**CHAPTER II**

**Theoretical Framework and Review of Related Studies**

**2.1 Theoretical / Conceptual Framework**

**INPUT PROCESS OUTPUT**

Knowledge Requirements

* MySQL, React – Express – Node – JS Postgre
* Git
* JavaScript
* SSL Configuration
* Webpack

Software Requirements

* Atom
* Microsoft Visual Studio 2015
* NPM and Node JS
* Linode Ubuntu Server

Hardware Requirements

* RAM 4GB or Higher
* Intel Core i3 or Higher
* Minimum of 250GB of HDD or Higher
* DigitalPersona USB Fingerprint Scanner

Online Patient Portal with Secure Socket Layer, Scheduling and Human Resources Forecasting

Methodology Agile System Development Life Cycle

* Concept
* Inception
* Construction
* Transition
* Production
* Retirement

Development of System

* GitHub
* Stock overflow
* W3schools
* Tutorial Points

Development of System

* System and Database Installation

**FIGURE 2-1 Input-Process-Output**

The Input-Process-Output (IPO) model is a functional model and conceptual schema of a general system. An IPO chart/table identifies program’s inputs, its outputs, and the processing steps required to transform the inputs into the outputs.

**2.2 Review of Related Studies**

**e-therapy.com.au by Silvertrees Web Development**

Review for this Study shows that the “E-treatment” framework enables customers to enlist and select from a scope of various specialists on the web. The E-treatment offers adaptability to the customers, and it permits customers to book a secure online talk session.

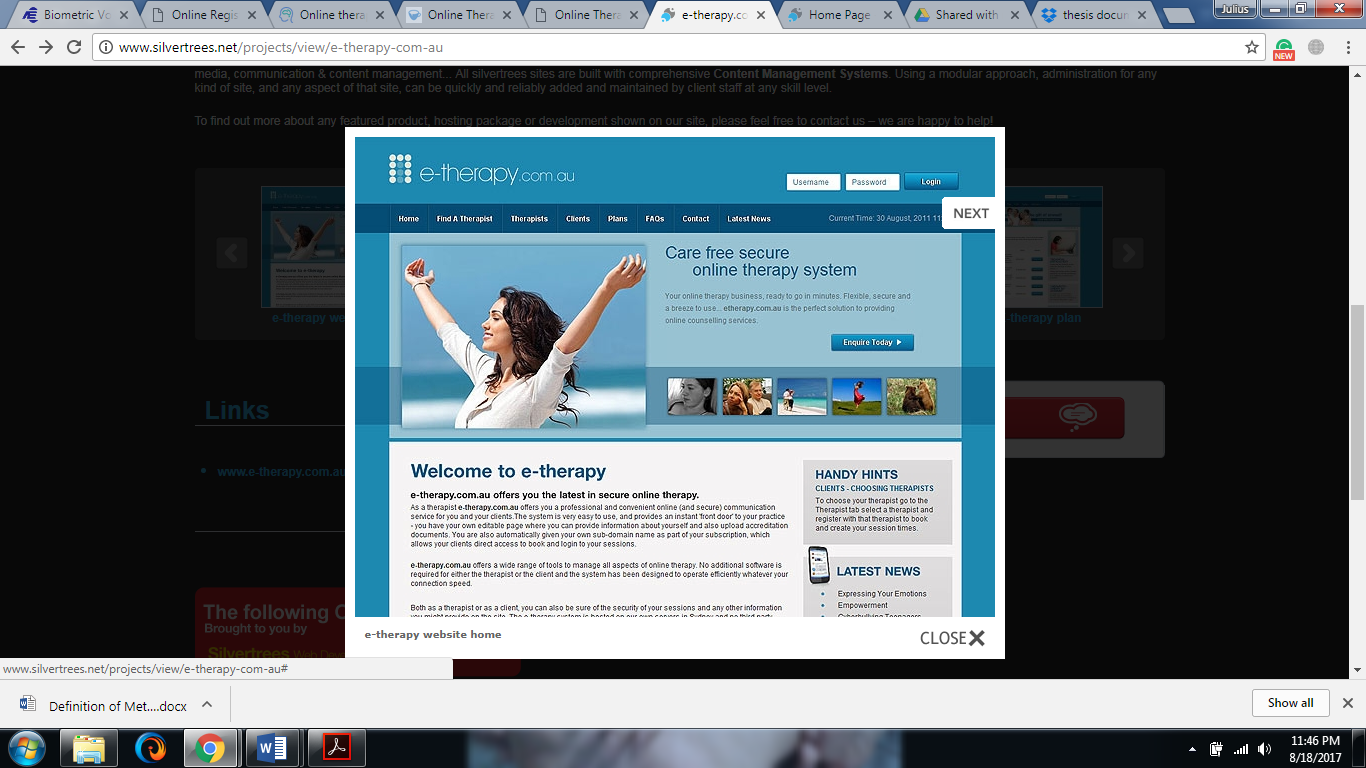


Figure 2-2 e-therapy Home Page

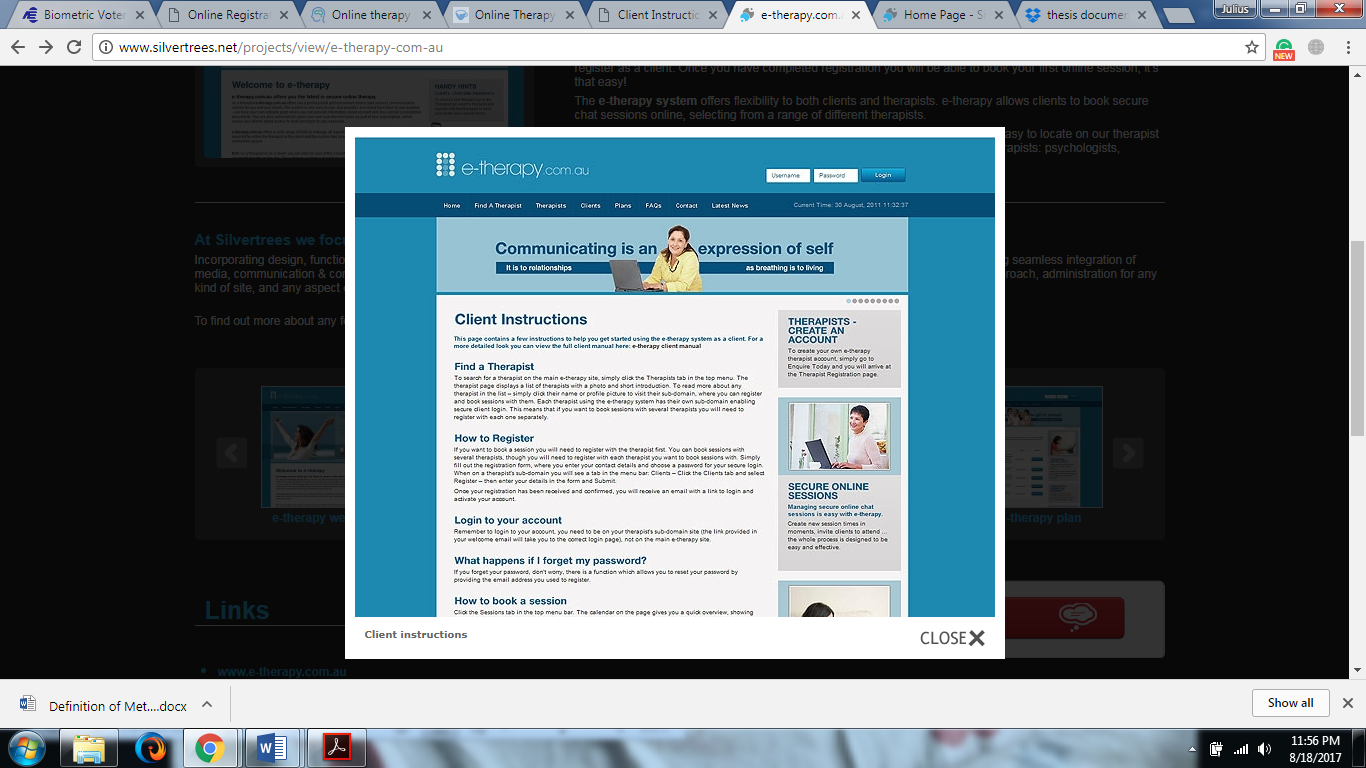


Figure 2-3 Client Instruction Page

The E-therapy system was created to have an easy and convenient online communication service for therapist and the clients. In the Instruction Page, the Client will be told know how to register an account and to Find a Therapist that will in his or her their health condition.

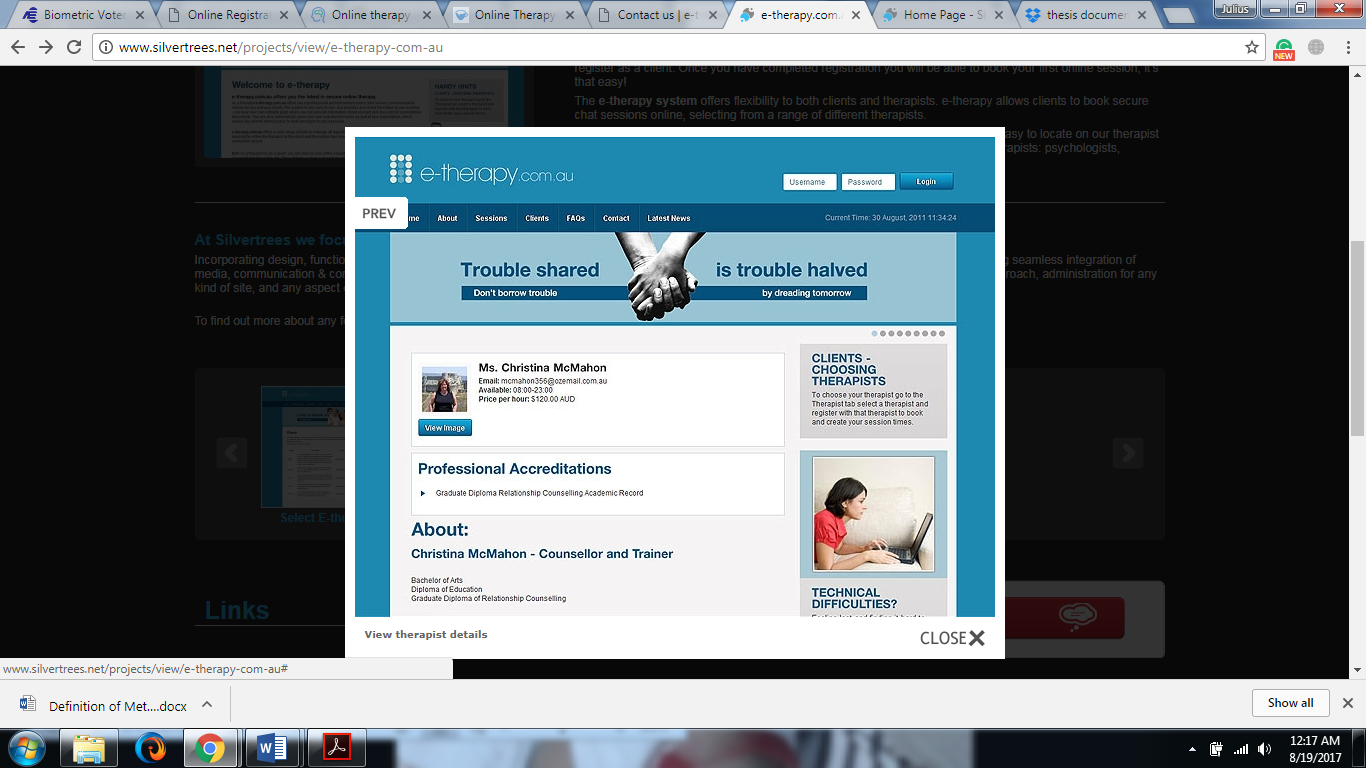


Figure 2-4 Therapist Details Page

In the Therapist Details Page, the client can view information about the Therapist like Personal information, Professional Accreditations, etc. The client can also request and book a session with the Therapist.

**wecounsel.com**

The “wecounsel” system helps to providers to use telemedicine in their practices through an advanced cloud-based communication technology, such as HIPAA-compliant video conferencing, secure messaging, and Instant Chat. Telemedicine also helps mental health providers to widen their reach to patients in a cost-effective manner for a greater continuum of care.

Telemedicine allows health care professionals to evaluate, diagnose and treat patients at a distance using telecommunications technology. The approach has been through a striking evolution in the last decade and it is becoming an increasingly important part of the American healthcare infrastructure. [[CHIR2017](https://chironhealth.com/telemedicine/what-is-telemedicine/)].

HIPAA is the acronym for the Health Insurance Portability and Accountability Act that was passed by USA Congress in 1996. HIPPA provides the ability to transfer and continue health insurance coverage for millions of American workers and their families when they change or lose their jobs. It reduces health care fraud and abuse. In addition, the Act also mandates industry-wide standards for health care information on electronic billing and other processes. Lastly, it requires the protection and confidential handling of protected health information. [[DHCS2017](http://www.dhcs.ca.gov/formsandpubs/laws/hipaa/Pages/1.00WhatisHIPAA.aspx)]

The “wecounsel” system meets these HIPAA requirements and is used by health clinics as a supplement to the clinic’s in-person services and for clients who struggle to make it to the center regularly. It is also used by Specialty Service Providers like InSight and MedOptions. InSight is a leading behavioral telemedicine services company. It conducts the nation’s highest number of virtual psychiatry sessions. MedOptions is the United States of America’s leading provider of behavioral health services to skilled nursing and assisted living facilities.

The system also has security features such as Password Management Systems and Session Time-Out to protect the important information of the users. It also employs 256-bit AES encryption and passwords that are stored and transmitted must be in protected (e.g. encrypted or hashed) form.

**yellowschedule.com**

Based on the review of the system, “yellowshcedule” is was being used as an online appointment scheduler for a therapist and his or her clients. The system enables fast and secure online scheduling of appointments by allowing the clients to book their own appointments anytime they want through online and it uses SHA-256 to encrypt the client’s data.

The systems also used SMS & Email reminder that automatically reminds clients about their scheduled appointment. It also has a response gathering that allowing the Therapist and their clients to see at a glance who has confirmed and who has canceled an appointment. This eliminates guesswork and enables the Therapists to rebook vacant appointment slots.

The appointment-scheduling process, historically viewed as a necessary burden in medical offices, healthcare facilities and wellness centers can be completely automated through an efficient online scheduling software program. The benefits of implementing this technology touch everyone involved in the scheduling process, as administrators and staff can conduct their tasks more efficiently and accurately, while customers and clients have the ability to book their appointments and reservations quickly and more conveniently [[APPO2012](https://www.appointment-plus.com/images/pdf/online-appointment-scheduling-benefits-to-medical-healthcare-wellness.pdf)].

**appointmentreminder.org**

Based on the study, proponents learned that the “appointment-reminder” system is an online scheduling appointment and reminder system that is being used by personal services and professional services industries like law firms, auto repair business, healthcare, etc. It uses Short Messaging Service (SMS) and Email notification to automatically remind their clients for their scheduled appointments. The system increase revenue by saving appointments by means of giving clients reminders shortly in advance of their appointment, thereby decreasing no-shows and, when a cancellation is unavoidable, giving the therapist enough time to book an appointment with a different customer for the freed time.

In today's competitive world, differentiation is a significant factor in the success of the service provider. Once the basic services, such as voice telephony, are deployed, SMS provides a powerful vehicle for service differentiation. If the market allows for it, SMS can also represent an additional source of revenue for the service provider. The benefits of SMS to subscribers’ center around convenience, flexibility, and seamless integration of messaging services and data access. From this perspective, the primary benefit is the ability to use the handset as an extension of the computer. SMS also eliminates the need for separate devices for messaging because services can be integrated into a single wireless device- the mobile terminal. These benefits normally depend on the applications that the service provider offers. [[EDUC2017](http://educypedia.karadimov.info/library/SMS.pdf)]

**Biometrics and Healthcare**

Rawlson O`Neil King Lead Researcher, Biometrics Research Group, Inc. has come out with a new idea for integration of biometrics in to the Healthcare Industry, using Biometrics as a validation for staffs and patients to avoid from health care fraud and improve patient privacy and health care safety.

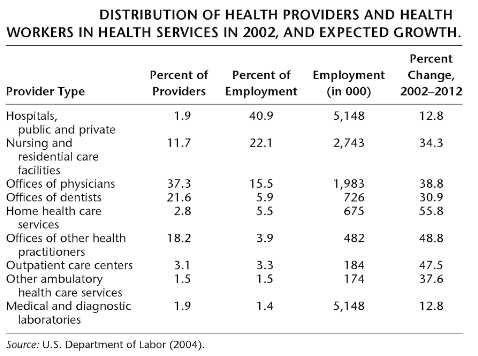
This provides ideas to the proponents by showing that Biometrics can be used as a primary way of security authentication instead of passwords, tokens, cards, and PINs. It can be also make for improved workflow by using fingerprint biometric authentication. Research for the Study showed that password resets and managing token, card and PIN programs include subtle hidden and recurring costs, which in time, become significant. They also bear intrinsic risk factors such as the ability to be lost, stolen or shared; unlike any biometric solution.

Since inefficiency and fraud are overriding administrative concerns for health care systems, especially in the United States, increased investment in health care security protocols that involve biometrics can be expected. Adoption of “health care biometrics” will mainly take place in hospitals, clinics, and other facilities. In terms of workflow, these tools will protect health care resources and medical data. Concerning patients, biometric systems will be used for patient identification. While small-scale implementations will be used initially in the United States, it is to be expected that large-scale patient identification systems will be rolled out in emerging and developing countries [[RAWL2015](http://www.biometricupdate.com/wp-content/uploads/2015/02/Biometrics-in-Healthcare.pdf)].

**Quantitative Methods in Health Care Management**

The improvement of the system management and processes that provide health care must rely on quantitative tools, specific methods that can help managers analyze, design and implement organizational changes to achieve efficiency as well as high quality of care (effectiveness) for the patient.

According to the U.S Department of Labor statistics shown in the table below, growth in health care management positions is projected to be slightly higher than in all heath care occupations. The changes in the health care industry will continue and will affect the delivery of health services in terms of cost and efficiency as well as the quality of care [[YASA2005]](https://books.google.com.ph/books?hl=en&lr=&id=zPeCLkDcIlAC&oi=fnd&pg=PR3&dq=health+care+forecasting+analysis+monthly&ots=NVl-EWL3op&sig=8Q5Og0M4p2l2RNXJqz1_MDr3XZc&redir_esc=y#v=onepage&q&f=false).



**Demand Planning and Forecasting**

Base on the research, planning according to demand would reduce the wasted and unused provider resources and the opportunity cost of patient’s time. Using demand analysis does not mean that medical need is disregarded. Instead, additional demand factors, as well as need, are used to estimate utilization. Once demand has been forecast (by type of facilities, health manpower, etc.), it can be decided, based on value judgements, whether supply should be increased or decreased. Shortages of facilities and manpower are costly because they waste a patient’s time that could have been spent in a more productive manner [[PAUL2012].](https://books.google.com.ph/books?hl=en&lr=&id=-XEJAAAAQBAJ&oi=fnd&pg=PT7&dq=forecasting+in+health+care+using+quantity&ots=u9PQPRg7Bc&sig=P5Ep4eGm9-h-oXXrsaHoxbfKxJo&redir_esc=y#v=onepage&q=forecasting%20in%20health%20care%20using%20quantity&f=false)

**2.3 Operational Definition of Terms**

For a better understanding of the research, some terminologies and words that are used in relation to medical and engineering application are arranged alphabetically.

* **BitBucket -** is a term used to describe a logical space where lost, deleted or unrecoverable data goes
* **BIOMETRIC** – Biometrics refers to technologies used to detect and recognize human physical characteristics. In the IT world, biometrics is often synonymous with "biometric authentication," a type of security authorization based on biometric input [[TECH2017].](https://techterms.com/definition/biometrics)
* **Database** - is a collection of information that is organized so that it can be easily accessed, managed and updated (as by a computer).
* **Domain -** in the context of networking, refers to any group of users, workstations, devices, printers, computers and database servers that share different types of data via network resources.
* **Hosting** - storing (a website or other data) on a server or other computer so that it can be accessed over the Internet.
* **Knex.JS** - is a "batteries included" SQL query builder for **Postgres, MSSQL, MySQL, MariaDB, SQLite3** and **Oracle** designed to be flexible, portable, and fun to use.
* **ORM** - or Object-relational mapping is a mechanism that makes it possible to address, access and manipulate [object](http://searchsoa.techtarget.com/definition/object)s without having to consider how those objects relate to their data sources.
* **React** - sometimes styled React.js or ReactJS, is an [open-source](https://en.wikipedia.org/wiki/Open-source_software) (with caveats) [JavaScript library](https://en.wikipedia.org/wiki/JavaScript_library)for building [user interfaces](https://en.wikipedia.org/wiki/User_interfaces).
* **Repository**- is a central place in which an aggregation of [data](http://searchdatamanagement.techtarget.com/definition/data) is kept and maintained in an organized way, usually in computer storage.
* **REST API** - also referred to as a RESTful web service -- is based on representational state transfer ([REST](http://searchsoa.techtarget.com/definition/REST)) technology, an architectural style, and approach to communications often used in [web services](http://searchsoa.techtarget.com/definition/Web-services) development.
* **Schema** - is the skeleton structure that represents the logical view of the entire database. It defines how the data is organized and how the relations among them are associated. It formulates all the constraints that are to be applied to the data.
* **SSL Certificates** – Secure Sockets Layer certificate is a digital certificate that authenticates the identity of a website and encrypts information sent to the server using SSL technology.
* **SMS** – Stands for short message service It's a way to send short, text-only messages from one phone to another. These messages are usually sent over a cellular data network [[SAMC2017]](https://www.lifewire.com/what-is-sms-mms-iphone-2000247).
* **Webpack** - is an [open-source](https://en.wikipedia.org/wiki/Open-source) [JavaScript](https://en.wikipedia.org/wiki/JavaScript) module bundler. Webpack takes modules with dependencies and generates static assets representing those modules. It takes the dependencies and generates a dependency graph allowing web developers to use a modular approach for their web application development purposes.