**Final report – Switch Me**

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**GitHub:** https://github.com/YuvalNurlian/switchMe-repo.git

1. **Introduction**  
   *Switch Me* is a digital platform for product exchange between private individuals. The system allows users to upload items, view available items, match products, and make direct exchanges without payment. In the future, an AI system will be integrated to evaluate product value and offer fair exchange suggestions.
2. **Problem statement**

In today's digital world, private individuals seeking to exchange products are often forced to rely on social media groups or platforms that are not designed for such interactions. These solutions lack proper tools for mutual matching, do not offer fair value estimation, and often fail to ensure user privacy and security. This leads to an unreliable, inefficient, and sometimes unfair exchange process. There is a clear need for a dedicated platform that enables secure, direct product exchanges with intelligent matching and AI-based fair value suggestions.

1. **Literature review &** **Competitor Analysis  
   Literature review:**

**Artificial Intelligence (AI) has brought a significant transformation to e-commerce.**  
This review focuses on two key areas:

* **AI-Based Pricing** – enabling transparent and fair valuation of items.
* **AI in E-Commerce** – enhancing user experience and enabling intelligent product matching.  
  These areas form the foundation for developing the platform and offering users an innovative solution.

### 1. ****AI-Based Pricing Algorithms****

Over the past decade, AI-based algorithms have become a central tool in automated and fair pricing processes. These algorithms analyze vast amounts of historical data, trends, demand, and supply to estimate product value accurately and dynamically.

The main advantage is that these algorithms can adapt pricing in real time based on variables such as demand fluctuations, seasonality, or competitor products.  
Companies like Amazon and eBay utilize such algorithms to enhance the trading experience and increase sales.

**Relevance to the Project:**  
In a product-exchange platform, using an AI-based valuation algorithm provides a transparent and fair solution, helping to prevent disputes and encouraging successful exchanges.  
Research has shown that applying models like Machine Learning can identify pricing trends for second-hand products and prevent over- or under-valuation. These types of algorithms give end users a better understanding of their item's market value.  
Reference: Source 1

### 2. ****AI in E-Commerce and Online Marketplaces****

The integration of AI in e-commerce platforms has revolutionized the user experience and improved the efficiency of trading processes. AI capabilities are expressed in various areas:

* **Personalized product recommendations:** AI algorithms analyze user preferences based on browsing history and past purchases to display relevant products.
* **Smart product matching:** Many platforms use AI to connect buyers and sellers based on parameters such as location, category, and relevant searches.

**Relevance to the Project:**  
In the context of a product exchange platform, AI plays a central role in both matching items between users and evaluating their value. Moreover, the personalization capabilities of AI algorithms will enhance the user experience and increase the likelihood of successful matches.

**Competitor Analysis** -

As part of the development of the product exchange platform for private individuals, a review of several existing platforms was conducted to better understand the market, identify strengths and weaknesses, and explore opportunities for innovation.  
The review includes platforms with diverse characteristics, ranging from global barter services to local social networks, and focuses on aspects such as user interface, exchange methods, target audience, and more.

### ****Swap.com****

**Background:**  
An American platform focused on exchanging, buying, and selling second-hand items such as clothing, toys, and books, primarily targeting families.

**Advantages:**

* Dedicated categories tailored for family-oriented users
* Simple and user-friendly interface

**Disadvantages:**

* Focused on a narrow geographical market
* Requires significant user effort for manual searching and matching of items

### ****BarterQuest****

**Background:**  
A global platform for barter transactions, enabling users to directly exchange products and services based on a barter system.

**Advantages:**

* Supports service exchanges in addition to products
* Allows for complex, multi-party deals

**Disadvantages:**

* The interface may be less intuitive for new users
* Requires high user involvement to initiate and manage trades

### ****Bunz****

**Background:**  
A social network that began in Canada, enabling users to trade items using an internal currency (Bunz points) instead of money.

**Advantages:**

* Promotes cashless transactions, creating a more personal and community-driven experience
* Active and supportive community that fosters a sense of belonging

**Disadvantages:**

* The internal currency system may confuse or deter some users
* Limited geographical support

### ****OfferUp****

**Background:**  
A popular platform for selling second-hand items and facilitating exchanges between users. It is mainly active in the United States and features a modern, user-friendly interface.

**Advantages:**

* Pleasant and intuitive user interface
* In-app direct messaging between users

**Disadvantages:**

* Large volume of irrelevant listings may reduce user experience quality
* Platform is more focused on selling, which may complicate exchanges for users interested only in bartering

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Platform** | **Exchange Method** | **Target Audience** | **User Interface** | **Geographic Coverage** | **Innovation** | **Overall Rating** |
| **Swap.com** | Buying and exchanging second-hand items | Mainly families | Simple and user-friendly | Limited to the U.S. | Family-focused categories | ⭐⭐⭐⭐ |
| **BarterQuest** | Direct value-based exchange and coordination | General public | Less intuitive and not accessible | Global | Supports services and complex multi-party trades | ⭐⭐⭐ |
| **Bunz** | Exchange using internal platform currency | Certain communities (region-limited) | Accessible and user-friendly | Limited to specific regions | Cashless trading and collaborative trade community | ⭐⭐⭐⭐ |
| **OfferUp** | Buying and exchanging | General public with U.S. emphasis | Modern, convenient, intuitive | Global | In-app messaging | ⭐⭐⭐⭐ |

Competitor Summary

Existing platforms offer a variety of approaches and methods for item exchange, ranging from direct sales to the use of internal currencies or barter deals.  
This diversity highlights the need to develop a unique platform that focuses on the weaknesses of current solutions—such as a tailored user interface, transparent valuation methods, and support for a broader audience.  
The goal is to create an innovative user experience that combines technological efficiency with a simple, fair, and convenient exchange process for all users.  
  
**References**

**Literature Review:**

* Jiaxi Liu, Yidong Zhang, Xiaoqing Wang, Yuming Deng, Xingyu Wu – "Dynamic Pricing on E-commerce Platform with Deep Reinforcement Learning: A Field Experiment", 2019.  
  <https://arxiv.org/abs/1912.02572>
* Will Knight – "Amazon Dreams of AI Agents That Do the Shopping for You", Wired, 2024.  
  <https://www.wired.com/story/amazon-ai-agents-shopping-guides-rufus>
* Emilio Calvano, Giacomo Calzolari, Vincenzo Denicolò, Sergio Pastorello – "Artificial Intelligence, Algorithmic Pricing, and Collusion", American Economic Review, 2020.  
  https://www.aeaweb.org/articles?id=10.1257/aer.20190623
* Webretailer Team – "AI in eCommerce: Explanation, Benefits, and Impacts", 2023.  
  <https://www.webretailer.com/ai-retail/ai-in-ecommerce-explained>

**Competitor Analysis:**

* Swap.com – <https://www.swap.com>
* BarterQuest – <https://www.barterquest.com>
* Bunz – <https://bunz.com>
* OfferUp – <https://offerup.com>

1. **Functional Requirements & Non- Functional Requirements**Functional Requirements-
   1. **User Registration and Login:**
   * Ability to register via email or ID.
   * Creation of a personal profile with user information (name, phone number, location, gender, date of birth).
   * Login system with password authentication.
   1. **Product Upload:**
   * Ability to upload items including pictures, descriptions, condition of the item, and category.
   * Adding product details such as location, descriptions, and quality measures etc.
   * Option to set priority preferred categories.
   * Automatic Product Valuation via AI Algorithm:

* The system collects relevant details entered by the user about the product.
* These details are inserted into a predefined text template.
* The template is sent through an API to an AI-based valuation mechanism.
* The AI mechanism processes the input and returns a response in a fixed format, containing an estimated price range for the product.
* The system presents the estimated price range to the user, along with a recommendation to set the suggested price for better matching success. If the mechanism fails to estimate the price, the system will return a message indicating that the item cannot be valued.
  1. **Search and Match:**
  + Advanced search system with filters (category, condition, price range, location).
  + The system will display product swap suggestions based on intelligent matching algorithms that take into account the user's search history, preferred categories, age, gender, and other relevant factors.
  1. **Rating and Reviews:**
  + Ability for users to rate products and completed swaps .
  + Display of user and product reviews.
  1. **Swap Process:**
  + Transaction management system to review transaction details.
  + Option to accept or reject swap offers.
  + Ability for users to communicate for arranging swap details.
  1. **Admin Interface:**
  + **Inappropriate Product Removal:** Ability to remove products that violate platform guidelines or are deemed inappropriate.
  + **User Blocking:** Option to block users who violate the platform’s terms of service, engage in fraudulent activities, or misuse the platform in any other way.
  + **Usage Data Monitoring:** Access to platform usage data, including statistics on swaps, product uploads, and active users.

Non-Functional Requirements-

#### **3.1 Performance:**

* **Response Time:**
  + The average system response time should not exceed 3 seconds for standard actions and 9 seconds for complex actions (e.g., searches with multiple filters).
  + Real-time updates should be available within less than 2 second.
* **Load Handling:**
  + The system should support at least 100,000 active users simultaneously without performance degradation.

During the initial pilot phase, the platform will allow a limited number of users on the local computer.

#### **3.2 Security:**

* **Data Storage:**

Personal data will be stored securely with password protection.

#### **3.3 Reliability:**

* **System Availability:**
  + The platform should maintain 99% availability, excluding scheduled maintenance.

#### **3.4 Usability:**

* **User Interface:**
  + The interface should include clear feedback for user actions (e.g., success messages after uploading an item).
* **Device Support:**
  + Initially, the platform will be compatible with the web only. If demand arises, a mobile version will be developed.

#### **3.5 Maintainability:**

* **Future Upgrades:**
  + The codebase will be designed in a modular manner to allow easy updates and enhancements.
  + Ongoing updates will be supported without requiring system downtime.
* **Monitoring:**
  + The system will log user activities (e.g., account creation, item uploads) and enable tracking of user operation times.
  + Automated activity reports will be generated to analyze performance and improve the system.
* **Clear Policies:**
  + The platform will include well-defined policies for administrative actions such as blocking users and removing inappropriate items to ensure transparency and fair operation.
* **Scalability:**
  + The system should easily scale to support a larger number of users and items as the platform grows.

1. **Architectural Requirements**

The system is a **web-based platform** with separate **backend** and **frontend** components. Below is a detailed breakdown of each component:

#### **3.1 Backend:**

* **Database**: PostgreSQL (using pgAdmin4), fireBase.
* **Programming Language**: The backend will be developed using type script
* **Functionality**:
  + Handles business logic, user authentication, and data processing.
  + Provides APIs for communication with the frontend and integration with AI mechanisms.

#### **3.2 Frontend:**

* **Frameworks**: Angular and Node.js for dynamic and efficient development.
* **Technologies**:
  + **HTML** and **CSS** for structuring and styling the application.
  + **TypeScript** for scalable code.
* **Functionality**:
  + Delivers an intuitive and responsive user interface.
  + Communicates with the backend through RESTful APIs.

#### **3.3 Additional Features:**

* **AI Integration**:
  + The system will include APIs to integrate various AI mechanisms, such as automatic product valuation, intelligent matching algorithms, and real-time notifications.

1. **Result**

**Test Cases -**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Test Case ID** | **Description** | **Preconditions** | **Test Steps** | **Expected Result** | **Actual Result** |
| TC-001 | Register new user | Backend and DB running | 1. Go to signup page 2. Enter unique username, email, and password 3. Submit form | User account is created and redirected to login page | Same as Expected Result |
| TC-002 | Attempt to register with existing email | Email already registered | 1. Go to signup page 2. Enter existing email and new username/password 3. Submit form | Error message shown: 'Email already in use' | Same as Expected Result |
| TC-003 | Login with valid credentials | Valid user account exists | 1. Go to login page 2. Enter valid credentials 3. Submit form | User is logged in and redirected to homepage | Same as Expected Result |
| TC-004 | Login with incorrect password or email | Valid user account exists | 1. Go to login page 2. Enter valid username and wrong password 3. Submit form | Error message: 'Invalid credentials' | Same as Expected Result |
| TC-005 | Add product with valid data | User is logged in | 1. Navigate to add product page 2. Fill in all required fields 3. Submit form | Product is added and visible in user's products list | Same as Expected Result |
| TC-006 | Prevent submission product when required fields are missing | User is logged in | 1. Navigate to add product page 2. Leave required fields empty 3. Observe the submit button | Submit button is disabled and form cannot be submitted | Same as Expected Result |
| TC-007 | Delete product (owned by user) | User is logged in and has a product | 1. Go to my products 2. Click delete on a product 3. Confirm deletion | Product is removed, the list updates immediately, and a success message displayed to the user | Same as Expected Result |
| TC-008 | Attempt to delete product not owned by user | User is logged in but does not own the product | 1. Attempt to delete another user's product | Action denied | Same as Expected Result |
| TC-009 | Search with keyword | Products exist | Enter a keyword in search bar | Relevant products displayed | Same as Expected Result |
| TC-010 | Search using filters | Products exist | Set category, condition, and price filters | Filtered results are displayed | Same as Expected Result |
| TC-011 | Combined keyword + filter search | Products exist | Enter keyword and set filters | Results matching both are shown | Same as Expected Result |
| TC-012 | Real-time result update | User is on search page | 1. Type in the search field 2. Observe result update | Results update in real-time | Same as Expected Result |
| TC-013 | User expresses interest in product | User is logged in | 1. View another user’s product 2. Click 'I'm interested' | Notification is sent to product owner | Same as Expected Result |
| TC-014 | View interested product's users | User has products | 1. Open my products list 2. View interested users per product | Correct list of interested products of the users is shown | Same as Expected Result |
| TC-015 | Logout process from every page | User is logged in | 1. Click 'Logout' | User is logged out and redirected to login | Same as Expected Result |
| TC-016 | |  | | --- | | View matched products (Matches) |  |  | | --- | |  | | |  | | --- | | User A has liked a product of User B, and User B has liked a product of User A |  |  | | --- | |  | | |  | | --- | | User A logs in and likes a product of User B.  User B logs in and likes a product of User A |  |  | | --- | |  | | User A opens the “Matches” view - A table displays the matched products between User A and User B, including the new option | Same as Expected Result |
| TC-017 | Trigger AI price estimation on product submission | User is logged in,  AI Gemini API is available | 1. Add product 2. Click "Estimate Price" | System sends a request to the external AI API (Gemini) with the relevant product data | Same as Expected Result |
| TC-018 | Receive and display estimate price from AI API | AI API is functioning and responds with a valid price | 1. Trigger AI estimation after submitting product  2. Wait for AI response | Estimated min price and max price is displayed clearly in the UI | Same as Expected Result |
| TC-019 | View another user's product list | At least one other user has products and he interest my product | 1. Go to my products  2. Click on "View product to switch" | Products are displayed correctly | Same as Expected Result |
| TC-020 | Contact user after expressing interest | User has expressed interest in product | 1. Click 'Contact Seller' on interested product 2. View the seller's phone number and email, then contact them directly | Contact details displayed successfully | Same as Expected Result |
| TC-021 | System handles API failure gracefully | AI API is temporarily unavailable | 1. Add product 2. Attempt price estimation | User is shown friendly error message | Same as Expected Result |
| TC-022 | Mark product as "Not Interested" | User is logged in | |  | | --- | |  |   1. User views another user's product 2. Clicks on the "Not Interested" button  3. Opens search screen with "Show relevant only" filter | The system saves the user's preference ("Not Interested").  The product no longer appears in future search results when the "Show relevant only" filter is applied. | Same as Expected Result |

1. **Startup**

### 7. What Does It Take to Turn This Into a Startup?

1. **From MVP to Market-Ready Product**  
   Switch Me is currently a functioning MVP. To become a real startup, we need to refine it for public release: improve performance, fix edge-case bugs, and polish the UI/UX.
2. **Legal and Trust Infrastructure**  
   As a peer-to-peer platform, user trust is key. Building identity verification, rating systems, and a mechanism for dispute resolution will be crucial for scaling responsibly.

### ****Potential Revenue Models:****

1. **Paid Product Promotion (Premium Subscription):**  
   Users can purchase a premium plan that offers benefits such as top placement in search results, greater visibility, and personalized match suggestions.
2. **Ad Revenue from Sponsored Content:**  
   Integrating relevant sponsored ads (e.g., second-hand stores, delivery services) can generate consistent revenue without disrupting the user experience.
3. **Transaction Fee on Swaps:**  
   A small fee can be charged per successful exchange on the platform. While this may reduce usage slightly, it has strong long-term revenue potential if managed carefully.
4. **Conclusions**

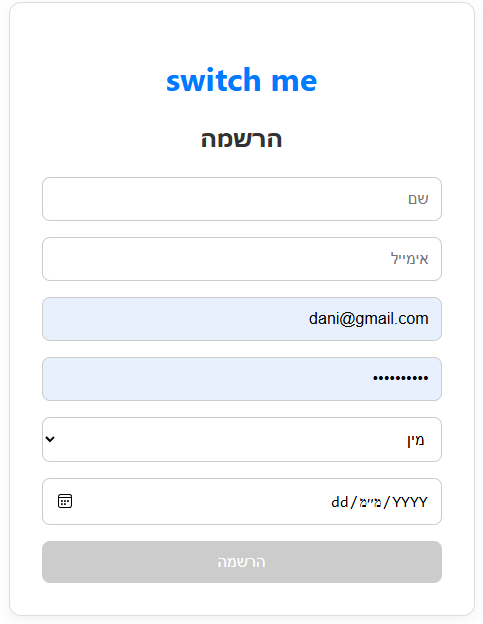
**AI Matching Potential**  
The concept of AI-driven product matching is promising but complex. More testing is needed to ensure accurate and fair suggestions based on item value, condition, and user preferences.

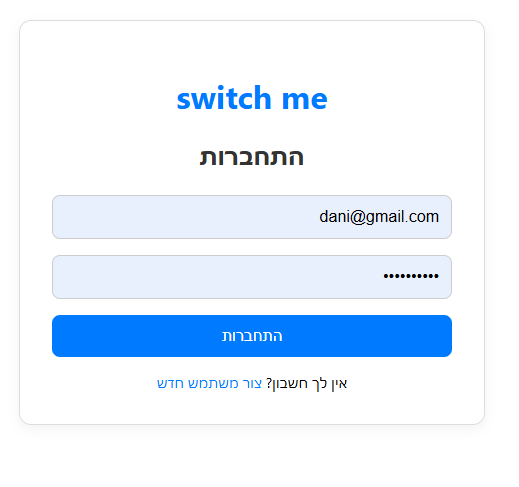
**User Experience is Everything**  
Simplifying the item upload process, improving mobile responsiveness, and reducing friction in the swap proposal flow would make the platform more usable.

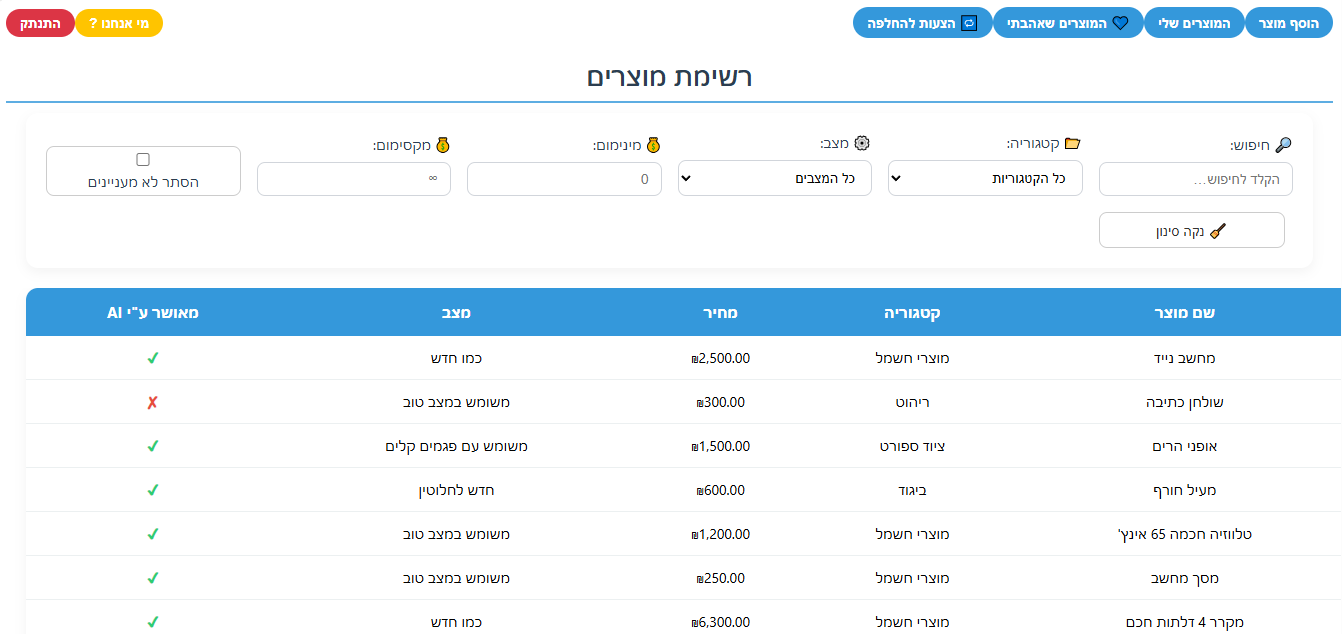
**Data-Driven Decisions**  
We would integrate analytics earlier – to track user behavior and iterate faster on what works (e.g., which filters are most used, where users drop off).

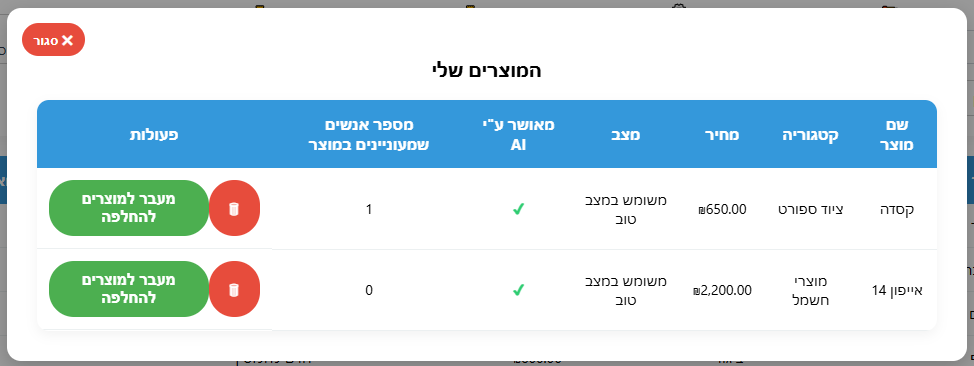
**Security and Privacy**  
Handling user-uploaded images and personal data requires end-to-end encryption and a clear privacy policy. These will be prioritized before public launch.

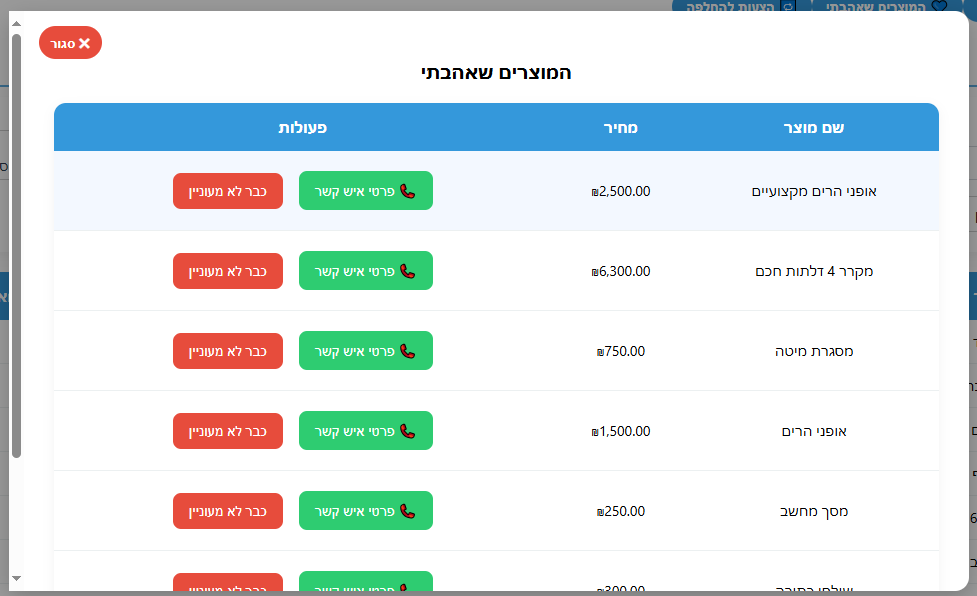
**More Modular Codebase**  
In hindsight, breaking the platform into more independent components would have allowed faster testing of features like “Suggested Matches” and “Swap History.”

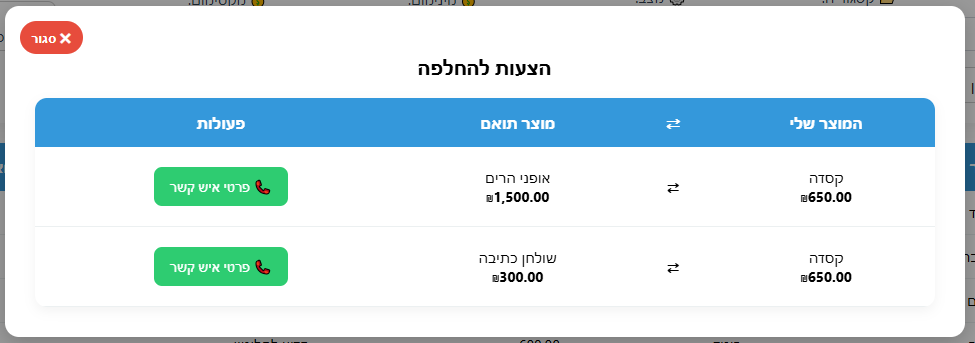
1. **Screenshots**

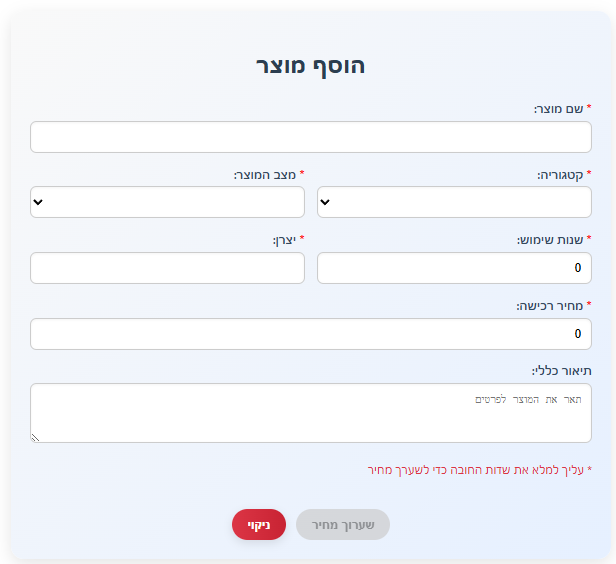
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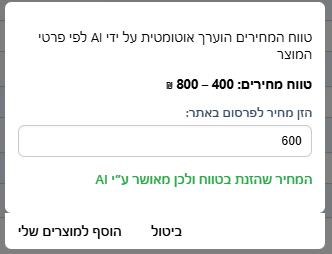
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