Umeå University
Department of Computing Science

Development of Mobile Appliations 7.5 p
5DV155

'Mealpricer' - Free of Choice App Project

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1 Introduction

The aim was to come up with a good idea for a reasonable sized mobile application that should then be implemented. Reasonable size here was that implementation should be possible in about 60 hours of work (1.5 week).

During the course, there were some propositions of possible applications where one was a cooking recipt app with shopping list functionality. I like to cook and I am usually on a tight budget. Further, I actually like to guess or calculate the price of all kind of stuff I see around me. Hence, from the cooking receipt application I got inspired to develop 'Mealpricer', an app to calculate the fractional costs of meals.

Generally, wile pondering about potential projects, I was convinced that I did not want to implement a game as this would involve mostly general java programming. My aim was to find a project that would give me the possibility to improve on my general crafts for navigating the android framework. In my opinion, the most typical mobile application is data centric. It presents some sort of data in lists. Currently, to make a professional looking android app, I think it is indispensable to master the elements of material design. Therefore, another aim for me was to incorparate as much material design as possible in my project. So far, I have not spent much time with GUI programming in general, there I wanted to develop more in this field.

2 General Description and Target Group

The envisioned and implemented android app with the name 'Mealpricer' is targeted towards indviduals that are looking for a tool to quick and easily determine the fractional cost of a specific meal.

I checked out the Google Play Store for similar apps. There were a few with a smiliar idea. There I also realized the potential behind the concept: Calculating fractional costs of a meal from bulk ingredient prices and ingredient amounts is actually a very common application for restaurants to price their meals.

So besides individuals, I think this application could make a good tool for food and catering professionals to quickly recalculate meal prices while shopping for ingredients.

3 PlayStore Description

MealPricer is an application that helps you to keep track of how much individual meals that you prepare cost. Whether you are a student on a tight budget or a restaurant owner that wants to calculate the fractional costs of his offerings from bulk products, MealPricer will help you in the most simple way to keep track of it.

4 Target Course Grade

I aim for a 'VG'. Below follows some reasoning around it.

I have spent quite a bit more time on the app than the indicated target of 60 hours. I am aware that for a senior android developer, such an app could be developed in a fraction of that time. However, I think it is also understood that this is an introduction course to the android framework, hence additional time is justified.

Generally, I am pretty happy with the result of my application. I am aware that the app has a rather simple concept with an easy to implement data model. But this was also by purpose as mentioned earlier: My aim was to spend as much time as possible with actual android framwork programming and not general Java. I think that the final product looks appealing and can be used practically. I spent quite some time on drafting the initial flow of the app and looking up which concepts of material design that would make for a good user experience.

5 Aspects on Security and Ethics

MealPricer in it's current form is both from a security and ethics point of view rather unproblematic. In terms of security, all the data is stored only locally, withing the application directory. There is currently no possiblity from another app to make use of the MealPricer data or to use a service from MealPricer that would give access to user data. One Issue, that is currently solved rather clumsy are the photos, which are stored at full size. This should be either adjusted to store a scaled, less storage intense version, or to at least inform the user about it. In a more advanced version of MealPricer, photos could be stored in a already accepted thirdparty app such as Google Photos, or the images could be stored in the cloud, if MealPricer would get launch as a more advanced service with own backend servers. Such a service would need more detailed considerations regarding both security but also ethics.

In general, the data does not seem to be of very privacy sensitive type, however, if collected in a cloud service, MealPricer data from a large userbase could become valuable to marketing or food related services and companies. As such, ethical handling of user privacy could become an issue.

6 User Guide - How To

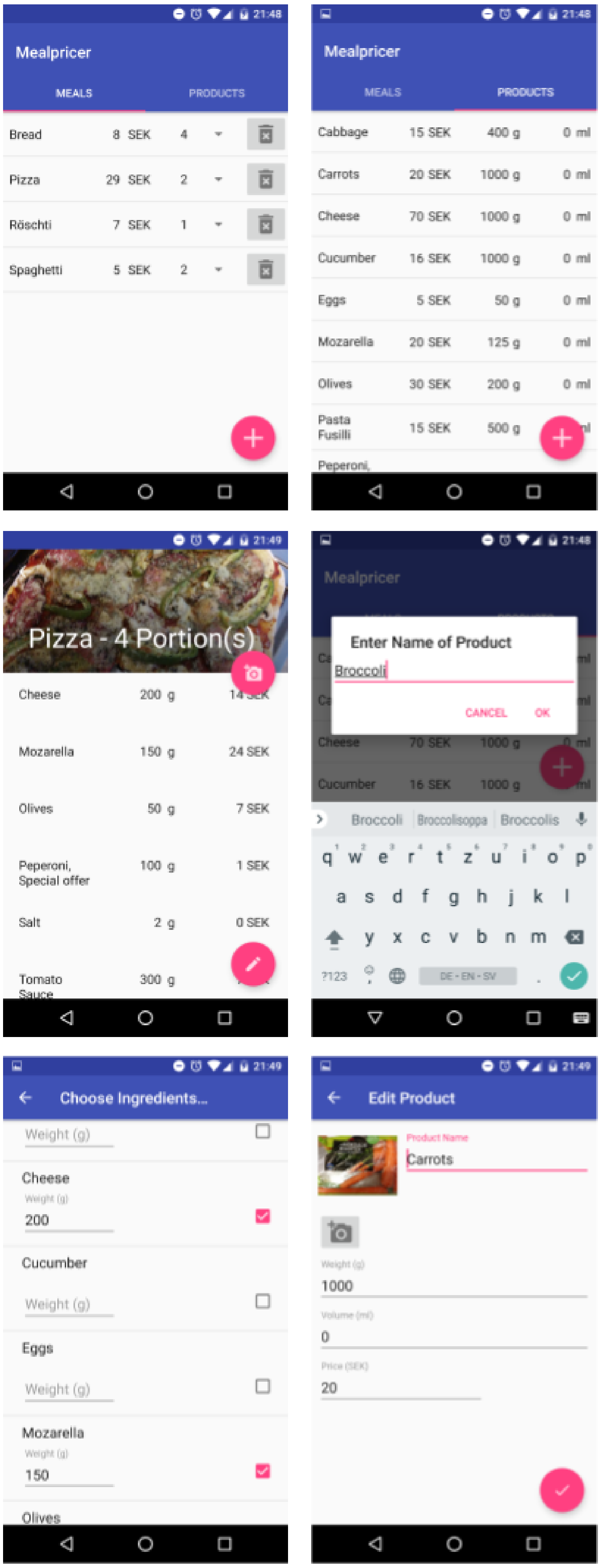
6.1 General Intro

MealPricer is used to calculate the fractional cost of a meal from bulk ingredient prices. To start using MealPricer, you should first enter a number of products that you use for your meals.

6.2 Step by step

Mealpricer opens automatically on the main page, ‘Meals’. If you open MealPricer for the first time, there will be no entries. The main view of MealPricer consists however of two views that are organized side by side as tabs. By swiping from right to left, you activate the product tab. Here you can press the pink colored ‘add’ button in the lower right corner to start entering a new product. First you enter the name in the upcoming dialog. You can later stil modify the name.

After pressing ‘OK’ you enter the ‘Product Edit’ screen where you enter the requested info about amount and price. On pressing the button with the camera icon, you can take a photo of your product. All prices are calculated either by volume or by weight, hence, this you should enter either of them together with the corresponding price. For convenience with some products, it can make sense to enter both weight and volume information. Mealpricer of course has no possibility whether the values correspond to the indicated price. When you have finished entering the product details, you get back to the product list view either by the ok tick mark button in the lower right or by the top menu ‘up’ arrow. To edit existing



Bread	8 SEK	4	
Pizza	29 SEK	2	
Röschti	7 SEK	1	
Spaghetti	5 SEK	2	

Cabbage	15 SEK	400 g	0 ml
Carrots	20 SEK	1000 g	0 ml
Cheese	70 SEK	1000 g	0 ml
Cucumber	16 SEK	1000 g	0 ml
Eggs	5 SEK	50 g	0 ml
Mozarella	20 SEK	125 g	0 ml
Olives	30 SEK	200 g	0 ml
Pasta Fusilli	15 SEK	500 g	ml
Peperoni,			

Pizza - 4 Portion(s)

Cheese	200 g	14 SEK
Mozarella	150 g	24 SEK
Olives	50 g	7 SEK
Peperoni, Special offer	100 g	1 SEK
Salt	2 g	0 SEK
Tomato Sauce	300 g	

Enter Name of Product

Broccoli

Choose Ingredients...

Weight (g)

Cheese
Weight (g)
200

Cucumber
Weight (g)

Eggs
Weight (g)

Mozarella
Weight (g)
150

Olives

Edit Product

Product Name
Carrots

Weight (g)
1000

Volume (ml)
0

Price (SEK)
20

Figure 1: A picture of a gull.

products, you can tap the product in the list which will bring you back to the edit view.

When you have entered enough products to compose your meal, you can swipe back to the meal tab. There you press the ‘add’ button in the lower right corner. In the dialog, you can choose the name of the meal and for how many portions you want to enter the indgredients. On Pressing ok, you come to the detail view of an individual meal. This view is currently empty, until you have chosen the ingredients which you do by pressing the ‘edit’ button in the lower right corner. The ingredient edit screen allows you to choose which ingredients and how much of them are used for the meal. When you are finished, you press the ‘up’ arrow in the menubar. Now you can see all the fractional costs for all ingredients of the meal. With ‘pink’ camera button at the top of the screen, you can take a photo of the meal that will then show up in the extensible menu bar. The ‘up’ menu button brings you back to the meal list. Here you can now see the total price of the meal. You can also choose to recalculate the price for a different portion size by tapping the spinner next to the price indication. Meals can be removed by pressing the waste bin icon in the right end of each meal list entry.

7 Application Architecture

7.1 General Structure and Flow

After the idea of Mealpricer was born, it was decided how many views would be needed and in which sequence it would make sense to arrange them. An early design draft is shown in figure 2. There it can already be seen that the main application models would be meals, products and ingredients. The base view of the application was chosen to consist of two pages that are connected as tabs. Technically, this was implemented using an activity that hosts two framgents using a pager adapter. The fragments themselves both host a recycler list view for each the meals and the products. Both these recycler view implement list item touch navigation: On touching a list item, the user is brought to the next activity, either the MealDetail activity or the ProductDetail activity.

If the user wants to add new list elements, in both the meal and product list an alert dialog is shown that allows the user to chose a name for the new meal or product and in the case of the meal, also the portion. The alert dialog step allows to open the respective edit activity directly with an element that exists already in the database. This has certain advantages to keep the data flow in the application as simple and consistent as possible.

While the meal and product list shared one Activty to handle the tabs, the detail views have each their own activity. The whole application makes active use of material design elements such as floating action buttons, collapsing toolbars and tabbed screens. Many of these patterns can be implemented using templates. For an experienced android programmer, these should speed up development significantly. When using them first time however, there was usually quite some confusion until the general concept was grasped.

The main element of the application can be said to be recycler view lists in several variations. The most complex is the one where ingredients can be chosen for an idividual meal. The implementation of widgets with interconnected listeners was not obvious from the beginning. Some details on it’s implementation will be given further down as a special topic.

The application uses a database to store all application data expect the binary photo data. The photos are currently stored freely in the application directory using the unique id’s of the meal respective the product. When a corresponding element is deleted in the database, a

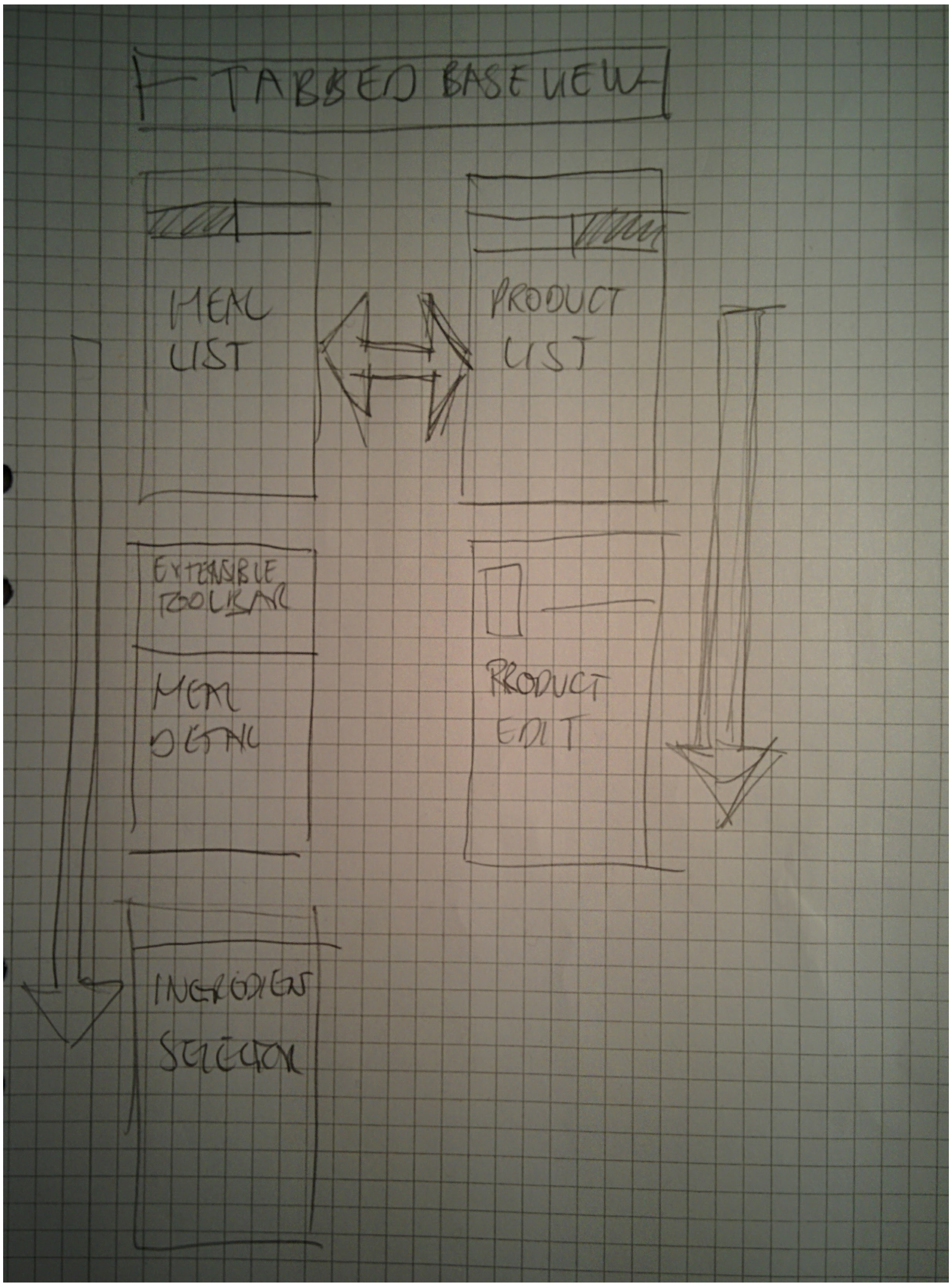


Figure 2: A picture of a gull.

separate routine will check whether there exists a photo which in turn will also be removed. As such, the application should keep it's space clean and tidy.

To take photos an implicit intent is used. The photos are currently stored at full size. This is probably not the best idea, however, the idea for a future version would be to implement a simple web backend that stores the user data.

Photo's are shown in two places. Once they have to be only scaled, while in the other place, as background of the 'Flexible Space with Image - Collapsible Toolbar' pattern they have to be both scaled and cropped. More details on this will also be provided as a special topic further down.

Generally, the application model of MealPrcer is very simple. However, despite of it's simplicity, there were already a number of concerns to make the user experience consistent and logical throughout the whole application. There are for example the issues what should happen if a user attempts to delete a product that is still part of (a) meal(s). For ingredients, the same case was a simple choice as it was decided to implement the ingredients table with references to the unique identifiers of both meals and products. Hence, when a meal get's deleted, all of it's products can also be removed from the database. Currently, for the products, it was simply chosen to not allow deletion! This might sound drastic, however in an early stage of this' apps liftetime, it works out surprisingly well. The solution was to keep the product completely editable, including the name and photo. As such, unused products can simply be changed to a new one.

There were a number of such architectural design deciscions. Of course, not all of them are the most elegant solution, however, it became clear quite soon during implementation, that in 1.5 weeks, there would not be enough time to polish the app as much as one would like to. There were several phases during implementation, such as designing the data model, optimizing the UI layout etc. Each of these development phases needed a substantial amount of time and needed as such a compromise in how many details could be solved.

8 Selected Discussion Topics

8.1 Embedding Fragments statically/dynamically in Activity

Trying to use the provided templates for google material designed activities and fragments, I run into the situation where fragments where by default embedded into activities by instantiating them in XML. This works fine when the Activity/Fragment combo in question does not need to obtain extras on creation. In many cases however, for example when the Activity/Fragment combo represents the detail view after a list activity, the ID of the chosen list item has to be obtained. Hence, the given template code had to be modified for dynamic instantiation of the fragment from within the activity. During planning for the above modification, it was noted that there are at least three single activity / single fragment views in the current application. According to the example in the course book, this could make up for an 'Abstract' 'SingleFragmentActivity' class. However, it was decided against this due to implications on the material design elements: The Appbar and Floating Action Button are kept in the activity, while the content layout is in the fragment. But the three single fragment activities don't share exactly the same setup for appbar and Floating Action Buttons. Hence another layer of abstraction would be needed that would make things overly verbose.

8.2 Deciding on the Persistance Model

It was chosen in the beginning to store the application data in SQLite. In many cases, it was possible to store the data into the database on UI orientation changes. In some cases however, for example the position of the portion spinner in the meal list view, the data is not stored in the database. After having implemented an initial version where the spinner would always return to the portion that is stored along with the corresponding ingredient amounts, UI testing led to the conclusion that the spinner position should at least be persisted during orientation change. This was then done by using extras. Hence, in some cases, the current application uses various techniques to persist the data.

8.3 Deciding on Ingredient Chooser UI

The ingredient choose turned out to be the most complex UI item. Bascially it is implemented as a recycler view that holds three widgets in each row. The EditText widgets are used to enter the amount of the ingredient for either volume or weight. A checkbox is used to include the ingredient in the meal. This will result in persisiting the ingredient to the database when the view is left or also on orientation changes.

In a initial implementation, all listeners (TextWatcher and onCheckedChange) were attached during the ‘onBind’ override of the ViewHolder. This was chosen as attaching them during instantiation of the ViewHolder resulted in a firing the listeners already while loading the ViewHolder initially with data. However, attaching ‘onBind’ eventually turned out to be even worse: While already the performance was much worse, during a stress test with many elements, it was found that the ViewHolder was not working correctly as dozens of listeners were attached without ever being removed. This led to glitches and seemingly unpredictable wrong behaviour. After reading a number of StackOverflow threads, the correct way was found where listeners are attached during instantiation, but are deactivated during onBind.