

HEALTH TECHNOS PRIVATE LIMITED (HTPL)

INTELLIGENT HEALTH MONITORING SYSTEM

(IHMS)

IDENTIFICATION OF CRITERIA FOR ASSESSING  
RISK FACTORS IN DIABETES AND HYPERTENSION

BENZAKHIR FAIZAL SYED ABDUL

Dissertation submitted as partial fulfilment of the  
requirements for the degree of Master of Science  
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**Student's Declaration**

Name: BENZAKHIR FAIZAL SYED ABDUL

Matric No: PCOM0027/08

School: SCHOOL OF COMPUTER SCIENCES


Thesis Title: INTELLIGENT HEALTH MONITORING SYSTEM: IDENTIFICATION OF CRITERIA FOR ASSESSING RISK FACTORS IN DIABETES AND HYPERTENSION

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Students Signature:  .....

Date: 9/6/09 .....

Acknowledgement of receipt by:  .....

Date: 22<sup>nd</sup> June 2009

**MOHD REDZUAN ASMI**  
Penolong Pendaftar  
Pusat Pengajian Sains Komputer  
Universiti Sains Malaysia  
11800 Pulau Pinang, Malaysia

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## ABSTRAK

Kadar morbiditi dan mortaliti akibat penyakit-penyakit gaya hidup seperti diabetes dan darah tinggi telah meningkat dan ini membawa kepada fokus terhadap kepentingan pengurusan kesihatan. Dengan adanya peralatan elektronik untuk mengawasi pelbagai aspek kesihatan, tidak mustahil untuk kita menyediakan satu kaedah termaju dalam mengawasi dan menguruskan kesihatan. Masalah kesihatan akibat penyakit gaya hidup ini bukan sahaja mempengaruhi individu-individu berkenaan tetapi juga golongan yang bergantung pada mereka termasuklah organisasi mereka. Melihat perkara ini sebagai satu peluang perniagaan berdaya maju, satu sistem dikenali sebagai Intelligent Health Monitoring System (IHMS) iaitu sistem pengawasan berdasarkan internet, telah dikembangkan oleh sebuah syarikat iaitu Health Technos Private Limited (HTPL).

Sistem ini mengukur nilai gula dalam darah dan tekanan darah pekerja-pekerja di organisasi. Ia berfungsi dengan mengira faktor-faktor risiko dan menyerahkan segera nilai-nilai tersebut kepada pegawai perubatan untuk rujukan beliau.

Satu kajian telah dilakukan bagi membolehkan sistem ini mengkategorikan pesakit kepada pelbagai kumpulan risiko berdasarkan keadaan perubatan terkini. Kajian ini dilakukan ke atas pakar-pakar perubatan menggunakan kaedah Delphi. Kesemua peserta kajian ini terdiri daripada pakar-pakar Perubatan Am, Kardiologi, Endokrinologi dan Diabetes. Daripada kajian ini, panduan pengelasan diperolehi di samping panduan ramalan risiko mendapat penyakit-penyakit tersebut dengan

mengubah suai skor risiko sedia ada. Skor ini telah diubah suai untuk meramal penyakit seawal mungkin pada masa kini.

IHMS akan dijual kepada organisasi untuk kegunaan para pekerja pada harga RM 30 per pekerja per tahun. HTPL akan memulakan operasinya di Pulau Pinang dan mengembangkan sayapnya ke seluruh Malaysia dan kemudiannya ke Asia. 'An Expense to cut your Expense' akan menjadi kata tanda yang digunakan untuk mempromosikan IHMS.



## **ABSTRACT**

The morbidity and mortality rates due to lifestyle diseases such as diabetes and hypertension are increasing, which has led to focus on the importance of health management. With the availability of electronic instruments to monitor various aspect of health, it is possible to provide an advanced method of health monitoring and health management. The health problems due to lifestyle diseases not only affect the individual but also those who depend on them, this includes their organizations. Seeing this as a viable business opportunity, a system called as Intelligent Health Monitoring System (IHMS) which is an internet-based monitoring system is being developed by a company called as Health Technos Private Limited (HTPL).

The system measure blood sugar and blood pressure values for employees in organizations, processes these values by calculating the risk factors and transfers the values immediately to a medical officer for his reference.

In order for the system to categorize patients into various risk groups based upon their current medical condition, a study was conducted. The study was performed on medical experts by a Delphi method. All the participants for this study were medical experts who were specialists in General Medicine, Cardiology, Endocrinology and Diabeteologist. From the study, the guidelines for classification were obtained and also guidelines for prediction the risk of getting lifestyles diseases by modifying existing risk

scores. The risk score have been modified to predict the disease as early as possible in the current time.

IHMS will be sold to the organizations for the use of their employees at a price of RM 30 per employee per year. HTPL will start in Penang, and expand throughout Malaysia and then to Asia. 'An Expense to cut your Expense' will be the tag line used for promoting the IHMS.

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## **SECTION 1.0**

### **EXECUTIVE SUMMARY**

#### **1.1 Company Background**

Health Technos Private Limited also known as HTPL which was formed by a group of students pursuing Masters degree in Information Technology Technopreneurship at Universiti Sains Malaysia. The team has an ambition to provide the best electronic based health services to the people.

It all started when Mr. Benzakhir Faizal (founder of HTPL) was reading about the increase in lifestyle diseases in recent times. Then he decided to provide a product which will be able to reduce the morbidity and mortality due to these lifestyle diseases. He then pitched his idea to Dr. Jayabalan (an Occupational Safety and Health Officer), who encouraged him to develop the product. Dr. Jayabalan also suggested on focusing the product towards occupational safety.

#### **1.2 Mission**

Providing Health Technologies for ensuring a healthy future.

#### **1.3 Users Pains**

Employee sickness affects the organization (Success Performance Solutions, 2009). The employee may suddenly absent himself or may not contribute to his full

potential in the work assigned to him. The companies also pay for the medical expenses of its employees. Hence, the companies lose money directly and indirectly because of the employee health conditions. HTPL will harness this niche and provide its product the Intelligent Health Monitoring System also known as IHMS.

## **1.4 Product and Services**

IHMS is a product which would monitor the employees' health for lifestyle diseases such as diabetes and hypertension and then transfer the values to the medical officer automatically. IHMS will be offered to the various industries in Malaysia.

### **1.4.1 Research and Development**

IHMS monitors and transfers the values to the medical officer. However, it does not classify the patient into different groups based on their medical condition. Hence Mr. Benzakhir Faizal did a study among medical experts to find the guidelines for classification of patients into various risk groups such as diabetic, hypertensive, pre-diabetic and pre-hypertensive, which can be used for patient classification in IHMS.

## **1.5 Market Place**

Currently there are a number of providers who provide e-health systems like One Touch and Life Clinic which offer diabetes and hypertension monitoring. However, they do not link the values with the respective Body Mass Index (BMI) nor do they transfer the values to the medical officer. These above mentioned companies also do not focus

its product towards occupational safety. Apart from the above, there are several companies which offer web based monitoring services, however they are focused on heart ailments.

HTPL will approach the organization, and explain the benefits the organizations can gain by the use of IHMS. This will interest the organizations to use the IHMS service, which will lead to future success for HTPL.

### **1.5.1 Market Research**

The success of any product depends on the acceptance of the product by the consumers. As IHMS is an e-health system which replaces the traditional monitoring system, it is important to find the acceptance of IHMS. Hence, Ms. Manimegala did a study to find the acceptance of e-health products in Malaysia. The results showed that the IHMS will be accepted in Malaysia.

### **1.6 Management Team**

HTPL currently consists of two key personnel to start the business. However, to run the various operations successfully they will need to hire four more employees, a software engineer, a database administrator, sales executive and an accounting officer. The organization will be managed by Mr. Benzakhir Faizal Syed Abdul and Ms. Manimegala Elavarasen. Mr. Benzakhir Faizal, an electronics engineer with experience in operating a business in India holds the positions of Managing Director, Marketing Director and Finance Director. Ms. Manimegala, a computer graduate with good

programming and computer knowledge leads the technical team as the Technical Director and also holds the position of Executive Director.

## **1.7 Financing**

HTPL expects to acquire the MDeC pre-seed fund of RM 150,000 to begin its operation. Initially, it will spend RM 10,000 for design of the prototype of IHMS. It will then spend RM 5000 annually for advancement of IHMS. HTPL predicts a gradual increase in its sales from the first year of its launch. The financial status of HTPL is healthy, as it does not require external funding after securing the MDeC pre-seed fund.



## **SECTION 2.0**

### **INTRODUCTION TO THE COMPANY**

#### **2.1 Company Background**

Health Technos Private Limited also known as HTPL was formed by students pursuing M.Sc IT Technopreneurship in Univerisiti Sains Malaysia. It was formed to tackle the health issues which are arising now. HTPL will offer its services to various corporations which have staff strength of over hundred and also offer medical benefits to these employees. HTPL maintains a database with the employees' blood sugar and blood pressure. These values will be transferred to the medical officers for their reference and also to offer the appropriate treatment before any problem arises. The monitoring equipment needed for recording the blood pressure and sugar values will be setup in the various departments in the organization and this will enable the doctors to read the medical condition of the employees from the convenience of their clinic. The idea for the product came from Mr. Benzakhir Faizal, one of the founders of HTPL. HTPL is yet to officially register itself as a company.

#### **2.2 Business Intent**

HTPL is developing a system which may aid the world labor force, by enhancing the current method of health monitoring with the aid of information technology. The current competitive environment has caused the people to go for faster and unhealthy meals such as fast foods. This, combined with lack of physical activities and causes of

stress leads to various lifestyle diseases like Diabetes Mellitus also known as Diabetes and Hypertension. These two diseases alone can act as a cause for more severe complications impairing an individual's life. HTPL system will monitor heart rate, blood glucose level and blood pressure level and associate the measured values with the Body Mass Index (BMI) of the respective individual on a periodic basis.

There is proof that this method is cost effective, as most of the adverse cases which require severe medical treatments can be detected at the earliest and immediate attention can be given. HTPL will be targeted to the corporate sector, which pays the medical expenses as a part of the employee's benefits. Once a critical condition is identified, the medical officer can intervene and provide the needed treatment to ensure the health condition of the respective individual. The system will result in reduction of the morbidity and mortality rates among its users.

In addition, more features will be added to the current IHMS system, to help the current population to tackle the problems due to health. Subsequently more products will be developed to deal with the problems due to other diseases. HTPL also plans to offer its services directly to consumers in the future.

### **2.3 Growth Strategies**

In order for a company to develop into a successful entity, it is essential to choose the correct strategy which will guide the company towards achieving its goals. HTPL employed the following strategy to achieve its targets.

### **2.3.1 Financial Strategy**

HTPL plans to apply and receive funding from the MDec and Cradle pre-seed fund for initiation. Subsequently, it plans to secure additional funding from a venture capitalist. HTPL also plans to get itself listed in the Software Consortium of Penang (SCoPe), an alliance of Penang-based software companies.

As a startup venture, HTPL plans to begin its operations in the USM incubator (Kompleks Eureka, a Multimedia Super Corridor Incubator) in order to reduce costs. The product offered by HTPL will consist of different health monitoring instruments manufactured by outside companies and hence no manufacturing is required.

Initially, all the operations in the company will be managed by the directors. This is done to reduce the operating costs of the company, and to achieve a good profit margin.

As a startup entity, the company will not give dividends in the first three years of operation and will use its profits for research and development.

### **2.3.2 Strategy to Increase Market Presence**

The product will be certified by Dr. Jayabalan, an Occupational Safety Officer, who is also a member of National Institute of Occupational Safety and Health. It will also be certified by Dr. Joy Thomas and Dr. Chenniappan, leading cardiologists, both of whom have been awarded fellowships by the American Cardiologist Association. The directors will initially visit the medical and safety officers from different organizations to explain the benefits of this system.

## **2.4 Target Markets**

The product offered by IHMS is an automated remote health monitoring system which can be used by any individual with or without a medical complication, but it would be focused towards occupational safety as this is an arising concern now. Moreover, it is possible to generate higher revenue by concentrating towards industries rather than offering the service to individuals as an industry may purchase the system for all its employees. This system will assist the occupational safety officers and occupational medical officers by creating a database for glucose levels and blood pressure levels. The total workforce in Malaysia as of the year 2007 is 10.89 million (U.S. Department of State, 2008); hence the target segment has strength of 10.89 million employees. After succeeding in the above mentioned segment, HTPL will extend its operations to other countries in the Asia Pacific region and expand its service to direct consumer usage.

## **2.5 Revenue Model**

HTPL generates its revenue by sale of its services to various organizations. It would charge the organization on the basis of the number of employees it monitors.

HTPL would be able to generate enough funds in the first year to cover its total expenses. HTPL will retain its profit totally for the first three years. This will be done because additional funding will be required for entering new markets and also expanding its product range.

**Charges:** RM 30 per employee per year.

**Table 2.1: Revenue model for HTPL**

|                                 | <b>Year 1</b>   | <b>Year 2</b>    | <b>Year 3</b>    |
|---------------------------------|-----------------|------------------|------------------|
| <b>Sales per Year</b>           | RM 300000       | RM 600000        | RM 1200000       |
| <b>Total Cost per Year</b>      | RM 193700       | RM 199100        | RM 217100        |
| <b>Profit/Loss per Year</b>     | <b>RM 73896</b> | <b>RM 207242</b> | <b>RM 631581</b> |
| <b>Retained Profit per Year</b> | RM 73896        | RM 207242        | RM 631581        |

## **2.6 Operational Setup**

HTPL does not have any manufacturing unit. HTPL would begin its initial operations in the Kompleks Eureka business incubator, located in Universiti Sains Malaysia. After the third year, HTPL will relocate its office to a private business complex. HTPL will lease a web server for its web based operations. After the third year HTPL also has plans to setup offices in other Asian countries, as this will be required to establish the product in that market.

### **2.6.1 Customer Support**

HTPL offers the after sales support to the customers via mail, telephonic conversation and on-site visit depending upon the need. The mail-based service will be available around the clock. The telephonic conversation will be available during office hours. The on-site visit needs to be scheduled 24 hours in advance.

## **2.6.2 Distribution**

The sale of the product can be done online. However, a technical person from HTPL will visit the organization in order to do the initial setup. During the setup for the first customer the Managing Director and Technical Director will visit the organization to ensure the system is setup correctly, to ensure proper functioning of the system. This is done as the management is aware of the importance of getting customers immediately after beginning operations.

## **2.7 Long Term Goals of company**

HTPL aims to be one the leading company to offer electronic based health services in Malaysia. After it expands its operations to various countries in Asia Pacific, it also aims to become one of the leading companies to offer electronic based health services in the Asia Pacific region. HTPL targets to reach a sales figure of 10,000 employees by the 1<sup>st</sup> year and also increase its annual sales by another 10,000 in the following year. HTPL also plans to add new features to its current IHMS system. It also plans to develop other electronic-based health products. In the third year, HTPL predicts an increase in its sales by 20,000.

## **2.8 Market & Competitors Information**

There are some products such as One Touch and Life Clinic both of which offer diabetes monitoring and hypertension monitoring by use of software. One Touch (Life Scan, 2009) offers diabetes management software which records the glucose levels,

prepare reports and also trend pattern for the glucose level. Though it records the blood pressure values, it does not prepare a report with the blood pressure values.

Life Clinic (Life Clinic, 2009) offers similar software which record hypertension and diabetes, and prepares a report with these values. The above mentioned softwares are useful for individuals who have diabetes and hypertension but it will not serve as a tool for prevention of these diseases.

Another product by Card Guard monitors hypertension and diabetes conditions, but it is a system for prediction of emergencies in households and is mainly used by aged people (Card Guard, 2009).

A system which was developed in Temple university medical center offers more features when compared with those offered by IHMS (Bove, 2008), but the user has to manually enter the data to the system which will make it a difficult system to operate for people with minimal computer knowledge.

All the above systems can be considered as the direct competitors for IHMS. The direct competitors have offered their products for household use unlike IHMS which has been offered for occupational safety.

**Table 2.2: Comparison of IHMS with its competitors**

| <b>Features</b>  | <b>OneTouch</b> | <b>LifeClinic</b> | <b>CardGuard</b> | <b>System by Temple University</b> | <b>IHMS</b> |
|--|-----------------|-------------------|------------------|------------------------------------|-------------|
| <b>Diabetes</b>  | YES             | YES               | YES              | YES                                | <b>YES</b>  |
| <b>Hypertension</b>  | YES             | YES               | YES              | YES                                | <b>YES</b>  |
| <b>Association with BMI</b>                                    | NO              | NO                | NO               | YES                                | <b>YES</b>  |
| <b>Connect with Medical Officer</b>                            | NO              | NO                | YES              | YES                                | <b>YES</b>  |
| <b>Automatically collect data from bio-medical instruments</b> | YES             | YES               | YES              | NO                                 | <b>YES</b>  |

Apart from the above mentioned products, there is a number of other internet based or remote health monitoring products that can only be operated by medical officers like Afhcan Telemedicine Cart (Afhcan Telehealth Solutions, 2009) and ViterionNet TeleHealthCare Network (Viterion TeleHealthcare, 2009). Medtronic is also developing an internet based medical device monitoring system which uses telephone connection to transfer the medical data, but currently it only has a heart monitor to assess the condition of the heart (Medtronic Incorporation, 2003). Another health monitoring system called the Sapphire patient monitoring system is in its testing phase. This system transfers the data to doctors, but unlike IHMS it also provide suggestions to doctors based on the patient's medical history (EHealthNews, 2007; METU - Software Research and Development Center, 2008). Another similar system has been developed by Columbia University for monitoring the heart, but this system uses Bluetooth heart



monitors and transfers the readings to the medical officers (Schulzrinne, 2003). None of the competitors of IHMS offer the exact service offered by IHMS.

## 2.9 SWOT

### **Strength (Internal) :**

- Having a complimentary skilled management team gives HTPL a strong inspiration to compete and conquer the new market.
- The product is a first of its kind as it focuses on occupational safety.
- It can be used by any individual with or without any medical complication

### **Weakness (Internal) :**

- Though HTPL deals with internet-based medical services; it does not have a medical officer in its internal management team.
- One member of HTPL has experience in managing a business; however he is not aware of the business procedures in Malaysia.

### **Opportunities (External) :**

- HTPL is focusing on an arising problem.
- HTPL is focusing on only one group of customers, this gives them the ability to experiment the product and develop a competent product.

### **Threats (External) :**

- HTPL uses health monitoring equipments which are manufactured by other manufacturers for its system. Hence it will be easy for competitors to create a similar system.

- If the employees, who need to get themselves measured, do not show interest towards using the product, the product may not be effective for them.

## **2.10 Methods to Overcome Threats**

- The competitors will try to replicate the system offered by HTPL. HTPL will provide regular advancements to our existing system and it will also add new features like lipid profile monitoring, renal function monitoring and dietary monitoring. These regular advancements will provide HTPL with a competitive edge over its competitors.
- HTPL will educate the employees about the use and the benefits the employees can achieve by the use of IHMS. This will improve the employee participation towards use of IHMS. The organizations which subscribe to this service should also enforce a condition that the employees should use the service for medical benefits.

## **SECTION 3.0**

### **EMPLOYMENT OF KNOWLEDGE WORKERS**

#### **3.1 Introduction**

Knowledge workers are needed for any industry, it is even more essential for industries which are based on the latest trends and technologies. HTPL being a startup venture needs a team of knowledge workers to drive the company towards success. However, it does not require many workers in the beginning because there is no manufacturing.

#### **3.2 Management Team**

Management team consists of:

- Mr. Benzakhir Faizal Syed Abdul, the Managing Director cum Marketing Director cum Finance Director and founder of HTPL. He is 23 years old, Indian and has secured his Bachelors in Engineering in Electronics and Communication Engineering, from Anna University, Chennai, India. He started his career as a part-time Industrial Engineer in Maschmeijer Aromatics India Limited, Chennai, India, a company owned by his family, in the year 2004. After graduation, he became a full time employee of the company and was promoted to a Technical Support Executive. He was responsible for meeting the customers to get their requirements for the products and also make sure the final products meets their requirements. As the company was owned by his family, he has also learnt the administration of the company. He is currently pursuing his post

graduate studies in IT Technopreneurship in USM. As the Managing Director of HTPL, he is in charge of the overall administration of the HTPL. He holds the highest rank among the board of directors.

- Ms. Manimegala Elavarasen, the Executive Director cum Technical Director and co-founder of HTPL. She is 23 years old, Malaysian and has secured her Bachelors in Computer Science, from USM, Penang. She has worked as a trainee in Solectron Technology Sdn. Bhd for a period of 5 months. There she learnt to program and test Printed Circuit Boards (PCB). She is well versed in C++ and Java programming. She is also well versed in Oracle and ASP. She is currently pursuing her post graduate studies in IT Technopreneurship in USM. As the Executive Director of HTPL, she has been assigned special powers in the management and administration of the company. In the absence of the managing director she has the right to exercise the powers of the managing director.

#### Advisors:

- Dr. Cheah Yu-N, Technical Advisor, lecturer from School of Computer Sciences, USM.
- Dr. Vincent Khoo Kay Teong, Entrepreneurship Advisor, lecturer from School of Computer Sciences, USM.
- Dr. Jayabalan Thambyappa, Medical Advisor, a medical doctor with specialization in Occupational Safety and Health Management.
- Mr. Mohamed Shareef, Business and Finance advisor, a Certified Cost Accountant.

### 3.3 Organizational Chart

The structure of Health Technos Private Limited can be shown as follows:

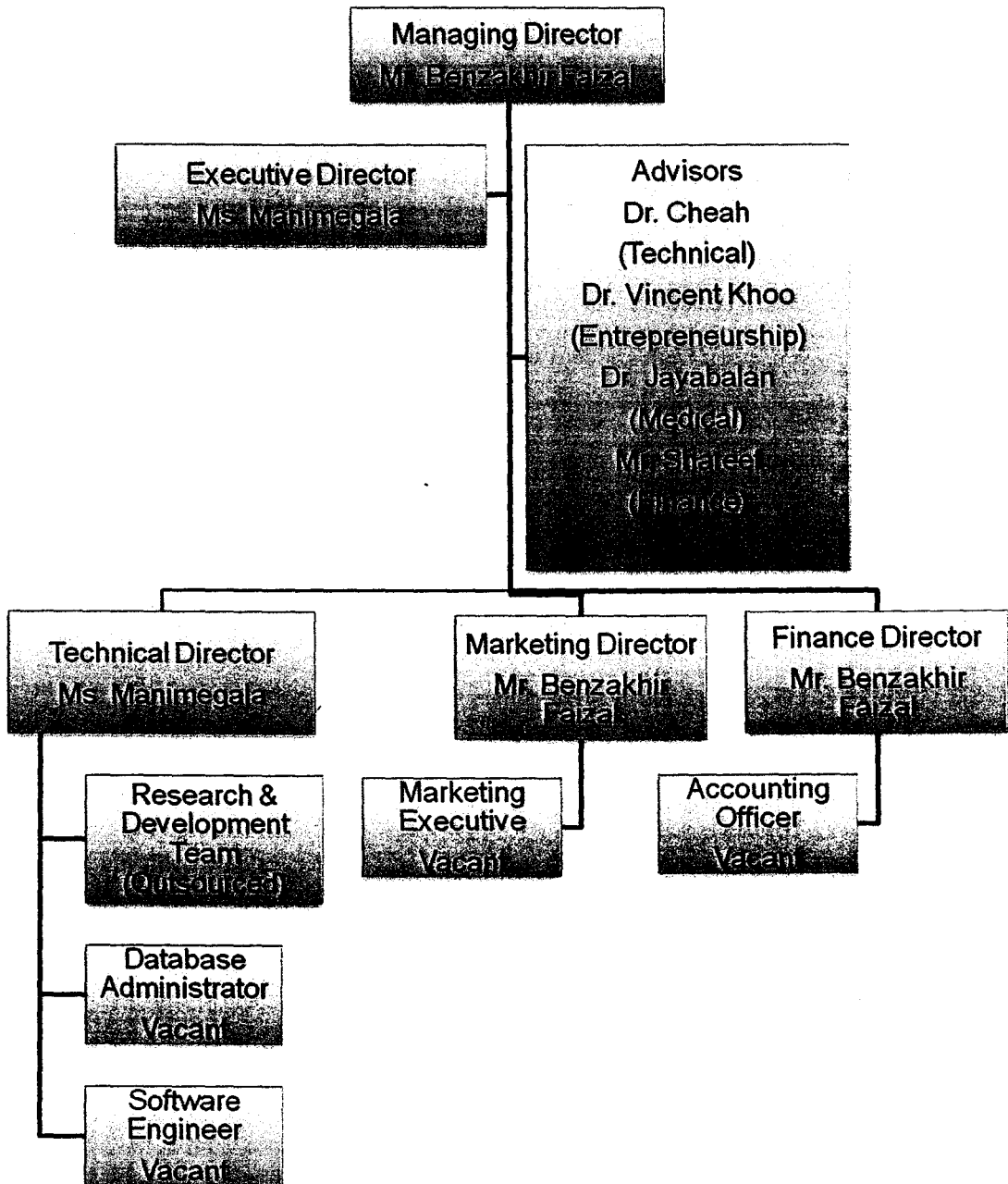


Figure 3.1: Organization Chart of HTPL

### 3.4 Human Resource Plan

HTPL consist of six key staff members during initial startup. In order to reduce operating expenses, the directors will share more than one responsibility. During the first three years of operation, the staff will draw the same salary. The human resources structure for the first three years is as follows.

**Table 3.1: Human resources plan of IHMS**

| <b>Position/Role</b>                             | <b>2010</b> | <b>2011</b> | <b>2012</b> |
|--|-------------|-------------|-------------|
| <b><u>Administration</u></b>                     |             |             |             |
| Managing Director                                | 1           | 1           | 1           |
| Executive Director                               | 1           | 1           | 1           |
| Advisors*  | 4           | 4           | 4           |
| <b><u>Technical Division</u></b>                 |             |             |             |
| Director**                                       | 1           | 1           | 1           |
| Software Engineer                                | 1           | 1           | 1           |
| Database Administrator                           | 1           | 1           | 1           |
| <b><u>Marketing Division</u></b>                 |             |             |             |
| Director**                                       | 1           | 1           | 1           |
| Marketing Executive                              | 1           | 1           | 1           |
| <b><u>Finance Division</u></b>                   |             |             |             |
| Director**                                       | 1           | 1           | 1           |
| Accounting Officer                               | 1           | 1           | 1           |
| <b>Total Number of Workers</b>                   | 10          | 10          | 10          |
| <b>Total Number of Knowledge Workers</b>         | 10          | 10          | 10          |
| <b>Total Number of Foreign Knowledge Workers</b> | 2           | 2           | 2           |
| <b>% of Knowledge Workers</b>                    | 100         | 100         | 100         |
| <b>* - not a worker</b>                          |             |             |             |
| <b>** - Concurrent post</b>                      |             |             |             |

Employees will be hired once the company is initiated and begins its operations.

The software engineer will be responsible for the maintenance of the IHMS bridging software. The database administrator will be in charge of the maintenance of the database server of HTPL. The marketing executive will visit the organizations to explain the benefits of IHMS and also to make sale. The accounting officer will be responsible for the financial aspects of HTPL.

## SECTION 4.0

### PRODUCT OR SERVICE DEVELOPMENT

#### 4.1 Product / Service Overview

The onset of lifestyle diseases has increased with time and this has also caused an increase in the mortality rates due to these lifestyle diseases (Khandekar, 2008). Disease management has proven to reduce the mortality rates and also reduce the costs (Linden, Adams, & Roberts, 2006). Though there are many ailments which may lead to high medical expenses, HTPL will focus its service towards monitoring hypertension and diabetes which is the most commonly found lifestyle disease. Earlier chemical methods were used in laboratories to measure the blood sugar levels, however the advancements in technology has given rise to automated blood sugar level monitoring equipments known as Glucometers. These equipments are being used by individuals to monitor their blood sugar level.

Similarly, for measuring blood pressure, mercury-based BP apparatus was used, but now automated blood pressure monitoring equipments with digital display and a provision to be linked with a computer have been developed.

These health monitoring equipments give the individuals the ability to measure their blood sugar level and blood pressure. However, not all individuals are qualified to analyze the results produced by these equipments.

HTPL has identified this niche and designed a product, the Intelligent Health Monitoring System, also known as IHMS which is an internet based health monitoring



system. This system transfers the raw recorded values to the respective medical officer of the organization.

The health monitoring equipments which will be connected to a computer will be setup in the organization. The patients or the employees have to get themselves checked by these equipments, which will immediately transfer the recorded values to the respective medical officer who is in charge of them. This will enable the medical officer to assess the medical condition of each employee. The employees can also access their medical history from our web portal by using the username and password which will be provided to them.

The internet access facility also contains the history of treatment which has been provided by the respective medical officer. This data will be useful if the patient goes to some other medical officer for treatment.

The uniqueness of IHMS is that it transfers the recorded data to the medical officer immediately. This will give the medical officers the ability, to assess the medical condition of the employees on a periodic basis. The advancement of IHMS which includes the risk scores for predicting (i.e. assessing) the chances of getting diabetes and hypertension will also assist the medical officers, in assessing the medical condition of the employees. None of the existing products in the market have employed a method for prediction of the chances of getting diabetes and hypertension for the patients who do not have the disease. Hence, it can be used by individuals with or without diabetes and hypertension.

### 4.1.1 How IHMS works

IHMS is an internet based health monitoring system which uses remote monitoring to record the values. The biomedical instruments for recording the medical values will be set up at various places in an organization. These equipments will be connected to a computer which will transfer the data to the IHMS server. These values will be processed in the IHMS server.

The basic operation that will take place at the observing station is as follows:

1. Record the unique employee ID.
2. Record glucose, blood pressure and Weight.
3. Communicate with IHMS server.
4. Transfer the measured data with the unique ID.
5. Disconnect and record the next unique ID.

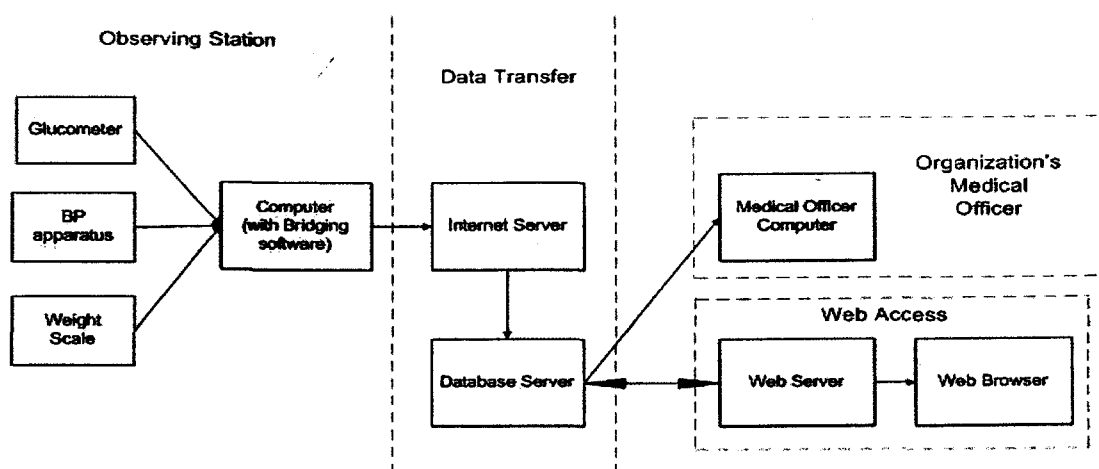


Figure 4.1: Block Diagram of IHMS (Created by Ms. Manimegala)

The operation in the server will be as follows:

1. Connect with observing station.
2. Receive data from the observing station.

3. Search data base for received record of unique ID.
4. If unique ID is not found, create a new record in database.
5. Add the data to the record.
6. Disconnect with the observing station.
7. Connect with the medical officer computer.
8. Synchronize data which matches the medical officer ID.
9. Disconnect.

The patient can access his medical record by logging into the IHMS website. This website will contain his personal medical information, health tips, diet tips etc. Once the medical officer of the organization logs into his account provided by HTPL, he will get a record of all the patients that have taken up the monitoring.

#### **4.1.2 Components of the system**

**Glucometer:** This is an electronic device to measure the blood glucose level. This device transfers the value to the computer after the value has been recorded.

**BP apparatus:** An automated blood pressure monitoring device with an electronic display. This device transfers the value to the computer after the value has been observed.

**Electronic Weight Scale:** This device measures the body weight. It also measures the body fat percentage by passing an electric pulse through the body. The values are then transferred to the computer.

**Bridging Software:** Each of the monitoring equipments has its own support software. The bridging software will transfer the values to the IHMS software at the observing station.

**Computer at the Observing station:** All the monitored reading will be transferred to the IHMS database server through the computer which is located at the observing station.

**Servers:** IHMS totally uses three servers. An internet server, which receives the data from the observing station. A database server which records all the values which has been observed. A web server which will be used for accessing the data directly from the database server by the employees.

**Computer for medical officer:** This computer will be used by the medical officer for monitoring the medical condition of the employees. This computer will synchronize with database server to retrieve all the information which has been observed.

**Webpage:** The users who use the IHMS system can access their medical records through our web portal.