



Bilkent University

Department of Computer Engineering

CS353 TERM PROJECT

Final Report

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1. Introduction

Betman is a web-based application implemented to establish a social betting platform for its users. System keeps information on sports teams, matches, bets, and users. The user base consists of bettors, editors and admins. All of the users must provide their TC identification information, username, date of birth, e-mail address and phone number in order to sign up to the application. All types of users have a profile page where they can change their password.

Bettor users can access their wallet and add money to their wallet. They can go to the matches page and comment on these matches. They can access bet slips, comment on them and bet on these slips using the money they have on their wallet. They can bet using either the application currency or real currency. The users can earn both real money and in application money from their bets. In-application money can be used to buy lottery tickets and depending on their ticket, they can earn real money. Bettors can befriend other bettors and follow editors.

Editor can prepare bet slips but they cannot bet on the matches. These slips can be shared so bettors can bet on them. The bettors can also see the success rate of editors.

Admins are responsible of maintenance. They can remove bets or change their odds, add or remove matches, add or remove teams, remove comments.

2. Final ER Diagram

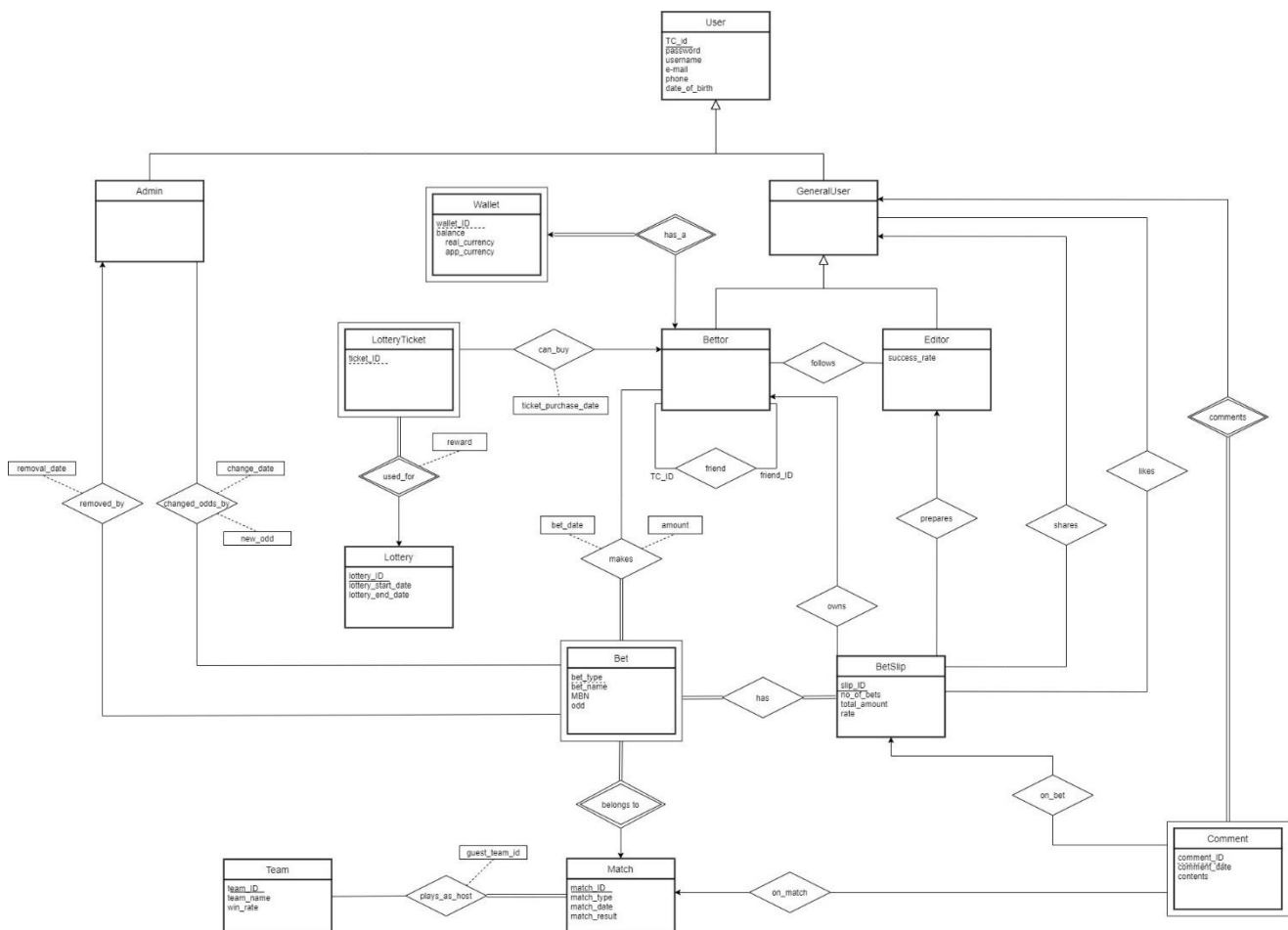


Figure 1 ER Diagram

3. Tables

- User (TC_id, password, username, email, phone, date_of_birth)
 - *Candidate Keys:* TC_id, username, email, phone
 - *Primary Key:* TC_id
- GeneralUser (TC_id)
 - *Candidate Keys:* TC_id
 - *Primary Key:* TC_id
 - *Foreign Keys:* TC_id to User Relation
- Admin (TC_id)
 - *Candidate Keys:* TC_id
 - *Primary Key:* TC_id
 - *Foreign Keys:* TC_id to User Relation
- Bettor (TC_id)
 - *Candidate Keys:* TC_id
 - *Primary Key:* TC_id
 - *Foreign Keys:* TC_id to GeneralUser Relation
- Editor (TC_id, success_rate)
 - *Candidate Keys:* TC_id
 - *Primary Key:* TC_id
 - *Foreign Keys:* TC_id to GeneralUser Relation
- Wallet (TC_id, wallet_id, real_currency, app_currency)
 - *Candidate Keys:* TC_id, wallet_id
 - *Primary Key:* (TC_id, wallet_id)
 - *Foreign Keys:* TC_id to Bettor Relation
 - Dependencies:
- Match (match_id, match_type, match_date, match_result)
 - *Candidate Keys:* match_id
 - *Primary Key:* match_id
 - While in SQL the table for matches is called Match but during implementation this table was renamed to Game
- Team (team_id, team_name, win_rate)
 - *Candidate Keys:* team_id, team_name
 - *Primary Key:* team_id
- TeamsPlaying (host_id, guest_id, match_id)
 - *Candidate Keys:* match_id
 - *Primary Key:* match_id

- *Foreign Keys:* match_id to Match, host_id to team_id in Team, guest_id to team_id in Team
- BetSlip (slip_id, no_of_bets, total_amount, rate)
 - *Candidate Keys:* slip_id
 - *Primary Key:* slip_id
 - *Foreign Keys:* editor_id to TC_id in Editor, bettor_id to TC_id in Bettor
- EditorPreparesSlip (slip_id, editor_id)
 - *Candidate Keys:* slip_id
 - *Primary Key:* slip_id
 - *Foreign Keys:* slip_id to BetSlip, editor_id to TC_id in Editor
- Bet (match_id, bet_type, bet_name, MBN, odds)
 - *Candidate Keys:* (match_id, bet_type), (match_id, MBN, odds)
 - *Primary Key:* (match_id, bet_type)
 - *Foreign Keys:* match_id to Match
- SlipHasBet (slip_id, match_id, bet_type)
 - *Candidate Keys:* (slip_id, match_id, bet_type)
 - *Primary Key:* (slip_id, match_id, bet_type)
 - *Foreign Keys:* slip_id to BetSlip, (match_id, bet_type) to Bet
- BettorOwnsSlip (bettor_id, slip_id)
 - *Candidate Keys:* slip_id
 - *Primary Key:* (slip_id, bettor_id)
 - *Foreign Keys:* slip_id to BetSlip, bettor_id to TC_id in Bettor
- BettorMakesBet (bettor_id, match_id, bet_type, bet_date, amount)
 - *Candidate Keys:* (bettor_id, match_id, bet_type)
 - *Primary Key:* (bettor_id, match_id, bet_type)
 - *Foreign Keys:* bettor_id to TC_id in Bettor, (match_id, bet_type) to Bet (bet_type))
- BettorFollowsEditor (bettor_id, editor_id)
 - *Candidate Keys:* (bettor_id, editor_id)
 - *Primary Key:* (bettor_id, editor_id)
 - *Foreign Keys:* bettor_id to TC_id in Bettor, editor_id to TC_id in Editor
- Lottery (lottery_id, lottery_start_date, lottery_end_date)
 - *Candidate Keys:* lottery_id
 - *Primary Key:* lottery_id
- LotteryTicket (ticket_id, lottery_id, reward)
 - *Candidate Keys:* ticket_id, lottery_id
 - *Primary Key:* (ticket_id, lottery_id)

- *Foreign Keys:* lottery _id to Lottery
- BettorBoughtTicket (ticket_id, lottery_id, bettor_id, ticket_purchase_date)
 - *Candidate Keys:* ticket_id
 - *Primary Key:* (ticket_id, lottery_id)
 - *Foreign Keys:* bettor _id to TC_id in Bettor, lottery_id to Lottery, (ticket_id, lottery_id) to LotteryTicket
- Comment (comment_id, TC_id, comment_date, contents)
 - *Candidate Keys:* comment_id
 - *Primary Key:* comment_id
- CommentOnSlip (comment_id, slip_id)
 - *Candidate Keys:* (comment_id, slip_id)
 - *Primary Key:* (comment_id, slip_id)
 - *Foreign Keys:* comment_id to Comment, slip_id to BetSlip
- CommentOnMatch (comment_id, match_id)
 - *Candidate Keys:* (comment_id, match_id)
 - *Primary Key:* (comment_id, match_id)
 - *Foreign Keys:* comment_id to Comment, match_id to Match
- Friend (TC_id, friend_id)
 - *Candidate Keys:* (TC_id, friend_id)
 - *Primary Key:* (TC_id, friend_id)
 - *Foreign Keys:* TC_id to Bettor, friend_id to TC_id in Bettor
- UserLikesSlip (TC_id, slip_id)
 - *Candidate Keys:* (TC_id, slip_id)
 - *Primary Key:* (TC_id, slip_id)
 - *Foreign Keys:* TC_id to GeneralUser, slip_id to BetSlip
- UserSharesSlip (TC_id, slip_id)
 - *Candidate Keys:* (TC_id, slip_id)
 - *Primary Key:* (TC_id, slip_id)
 - *Foreign Keys:* TC_id to GeneralUser, slip_id to BetSlip
- BetRemovedByAdmin (TC_id, match_id, bet_type, removal_date)
 - *Candidate Keys:* (TC_id, match_id, bet_type)
 - *Primary Key:* (bettor_id, match_id, bet_type)
 - *Foreign Keys:* TC_id to Admin, (match_id, bet_type) to Bet
- BetChangedByAdmin (TC_id, match_id, bet_type, change_date, new_odd)
 - *Candidate Keys:* (TC_id, match_id, bet_type)
 - *Primary Key:* (bettor_id, match_id, bet_type)
 - *Foreign Keys:* TC_id to Admin, (match_id, bet_type) to Bet

4. Implementation Details

The code was written using Visual Studio code for easier project management and practical access to Github. During coding, everyone worked on separate branches and did their own assigned parts. For the implementation of backend, PHP was used due to how it was practical to use MYSQL with this language as it allows direct query processing with its' methods. For frontend and the design of the webpage Javascript, HTML and CSS were used. As the base of the user interface, a template was used from the given website: <https://templatemo.com/tm-541-host-cloud>. This template was changed to suit our needs for our website. The database was set up on localhost using XAMPP and testing was done through there.

Several problems were encountered during implementation. In one case, using a form, we had to POST more than one values to server while only having one possible input area. To solve this, the values being submitted were combined as strings using a dash and on PHP side, they were separated using an appropriate function. Another problem encountered was while preparing a bet slip, there were uncertainties on how to add a bet to the slip. One possible solution was to send the user to bet page but now with each betting having an extra button to notify that they are being added and return back to slip page once completed. However, due to the increasing number of forms and repetition of queries, checkboxes with important bet data were used. Another error was using the name 'Match' for a table which was a keyword. To prevent this, the table was renamed to 'Game' during implementation.

Each group member was responsible of a specific page, its' frontend and backend. Functions and queries required by that page were also prepared by that member:

Zeynepnur Cavcar:

- Match List, Match Details and Comments
- Available Bet Slips
- My Bet Slips
- Prepare Bet Slip (by Editor)
- Table Creation/Config

Yaren Durgun:

- Registration Page
- Bet Slip Information and Comments
- Wallet
- Profile
- Certain functions – Logout, Login

Ece Teker:

- Login Page
- Implementation of test cases
- Main Feed
- Certain functions – Check user type, Some Registration Page Functions

Selen Görgün:

- Bet List
- Admin's Bet List
- Lottery Ticket Page
- Certain functions – Random lottery ticket generation

5. Advanced Features

a. Reports

1) Number of comments made on football matches by the current user

```
($ _SESSION['TC_id'])  
WITH chosenmatch(match_id) AS  
  (SELECT match_id  
   FROM Match  
   WHERE match_type='Football')  
SELECT M.match_id AS mid, COUNT(*) AS c1  
FROM chosenmatch AS M, CommentOnMatch AS CM, Comment AS C  
WHERE M.match_id = CM.match_id AND CM.comment_id = C.comment_id AND  
C.TC_id = '($ _SESSION['TC_id'])'  
GROUP BY M.match_id
```

Output: (Information – At this stage in the database there were 3 available matches and only number 1 and 3 were football matches, the active user had comment 8 times on match 1, 5 times on 2, 1 time on 3)

Match ID - 1 Count - 8 Match ID - 3 Count - 1

2) Number of times user won money from the lottery but less than 100 TL

```
($ _SESSION['TC_id'])  
SELECT COUNT(*) AS c1  
FROM BettorBoughtTicket AS BT, (SELECT ticket_id, lottery_id FROM LotteryTicket  
WHERE reward BETWEEN 1 AND 100) AS LT  
WHERE LT.ticket_id = BT.ticket_id AND LT.lottery_id = BT.lottery_id AND BT.bettor_id  
= '($ _SESSION['TC_id'])'
```

Output: (Information – User had bought 5 tickets: One of them had no reward the rest were 10, 150, 50, 80 TL)

Number of times user won money from the lottery but less than 100 TL - 4

3) Most Played/Owned Bet Slip, and how many times it was played

```
WITH slipboughtcount(slip_id, c) AS  
  (SELECT slip_id, COUNT(*) FROM BettorOwnsSlip GROUP BY slip_id)  
SELECT slip_id, c  
FROM slipboughtcount NATURAL JOIN Betslip  
HAVING MAX( c )
```

Output: (Information – slips were available, one was played 2 times, the other one once)

Slip Id 0 // 2

b. Views

1) View of Match List (If Match table is updated by admin view is dropped to be recreated)

```
CREATE VIEW matchlist(host_name,guest_name, mtype, mdate) AS  
  ( SELECT Host.team_name, Guest.team_name, Match.match_type,  
    Match.match_date  
    FROM TeamsPlaying AS TP, Team AS Host, Team AS Guest, Game
```


WHERE TP.match_id = Game.match_id **AND** TP.host_id = Host.team_id **AND**
TP.guest_id = Guest.team_id)

Output:

Team A - Team B

Football // 2022-06-12

Team C - Team D

Basketball // 2022-04-12

Team E - Team A

Football // 2021-04-12

1) View of Number of Matches of each Team

```
CREATE VIEW matchcount(t_id, c1) AS  
( SELECT T.team_id, COUNT(*)  
FROM TeamsPlaying AS TP, Team AS T  
WHERE TP.host_id = T.team_id  
GROUP BY T.team_id)
```

c. Triggers, Constraints, Stored Procedures and Secondary Indexes

Constraints were used during table creation to ensure that all the critical values would be entered by declaring them NOT NULL and during creation appropriate data types were determined for fields like numeric for ids, varchar for names. The primary and foreign keys were also declared during creation.

Triggers are mainly used after deletions. When a comment is deleted by the admin, first it is removed from CommentOnMatch or CommentOnSlip which is the trigger. When trigger is activated, it is deleted from Comment table. Another is when user adds a friend. Friend relation has 2 columns: TC_id and friend_id. As an example when user A adds B as a friend the new tuple inserted is (A,B). The trigger is activated after this insert action to add (B,A) to table. Trigger after deletion is used in every case where an entity is deleted, it is properly deleted from every relation.

Only B+TREE indexes are allowed on InnoDB. Secondary indexes will be used for tables where there will be large amounts of tuples to use in queries. Better table will use B+TREE type secondary index but not the user types as there will be a smaller number of admins and editors. The same issue applies for Comment table as well as each comment made by users made on slips and matches will be separately stored so in future, there will be a large number of comments to process. Each lottery ticket will be generated randomly whenever a user buys one so again, the number will increase drastically and to speed up queries B+TREE will be used. Stored procedures were used on functions that were called often or complex, like generation of a random lottery ticket and also to check the user type, the related user tables were called through procedures.

Trigger for Match Comment Deletion

```
CREATE TRIGGER commentdeleter  
AFTER DELETE  
ON CommentOnMatch FOR EACH ROW  
REFERENCING OLD ROW AS orow  
DELETE FROM Comment  
WHERE Comment.comment_id=orow.comment_id
```

6. User Manual

When you first open the web site, you are faced with a welcome page. From there you can have more information about the application and the website by going to the About Us page, you can sign in to your account or you can create a new account. Each user can choose the type of their account and go to the corresponding signup page from the links below. It is assumed that the type of the users is decided before the signup process with TC number of the user.

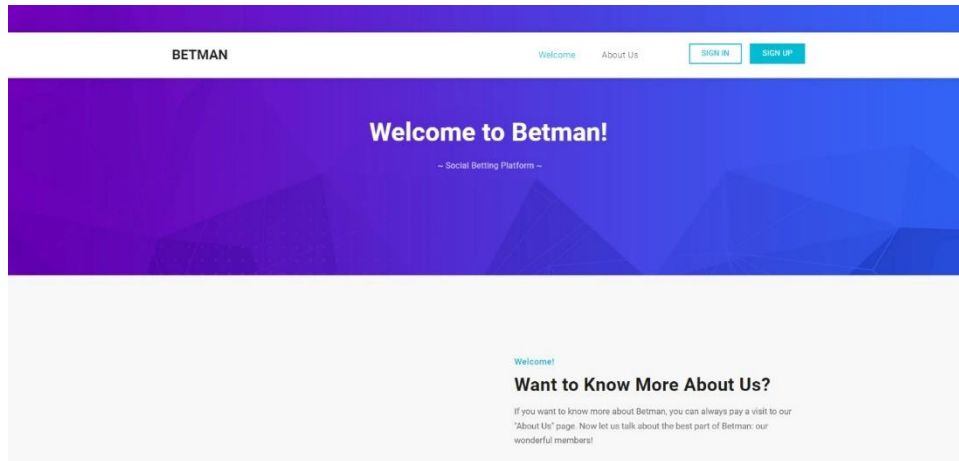


Figure 2 Welcome Page - 1

If you already have an account, you can sign in by entering your username and password.

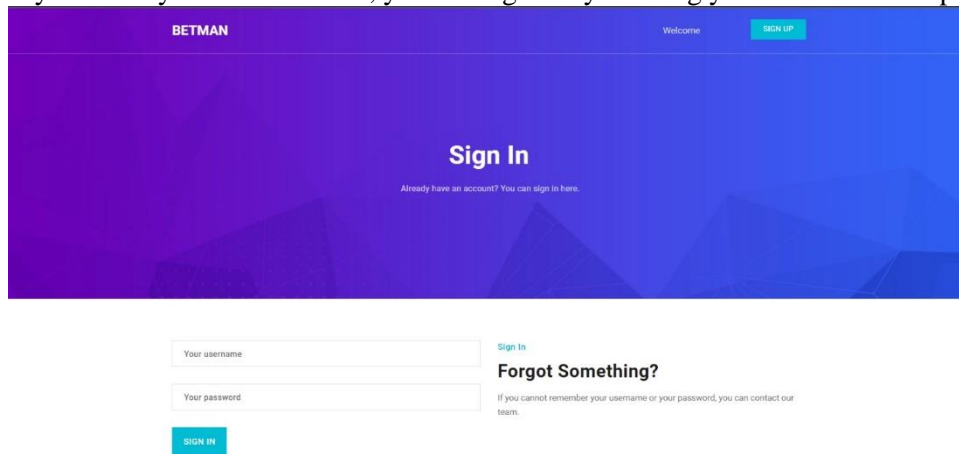


Figure 3 Sign In

If you do not have an account, you should create an account by choosing the user type of your account. There are 3 types of accounts: Bettor, Admin and Editor. You should click the one with your user type.

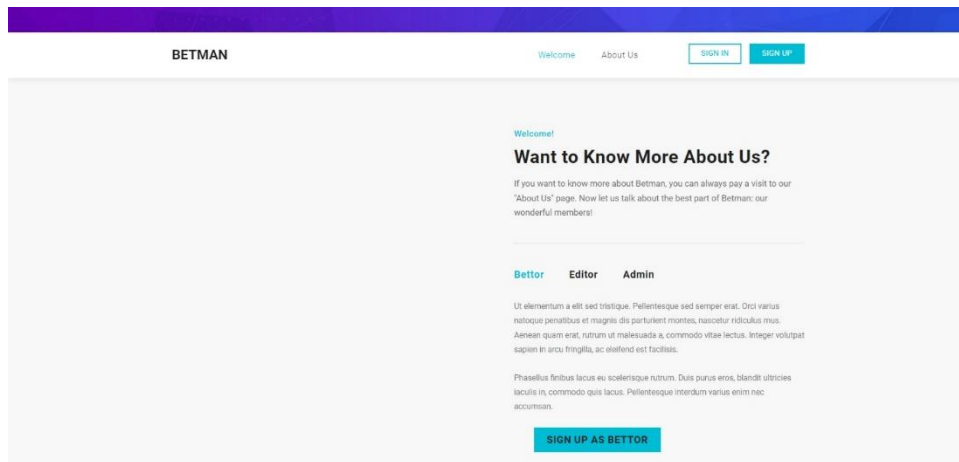


Figure 4 Welcome Page - 2

For Editors:

If you are going to sign up as editor, you should provide your username, TC number, e-mail, phone number, birth date and password information. None of the areas can be left blank.

Figure 5 Sign Up

If you have logged in as an editor, you are directed to your profile page. In this page, you can see your TC number, e-mail, phone number and date of birth. Also, you can change your password. At the top of the page, there is a navbar that includes links to the available betslips and matches.

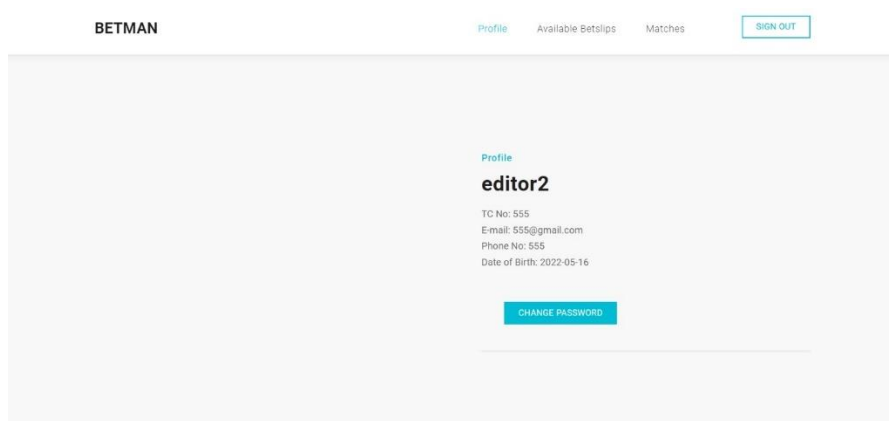


Figure 6 Editor Profile

You can see the betslips in the systems by clicking the Available Betslips link. From this page, you can see the information about all of the betslips in the system such as the number of bets each betslip has, the rate of the betslip and information about each bet.

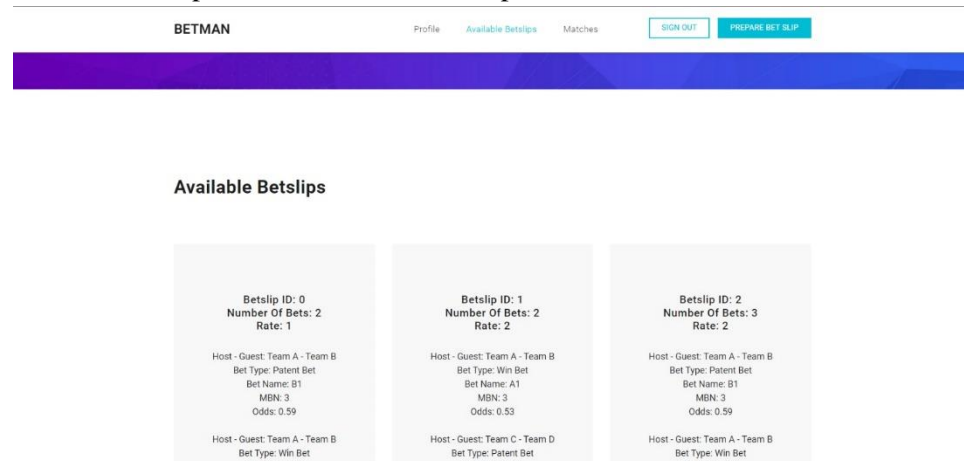


Figure 7 Available Betslips Editor Version

If you have clicked on the prepare betslip button, you are directed to the Create Betslip page where you can choose the bets that the betslip contains and the rate of the betslip. You cannot create a betslip without choosing any bets. After you have submitted the form, the betslip is created and the other users can see it and bet on it.

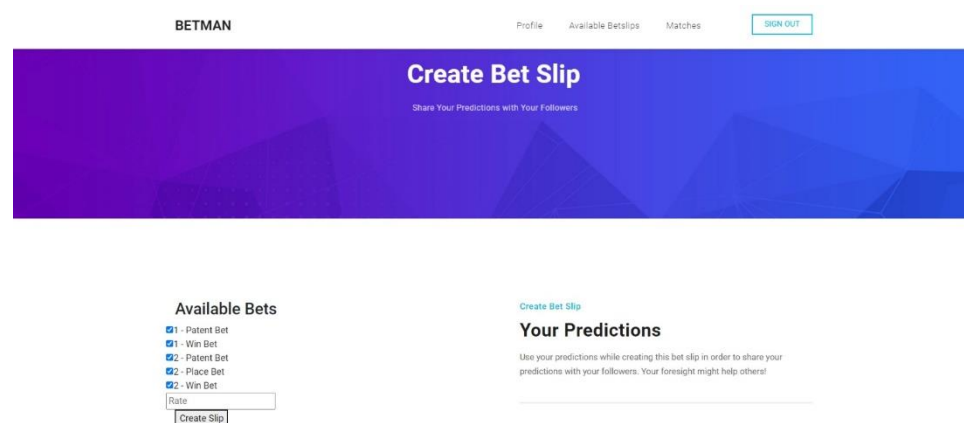


Figure 8 Betslip Preparation

For Bettors:

If you are going to sign up as bettor, you should provide your username, TC number, e-mail, phone number, birth date and password information. None of the areas can be left blank.

BETMAN [Welcome](#) [About Us](#) [SIGN IN](#)

[Sign Up - Bettor](#)

Have Some Questions?

If you have any questions regarding the registration process, you can contact our team. We are here to help!

Your username

Your TC No

Your E-mail

Your Phone No

mm/dd/yyyy

Your Password

Your Password Again

[SIGN UP](#)

Figure 9 Sign Up - Bettor

If you have logged in as a bettor, you are directed to your profile page. In this page, you can see your TC number, e-mail, phone number and date of birth. Also, you can change your password. At the top of the page, there is a navbar that includes links to the available betslips, matches, your wallet, bets and your lottery tickets. You can also search for profiles to find editors to follow or bettors to befriend.

BETMAN [Profile](#) [Available Betslips](#) [Matches](#) [My Wallet](#) [Bets](#) [My Betslips](#) [My Lottery Tickets](#) [SIGN OUT](#)

Profile

All your account information at one place!

[Profile](#)

zeynep

TC No: 987654321
E-mail: aaaa@gmail.com
Phone No: 0
Date of Birth: 2022-04-16

[CHANGE PASSWORD](#)

Figure 10 Bettor Profile

Note that you can sign out from the button at the top right of the page. If you click on the My Betslips link, you go to a page where you can look at the betslips that you played. From this page, you can follow the status of the bets and matches.

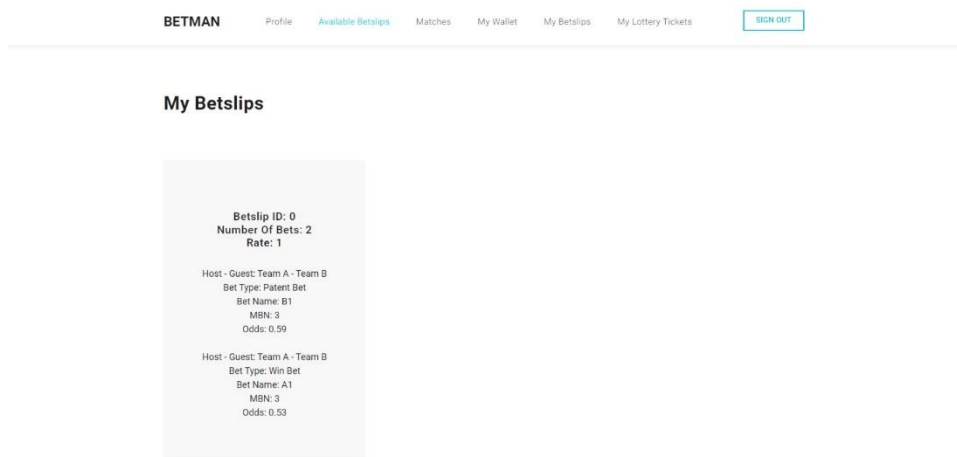


Figure 11 Betslips owned

If you click on the Available Betslips link, you go to a page where you can see all the bets in the system. From this page, you can bet on bets by clicking the corresponding button.

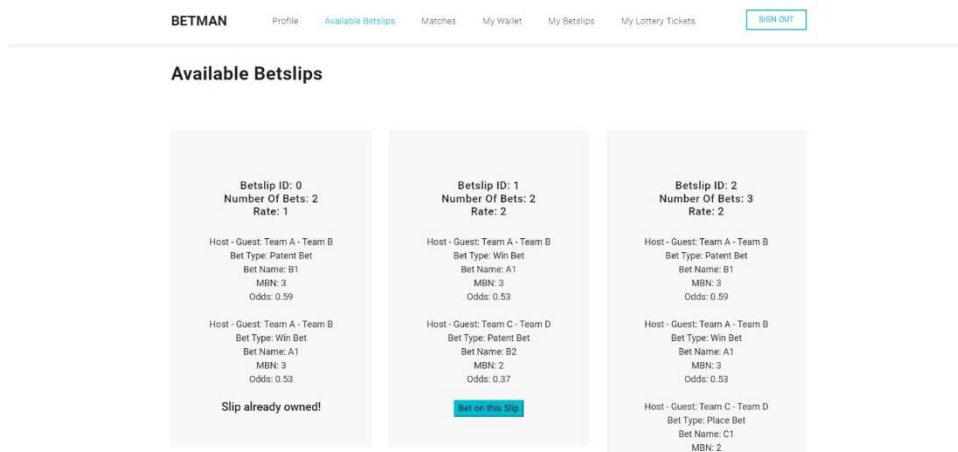


Figure 12 Available bets

By clicking on the Matches link, you are directed to a page where you can see the past and upcoming matches. This page is available for all users. You can see the information about each match such as the teams that are playing, the date of the match and the corresponding sport of the match. You can see the details of each match by clicking on the button below the match information.

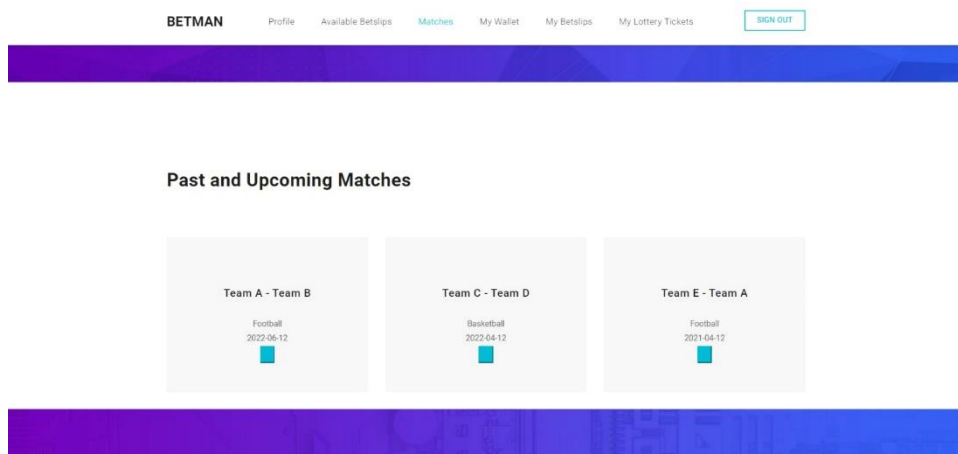


Figure 13 Match List

In the Match Details page, you can see the teams playing and match date. If the match date has passed, you can see the result of the match and comment on it.

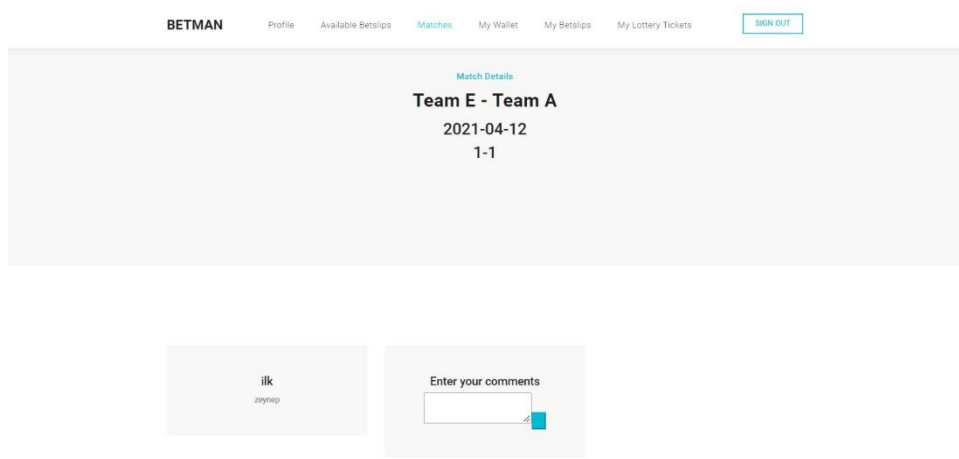


Figure 14 Match Details

By clicking the My Wallet link, you are directed to a page where you can see the information about your wallet. You can see the amount of real and app currency in your wallet. Also, you can

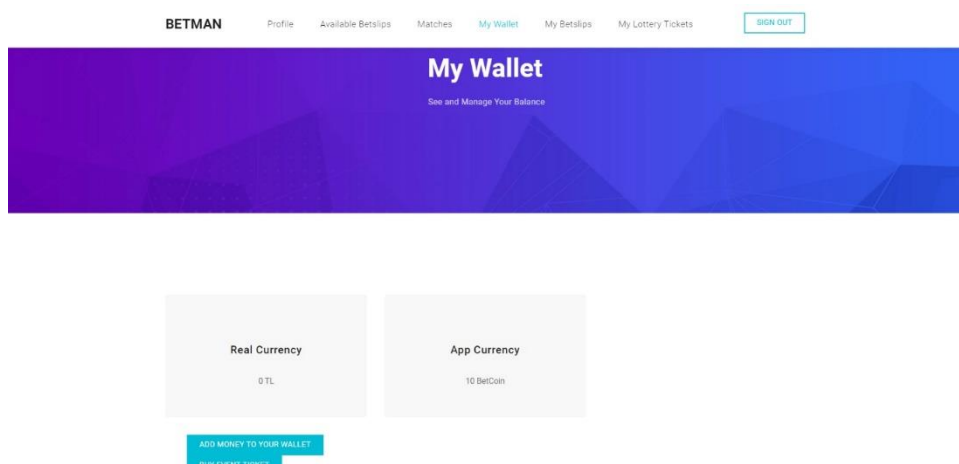


Figure 15 Wallet

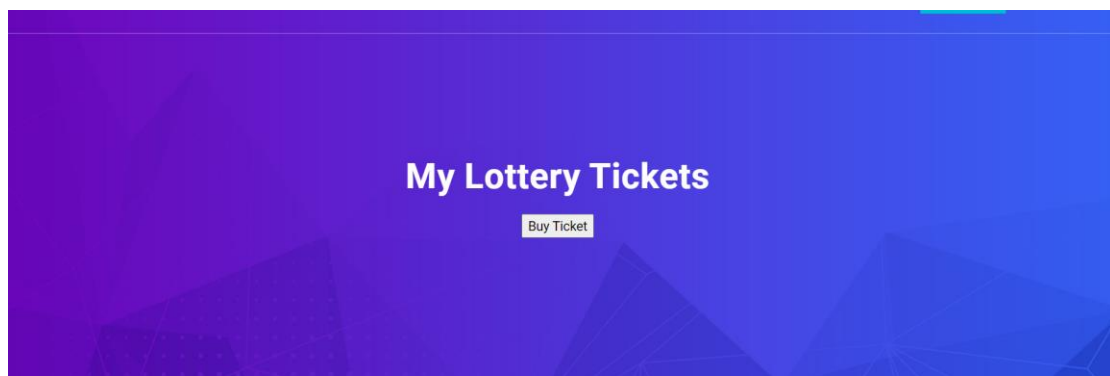
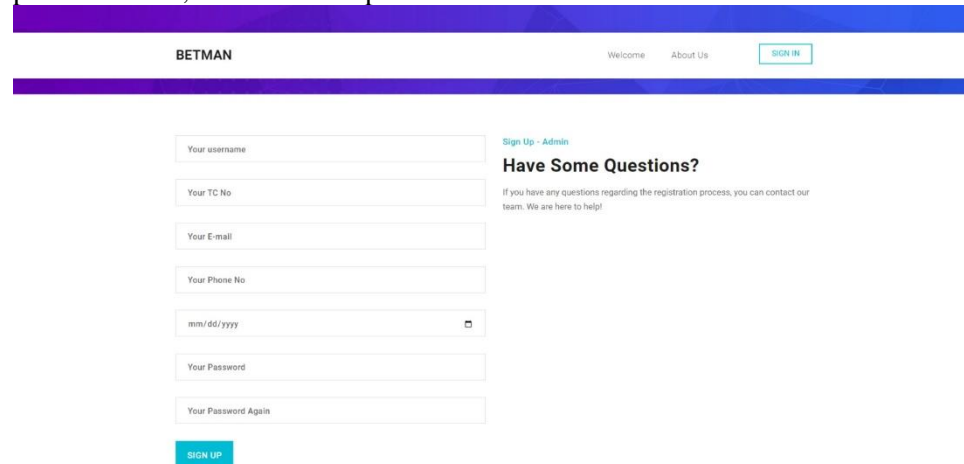


Figure 16 Lottery Tickets

As a bettor, you can also buy lottery tickets using your application currency. With these tickets you have a chance to win real money. Each lottery runs for a certain period of time and once this time ends, it is announced whether your ticket had a reward or not.

For Admins:

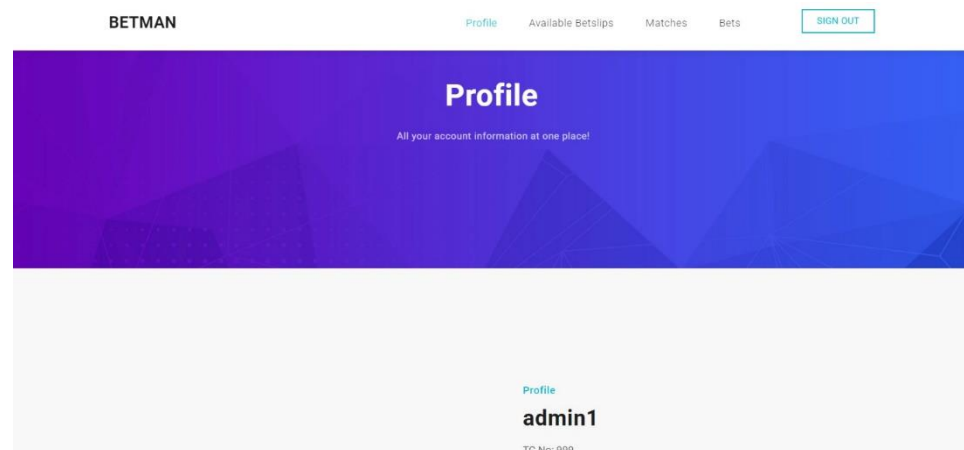
If you are going to sign up as admin, you should provide your username, TC number, e-mail, phone number, birth date and password information. None of the areas can be left blank.



The screenshot shows the 'Admin Sign Up' form on the BETMAN website. The header includes the BETMAN logo, 'Welcome', 'About Us', and a 'SIGN IN' button. The form itself is titled 'Sign Up - Admin' and 'Have Some Questions?'. It contains several input fields: 'Your username', 'Your TC No', 'Your E-mail', 'Your Phone No', 'mm/dd/yyyy' for the birth date, 'Your Password', and 'Your Password Again'. A 'SIGN UP' button is located at the bottom of the form.

Figure 17 Admin Sign Up

If you have logged in as an admin, you are directed to your profile page. In this page, you can see your TC number, e-mail, phone number and date of birth. Also, you can change your password. At the top of the page, there is a navbar that includes links to the available betslips, bets and matches.



The screenshot shows the 'Admin Profile' page on the BETMAN website. The header includes the BETMAN logo, 'Profile', 'Available Betslips', 'Matches', 'Bets', and a 'SIGN OUT' button. The main content area has a blue background with the title 'Profile' and the subtitle 'All your account information at one place!'. Below this, the profile information is displayed: 'Profile', 'admin1', and 'TC No: 999'.

Figure 18 Admin Profile

Note that you can sign out from the button at the top right of the page.

As an admin, you can remove bets or change their odds, add or remove matches, add or remove teams, remove comments from the related pages.