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BACHELOR THESIS

e-Questionnaire Platform
(ON-Surveys)

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ABSTRACT

Businesses and researchers across industries are conducting research with the use of surveys to investigate answers of specific questions related to one or more topics. These questions usually cover a wide range of areas and can be requested in multiple forms. Unlike other types of research, like written and face-to-face questions, Web-based questionnaires are not the typical choice of researchers as the results are mainly stored to inaccessible servers. This infrastructure makes the system vulnerable to potential data leakage, that could affect the integrity and confidentiality of the stored personal information. Moreover, the vast majority of these systems are used for anonymous surveys and do not provide any countermeasures regarding the data protection, such as authentication and/or authorization features.

Based on these facts, the aim of this thesis is to build a web platform that can support local installation of the application and database, in order to prevent the potential data leakage and exposure of the user's personal information.

The present thesis aims towards design and develop of a web platform **(ON-Surveys)** for creating questionnaires. It focuses on the safety of the system that will make both creator and receiver of the questionnaire certain that information and data are not approachable by unauthorized users.

ΠΕΡΙΛΗΨΗ

Οι επιχειρήσεις και οι ερευνητές από διάφορες βιομηχανίες διεξάγουν έρευνες με τη χρήση ερωτηματολογίων για τη μελέτη απαντήσεων σε συγκεκριμένες ερωτήσεις που σχετίζονται με ένα ή περισσότερα θέματα. Αυτά τα ερωτήματα, συνήθως, καλύπτουν ένα ευρύ φάσμα τομέων και μπορούν να βρεθούν σε πολλαπλές μορφές. Σε αντίθεση με άλλα είδη έρευνας, όπως γραπτές ερωτήσεις και ερωτήσεις πρόσωπο με πρόσωπο, τα ερωτηματολόγια που χρησιμοποιούν το διαδίκτυο δεν είναι η πρώτη επιλογή των ερευνητών, καθώς τα αποτελέσματα αποθηκεύονται ως επί το πλείστον σε μη προσβάσιμους servers. Αυτή η υποδομή καθιστά το σύστημα ευάλωτο σε πιθανή διαρροή δεδομένων που θα μπορούσε να επηρεάσει την ακεραιότητα και την εμπιστευτικότητα των αποθηκευμένων προσωπικών πληροφοριών. Επιπλέον, η πλειονότητα αυτών των συστημάτων χρησιμοποιούνται για ανώνυμες έρευνες και δεν παρέχουν μέτρα ασφαλείας αντίμετρα σχετικά με την προστασία δεδομένων, όπως χαρακτηριστικά γνωρίσματα πιστοποίησης ή / και εξουσιοδότησης.

Με βάση τα παραπάνω, στόχος της παρούσας εργασίας είναι η δημιουργία μιας πλατφόρμας στο διαδίκτυο που υποστηρίζει την τοπική εγκατάσταση της εφαρμογής και της βάσης δεδομένων, προκειμένου να αποφευχθεί η πιθανή διαρροή δεδομένων και η έκθεση των προσωπικών πληροφοριών του χρήστη.

Η παρούσα εργασία στοχεύει στον σχεδιασμό και την ανάπτυξη μιας διαδικτυακής πλατφόρμας **(ON-Surveys)** για την δημιουργια ερωτηματολογίων. Επικεντρώνεται στην ασφάλεια του συστήματος ως τόσο ο δημιουργός όσο και ο παραλήπτης του ερωτηματολογίου να είναι βέβαιοι ότι οι δοθείσες πληροφορίες δεν μπορούν να προσπελαθούν απο μη εξουσιοδοτημένους χρήστες.

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1. INTRODUCTION

1.1 PROJECT BACKGROUND

This bachelor thesis reflects on a project that implements a web-based platform for easy and secure creation of questionnaires and it is aimed to be used by healthcare facilities.

The project is undertaken in the BMI and eHealth Laboratory (BMI Lab), a research unit located at the Dept. of Informatics Engineering of the Technological Educational Institute (TEI) of Crete. The laboratory is involved in Research & Development in the fields of Biomedical Informatics, Intelligent Health Information systems and Clinical Decision Support Systems.

BMI Lab is coordinated by Prof. Manolis Tsiknakis, the Professor of "Biomedical Informatics and eHealth" at the Department of Informatics Engineering of TEI of Crete and an affiliate researcher at the Computational Medicine Laboratory of FORTH/ICS.

1.2 THE PURPOSE OF THE STUDY

The purpose of this study is to develop a web platform (ON-Surveys) with responsive web design technology. It will offer a basic common model which can be used by application developers in the future. The ON-Surveys is designed to develop a Web platform, aiming the creation of surveys by people that work in health care industry, so the targeted audience can answer them.

1.3 THESIS STRUCTURE

The first chapter of this thesis presents a small description of this study. The second chapter includes a presentation of the background research and a sample of other tools and systems that we could use to complete the implementation of the Web platform.

Chapter 3 presents the architecture of our program and how it communicates with server and client. Also, a small brief of what software, tools and platforms are needed for the implementation and how each one is used. Chapter 4 elaborates the implementation. All systems that need to be installed and every step of the process with all details needed for someone to understand how to properly run the system and a step by step navigation with detailed pictures.

Finally, chapter 5 gives our conclusions and directions for possible future work.

2. BACKGROUND AND RELATED WORK

2.1 SURVEYS

2.1.1 WHAT IS A SURVEY?

Survey is a method of collecting information from a sample of people, usually with the purpose of generalizing results to a larger population. Surveys have many forms but the most popular is the form of a questionnaire, either written or online. They provide a crucial source of data and ideas for almost everyone who is involved in the information economy, from businesses and the media to academics and government.[1]

In continuous quality improvement, surveys help to identify customer expectations, measure satisfaction levels, and determine specific areas for improvement.

2.2 SURVEY TYPES

There are four basic categories that surveys can be divided:

1. Face-to-face surveys
2. Telephone surveys
3. Mail surveys
4. Online surveys

1. **Face-to-face surveys**: an interviewer gathers information directly from the respondent. That requires an experienced interviewer to ask relevant questions to collect meaningful information.

2. **Telephonic surveys**: are time more time consuming and most of the times results depend on how many people answer the phone and if they want to invest their time answering questions over the telephone [1][49].

3. **Mail surveys**: before the huge evolution of online survey software, they were the only way for someone to answer a questionnaire from distance anytime. They usually have a low response rate and sometimes it may take a while the responder to return the questionnaire [48].

4. **Online survey**: the past years are becoming more popular due to continuous advance of technology and have a profound impact on research methodology. Large organizations and research professionals are no longer the only ones conducting research on the Web. Software that can produce survey forms, is publicly available so that anyone who wants to conduct a research can do it without much difficulty. [1][2]

ADVANTAGES AND DISADVANTAGES OF SURVEY TYPES

Survey type	Advantages	Disadvantages
Face-to-face	• Good response rates • Longer interviews more likely to be tolerated • Attitude can be observed	• Expensive • Time-consuming • May produce a non-representative sample
Phone	• Large scale accessibility in many countries • Rapid data collection, particularly with the integration of CATI (computer assisted telephone interviewing) systems • Quality control • Anonymity • Flexibility	• Lack of visual materials • Call screening is common • Limited open-end questions or time constraints due to more limited survey length • Wariness • Inattentiveness
Mail	• Easy and cost efficient • No interviewer, respondents may be more willing to share information	• Response rates are typically low • Not appropriate for low literacy audiences • No interviewer, respondents cannot be probed
Online	• Low costs • Automation and real-time access • Less time needed • Convenience for respondents • Design flexibility, surveys can be programmed even if they are very complex. • No interviewer, respondents may be more willing to share information	• Limited sampling and respondent availability. • Possible cooperation problems • No interviewer, respondents cannot be probed

TABLE 1 ADVANTAGES AND DISADVANTAGES OF USING SURVEYS IN HEALTHCARE EPIDEMIOLOGY RESEARCH

NOTE. Adapted from http://www.fao.org/ag/humannutrition/33251-0a0b0928c3532ed36c3b6624d54d73f86.pdf.

2.2.1 SURVEYS IN HEALTHCARE

Healthcare surveys are separated in 2 categories. First targets health care professionals and second targets patients. The recent year, collecting feedback from patients and employees to improve healthcare facilities and collect useful data, has become a simple process and with minimum effort information is stored in one place.

This kind of surveys and questionnaires enable healthcare providers listen to the patients' and employees' needs, as they gather information that in many cases they cannot be gathered by a simple examination [5]. When it comes to understand patient results, collect health statistics and data from members of a medical community, online surveys are usually the best way to conduct that kind of research. The fact that many people feel uncomfortable giving feedback about possible complaints about services in person, questionnaires offer the opportunity to do it with anonymity. By sharing experiences, healthcare suppliers can identify and solve problems on time and improve care [4].

Furthermore, online surveys provide the ability to evaluate data in many questions and present the results in many forms such as graphs and tables. A recent study conducted by SurveyMonkey [3], showed that many clinics and doctors use online questionnaires, so their patients and employees can express their opinions and possible issues. Specifically, approximately 33% of them use surveys to follow patients' health and more than 50% use them to measure employee satisfaction, by protecting users' privacy and anonymity.

2.2.2 PROBLEM STATEMENT

Online surveys are used for gathering information through questionnaires on the Web. The question that one raises is: where is all this information stored? Data privacy these days has become a sensitive issue and many people realize the danger of exposure of their digital information. In fact, agencies and websites

that host medical survey panels face the same issue, since they never really know what the supplier is doing with the given information [7] .

Most of online surveys' platforms have located their own data storage servers and third-party cloud service providers. Meaning that by conducting a survey people specifically agree their personal information transfer and store wherever the server is located. One more disadvantage is that cloud base technology has minimal flexibility. The application and services running on a remote server. For that reason, companies that use cloud systems have not much control over software and hardware. Apps can never be run locally because of remote software[6].

HTML technology makes it possible, for Web-based Surveys, to integrate polls and surveys directly into an email. However, it is controversial, if they work properly or not. The problem starts because most of the clients that use mail, automatically remove or block any forms included in a message. That's why it is recommended to create a survey in a web page and link it directly to a database.

2.3 ONLINE SURVEY PLATFORMS

Across the web there are plenty of online platforms to create surveys not only for healthcare industry but also for businesses, universities and government. Most of them provide a list of already existing templates for each category, without it being a barrier for user to create one survey from scratch. Platforms that do similar work with ON-Surveys are shown below.

2.3.1 SurveyPolice

FIGURE 1 SURVEYPOLICE LOGO

SurveyPolice is a platform for paid medical studies and only refers to medical professionals, doctors and healthcare employees. It ensures that privacy is not compromised, and survey results are being accessed only by the client [8].

2.3.2 SmartSurvey

FIGURE 2 SMARTSURVEY LOGO

SmartSurvey is an online platform for conducting surveys in various fields. Including healthcare, universities, personal use and government. It supports the idea of real-time results for instant further analysis and graph creation. For EU users they provide EU/UK based servers to store all data, so companies are reassured that data never leaves the EU. [9]

2.3.3 Snap Surveys

FIGURE 3 SNAPSURVEYS LOGO

Another online web-based survey software is Snap Surveys. Many organizations across the world use it to create their own surveys including charities, universities and government bodies. It is under the ISO 27001 information security management system that guarantees complete data protection. Also, Snap Surveys hosts data in UK and US servers, but most importantly gives organization the option to host it in personal servers [10].

2.4 ONLINE SURVEY TOOLS

Creating an online survey is trivial. There are many online surveyors to help on making a survey from the beginning. When it comes to online tools, there is always the option of paid and free services. Below there is a sort brief of some online, self-hosted survey tools.

2.4.1 LimeSurvey

FIGURE 4 LIMESURVEY LOGO

LimeSurvey is an open source survey tool that can be used to create from the top a survey. Among others, it offers hosting locations in their servers, 28 different question types such as simple choice or multiple-choice questions, file upload, equations and semantic differential question types. Furthermore, there is an option to filter sub questions based on previous multiple-choice questions or use answers given to your previous questions to validate and refine results.

Also, another important feature, is the ability to design your survey appearance. This is achieved by using the special design tools or by inserting your own HTML or JAVASCRIPT code [11].

2.4.2 SoSci

FIGURE 5 SOSCI LOGO

Another tool that has similar functions with LimeSurvey, is SoSci. SoSci is a software package to create online questionnaires. It provides a variety of more than 30 question types to create the needed questionnaire. It is also, cloud based with the option of setting up the software in your own server (non-free version). It has freely programmable layout and implementations of HTML.[12]

2.4.3 SURVEYJS

FIGURE 6 SURVEYJS LOGO

SurveyJS is a JavaScript library and an easy applicable module to add a survey to a website. It is an open-source and free tool that gives the user the option of hosting surveys as self-hosted web applications in their own server for free. It is valid with many Javascript frameworks like Angular, jQuery, React etc.

It gives user the chance of using a visual editor with many question types and options. After creating the questionnaire, you can store results in your own database and then the insertion into the website is easy thanks to the documentation provided.[13]

2.4.4 TELLFORM

FIGURE 7 TELLFORM LOGO

Tellform is similar to LimeSurvey. It is mostly for people that need a tool with more than a minimal set of functions. In addition to having 11 different types of surveys, Tellform gas pretty good analytics attached to its survey. You can easily customize the look of your surveys, and the application's interface is simple and clean.[14]

2.4.5 JDESURVEY

FIGURE 8 JDESURVEY

JDeSurvey is a JAVA open-source survey tool developed by JD software for the creation and analysis of surveys. It has a variety of features and a long list of question types. Easily you can gather concise data in a format with graphs and statistics.

User can choose from plenty of types of questions to create forms with great ease. In addition to many standard question types JDeSurvey provides many advanced features you can master within minutes. Like branching and skipping logic, randomizing questions and piping of previous answers.[15]

2.4.6 RESPONSTER

FIGURE 9 RESPONSTER LOGO

Responster is a beautiful and easy-to-use survey tool that helps companies and organizations interact more efficiently with their customers, partners and employees. It is consisted with a friendly interface both for creator and receiver of the form and easy drag and drop setup with many features and question types.[16]

COMPARISON OF ONLINE SURVEY TOOLS

TOOL	TYPE	TECHNOLOGIES	LICENSE	PRICE
LimeSurvey	Online or self-hosted	Mysql, php	Commercial or open source (GNU GPL)	349€/year
SoSci	Online or self-hosted	Php, Javascript	Commercial	80€/3 months & 620 annual self-hosted license
SurveyJS	Self-hosted	Javascript	Commercial or open source (MIT)	499€/year
TellForm	Online or self-hosted	Javascript	Open source (MIT)	Free
JDeSurvey	Self-hosted	Java	Open source (GNU GPL)	Free
Responster	Online or self-hosted	-	-	190€/year

TABLE 2 COMPARISON OF ONLINE SURVEY TOOLS

2.5 ON-SURVEYS AND SURVEYJS

For the complete implementation of this project we chose SurveyJS library that has a dozen built-in question types, like a simple text or a complex matrix with different input types.

Some of the advantages of SurveyJS are:

1. Allows developer to customize every element in the way needed.
2. Like the ON-Surveys platform, it supports Bootstrap.
3. Represents survey model and survey results as JSON.
4. Easy way to change the survey flow (e.g. change questions, panels, pages visibility and skip pages).
5. Has a built-in support for multi-languages.

3. IMPLEMENTATION

3.1 ARCHITECTURE

The basic characteristics of client-server architectures are:

- Client (front-end) that interacts with the user.
- Server (back-end) that interacts with the shared resource.
- The client process provides the interface between the user and the rest of the application system.
- The server process acts like a software engine that manages common resources such as databases.
- The front-end and back-end have essentially different necessities for computing resources (e.g. processor speeds, memory, disk speeds etc.).
- Client and server processes communicate through a well-defined set of typical application program interfaces (API's).
  [51]

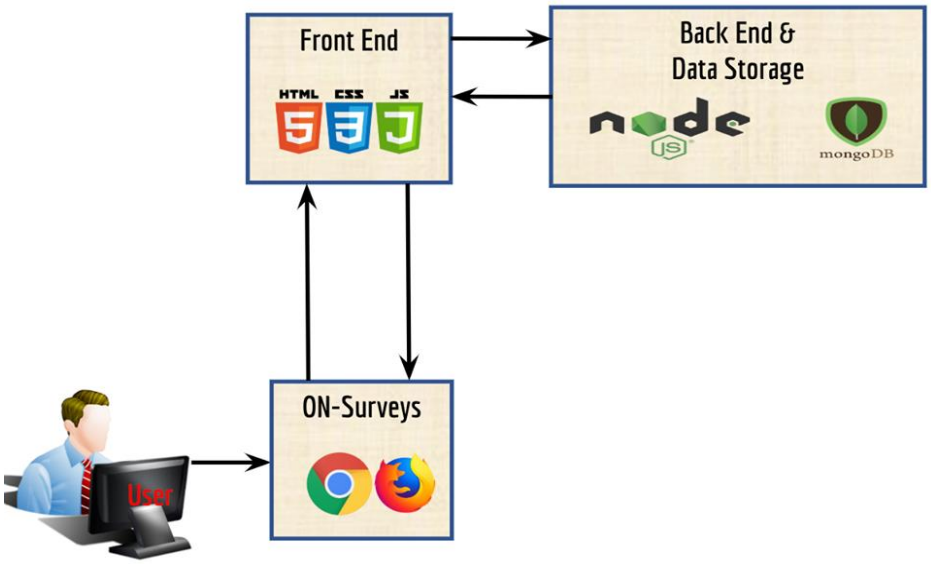

FIGURE 10 CLIENT-SERVER COMMUNICATION

3.2 FRONT END

The front-end is commonly referred to as the client-side development. That focuses on everything that user touches and interacts with on a website or an application. This encompasses everything on the website or application that user sees, like layouts, dropdowns, menus, buttons and all the responsive nature of things. The core three languages that someone who develops front-end projects usually are HTML, CSS and Javascript.[17]

3.2.1 HTML5

FIGURE 11 HTML LOGO

HTML stands for the words HyperText Markup Language and the HyperText refers to the fact that HTML makes it so that you can click on links in web pages and the works Markup Language mean that it's something that developer sees to mark up normal words to indicate things. With the fast advancement of technology, the demand of a better coding experience in creating web pages has

pushed HTML to its limit and, thus, a better version was created in the new standard of HTML5. There are a lot of new things that HTML5 supports, like new elements, new attributes, full CSS3 support, video, audio, 3D graphics, local storage and local SQL Databases [18][19].

3.2.2 CSS

FIGURE 12 CSS LOGO

CSS stands for Cascading Style Sheets and it creates styles that will cascade over the entire site or application. With CSS, for example, a developer can start setting color and fonts for specific element or the page as a whole. CSS can also change where parts of page get displayed like vertically, side-by-side, everything in one corner etc. CSS, also, can create animations for stat items, fade things in and out, slide them across the page etc. [20][21].

3.2.3 JAVASCRIPT

FIGURE 13 JAVASCRIPT LOGO

Javascript is one of the most popular and widely used programming languages. For a long time Javascript was only used in browsers to built interactive web pages but because of huge community support and investments you can now build full-blown web or mobile apps, real time networking applications and even games [22][23].

3.2.4 BOOTSTRAP

FIGURE 14 BOOTSTRAP LOGO

Bootstrap is a free, open source and most popular HTML, CSS and Javascript framework developed by Twitter for creating responsive web applications. It includes HTML and CSS design templates for common user interface components like buttons, dropdowns, tabs, forms etc. along with optional Javascript extensions. Bootstrap can be used with any server-side technology and any platform [24][25].

3.2.5 TEMPLATE ENGINE EJS

FIGURE 15 EJS LOGO

A template engine is some Javascript you can use when you use server-side JS (for example NodeJS) and helps us render HTML. EJS is one of many template engines that combines data and assembles it to produce HTML [26][27].

3.3 BACK END

On the other side, there is the Back-end which commonly referred to as server-side development and there belong things that are more focused on functionality (i.e.: data, algorithms etc.). Those are the components that are “behind” everything that make a site or application, accessible. These might also contain operations like storing or organizing data and creating complex procedures in parallel with the front-end [28][29].

3.3.1 NODEJS

FIGURE 16 NODEJS LOGO

Interestingly, Javascript can also be a back-end language with NodeJS. NodeJs is an open source and cross-platform runtime environment for executing Javascript not just in the browser but also in a back-end environment. Quite often is used to build back-end services, also called API's or Application Programming Interfaces [30][32].

NodeJs is easy to get started and can be used for prototyping and agile development. In node applications the use of Javascript and a front-end developer that uses Javascript can reuse their skills to both front-end and back-end with a cleaner and more consistent source code. NodeJS is ideal for building highly scalable, data intensive and real-time back-end services that power the client applications. Finally, NodeJS has the largest ecosystem of open source libraries available. So, for many features or building blocks an application needs, there is some free open source library [31][33][34].

3.3.2 EXPRESS JS

FIGURE 17 EXPRESS LOGO

A minimal and flexible Node.js web application framework that provides a robust set of features for applications is ExpressJS. Express is the most popular framework for building web applications with Node.js. It manipulates the

behavior of an application towards a client request and executes functions when the request's Uniform Request Identifier (URI) matches the route. [50]

3.3.3 NPM

FIGURE 18 NPM LOGO

NPM stands for Node Package Manager and being formed by two components. An online platform and a command-line tool. The online platform is a place where people can publish and share tools written in Javascript. Everyone can search and use tools (packages) published to this online platform. NPM is also a command-line tool that helps developers to interact with the online platform. Developer can easily install and uninstall packages, manage the versions of the packages and the dependencies a package need [35][36].

3.3.4 MJS

FIGURE 19 MJS LOGO

An extension of ECMASCRIPT modules are files with .mjs ending. It is an import and export way of creating and bringing in modules. At this point, in latest version of NodeJS you can use the .mjs syntax but are a few stipulations. The most important are that it must be under an experimental flag and always use the .mjs extension [37][38].

3.3.5 MONGODB

FIGURE 20 MONGODB LOGO

MongoDB is a noSQL and document-oriented database that has certain advantages such as flexibility (lack of rigid structure), direct use of JSON and flexibility in big data processing. Modern applications are more complex, network-based, social and interactive than ever. This creates new requirements to support big data, for fast feature development and flexible deployment strategies. [39][40]

MongoDB scales up by supporting more servers and developers can add more capacity whenever needed. MongoDB increases productivity by modeling data as documents and allows schemas to evolve effortlessly. A front-end for MongoDB is Mongoose that provides a straight-forward, schema-based solution to model an application's data. Meaning that it acts as an intermediate between mongodb and server-side language (NodeJs). [41]

Mongoose uses Schemas to define the distribution of the documents within a Mongo collection. There are different kinds of Schema types allowed in Mongoose: String, Number, Date, Buffer, Boolean, Mixed, ObjectId, and Array.

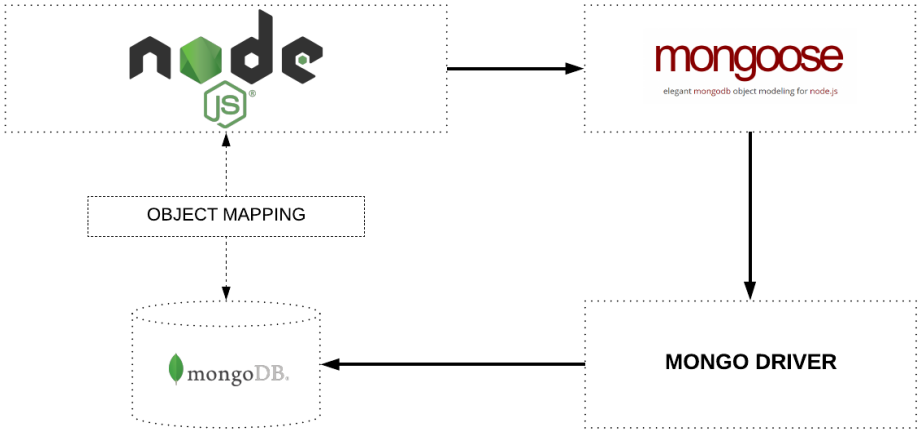

FIGURE 21 NODE, MONGO AND MONGOOSE CONNECTION

MongoDB uses JSON documents in binary-encoded format called BSON that extends the JSON model to provide additional data types and to encode and decode with efficiency in different languages. In ON-Surveys MongoDB is the place where we store all data from user's information to complete survey templates and answers [42][43].

A Graphical User Interface (GUI) for MongoDB is MongoDB Compass. MongoDB Compass analyzes documents and visualizes data, so we can explore the schema and modify fields.

3.4 OTHER SOFTWARE

3.4.1 CMD

The Command Prompt is one of the most powerful tool within the windows OS. It allows users to do almost anything like they are using a GUI (Graphical User Interface), but simply in words. User can copy, move and delete files, and even create undeletable folders and many more. The Command Prompt used to be the only way to interact with computers, so a simplistic set of commands and syntax was used in order to make the system do anything. [44][45]

In our case, CMD is used to navigate through folders, install packages and dependencies, run the start script and check if everything works properly by using it as a debugging tool.

3.4.2 MODULES

Module in NodeJS is considered to be the same as JavaScript library. Specifically, it forms a set of functions that needs to be included in the application.

3.5 ON-SURVEYS REFERNCE ARCHITECTURE

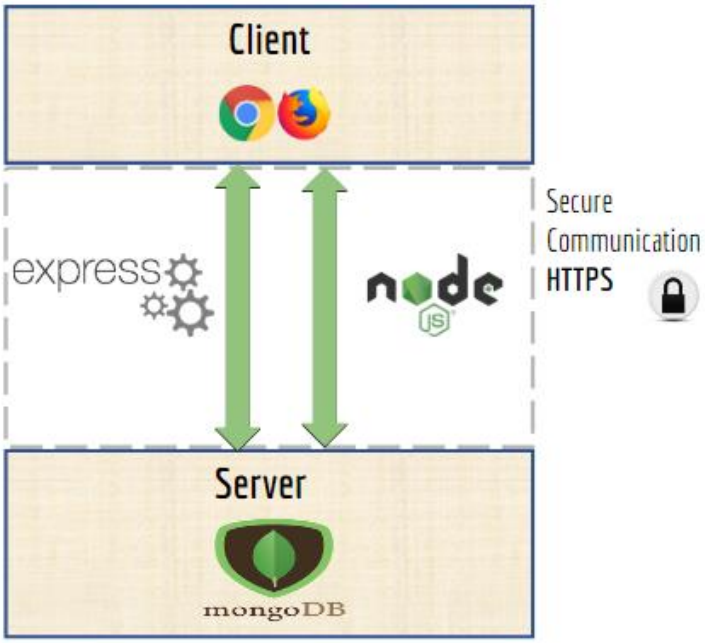

FIGURE 22 CLIENT-SERVER SIDE ALONG WITH THE SECURITY MECHANISM

At this project we used Express, a fast and minimalistic web framework that provides tools for HTTP servers and helps organize a web application into an MVC architecture on the server side. MongoDB, as the official driver for NodeJS that provides a high-level API. Mongoose, that is a MongoDB object modeling tool that works easily in an asynchronous environment. Also, we used PassportJS, a simple authentication middleware using strategies to authenticate requests like verifying username and password [46][47].

4. THE ON-SURVEYS SYSTEM

4.1 DEPLOYMENT

To make ON-Surveys system work requires to install NodeJs and MongoDB before starting. Also MongoDB Compass will help us to have a clear view of how data is stored. Installation process is simple and straightforward on all major platforms.

The installation of **NodeJS** is simple by following these steps:

1. Go to the Node home page.

2. Click the INSTALL button.

3. Execute the .msi installer file and click Run

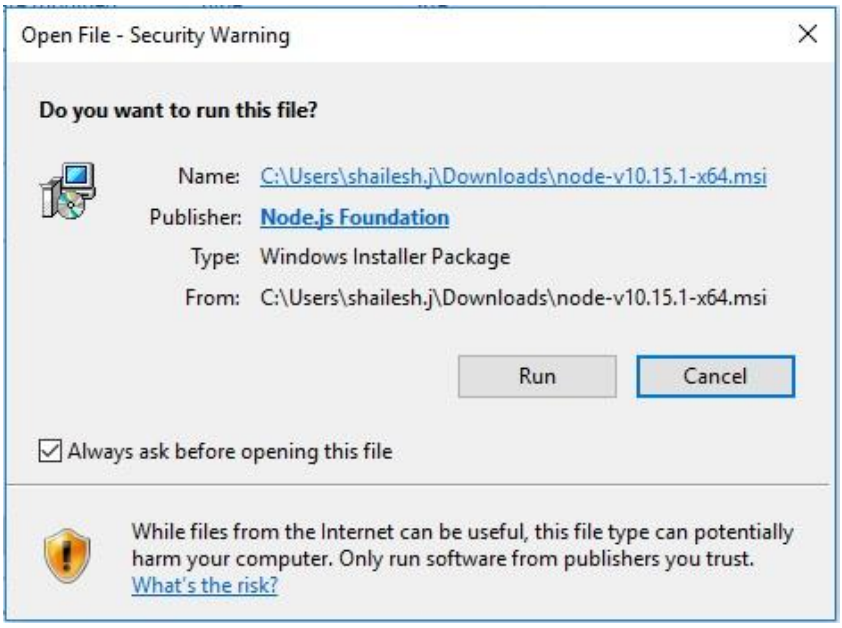

FIGURE 23 NODE INSTALLATION 1

4. Click on Next to continue and accept the License Agreement, then again click Next.

FIGURE 24 NODE INSTALLATION 2

5. Select the Installation folder (default recommended) and click Next.

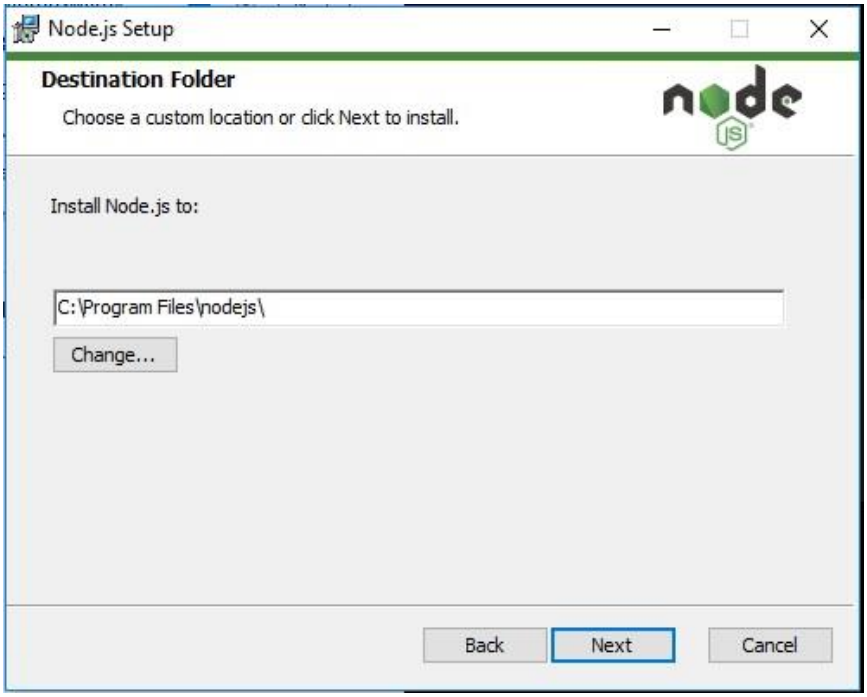

FIGURE 25 NODE INSTALLATION 3

6. Accept the Default features by clicking Next.

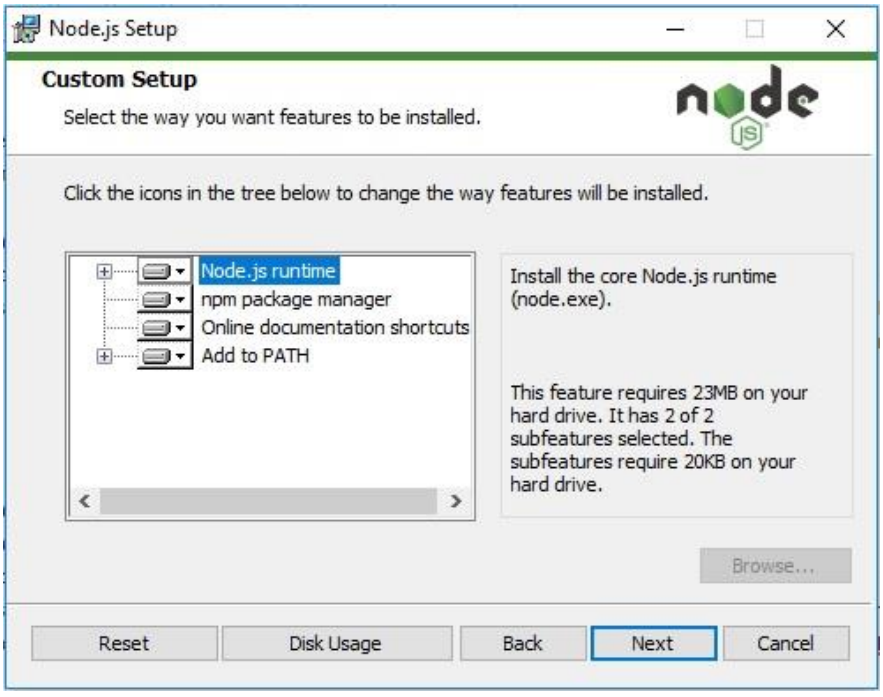

FIGURE 26 NODE INSTALLATION 4

7. Click Install and wait for the installation to complete. Then click Finish to complete the process.

8. This will have NodeJS installed and ready to use.

The following steps can be used to install **MongoDB** on Windows 10:

1. Go to link and Download MongoDB Community Server.

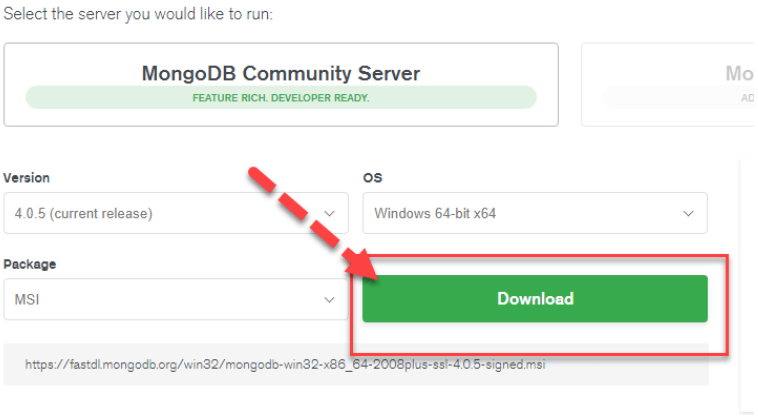

FIGURE 27 MONGODB INSTALLATION 1

2. Once download is completed open the .msi file. Click next in the start up screen.

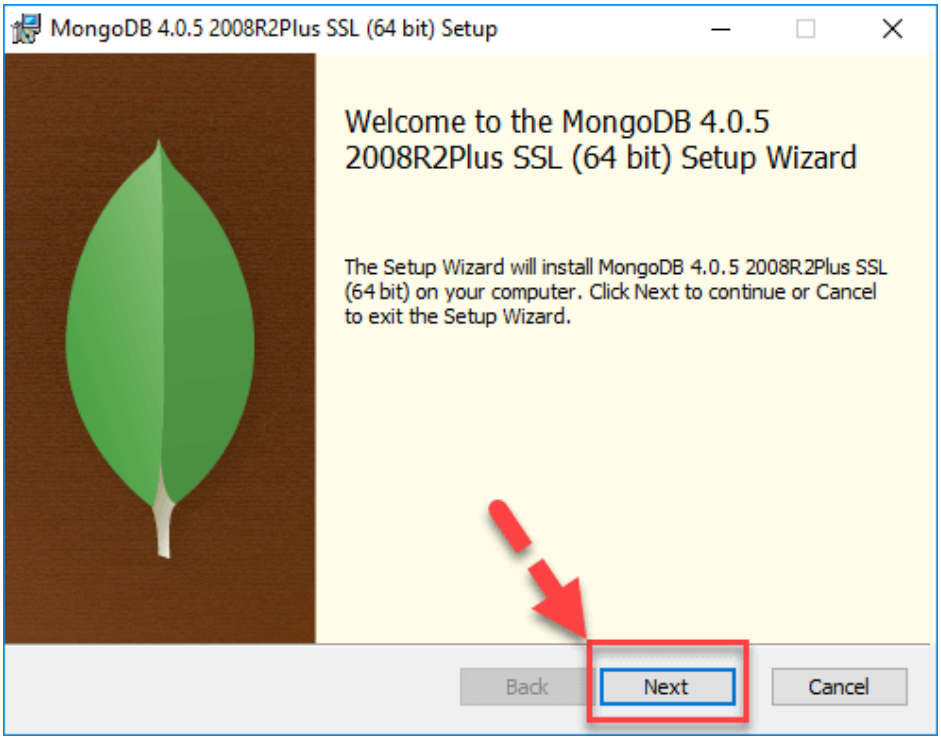

FIGURE 28 MONGODB INSTALLATION 2

3. Accept the term and License Agreement and click Next.

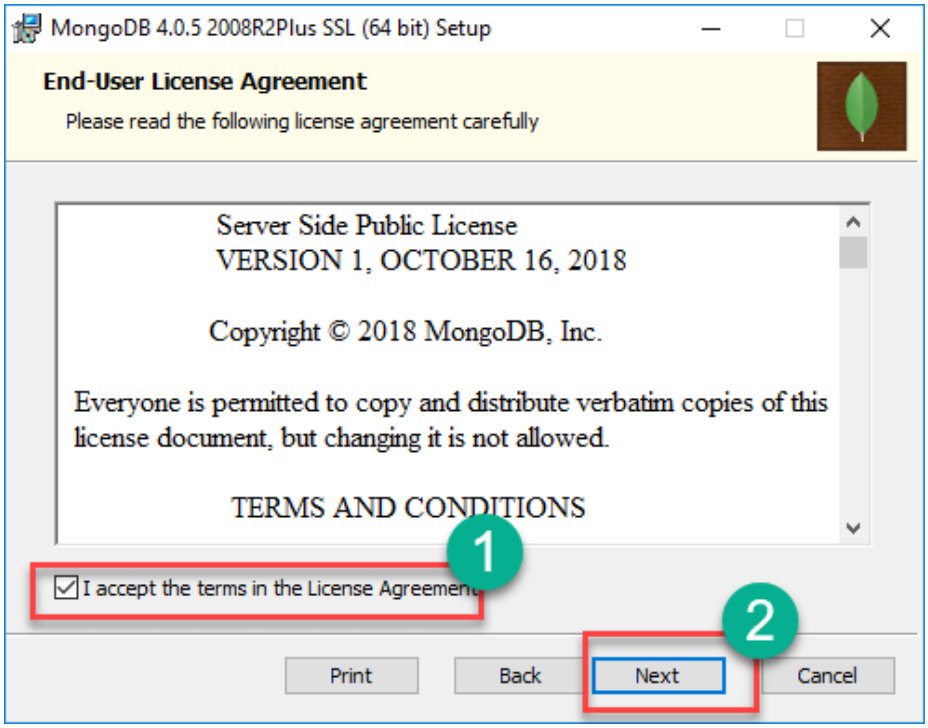

FIGURE 29 MONGODB INSTALLATION 3

4. Click on the "Complete" button to install all of the components.

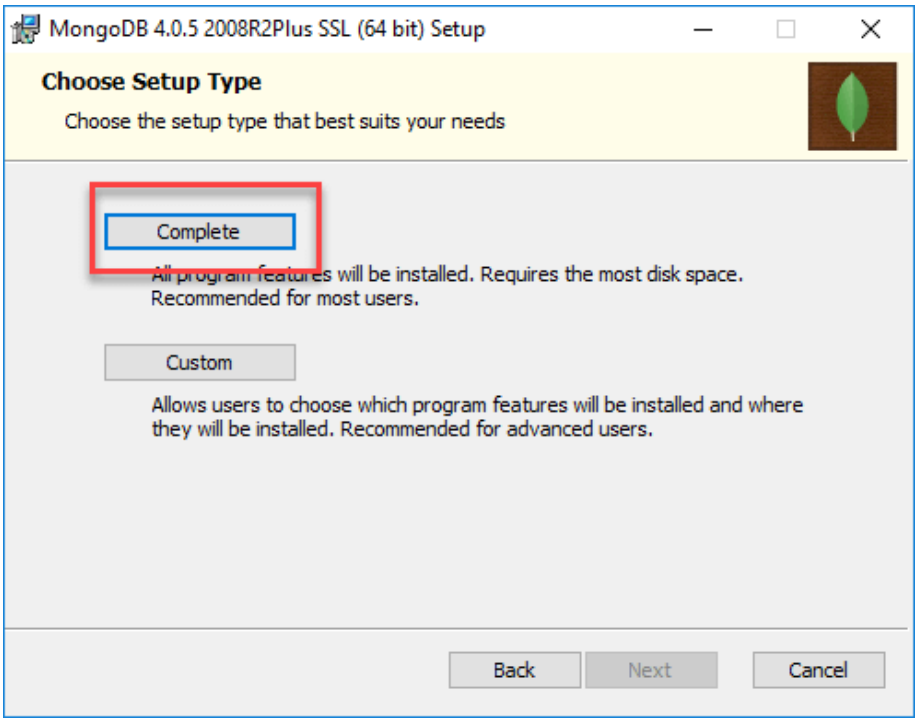

FIGURE 30 MONGODB INSTALLATION 4

5. Select “Run service as Network Service user”, make a note of the data directory and click Next.

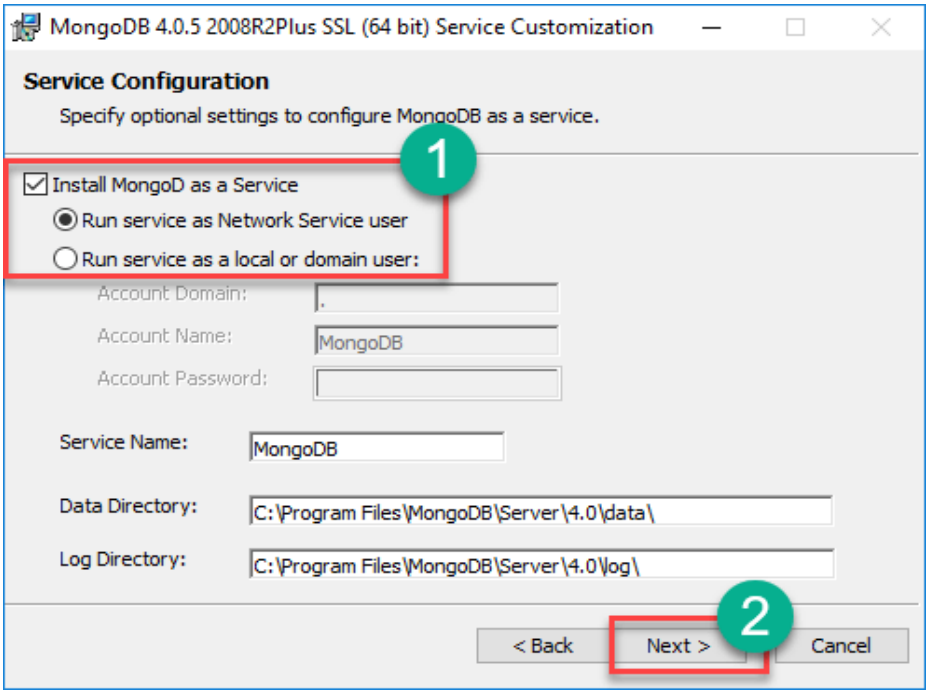

FIGURE 31 MONGODB INSTALLATION 5

6. Click on the Install button to start installation.

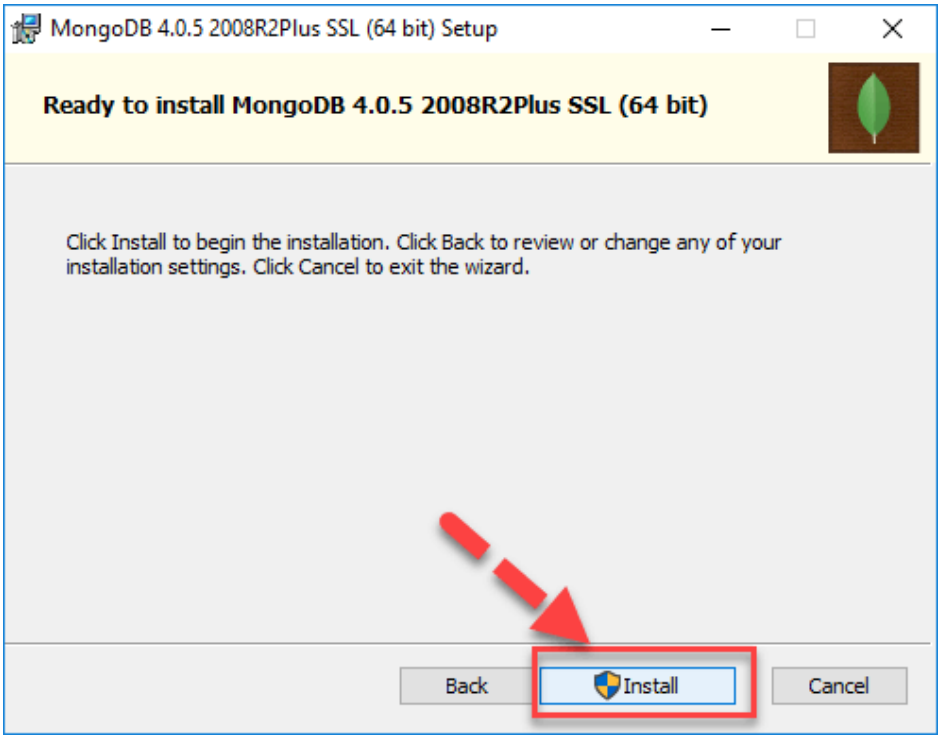

FIGURE 32 MONGODB INSTALLATION 6

7. Click Next once completed.

8. Click on the Finish button to complete the installation.

To manage the MongoDB there are plenty of tools in market. One of them is the non-commercial tool MongoDB Compass. To install **MongoDB Compass** follow the next steps:

1. Go to link and click download.

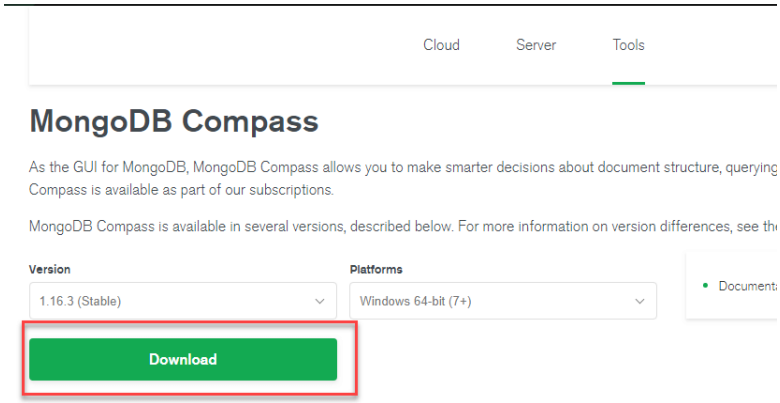

FIGURE 33 COMPASS INSTALLATION 1

2. Enter the details in the popup and click Submit

3. Double Click on the downloaded file.

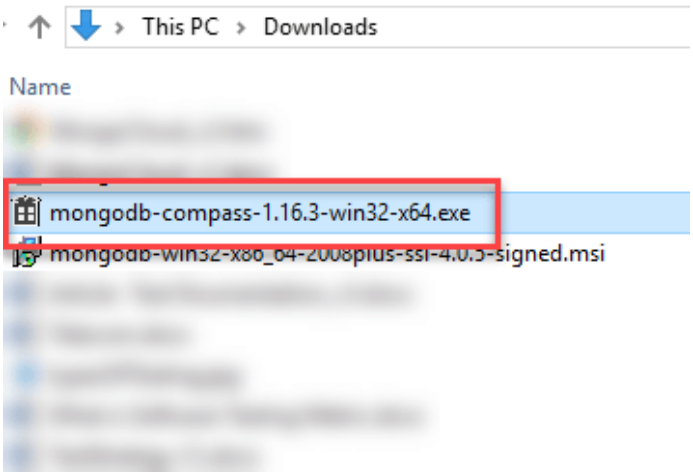

FIGURE 34 COMPASS INSTALLATION 2

4. Installation will auto-start.

5. Compass will launch with a Welcome screen.

6. Keep the privacy settings as default and click “Start using Compass”.

7. You will see a list of current databases in home screen.

Once everything is installed, system is ready to run.

- Open the Terminal (CMD) and navigate to the folder of the project.
- Install npm packages via the “npm install” command.
- Type “npm run start” to run the start script

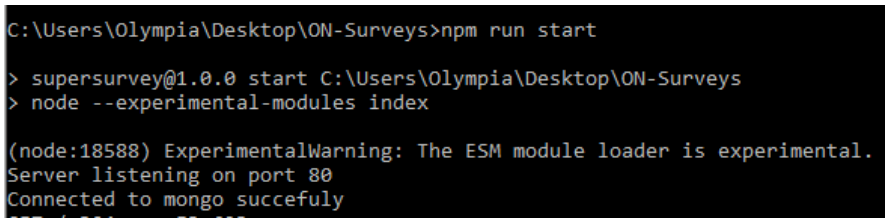

FIGURE 35 CMD VIEW 1

- Server is listening in port 80 (default port of HTTP Protocol)
- Go to http://localhost:80 in browser.

4.2 SYSTEM NAVIGATION

The first page of the program has a Login form, so user or admin can insert their email and password to login into the system.

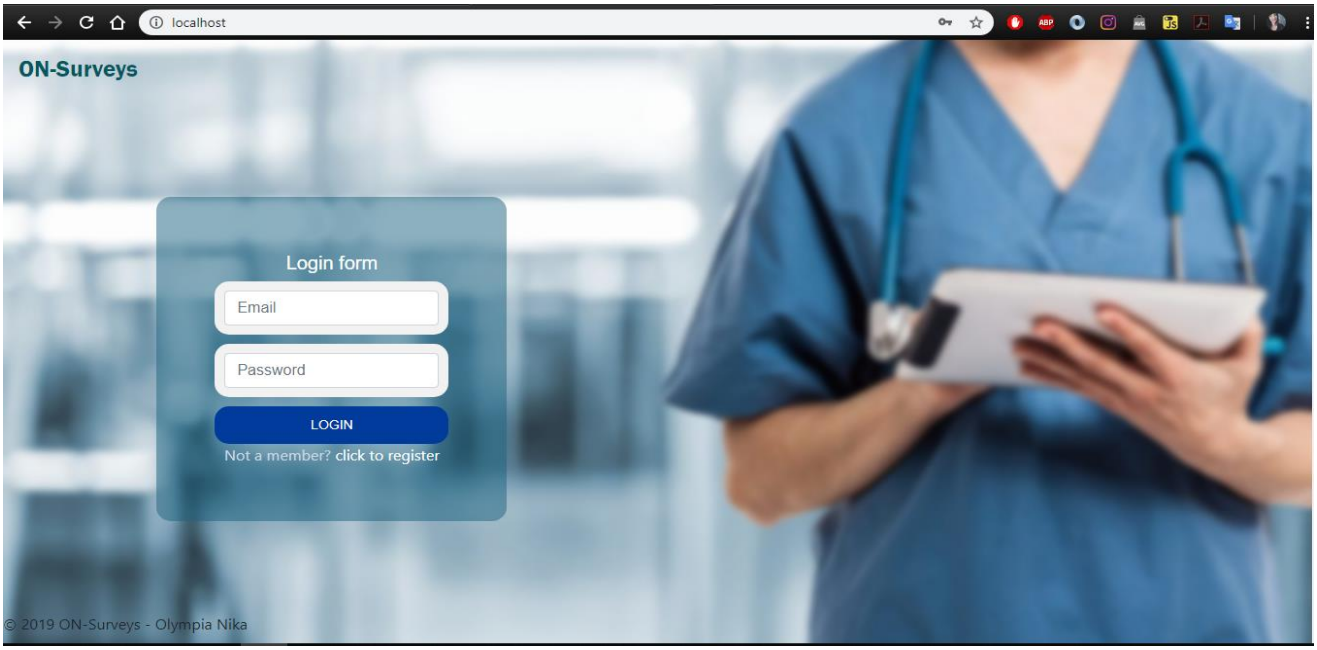

FIGURE 36 ON-SURVEYS LOGIN PAGE

For non-registered users, clicking the click to register link in the Login form, opens the Registration form.

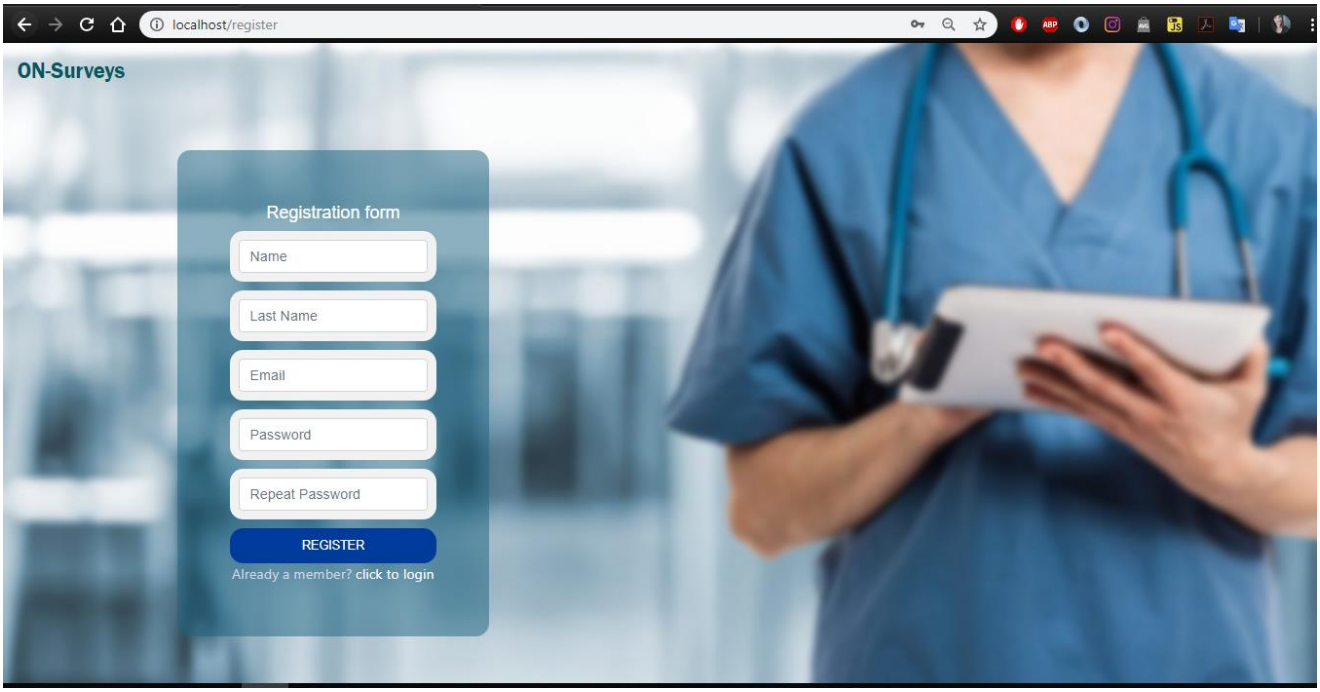

FIGURE 37 ON-SURVEYS REGISTRATION PAGE

Again, the click to login link opens the Login form.

In MongoDB, the user Schema looks like the one below.

```
_id: ObjectId("5caa3355d14c1612689aeed1")
isAdmin: false
firstName: "Panagiotis"
lastName: "Papadopoulos"
email: "panagiotis@pap.com"
password: "$2b$09$zfNeXZHQplCCGyz/Anqt0ev6Pc7A8ldsEW.lcW1yx.g/iON2Oalli"
> answeredSurveys: Array
__v: 1
```

Making someone an Administrator of the systems, requires someone to have access to the database, to add the isAdmin : true variable to the user.

```
isAdmin: true
```

FIGURE 38 ISADMIN IN MONGODB

Administrator page

When someone logins as an Administrator, the system opens at the Admin home page.

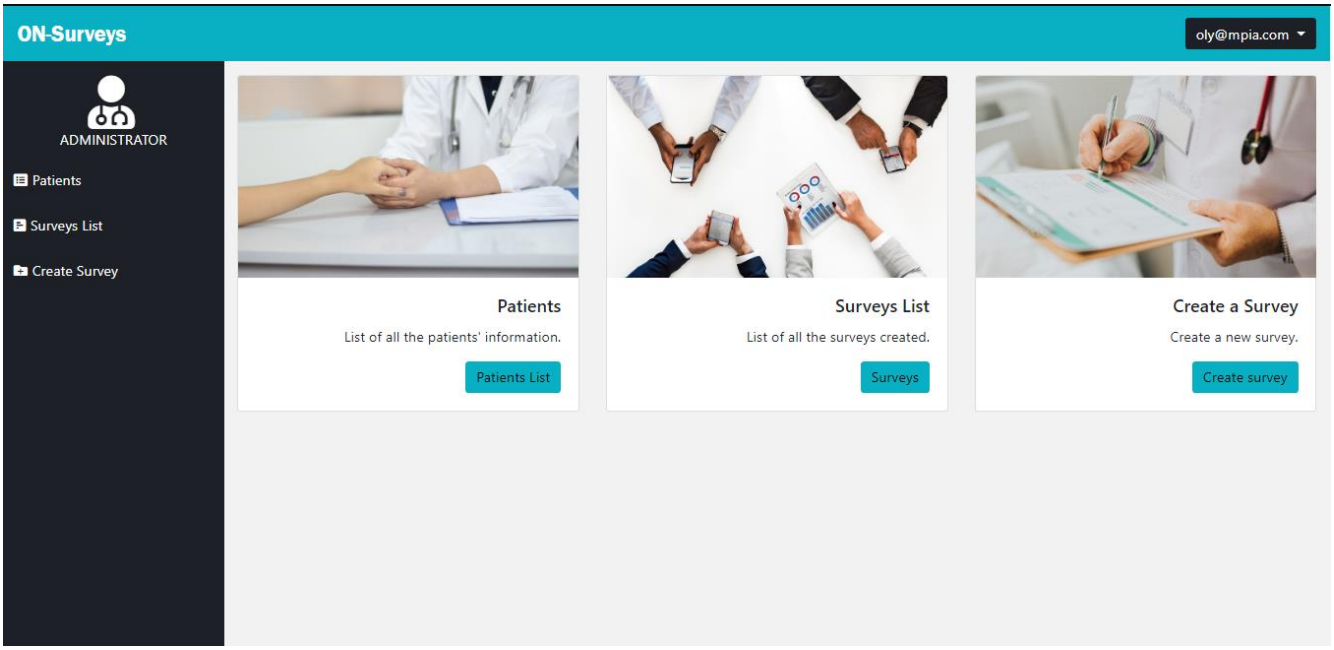

FIGURE 39 ON-SURVEYS ADMIN HOME PAGE

Both side list buttons and card buttons redirect to the same pages. As an administrator there is an option to see the list of registered users, the list of the Questionnaires created and lastly the option to create one new survey.

The patients list shows all the registered users' names and last names. By clicking the button info the system shows each patients' personal information.

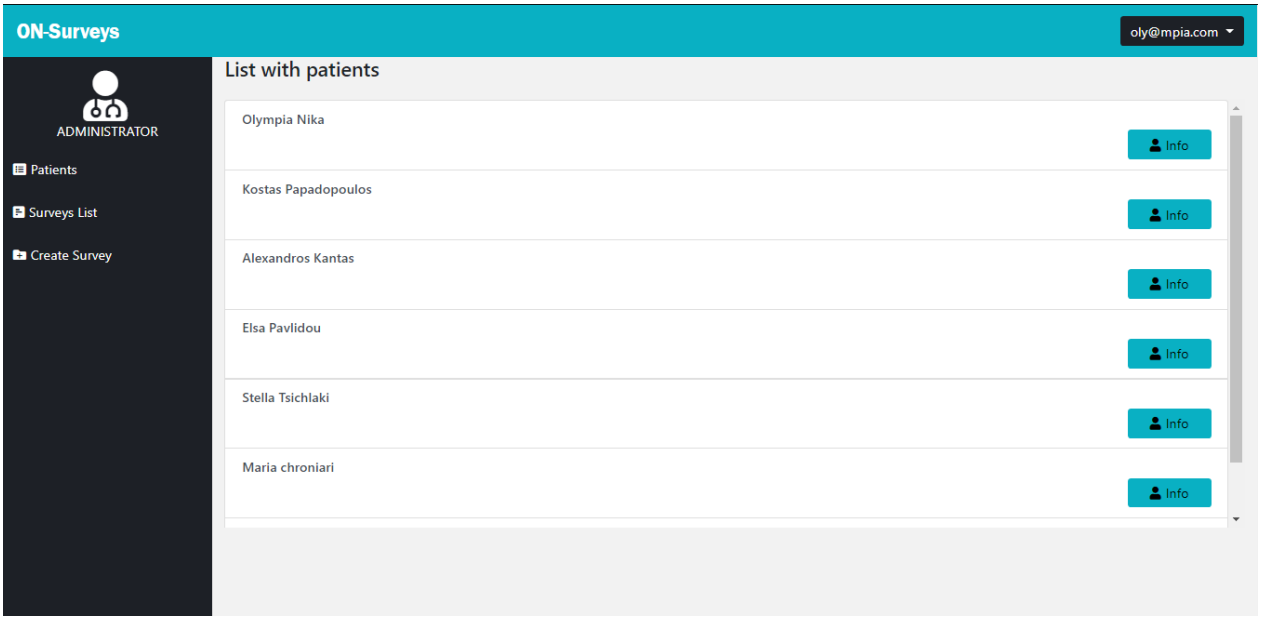

FIGURE 40 ON-SURVEYS LIST WITH PATIENTS

Name, Last name, email and a list with the questionnaires answered by the patient are in the Info page.

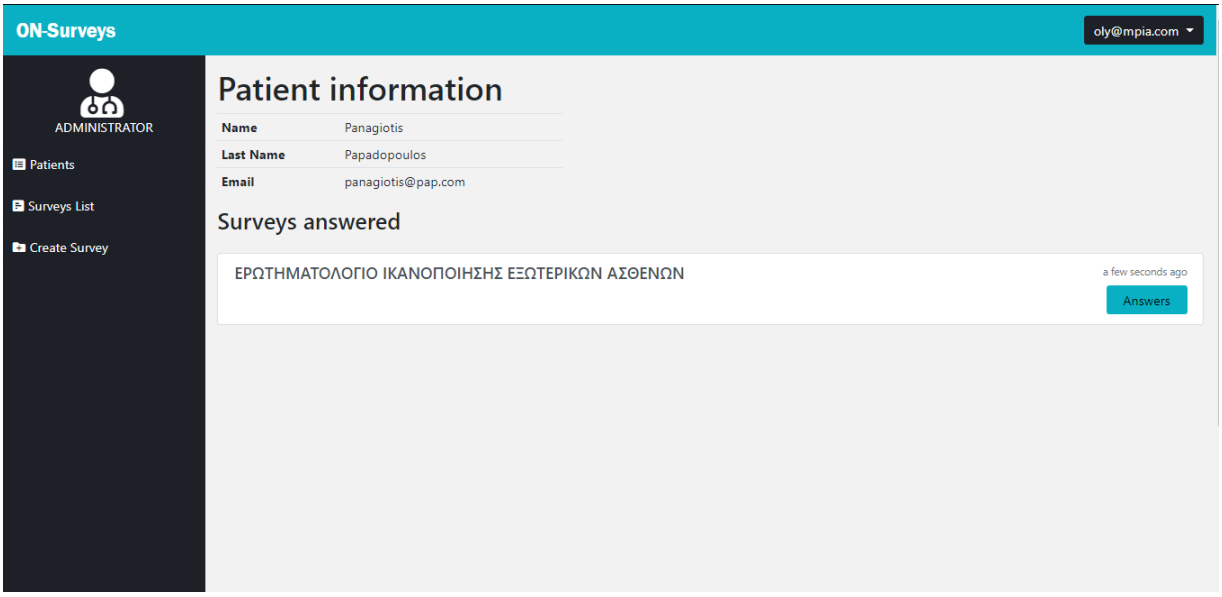

FIGURE 41 ON-SURVEYS PATIENT INFORMATION PAGE

By clicking the button Answers in each survey system opens a page with the survey's answers.

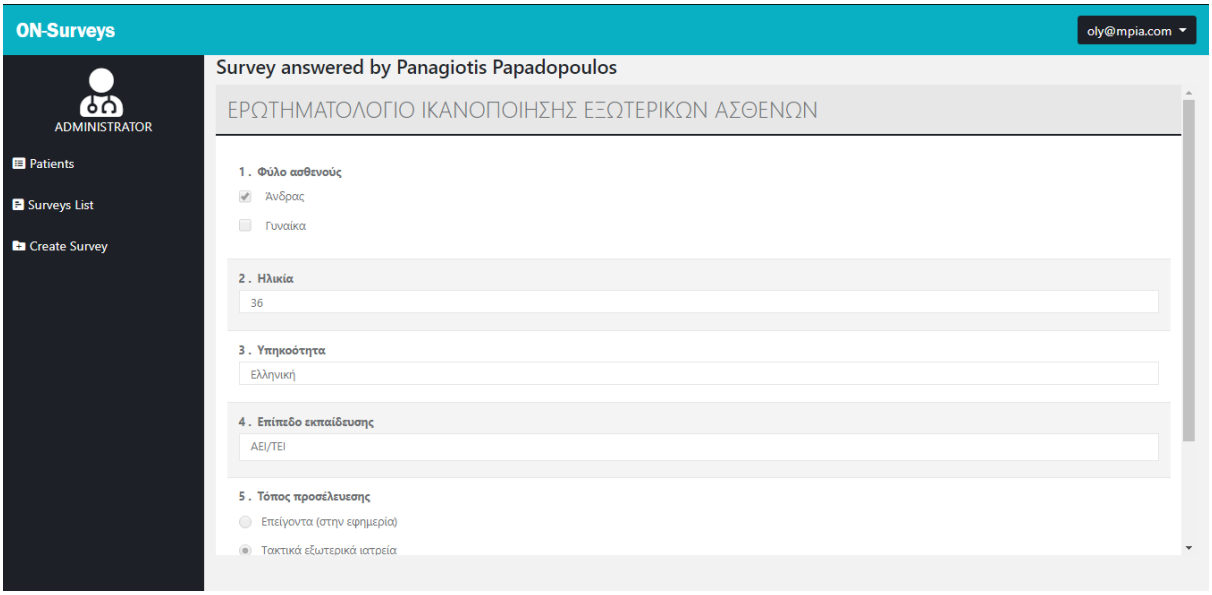

FIGURE 42 ANSWERS OF A SURVEY PAGE

In Surveys List tab there is the list with created questionnaires.

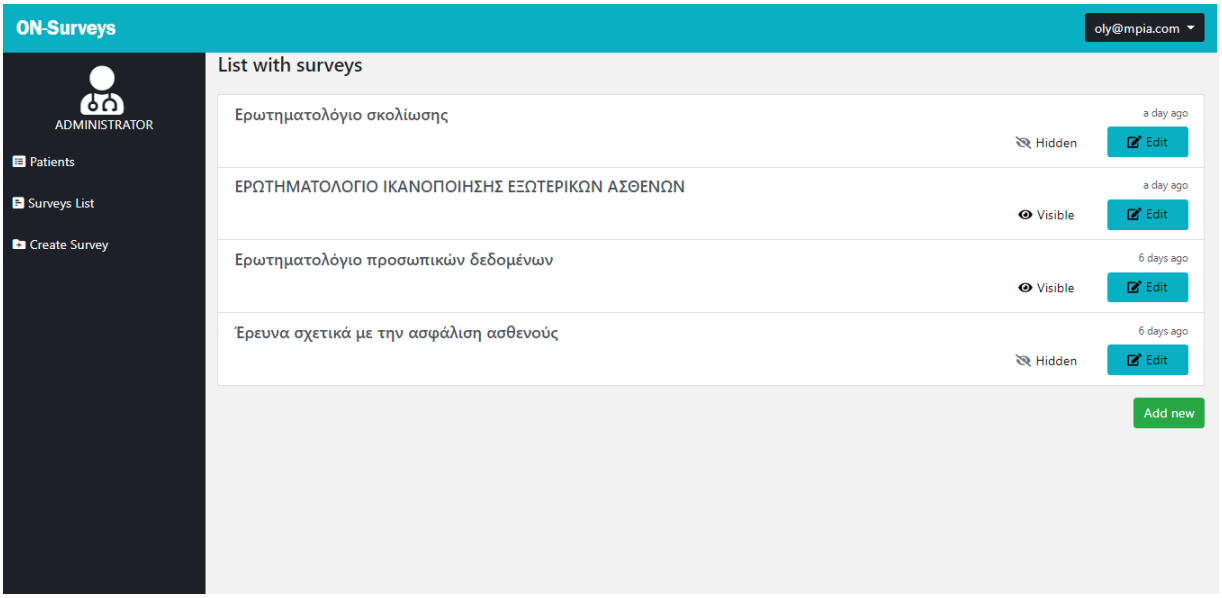

FIGURE 43 ON-SURVEYS LIST WITH SURVEYS

Also a button visible/hidden that the administrator can change the visibility of each survey. The button edit opens the editor with the survey for modification.

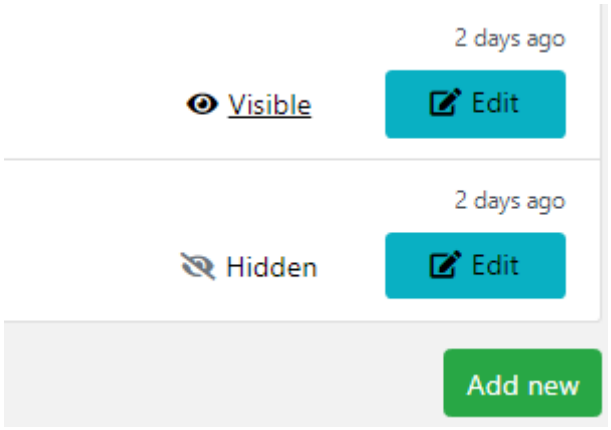

FIGURE 44 ON SURVEYS LIST WITH SURVEYS BUTTONS

By clicking edit, the survey editor appears with the data of the survey. There the creator can add or remove questions and then click update to save the new survey. Also the delete button permanently deletes the survey from database.

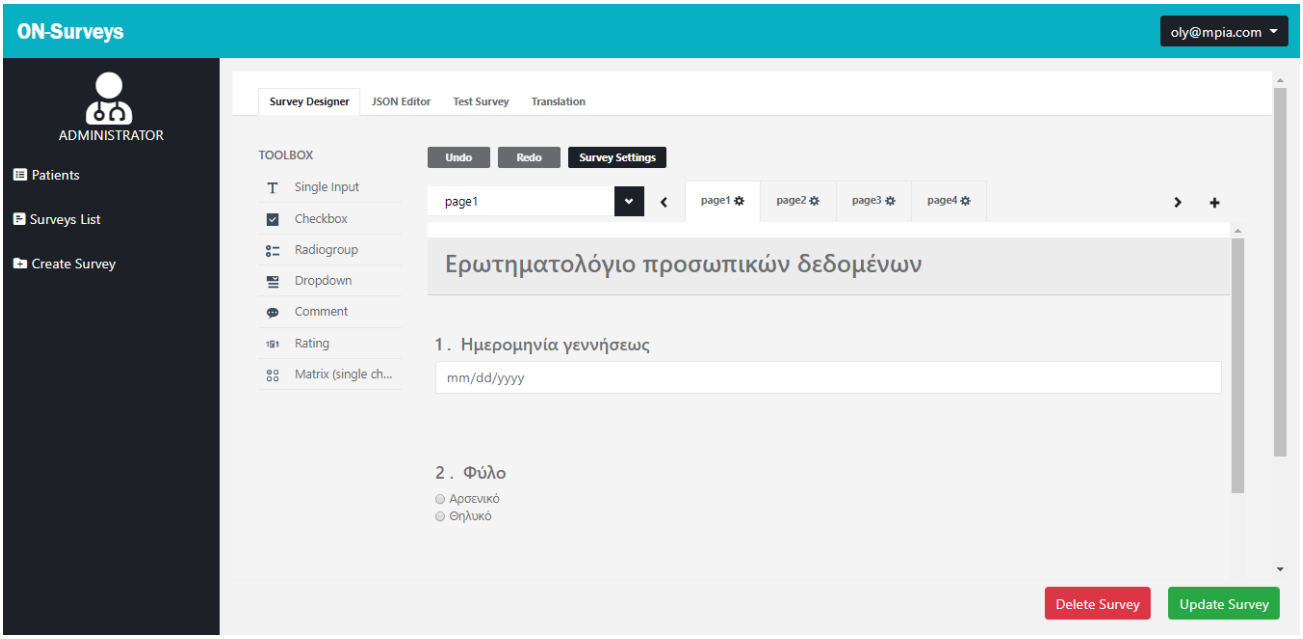

FIGURE 45 ON-SURVEYS EDIT A SURVEY PAGE

Survey Schema stores the database with the fields below. An id is provided by MongoDB. The *visible* field is a Boolean type and checks whether patient can see the survey or not. Survey data stores all the survey's information in JSON form. The *title* shows the title of the survey and the *created at* and *updated at* are timestamps, so we have access to each survey creation date.

```
_id: ObjectId("5ca26e07f519ac16180d6497")
visible: true
surveyData: "{
             "locale": "gr",
             "title": "Ερωτηματολόγιο προσωπικών δεδομένων",
             "..."
title: "Ερωτηματολόγιο προσωπικών δεδομένων"
createdAt: 2019-04-01 20:01:11.963
updatedAt: 2019-04-03 16:31:15.424
__v: 0
```

FIGURE 46 SURVEY SCHEMA IN DATABASE

The create survey opens the Survey editor from SurveyJS. It has many options to create surveys of multiple types of questions.

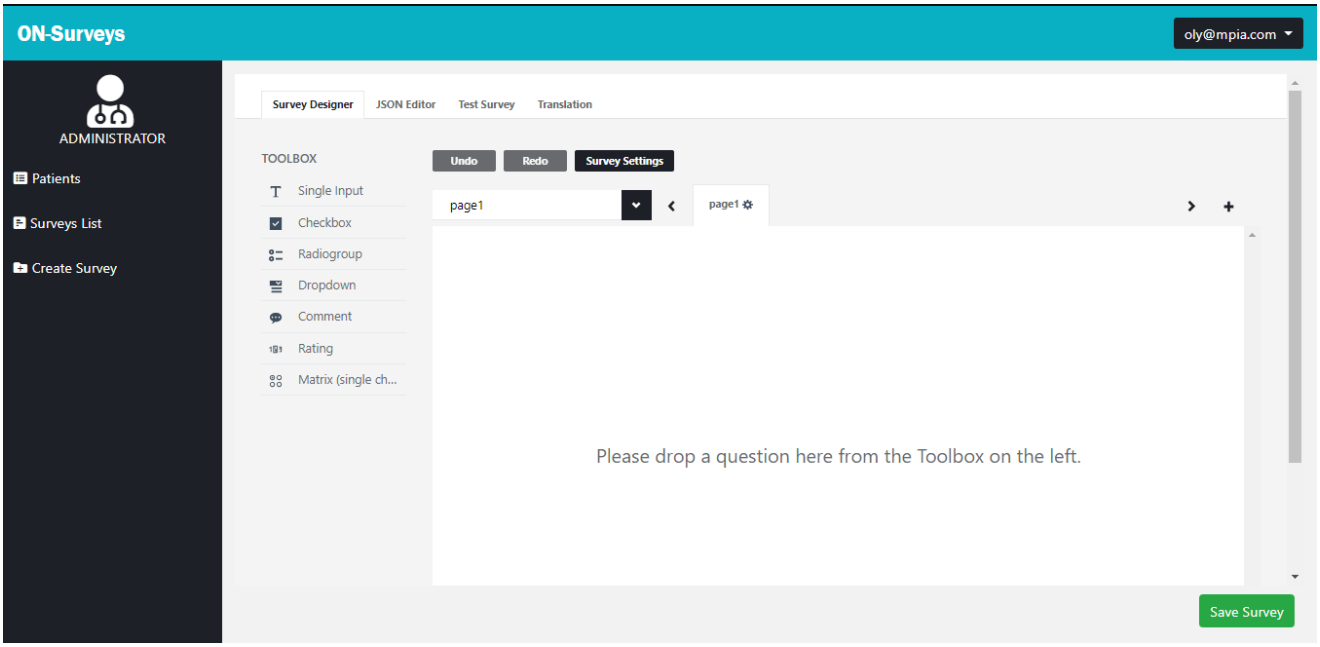

FIGURE 47 ON-SURVEYS CREATE SURVEY PAGE

The editor's toolbox is consisted of multiple question types. For the implementation of this thesis we eliminated the toolbox's options to the ones below.

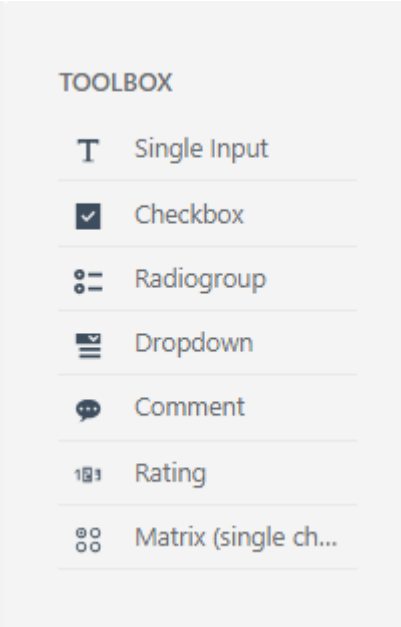

FIGURE 48 ON-SURVEYS TOOLBOX

- Single input

A simple question with one-line answer.

FIGURE 49 QUESTION TYPE SINGLE INPUT

By clicking **Edit** the Editor of the question opens. Where administrator can choose the input type (date, link, text, email etc.) and when to enable this question.

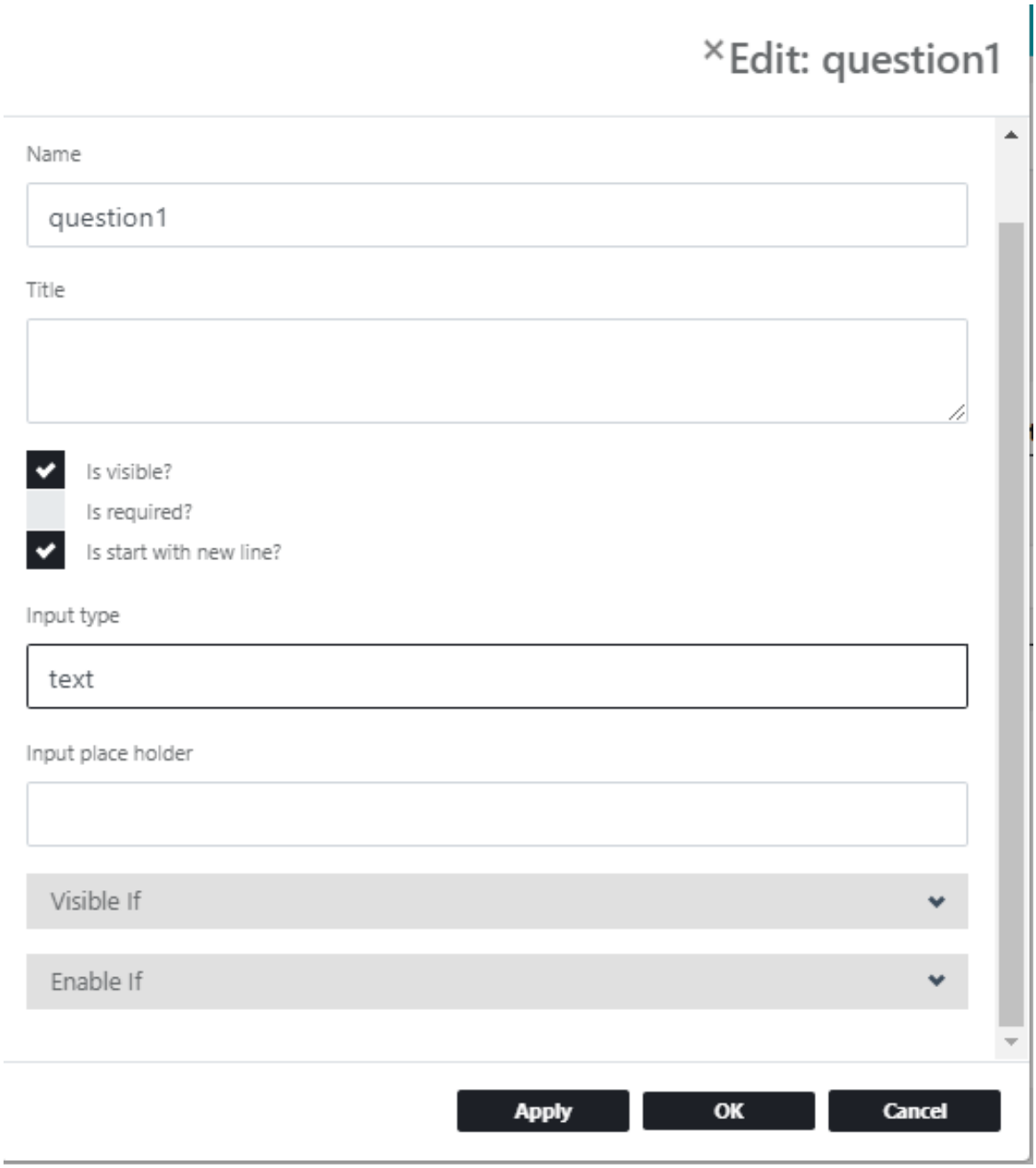

FIGURE 50 QUESTION EDITOR

- Check box

A multiple choice question where answer might have more than one options.

FIGURE 51 QUESTION TYPE CHECK BOX

The **Edit** button opens the Editor of the question where Administrator can add or remove boxes and change the visibility of the Check box.

- Radiogroup

Is the same as Checkbox but only one answer is valid. The Editor is the same with Check box.

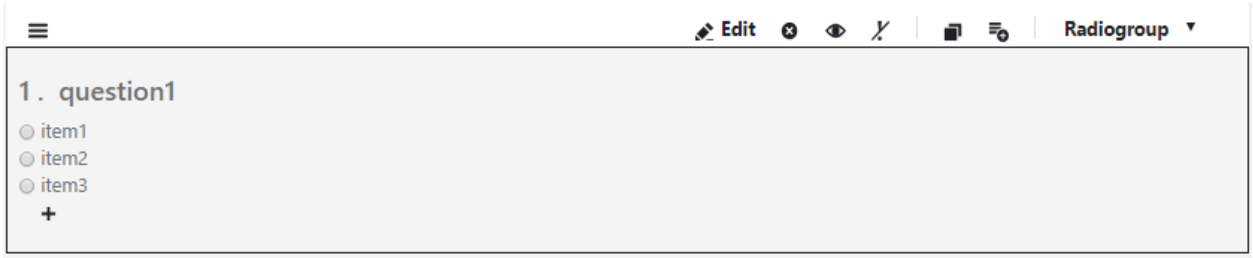

FIGURE 52 QUESTION TYPE RADIOGROUP

- Dropdown

Dropdown is a question type that opens a list with answers as clicked. The Editor is the same as above.

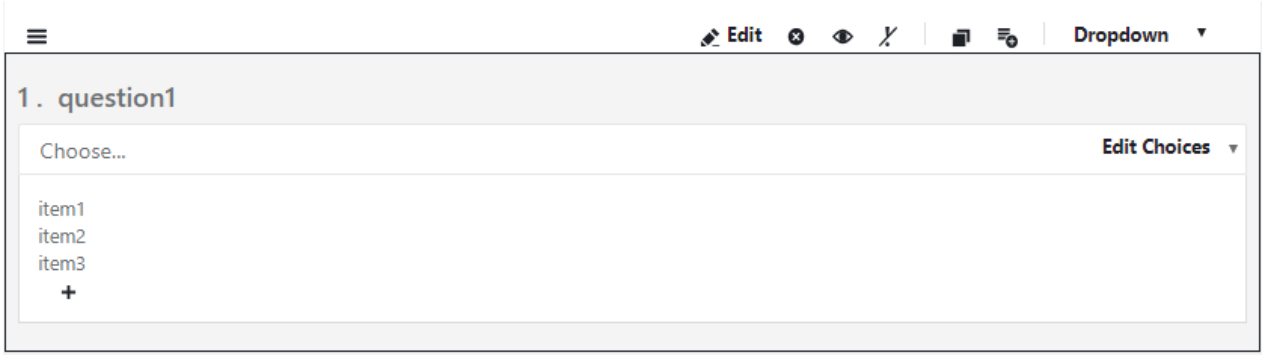

FIGURE 53 QUESTION TYPE DROPDOWN

- Comment

Question type like simple text that requires a bigger answer than one line. From the **Edit** button Administrator can choose the size of the box.

FIGURE 54 QUESTION TYPE COMMENT

- Rating

Rating question type where user can choose their answers from a specific range.

FIGURE 55 QUESTION TYPE RATING

- Matrix

Matrix is a question type with radio buttons that only one answer per row is valid. With the Question's editor Administrator can add or remove columns and rows and give titles.

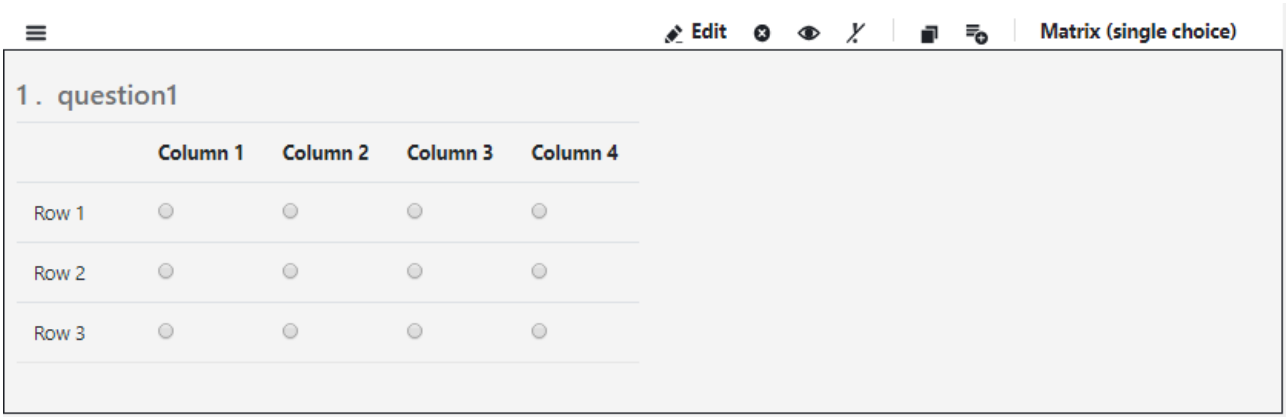

FIGURE 56 QUESTION TYPE MATRIX

Survey editor has options to undo and redo tasks, add pages and change the Survey's settings (title, page numbers etc.)

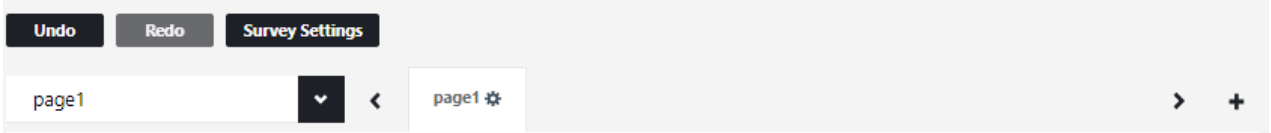

FIGURE 57 EDITOR'S BUTTONS

After completing the questionnaire Administrator can test with the **Test Survey** button it to see the final form of the survey.

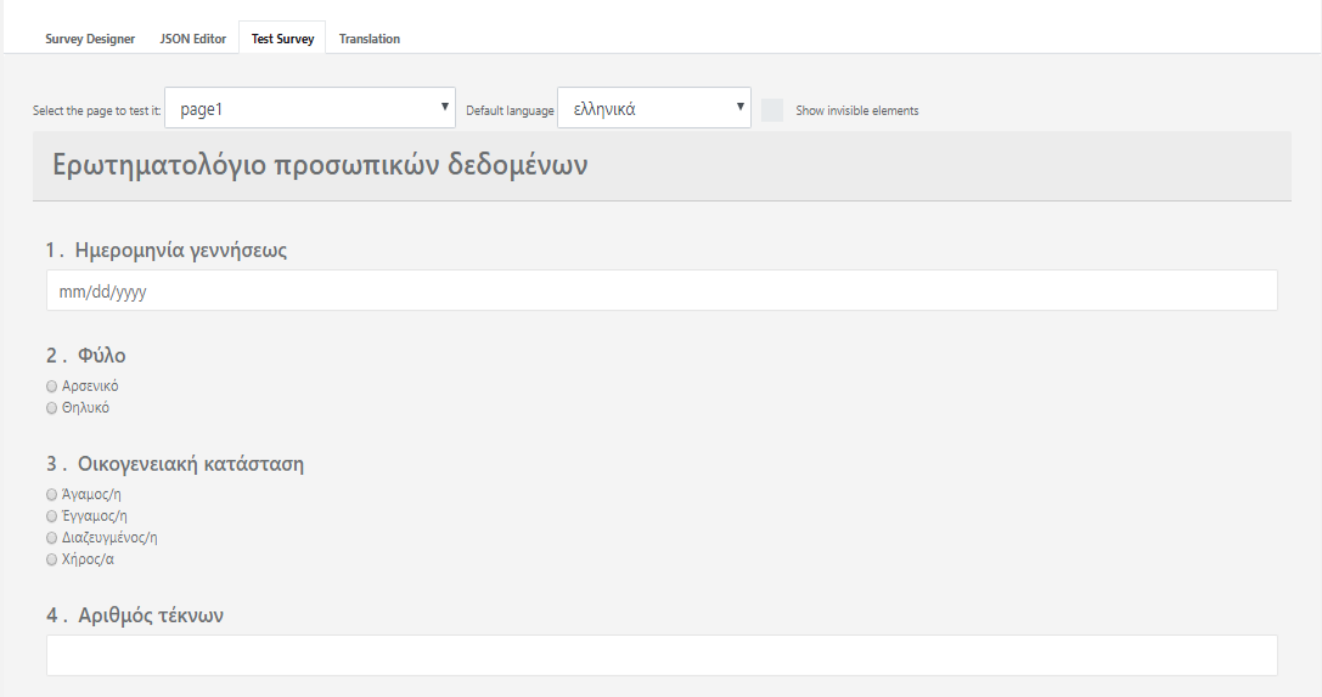

FIGURE 58 EDITOR TEST SURVEY TAB

Also the default language of the questionnaire can change in the Translation tab.

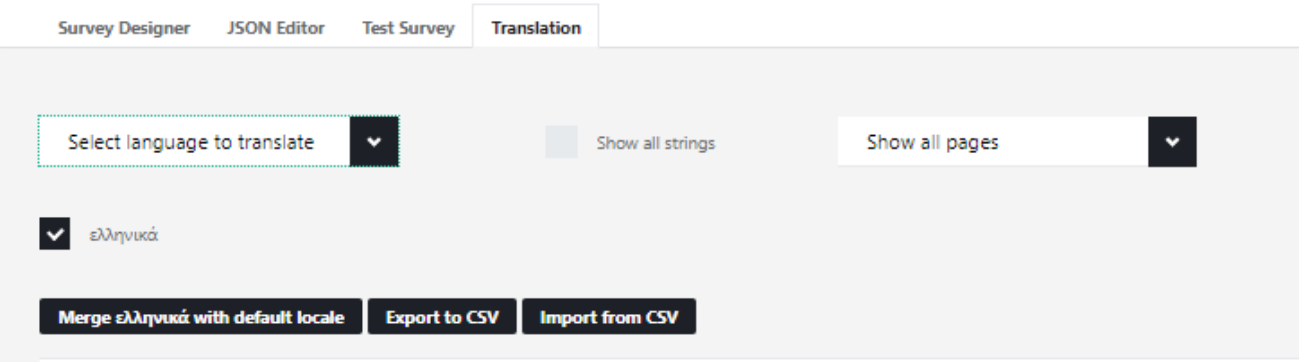

FIGURE 59 EDITOR TRANSLATION TAB

User page

When someone logins with User role, the system opens at the User home page.

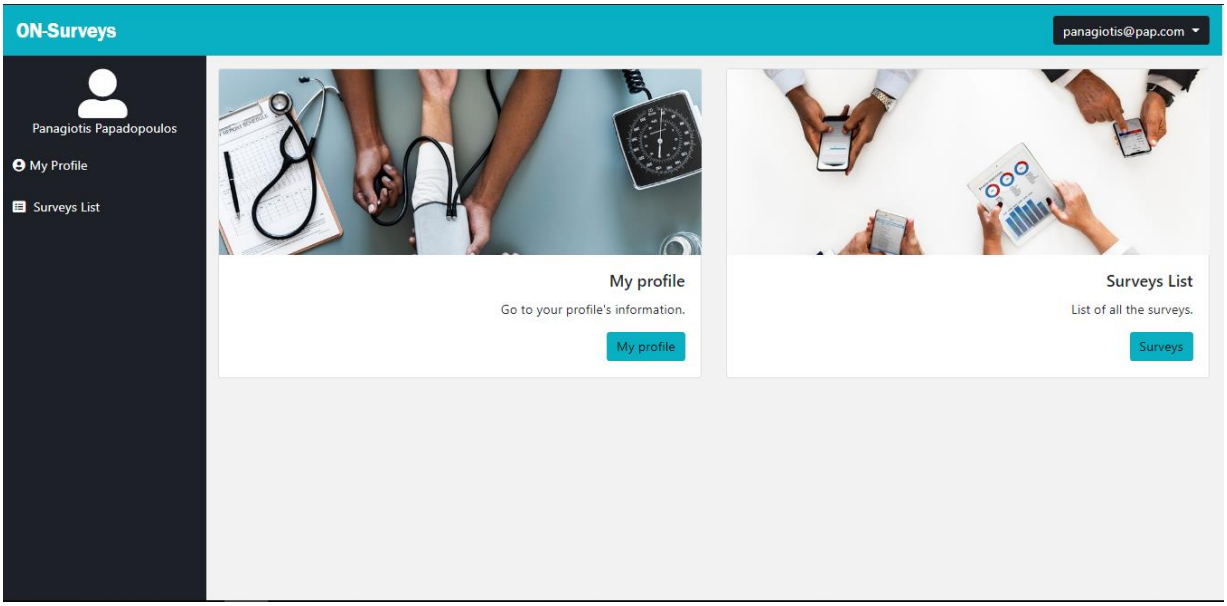

FIGURE 60 ON-SURVEYS USER HOME PAGE

Both side list buttons and card buttons go to the same pages. As a user there is an option to see the list of the Questionnaires created and profile's information.

In My Profile tab, users can see and change their profiles' information and a list with the surveys they have answered.

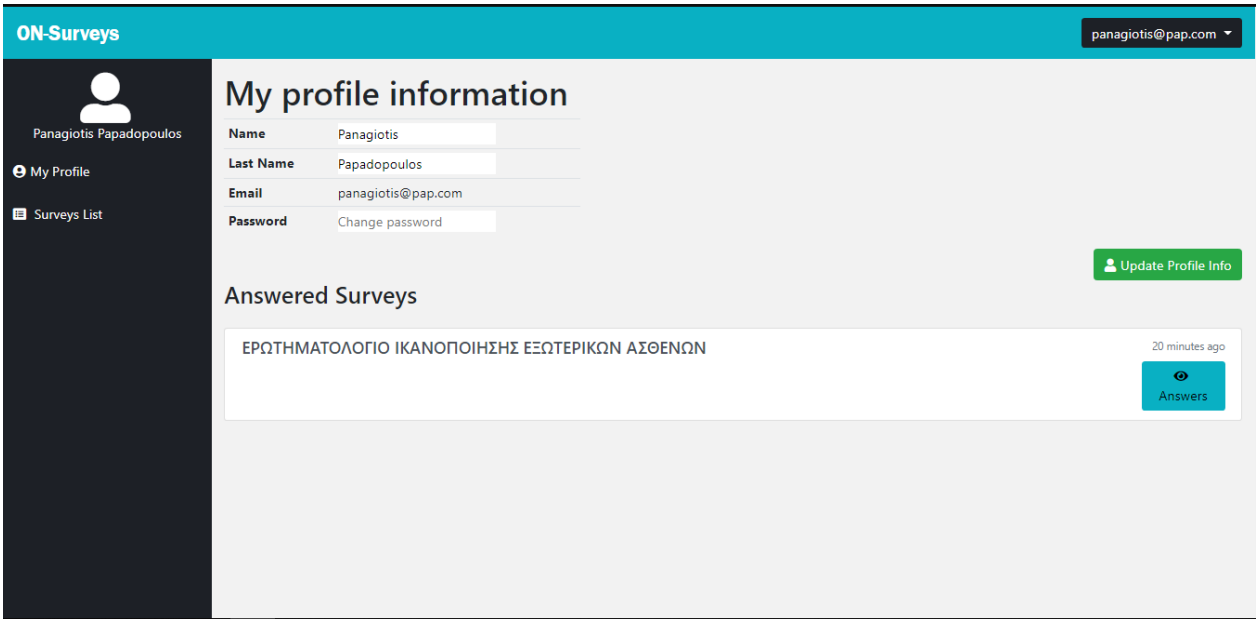

FIGURE 61 ON-SURVEYS MY PROFILE PAGE

Button Answers opens the survey with highlighted user's answers.

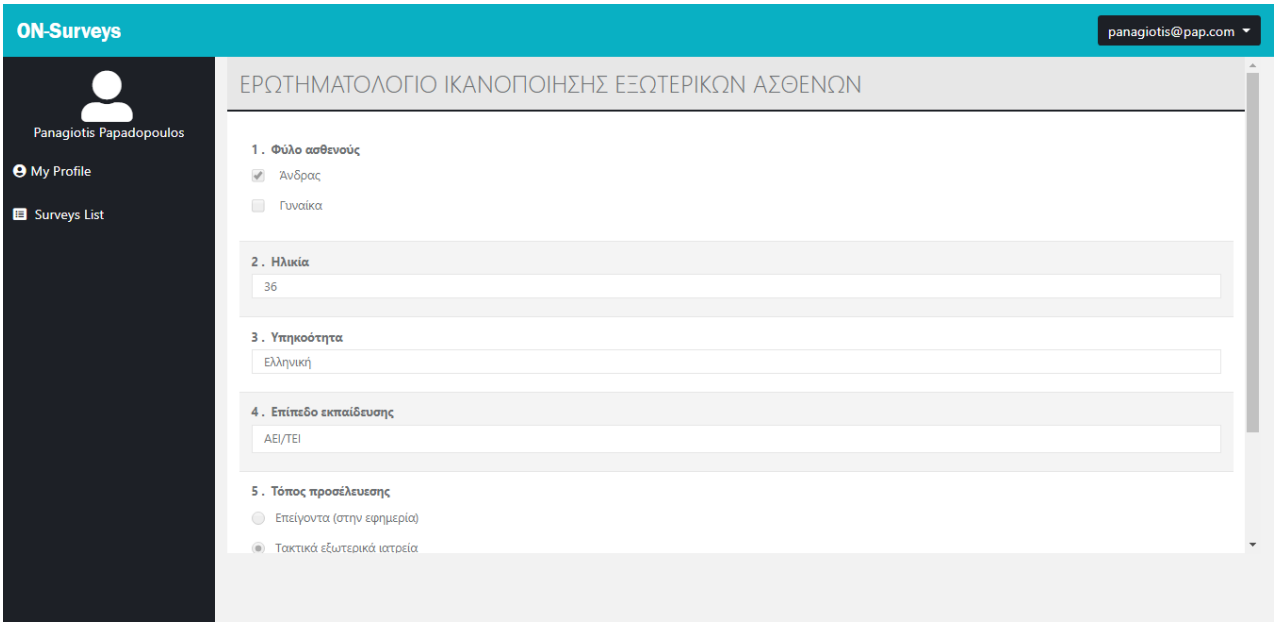

FIGURE 62 ON-SURVEYS USER'S ANSWERS TO A SURVEY

In Surveys List tab user can see all the visible and not-answered surveys,,

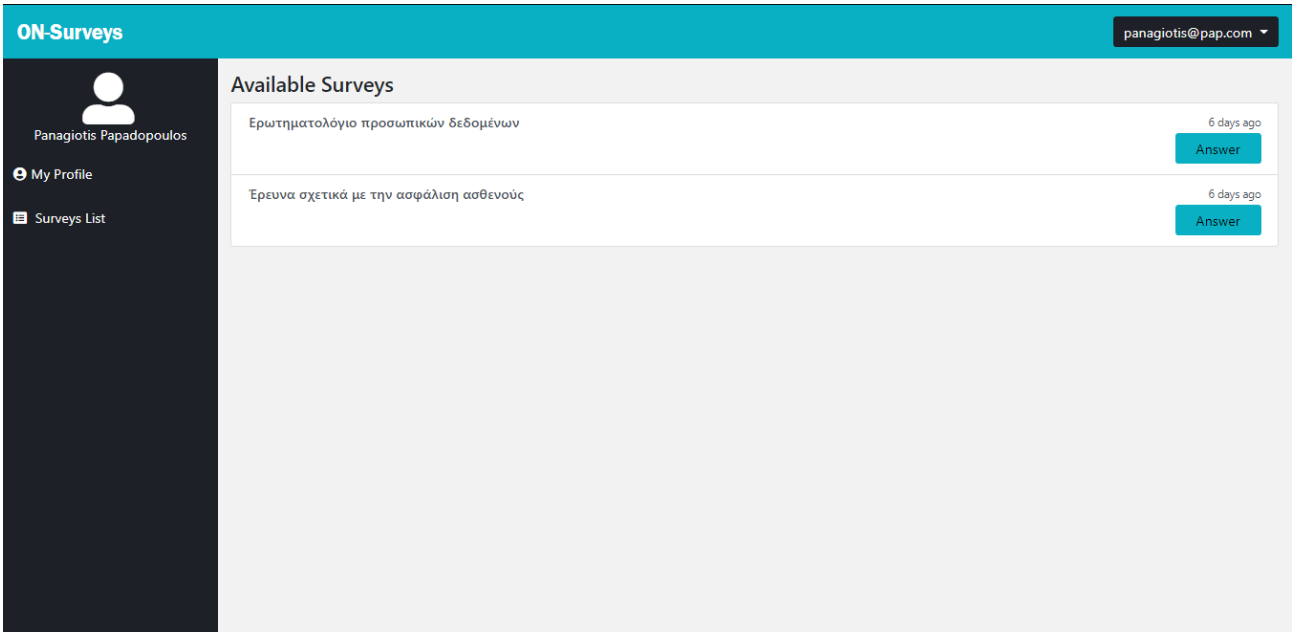

FIGURE 63 ON-SURVEYS USER SURVEYS LIST PAGE

Button Answer opens the clicked survey.

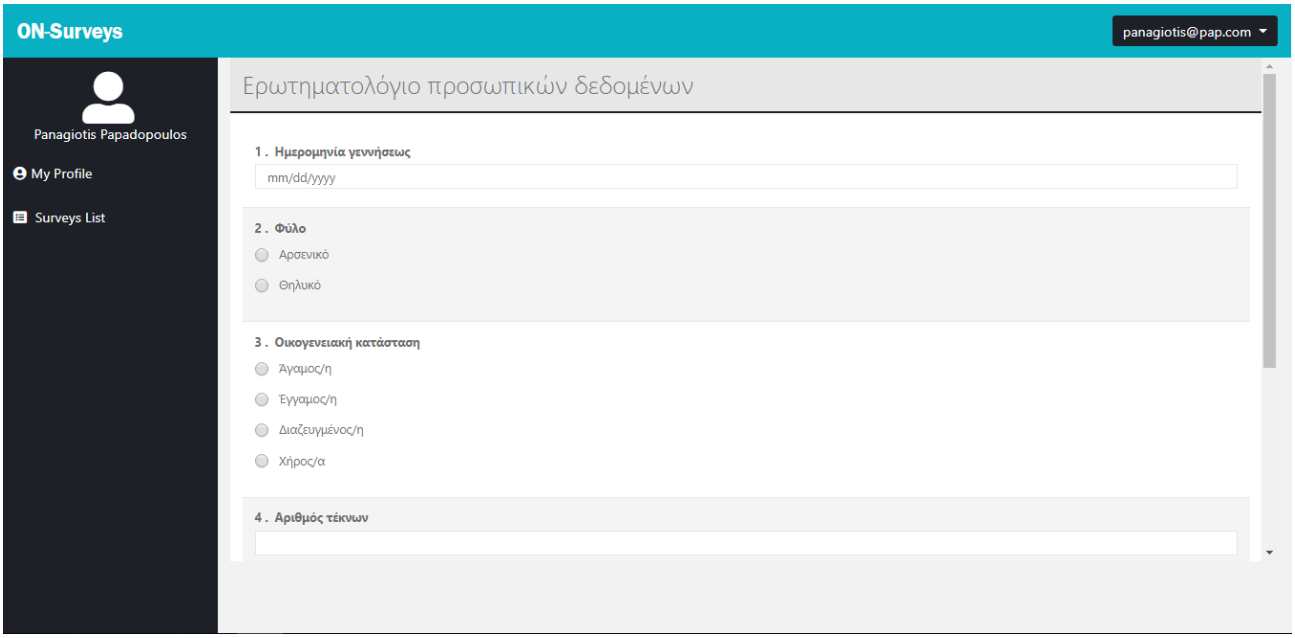

FIGURE 64 ON-SURVEYS ANSWER A SURVEY PAGE

Lastly, after completing the survey a Success "Thank you for completing the Survey" message appears.

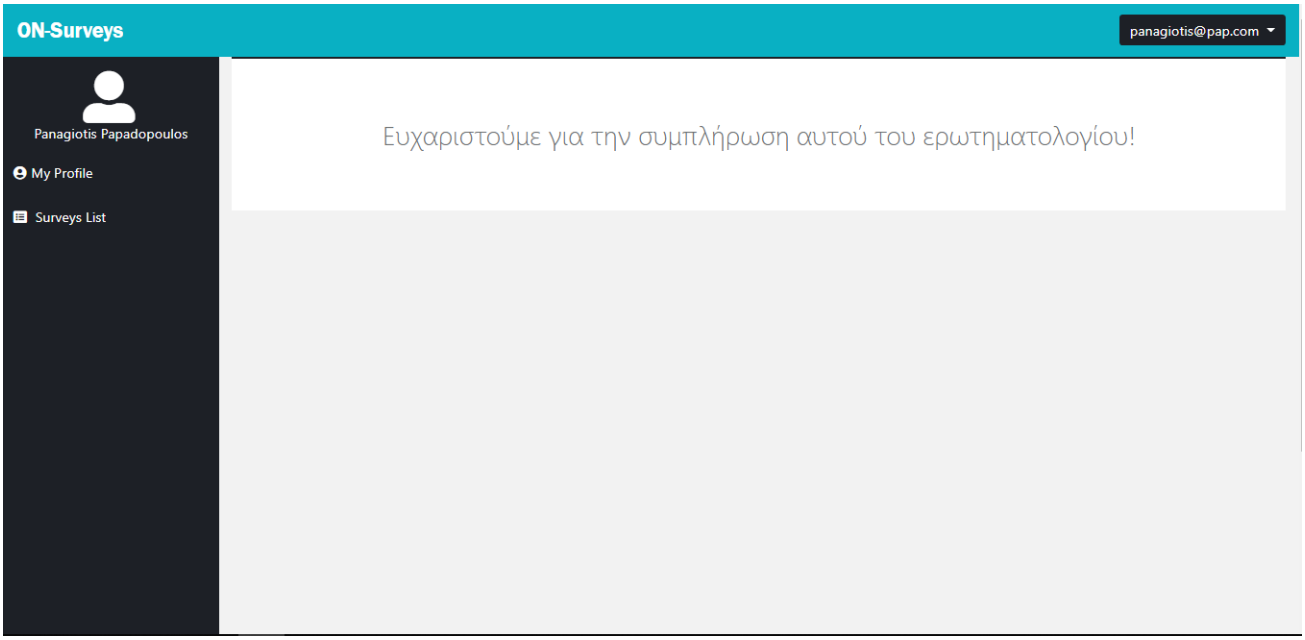

FIGURE 65 ON-SURVEYS SUCCESS MESSAGE FOR COMPLETING SURVEY

4.3 EVALUATION

To evaluate the effectiveness of our tool in terms of user satisfaction, it was necessary for people of different ages and occupations to test the ON-Surveys system. For this purpose we chose the User Experience Questionnaire (UEQ) and the System Usability Scale (SUS) questionnaires.

The UEQ measures among others, attractiveness, efficiency and perspicuity of a product. With a series of rating questions creator can easily understand if users like the product, if it's secure and easy-to-use and if users can understand it without much effort. UEQ consists of 26 pairs of contrasting attributes and, usually, 5 scaling radio-buttons [53].

For example:

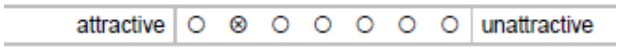

FIGURE 66 UEQ EXAMPLE

This response means that user rated the application as more attractive that unattractive.

The format and questions of UEQ are:

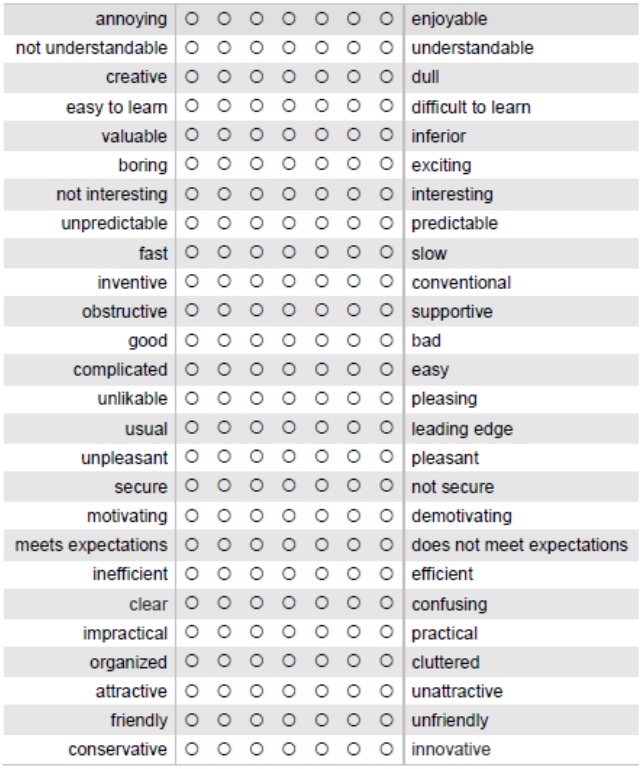

FIGURE 67 UEQ QUESTIONS

The SUS is a tool that measures usability with 10 questions and 5 responses for respondents, from Strongly Disagree to Strongly Agree. It's a valid and can differentiate easily useful and not useful applications[54].

The format and the questions of SUS are:

System Usability Scale

Instructions: For each of the following statements, mark one box that best describes your reactions to the website *today*.

		Strongly Disagree				Strongly Agree
1.	I think that I would like to use this website frequently.	☐	☐	☐	☐	☐
2.	I found this website unnecessarily complex.	☐	☐	☐	☐	☐
3.	I thought this website was easy to use.	☐	☐	☐	☐	☐
4.	I think that I would need assistance to be able to use this website.	☐	☐	☐	☐	☐
5.	I found the various functions in this website were well integrated.	☐	☐	☐	☐	☐
6.	I thought there was too much inconsistency in this website.	☐	☐	☐	☐	☐
7.	I would imagine that most people would learn to use this website very quickly.	☐	☐	☐	☐	☐
8.	I found this website very cumbersome/awkward to use.	☐	☐	☐	☐	☐
9.	I felt very confident using this website.	☐	☐	☐	☐	☐
10.	I needed to learn a lot of things before I could get going with this website.	☐	☐	☐	☐	☐

FIGURE 68 SUS QUESTIONS

We gathered 20 people from all ages and occupations to test the ON-Surveys system and answer the above questions. All 20 people were not computer programming related but most of them knew how to use a computer properly. Their ages vary between 24 and 38. Two of them tested the system on mobile, one on Tablet and the rest on Desktop. I asked them to use it with both Administrator and Patient role. As a patient I requested them to change their profile information and answer to one of the questionnaires and as an Administrator I requested them to simply navigate through the platform and create a simple questionnaire to have a general idea of how the editor works.

After the whole process that it took on average about 10 minutes per person, they all evaluated its usability and effectiveness. Results are shown below:

- Around 75% found system more than average enjoyable and creative and around 61% attractive and pleasing
- Approximately 90% rated the system as understandable and 66% said it is easy to learn. More than 66% voted it is practical and well organized.
- At least 66% characterized ON-Surveys as a pioneer idea and almost half of them believe it is innovative.
- Lastly, less than 15% found the system not secure and only 4% impractical

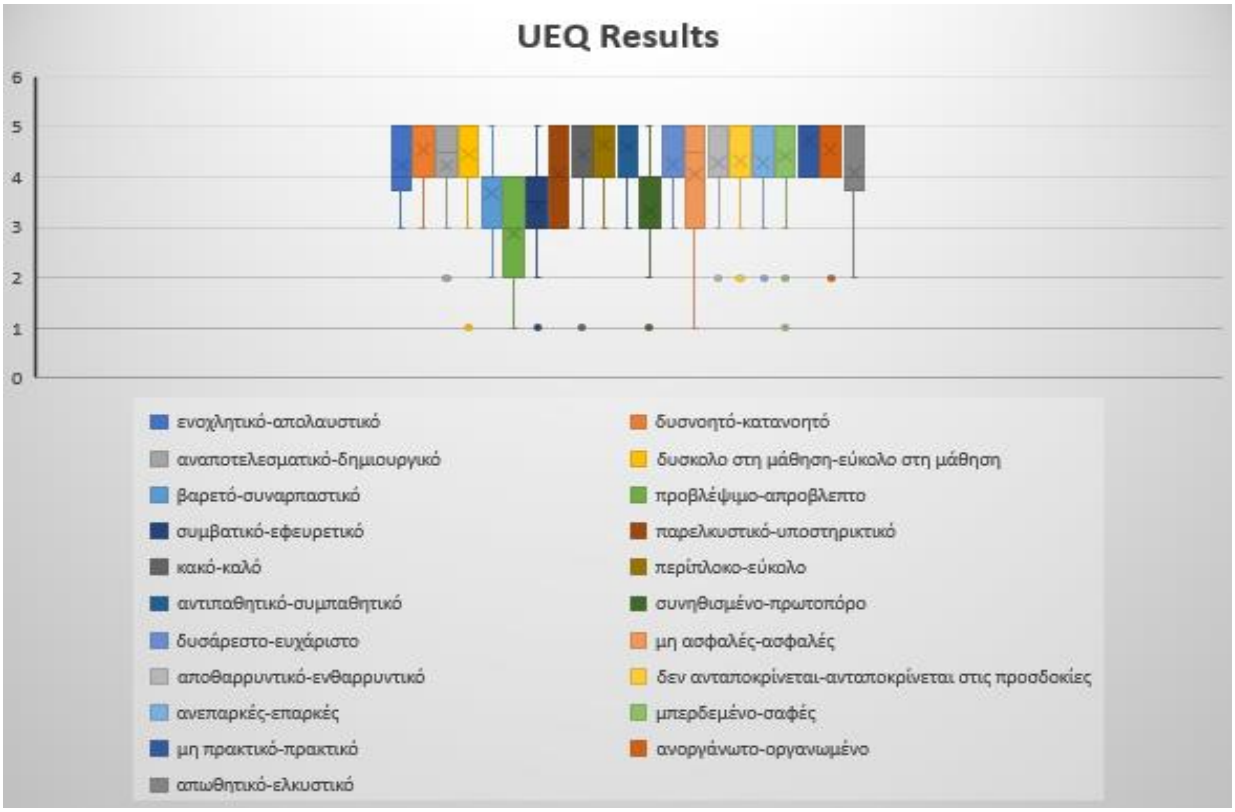

FIGURE 69 UEQ RESULTS

Moreover users evaluated Administrator's and User's profile separately. As for the Administrator's profile only 4% said that system was complicated, and they might need help to understand how it works while 80% of them said that they could use it with great ease [Figure 69]. In regards of User's profile, 42% found the various functions in the website were well organized and that

they would use the platform again while 9% thought it would be easier to use [Figure 70].

5. CONCLUSIONS

5.2 DISCUSSION

To sum up, surveys in healthcare industry have an important role not only for employees but also for patients. Continuous gauging of patient satisfaction and feedback collection to improve overall healthcare experience. There is a huge variety of existing online survey creating systems but only few of them provide proper data safety measures.

ON-Survey is and easy-to-use platform that focuses on the simple creation of surveys so registered users have access to each questionnaire to answer it. The system provides simplicity, so someone who is not familiar with computers can use it without any difficulty. Moreover, data are stored locally to prevent any unauthorized user that tries to access it.

The SurveyJS editor runs under a Non-commercial license (Creative Commons (CC) Attribution-NonCommercial licence). This allowed us to embed SurveyJS creator into our non-commercial product for free. Due to this free use, there are some specific limitations. We are not allowed to modify source code or use it without giving the appropriate credit [52].

The platform originally was created to be used by healthcare employees as administrators and patients as receivers of questionnaires. But its design with few adjustments can be useful for other services, too. The main purpose is to create questionnaires and store answers to a local server. Also, it can be used by other facilities like universities, large companies and even government. It is easy adjustable to anyone who wants a secure online survey system.

5.3 DIRECTION FOR FUTURE WORK

Although, the goal of this thesis has been accomplished, there are plenty of improvements and further expansion of the project that could be done in order to achieve better results. Possible interesting future work would be for the system to :

- Keep an updated personal health record (PHR) of each registered user.
- Export statistics and graphs for each survey depending on user's answers.
- Direct contact form for easy patient-doctor communication.

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APPENDIX

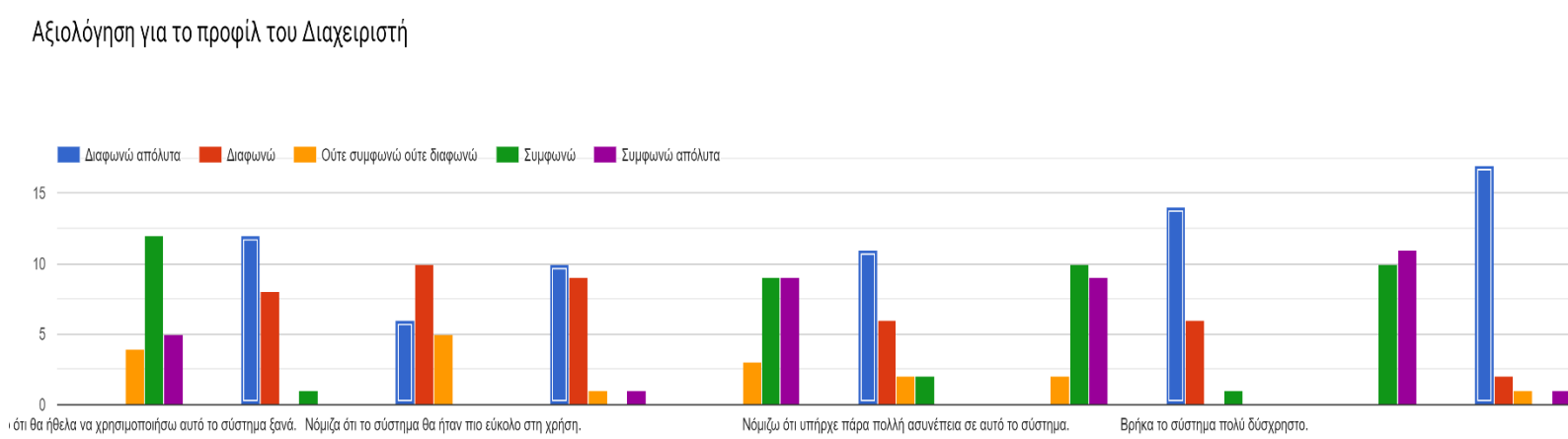

FIGURE 70 ADMINISTRATOR'S PROFILE EVALUATION

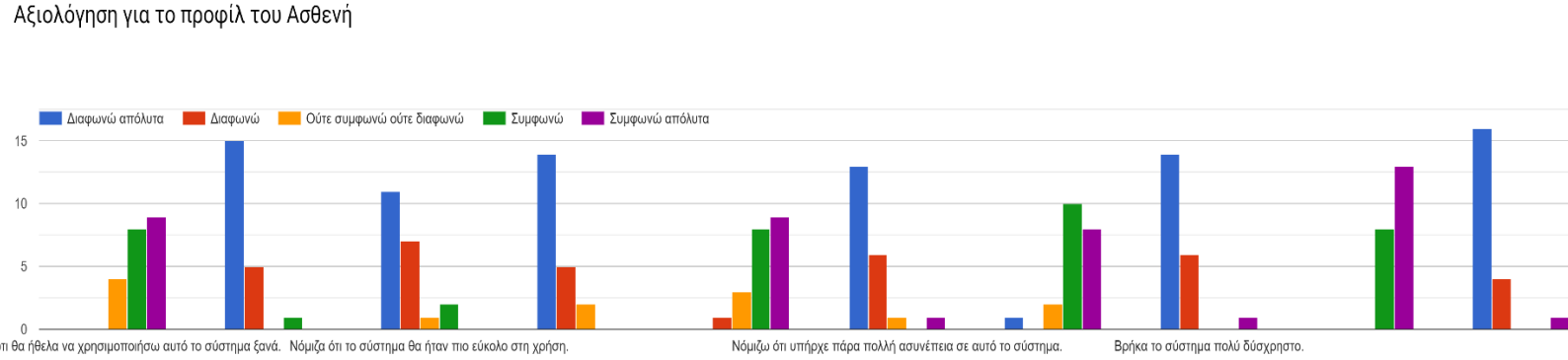

FIGURE 71 USER'S PROFILE EVALUATION