DEVELOPMENT OF A DATABASE DRIVEN WEB APPLICATION

HEALTH AND WELLNESS IN MY FAMILY

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ENDORESMENT

The report has been written by the author and has not been used in any other institution for academic credits or other purposes.

Saryu Singla

EXECUTIVE SUMMARY

The scope of the project revolved around the development of an online inventory tool which would help Issak Walton Killam (IWK) Health Centre understand the health of the community in a better way. The scope also involved informing community members about the health of their family. IWK Primary Health is making an effort to provide families with better programs to improve the health status in the various communities. The inventory tool will help the IWK analyze data to be used to build better programs for the future to help families in the community.

Online surveys are conducted due to their various advantages like higher response rates, time and cost effectiveness, easy data collection etc. [1] [2]. But they do have their limitations associated with them. They might have security and confidentiality issues related to them. People might not have easy access to internet etc. [3]. Keeping all the advantages and disadvantages in mind, the IWK Primary Health in collaboration with IWK Research Services built the questionnaire for an online survey- Health and Wellness in My Family.

The team members had already developed the set of questions which the author had to transfer to the web server by the use of programming language like PHP and MySQL. The objective of building the survey application was that a score (red, yellow or green) is available immediately to the user after the completion of the survey. This would help them familiarize with the areas that are yellow and red in color and needs attention. Also, aggregate data could be accessed by the bigger workgroup about who has completed the tool and how they have responded (number of people, top red yellow green scores, relation of demographic data with other sections etc.). The application to provide data in .csv format so that it can be exported to SPSS for further research.

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INTRODUCTION

The author was hired by Primary Health at the IWK Health Centre to develop an online tool using PHP programming language and knowledge of MySQL. This tool would help Primary Health to collect data for research purposes and improve the support programs provided to the public in relation to their overall health and wellness. IWK Health Centre employed the author for the period of May 7th- August 15th, 2012.

The project was driven by Jackie Spiers (Primary Health Manager) and Dr. Jill Hattchett (Consulting Scientist, Research Services). The other workgroup members were Dr. Brett Taylor (IWK Physician and Technical supervisor), Monique Yazbek (Coordinator, Primary Health), Anne Cogdan (Executive Director, Primary Health), Dr. Patrick MacGrath (Vice President, Research Services) and Saryu Singla (as student Intern).

The Community Health Team initiative is collaboration between Capital Health and IWK. The Community Health Teams (CHT) uses a tool called the "Personal Wellness Profile" with adult community members to assist them in identifying areas of their health that need improvement. They use this information to set goals regarding their health. IWK partnered with Research Services, in 2009 to develop a similar tool that would help in screening of a family's health. This type of tool did not exist so as a starting point for development, IWK Primary Health and Research Services began to identify domains that represented aspects of family health (e.g. nutrition, safety, physical activity and recreation etc.). The purpose of this tool was to cover all important domains that affected family's health in one way or the other. The group gradually populated the domains they identified with questions many of which were based on questions from the Canadian Community Health Survey. The draft tool was circulated to a number of content experts for their feedback such as CHT staff, IWK

Child Safely Link, IWK Extra Support for Parents and the IWK Family Leadership Council. The tool was also reviewed by the Read to Me program for readability. The scoring of the questions was discussed within the workgroup. It was decided that individuals will receive a red, yellow or green score for each category in the survey (Support for My Family, Health of Adults in My Family, Health of Children/Teens in My Family, Healthy Eating in My Family, Safety in My Family, Physical Activity in My Family, Transportation and My Family, Availability of Services for my Family). Red will indicate areas of wellness where the family should spend efforts in improving, yellow are areas that they could work on and green indicates areas that they are doing well in currently. In addition, they will be provided with the Portable Document Format (PDF) report of their answers to the questions and tips which will link them to various websites that help individuals improve their health.

Primary Health Care (PHC) is composed of 5 elements- Primary Care, Primary Health, Care, Health Promotion, and Population Health. Primary health is delivery of qualitative health care services to the population where it lives and works. Primary Care is the first point of contact with the health care system. It serves two purposes. The first purpose is to provide basic needs to the patients during their first point of contact. Second it provides, coordination for continuity of care to help move patients effectively and efficiently through the health care system providing them easy access when specialized care is needed [4]. Primary health covers all those factors that play a role in health such as income, education, culture, transportation, finances etc. [5][6] Health Promotion first came into existence in 1978 with the declaration at Alma Ata where it was recognized the need of preventing diseases and promoting and protecting the health of all people. The main aim of the declaration was that governments of all countries to formulate policies and procedures that would help equalize an acceptable health status of people [7][5].

It is rightly said that prevention is better than cure. In Canada, Primary Health Care is of the utmost importance. The objective of providing Primary Health is to concentrate on promoting health, preventing illness, easy access to healthcare, improved coordination in providing health services and better management of chronic diseases. Statistics Canada, 2008 also stated that Primary Health helps in reduction of hospitalization by promoting health and reducing uncoordinated care which further, boosts the confidence in healthcare system [8]. Around 94% of population in Canada 15 years or older uses the primary care services each year. Despite the importance mentioned for Primary Health, there is a major room for improvement in the area. Canadian Institute for Health Information (CIHI) Primary health indicator report, 2009 stated that PHC lacks standardized and comparable data which can be used to deliver better information and care [9].

Surveys in primary health are developed across Canada to collect and measure the data points that normally have not been captured. CIHI suggests that, though surveys lessen the information gaps but more efforts are required to ensure the information collected is informative, comparable and relevant in the healthcare settings [10]. The goal of this project is to make the public aware of their health status by introducing a survey-"Health and Wellness in My Family" and the services provided by different Community Health Teams for making improvement in the areas of health. The electronic survey is the most cost effective way to be accessible to the public. It has a wide coverage since it can be accessed by anybody; any where a computer is available. The survey is designed in such a way that it collects all relevant data and is comparable to other settings in different communities and provinces.

Overall, the objectives that needed to be achieved from this internship were to learn work independently in real-job settings, gathering information and contacting various people as per needs. The application "Health and Wellness in My Family" was paper based questionnaire developed by collaborative effort of IWK Primary Health and Capital Health. This work term gave author the opportunity to transfer the set of questionnaire to a web based format using programming language. This would help the workgroup to gather data and access it for research purposes. The application would provide the data in a format (.csv) that could be exported to SPSS (software used by Research Services in IWK for data analysis).

IWK HEALTH CENTRE

IWK Health Centre was originally established in 1909 was not called IWK until 1970. It mainly serves women, children, youth and families in the Maritime Provinces. IWK provides tertiary, secondary and primary health care as well as being involved in research activities and supports education opportunities for Health professionals. The vision of IWK is "Healthy families. The best care." [11]

PRIMARY HEALTH, IWK HEALTH CENTRE

As mentioned above, IWK provides tertiary, secondary and primary care. The author worked with IWK Primary Health in collaboration with Research Services. Primary Health assesses the health status of the population to serve their needs. The various initiatives, teams that come under the scope of Primary Health are [12]:

- Bilingual services (providing translation services to families those who do not speak English)

- Child safety link (An injury prevention program which works towards keeping children of all age groups safe at home and play)

- Community Health teams (promotes health and wellness in communities)

- Community grants (arranging funds for projects promoting health and wellness to the population served)

- Diversity and Inclusion (working with employees of IWK towards creating a welcoming environment for families with diverse backgrounds and ethnicity)

- Extra Support for Parents (providing support and services to families with infants)

- prideHealth (providing safe access to health care services for people who are bisexual, transgender, intersex and gay.)

- Read to Me! (program that provide free books to families that have newborns or have adopted a child in Nova Scotia)

- Spiritual Health (provides spiritual support and counseling to the served population and employees)

- Stepping Up: A Physical Activity Strategy for the Halifax Region (to reduce the physical inactivity across Halifax Region) [12].

Roles and responsibilities: The author was employed as a full time Research Assistant for 13 weeks. The author's responsibility was to program an inventory tool according to the requirements of the workgroup so that it is available to individuals in the community. The author had to work independently, contacting different people to track down necessary information utilizing input and guidance from the workgroup. The author was also expected to complete the project in a limited time period. She was accountable for the work done regarding the update of the online survey which was discussed during weekly meetings.

DETAILS OF THE PROJECT

The application "Health and Wellness in My Family" will help families in the community to get results and feedback in various areas of their health instantly and provide them with links to important services as per their requirements. An administrative panel can monitor and analyze the aggregated data for research purposes. With the development of the application, IWK Primary Health can serve families better by better understanding the supports they require.

In the development of the project, software that were used by author were Notepad++ for programming, MySQL workbench for creating database for data storage and management, Filezilla/WinSCP for uploading and downloading the files.

The inventory tool built by Primary Health, had 9 different sections covering different aspects of health of population. These were:

- Support for My Family
- Health of Adults in My family
- Health of Children/Teen in My Family
- Healthy Eating in My Family
- Safety in My Family
- Physical Activity and Recreation in My Family
- Transportation in My Family
- Availability of Services to My family
- Information About You

Each section had a different set of questions. Each question further had 3-5 possible answers. Each possible answer has a color (red, yellow, green) assigned which helped in scoring. As mentioned earlier, red indicated

that "Your family should start working on this", yellow stated "Your family may need help" whereas green stated "Your family is doing great".

REQUIREMENTS

- The requirements of the project revolved around transferring the inventory tool into a web based format in a specific way such that a score of red, yellow or green is available to the user after the completion of the survey for every section. The scoring was based on maximum frequency count of the color occurring in the corresponding section.

- There were some "critical questions" that were identified. By critical questions it is meant that a score of red on these questions would turn the whole section score as red.

- Registration: User was made to register for the survey for their convenience. Registration would help them login and logoff multiple times from the survey. Option of email was available too, as they might be contacted for follow up surveys and will be forwarded the results of the survey.

- Each question has a health tip associated with it. When a user has completed the survey, s/he would be provided with a personalized report in the form of pdf providing them tips in areas which need improvement.

- A separate page was developed for administrative purposes so that the data can be exported in the form of excel sheet (.csv file) and imported in SPSS for further analysis. An administrator is able to add a question to the survey if needed and various related functionalities.

- For the pilot of the web application it would be restricted to certain people to collect data from particular sample.

- The application also required HTML and CSS coding.

TECHNICAL

The project involved 3 main steps.

- Data storage and management: For the initiation of the project a database had to be created where all the values of the data could be stored in tables and accessed any time. It was divided into four steps.

  - Create database: The author created a database which was relational in nature. Different tables created and linked to each other with a primary key (unique user id).

  - Create table: There were 7 tables (eval_section, evaluation, option, question, section, tips, and user) tables created in the database, each collecting different data points.

  - Insert data in tables: Each table has various columns which would store the record for different attributes. When a user operates the web application, the record enters automatically and get stored in these tables accordingly. For e.g. a table named user would have information about user (username, password, email address) etc.

  - Query data: When the data is inserted into the tables, MySQL query is used to retrieve data from the tables. For e.g. "SELECT * FROM db_name . table_name;" is the statement used to fetch information of that particular table from the database. Please see Fig.1 for the snapshot of the database and its structure from the software MySQL workbench.

- Programming: the next step succeeding the building of databases was programming. Notepad++ was used as a text editor for programming language. The software displays different functions, arrays as different colors which make it easier to detect errors in the codes. Since the project dealt with the development of dynamic web content the programming language used for the project was PHP. Connection of the codes to MySQL

database is very important since the codes direct the website to work and dump the data into MySQL database. Figure 2 is a snapshot of the software and programming (Please see Appendix).

- Testing phase: Once the application is complete according to the requirements, it will be piloted with the community. An ethics approval would be needed first and a satisfaction survey would be put in place. This phase is beyond the scope of author's project.

When the user enters web address of the application; a code is required so as to open the application. After the code has been validated, the user can access the web application. He/she can either login (if he/she has already registered and used the survey atleast once) or register (if he/she is using the survey for the first time). After login/registration, the user will be directed to questionnaire of different sections. There are 7 sections and the individual proceeds by finishing each section. Later, when the questionnaire is completed, a page with results appears which presents all the scores relating to each section.   In addition, the user can generate PDF of their personalized scores from the same page. The user is also directed to a website where all the tips with various links of useful websites related to health problems are indicated. The flow of the application is depicted in Fig 3 (Please see Appendix).

  Administrators will be able to export data in the form of .csv file from the application by logging via different user type. The reports can be generated from the exported file by running queries into excel or any other specialized software such as SPSS. The flow is shown in Figure 4 (Please see Appendix).

People: In author's opinion, the application developed is user friendly. The web based application is easy to use and can be used by any individual who has the basic knowledge of using a computer. But the use of this application remains limited to the people who lack knowledge in understanding computer usage. The application has been built in easy to understand English language. But, since this application is restricted to only one language i.e. English; people who do not know the language will not be able to take the survey though residing in area covered under Community Health Teams. Currently, accessibility of the survey has been limited to only certain communities. Some people in these communities have a low income status and less education. Not all families in these communities will own a computer or laptop, however, the survey application can be accessed through public libraries, etc. Author feared that due to lack of knowledge of the employees in programming languages, training the personnel to maintain and update the survey application at the back end could arise as an issue. But employees were enthusiastic to learn different functionalities of updating the survey. The employees had to be trained and process of updating the database with new questions had to be documented.

Process: The author personally attended the "Personal Wellness Profile" (PWP) session in one of the Community Health Teams offices to experience the working of the same. Currently they operate on paper based surveys. After the surveys are taken by the individuals they are provided with a score (not electronically) and various areas of the health an individual needs improvement in. The professionals explain the meaning of the scores to the individuals present for the session. PWP is very similar program to Health and Wellness in My Family application. The development of the new application would result in generation of score electronically and the scores are self explanatory as the application is designed in an easy English language.

Information: The application needs the user to register in order to take the survey. User is capable of taking the survey more than once with different usernames. Author felt this issue could hamper the reliability of the data. Since this was author's first time in the real job, at first , it was difficult to realize that in real world problems needs to be tackled dynamically taking care of all requirements and changing expectations. It was learned that in real job information provided is never at once. Unlike assignments, the author wasn't provided with the requirements that were needed to know in the beginning. The author felt that not having complete information about the expectations and requirements in advance hindered author's efficiency and she could have performed better if information available was well in advance.

Author would have loved to take on some others projects in order to gain more experience. However, as the needs of the team changed so did the demands and expectations of the project. Therefore, the time and focus of the author remained on this project in order to accommodate the constant changes.

Technology: The author lacked experience in the programming language that was used in the development of the project. PHP programming was entirely new to the her. She had basic knowledge of HTML and MySQL but lacked experience in the field. This was a big learning curve for her and a lot was gained out of this valuable experience. In addition, File Transfer Protocol (FTP) access was denied to the author, so personal laptop was used for the development of project. With intranet not being available on the laptop, author experienced slow and time consuming internet problems during her work term. But in the end, it turned out to be a better option as the computer provided to the author by the health centre was outdated and lacked a number of software needed by the author throughout the work term.

Physical Environment: Author found no trouble with the workspace provided by IWK Primary Health. The environment of IWK Primary Health was warm and friendly throughout the internship period. Support available from the team was tremendous.

Through this internship author learned how to work in a team with interdisciplinary members, understand the project's requirements, implement them and find good solutions.

ANALYSIS OF A PROBLEM

The two major issues that author thought needed attention were proficiency of English and access to computers by users. They are explained below.

Proficiency in English: Canada has been granting immigration to almost 250,000 people per year [13]. As the immigration population increases there is need for improving health care system for immigrants [14]. Immigrants belong to various different countries where English is not the first language and people have limited proficiency in the same. English has been regarded as "Lingua Franca" [15] of the research world. As author mentioned above, the limitation of this web application is that it has only been developed in English. This limits the use of various health care services by the users [14] [16]. Government of Canada has provided language interpreter services and established multicultural health centers but people and health care providers are unaware of these services. It is also suggested that more "language concordant" providers of health care are needed so as to remove language as a barrier from healthcare system. Access to language interpreters should be improved and cross cultural training should be increased so as to provide better care to immigrant population [14] [16]. Users report that cultural and language barriers are the two biggest barriers in the medical settings [16]. Lack of health information materials available in languages other than English hampers the use of healthcare services.

Access to Computers: In this age of computers and internet, health and government sectors are trying to keep pace providing the information electronically. Public libraries play an important role in access of information by low income families, immigrants and rural communities [17] [18]. Without availability of these services the families in these communities would not be able to participate in providing the information about their needs. It was observed that rural communities are less likely to own computers and have internet access at home [18]. In

early 1990's, in Canada, a large number of libraries did not have sufficient number of public service personal computers (PC) [19]. But public libraries today are very well equipped with public service PCs. They also provide free access to high speed internet [18] [20]. Immigrants mainly rely on public libraries for seeking information. But this does not solve the issue arising for technological impaired population. Public libraries also lack the number of professionals providing training to patrons seeking information who are technologically challenged. These patrons are usually seniors, people with no internet access at home and adults with continuing education [20] .Limited availability of workstations in the public libraries can also affects the user's access to health care information.

RELEVANCE TO HEALTH INFORMATICS

The author was already provided with the survey to Health and Wellness in My Family. The deliverable of the project would lead to the collection process of Primary Healthcare data. It would be useful for Community Health Teams to gather data in relation to various aspects of health status of the families residing in the communities. This data further would be mined and analyzed by the research services in IWK Health Centre and generate useful information. It would also be used to generate reports on current prevailing health conditions in these communities. This information will help the IWK and the Community Health Teams to deliver better programs to the public. The information and health tips would help the individual and/or families seek help if needed from Community Health Teams where they would be advised on dealing with the problems related to their health. The survey had measurable health indicators. The survey was an interactive medium of providing user with the feedback on the areas where improvement was required. During the employment period, the author personally attended a session of Personal Wellness Profile at one of the Community Health Centre. This session was greatly helpful in understanding how the development of surveys and promotion of this initiative would bring community members to register, attend and seek the services offered by Community Health Team.

During the fulfillment of program's requirements, the author had to undertake many courses like Project Management, Health Information-Flow and Use, Health Information Flow and standards, Data Mining, Strategic Planning in Health care etc. The author has benefitted a lot from the academic learning in gaining practical experience. Throughout the work term, author was working with the interdisciplinary team and under a time consideration for the completion of the project. Project Management skills were very helpful in the division of the work into small elements and assigning them a certain amount of time. This helped author to

keep track of the project and the lag points. The courses like HI Flow and Use and HI Flow and Standards were of great help in the introduction of Healthcare system in Canada theoretically which gave author an overview of the working, information flow and standards used in health centres across Canada. Through this internship, author gained a practical experience and insight of working in health industry while applying the theoretical knowledge.

CONCLUSION

The deliverable of the project would help the organization gather data relating to health and also, help them improve the services provided by the IWK and the Community Health Teams to families. The data analysis will also predict the health status of the population served and provide them with the instant tips of getting help and improving it. This project will result in a cost – effective, reasonable and quick way to provide feedback to the families about their health problems. But there are still issues that need attention while disseminating an electronic version of healthcare service due to various limitations (language proficiency, access).

Since, there is a room for improvement in Canadian healthcare, the result of the project would identify the loop holes in the health status of different communities in Halifax and thereby would try to fill the gaps.

RECOMMENDATIONS

Since the survey questionnaire is designed with expertise and captures most of the aspects of health, it can further be used not only locally (only Halifax Regional Municipality), but expanded to other regions of Canada. Then the standardized form of data collected, compared and variations in the health status can be measured across Canada. Author believes that different aspects captured in the survey and the data collected from this application will help IWK Primary Health make important decisions about future programming. Through the questionnaire data, they will be able to retrieve the information of what conditions are prevailing in the families of these communities and the kind of services and help required by the individuals filling out the survey. Through the demographics data, it could be known what kinds of families are more involved in filling out the surveys. More questions can be inserted so as to capture more data points. The access to the web application can also be improved by publishing the same in various other languages since the material is non-English language available is very limited in health care industry.

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Fig1: Snapshot from MySQL database (Software: MySQL Workbench, Server: Bluenose)
The numbers in the boxes indicate:
1. Tables in the database
2. Data in the tables
3. Query data
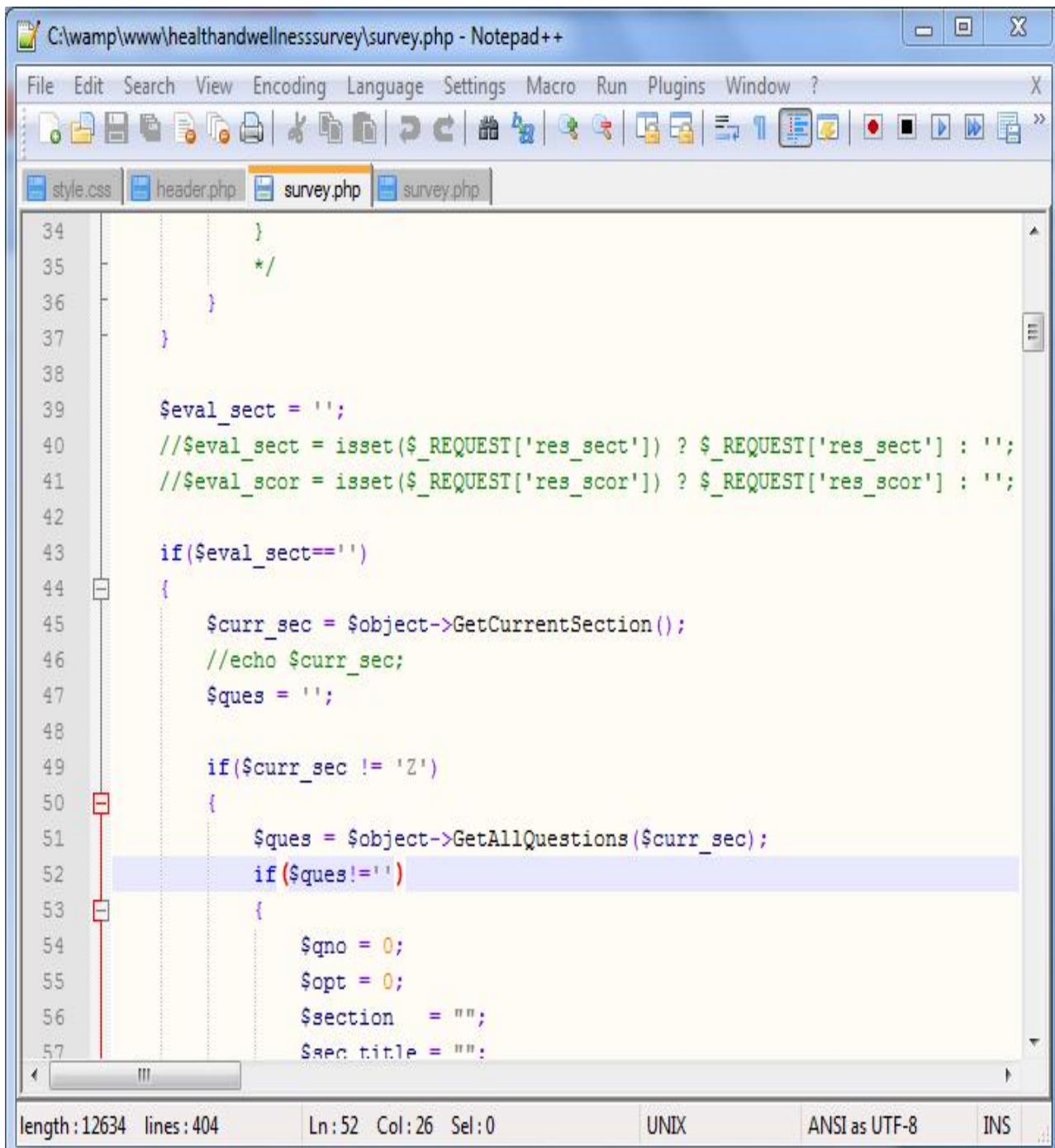
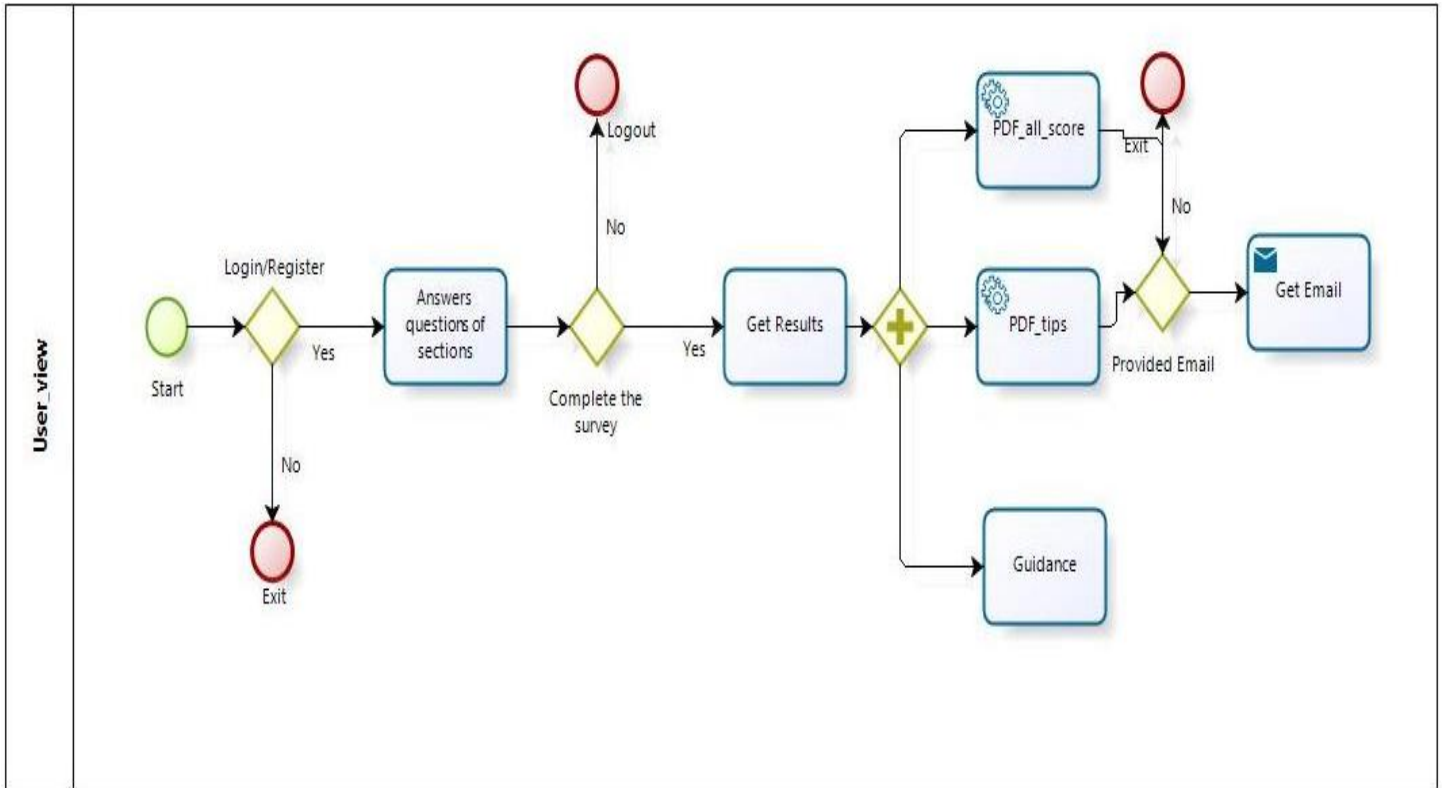Fig. 2: A snapshot from programming in Notepadd++

Figure 3: Flow of web application: User view

Figure 4: Flow of web application: Administration view