

Production specifications

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I. Summary

This is the technical specification document for the mobile furniture store app **Virtual Home**

This version 1 of this document was created on 08/08/2024 by *Matthew Robinson*.

Objectives:

The purpose of this app is to provide a store page where users can freely browse and check product specifications of the furniture. The user can also place orders and keep track of offers, orders and favorites by creating an account.

The added value compared to competitors is the AR feature that allows previewing products in your home space by using your phone camera.

Target Audience:

The target audience for this application are adults looking to buy furniture. The plan is to reach both existing clients of the furniture company and new clients attracted by the prospect of the app.

The target platform is currently limited to Android but could be extended to iOS in time and at the client's request.

Budget:

The budget for the project is divided in two parts, production and monthly upkeep.

The production includes hourly wages and costs a total of **5 880€** all tax included.

For the monthly upkeep the first 6 months will cost **264€/month** all tax included for the cloud services then if you choose to maintain support and maintenance after that period

444€/month all tax included. Note that the monthly cost can vary depending on the scale of the project and the possibility to accommodate more data or users.

Estimated duration:

Given the currently requested features and specifications the development of the app is estimated to take 30 business days. You can find the detailed timeline in section IV. Budget and planning.

II. Project description

Business needs:

Virtual Home aims to bring a competitive candidate in the field of furniture sales companies by providing an easy to use app that can not only provide all the expected features of an online store. To keep an edge on the competition the main feature is the possibility to preview products in augmented reality directly in your home.

For clients, this feature brings the comfort of knowing with certainty whether a product suits their needs, both in terms of dimensions but also for aesthetic cohesion with their own furniture. With ease of use and practicality in mind, **Virtual Home** plans to provide an experience that even the least tech savvy users will find smooth and intuitive.

Functionalities:

User side:

Account management: The users are free to use the application as guests and will have access to the main functionalities of the app. However users that choose to register an account will unlock the full potential of **Virtual Home** like favorites, order tracking, payment and shipping saving as well as user exclusive promotions.

In accordance with the **GDPR** users are free to request their data, what it's used for and delete it along with their account.

Product viewing: By navigating the sales and search tabs, users will be able to browse products, view their information including dimensions, price, and alternative color schemes. They will also be able to view reviews of other users that bought the product and leave their own review after purchase.

Favorites: While navigating the store, logged in users can add products to their favorites with a single button press which not only lets them keep track of the products they are interested in but also allows them to preview them in the AR preview tab. Users will additionally be notified when a product in their favorites goes on sale.

Checkout: Logged in users will be able to save their shipping and payment methods for a faster checkout process. Note that guest users are still able to place orders but will need to fill in that information every time.

AR preview: The main strength of **Virtual Home** is users will be able to easily preview products in their favorites in their home space using their phone camera. With the ability to rotate the model, change its color scheme and lock it in place, they can arrange multiple products at once (very useful when viewing a bundle for example). By providing a known measurements reference, they can ensure that the product they're viewing is resized to their



real size and as such get a realistic preview of the dimensions in the space they're previewing.

Efficient UI: By using Unity's UIToolkit, we can provide an elegant and straightforward UI with seamless transitions that is both lightweight and responsive, meaning it will adapt to different phone resolutions and lower the hardware requirements to reach even low end models. The use of UXML also makes it easy to change the appearance of the app at scale through USS styling should the client change his graphical chart.

Company side:

Data management: To facilitate managing products and their data, the department in charge will be provided with a lightweight PC app to have a visual view on the database and easily add or modify products with forms. This app will also have a model preview tab in order to check that the models to be uploaded are being displayed correctly and no errors occur when interacting with their colors, size or rotation.

User moderation: If users of the app act against the terms and conditions set by the company, authorized personnel can enact the measures detailed in the former by deleting content or suspending accounts.

Send notification: While some notifications like sales can be automated, the company is also able to send custom notification or issue warning notices (for example shipping delays due to extreme weather conditions).

Analytic data: If the company decides to subscribe to additional database services, they will have access to more in depth data of the usage of their app, with charts and graphs depicting most viewed products, correlation between product searches (item B is x% more favored by users that favor product A)

Ergonomy and design:

Font and colors: The font used for the project is **Inconsolata** and the main color scheme will be gray scales. The reason behind these choices is to have a sober and discreet UI that really emphasizes the products. The outlying colors will be **#F44949** for favorited items and **#FFF61C** for when in the favorite tab.

Intuitive navigation: With most elements being scrollable horizontally or vertically by swiping or dragging we have the possibility to display large elements for ease of view without compromising the amount of elements we can display. The list view can also allow for a more compact view and makes it easier to search products by name and compare prices. The favorite tab allows to focus features in a single accessible place. Favoriting products is the cornerstone to use other features, it notifies users when these products are on sale,



allows for quick access to revisit them or add them to the cart and most importantly, preloads it's 3D model to be able to view it in the AR preview.

Content:

Templates: To generate the UI for each product in its different forms (grid view, list view, product page) we use UXML templates that will be instantiated with the data provided by the product database.

Product information: The most complete form of a product view is the product page which will include: A picture of the product for each available color scheme, its name, its price, its dimensions, its description and its current availability.

3D models: For AR previews users will have access to the 3D model of a product to place it and visualize it in their home space.

Technical Specifications:

UI Toolkit

Pros:

- Very efficient at runtime while still providing elegant animations through transitions
 - Modify the design at scale easily by properly using style sheets
 - Create templates that can be instantiated later with specific content
 - Responsive scaling

Cons:

- Some Unity default elements are cumbersome to overwrite
- Some script actions require workarounds to interact properly with the UI

AR SDK

For the sake of clarity we will only be comparing features that are relevant to this specific project (Vuforia is strongly suggested for our purposes)

Vuforia (free for intended

AR Foundation + AR



purposes)

Pros:

- Ground Plane: by using automatic or interactive hit testing, detect horizontal planes and create a surface indicator for virtual objects to be placed on
- **Device tracking:** offers a robust and accurate tracking of targets even when the object is out of camera view allowing placement of multiple objects in a large space without losing their positions
- **Device compatibility:** Vuforia is compatible with Android, iOS and Universal Windows Platforms with no device specific code to worry about
- Ease of use: The SDK is easy to implement and well documented with many built in features like automatic scaling of virtual objects based on their real dimensions

Cons:

- Vuforia Fusion: while it brings great features such as Light estimation to reflect ambient conditions, it requires implementing device specific SDKs which defeats the purpose of a “one for all” solution.
- Paid service: while all the features we need for this project are available in the basic free

Core (free)

Pros:

- **Environmental understanding:** Uses feature points to detect clusters that are linked on a common horizontal or vertical surface in order to create planes on which objects can then be placed
- Oriented points: by analyzing nearby feature points ARCore can estimate angles allowing for objects to be placed on slanted surfaces while reflecting the orientation resulting from that angle.
- **Light Estimation:** by analyzing the lighting of the environment ARCore provides an average intensity and color correction which lets us light our virtual objects under the same conditions
- Anchors and trackables: When placing a virtual object you also place an anchor. By placing an anchor on a trackable object, the virtual object will stay on the object if it moves

Cons:

- **Single platform solution:** AR Core is only compatible with android and a different SDK with different code implementation has to be integrated for other platforms.
- **Feature complexity:** while almost all features proposed by Vuforia can be accomplished in

plan, if the client wishes to branch out and add features it might require a premium plan.

ARCore, some require additional coding and setup which adds to the time complexity of the tasks.

Database

Google Cloud

Estimated cost (for 100GiB SQL and 5TiB cloud storage): 200€/month

Pros:

- **Pay as you go:** The payment structure is set up so you only pay for the services you use and for the amount you use them. With options to set budgets and limits and get discounts with prepaid committed use of services you can stay in control of your costs.
- One service solution: Google cloud provides a wide array of services which we can use to centralize our provider. This also allows for easy expansion or branching out into new features.
 - **Cloud SQL:** With a cloud hosted MySQL database we can store user information as well as product information. We can use Unity Adressables to reduce our queries by initially loading critical assets and asynchronously loading more specific data in the background
- **Firestore authentication:** By linking our Cloud SQL user table with Firestore authentication we can provide a safe and secure authentication service with access to two factor authentication services.
- **Cloud Storage:** In order to store our 3D models cloud storage is google's solution. We can again use Unity's addressables system to load models in the background when they are added to favorites by the user

Cons:

- **Limited support:** Due to its large user base Google Cloud's support can take a long time to respond which can be extremely dangerous when facing critical errors. Fortunately there is a way to circumvent this by paying for premium support, guaranteeing a timely response
- Limited regional reach: While there will be no problem with the quality and speed of the service on a national scale, localized servers make it almost a necessity to pay for additional servers overseas when planning to reach an international audience.

Amazon Web Service

Pros:

- One service solution: AWS provides a wide array of services which we can use to centralize our provider. Being the current market leader for AI technologies also means that it would be easier to integrate features like AI learning, automated analytics and AI store assistants in the future.
- **Amazon RDS:** Is Amazon's solution to relational databases, with access to PostgreSQL, MySQL, Oracle and more.
- **Amazon Cognito:** Amazon's advanced authentication services provide more options to increase security for the users. Features like compromised credential monitoring, local adaptive authentication and Two Factor authentications provide a peace of mind towards user's security.
- **Amazon S3:** Boasts the most robust and available cloud storage in the market. With data encryption and elastic structure which means it grows and shrinks as needed, S3 is possibly the most powerful cloud storage available today.
- **Global reach:** The main strength of AWS is its capacity to be accessed from anywhere, making international expansion much easier without incurring additional costs

Cons:

- **Complex pricing model:** While using the same "Pay as you go" system as Google Cloud, AWS pricing calculation is far more complex which can make cost estimation difficult
- **Integration Complexity:** Having more options to choose from is great, but the complexity of implementing each solution is proportionally greater. With a more cluttered and less user friendly interface, AWS has a steeper learning curve than Google Cloud which can vastly impact production costs.
- **Community and support:** Feedback from developers note that the quality of support and the community engagement for AWS is lacking which further increases the difficulty of implementing it.

III. UML Architecture

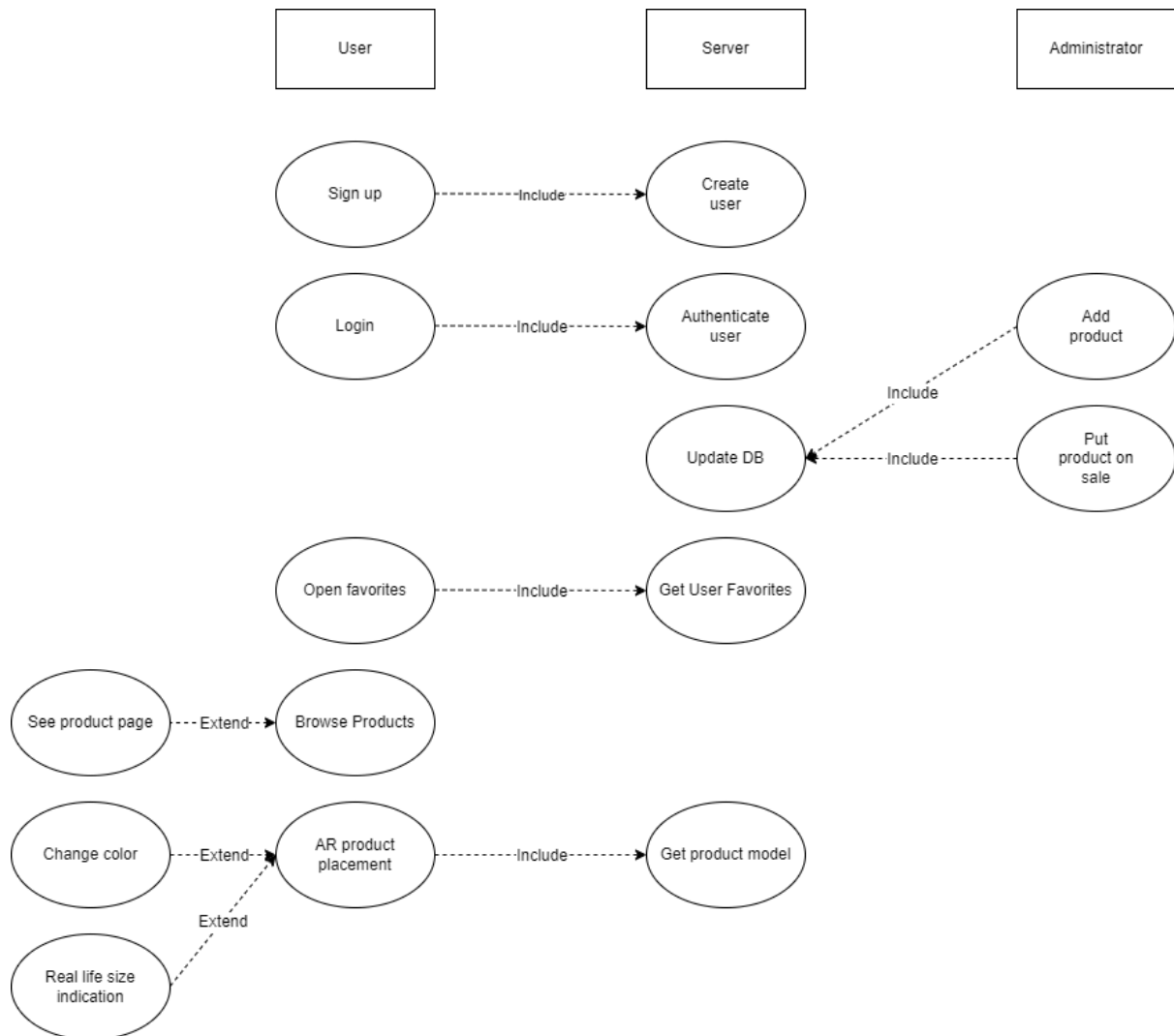
User stories:

User Stories		
As a	I want to	So that
User	Sign up	I can log in to the app
User	Log in	I can access my account's information
User	Add a product to favorites	I can find it in my favorites tab
User	View product information	I can choose the right product
User	Sign out	My activities remain private when I am done using the app
User	Search for a product	I can find a specific product or narrow it down to a type of product
User	Add a product to my basket	I can keep browsing and then proceed to the order when I am done
User	Remove a product from favorites	It is not kept in my favorites tab
User	Save my payment information	I don't have to enter it every time I make a new purchase
User	Enable notifications	I can get notified when new sales start
User	Disable notifications	I don't receive notifications anymore
User	Leave a review	I can give my opinion on a product I've purchased
User	Read reviews	I can read others' opinion on a product I want to purchase
User	Change tabs	I can navigate the different sections of the app
User	Preview products in AR	I can see if the product fits my space aesthetically and in measures
User	Change product colors	I can see how the different color schemes look on

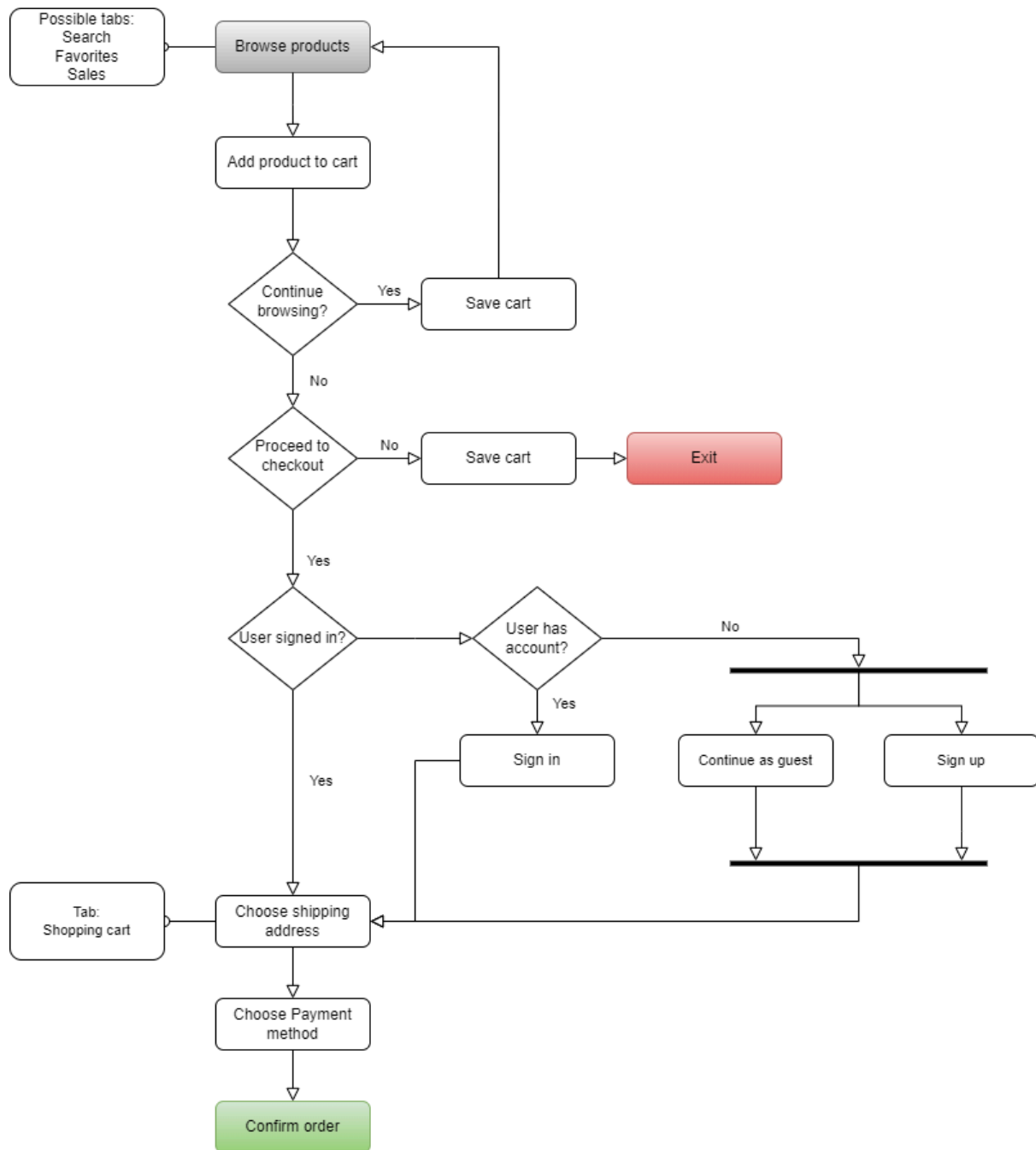
		the product
User	Rotate the product	I can adjust the preview and place the product correctly in my space
User	Save preview	I can save an image of how the product(s) I've placed would look and a reference to all the products so I can easily add them to my basket later
User	Set size reference	I can accurately preview the item's real size the space I'm previewing
User	Contact customer service	I can communicate with the customer service to give feedback or resolve issues
User	View purchase history	I can see the products I've purchased
User	Follow order status	I can see the status of my order and get an estimate date for the delivery
User	Set my delivery address	I can specify at which address I want to receive my orders
User	Place an order	I can place an order of the products in my basket and pay for them
User	Delete my account	I can erase my account information and have my data wiped from the company's database
User	Share a product	I can send a link to the web product page of a product to my contacts
User	Redeem a promotion code	I can get discounts by using a promotional code provided by the company or its partners
User	Lock a product during preview	I can lock an object in space during preview and do other actions without it moving
User	Delete my payment information	I can keep my payment information secure
Administrator	Add new product	I can add a new product to the database to be viewed in the app
Administrator	Remove a product	I can remove a product that is no longer available from the app
Administrator	Create a sale	I can temporarily reduce the price of the selected products and notify users
Administrator	Set a product as out of stock	I can change a product status to out of stock so that users can still see it but not purchase it
Administrator	Remove review	I can remove a review that doesn't comply with the company policy (profanity, promotion of competitors, etc..)
Administrator	Upload product model	The product model is available for AR preview
Administrator	Set new promotion code	I can create a new valid temporary or use limited promotion code
Administrator	Set issue notification	I can notify users of a malfunction in the app or service (ex: shipping suspended)

Customer service	Access tickets	I can see a list of user created tickets organized by type of issues
Customer service	Respond to ticket	I can respond to a customer's ticket and resolve their issue
Customer service	Close ticket	I can close a ticket when the issue has been resolved or at the request of the customer

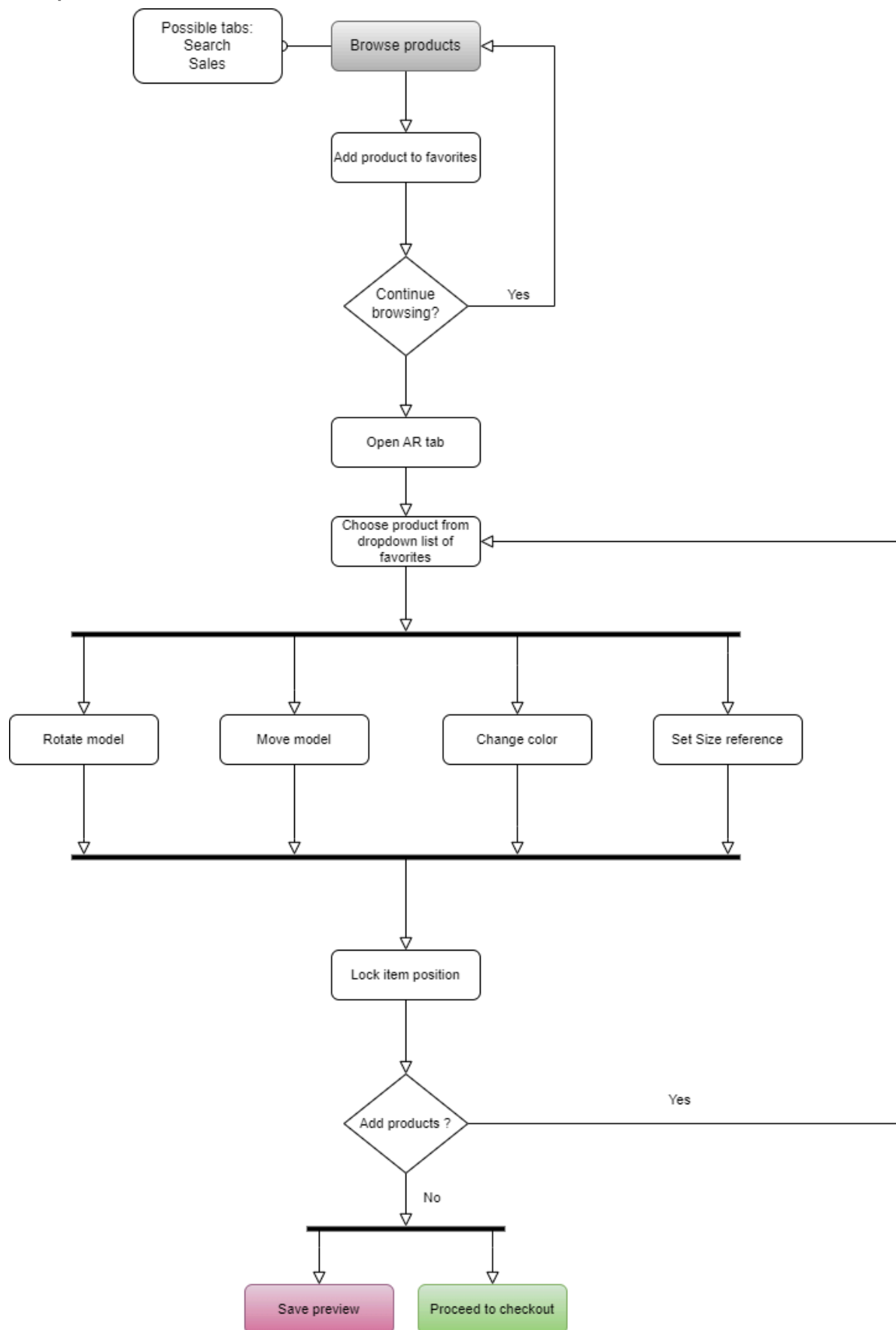
Use Case:



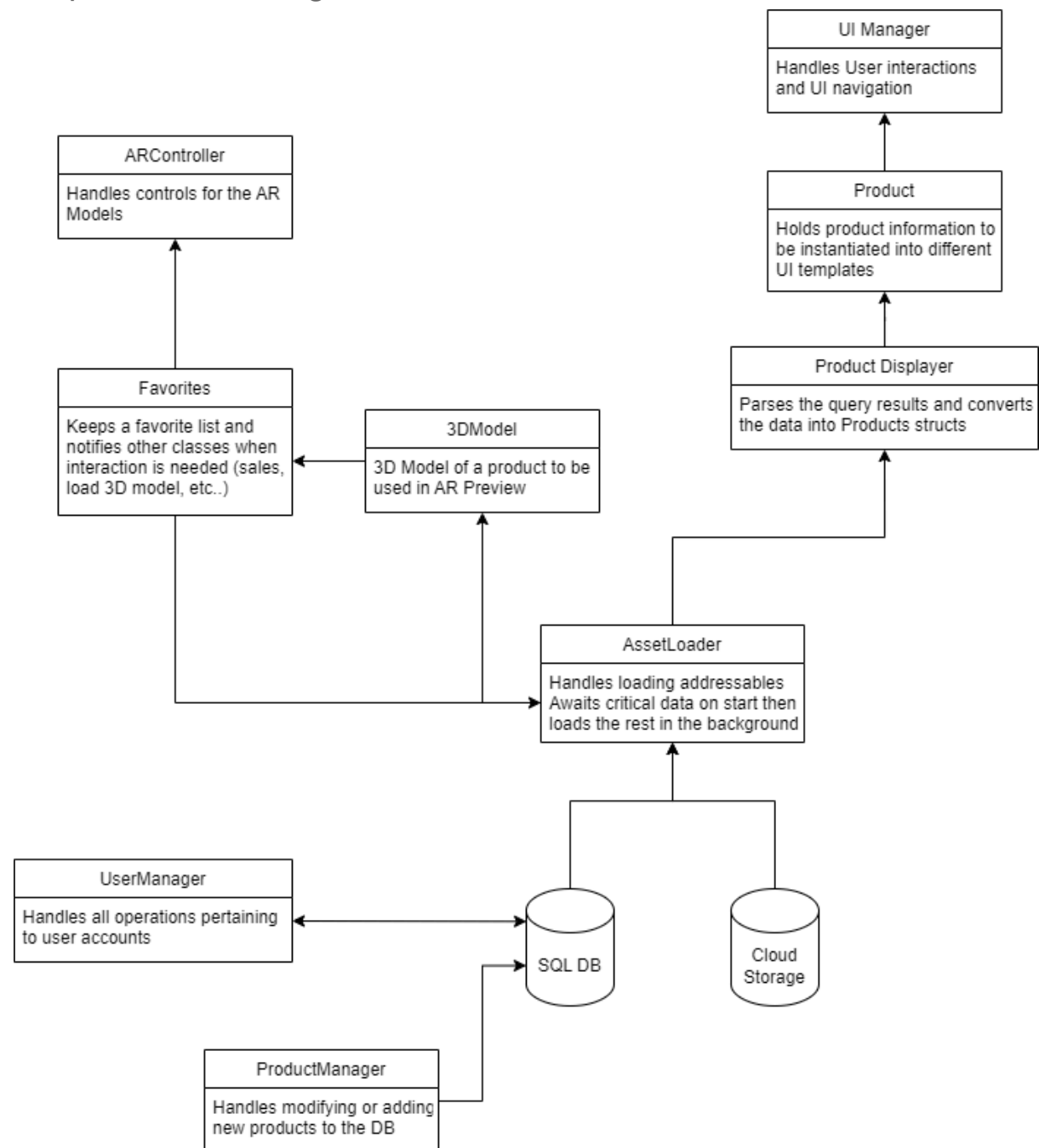
Buying workflow:



AR preview workflow:



Simplified Class diagram:



IV. Budget and Planning

Timeline:

Epic: UI

- Create adaptive USS and UXML : 2 stories
- Create navigation script : 1 story
- Polish styling : 1 story

Epic: AR

- Import and setup AR package : 1 story
- Set up plane detection: 2 stories
- Create dummy models for testing : 1 story
- Model manipulation tools scripting: 3 stories
- Model selection, lock and saving features: 2 stories

Epic: DB

- Create User database structure: 1 story
- Create product database structure: 2 stories
- Set up in app queries: 3 stories
- Provide dummy data for testing: 1 story

Epic: DB linking

- Create script to instantiate template UI from DB data: 2 stories
- Link user forms (account, address,etc...) with write queries: 2 stories
- Instantiate model prefab from DB file: 1 story

Epic: Testing

- Write unit tests : 2 stories
- Manual testing : 1 story

Total estimation : 28 stories

Week 34 19 Aug - 25 Aug					
Mo 19	Tu 20	We 21	Th 22	Fr 23	
Adaptive USS/UXML		Navigation script	Import and setup AR package		
			Polish styling		
Week 35 26 Aug - 1 Sep					
Mo 26	Tu 27	We 28	Th 29	Fr 30	
Set up plane detection		Create dummy models for testing			
		Model manipulation tools			
Week 36 2 Sep - 8 Sep					
Mo 2	Tu 3	We 4	Th 5	Fr 6	
Model selection, lock and saving		User Database structure	Product database structure		
Week 37 9 Sep - 15 Sep					
Mo 9	Tu 10	We 11	Th 12	Fr 13	
Dummy data for testing			Instantiante template from DB data		
In app search queries					
Week 38 16 Sep - 22 Sep					
Mo 16	Tu 17	We 18	Th 19	Fr 20	Sa 21
Write queries for user forms		Instantiate model prefab from DB	Unit tests		Manual testing

Budget:

Cost type	Amount	Cost	Total
Wage	196	25€/h	4 900€
Tax		20%	980€
Upfront (All tax included)			5 880€
Monthly			
Google Cloud	1	220€/month	220€
Support and maintenance (free for the first 6 months then 150€/month)	1	Free then 150€/month	150€
Tax		20%	74€
Monthly (All tax included)			444€

V. Appendix

Logo:



Graphic Chart

Font : Inconsolata

Rounded borders

Soft select: #D9D9D9

Hard Select: #A7A5A5

Toggle/Button: #2C2C2C

Tag : #CFF7D3

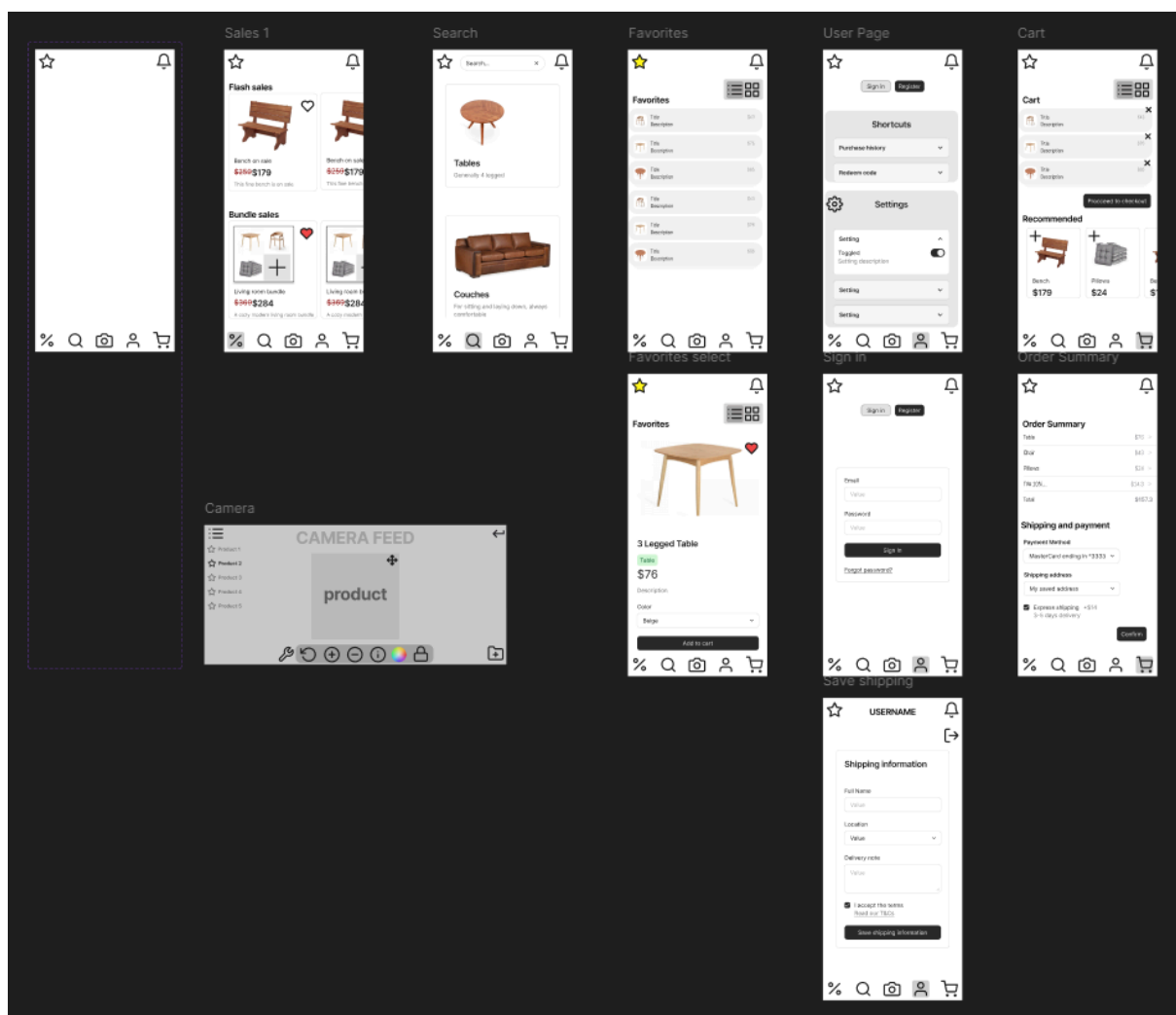
Favorite Tab: #FFF61C



Favorite Item: #F44949



Figma:





Flash sales



Bench on sale

~~\$259~~ **\$179**

This fine bench is on sale



Bench on sale

~~\$259~~ **\$179**

This fine bench

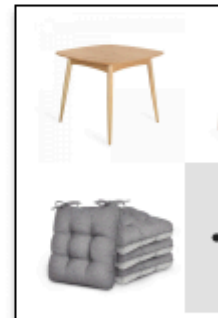
Bundle sales



Living room bundle

~~\$369~~ **\$284**

A cozy modern living room bundle

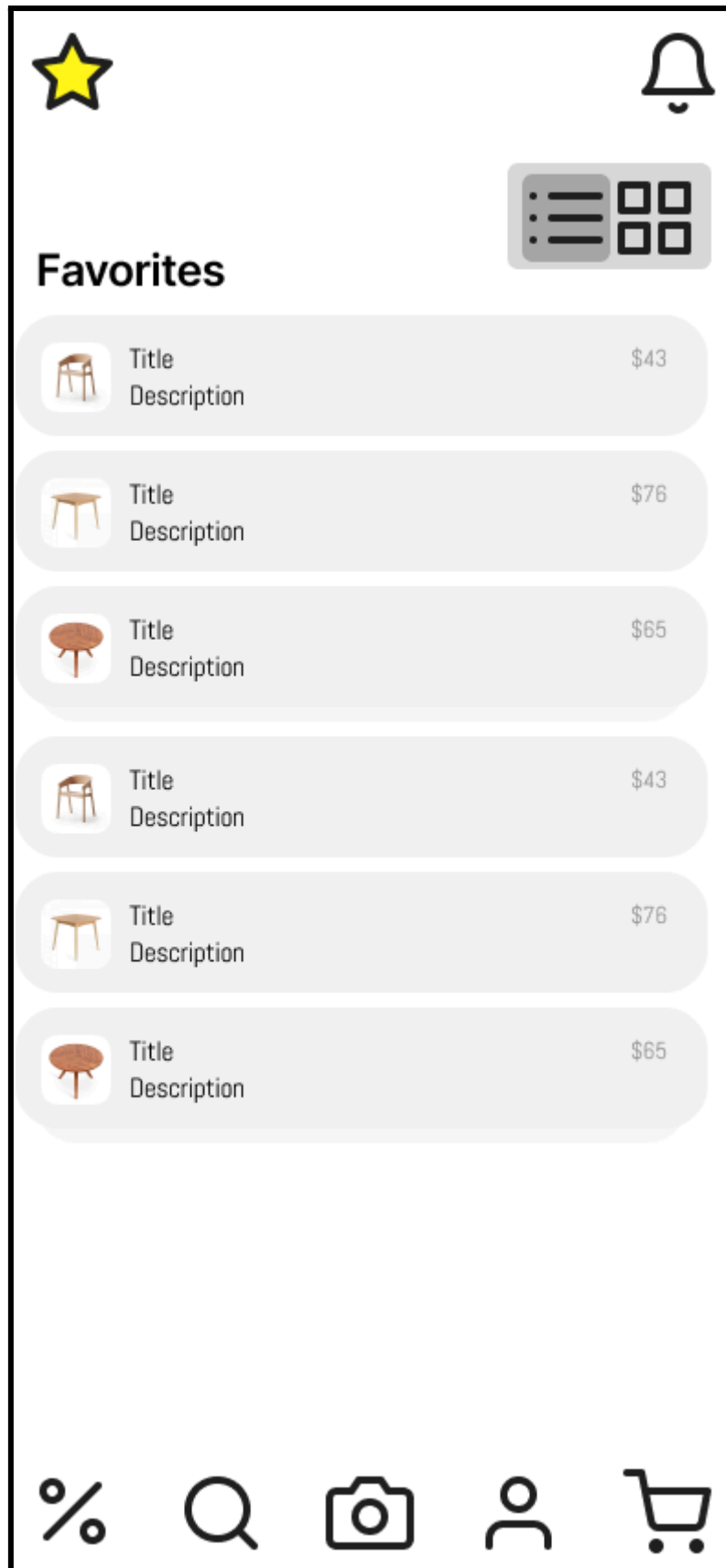


Living room b

~~\$369~~ **\$284**

A cozy modern







Favorites



3 Legged Table

Table

\$76

Description

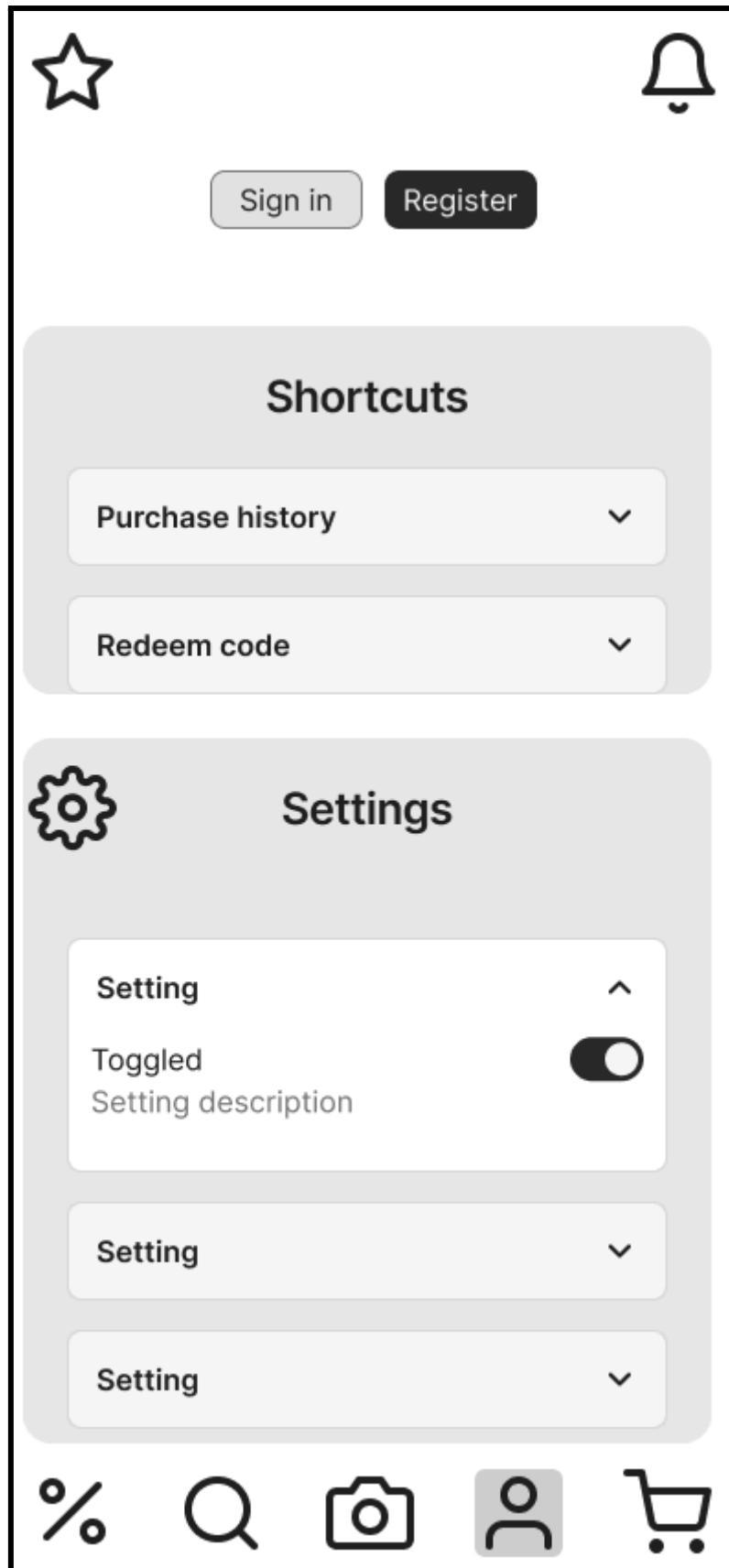
Color



Beige



Add to cart







Sign in






Register


Email

Password



Sign In

[Forgot password?](#)






USERNAME



Shipping information

Full Name

Location

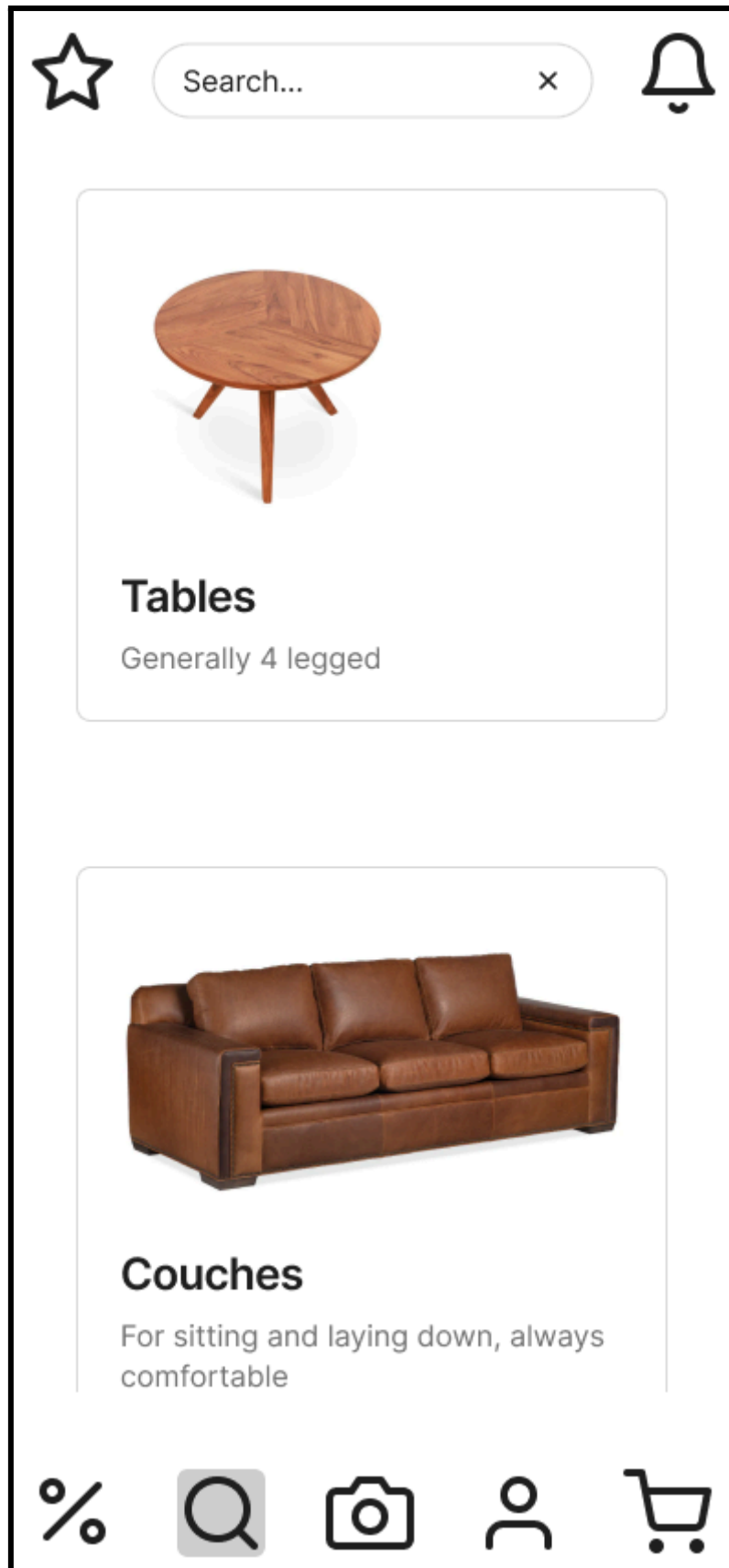


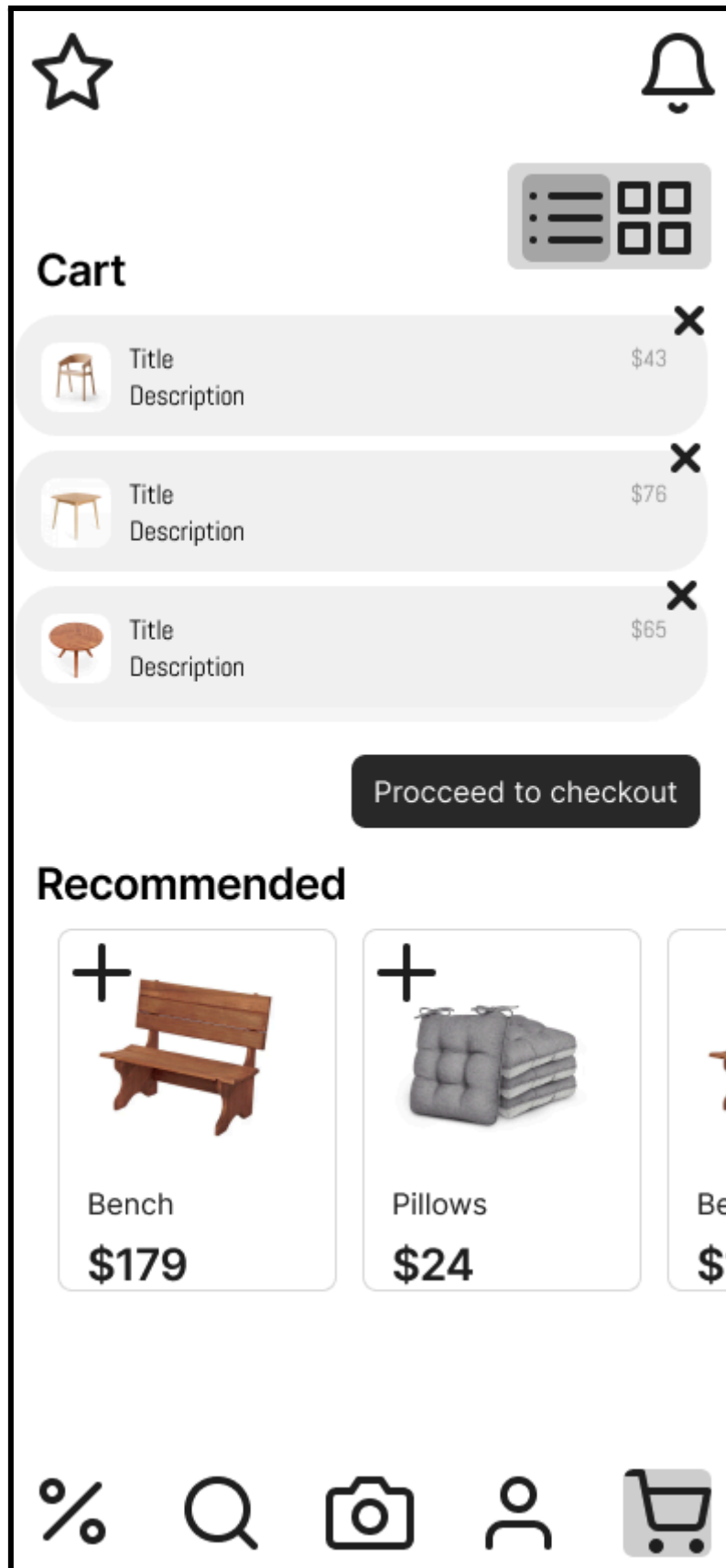
Delivery note

☒ I accept the terms
[Read our T&Cs](#)

Save shipping information









Order Summary

Table	\$76 >
Chair	\$43 >
Pillows	\$24 >
TVA 10%...	\$14.3 >
Total	\$157.3

Shipping and payment

Payment Method

MasterCard ending in *3333 ▾

Shipping address

My saved address ▾

☒ Express shipping +\$14
3-5 days delivery

Confirm



