HEALTH CENTRE IRELAND - AN APP DEVELOPED IN SYMFONY 3

Institute of Technology Blanchardstown
Fourth Year Computing Project

Individual Project
by
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DECLARATION

I herby certify that this material, which I now submit for this assessment on the program leading to the award of Bachelor of Science in Computing in Information Technology in the Institute of Technology Blanchardstown, is entirely my own work except where otherwise stated, and has not been submitted for assessment for an academic purpose at this or any other academic institution other than in partial fulfillment of the requirements of that stated above

Signed_____

Dated_____

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ABSTRACT

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Project Introduction

1.1 Overview of Project

The following project which was undertaken is an online web application developed using the Symfony 3[1] framework. Symfony is a PHP based web application framework, with a set of reusable PHP components and libraries which first published in 2005. Other web applications which use this framework include; prestshop.com[2], sonota-project.org[3] and pimcore.com[4]. The purpose of this web application is to create an application for "Health Centre Ireland", which is targeted for users who are suffering from an illness, whether it be a physical illness or a mental illness. The idea for this project came when reading articles about Mental Health in Ireland and how there is a lack of general knowledge in the media and throughout the public when it comes to this affliction. So the idea of developing an app, which could both be informative, and used as an assistant to people suffering from this disease. The idea for including other diseases came from wondering if the public had knowledge about other illness which effect people in the country, and deciding to incorporate these other illness' into the application also.

There are many services and charities which offer help to people suffering with these illness', and this web application will act as a hub where users can find out information relating to their illness, find out exercises which they can partake in to potentially help or relive pain relating to their specified illness. This application can also be used as an assistant, to potentially help anyone who suffer with these diseases' in a similar vein to previous assistant applications such as Pill Reminder[5] and MedCoach[6], two mobile applications for both Android and iOS which remind users when to take medication. This application will include a calendar which users can set these kind of reminders,

along with reminders of when to do exercises that can potentially relieve pain for their illness. Users signed up to this application should also have a method of communication, which can be used to talk about their personal experiences in battling with illness, and medication which they have taken to other users on the site.

1.2 Project Objectives & Goals

The main objectives and goals for the project are as follows.

- Research exercise methods which can be used to relive pain of diseases and if these methods are proven to be effective
- Create a web based application "Health Centre Ireland" to assist anyone who is suffering from physical or mental illness
- Make sure that the application is ascetically pleasing, easy to use, along with having a good responsive design.
- Interaction with the app should be straight forward and every user should know exactly what to do on each page, along with what each page is for
- Implement functionality for:
  - User Registration
  - User Login
  - Routing Security
  - A Scheduler for each User
  - A Communication System
- Create databases which store:
  - User Information
  - Scheduler Information
  - Information Regarding User Communication

1.3 Main Research Questions

When developing an application such as this which deals assisting a wide variety of people many questions must be asked in regard to the project, questions such as;

- How will this application be implemented to suit each individuals affliction?
- What illnesses and afflictions will be dealt with.
- How will any difficulty that arises during the research life cycle be dealt with?

- What topics must be researched to make this application as effective as possible for its target audience?
- Why use Symfony when implementing a project like this, as opposed to another web development framework?
- Are there any other similar technologies or applications in the marketplace right now?
  - If so, research these and find out what makes these applications so successful and try to improve on them

There are multiple ways in which these topics can be researched, such as the many books and articles relating to these matters that would make for excellent research material, some of the likes including; Cancer Fitness: Exercise Programs for Patients and Survivors by Anna L. Schwartz[7], Overcoming Arthritis: The Complete Complementary Health Program by Dr. Sarah Brewer[8], and for implenting the project and learning about the Symfony framework; An Introduction to Symfony 3 by Dr. Matt Smith[9].

1.4 Technologies Used

- Software Used for Server:
  - PHP built in Web Server
  - PHP
  - MySQL Database
- Software Used for Web Application Development:
  - PHP Storm
  - HTML
  - Twig(Template Engine)
  - JavaScript
  - CSS
  - MySQL Workbench
  - Symfony 3
- Device Used for Testing and Demonstration
  - Lenovo Z50-75(Windows 10, 8GB of RAM, AMD FX-7500 Radeon R7 Processor)

All of the required software is free of charge besides PHP Storm which requires a student subscription to be free of charge, otherwise it will cost 199€ for a year subscription.

1.5 Methodologies

Initially research will have to be conducted for the project in the area of Web Application Development, along with research for the illness' which the users can sign up with, such as how many

people in Ireland suffer from these illness' and the exercises that can be done to relieve pain for these. The "Research Life Cycle"[10] will also be closely followed. The reasoning for this is so that focus is not lost at any point, and throughout the life cycle the current step as to what must be done is always known. By following the Research Life Cycle the implementation of the project will be much easier.

The following steps of the research life cycle will be taken into consideration;

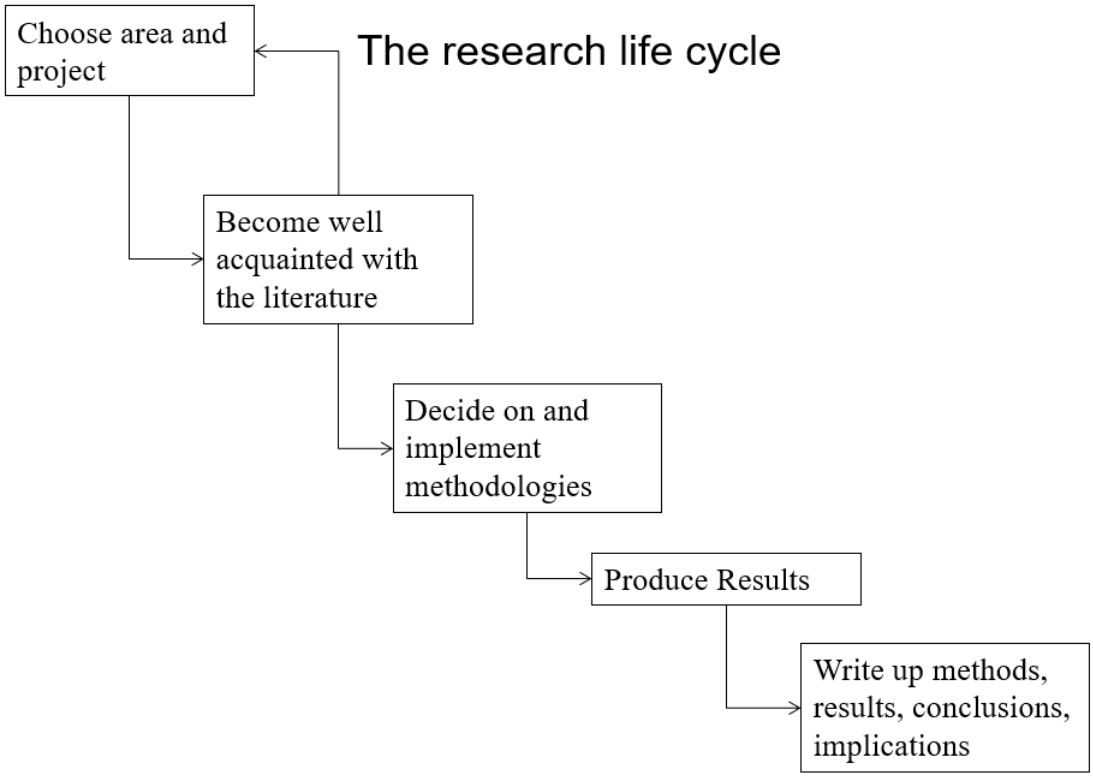

Figure 1.1: Research Life Cycle

1.5.1 Choose Area and Project

During this stage the project has been chosen. This includes the area of expertise for the project, in this case a web development based project. It is here where the system will be looked at as a whole, and whether or not the project is feasible and of a suitable standard for a fourth year based project. What type of research must be done to accomplish the project should be set out in this phase also.

1.5.2 Become Well Antiquated with the Literature

At this stage all the research will be conducted and you familiarise yourself with the literature which may help with the development of the project.

1.5.3 Decide on and Implement Methodologies

It is here where the project will start to be implemented and work on the project after all the necessary research is conducted and the developer is content with what the final version of the project will be. All of the assets involved with the application will be analysed and then this will form the final project.

1.5.4 Produce Results

The results of the research conduct will be produced and the final idea of what the project will be should be known, and the final implementations, along with the coding of the final project should be done here

1.5.5 Write up Methods, Results, Conclusions, Implications

This is the final stage, and this will include writing up methods used from the research that has been conducted, along with the results and conclusions came to from the research. From this point the coding, along with the deliverables of the software can be met in an effective and thorough way.

1.6 Expected Results

Once all the research has been conducted and the software is correctly implemented, what is expected is a fully functional dynamic web application, where users can register their illness, log in freely, be able to set reminders on exercises, or when they need to take medication, or if they have a doctors appointment. The users should also be able to find out information about their specified illness and view a live RSS social media feed of an organisations relating to their illness. They should also be able to communicate with fellow users on the application, through a messaging/blog type system. The user should also have wide access to a variety of information regarding their illness, such as useful websites, phone numbers, along with information on exercises they can do to help cope with the illness or disorder they may be facing.

1.7 Overview of Report

The contents of this report will show the research that has been conducted into this project, along a system analysis, the implementation and design of the system, the testing phase of the system, an evaluation of the project, along with a self reflection. The report will finish with conclusions drawn from the project and any further work which could be put into the project in the future to improve the application.

2

Literature Review/Research Conducted

2.1 Introduction

People have always had to deal with illness in a variety of ways. But like all things in today's modern society, and throughout history, everything evolves with technology and accessibility to medical care is now more convenient than ever. With the internet evolving in the way it has, along with social media too, it has become easier and easier to access valuable information, be it through research conducted online, or just simply by communicating with people through internet message boards, forums and social media. But with these advancements come negative implications too, a key example of this is being people who self diagnose online. According to Srini Pillay M.D[11] "In this day and age of limited time with doctors coupled with ample opportunity to Google anything, the temptation for people to reach their own conclusions about their illness is strong". He goes on to say how when people self diagnose online they are assuming that they know the subtleties that a diagnosis constitutes. He goes on to list the problems that can come with a self diagnosis. Some of the examples given are; self diagnosis in psychological syndromes, where you miss a medical disease that "masquerades" as a psychiatric syndrome and if a typical user is to miss the subtleties that a diagnosis constitutes, they may also miss the subtleties that come with the treatment of a diagnosis.

The purpose of this research is to show methods of treatments though exercises and therapy as conducted and researched by medical professionals and verified sources of information, this will be included in the final application to help users understand their illness better and be able to treat themselves as best they can through exercise or other methods, leading to no self diagnosis on treatments of their illness being necessary. This is not only beneficial for people with a physical

illness, but also a mental illness.

2.2 Review Of Literature

2.2.1 Lung Cancer Exercise Program

Lung cancer is a very common form of cancer which effects both men and women in Ireland, with over 2300[12] people being diagnosed each year according to the Irish Cancer Society. This is a disease which can often leave people horribly impaired and having trouble doing even simple tasks, mainly due to issues with breathing. The journal which was researched to try and improve this is A Structured Exercise Program for Patients with Advanced Non-Small Cell Lung Cancer[13], with research conducted by Jennifer S. Temel, MD, Joseph A. Greer, PhD, Sarah Goldberg, MD, Paula Downes Vogel, PT, MS, Michael Sullivan, PT MBA, William F. Pirl, MD, Thomas J. Lynch, MD, David C. Christiani, MD and Matthew R. Smith, MD, Phd.

The main research questions proposed by the authors in this paper is what hospital-based exercise program is feasible in dealing with patients who have non-small cell lung cancer. The reasoning behind the research conducted in this paper is what exercise can be proven to improve symptoms for certain cancer populations, but it is unknown whether or not these exercises are feasible within lung cancer. For the methodology technique used to accurately conduct this study, pateitns that were within 12 weeks of diagnosis were eligible to take part in it, while patients who had any type of cardiac disease including congestive heart failure were deemed ineligible. The tests were carried out with a senior physical therapist and vital signs of the patients were monitored/ These tests included a 6 minute walk test, in which the distance a patient could walk within a 6 minute time period, along with a muscle strength exercise which included upper body exercises such as flexing of the shoulders, elbows and extending the elbows too. Lower body exercises were also carried out these included hip extensions, hip abductions and knee extensions. These sessions would be carried out twice every week over the course of two months.

According to the studies conducted in this paper, it was recorded that 25 of the patients who took part in this research, 80% completed the initial evaluation. But overall only 44% of patients completed the exercise program due to progressions of the disease. But those who were able to complete the study in full showed a significant reduction in lung cancer symptoms and had no record of deterioration in the 6 minute walk test and and muscle strength test. Overall the research conducted was a success for the most part. While less than half of the patients who initially signed up for the research were able to complete it in full, which could be argued that this brings into question the full validity of the paper as these results could have potentially altered the final results of the paper as these patients showed the worst symptoms if the disease. But on the other hand it could be argued that the research was successful as the other half of the patients showed no signs of deterioration due to the disease, and actually showed an improvement in lung cancer symptoms. While an argument can be made for both sides that people showed signs of deterioration had no

recognizable improvements to their health, meaning this was a failed study, while the other side could argue that without this study being done, similar deterioration could have took place in the other 44% of patients.

2.2.2 Rheumatoid Arthritis Exercise Methods

Rheumatoid Arthritis is a condition in which the joints in a persons body become inflamed. It is an unpredictable disease as it can occur in any person of any age group. More than 44,000 people in Ireland have this affliction with 70% of them being women[14]. The piece of literature which was researched in how to effectively deal with Rheumatoid Arthritis using exercise methods, is Evidence For the Benefit of Aerobic and Strengthening Exercise in Rheumatoid Arthritis by Christina H. Stenström and Marian A. Minor[15].

The main research question put forward by the authors of this paper are to investigate the evidence regarding the benefits of both aerobic and strengthening exercises in Rheumatoid Arthritis and is there any truth to these benefits? The methodology technique used to accurately conduct this study were randomized controlled trials used to investigate the effects of exercise to improve aerobic capacity and muscle strength in people diagnosed with Rheumatoid Arthritis were searched. The search results produced 208 articles. Of which 30 of these articles reporting on 26 randomised controlled trials remained. These articles were broken down further into 17 papers with 15 randomized controlled trials remaining. It was from these articles where the final results would be determined.

The exercises were performed twice weekly, with a maximum of twice daily in one particular study. Aerobic exercises had an intensity level of being set from moderate to hard, meaning that the patients heart rate varied from 50-85%[16] of the maximum measured heart rate. While the strengthening exercise programs were adjusted, starting with an intensity level of 30-50% and increasing to a maximum of 80%[17]. The studies concluded that in 5 cases there were improvements to aerobic capacity, while in 3 cases there was not, while 8 studies reported muscle function increase after the strengthening exercises, whereas in 6 cases there was not. From the studies conducted there is more than enough evidence to support the theory that aerobic and strengthening exercises benefit those with Rheumatoid Arthritis. As the majority of patents who took part in research did show signs of improvement in both aerobic and muscle function capacities, specifically 62.5% in aerobic and 57.14% in strengthening exercises. A negative of this paper is that most of the research conducted by the author is drawn from other third party sources and not studies done by the authors themselves, meaning they could not validate themselves the questions being asked.

2.2.3 Dealing With Depression

Studies show that many people who suffer with depression don't seek professional help. But why is this the case? The following paper; Belief in Dealing with Depression Alone: Results From Community Surveys of Adolescents and Adults by Anthony F. Jorm, Clair M. Kelly, Annemarie

Wright, Ruth A. Parslow, Meredith G. Harris and Patrick D. McGorr[18] delves into this question on why is their a lack of treatment and why is it better to deal with depression with outside help. The methodology used to conduct this research was a series of surveys sent which were sent out to 3998 Australian adults, with 1001 receiving a vignette of a person with major depression, these vignettes were randomised so respondents would receive a male or a female version. 1115 surveys were sent out to Australian adolescents, with 564 containing a vignette. Questions were also asked regarding the vignette to the respondents of this survey. A second survey was also sent out to adolescents in the Melbourne region of Australia. There were 1207 of these surveys sent out. The respondents to these surveys were asked a series of questions regarding the vignette, such as assessing the particular disorder shown, their beliefs about treatment and whether they felt if it was better to deal with depression alone. From the data collected, responses regarding the question about dealing with depression alone were marked as helpful, harmful and other.

The results obtained from the adult survey indicated that 13.2% believed that it would be easier to deal with depression alone, while 63.4% would believe it to be more harmful. Men believed that it would be more helpful to deal with it alone at 14.8% compared to women at 11.7% and less likely to be harmful at 56.8% compared to 69.6%. Also when asked what was wrong with the individual in the vignette, the group that believed in dealing with depression alone was significantly less likely to correctly recognize depression than the group which thought this would have been more harmful according to the studies done, with the results of these studies standing at 68% for harmful, and 53.6% for helpful. The results obtained from the adolescents survey were similar to the results obtained from the adults survey in regard to the question whether dealing with depression alone was harmful or helpful. In the first adolescent survey, 12.7% of people believed that dealing with depression alone was more helpful, while in the second survey 9.5% of people believed it was more helpful too deal with depression alone. Also similar to the adult survey was that in both adolescent surveys there was a difference between the genders opinions, with males believing that it was better to deal with depression alone at 16.1% compared to females at 9.1% for survey one, and 11.7% compared to 7.7% in survey 2. Males were also less likely to believe that it is harmful with 63.3% compared to females at 70.1% in survey 1, and 55.8% compared to 68.3% in survey 2. When asked what was wrong with the individual in the vignette, the group that believed it was more helpful to deal with depression were less likely to be able to recognize depression. With the results of survey 1 indicating; helpful at 41.4% and harmful at 61.6%, and a similar pattern appearing in survey 2 with helpful at 38.2%, compared to harmful at 47.6%.

Judging from the results of these surveys it indicates that the majority of people do believe that dealing with depression alone does more harm than good. The strong points of these studies is that they got their results from a large group of people, not only different genders, but of different age groups too. This led to a more accurate answer whether or not people believed getting outside help is a better way of dealing with depression therefore answering the question which in which the paper originally set out to answer. One of the weak points of this study is mentioned in the paper itself, which is that the surveys did not ask why did the participants in the survey hold the beliefs that they did in regard to dealing with depression alone, or not alone? So people citing this paper

would not have an indication as to the reason why is dealing with depression alone, or not alone do more harm than good and vice versa.

2.2.4 Exercise Training in Alzheimer's

Alzheimer's disease is a chronic neurodegenerative disease that can cause a decline in a persons mental functions. It is a disease which progressively gets worse over time the older someone who is diagnosed with the disease gets. It can affect a persons memory, thinking, behaviour and language. Nearly 40,000 people in Ireland suffer from Alzheimer's disease[19]. A number of studies have also contributed Alzheimer's to a physical deterioration, reduced muscle mass, resulting in a higher risk of falls and severe injuries[20]. The following journal; Exercise Training is Beneficial for Alzheimer's Patients by E. Santana-Sosa, M. I. Barriopedro, L. M. López-Mojares, M. Pérez, A. Lucia[21] researches into how can resistance exercise and training prevent these problems and lead to increased muscle mass and strength, along with higher endurance and fitness levels in Alzheimer patients, therefore making it easier for people diagnosed with this disease to perform "activities of daily living". To conduct this study; 16 patients were chosen, 10 female and 6 male. They were assigned to either a training or a control group.

A series of tests were done on the patients including a senior fitness test, this test was used to evaluate the functional capacity of the patients testing their muscle dynamic strength for the endurance of their legs. This was accomplished by doing a 30 second chair stand test. The patients upper body was also tested, an arm curl test using 5 pound weights for women and 8 pound weights for men was used to accomplish this. Flexibility of the upper and lower body was also tested using a chair sit-and-reach test and a back scratch test. Also tested were speed, agility, endurance, balance while moving and aerobic endurance, this was done through an 8-foot-up-and-go exercise and a 2-minute-step-test. The intervention included 36 programmed training sessions, each 75 minutes, and done over a period of 12 weeks. Each session started with a 15 minute warm up period and a 15 minute cool down period. Patients assigned to the control group did not perform in any physical activities.

No significant difference was found between either group at the start if the tests. By the end of the twelve weeks a significant difference was found for post intervention values in both chair stand and arm curl tests, whereas no difference was found in the control group. No significant difference was found between either group at the start of the lower and upper body flexibility test, and while no significant difference was found between the groups after the tests, there was a significant time and interaction effect that existed. In the training group for the 8-foot-up-and-go and 2 minute step tests revealed that post intervention values were significantly lower and higher. The final results also showed that post intervention training values were much improved in the training group as opposed to the control group when it came to performing activities of daily living.

Overall it is no surprise that daily exercise can help reduce the effects of muscle deterioration as associated with Alzheimer's disease, and this study did a perfect job showing the effects of

exercise over an extended period of time as shown by the significant improvements to the patients performance of activities of daily living according to the authors. This can lead to reduced injuries of patients with Alzheimer's when it comes to performing mundane tasks around their home, especially if unsupervised. The authors also answered their original question on whether these daily exercises can help Alzheimer patients regain muscle mass, while increasing the endurance and fitness levels, and the studies done proved this.

2.2.5 Type 1 Diabetes Treatments

Type 1 diabetes is a metabolic disorder which tends to occur in childhood or early adult life. In this form of diabetes little insulin is produced, which results in high blood sugar levels and it is required that it is treated with insulin injections. There are an approximate 14-16,000 people in Ireland with type 1 diabetes which accounts for 10-15% of the total diabetes population in Ireland. On top of this it is estimated that 2,750 of these people with this condition are under the age of 16[22]. The following paper; Intensive Diabetes Treatment and Cardiovascular Disease in Patients with Type 1 Diabetes by the Diabetes Control and Complications Trial along with Epidemiology of Diabetes Interventions and Complications (DCCT/EDIC) Study Research Groups ask the question, can intensive therapy aimed at achieving near normal levels of blood sugar reduce the risk of micro-vascular and neurological complications that come with with type 1 diabetes. To see if this was possible 1441 patients ages 13-40 were chosen to take part in this study. These patients were randomly assigned to intensive or conventional therapy. Intensive therapy consisted of three or more daily injections of insulin with dose adjustments based on the patients glucose levels throughout the day. The conventional therapy group did not have to worry about glucose levels and therefor only had to inject two doses of insulin a day.

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Part I

Appendices

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