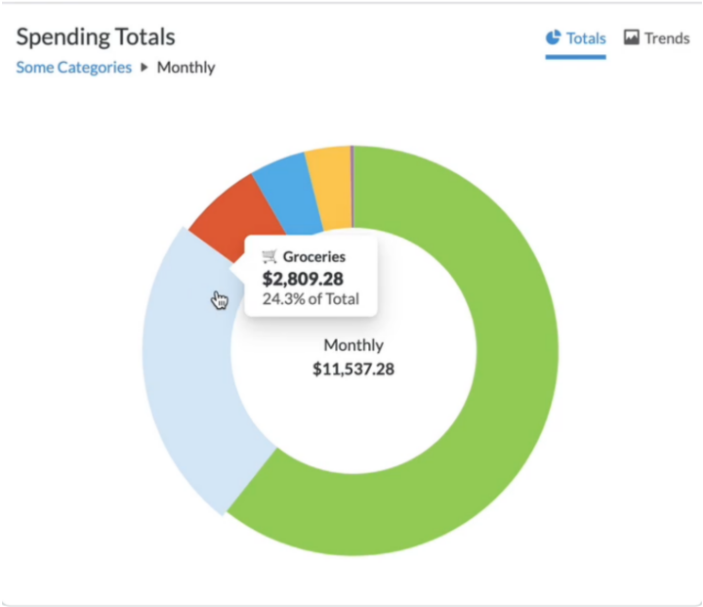
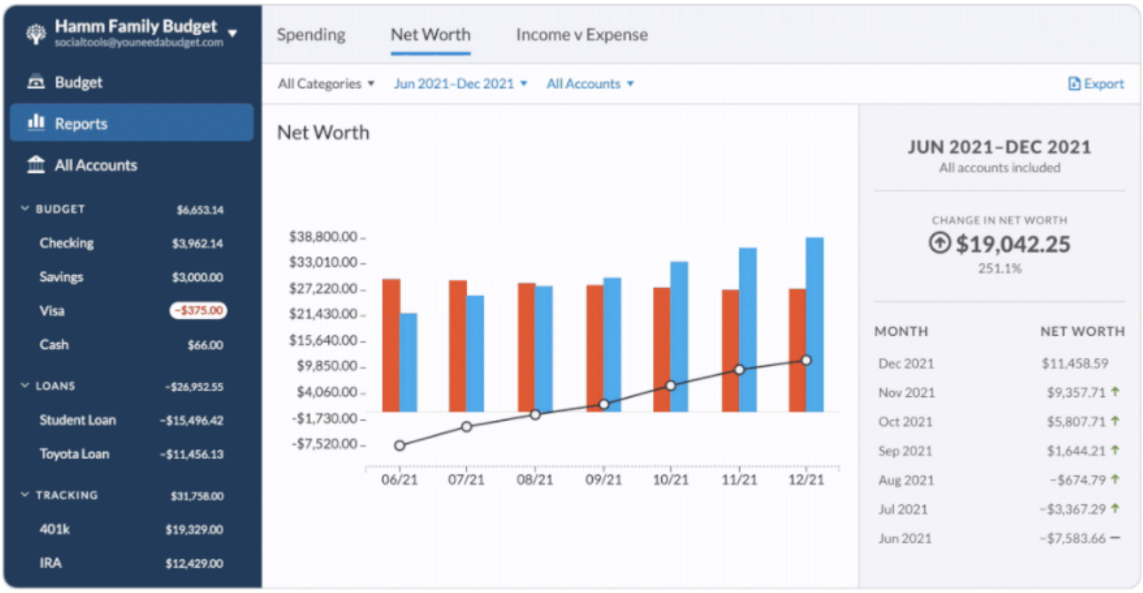


Figure D.7: YNAB's Pie Chart [95].



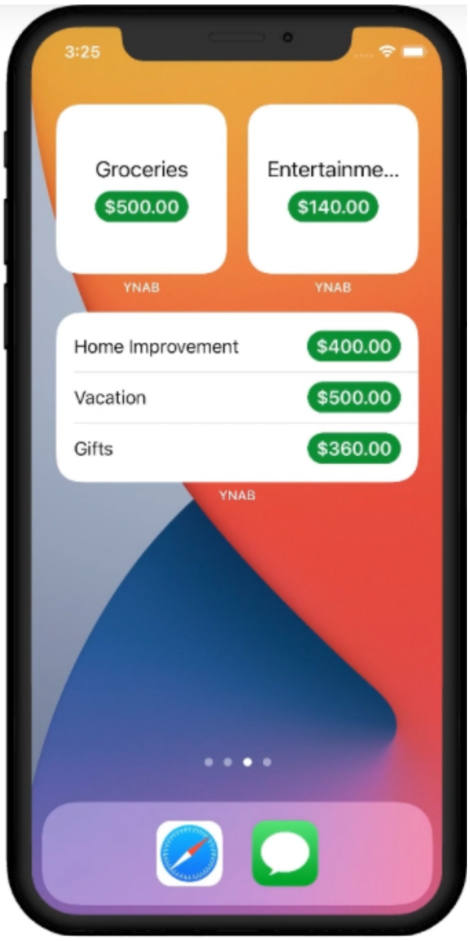
BUDGET	$6,653.14
Checking	$3,962.14
Savings	$3,000.00
Visa	-$375.00
Cash	$66.00
LOANS	-$26,952.55
Student Loan	-$15,496.42
Toyota Loan	-$11,456.13
TRACKING	$31,758.00
401k	$19,329.00
IRA	$12,429.00

JUN 2021–DEC 2021
All accounts included

CHANGE IN NET WORTH
$19,042.25
251.1%

MONTH	NET WORTH
Dec 2021	$11,458.59
Nov 2021	$9,357.71 ↑
Oct 2021	$5,807.71 ↑
Sep 2021	$1,644.21 ↑
Aug 2021	-$674.79 ↑
Jul 2021	-$3,367.29 ↑
Jun 2021	-$7,583.66 —

Figure D.8: YNAB's Net Worth [95].



Groceries
$500.00

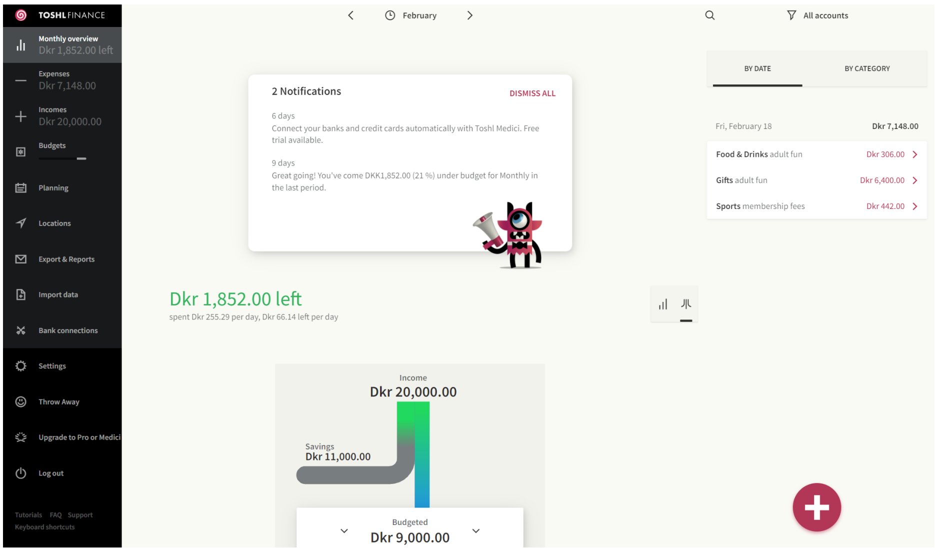
Entertainme...
$140.00

Home Improvement	$400.00
Vacation	$500.00
Gifts	$360.00

Figure D.9: YNAB's Widget [96].

Appendix E

Toshi



2 Notifications

6 days
Connect your banks and credit cards automatically with Toshl Medici. Free trial available.

9 days
Great going! You've come DKK1,852.00 (21 %) under budget for Monthly in the last period.

Dkr 1,852.00 left

spent Dkr 255.29 per day, Dkr 66.14 left per day

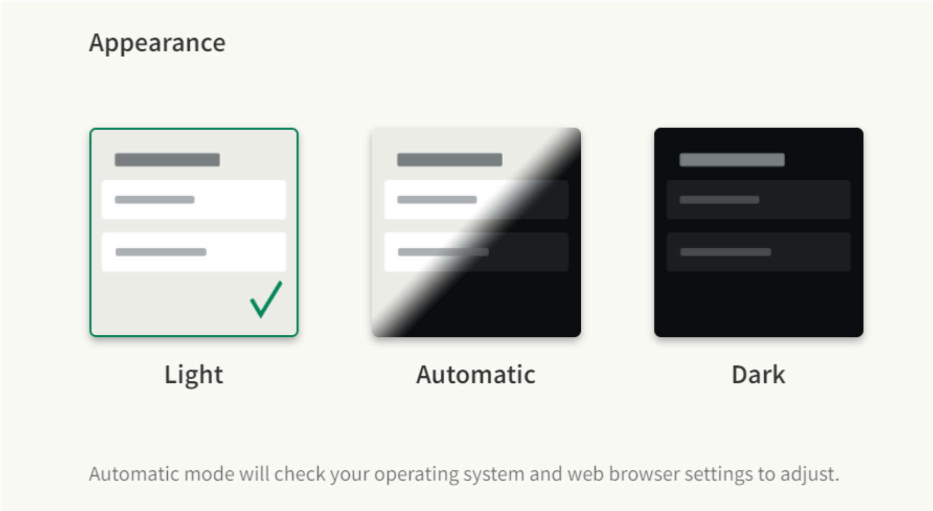
Income
Dkr 20,000.00

Savings
Dkr 11,000.00

Budgeted
Dkr 9,000.00

Fri, February 18	Dkr 7,148.00
Food & Drinks adult fun	Dkr 306.00
Gifts adult fun	Dkr 6,400.00
Sports membership fees	Dkr 442.00

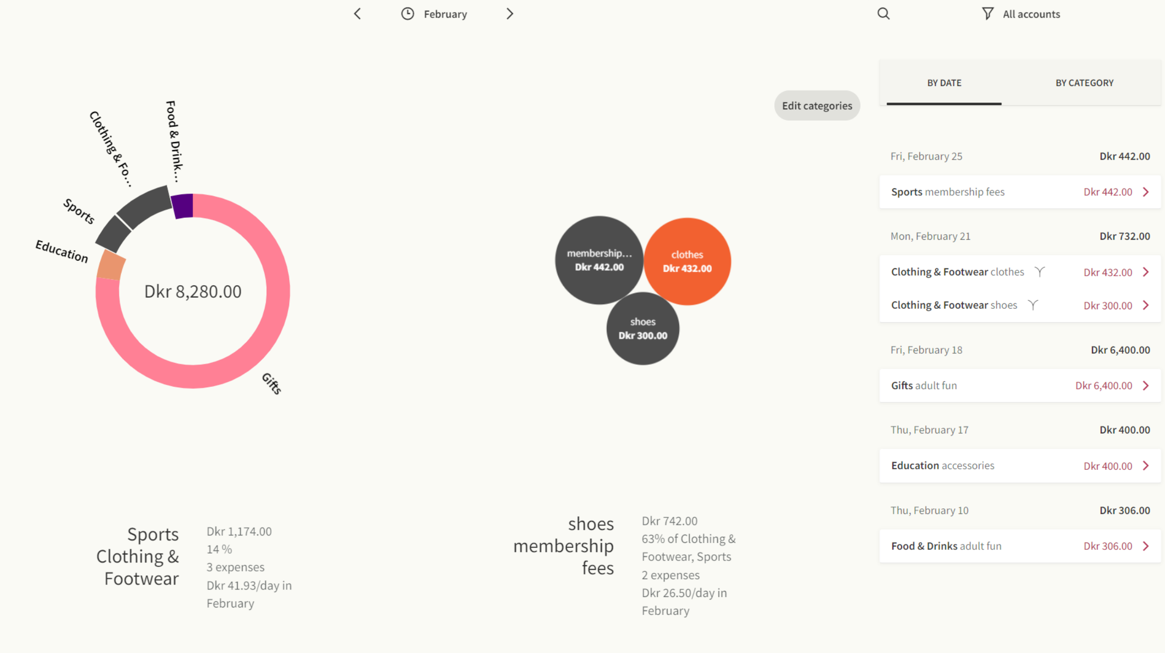
Figure E.1: Screenshot of Toshl's Website Design


Appearance

Light ✓ — Automatic — Dark

Automatic mode will check your operating system and web browser settings to adjust.

Figure E.2: Toshl's appearance.



Sports
Clothing & Footwear

Dkr 1,174.00
14 %
3 expenses
Dkr 41.93/day in February

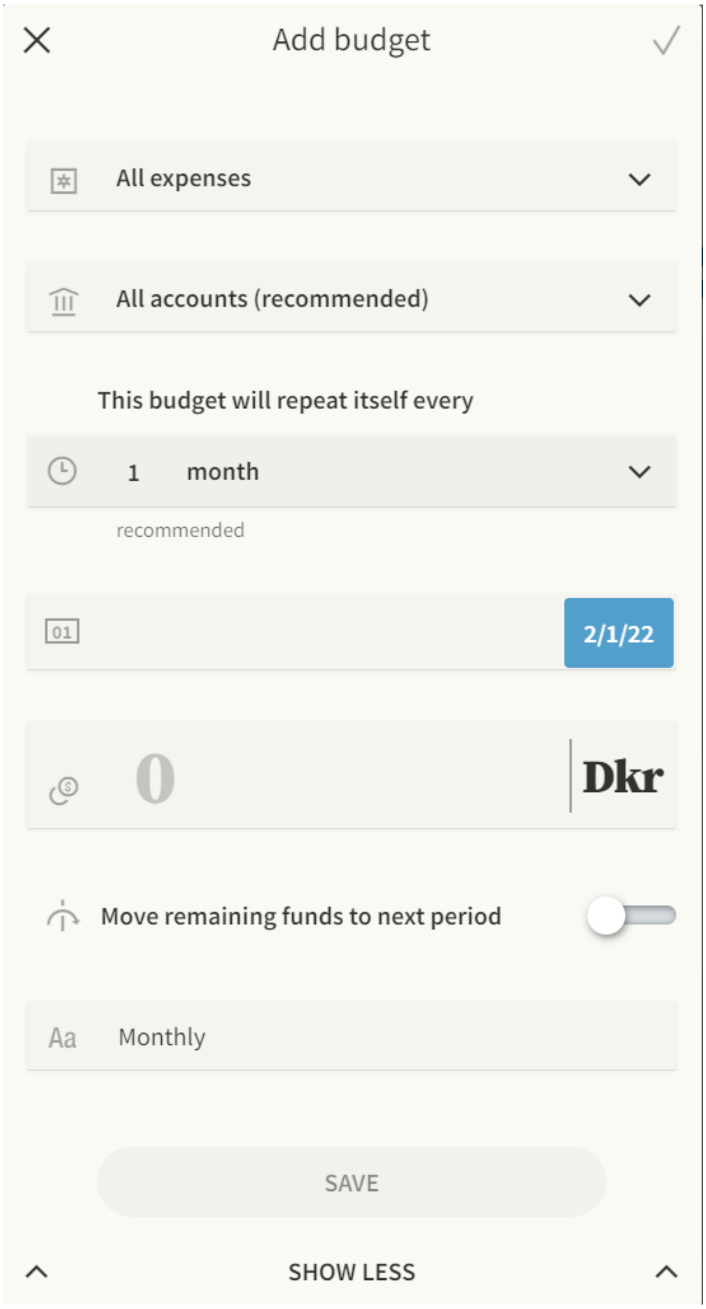
shoes
membership fees

Dkr 742.00
63% of Clothing & Footwear, Sports
2 expenses
Dkr 26.50/day in February

BY DATE | BY CATEGORY

Fri, February 25	Dkr 442.00
Sports membership fees	Dkr 442.00
Mon, February 21	Dkr 732.00
Clothing & Footwear clothes	Dkr 432.00
Clothing & Footwear shoes	Dkr 300.00
Fri, February 18	Dkr 6,400.00
Gifts adult fun	Dkr 6,400.00
Thu, February 17	Dkr 400.00
Education accessories	Dkr 400.00
Thu, February 10	Dkr 306.00
Food & Drinks adult fun	Dkr 306.00

Figure E.3: Toshl's charts.



Add budget

All expenses

All accounts (recommended)

This budget will repeat itself every

1 month

recommended

01

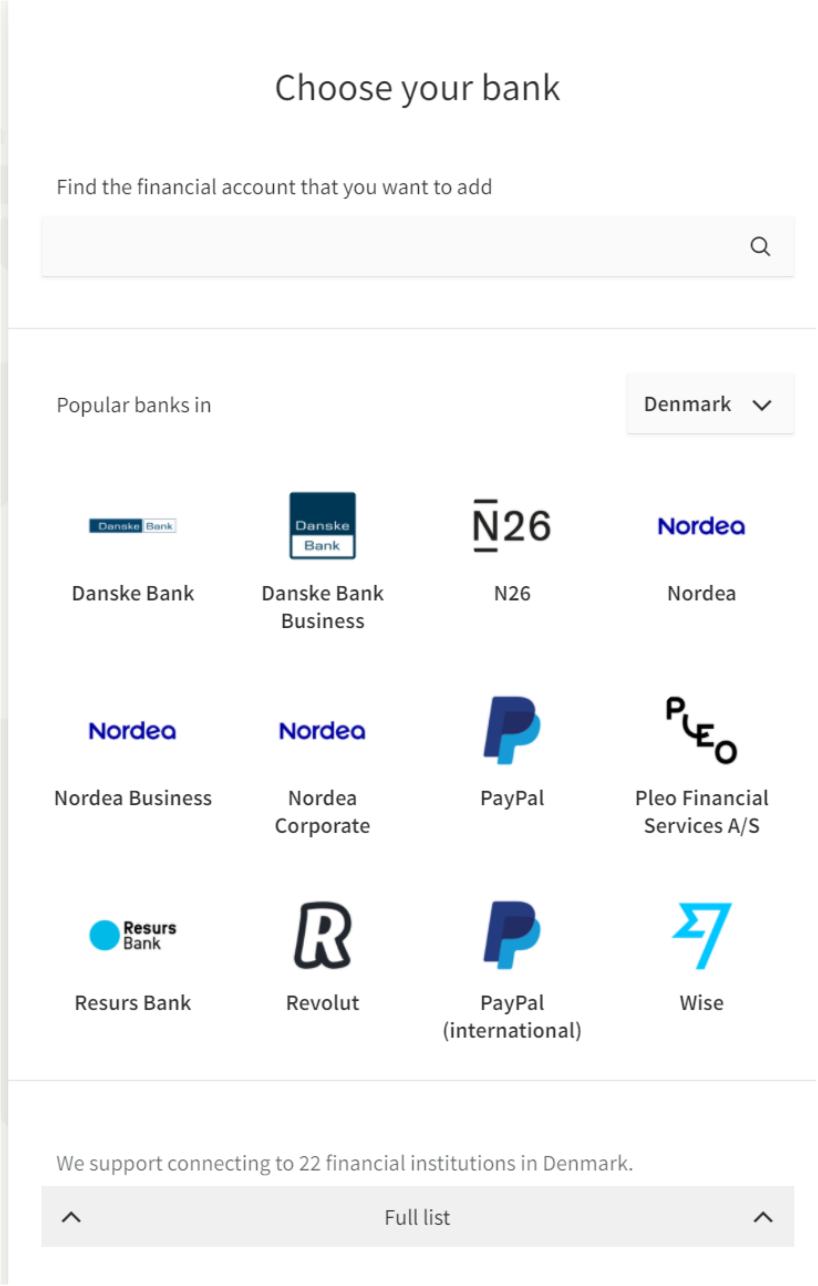
2/1/22

0 Dkr

Move remaining funds to next period

Aa Monthly

Figure E.4: Toshl adding a budget.



Choose your bank

Find the financial account that you want to add

Popular banks in Denmark

Danske Bank

Danske Bank Business

N26

Nordea

Nordea Business

Nordea Corporate

PayPal

Pleo Financial Services A/S

Resurs Bank

Revolut

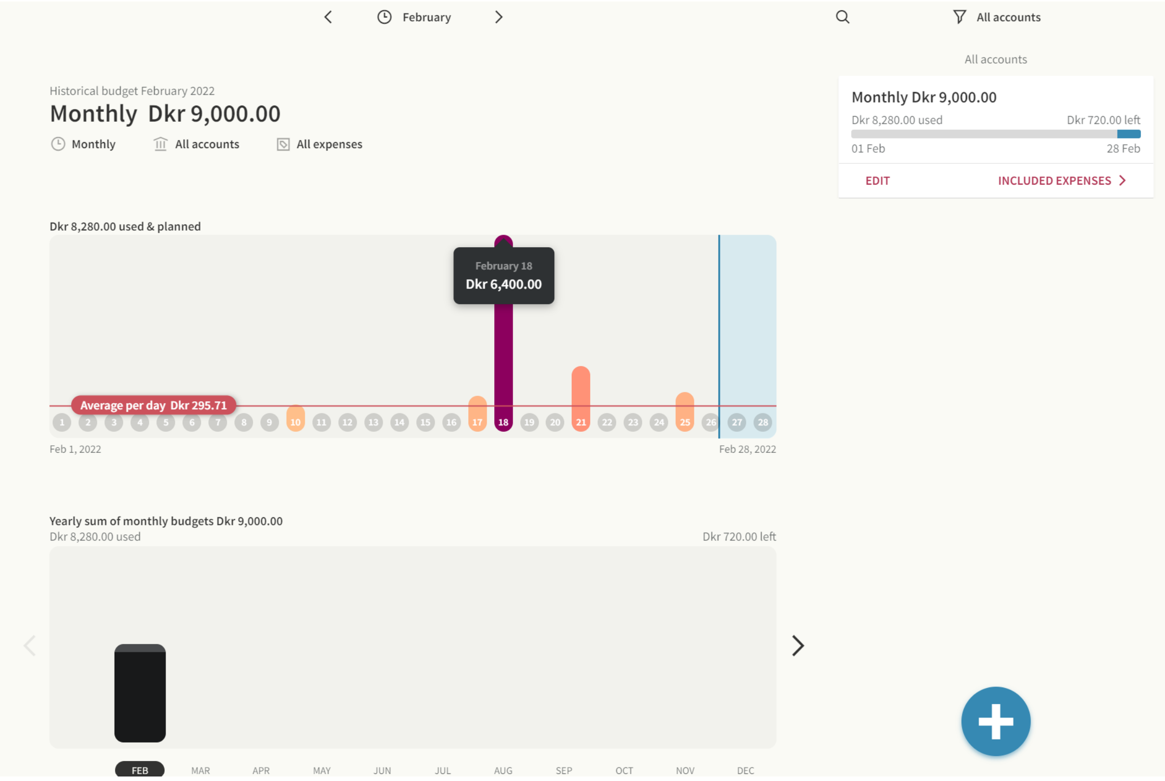
PayPal (international)

Wise

We support connecting to 22 financial institutions in Denmark.

Full list

Figure E.5: Toshl choose your bank.



February

All accounts

All accounts

Historical budget February 2022

Monthly Dkr 9,000.00

Monthly All accounts All expenses

Monthly Dkr 9,000.00

Dkr 8,280.00 used Dkr 720.00 left

01 Feb 28 Feb

EDIT INCLUDED EXPENSES

Dkr 8,280.00 used & planned

February 18

Dkr 6,400.00

Average per day Dkr 295.71

Feb 1, 2022 Feb 28, 2022

Yearly sum of monthly budgets Dkr 9,000.00

Dkr 8,280.00 used Dkr 720.00 left

Figure E.6: Toshl budget.

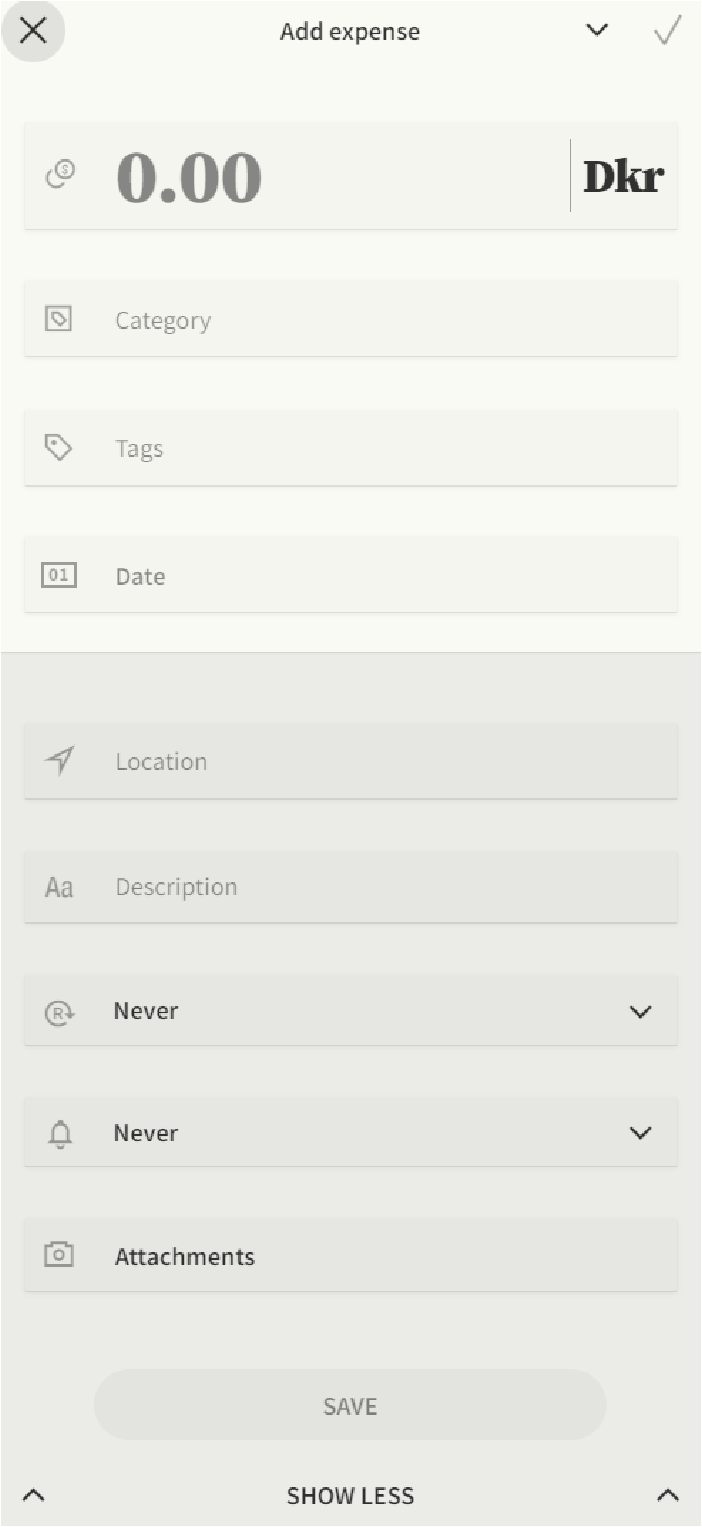
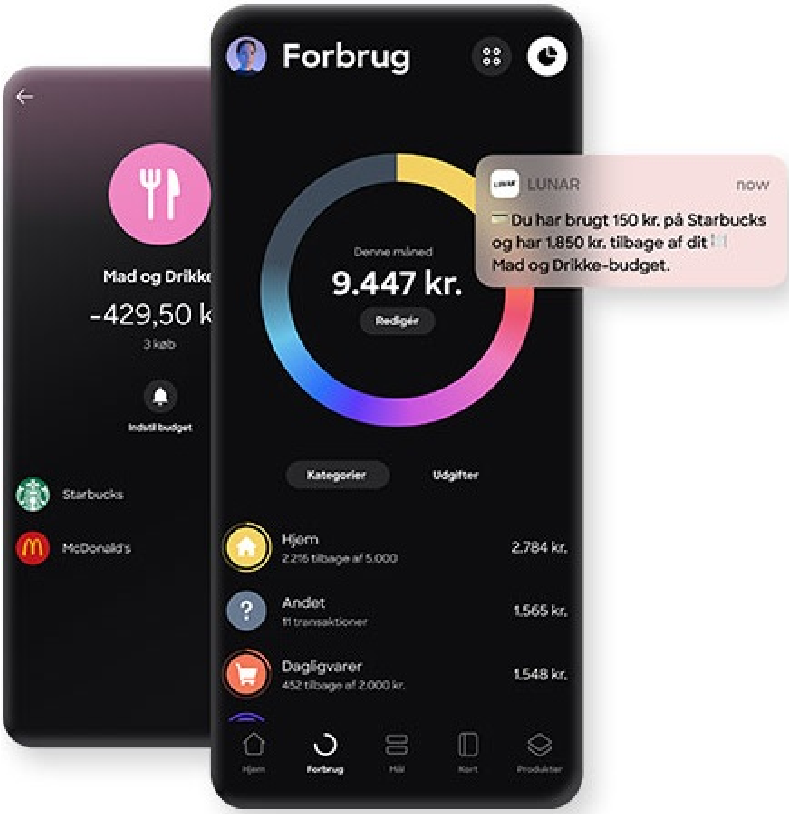


Figure E.7: Toshl expenses.

Appendix F

Lunar



LUNAR now

Du har brugt 150 kr. på Starbucks og har 1.850 kr. tilbage af dit Mad og Drikke-budget.

Forbrug

Denne måned

9.447 kr.

Hjem 2.784 kr.
2.216 tilbage af 5.000

Andet 1.565 kr.
11 transaktioner

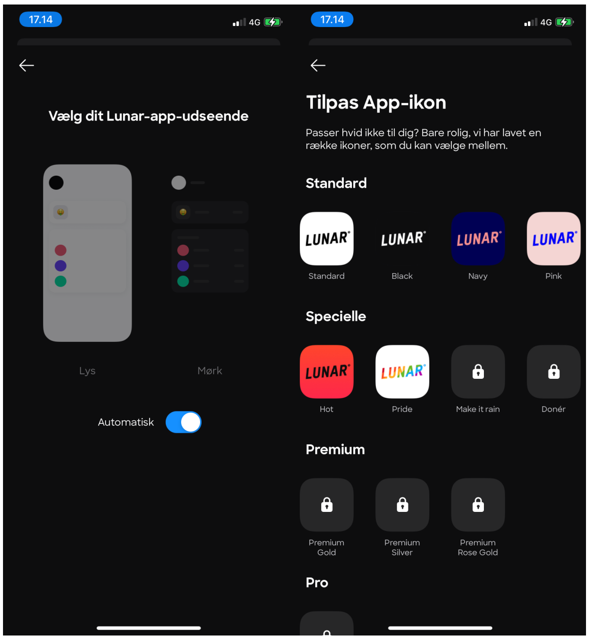
Dagligvarer 1.548 kr.
452 tilbage af 2.000 kr.

Mad og Drikke
-429,50 k
3 køb

Starbucks

McDonald's

Figure F.1: Lunar's budget overview [1].



Vælg dit Lunar-app-udseende

Lys

Mørk

Automatisk

Tilpas App-ikon

Passer hvid ikke til dig? Bare rolig, vi har lavet en række ikoner, som du kan vælge mellem.

Standard

Standard · Black · Navy · Pink

Specielle

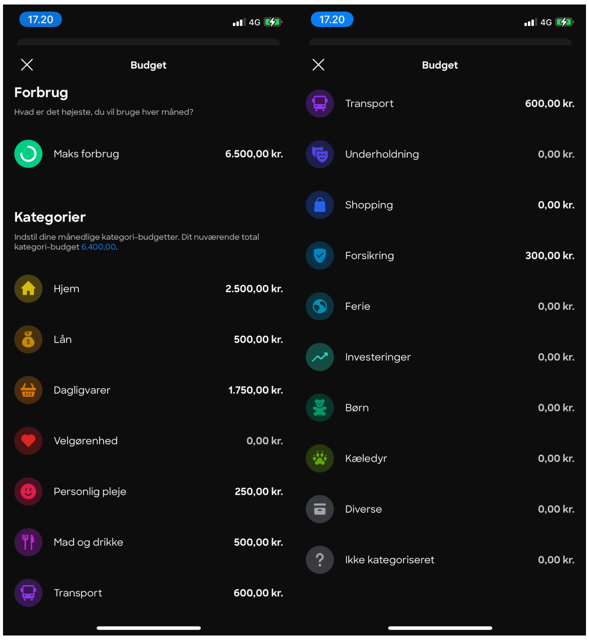
Hot · Pride · Make it rain · Donér

Premium

Premium Gold · Premium Silver · Premium Rose Gold

Pro

Figure F.2: Lunar's Two Display Options Merged Together.



Budget

Forbrug

Hvad er det højeste, du vil bruge hver måned?

Maks forbrug	6.500,00 kr.

Kategorier

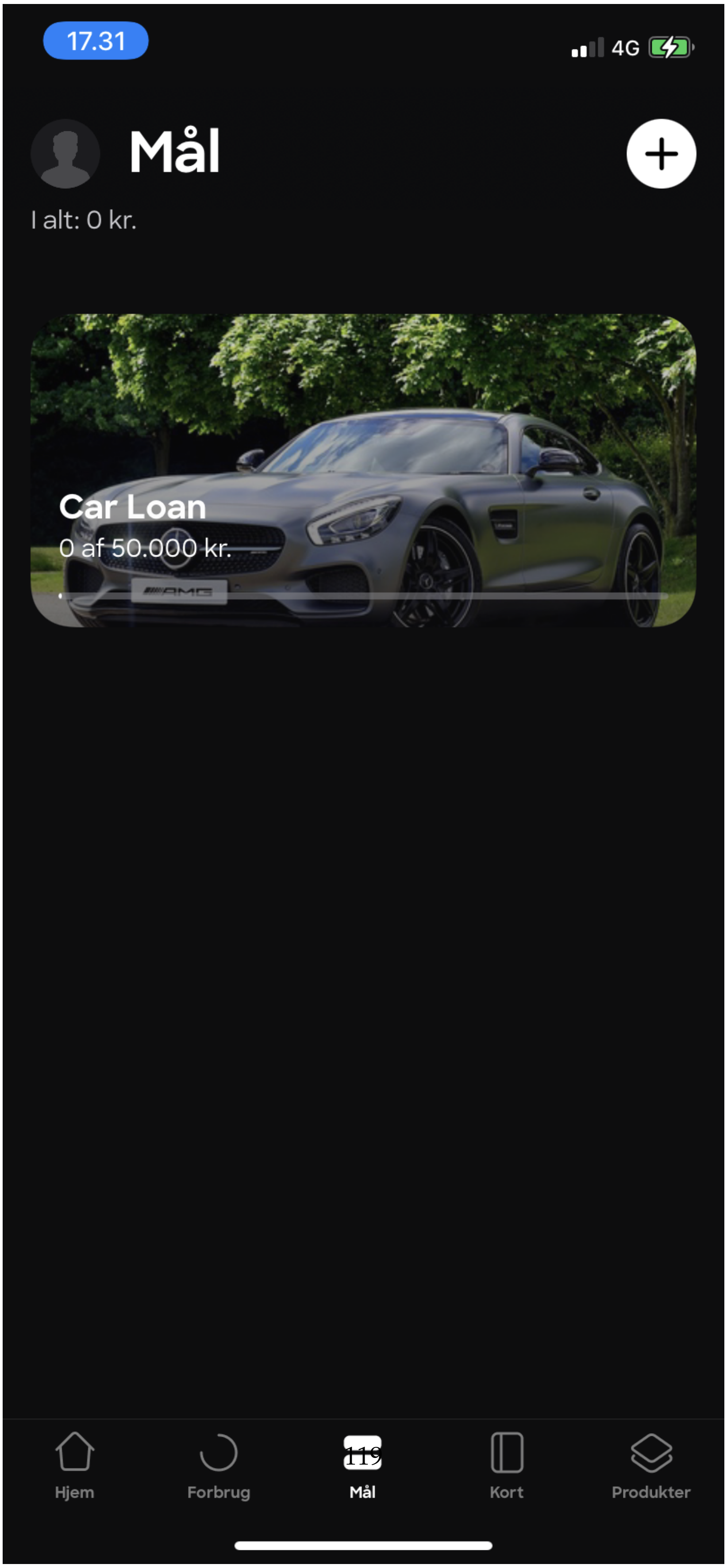
Indstil dine månedlige kategori-budgetter. Dit nuværende total kategori-budget 6.400,00.

Hjem	2.500,00 kr.
Lån	500,00 kr.
Dagligvarer	1.750,00 kr.
Velgørenhed	0,00 kr.
Personlig pleje	250,00 kr.
Mad og drikke	500,00 kr.
Transport	600,00 kr.

Budget

Transport	600,00 kr.
Underholdning	0,00 kr.
Shopping	0,00 kr.
Forsikring	300,00 kr.
Ferie	0,00 kr.
Investeringer	0,00 kr.
Børn	0,00 kr.
Kæledyr	0,00 kr.
Diverse	0,00 kr.
Ikke kategoriseret	0,00 kr.

Figure F.3: Lunar's Categories List Merged Together.



17.31

4G

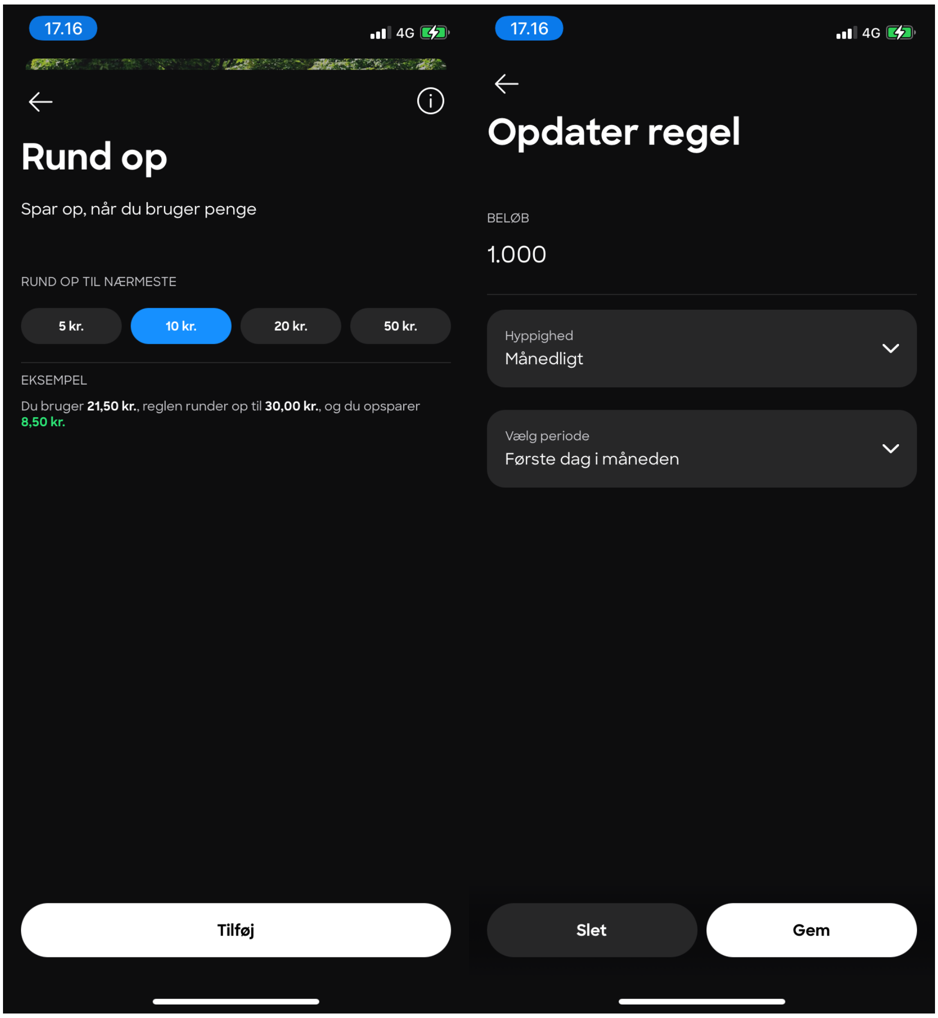
Mål

I alt: 0 kr.

Car Loan

0 af 50.000 kr.

Figure F.4: Lunar's Goal Overview.



Rund op

Spar op, når du bruger penge

RUND OP TIL NÆRMESTE

EKSEMPEL

Du bruger **21,50 kr.**, reglen runder op til **30,00 kr.**, og du opsparer **8,50 kr.**

Opdater regel

BELØB

1.000

Hyppighed
Månedligt

Vælg periode
Første dag i måneden

Figure F.5: Lunar's Two Goal Rules Merged Together.

Appendix G

Competitor / Product Analysis

G.0.1 Features

Mint

Mints offers the following features; all accounts in one place, bill payment tracker, budgeting goal tracker, free credit score, budget alerts, categorise bank transactions, investment tracker, safety & security. [56]

Mint has a resources section that links to a blog, where they offer educational and informational articles and suggestions about various different financial topics like; budgeting tips, credit tips, investing tips etc. Mint also offers a wide variety of calculators for financial calculations, like: retirement calculator, loan calculator, budgeting calculator etc. [56]

The all accounts in one place feature makes it possible to connect all of one's financial accounts in one place, be it a cash account, a loans account or anything in between, therefor as a result one's cash flow can can be tracked with ease. [44]

The bill payment tracker, creates a monthly overview regarding bill's and subscription, it informs the user when they are due, when hidden fees are detected or when fluctuation in pricing is detected. [48]

Budget and goal tracker with the use of different visual representation helps painting a clear picture on ones budget and goals, the user can create budget for the different categories upon which they will get notified when they are nearing their budget limits, this feature also gives recommendations on which categories spending's can be cut down. [49]

The free credit score, gives an report summary on one's credit score, offers information on how its calculated and also educational advice on it, and how it can be improved. [52]

The Budget alerts feature alerts the user when fees are being applied to transactions, budgets are exceeded, large or suspicious transactions are detected or when bill payments are closing in. [46]

Categorise bank transaction feature, provides the user with customizing categories as well as tags for easier transaction organization. The feature does it possible to split a single transaction in multiple categories in case the transaction consists of different types of consumer goods. [51]

An investment tracker feature that allows the user to link all theirs investments accounts like 401(k), mutual funds, brokerage account and IRAs, enabling to track all investments in one place and helps catching hidden fees.[53]

Safety and security feature, has a safeguard for the mobile app by either using a 4-digit-code or a Touch ID, if the device is lost or stolen all the information can be deleted remotely. A Multi-factory authentication (MFA) can also be enabled meaning login into one's account will require a code that is either sent to one's phone or email, as well as irregular MFA checks are made to make sure the account belongs to the rightful owner. [54]

GoodBudget

The features GoodBudget contains are the envelope method, educational classes, sync & share budgets, save for big expenses, pay off debt and graphs over spending [21]. Unlike applications as Mint and YNAB, GoodBudget do not offer the bank connection feature, but it does provide the option to import the users bank transactions.

The envelope method is principally making envelopes for each category; rent, food & drinks, groceries etc. After making the envelopes, the user put money up front in each envelope, to spend, from the account balance. *"It's a way to plan your spending instead of just tracking your spending"* [21].

The GoodBudget website offers a way to learn budgeting, no matter if the user is a beginner or intimate to budgeting. The learning is taught through courses, podcasts or articles, all made and provided by GoodBudget. As by the time the report is written, GoodBudget has four courses available to the users and they are called Budget Bootcamp, Budget With a Why, Break the Cycle and Crash Course [18].

The sync & share feature is making it possible for multiple users to access the same budget across all IPhone and Android devices. That makes it clear when, where and what is deducted for all users sharing the budget.

The feature saving for big expenses is a feature allowing the user to plan ahead months in advance and therefore, saving for bigger expenses. Big expense can be saving up for a vacation, payments for rent and payments for a car.

Pay off debt is a feature using debt accounts. Debt accounts are keeping progress of the debt and calculating when the user is debt-free. The progress of the debt is visual by a graph with a selected time period.

Graph over spending is the feature making the user able to see their spending in a selected time frame by a graph or pie chart. The different categories is colourised in the graph, so the user can gather an overview of their spending. There is eight types of graphs provided in the application to gain an overview over specific areas of the users finances. The types, observed inside the website, are named; spending by envelope, spending by payee, spending vs budget, spending by month, income vs spending, envelope balances, debt progress and budget allocation.

YNAB

The main features included in YNAB are educational classes about budgeting and finances [90], bank connection, real-time sync, goal tracking, loan calculator, spending and net worth reports, it's ad-free and uncluttered, smart categorisation and bank-grade security [94].

YNAB offers a variety of different workshop and classes on their website under "how to's". The "how to's" section contains knowledge about buying a car, buying a house, getting married etc. It also have free workshops nearly everyday through the website in the following categories: get started with YNAB, maintaining a budget, manage credit card and eliminate your debt and level up your savings [91].

The bank connection is a feature linking a bank account from numerous banks worldwide to YNAB, so the user do not need to enter every transaction manually. Though, an account can be made manually by creating an unlinked account.

The real-time sync feature allows the user to access their budget on all devices as a computer, mobile and tablet, where it always syncs in real-time and updates the budget automatically.

Goal tracking is a feature, that let the user prioritise their spending and savings. The user can set for goal for a specific goal, such as a new bed, where the user employ money into the selected goal from the original budget. The progress is represented by a status bar, that will light green if the goal is on track in terms of the goals deadline or orange if the founding is behind the deadline. Lastly, the user can see a percentage of how much the goal is founded.

YNAB has also the feature loan calculator. The feature is meant to create an overview over the users obtained loan or loans. The loan calculator gives an estimate of when a loan is payed off by having payoff date, monthly payments and the interest of the loan. The feature shows both the amount of money saved on interest savings and the time saved by a certain monthly payment.

By use of graphs and charts in different colours, the user can follow their spending and net worth from selected dates. The feature does, that the user can see example their average monthly spend on transportation, rent etc. The user can also see all of their spending in a pie-chart or graph spilt up by categories. The net worth feature works that the accounts with a negative red amount, from loan and such, is calculated against the positive blue account, thus providing the net worth. The user can also see their income vs expenses in list form and the net income is calculated at the bottom.

YNAB has three feature to aid their "Mission to Build a Better Budget" [94]. Those features are ad-free and uncluttered, smart categorisation and bank-grade security. YNAB is ad-free, meaning that there is no third party buying ad-spots on the website, making it uncluttered to use. The smart categorisation is basically machine learning, because the budget learns over time to make the users categorisation easier and more automatic. Lastly, the bank-grade security feature is making the website secure by using data encryption, 2FA (two-factor authentication by password and another form of identification) and data centers, which are accredited and recognised as secure.

The other and self-explanatory features are easy setup mode, split transactions, multiple budgets and unlimited one-on-one customer support. The last feature as for now is widgets, which is the ability to add a budget to the home screen of the users phone in small, medium or large sizes [94].

Toshl

The main features Toshl provides are bank connection & all accounts in one place, automatic categorization, advance budgeting & budgets graphical illustrations, currencies and safety. [81]

Toshl also has a blog where they post information regarding all previous and new upcoming updates [78],the blog contains different sections that carry diverse information, one of them being the "Tutorials & Manuals" section, in which with great detailed explanations the different functions of the application are described, as to what they offer and how they should be used [82].

The bank connection & all accounts in one place are features that offers linking of one or multiple account from over 14.000 different banks & financial services world wide to a singular place namely Toshl, resulting in tracking of multiple financial accounts to be effortlessly and swiftly. [76]

The automatic categorization feature, does categorization in two different ways; initial categorization and personalized categorization. The initial categorization analyzes transactions from the users linked account as to which category and tags suits the transaction best and automatically applies them to the transaction, and the personalized categorization comes in play when the user changes the initial category and tags, upon which the application learns and improves as to how it initially categorizes transaction of similar kind. [77]

Advance budgeting & budgets graphical illustrations feature, presents the possibility for the user to create budget that automatically track expenses with specific categories, tags or financial accounts. Furthermore the application offers enrichment of budgets by allowing to add a repeat frequency of budgets, if the remaining funds should be moved to next month and more. All of the monthly budgets are also included in the graphical illustrations River flow, Monthly overview and Planning graphs. [79]

The currencies feature, does so that the app supports 289 different traditional and crypto currencies altogether, where the user can freely switch up their main currency to one of the 289 currencies. The feature also offers accurate exchange rates of the 289 currencies that are updated every hour, which enables instant currency conversion of purchases made in foreign currencies to the main currency. [80]

Lastly a safety feature that makes the website more secure by encryption and tokenization of data, a two-factory authentication (2FA) can be enabled for additional account security. [76]

Lunar

In the other competitors section in 3.2, various banks were mentioned to be a competitor for the groups product. Since the start of the research, the group conducted a survey, where the results and sub-conclusion in 4.3.3 points to specifically aim the scope towards the bank app Lunar.

The reason why people have chosen this app, for their personal budget tracker, may lay in the applications features; free account and card, 0.5 percent positive interest up to 50.000 Kr., no underlying fees, budget overview of finances, save automatically up, shared account up to ten users, Apple Pay and Google Pay, investing in stocks, foundations, EFT's (Exchange Traded Funds) and crypto, loan up to 350.000 Kr., goal tracking and lastly, the pay later feature [34].

Since Lunar is not just a budget app but a whole bank, all the features is not relevant to present and analyse on the grounds of the topic for the groups product being develop a personal budget and expense tracker. Therefore, the elected features of Lunar are; budget overview of finances, save automatically up, shared account and goal tracking.

The feature budget overview of finances contains quite a few features, such as overview of the spending in the current or previous months and making a budget by prefixed categories and "other expenses". The overview of spending allows the user to see on one site the spending of categories or expenses, the users max spending calculated from the budget and the total amount of spending of the month. The user can make only one budget in the application, because it correlates directly to the current month and the spending of that month. The budget is build up by a max spending, where the user can allocate money. Then, the user can locate money in the prefixed categories; rent, loan, groceries, personal care, food & drinks, transport, entertainment, shopping, insurance, investing and more. When entering a amount into a category, there is a text at the top of categories, which displays the category-budgets total amount. The feature is not customisable, since there is not the ability to create multiple budgets, add the custom-named categories or modify the current categories by deleting then not used ones or change the names to a specific purpose.

The save up automatically and goal tracking feature is strictly related to each other. The savings account is located in the goal section of the application, where the user can add; said savings account, vacation savings, payment of debt or other. All the accounts have the same functions, it is just the names and pictures that differs. The save up automatically is split in two "rules" the user can apply on a goal account, like savings account. The first is round up and it does that all the transactions, made from the card connected to the account, are rounded up and the rest is placed into the savings account. The user can choose to round up to the nearest 5, 10, 20 or 50 Kr. The second rule is an automatic transfer, where the user choose an amount that should be transfer from the card to the savings account. The choices in this rule is the frequency of the transfer, which is daily, weekly, monthly, quarterly and yearly. The goal tracking feature is containing an overview of all the goal accounts with pictures of each account and a progress bar with the current amount placed in the account and the wanted amount shown at the accounts "front page". Again, these two features are quite customisable, since the user cannot pick a user defined amount to round up from or select their own time frame for automatic transfers into savings accounts.

The last relevant feature is shared account [35]. This feature allows the user to share an account with other users, where the transactions can be commented and add emojis on. Each transaction has the name of the user, that made the transaction. The feature presents the transactions to the users of the shared account with a pop-up message.

G.0.2 Design

Since some of the features mentioned in G.0.1 are premium features, the group cannot get the design of them all. Therefore, the focus will be directed on the designs of the available features.

Mint

The starting page of Mint's can be seen in figure B.1, which is the page that contains an overview over one's financials. The websites color pallet primarily consists of mostly white (background, logo, text), dark-grey (header bar), light-grey (navigation bar) and green/mint (logo, text). The overview web page is divided into two columns, the left columns contains all of the user's connected accounts and are shown under one of the following groups "Cash", "Credit Cards", "Loans", "Investments", "Property", as well as each of the accounts individual worth and the worth of the group as a whole. The right columns only contains overview over different things, like overview over upcoming bills, monthly spending's by the use of a line graph, monthly budgets using a progress bar etc. The top of the website consists of a header bar and a navigation bar underneath the header bar. On the header bar the following buttons can be accessed: "+Add Accounts", "Settings", "Profile", "Tour", "Log Out" and a notifications icon, and the navigation bar includes the following buttons "Overview", "Transactions", "Goals", "Credit Score", "Bills", "Budgets", "Trends", "Investments" and "Ways to save".

The all accounts in one place function, as the name states takes into account all of ones assets and all financials to create an overview in one place as seen on the left column in figure B.1, additionally it calculates ones net worth at the same time, and the data can be used in other functions. The user can add accounts by pressing the "+Add account" button from the header bar, then he is greeted with a window as seen on figure B.4, the user has three different options, either to link a bank account, add an offline bill or add a property. The link a bank account option, shows a variety of more popular banks the user can choose from, or else they can use the search bar to search for a specific bank, the user can then proceed by clicking on the bank where they are further prompted to allow a linkage by logging into the bank, this fetches all transactions from the past 90 days [45] To compensate for bill transactions that are not done online the user can choose the add offline bill option, here the user can define the name, category, frequency, due date and price of the bill. The last option add a property, offers the user to add assets they posses, the assets can range from real estate, vehicles all the way to jewellery, clothing and anything in between.

The bill payment tracker on figure B.5 is used to showcase all of ones bills. Online bills that are from ones bank account are automatically added whilst offline bills can be manually inserted either as mentioned previously trough the "+Add accounts" button or by using the "+Add a bill" button. The top contains information about the current months due bills expenses, available cash and available credit. On the right side via a calendar a monthly overview is used to show which day bills are due, depicted with an orange color, and the paid bills depicted with a green color. On the left a list over due bills is created, sorted by upcoming bill, and underneath a paid bills list is created, sorted by last paid bill.

The budgeting goal tracker function can be seen on figure B.6, budget categories are classed either as income or spending. Upon creation of a budget by the use of the "+ Create a budget" button, the user is prompted to choose one of the premade categories [51], amount of money they want to allocate, if it should repeat and the repeat frequency of it, and if it should carry over previous month's leftovers amount. Under the spending section the user can define categories and how much of a budget they allocate to each category, in the income section the user can allocate amount of money in total they expect to have available for spending. Both income and spending are only tracked via progress bars, as to the progress bars of spending are color coded, green meaning the user has more than 10% left of the budget, yellow means there is less than 10% of the budget, red means that the budget has been exceeded. Goals can also be created where the user can decide how much money they want to use towards the goal each month, where it is also possible to use the left over budgeting money and put them towards the goal. Furthermore every other spending category that doesn't have an allocated budget is grouped together and a grouped budget can be created if desired.

Mint presents an section called "Trends" shown on figure B.3, on the left side a list can be seen which contains different financial categories and the manner to be filtered in. To the right of the list a visual representation is displayed of the chosen financial category and filter, the figures are created over the current month only, above the figure the time period over the figure is shown, and an option where the user can alter the figure from a pie-chart to a bar-chart and vice-versa. More descriptive information is shown when the user hovers over a part of a figure, and also underneath the figure an overview is shown over transactions and its value.

Mint's mobile app-version is characterised by vibrant colours and a simple user friendly design for new-users, whilst the web-version design is a tad more complicated to new-users, but it also makes use of the same color pallet but with less intensity of the more vibrant colors. Mint uses a predetermined selection of charts and graphs to visualise numeral information. For example, a pie-charts are used to provide a visual representation for the user's monthly spending broken down into categories. Personal budgets are also expressed via progress bars, which are some examples of their visual representations.

GoodBudget

The GoodBudget starts at its homepage, seen in figure C.1. It is made of the colour scheme green (in the logo, heading and progress bars), light blue (in the background), purple (primarily at the functions; fill envelope and add transaction) and a mix of white and grey for the rest of the page. The website is divided into two widgets; overview of envelopes, on the left side, and accounts and overview over transactions, on the right side. The progress bars at the widget on the left turn green when the envelope has been filled with an amount of money, and it will turn gray again after all of the money in the envelope has been spent. At the top of the page, the menu bar is found with Home, Reports, Help and Learn.

GoodBudget is using the envelope method, as mentioned in G.0.1, which is displayed in C.2. The design shows three steps; fill envelope from income account, fill the envelopes and review the changes in the budget and save it. In the first step, the website needs to know which account the user wishes to fill an envelope and how much is the amount. In the second step, the user has the ability to add and set money into the different envelopes, where the progress bar will respond according to the amount being entered. It has a function, when selecting how much money should go into an envelope, where it suggest the total amount needed to fill the envelope. On the right side of the progress bar, there is the total amount and the amount entered into the envelope stated in respectively black and grey. Lastly, the third step is the overview of the income account vs the money allocated in the envelopes. It will show the rest amount in red if the envelopes is greater than the income and if vise versa it will show green.

In the sync and share feature, the design shows the share feature by the ability to write the person, that clears a specific transaction. This is both seen in figure C.1, in the overview of transactions, and in figure C.3, in the Payee text field. The application is synced in all devices, G.0.1, and multiple people, in for example an household, can edit and make transactions. When a specific person makes transactions in an envelope, it shows the name and it will be displayed in the graph in figure C.6. This gives an overview of who of the users spends money from which envelope in the shared budget at what given time. Lastly in the design, the user can also make transactions by transferring, stating income and debt transactions.

The save for big expense feature is shown the website's design by the goal function. In figure C.4 is an example of a goal. When adding a new envelope, the choices for the user for setting the regularly of the payments; 2 months, 3 months, 6 months, annual and goal. The goal is about to save up for a new IPhone, which costs 1.000 dollars. The user sets the length of the goal to 2 months with the a monthly payment of 500 dollars. The design is made, so the user can edit the goal later if the finance situation changes etc.

The debt progress feature allows the user the enter a loan of some sort its interest, due date and total amount. When the previous parameters are entered, the website calculates the minimum monthly payment and it calculates the new due date when the user raises the monthly payments. There is an example in figure C.5 on how the design of the debt feature is implemented. The example shows the graph on a personal loan of 2.500 dollars with a due date in may 2024. The orange straight line close to the y-axis is representing the actually amount of money the loan is on the current date. The descending black line is representing the expected loan in total after the scheduled payments each month has been paid. The design allow the user to choose a selected time frame for the debt and which debt accounts should be shown in the graph.

The web application has various graph displaying different reports, mentioned in G.0.1.

The first graph is spending by payee in figure C.6. It is showing the same time period as the other examples and gives an overview of a selected envelope and account or all envelope and accounts. The chart shows how much each payee has spent in percentage and amount. For example, Niels has spent 600 dollars or 71 percent of the spending. There is three payees in this budget; Siri, Jette and Niels with the respective colours; light green, yellow and dark green. The bottom of the screen shows, in a list form; the payees, how many transactions each payee have had, the amount of money each payee has spent and how much of the spending the payee has spent in percentage. The previous sentence exhibits why the spending by payee feature is a way to visualise the shared feature in G.0.1, where multiple users have access to the same budget and they can keep track of each others spending.

In figure C.7, the design differentiates from the previous graphs. The income vs spending is displayed as a stacked bar chart. The green bar is the income, the red bar is expenses and the black line is the cash flow. In the example in the graph the cash flow goes from zero to 1.700 dollars in a month, where the green is the same amount as cash flow and the expense is -850 dollars. Even though the graph is different from the other graphs mentioned, the time frame, refresh and background design is exactly the same.

Again, the graph in C.8 is showing a different graph with the same design template for the other widgets on the website. The graph is a stacked area chart with properties groceries, gas, rent, fun and debt payment in this particular example. The different categories are colour coded in the graph and stacked on top each other, so it is clear to the user how much of each envelope fill in the total spending by months. At the bottom of the screen, there is the overview of the envelopes and the amount of money from the selected months.

The last graph on the GoodBudget website, in figure C.9 is an overview of the envelopes balances. It is a stack area graph with a beginning in zero on the y-axis. The graph displays the current balance of each envelope, when hovering the mouse over a chosen colour. The user can see that their income account is less than zero, because the blue, unallocated envelope, is in minus. It is also shown to the user how big the envelopes balance is compared to the other envelopes, thus helping with knowing how much of the allocated is left for the rest of the month.

YNAB

YNAB's design from the start page is displayed in figure D.2 and it uses a dark navy colour on the navigation bar to the left to contrast the white and gray in the budget section. It has a green section with the balance of money, that would turn red if negative.

The website also allows the user to choose between different display options, such as "default", "dark" and "basic", which all provides different colour schemes. The progress bar is customisable because the user can choose to remove or keep it on the dashboard. The design is visible in figure D.3.

The feature bank connection is implemented by the design showed in figure D.4. The website allows the user to create an unlinked account by not using bank connection and this is done manually. Bank connection is designed such as the user searches for their bank and then enter the information for the account and then all transaction from the users is employed in the budget list, shown at figure D.2, automatically.

The goal tracking feature is designed by figure D.5 where an example is demonstrated. The example shows a goal for a new phone and car payments. There has been set monthly payment of 250 Kr. for reaching the goal of buying the phone. The progress bar has the orange, because the target/goal has not been met yet, 80 percent of the goal is founded. The progress is green at the electric category by allocating the full amount of money for the bill. It turns light green, when the money has been spent. Lastly, it turns red when more money than assigned has been spent as seen in the groceries post.

The design of the loan calculator is divided into several different widget in the same colour scheme as the start page D.2. In figure D.6 is there an example. First, the page has a top-bar containing the information about the current balance of the loan. Then, the page has a calculator on the left, where the monthly payments and due date is placed. In the middle at the top is the overview of interest remaining and time remaining. Under that widget is more in-depth details about the loan and payments. Lastly, there is a widget on the right side filled with the account details about the loan.

The net worth and spending reports feature is displayed in figure D.7 and D.8. The pie chart is a total of the spending of a month using categories in different colours to visualise the amount of spent money in each post. In the middle of the chart, there is the total amount of money spent shown in dollars. The user can hover the mouse over the different categories to see what the category is called and how much money has been spent of the total amount.

The net worth is visualised by a graph with the colours blue and red, as mentioned in G.0.1, where the red represents the debt of the user and the blue represents the assets.

By those calculations, the graph can show the net worth in a bar graph. The left side of the page is displaying the total change in net worth in dollars and percentage from a selected period, in this example from Jun 2021 to Dec 2021. There is also a list showing the net worth per month and there is an green arrow if the change in net worth from the previous month is positive.

The widget feature is the feature making it possible for users to add their budget to their home screen. Even though the group focuses on the website aspect of YNAB, the feature widget is a part of what YNAB provides to its customers. Therefore, it is valid to explain how the feature operates. Thus, can the widget be displayed in small widgets as shown on the top of the screen in figure D.9, medium widget, also seen in D.9, and a larger widget. The design of the widgets is, there are an heading with the name of the category in black. Beside or under the heading is the amount money of the category in a green bobble and the widgets have a white background.

Toshl

The starting page of Toshl can be seen in figure E.1, which is the monthly overview page, on the left side a navigation bar can be seen consisting of black and dark grey colors, a light cream color is used for the background, it heavily relies make use of complementary colors in the spectrum of its logo color ruby in most of its visual representations. To the right side of the page an overview can be see over monthly financials either by date or category, and a add a transaction button in the bottom. In the center the user can receive notifications, and there is a visual representation over monthly transactions, and in the top the user can freely change the time period of the overview.
The design of add a bank account function can be seen in figure E.5, the user is greeted with popular banks in their region which they can chose from or else they can use the search function and search for their bank. Upon selecting a bank they are prompted to allowing linkage between their bank account and the website by logging into the bank, and thus the website can retrieve transactions.
Manual insertion of expenses can be done trough the UI-design seen in figure E.7, the following fields must be filled, the expense amount, category, tags and date, whilst the expenses entry can be further enriched by filling the optional fields: location, description, repeat frequency, reminders and image attachments.
The advance budgeting feature is displayed in figure E.4, the following options are offered upon creation of a budget, should it track expenses in specific category or tags, which account should it track these expenses on, repeat frequency, amount of budgeted money, if remaining funds should be moved to next period and a budget description.
Under the budgeting section the user can see a monthly bar graph over their daily expenses, an annual bar graph over their monthly budgets and an overview over all their budgets on the right section, displayed in figure E.6. The monthly bar graph shows the user how much they've spent each day represented by the height of the bars, and by hovering on a bar an exact amount of money is show, an average amount of spending per day is also shown, and lastly the blue overlay shows the left over amount of money.
The website also offers expense and income visual illustrations, expense visual illustrations are displayed in figure E.3. The website introduces a pie chart and a bubble chart. The total spending amount of the month or a user defined period is displayed via a pie chart, where the various different colors represent the different categories, by selecting categories further information is display regarding those selected categories underneath the pie chart. The bubble chart displays all the tags of the selected expense categories in the pie chart, the size of the bubble proportionally represent the spending amounts of the tags, and likewise with¨the pie chart selecting tags will display further information underneath the bubble chart.
Lastly the appearance (color scheme) of the website can be changed between *"Light"*, *"Automatic"* or *"Dark"*, this appearance options can be seen in figure E.2.

Lunar

Lunar is an app for mobiles, therefore, the group may get some ideas for the design of the product, but it does not correlates to the topic of the project.
The figure in F.1, shows the overview of the spending budget. The page is divided into two sections with the background of both sections being black, or white if chosen the light display option. At the top, the total spending of the month is displayed in a pie-chart of various colours blending into each other. Inside the chart, the total amount is placed, like 9.447 Kr. is in the example in the figure F.1. In the second section of the screen is the list of categories and how much there has been spent in each category in the current month. The categories has a progress bar placed around its circular logo in the same colour as the category. Under the name of a category, the amount of money left is stated with the total amount of the category. In the middle of the screen is the option to see all transactions, with the most recent ones at the top, mixed together and outside of the filtered categories. Each category or place of transactions has a logo, like a house logo to home/rent or Starbucks's and McDonald's logo.
Continuing with Lunar's overview, the application offers various display options shown in the figure F.2. This makes Lunar quite customisable, explained in the following lines. The application allows the user to pick between dark and light mode. The changes are primarily in the background and profile logo, where it goes from black to white. The app provides also the ability for the user to chose between various, though some are locked because of the subscription plan not being high enough, icon for the users home screen of their phone.
When the user is composing their budget, they are sent to the screen shown in figure F.3. The figure displays the whole length of the screen of the feature. This feature is divided into two widgets; max spending and spending all categories. Mentioned in G.0.1, the application does not allow the user to add, rename or change the categories. The first section of the screen has a heading named "Forbrug", which is spending in English. Under the heading is the max spending category placed with the amount of money written to the right of it. Here, can the user choose the total amount of money to have as the max spending of the month. The second part of the screen is the categories in a list form and share the same design as the first section. The categories have each their own colour and logo, for example has the loan category the colour orange and a moneybag as logo. The design continues up to and including the last category "not categorised", where spending that cannot be placed in any of the prefixed categories are put. When the user inserts money into the categories, the application calculates the total of spending. The total of spending will be displayed for the user in white text, where the total amount of money is written in blue so it differs from the text, under the heading of the second section.
Lunar's last feature is the goal feature, and it contains two rules/functions. The overview of the users goal or goals are displayed in figure F.4. It has the button in the top right corner to create new goals. In the top left corner, it shows the total amount of money, that has been put into the users goals. The goals are accounts and they are placed in a

scrollable list. In the figure F.4, there is only one goal made. The goal is user named and the target of money is also user defined. The user picks a picture for nicer display in the application with a progress bar through the whole width of the bottom of the picture. The goal has the title, how much money is located in the goal and the target amount of the goal, written over the progress bar to the left in the picture.

The user has the ability to select two different kind of rules to the goal. The design for the rules is shown in figure F.5. The first rule is the picture on the left and is named round up. The user can pick between the four options of how much the rule should round up from the users transactions. The buttons are placed on line with rounded corners. When selected a button, it will turn blue and the example text under the buttons will change accordingly. The example text is written in gray with the rules explained by using numbers, which are written in white, and the money expected to be put into the goal written in green. That catches the users eye and makes it easy to know where to focus on the the important information about the benefits of the rule. The design ends with a big white button at the bottom of the screen to add the rule to the goal. The second screen displays the save up automatically feature, also mentioned in G.0.1. The design of this feature starts with the big heading again and under it, there is the wished amount of money to be automatically transferred to this goal. In figure F.5, the user has selected to transfer 1.000 Kr. monthly, by, in the first drop down box under the selected amount, picking the monthly option. In the second drop down box, the user picks the first day of each month to be the day the money transfers to the goal. Continuing the design of the first rule, at the bottom of the screen there is placed two buttons. The button on the left is black and cancels the rule, and the button on the right is white and saves the rule. By the button to cancel being black, and therefore blending in with the design, makes the user not focus on that. Instead the user focus on the white button, which sticks out from the design, and makes the application more user-friendly.

Appendix H

Customer Review - The Reviews

H.0.1 Mint

Mint App-store review 1:
"Using for years and love it"
Hi there - I have been using this app for budgeting and keeping track of my credit score for a couple or few years now.
...
*Also, when I get frustrated and just want a break from tracking finances this app is still in the background so when I come back to it I can hop right in and get a relatively accurate picture of my month or 2 I didn't actively use it. There are ads, of course, and the syncing isn't always *perfect* and has to be manually refreshed- but for a free app, I seriously have 0 complaints! Kudos to the Mint developers team. Keep up the good work.*
..."
- Written by Mere67193, 13/05/2020, 5 stars out of 5 [43].

Mint App-store review 2:
"Has potential but not quite there
This app definitely does what I wanted it to. However there are a few things that make it very hard to use. First the UX is way off for the tabs, the common actions from the overview tab should be spread out into the other tabs because I see myself only using this one tab 95% of the time and scrolling up and down for the common actions is a pain. Maybe add a side menu to make it much easier to select these. Second, it feels like it's lacking the historical overview and analysis that I want with an app like this. I can add a budget for the current month for something new like bills but this new budget does not get applied to the previous month so I'm unable to see it. This budget should also allow a view to see your trends on it. Another pain is the [Month] Spending section. I can't view previous months only the current one and when a new month comes You are stuck to only seeing those couple days of transactions. This is very troubling given that the graphs and info provided in this section are very well made yet under utilized.
...
- Written by Booookkkksss, 02/10/2020, 3 stars out of 5 [8].

Mint Play-store review 1:
Props to the dev team. This app is seriously well-made. Smooth, fluid, responsive, and intuitive. It's extremely useful to have all of my financial information in one place. No more logging in to multiple apps on multiple platforms. I can do almost everything from here. Really love it.

- Written by Timothy Boulanger, 03/03/2022, 5 stars out of 5 [9].

Mint Play-store review 2:
Extremely unintuitive. I'd like to be able to track bills, but I am unable to manually enter amounts and due dates. It tries its best to pull them automatically but out of a dozen bills it only shows 3, 2 of which were not recurring payments. Give me a calendar, give me the ability to select a date on that calendar, and give me the ability to manually enter the amount and institution that the bill is for.
- Written by Javaris Jamar Javarison-Lamar, 14/02/2022, 2 stars out of 5 [29].

GoodBudget

GoodBudget App-store review 1:
"Needs a couple features, but great app!
I've been using this for five months now, and this is the best app for a digital version of the old cash envelope system, a la Dave Ramsey. It's great because some budget categories get spent completely every month to a zero balance, whereas other categories may accumulate over time, like savings, and this app accounts for these growing "envelope" balances - something that every budgeting app I've tried lacked.
...
WHAT IS LACKING: There needs to be a RECONCILE feature in the app for when you need to compare what's in Goodbudget versus your bank or credit card statements - like a checkbox next to each transaction in the transaction list. It's frustrating sometimes to try and make sure you've got everything entered but have no way to mark what you've already verified. Ugh! Also, there needs to be a SEARCH feature in the app to search for specific transactions."
- Written by Tricksterinator, 01/23/2019, 5 stars out of 5 [84].

GoodBudget App-store review 2:
"A great App but needs a little improvement
Goodbudget is an amazing app that helps with budgeting. It does what it is supposed to and can help everyone to understand how to budget well and effectively. Goodbudget has graphs that are easy and simple to understand.
...
However, this app isn't perfect just like everything. One negative about this app is that there is a paywall to get all the features and it can be tricking when first starting. The videos created are also a bit of a problem because they show that the app is very complex and can't be fully used if not watched. Personally, one thing that bothered me was I needed to pay for an app about budgeting which I think is silly."
- Written by Thadsdad42, 03/11/2021, 4 stars out of 5 [70]

GoodBudget Play-store review 1:
"Super tool

Nothing more to say and the free edition is more than enough !"
- Written by Simon Kröger kronmose, 31/01/2013, 5 stars out of 5 [32]

GoodBudget Play-store review 2:
"Very good"
Works great with 2 Users. Would like to see a "counter entry" function so you could indicate whether you used cash or debit card - but then we're over in the gourmet department." (translated from danish by deepl.com/translate)
- Written by A Google user, 17/11/2012, 4 stars out of 5 [85]

YNAB

YNAB App-store review 1:
"Excellent cash flow management tool
Most budget programs are set it and forget it. Which is the problem: once you set it, you forget it and you drift away from your spending plan. The beauty of YNAB is that it is flexible and dynamic, and allows you to adjust your spending plan as you need to. I found the program itself is well designed, reliable, and easy to use. The only issues I've had were with banks making it hard to set up connectivity."
- Written by CatherineB58, 29/10/2021, 5 stars out of 5 [11].

YNAB App-store review 2:
"Love YNAB....one request
I really love YNAB! It has helped us tremendously with our budget and is easy to use. For me, the app is a bit smoother and simpler to use than the website. Here is my conundrum: We use a small town bank that does not have direct download, so we have to manually download our transactions."
- Written by rp.xray, 06/04/2020, 4 stars out of 5 [67].

YNAB Play-store review 1:
"I have loooooved YNAB since 2010 and now they have finally increased my subscription from 5$ to $14.99... That is an insane amount for what is essentially a glorified spreadsheet. They are a great company, dont get me wrong, and the app is great, but there are plenty of alternatives at cheaper price point."
- Written by Bjørn Søvad, 02/02/2022, 2 stars out of 5 [69].

YNAB Play-store review 2:
"YNAB is the ultimate budgeting app. My savings have gone up and up since I started to use it - it's easy to use, the location function for payees is great and makes entering expenses easy, and it's great to see your bank account grow with just a little bit of help :)"
- Written by Thomas Jonstrup Thomsen, 17/02/2020, 5 stars out of 5 [74].

Toshl

Toshl App-store review 1:
"My Favorite Budget App
"I've tried a huge variety of budget apps, but finally settled on Toshl. To me the biggest thing is easy of use and being able to customize budget periods. Toshl is one of the few apps that allows more unusual time periods for budgets like every two weeks along with rollover for the amount that's left. This is huge for me when it comes to budgets for personal spending and skin care. It makes it much easier to visualize the amount of money that is left in each period. I highly recommend it!"
- Written by Koneko215, 11/01/2020, 5 stars out of 5 [31].

Toshl Play-store review 1:
"App is great and all, I wish it had an option of linking two or more accounts together to track couple/group spending from joint accounts.."
- Written by Maan Mohammad, 19/12/2019, 4 stars out of 5 [57].

Toshl Play-store review 2:
"The best thing is that everything is finally under control... Great design and surprisingly easy to use :-)" (translated from danish by deepl.com/translate)
- Written by Sofie Møller, 30/5/2013, 5 stars out of 5 [62].

Lunar

Lunar App-store review 1:
"Works flawlessly!
Absolutely perfect and user-friendly app! The bank & app is definitely a must for all young people!" (translated from danish by deepl.com/translate)
- Written by Mcerlækker, 19/09/2017, 5 stars out of 5 [42].

Lunar Play-store review 1:
"I think it's a good app, know friends who use it. It said they need a passport or driver's license. But then they need last 3 months salary, account statement and tax information. Just got too demanding to just create account." (translated from danish by deepl.com/translate)
- Written by Cyllionz One, 21/02/2022, 3 stars out of 5 [64].

Lunar Play-store review 2:
"Easy to find out. Works as it should." (translated from danish by deepl.com/translate)
- Written by Tania Nygaard, 15/02/2022, 5 stars out of 5 [63].

Lunar Play-store review 3:
"Functional, intuitive, fast and a great design. The app alone is reason enough to be a Lunar customer. In short IT WORKS" (translated from danish by deepl.com/translate)

- Written by Aksel Maack, 01/02/2022, 5 stars out of 5 [38].

Appendix I

Customer Review - Analysis

Mint

The customer reviews of Mint on the App-store are overall overwhelmingly positive with 4.8 start out of 5 with around 726.2 thousand reviews, majority of the review ratings consisting of very positive (5 starts), positive (4 stars), some neutral (3 stars) and a few very negative (1 star). [50]
The costumer reviews on the Play-store are up to a certain extent spread out amongst all rating levels just like the review distribution of the App-store, however the reviews are overall slightly more negative with 4.5 starts out of 5 with around 199.5 thousand reviews [55]. All the referred reviews can be read in the Appendix H.

According to the Mint customer reviews seen in the appendix, one of Mint's best qualities regarding the application is the sync and automation of bank transactions feature, which is probably the most vital feature that both characterizes Mint and some of the other features rely on it. A similar statement can be seen in the first App-store review: *using for years and love it.*[43].The reviewer describes that this feature enables them to have a passive approach to the app usage. However throughout the customer reviews there is a considerable amount of criticism towards specifically this sync and automation feature, this criticism can be seen in the first App-store review: *"and the syncing isn't always *perfect* and has to be manually refreshed"* [43]. A similar statement can also be seen in the second Play-store review, which states: *"but I am unable to manually enter amounts and due dates. It tries its best to pull them automatically but out of a dozen bills it only shows 3, 2 of which were not recurring payments."* [29].
Additionally in the second Play-store review, the reviewer expresses a desire to be able to manually enter the amount, date and institution for their bills, since they've experienced a great deal of issues with the sync and automation of bank transactions. *"I'd like to be able to track bills, but I am unable to manually enter amounts and due date"..."Give me a calendar, give me the ability to select a date on that calendar, and give me the ability to manually enter the amount and institution that the bill is for"*[29]. This reviewer has also rated the Mint application 2 out of 5 stars on the Play-store site, since they've experiences these issues with the application.

The second App-store reviewer: *Has potential but not quite there* has a couple point of criticism towards the Mint application. Firstly the reviewer states that the design of the navigation bar (described in chapter G.0.2) is outdated and that it needs to be updated in form of a side panel, this design recommendation can be seen across other competitors

like Toshl and YNAB, they state: *"First the UX is way off for the tabs, the common actions from the overview tab should be spread out into the other tabs because I see myself only using this one tab 95% of the time and scrolling up and down for the common actions is a pain. Maybe add a side menu to make it much easier to select these"*[8]. Secondly the reviewer criticized Mint for a lacks of historical view and analysis, the reviewer desires to the budgets from past months or just be able to access them (described in chapter G.0.2). The user description of the graphs in the Trends section as the following *"The graps and info provided this section are very well made yet under utilized"*, the graphs would be a good quality to have if they were utilized to their full potential, currently they are still usable though they are half-baked.
All of the previously mentioned flaws except the visual representation of budgets have been tackled and are already resolved in the beta-website of Mint. [47]

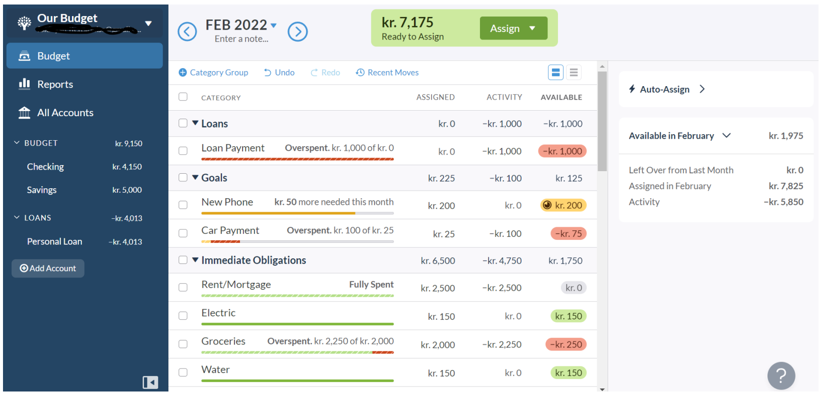
GoodBudget

The reviews for GoodBudget is fairly good, but with some comments on lack of certain features and room for improvement. The customer reviews and ratings on App Store resulted in a 4.7 out of 5 stars with approximately 12.7 thousand reviews [2].
The customer reviews from Play Store is also placed in the higher end of the scale, though a few decimal points in average lower than App Store. The rating of the application is 4.4 stars out of 5 and exactly 19.065 customer reviews [22]. The reviews from Play Store is quite a lot older than the App Store, so the group can argue that the reviews from App Store weights higher. It is due to the application have had several new releases and bug fixes in the term of nine and ten years. All the referred reviews can be read in the Appendix G.

According to the GoodBudget reviews seen above, the GoodBudget application has some good quality features which the customers seem to enjoy. One of them is the experienced great quality within abilities of the envelope system. The first App-Store review: *needs a couple of features, but great*[84], states this: *"...best app for a digital version of the old cash envelope system" (...) "It's great because some budget categories get spent completely every month to a zero balance..."*[84]. Another positive statement regarding the GoodBudget app can be seen in the second App-store review : *A great App but needs a little improvement* [70]: *"It does what it is supposed to and can help everyone to understand how to budget well and effectively. Goodbudget has graphs that are easy and simple to understand."* [70]. This reviewer expresses their appreciation and likeness of the graphs feature, they also express from their own experience that this app effectively helps creating an understanding of budgeting. Furthermore the same reviewer has one negative criticism of the GoodBudget application, that it is required to monthly pay for access to all features: *"One negative about this app is that there is a paywall to get all the features and it can be tricking when first starting." (...) "Personally, one thing that bothered me was I needed to pay for an app about budgeting which I think is silly"* [70]. However the first play-store review *Super tool* [32] contradicts the previous statement by approving of the free edition of the application, the reviewer states: *"Nothing more to* *say and the free edition is more than enough"* [32], but it is important to notice the difference of the dates these two reviews where written. *"Nothing more to say and the free edition is more than enough"* [32] was written 6 years prior to the review *A great App but needs a little improvement* [70]. A lot could have changed in relation to which features has been available in the free edition. In the second Play-store review *Very good* [85], they express a desire for a editable function which indicates if a payment was by cash or debit card, the state as followed: *"Would like to see a "counter entry" function so you could indicate whether you used cash or debit card - but then we're over in the gourmet department"* [85]. However this review was made in 2012 and after further inspection, it can be concluded that this function has been added to the application.

YNAB

YNAB's customer reviews is a combination of very good reviews (5 stars) and very bad review (1 stars). On the App Store is the average rating of the application 4.8 stars out of 5 with around 37.8 thousand reviews [5]. This indicates, that the users are happy with the app, the price and its features.
On the Play Store, the application has gotten worse ratings with less reviews than App Store. The rating is 3.7 stars of 5 with 8.319 reviews [25]. All the referred reviews can be read in the Appendix H.



BUDGET	kr. 9,150
Checking	kr. 4,150
Savings	kr. 5,000
LOANS	-kr. 4,013
Personal Loan	-kr. 4,013

kr. 7,175
Ready to Assign
Assign

CATEGORY		ASSIGNED	ACTIVITY	AVAILABLE
▼ Loans		kr. 0	-kr. 1,000	-kr. 1,000
Loan Payment	**Overspent.** kr. 1,000 of kr. 0	kr. 0	-kr. 1,000	-kr. 1,000
▼ Goals		kr. 225	-kr. 100	kr. 125
New Phone	**kr. 50** more needed this month	kr. 200	kr. 0	kr. 200
Car Payment	**Overspent.** kr. 100 of kr. 25	kr. 25	-kr. 100	-kr. 75
▼ Immediate Obligations		kr. 6,500	-kr. 4,750	kr. 1,750
Rent/Mortgage	**Fully Spent**	kr. 2,500	-kr. 2,500	kr. 0
Electric		kr. 150	kr. 0	kr. 150
Groceries	**Overspent.** kr. 2,250 of kr. 2,000	kr. 2,000	-kr. 2,250	-kr. 250
Water		kr. 150	kr. 0	kr. 150

Available in February	kr. 1,975
Left Over from Last Month	kr. 0
Assigned in February	kr. 7,825
Activity	-kr. 5,850

Figure I.1: YNAB Start page.

The chosen customer reviews regarding the YNAB application which you can see the start page of in figure I.1, are overall very positive with only a few issues. The YNAB application is mostly described throughout the reviews as easy to use, well designed, reliable ect. Some of these positive statements can be seen in the first Customer review[11] and the fourth[74]. The main issue commented is there are some issues connecting the YNAB application to the reviewers bank, these comments can be seen in both App-store reviews, it is firstly stated in the *Excellent cash flow management* review: *"The only issues I've had were with banks making it hard to set up connectivity"* [11]. Secondly a somewhat similar

statement is made in the *Love YNAB... one request* review: *"We use a small town bank that does not have direct download, so we have to manually download our transactions"* [67]. However this reviewer expresses their issue is the YNAB doesn't recognize their "small town bank" and therefore they have to manually download their transactions. Another comment from the reviews regarding YNAB is a though about the price: *"the app is great, but there are plenty of alternatives at cheaper price point"*. This statement is true when looking at other competitors throughout the market.
Thus, the application is concluded from the customer reviews to be a high quality and useful application, which the group can draw some similarities to when designing the product later in the report.

Toshl

Toshl's user reviews are quite good with a high number of five stars reviews, and a low number of one star reviews. On the App Store the application has an average score of 4,7 out of 5, with 1.6 thousand reviews. Which would imply that most of the users are satisfied with the application performance [4].
There are also looked at and taken some reviews from the play store, here Toshl has an averagely score of 4.4 out of 5, with 30 thousand reviews, the highest proportion of reviews where 5 star but still with a large sum of 1 star reviews [24]. Here Toshl has 28 thousand more reviews than on the App Store but it has 0,3 less star. All the referred reviews can be read in the Appendix H.

The majority of the reviews, especially on Play-store are mainly very positive with a couple of comments, an example of this can be seen in the second Play-store review [62]. where the app is describes as *"Great design and surprisingly easy to use"* [62]. In the first Play-store review [57] the app is described as "great" but the reviewer desires an option to link multiple accounts together that spend from a joint account. In the App-store review [31]. Toshl is praised for their budgets ability and flexibility so they do not need to follow normal time settings. *"Toshl is one of the few apps that allows more unusual time periods for budgets like every two weeks along with rollover for the amount that's left"*[31]. Furthermore this reviewer also expresses the easiness of the app and their visualization of the amount of money left in each period.

Lunar

Compared to the other software viewed in the analysis, Lunar has a slightly worse rating on the customer review sites. Lunar's rating on App Store is 4.5 stars out of 5 with the number of reviews being around 7.2 thousand [3].
There was found three relevant reviews on the Play Store. The application has here a rating of 3.8 stars out of 5, which is almost 1 whole star lower than on App Store, and 7.069 reviews by this current time of the report [23]. All the referred reviews can be read in the

Appendix H.

Overall the reviews of Lunar are very positive, the users of the bank and app seems to find it easy and great. Examples of this can be seems in the second Lunar Play-store review, which states: *"Easy to find out. Works as it should"* [64] or in the third Lunar Play-store review, which states: *"functional, intuitive, fast and a great design. The app alone is reason enough to be a Lunar customer. In short IT WORKS"* [38].As states previous throughout this project, the problem statement states, that the target group for this project is danish students. The first App-store review *Works flawlessly*[42] states *"The bank and app is definitely a must for all young people!"* [42]. This indicates Lunar has successfully aimed for the young target by its design and features. By that conclusion, the app can be a great instance to draw some qualities features from and differentiate them to the group's product. One of the lesser reviews of Lunar, which is the first Lunar Play-store review, expresses they had a lot of difficulty creating an account because it was to "demanding", it is states: *"It said they need a passport or driver's license. But then they need last 3 months salary, account statement and tax information. Just got too demanding to just create account"* [64].

Appendix J

Moscow

J.0.1 Must have

Personal profile and database based on profiles (with demo profiles) - (FR)

- On the welcome page a username can be entered. If it exists in the database, the user is logged in and rerouted to their home page. Most other functions rely upon modifying or accessing this database. It is in our best interest to start with this.

Adding transactions - (FR)

- Add button opens form. In this form, a category must be chosen, and price must be inputted. Further specify a purchase (optional). A date of "today" is automatically selected, but user has the option to change it. A completely custom label can also be given to the transaction, fx "Netto Food", or "Cheeseburger".

Adding income (extension to transactions) - (FR)

- Add button opens form, a price and label must be inputted. A date of "today" is automatically selected, but user has the option to change it.

Transaction history - (FR)

- Survey: 19/24. A list of all of the user's transactions from latest to earliest. All expenses in a month/or custom time period shown in a list form, further developed to be categorized; some premade topics (food, subscriptions, rent, fun-money, transportation etc.), and eventually user-defined when adding a purchase.

Editing / deleting transactions and income - (FR)

- Placed on a transaction history page. A list of all transactions, with edit and delete button next to each line. When clicking edit, a form should show up (same as adding), with all previous information written in, so user can change what they want to without changing everything. Deleting is done with a button next to edit + popup before deleting.

Selecting a pre-defined category for a transaction - (FR)

- When opening the transaction form. a category must be chosen, and transactions are stored according to these.

Creating a budget - (FR)

- Survey: 16/24. 1. input of income. 2. input of limits on expenses/categories. 3. output list of categories and limits & remaining money (savings). On the budget-page, total expense and total use of money are shown (monthly). For each category the used amount and planned amount are shown.

Savings account/category - (FR)

- Survey: 20/24 Predetermined element under budget (not a category, more special)."Zero-based-method" - everything the user has left in their budget on the 1st of a month is automatically transferred to the savings account.

J.0.2 Should have

Monthly Overview: Graphs of income/expenses - (FR)

- Survey: 14/24. A collection of graphs showing one's use of money broken down into categories, or in total, over the current month. Earlier months eventually?

Custom categorisation of transactions - (FR)

- Survey: 18/24. User being able to define their own categories when adding a transaction. Defined when adding a transaction (button next to drop-down menu).

Automating monthly subscriptions - (FR)

- Survey: 16/24. Relatively many deem this feature useful, making the feature a should have using API or hard code prices on subscriptions then fixed expense for the rest of the future months. User can add a custom subscription and it will be repeated each month.

Sign up (still w/o security) - (FR)

- At the welcome page a button "sign up" can be clicked. We are going to use Firebase (probably). This opens sign-up page where username must be inputted. When the form is filled, a create account button can be pressed, the user data is sent to the database, and is routed to the personal home page.Maybe sign up with google can be downloaded as module? Attributes: name, balance, saving balance, transactions (incl. income), categories, budgets.

J.0.3 Could have

Personal dashboard (custom widgets etc on home) - (FR)

- Survey: 11/24. A dashboard would function as the home page of the web application, so it could be implemented anyways. Determine what should be on your homepage. Widgets that can be toggled (graphs, shortcuts etc).

Setting personal goals - (FR)

- Survey: 10/24. Defined under budget.Prefixed goal like "Save "10.000 kr" and custom goals like "Save up for a new iPhone" with progress bars. User should be defined to use x amount of monthly income on goal and rest on savings. If the monthly budget is not completely used up, then the amount goes to goal or savings or split it up (user option).

Notifications when exceeding budget - (FR)

- Pop-up per category.

Tips for saving money - (FR)

- Survey: 1/24 (custom answer by a recipient). One person added this feature as an addition to the provided answer options. As the group considers it to be a somewhat useful feature, and some software has this feature, it could be a part of the project's product. Random pop-up recommendations, like the Office Assistant, Clippy.

Budgets suggestions from income - (FR)

- From testing (hopefully). Providing a recommended percentage to assign to each category.

Multiple budget plans under one user - (FR)

- The possibility of creating multiple budgets for fx holidays or festivals, etc.

Visual gratification - (FR)

- Gratification for creating budgets, completing goals, etc. This idea comes from looking at today's software and getting ideas for new features. When reaching a goal. When making a budget that looks viable. When loggin in first day of the month and saving were transferred to savings account.

J.0.4 Won't have

Personal profile creator (with password and security) - (NFR)

- Secure sign-up function with password. It is not required of the group for this project to work with security and sign ups, thus a wont have.

Multiple accounts under one user (like Netflix) - (FR)

- Survey: 11/24. Could be somewhat useful but not a main focus.

Adding images to transactions - (FR)

- Some mobile apps has this feature. It was not researched through the survey, but as this product will be a website it is deemed useless. Though a website can be opened on phones, it is still a wont have for this project.

Audial gratification - (FR)

- Not a lot of web-apps (other than messengers) has havel audial effects providing gratification for creating budgets, completing goals, etc. Could be cool, but generally not important.

Linking to bank - (FR)

- As it is very hard to connect to a bank, it won't be implemented to this product. Some software has this feature, and automation-wise this is a sacrifice, but the survey resulted in a 60:40 automation: customisability ratio. Could be very useful but is too ambitious.

Automatic Categorization of transactions (requires linking to bank) - (FR)

- Survey: 18/24. A big part of the survey recipients like this feature. Automation is very difficult and requires a form for intelligence or complex library to work well.

UI Compatibility with phone - (FR)

- New layout / better optimization for handheld devices.

Appendix K

User-Test

Format
Question

- *Description of attempt + personal experience (for user 1)*
- *Description of attempt + personal experience (for user 2)*
- ...
- *Description of attempt + personal experience (for user n)*

Welcome Screen
You are Bob and have already registered on our website, Cash Cope. Your username is "Bob". Try to log in!

- Easy to do, intuitive.
- Easy.
- Easy.

Budget - stay on this page
You want to know how your current expenses are looking. Find the expected total of your expenses on the budget page.

- Easy, good placement.
- Placement makes sense, could be larger potentially. The left corner is good for natural eye movement.
- Easy, good placement.

Find the recommended amount of money that should be spent on "transport".

- Should be made clearer, and bigger.
- Easy.
- Easy.

Find out how much your current spendings deviate compared to the recommended amount for "rent".

- Easy.
- Deviation could be a graph, but nice with colour and makes sense.
- Easy.

Seems like you need to update your budget for rent since your landlord raised their prices - the bastard! Now edit the expected budget for "rent", so you use 5000 DKK in this category.

- Easily located.
- Easily located, but colour coding could be nice.
- Easy.

You would like to take a look at your income sources. Attempt to switch to income, so the list below only shows transactions related to the income category.

- Easy.
- Easy and makes sense.
- Easy.

Add a new budget category called "haircuts" as an income. (...) Oh, you made a mistake, it was supposed to be an expense! Find it on the list, and change it to expense.

- Bit hard to understand with the switch but not too difficult. It goes to filter before finding haircuts, no real challenge.
- The switch is intuitive, but he experiments with it before being sure about its purpose. Uses filter before finding haircuts, success.
- Easy.

Good news, your roommate will cut your hair for free - you don't need to spend money on haircuts from now on! Delete the added category.

- Easy.
- Easy.
- Easy.

Transactions - navigate to this page
Crikey! You have just bought some shoes on Facebook Marketplace! Yay! Create an expense transaction with the main category being "other", and the sub-category being "shoes".

- Easy.
- Easy.
- Easy.

Reload the page, and locate it on the pie chart - switch to the bar chart to take a closer look at it.

- Easy.
- Easy.
- Easy.

Now, that you got your new shoe, you also ate a big fat burger at Gasolin with your friend. Nom nom nom. Add it to your expenses for 250 DKK, with the main category being “food”.

- Easy.
- Easy.
- Easy.

Oops, you forgot about the drinks from the day before. Add a new expense transaction with the main category, “food”, and set the date to yesterday.

- Easy.
- Easy.
- Easy.

Great! Now, still on the transaction page, limit the list to only show transactions related to the food category.

- Easy.
- Easy.
- Easy.

Try to look at all categories again, and set the date to only show transactions for today.

- Easy.
- Easy.
- Easy.

Savings page - navigate to this page
Your friend just bought the newest iPhone (6000 DKK), and you are jealous as hell! So let’s try to save some money for it. Make a new savings goal, choose the appropriate emoji, and set the monthly expected transfer to 500 DKK.

- Easy.
- Easy.
- Easy.

Find out how long it will take to save enough money for the phone of your dreams!

- Easy, but M is unclear.
- Easy, M is unclear.
- Easy.

Attempt to add an expense-type transaction, where you put extra money in your savings goal.

- He looked at the savings page first, but it was easy to find. Add button to savings.
- Easy.
- Very smart and easy. Very cool.

Find out what percentage of your savings you have already saved up.

- Easy.
- Easy.
- Easy.

You changed your mind. A phone is a waste of money, pigeons are much cheaper and more fun. Delete the savings goal for the iPhone. See what happened to the money that was invested in this saving category. (Hint: check income).

- Should be more clear (add tooltip maybe popup message after savings deletion).
- Unclear first but easy after.
- Nice and easy.

Feedback
Have you ever tried using a budget and expense tracker application before?

- No - not except my bank app.
- No - thought about using lunar.
- No - only excel.

If you had to describe the site in one or two words, what would you say?

- Slick, easy-to-use.
- Clean, responsive.
- Well-thought-out.

What features do you appreciate the most?

- Savings and good sidebar.
- Brief pages are nice and fast to learn. The sidebar is good. Savings is very useful, the progress bar is nice for quick visuals and the information is relevant. Pie charts are great, especially with hover functions.
- The budget info was great, but a bit too cluttered, diagrams are great. Good to add single income expenses instead of changing the whole budget.

What did you not like?

- Unclear returns, recommendations are not clear, grid-like design maybe.
- Colours should be more systematic, chosen colours could be used for more. Unclear returns should be explained better. The budget layout could be improved - emphasize what is important.
- Expense and income switch should be clearer maybe, but not necessarily. Budget cluttered, but still good if you learn it.

From 1 to 5, how useful do you find the website for students?

- 5, easy to make goals and see them in one budget. Would use the savings function with budget mostly.
- 3.5, works well for what it does, with no useless fluff. Needs more polish and important actions should be clearer.
- 5, once the bugs are fixed, I would consider using it in real life.

Would you ever consider using the site if it was more polished?

- Yes, definitely.
- Not sure but I feel like it would be a good idea to create a financial overview.
- Yes, for satan.

If worked on, do you think using this product could be a positive contribution to your finances?

- Very much so.
- Yes.
- Yes.

Considering your answer to the last question, do you think that the app could help reduce budget/finance related stress?

- Yes, mainly to organize savings and set realistic goals (more freedom).
- I do not stress too much, but it would make it easier to create a good plan and stability.
- 100%, it creates a good overview. I am pretty stressed already, so I could use this.

What would you change/add to the website to make it better?

- More explanation to actions. Subscriptions as a separate page. Calculate the total for subs instead of adding them individually.
- Colours could be used more. More visuals to budgets.
- Budget design/layout rework. Hard to spot some important things. Top navigation bar for expenses and income.