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高階主管管理學程碩士班

碩 士 論 文

老人照護服務營運模式初步探索

A Preliminary Exploration for elders' Home Care Business Models

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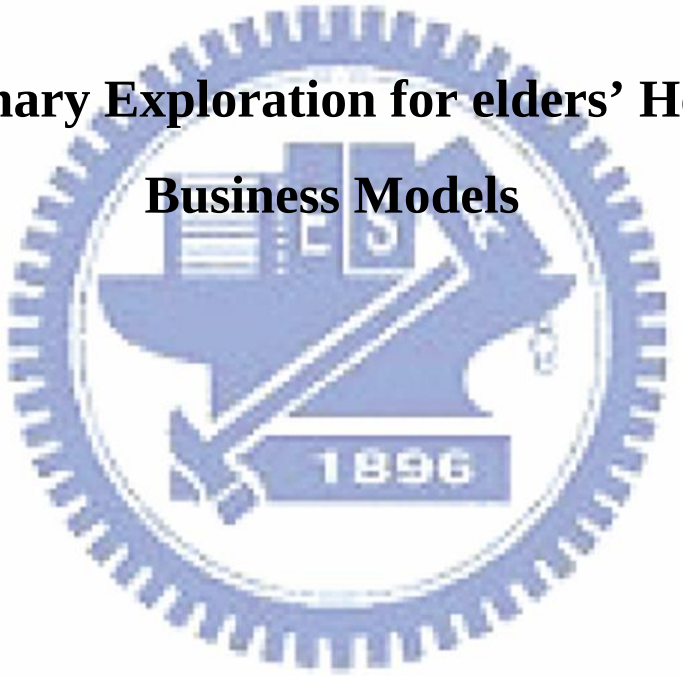

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June 15, 2005

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Abstract

As the age increases and fewer children are born, the result is that the changes in the structure of families, elder people living alone or lacking of care in daytime have become common social phenomena. Therefore, how to provide home care services for elder people with minimal manpower is now one of the most promising businesses in 21st century. However, since the elder home care services has to be integrated with high-tech monitoring and alerting technologies, home care services, medical services and insurance policies, the initial costs for establishing such a system is relatively high and the return on investment is low for the elder home care services. Therefore, issues like how to develop a practical operation pattern, analyzing internal and external environment and advantage over competition, collecting reasonable service fees and creating more added values are the difficulties that the elder home care services need to resolve. Thus, this research's purpose is to give a preliminary discussion on the service patterns for the elder home care services to establish a feasible operation pattern for the reference when an enterprise starts running such operation.

At first, this research carries out the estimates on the percentage of elderly population and the scale of elder care market, and then studies the needs for

cares for the elder. Finally, the service procedure of elder home care, system networks and analysis on requirement of hardware are described and the chargeable items are evaluated. Based on the assumption of membership framework, scenario and sensitivity analysis is performed to discuss more about the point when balance of benefit and loss occurs, and the company's cash value of 5 years later is calculated. This research has found that due to the slow return on investment of elder care services, business operators have to team up with up- and down-stream businesses as alliance to lower the cost of operations, to lease equipments to reduce the investment on purchasing equipments and to attract more members to accelerate the process of reaching financially profitable scale and the balance between benefits and losses.

As the limitation of this research is primarily that the elder care services still require the introduction of latest medical-related electronic communication technology, therefore, the effects and potential benefits of the latest digital communication technology and disease diagnosis technology to the elder care services are not described in details. Hopefully, the future researchers will continue the research on the application of advanced technologies in care services in a deeper level in order to bring the elder home care services to a full development.

Key words: Elders, Home Care, Business Plan, Marketing, Promotion, Value creation

老 人 照 護 服 務 營 運 模 式 初 步 探 索

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摘　　要

隨著壽命增長與少子化現象，造成家庭結構改變、老人獨居或是老人白天乏人照料成為普徧現象社會現象，如何運用最少人力進行老人居家照護服務，成為 21 世紀新興熱門行業。但是由於老年居家照護產業必需整合高科技監視預警技術、居家服務、醫療與保險理賠等不同特性產業技術，因此系統建置先期投資成本高，造成居家照護服務企業投資回收慢，因此如何建立可實施的營運模式，分析內外環境與競爭優勢，收取合理服務費用，創造附加價值，成為發展老年照護產業所必需解決的困境。因此本研究旨在初探老年照護產業的服務模式，進而建立可執行的營運策略，提供企業投入相關系統營運時的參考。

本研究首先進行老年人口比率與老人照護市場規模估算，接著研究老年人對於照護項目的需求。此後描述老年照護產業服務流程、系統網絡與需用硬体分析，評估可收費項目，在會員制架構的假設前提下，進行情境與靈敏性分析，探討企業損益平衡發生時間點，並計算投資 5 年後公司現金價值。本研究發現老年照護產業投資回收慢，因此投入廠商必需積極採取上下游產業聯盟方式降低營運成本，採用設備租用方式減少設備投資，吸收團体會員來加速達到經濟規模與損益平衡。

關於本研究的限制，主要在於老人照護服務產業發展仍需持續導入最新醫電通訊技術，因此未詳述最新數位通訊技術及疾病診斷技術在老人照護服務產業的影響及可能利基。期待後續研究者，可以針對高科技在照護服務產業的應用進行深層探討，促進老人居家照護產業全面發展。

關鍵字：老人、居家照護、營運計劃、服務模式、行銷、價值創造

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Thanks to instructor professor Dr. Chu Po-Young for his kind assistance and continuous provision of research advice during thesis writing. EMBA professors have also provided useful knowledge about management and some of the articles are integrated in this thesis. Classmate Alison, Allen, Victor, Patrick, Toryo, Victor, Joe, and Edith also provided their personal and valuable experiences and information in management during thesis writing. Thanks for their advice so this thesis can be constructed and finalized in 2 years. And also the author would like to acknowledge the EMBA office which provides excellent program for middle age workers and perfect service after enrolled in EMBA program. Finally, the spiritual support of my beloved wife C.H. Cheng and infant daughter S.H. Wang during these two years are the most important driving force. Besides, EMBA classmates provided many daily life experiences and much knowledge that can not be found in textbooks. Thanks for their patient and I sincerely hope everyone in grade 6 will finalize their theses in the following days. There are still a lot of people not referred in this acknowledgement and I hope their wishes come true. Thanks everyone again and may happiness to you all.

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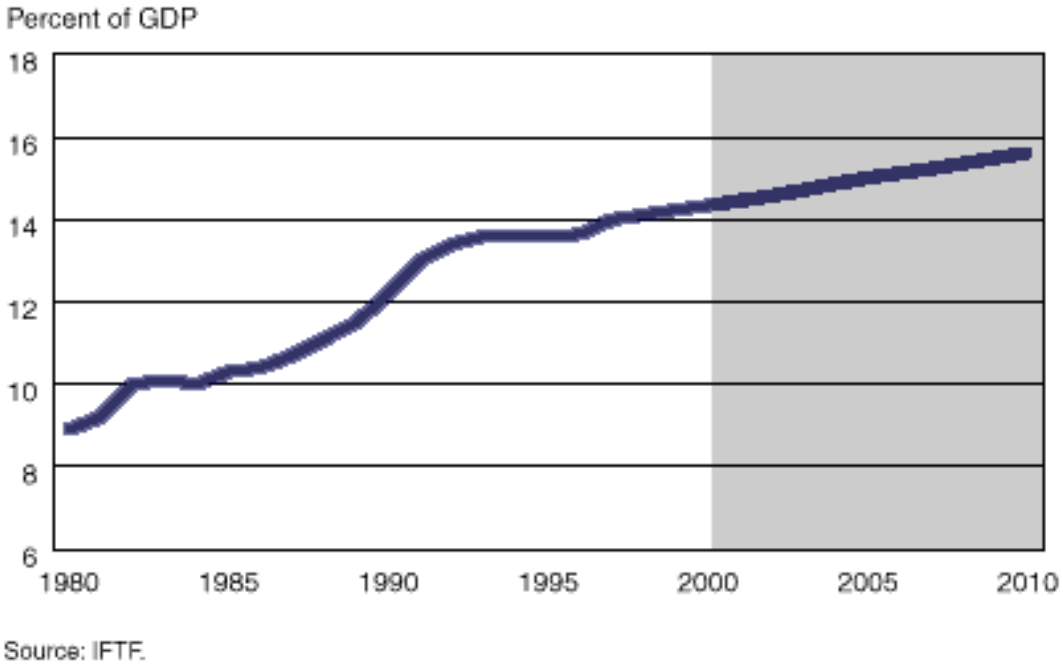
Chapter 1: Introduction

Worldwide aging wave is coming. There are about 550 millions people aged over 65 years old, and the number of elders in USA is 34 million. The ratio is 5 workers to 1 retiree in the U.S. and 3 workers to 1 retiree in Japan. By 2025, there will be 1.2 billion people aged over 65 years old, and 74 million elders in U.S., which leads to the ratio of 3 U.S. workers to 1 retiree and 2 workers to 1 retiree in Japan. Most developed countries have health as biggest percentage of GDP spending as shown in Figure 1. The only way to cut costs but increase quality is home care. Home care is the fastest growing segment of health industry. Yet, aid devices and service items have a characteristic of more varieties and fewer quantities; it is very difficult to reach economic scale for profit-seeking industries. How to manage aged care device or service enterprises seems difficult to most enterprises. This thesis tries to investigate aging care enterprise business plan and management strategy, as well as to discuss these topics and divide the investigation into 6 chapters.

Figure 3-5. Projection of Future Health Care Spending (Health care expenditures as a share of GDP)



Source: IFTF.

Figure 1 Projection of future health care spending

(Excerpted from: www.eecs.berkeley.edu/~eklund/ teaching/cs294/reading/Elder**care**%201.**ppt**)

Chapter 1 describes study motivation and research background. Chapter 2 discusses the influence of elder population, consumption behavior, aid device categories, and the survey of elder care device manufacturing companies' management strategy. In chapter 3, the marketing strategies for ageing care/aid device are discussed, and in chapter 4, business plan with different scenarios and sensitivity are used to predict the optimistic and pessimistic situation. In chapter 5, the ROIC and WACC values of 7 biomedical companies are calculated. Then extra value return rate of these enterprises are analyzed and their financial health and profitability are discussed. According to the analysis, this paper tries to figure out how to create value in this aids industry in the future and concentrate on more potential fields that will be easier to create value. Finally, findings and conclusion will be discussed one by one in chapter 6.

1.1 Study background and motivation

As we all have seen, birth rate is decreasing gradually and average life span is increasing steadily in most countries during past decades. According to statistic records, the ratio of elder population, aged over 65 years old, to the entire population will reach 20 percents in next decade. Therefore, elder population's health and consumption behavior become more and more significant to society than in the past. Nevertheless, there are few theses discuss about successful strategies in aging care industry. The characteristic of most elder home aids are custom made (small quantity manufacture) rather than mass production. Thus, more inventories and long term return on investment rate will be needed for this kind of companies. These theses discuss such enterprises marketing strategy and try to develop a business plan for this kind of companies. Further more, the financial statements of stock public offering's medical device enterprises are further discussed in order for comparison with their management

and financial leverage skill.

1.2 The target users of caring devices and their needs

The main users of aids are mentally and physically disabled people and elder people. The Protection Law for the Mentally and Physically Challenged People, revised and instituted in Apr. 25, 1997, mainly focuses on the categorizations by the different types of disabilities, not on the age factors and differences of needs. Benktzon (1993) has proposed a user pyramid concept for the motion support devices. In this concept, users are divided into 3 categories：1) Normal persons and persons who have the slight ability drawback, i.e. the persons of advanced ages with general muscle power movable decrease; 2) Medium ability drawback, disease caused medium disabilities; 3) The ones that have ability defects and need to ride in the wheel chairs, lack of strength in arm muscles and, in very limited number of person, loss of mobility.

Currently in Taiwan, no matter in rehabilitation therapies and design and manufacture for aids, suppliers concentrate on physically and mentally disabled people, and consider that the elder people as part of the physically and mentally disabled people. And the meantime, there is only the Subsidization Standards for “Aids for Daily Lives of the physically and Mentally Disabled People” in the subsidization systems for aids, and there is no such standard for the specific needs of elder people. In Japan, the subsidization system for aids for elder people is independent from that for physically and mentally disabled people. In fact, there are many differences between physically and mentally disabled people and elder people. In physically and mentally disabled people, only part(s) of their body functions are deteriorated or disabled and the rest are still fully functioning, which give these people sufficient strength and abilities to adopt in

their daily lives. On the other hand, the entire body functions of elder people are deteriorating and this deterioration is accelerating as aging progresses, and the abilities to adopt in new environments are deteriorating as well. It is very natural that the needs for aids and solutions for both populations are different.

1.3 Functions of the caring/assistance devices

Age caring devices assist the elders to monitor their health and allow elder's children to watch their parents' health. According to rehabilitation concepts, there are three types of opinions on mental and physical disabilities: 1) Impairment: it means disabilities in mental conditions and body organs, which is the definition of disabilities in most of countries; 2) Disabilities: it means the disabilities derived from impairment; 3) Handicap: it means socially inconvenience phenomenon that is generated by the interactions between impaired or disabled people and the surrounding environments. The concept of aids is to utilize medical and engineering auxiliary or self-helping devices to reduce or supplement all kinds of disabilities that mentally and physically disabled people and elder people have to face in every day lives.

For a long time, the main customers of aids are the mentally and physically disabled people, such as people with limb disability or the mentally retarded people, and now are gradually extending to the elders because of the aging of the social structure and the rapid growth of elder population in recent years. For general mentally and physically disabled people and the elders whose body functions are deteriorating, the major concerns are the handicaps of communications, movements, senses and mentality. Therefore the development for the functions of relevant devices is concentrating on these concerns:

(1) Communications

Most of the mentally and physically disabled people and the elders have

communication problems, so during the communications with others they need some special devices to help them. With the helps of these devices, they will be able to receive or express the messages to keep the fluency of the communications.

(2) Movements

The purposes of the aids for movements are to help the mentally and physically disabled people to deal with their daily routines and lives with assistance from others. In addition, for the disabilities of movements due to the damages to movement abilities, such as paralysis in all four limbs, one side of the body, lower limbs or upper limbs, etc., the uses of these aids can help improving the extension of the muscles, large movements and delicate movements.

(3) Senses

Hearing and sight are very important channels for a person to accept the stimulations of learning. If a person has any handicap in these two senses, the inputs of learning stimulations will be fragmental and incomplete, which will affect the accumulation of learning experiences, the daily lives, human interactions and career arrangement. Therefore, the provision of the aids for hearing and sight can help the learning of those who have sense disabilities achieving the independence in life and career.

(4)Mentality: With the improved functions of movement and senses, users can reduce the dependency on others, and also the use of these advices helps elders feel more willing to participating group activities and recovery the skills and self-esteem for participating the society.

1.4 Caring/assistance devices category defined by Taiwan and Japan

In “The Subsidization Standards for Aids for Daily Lives of the physically and Mentally Disabled People”, the properties of aids are divided into “life aid” and “rehabilitation aid” based on the use for daily lives or rehabilitation [Table 1]. The “life aid” devices include walking canes, walkers, wheel chairs and electrically powered scooters, etc. The “rehabilitation aid” devices include air cushion beds, custom-made wheel chairs, braces and artificial limbs, etc.

Table 1 Types of aids categories

Types		Products and Equipments
Life Aid	Clothing aids	Aids for wearing clothes, pants and skirts, long handled shoehorn, aids for wearing socks
	Washing and showering aids	Shower chairs, inflatable bathtubs, convenient bathtubs, inflatable hair washing sinks, bath lifts, shower lifts, anti-slipping mats, anti-slipping bath seats, bath seats in bathtubs, photo-activated faucets, touch-activated faucets, sponge brushes with long handles
	Excretion aids	Putty chairs, elevated toilet seats, urinal sets, urine collectors, putties and urine pots
	Dining aids	Silverwares, spoons, bowls and plates, cups, food cutters, holders, wheel chair trays, bed trays
	Handrails	Bathroom handrails, toilet handrails, standing handrails, bathtub handrails, bed side handrails, safety handrails
	Moving aids	Rope ladders, lifts, floor cranes
	Sleeping aids	Posture changers, bed side tables, matrices, air cushion beds, hand-rocker, electrical beds

Work aid	Voiced calculators, Braille writers, abacuses for the blind, special computers, word processors, keyboard aids
Movement aid	Electrical scooters, wheel chairs, electrical wheel chairs, special wheel chairs, canes sticks, quad canes, walkers, artificial limbs, support frames, safety belts
Rehab aid	Neck and back braces, respiratory aids, standing aids, sitting aids, shoulder joint exercisers, balance stairs, treadmills, step masters, rectifying canvas belts
Aid for barrier-free environments	Sitting lifts, platform wheel chair lifts, open elevating lifts, lifts, cranes, ramps
Recreation and sporting aid	Three-wheeled racing wheel chairs, sports wheel chairs, bikes
Communication aid	Hearing aids, telephoned aids, sight pagers, telephones for the blind, fax machines
Nursing aid	Rehab get-up belts, cranes
Other aid	Page flipping aids, pen holding aids, emergency reporting devices, silent alarm clocks, environment control systems, braillewatches, talking alarm clocks
Note: the table is abstracted from “Aids for Disabled people” printed by the Association of Spinal Cord Injury, R.O.C., which is subsidized by the Department of Interior.	

In Japan, which is also an Asian country, there is an extensive definition for these aids, which is called “welfare equipments”. As the Japanese scholar Takayama Tadao has said, the welfare equipments include equipments for therapies and training, equipments that can replace or make up the body functions, equipments that make daily lives more convenient and equipments that reduce the work loads of care takers of save the energy. And the purposes of

these equipments are categorized into 4 groups, replacing equipments, make-up equipments, care taking equipments and equipments that elevate and improve social lives. This study focuses more on care enterprise marketing strategy due to products are easy to accept by users. Besides, innovation and more business opportunity still wait to be explored.

1.5 Research scope and limitation

Usually the reasons of the disabilities in the physically and mentally disabled people are very obvious and clear, and the young and middle age disabled people are mostly showing strong independence motion will. Therefore, the solutions of aids are to help these people for the independence in their daily lives. As elder population grows more and more, the scope and uses of aids will expand away from the existing position. In the future, the market of aids will be no longer limited to the physically and mentally disabled people and the elder people who need nursing, but extended into the healthy elder people who are over 65 years old. These are the target groups that this study pays attention to. Care mode can be distinguished in community service, Medicaid, Medicare and continuum of cares as shown in Figure 2. If state of the care should be done in hospital is not in the scope of this study. This study focuses on the users stay at home, only few medical treatment needed. Besides, we limit the business plan validated in great china area due to some service models might not fit the culture outside this area. We also constrain the scope of this study to the marketing strategies and startup company financial scenario analysis. However, there are still many issues related to elder related devices manufacture which need to be further studied in the future. Results of this research may lead to the studies of following products, including home care medical device, risky biotechnology

industry, and consulting service network for elderly people.

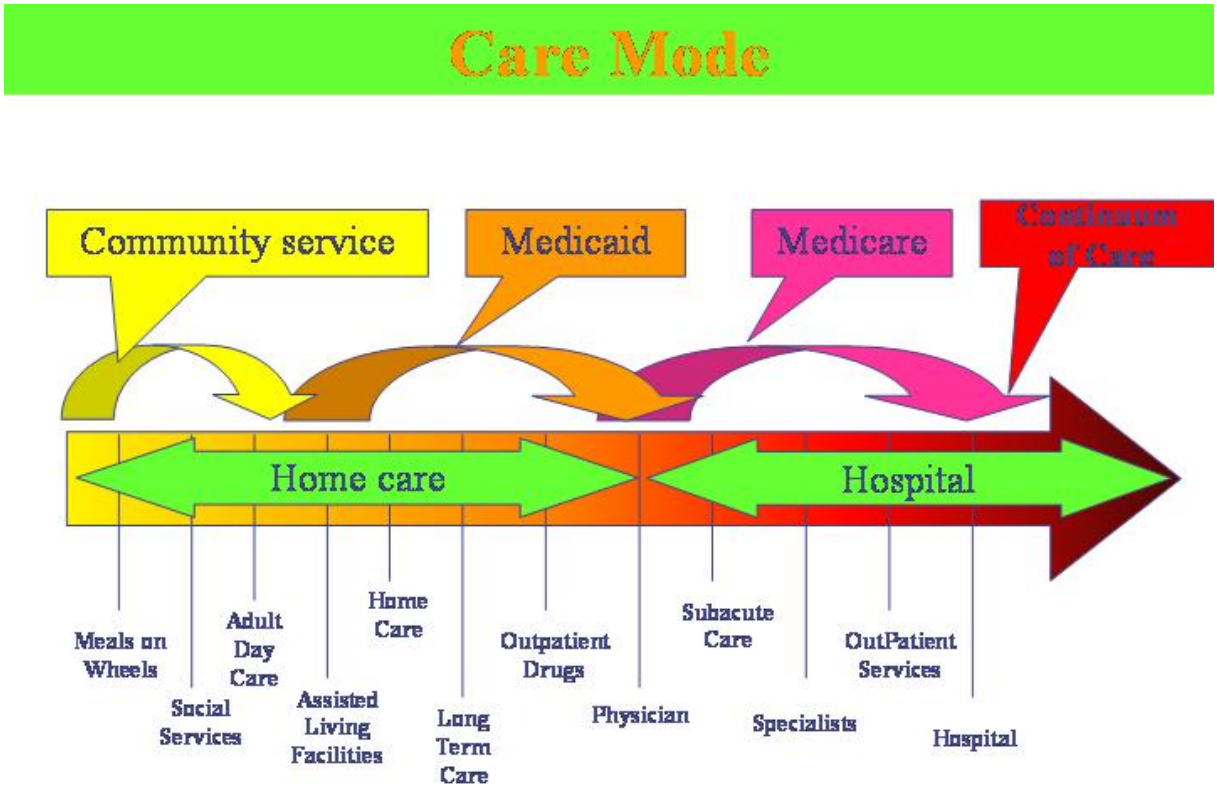


Figure 2 Home care coverage range

1.6 Chapter conclusion

Nowadays, the average percentage of global population over 60 years old is 10%, and it is estimated that this number will reach 21% in 2050 as shown in Figure 3. As the aged population keeps growing and the life span of people is increasing, eventually the thoughts of staying healthy will grow stronger and stronger, and people will be more willing to buy medical equipments for rehabilitation and health cares. Hence, everyday health will be monitored through everyday devices, everything is connected with a touch point to everything else, every device has a chip installed, and every chip has a radio transmitter attached. Aging care industry is an emerging business. There will be a lot of business opportunities in the aging care equipment markets. Yet, only few people, especially the rich can enjoy the benefits of these aids due to high price and service fees. Besides, only few companies can design and sell aids due to long period of return investment. On the other hand, competition in oligopoly market is relatively fewer than other industries. Therefore, aids device industry will provide an excellent opportunity for Taiwan industries. These theses discuss aids startup development and survive strategy. The results may also assist venture capital and entrepreneurs understanding how to invest high risk biomedical devices in the future.

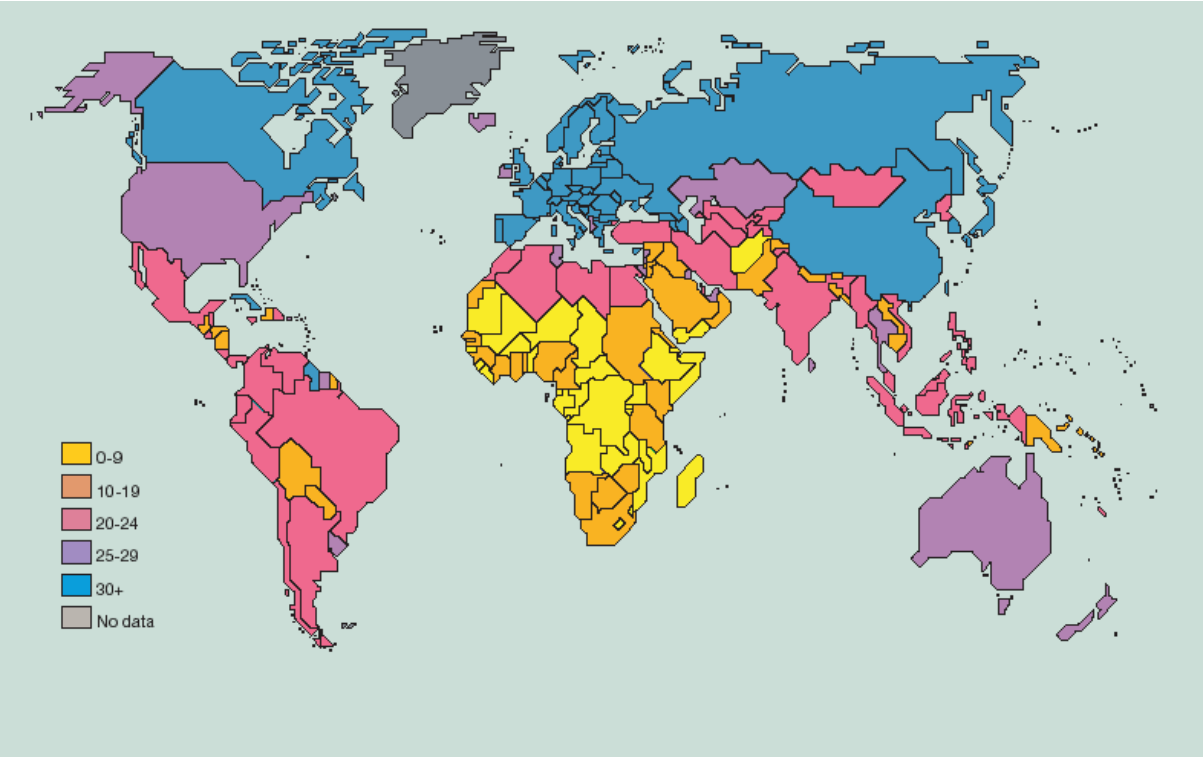


Figure 3 Population Aging in year 2002. Source: United Nation.

(Excerpted from: www.eecs.berkeley.edu/~eklund/ teaching/cs294/reading/Elder**care**%201.**ppt**)

Chapter 2: Literature Review for aging and long-term caring service types

Home caring is the long-term rehabilitation and nursing measures that the groups of people, which are less or lack of independent abilities in daily lives, such as the elder, chronic patients and the injured, can receive after disengaged for the acute state of disease and leaving the hospital. According to the definition of home medical caring given by Department of Health and Human Service, DHHS, of the United States, it is "part of continuous health care which provides caring services on individuals and at residences. The purpose of these services is to instruct and demonstrate the nursing techniques to enable the chronic patient to have the abilities independent self-caring and the families of patients to have the abilities to take care of the patients." Medical care does not only relieve the pressures on the demands on wards, which are very common in major medical facilities, but also provide the patients more varieties of options and more proper services based on humanity and industrialized management.

2.1 Meaning and service types of the long-term caring system

Home care means, by using new inventions and equipments, to provide services at residences, such as medical and health care to individuals and families and social works, etc., in order that those patients who have to be hospitalized now can have the intended medical attentions at homes, or other places, such as elder homes and nursing facilities, and to reduce the enormous costs on medical care for the elder in the future by providing home monitoring instruments for those who are having rehabilitation therapies to self-examine and for the patients' families to monitor the patients.

2.1.1 Application of products:

The purpose of home care is to provide those who do not to be hospitalized with continuous medical attentions by keeping the communications between the patients and hospitals in order to reduce the anxiety of the patients and

families after being released from the hospital, and help reducing the damages caused by the disabilities and diseases. At the meantime, it can also minimize the manpower of commuting between home and hospital and the inconvenience of going to hospital to reduce the risks of the complications due to long-term hospitalization. And the meantime, it can promote the effective uses of medical resources and reduce the huge economic burdens of aged people. The break-through of the medical diagnostic instruments enables homes to evolve into important places that can provide medical and health care. And the combination of innovating technologies, such as digitalization and communications, increases the effects of medical and health care. For example, the Intelligent Maintenance System (IMS), which combines communication and physical monitoring system, has made monitoring instruments part of everyday lives and the system can acquire physical information through Internet and raise the alerts in emergencies. By using IMS, the whereabouts of the elders can be tracked and the walking modes can be analyzed. Once there is any abnormal situation, it can diagnose the disease at real time. Through the concept of beforehand prevention, the national budgets and the costs of personal insurance can be reduced. IMS, which combines biotechnology, electrical medical equipments and communication networks, can perform long-term monitoring on the daily lives of the healthy elders, and provide health assessment and consulting through the data transmission of the information systems in order to inform the medical personnel when there is any abnormality. This can not only reduce the costs of medical care for aged people, but also maintain the healthy and independent living qualities of aged people.

2.1.2 Service contents:

Home medical care services may cover the rehabilitation of acute and chronic diseases after cured and elder cares, etc. The products can be in both software and hardware. Software is the techniques, resources, professional and unprofessional personnel for medical cares, and the hardware is the various health care and nursing equipments. The following is the discussion of the software and hardware:

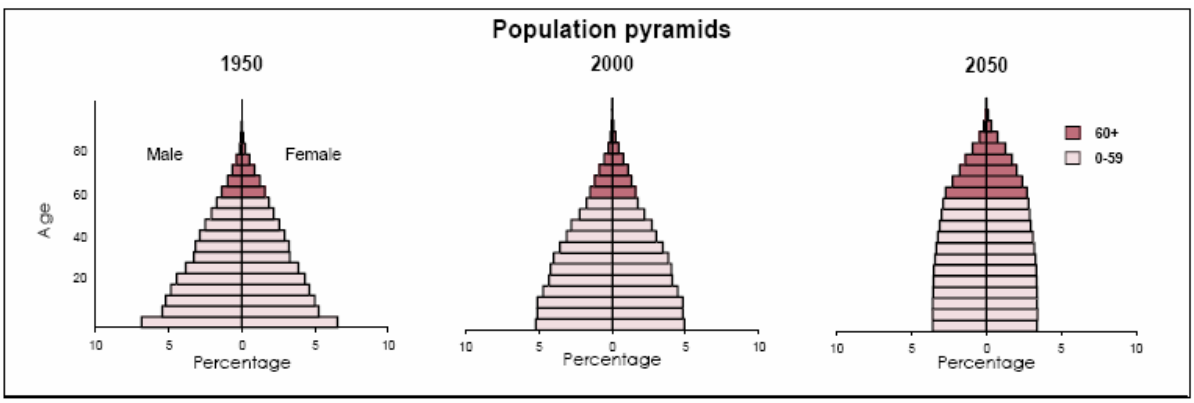
Software: This include the human resources and services required for medical care, such as the orderlies for showers, house keeping and moving patients, cooks, doctors, nurses, nutritionists, psychological consultants, psychological therapists, linguistic therapists, artificial limb specialists, respiratory therapists, health consultants, physical therapists and occupational therapists, and the health insurance for the middle aged people and the elders. In recent years, because of the progress of modern technologies, such as wireless communications, multimedia and wide band networks, many of these advanced technologies have been used for medical cares. The term “telemedicine” means that the patients can be closely monitored through the fast transmission of information, even though the patients are not in hospital.

Hardware: This includes the equipments and machines required for medical cares, such as medical instruments, the aids for those having trouble to move about, the tools to move the patients and medical consumables, etc. Based on the service contents, it can also be categorized as long-term care, out-of-hospital cares and high-tech medical cares. The long-term cares mean the rehabilitation, monitoring and cares for the elders and seriously ill patient. The out-of-hospital cares mean the linguistic, occupational and physical therapies and nursing

services for the patients, after being released by the hospitals, which have muscle or neural injuries. The high-tech medical cares mean the therapeutic and medical services for the patients by using scientific technologies and instruments. In addition, in the past a few years, because the booming telemedicine, real time medical and care services can be provided for the patients through the remote data and figure transmission enabled by the IT and Internet.

2.2 The current conditions/dilemma and trends of long-term caring system in Taiwan

The aging index, the ratio between the elder population and the work population aging from 15 to 64, has reached above 13% in Nov. 2003 in Taiwan, which means that average every 6.7 young working persons have to support an elder [Table 2]. Providing that most of young people are still at school, the ratio between the elder population and the work population aging 24 and above has gone up to 16%. As the economy grows, the average life span extends, and most of the advanced countries are facing the problem of aging population. Take Taiwan for an example: As the statistics of Council for Economic Planning and Development, Executive Yuan, shows that the ratio of people aged 65 and more will increase from 9.0% in 2002[Table 2] to 10.4% in 2011, and then it will be a steep ascend to 29.8% in 2051 as shown in Figure 4.



Population Division, DESA, United Nations 49

Figure 4 Global Population pyramids in 1950, 2000 and 2050.

The latest data is 9.48%, the ratio of people aged 65 and more in Jan, 2005 and 19.34%, 0 to 14 years olds, and that of 15 to 64 years is 71.19%. According to the definition from UN [Table 2], the society becomes aged society if the elder population reaches 7% of total population. With this definition, Taiwan has been an aged society since 1993. On top of that, the population of 15 and less of age are decreasing every year, and has dropped to 23.8% of total population in 1995, which clearly shows the total population is aging. Because of the rapid increase of aged people, the ratio of chronic disease increases dramatically as well. Therefore there are more and more demands for home medical care systems. As the population aged 65 and more gradually increases, the elder population has reached 2,031,300 persons, which was about 9.02% of total population. At the end of July 2003, the elder population has reached 2,050,000 persons, 9.12% of total population, and it is estimated the ratio of elder population will reach a staggering 20% in 2027.

Facing the rapid aging population, the Department of Interior has not only raised the birth subsidies, but also proposed tax deduction to encourage birth. In the future, citizens who gave birth will be able to have a birth deduction in taxes every year, the tax exemptions of children will follow those of parents and grandparents aged above 70, which has raised the exemption from current 74 thousand dollars up to 111 thousand dollars to reduce the burdens on raising children.

Table 2 The ratio of population aged above 65 to total population

Last update: Unit：%

2003/1

2/16

Year	ROC	USA	Japan	Germany	France	UK	Korea	Singapore	HK	China
1988	5.7	12	11	16	13	16	5	6	8	5
1989	5.9	12	12	15	14	16	5	6	8	6
1990	6.2	12	12	15	14	16	5	6	9	6
1991	6.5	13	13	15	14	16	5	6	9	6
1992	6.8	13	13	15	14	16	5	6	9	6
1993	7.1	13	14	15	14	16	6	7	9	6
1994	7.4	13	14	15	15	16	6	7	10	6
1995	7.6	13	15	16	15	16	6	7	10	6
1996	7.9	13	15	16	15	16	6	7	10	6
1997	8.1	13	16	16	15	16	6	7	10	6
1998	8.2	13	16	16	16	16	6	7	10	6
1999	8.4	13	16	16	16	16	7	7	10	7
2000	8.6	13	17	16	16	16	7	7	11	7
2001	8.8	13	17	16	16	16	7	6	11	7
2002	9.0	13	18	16	16	16	7	7	11	7

Date sources: Annual report of “social indices and statistics” of Directorate General of Budget Accounting and Statistics, Executive Yuan, Social development indices of the World Bank, monthly and annual statistic reports of every

country, “an overview of world population estimate” of Council for Economic Planning and Development, Executive Yuan

Notes: 1. According to the definition of the UN, the society becomes aged society if the elder population reaches 7% of total population.

2. The data of Germany before 1990 was from former West Germany.

2.3 Global long-term caring market size analysis

The United States is not only the country that spends most money on medical equipments, but also the largest supplier of medical equipments, because, in fact, almost half of the medical equipment supplies of the world come from The United States. According to the research report of Frost & Sullivan in 2003, the total revenue of the medical equipments in the United States in 2002 was approximately 57.6 billion US dollars, and an estimated 74.51 billion US dollars in 2005.[Figure 5] In addition, in 2003, new potential products like drug eluting struts (DES) and Cardiac Resynchronization Therapy (CRT), and the frequent merging between major medical equipment suppliers in the States will provide a more extensive market and opportunity for the entire industry.

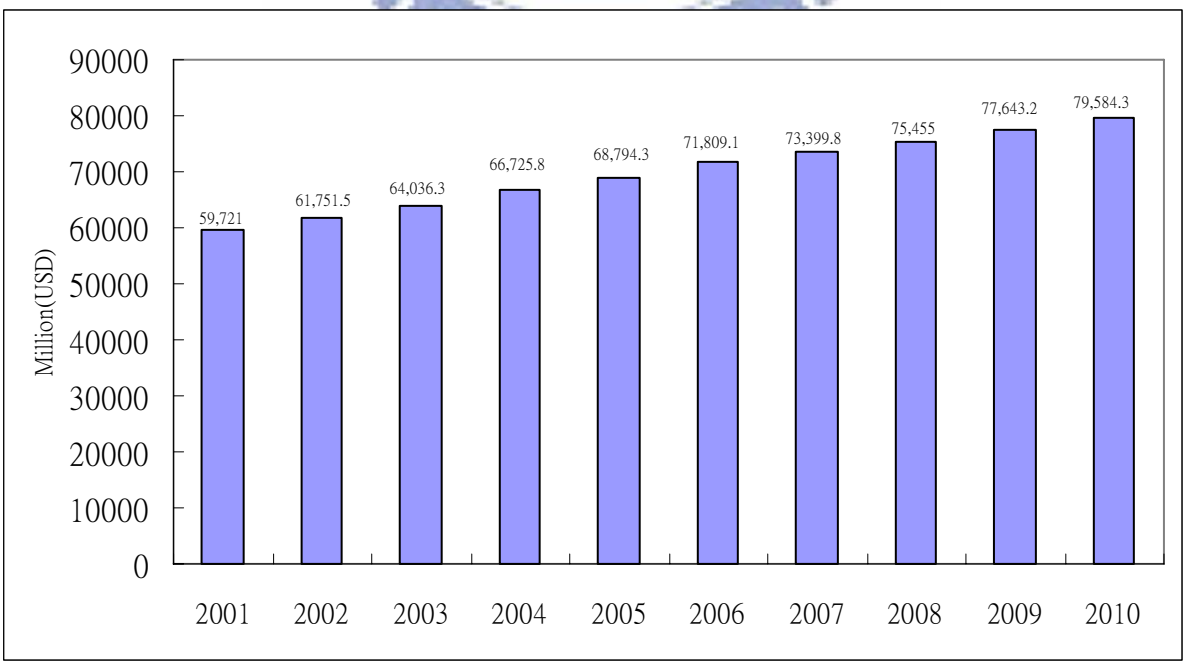


Figure 5 Growth rate of medical equipment market size

As for the scales of the enterprise, there are almost 6,000 medical equipment manufacturers/suppliers in the States alone, and the sizes of these companies or enterprises vary so broadly that the smallest companies are those one-man companies that are owned by the inventors of the equipments, and the large ones can be as large as the Johnson & Johnson, which is a mega corporation that hires more than 100,000 employees. However, most of these companies or enterprises are not very big, and 89% of them hire less than 50. If looking at the ratio of the sales of these companies to the total sales of the entire industry, the sales of those companies that hire more than 500 employees is about 45% of the total sales of the entire industry.

2.3.1 USA market size

While the global homecare market is 46,619 million in USA, growth rate will be 3.1% in 2005. As the applications market is about 1,564million and the growth will be 3.7% in 2005. Since growth ratio is low, cost down and flexibility manufacture will be more and more important in next decade.

Table 3 The current status and trend of the home care market in the States

Unit: Million USD,%

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Global homecare market	41,745.0	42,746.9	43,858.3	45,217.9	46,619.7	48,111.5	49,362.4	50,793.9	52,368.5	54,149.0
Growth rate	-6.0	2.4	2.6	3.1	3.1	3.2	2.6	2.9	3.1	3.4

Home care information applications market	1,213.4	1,308.0	1,432.3	1,564.1	1,706.4	1,860.0	2,025.5	2,203.8	2,395.5	2,601.5
Growth rate	2.6	7.8	9.5	9.2	9.1	9.0	8.9	8.8	8.7	8.6
Ratio of applications market divided by global market	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.6	4.8
Growth rate	-2.0	5.3	6.7	5.9	5.8	5.6	6.1	5.7	5.4	5.0
Source: Wintergreen : IEK-ITIS Project(2003/11)										

2.4 Future technology trend analysis

Self-care health systems make it possible for people to play a greater role in maintaining their own health. These systems' future trends are geared toward a prevention-oriented, consumer-driven model for health care that includes innovations such as "smart devices" that can "think" for themselves, customized wearable devices, electronic patient records, and wireless internet-linked systems--all expected to deliver convenient, user-friendly, intelligent health care at home. Innovation in the area of home health technology is thriving and many new business opportunities are waiting to be explored. New technology is used to help keep tens of millions of older people in assisted living situations much safer and to improve their quality of life. Sensing health activities such as fevers and sneezing to forewarn about epidemics are future need. Besides, combination of sensor's networks with complex algorithms that enhance communication and computing is an extremely promising area for home health technology development. Most importantly, health care improves elder care by detecting the activities of an elder to determine if they are taking medications or eating properly.

What kind of needs depends on the requirements that elders can use safely and effectively in the home. Generally it requires monitoring more than one physical parameter, such as body weight, heartbeat, blood pressure and body temperature, etc. Products well along in the development pipeline will incorporate miniaturization design and state-of-the-art technologies. The ability to bring these kinds of tools into the home adds a dimension of health care that people never had access to in the past.

Information technology becomes a more robust resource for people and their health-care providers, the link to home- and self-care products will lead to issues such as liability, privacy, financing, and most important, the safety and effectiveness of the products. Telemedicine is simply a steppingstone to a more sophisticated home health-care future. Currently, the wireless communication technology mainly used by home monitoring equipments still focuses on mobile cellular. However, as the wireless communications constantly improve, the technologies like WLANs keep evolving, especially the Bluetooth technology, which has the advantage of better application in home monitoring. The Bluetooth technology has characteristics of low power consumption and low costs, which make it very suitable for small products, and it becomes the main stream of the applied technology in home monitoring equipments. For example, the Polytel system developed by Polymap Wireless enables the medical equipments to upload the data to the network, and is inexpensive and easy to be integrated with monitoring equipments like weight scales and blood pressure meters. Wireless monitoring products like wireless electrocardiograph system and wireless wrist oximeters of Nonin Medical, which are soon available in the market, are adopting Bluetooth technology. Despite being threatened by the

powerful manufacturing abilities of Taiwan and Korea, the electronic industries in Japan, such as Canon and Kyocera, still have several unmatched advantages, especially in precision instruments and advanced electronic parts and components. The leading technologies of patents are the reasons why Japan electronic industries are still leading the world. However, many major electronic equipment manufacturers have thrown generous amount of funds in the development of medical equipments and medical electronics and have made a great impression. Japan has become the fourth largest export country of medical equipments in the world after the United States, Germany and the Netherlands, and is the largest in Asia, and the majority of these exports are products related to medical electronics and X-ray. The top ten manufacturers of relevant products in Japan include Canon, Toshiba, Olympus Optical, Terumo, Hitachi and Konica, among which there are several well known consumer electronics and IT manufacturers. Besides being a major digital camera manufacturer, Canon has put in significant efforts in home care and imaging equipments, for example the newly developed bath monitoring equipments. As for the Olympus, in addition to imaging products, the profit from medical systems and products is more than 40% of total profits, and it is very obvious how much profit the medical industries can make.

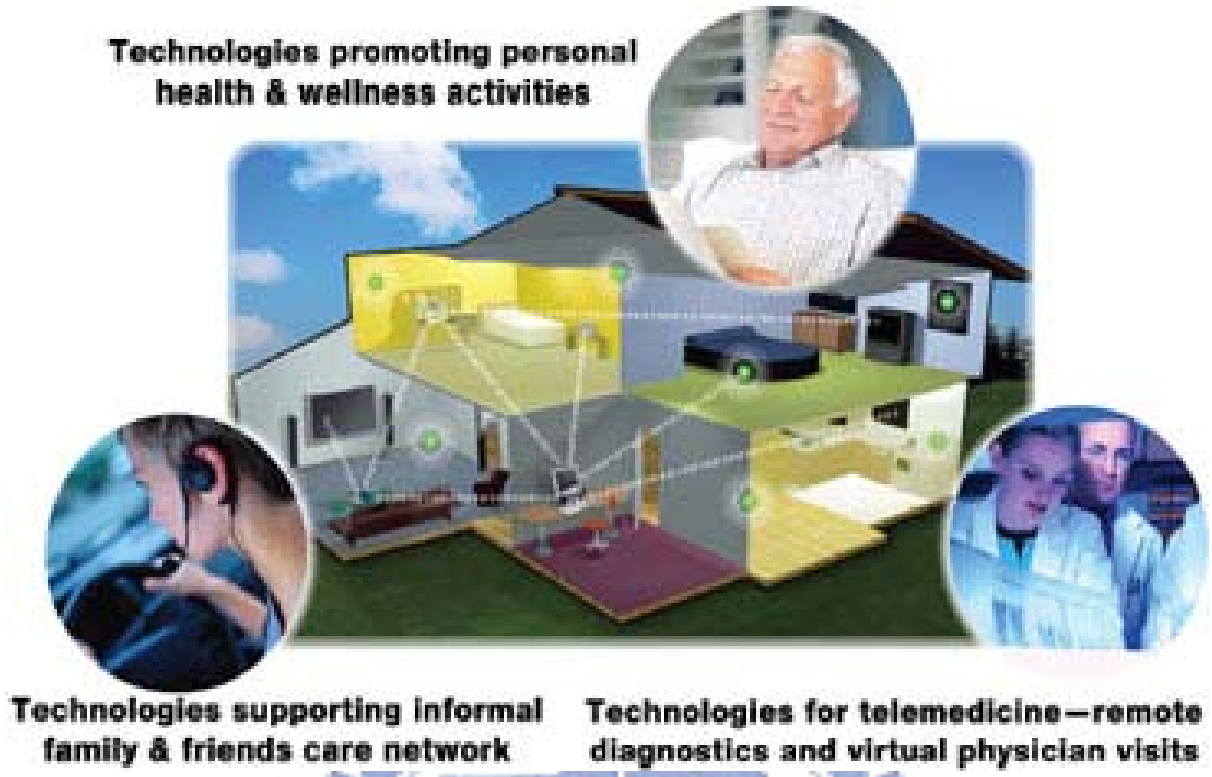


Figure 6 Future home health care technology

(Excerpted from INTEL Web site:http://www.intel.com)

2.5 Long-term care enterprise operation and business strategy

Table 4 Business model of home care manufacturer and service enterprise

Names	Main products	Business model	Characteristics
Apria Healthcare Group Inc.	Respiratory treatment, home fluid transfusion treatment, home medical equipments	Making alliances and cooperating with leading manufacturers in other fields	Provides panoramic home medical care products and services and monitors the patients' treatment plans. Currently the largest supplier of home care products in the United States.

American HomePatient Inc.	Respiratory treatment, home fluid transfusion treatment, home medical equipments and supplies	Provides high-quality services, and also provides home cares by investing hospitals.	Provides health cares and products, and disease assessment and health management as well.
Lincare Holding Inc.	Mostly provides home respiratory treatment and fluid transfusion treatment as well.	Declares most advanced oxygen systems and 24-7 services.	Provides best-quality home respiratory services and combines with home care plans. Currently largest supplier of respiratory treatments and services in the United States.
PolyMedica Corporation	Mostly provides test equipments and medicines for diabetes, and medicines and equipments for respiratory diseases as well.	It is a group consisting of several corporations, provides health management services. The major business mode is to sell the products directly to the customers.	Provides medical products and services. The business strategy is aiming at diabetes medication combining with the services and sales of test equipments and medicines, and working with health insurance system for medical

			management.
Star Multi-Care Services Inc.	Only provides professional care services.	Merges other services providers in the region to expand the size of the corporation.	Mostly provides professional and auxiliary personnel and services.
Baxter International Inc.	Drug in dose, dialysis treatments, biotechnological treatments.	Is a large medical equipment manufacturer. The product development strategy is multi-business mode. Establishes GHX to provide B2B procurements.	The business target is the manufacture and sales of large varieties of products, systems and services.
Data source: IEK-IT IS project of ITRI (2003/12)			

2.6 Chapter Conclusion

According to literature review we found most of the papers use sociology viewpoint to study home care behaviors. Some study public welfare fund applications, some study volunteers service, and some study the influence factors in care filed. If elders' have retirement pay, insurance pay or savings, elders can get specific pay service from house keeping or servant. Otherwise, elders care is mainly depended on public welfare, children, or self service. Hence, elders might cause some heavy burden to children as shown in Figure 7.

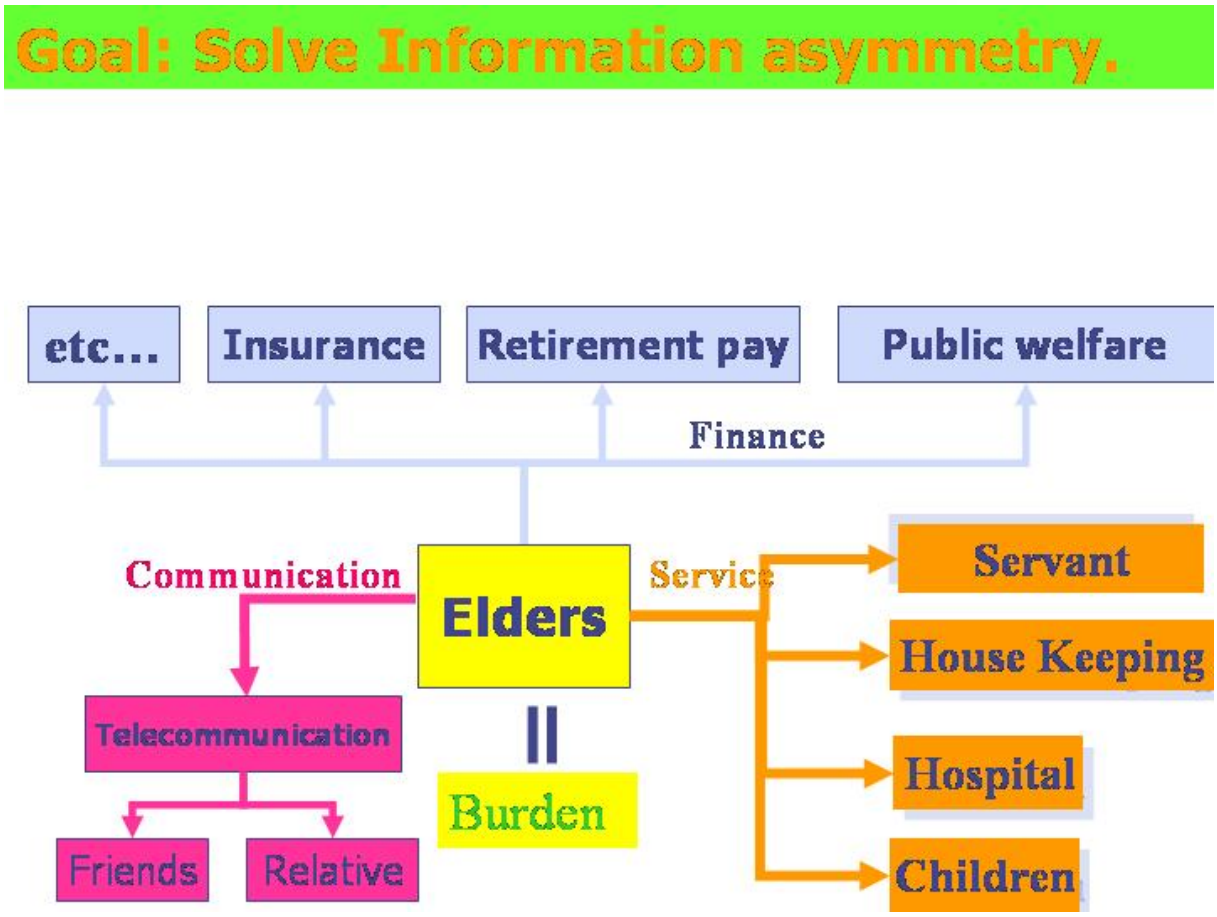


Figure 7 Elders' basic needs

As the statistics, it shows that the ratio of people aged over 65 will increase from 9.0% in 2002 to 10.4% in 2011, and then it will be a steep ascend to 29.8% in 2051. Elders' ratio rank priority is Japan, European, USA and great china area. The ratio in Taiwan is 9.4% of elders in 2005, the ratio will be a steep ascend to

20% in 2027. Due to more and more aged population, taking care aging population becomes a serious problem in the future. Home care and home monitoring can be used to reduce medical treatment and care service cost. A wide range of health and social services will gradually be delivered at home to recovering, disabled, chronically ill, or terminally ill people. Hence, health care device market will be enormous in the future. Home care market size is around 1.706 Billion in 2005 in USA.

The most important technology needs will be wireless and miniature modules. The tiny SOC sensor could potentially open new markets for proactive computing. Communications technologies have a big impact on future applications for healthcare, agriculture, public safety, transportation and environmental management. As the business strategy focused more on new products development than services development. Some also discussed non-profit service in elders care. Yet, keep financial profit margins will be the mainstream of elders' home care. New business opportunity waits for entrepreneur's further exploration. Nevertheless, entrepreneur entering this field needs to integrate several technologies into a system. Hence, total solution business plan and marketing strategy determine whether an enterprise can survive in elder caring field. Further discussion about product marketing strategy and business plan will be illustrated in the following chapters.

Chapter 3: Aging care business strategy

Business strategy can be formulated on three levels :(1) corporate level, (2) business unit level, (3) functional or departmental level. The proper generic strategy will position the firm to leverage its strengths and defend against the adverse effects. We discuss aging care enterprise business strategy and explore potential strength/adverse effects gradually in this chapter. This thesis proposed an agency that overall planning the care issues that fit the needs of elders. Through the agency help, elders can use telephone to order to service or take care of this personal business as shown in Figure 8.

Describe elders' caring service model, system network, hardware and charge items. Secondly, the business plan of the service model is discussed. The methodology adopted by this thesis is experts' opinion investigation. Hereafter, this paper discusses the pro forma balance sheet and income statement, predicts the working capital in 5 years and calculates the net present value of each year. Then, through scenario and sensitivity analysis, it can better control cash disbursements and allow the company to grow under controlled risk. Finally, the paper uses 5 forces and SWOT analysis to confirm the position of enterprise in value chain. It also helps enterprise allocate resources properly, handle unforeseen complications, and make good business decision.

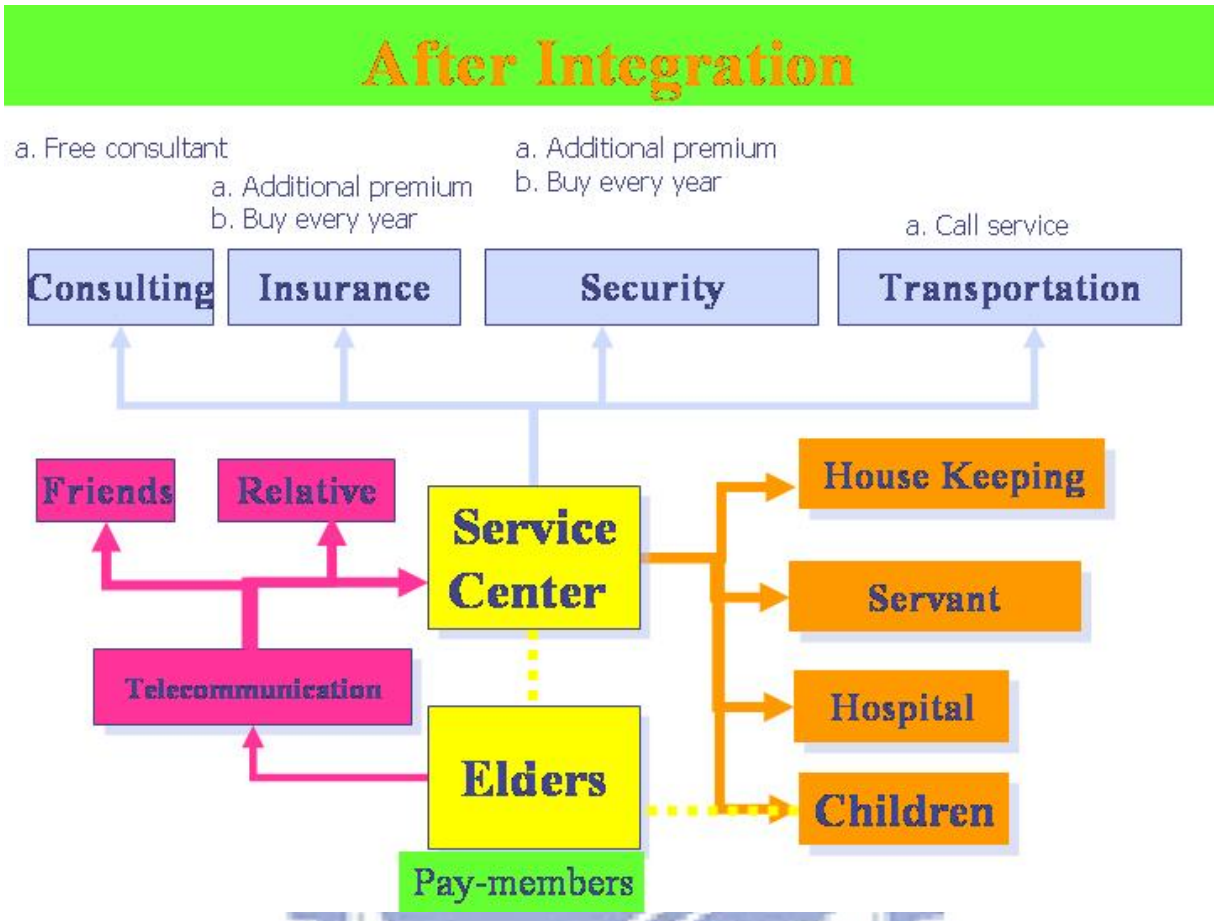


Figure 8 Elders via agent to get necessary service

3.1 Business model description

This section proposes an aging care business model. Goal of elders care service, bottleneck, business model, revenue, profit creation and charge standard are described one by one in this section. This business plans adopt state of art technology to monitor elders' health and motion in their residues. A service center occupied with web based computer system, quick respond team and physicians analysis the data collected from wireless modules in real time. Then, the car cruising on a planned route will reach the clients home as soon as possible. Most importantly, ambulance cars of hospital will follow the instruction of the service center to transport the clients to hospital if necessary. Medical treatment team in the hospital will immediately to take over service

center responsibility and execute the necessary treatment. All processing protocol will be designed in this business as shown in Figure 9. This service will be charged through insurance, monthly payment or Medicare service.

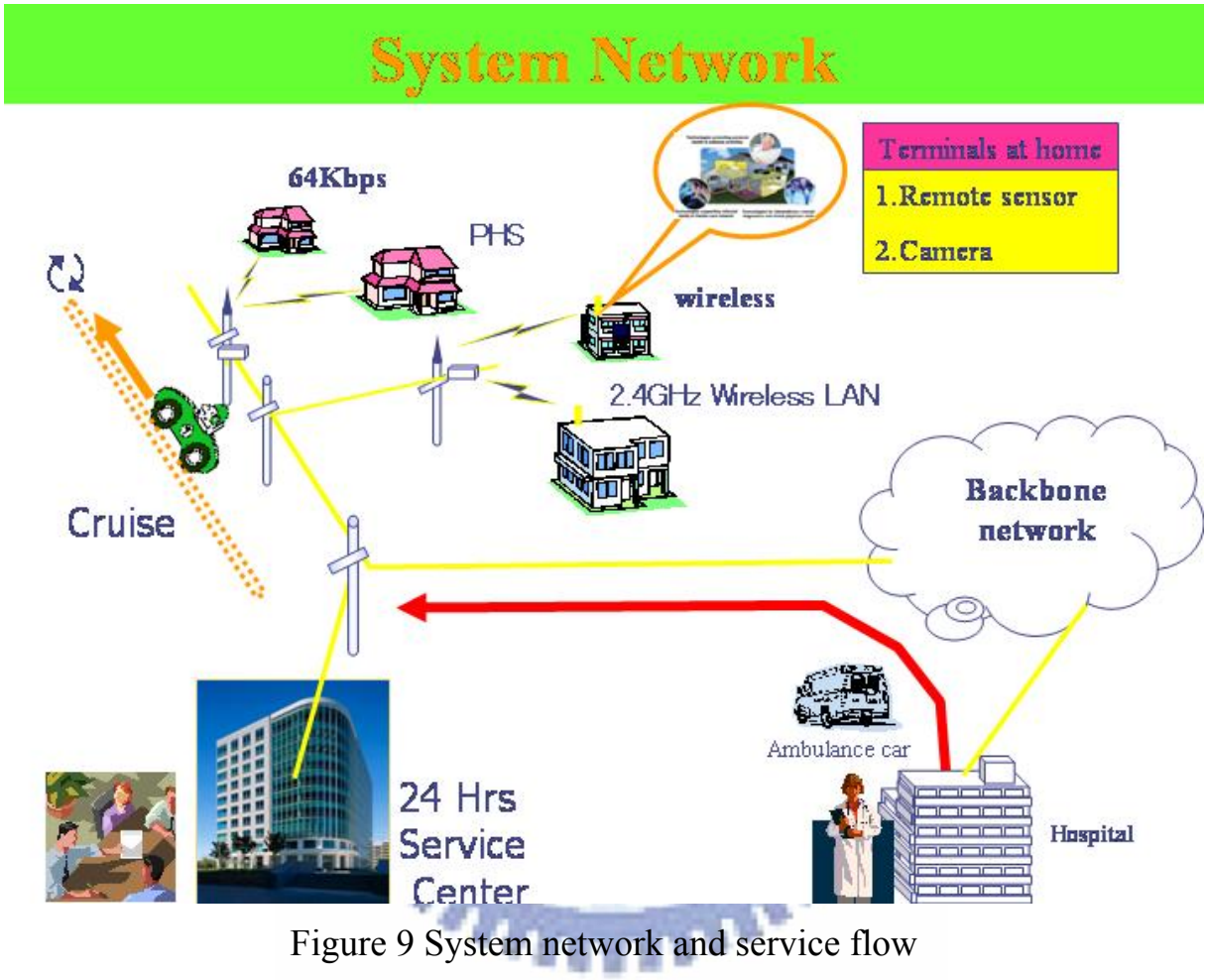


Figure 9 System network and service flow

3.1.1 The goals of aging care service

Aging care service watches elders' health and records clients' physiological parameters continuously. Most important services are providing alert visit and emergency handling service. For example, the clients are visited if alert occurs continuously and the visits will be responded to clients' relative immediately. Besides, providing daily house keeping service, food, transportation, call help service are also important to disabled group. Finally, providing convenient service, dignity and affordable price will attract the clients to share the service

cost with others and continuously buy this service. Figure 10 describes the service model and service flow chart.

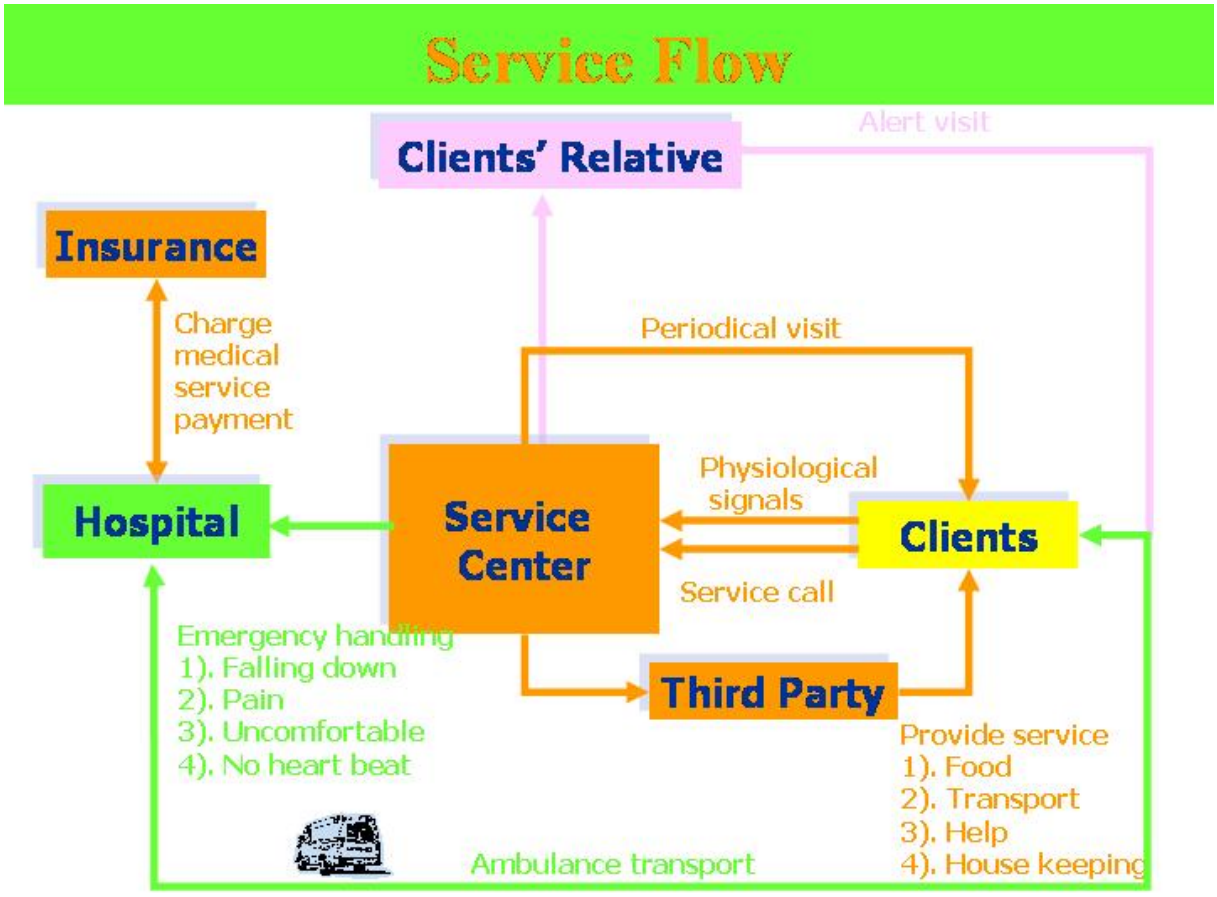


Figure 10 Service flow process block diagram

3.1.2 Aging care business bottleneck

Aging care enterprise has the problems about high investment in hardware setup and long break even point. Hence, enterprise needs to analyze all potential bottlenecks and develop a business model to solve the problems. The bottlenecks are summarized as shown below.

- Cash flow constraint: How to develop a practical business model that solves low ROI and shorten break even point schedule.
- Man power limit: How to use the limited man power to serve the clients in different place

- Capital Constraint: How to use the limited capital to establish service system hardware and software
- Traffic jam cause response time delay: How to use the constrained time to provide efficiency and reliable service
- Knowledge constraints: How to teach the employees to assist the elders and how to leverage medical doctors' clinical experience.
- Well use the resources to create revenue: How to attract the clients to buy service and keep clients number reach economical scale

3.1.3 Business Model

Providing this service will spend considerable budget to buy fixed assets if newly established companies hope to develop a brand new system completely by themselves. Hence, leveraging existing security service system to handle alert/emergency conditions will save a lot of investment. Besides, in order to avoid clients over-using the service resources, low pay extra charge (for example NTD10 per call) through telecommunication service seems good to this business model. It will save resources and keep service center easy to operate and avoid unnecessary waste. Besides, direct sales to group users and provision of special discounts to relative parties (30% discount) will generate high growth rate. Besides, consider elders care as option of private security service, or additional premium of insurance policy holders, both of them might attract clients to order this service if cost of elders care are reasonable. Finally, providing take-home modules leasing options to hospital-released patients or outpatients will attract some patients to buy the service, too.

3.1.4 Revenue Creation

After discussing the business model, we plan to describe the revenue creation strategy. Attraction for the potential clients to adopt the service and

earn extra profit from existing clients will cause the system to reach most suitable economic scale. We try to describe the revenue creation method in 9 items as shown below.

- Use inexpensive and introductory devices to attract large quantity of clients to adopt this service and avoid competition
- Develop high level service to earn extra profit
- Provide discounts to attract clients to continuously use this service.
- Profit mechanism: Guide clients continuously to buy high level service
- Charge clients yearly payment (annuity).
- Allow multi-leaguers (outsourcing to third parties) and charge yearly annuity
- Charge extra service calls (e.g. 10 NTD per call) through telecommunication enterprises.
- Gross margin should be 30% of revenue.
- Control the expense and make sure the break even point occurs when the number of client is more than 10,000.

3.1.5 Profit Creation

Some services may generate profits but some of them will not. Hence, before creating extra profit, one should know which kind of services is profitable. We try to analyze the profit creation methods as shown below.

- Develop high level service to earn extra profit
- Leverage existing channels and human resources to decrease fixed cost
- Encourage the clients to promote the service
- Help all leaguers to earn profits and grow up simultaneously

3.2 Business Plan

The enterprise will be founded for aging care service system setup, marketing, and promotion. There are many home care medical devices' manufacturers in Taiwan, most of them had over ten years of experiences in medical device design, ODM and manufacture experience. Yet, competition cause benefits shrink and most of them had to move the workshop to mainland china in order to minimum the direct expanse (salary). Most importantly, most of them can provide high quality home care devices. As more and more of the population getting older, the demand for aging care device has also increased. Most of the devices have microprocessor inside it. Due to cost of the microprocessors and wireless modules are cheaper and cheaper, added communication function to theses medical devices seems not difficult at all. Hence, using the existed device added communication function may be used to monitor the status of the clients at home. Using these device added communication function, we can establish a web based service center which continuously monitor the status of the clients at home. The cruise car will receive command from service center and visit the client home if necessary. Most of the elders wish to stay home than hospital. Yet, they have the potential risk of falling, suddenly accident, or sickness. They may not hope disturbance by others. Yet, they need emergency assist in unconscious situation. This is the key of this service which providing service to clients in specific condition. Besides, the service center will also call clients relative through GSM mobile phone system. This business creates value and something like insurance contract it will provide some protection against emergency or accident. Most importantly, emergency support may save elders life which very critical and valuable. This business plan tries to create this value. We illustrate the potential service items including:

1. Call Service: Provide service requested by clients.
2. Aids lease: Due to some back home patients need some aids device during recovering stage. Lease all medical devices to clients seems to be a big business.
3. Emergency handling: If emergency events occurred, visit the clients and call the ambulance to transport the elders.
4. Day care: Stay at elders home and take care the elders in day time.
5. House keeping: Clean the house if elders can not walk or too weak to do cleaning, cooking or repair the house.
6. Health monitoring: Lease the wireless modules and use the modules to monitor clients' life signals.
7. Treatment: Some simple would treatment could be done in home than hospital. Hence, the nurse dispatches to clients home may execute the treatment periodically.
8. Consulting: Sometimes, elders need some consulting service. Hence, provide cheap consulting service may attract clients to use this hot line. Besides, information of the clients' status may rich the clients medical history and provide some useful diagnosis information when alert occurred.
9. The others: The items that may generate profits can be included in this business plan.

This system service items attract clients to become member of an association and make money from clients, the enterprise must collaborate with the following groups.

1. Hospital: Collaborate with hospital to leverage the expertise knowledge and facility.

2. Employees: Pay good salary to employees in order to keep the service quality and provide some friendship with the clients.
3. Third parties: Provide taxi, housekeeping, and wounds treatment.
4. Physician: Real time analysis the clients' situation in service center. Provide some instruction to clients and the service experts.

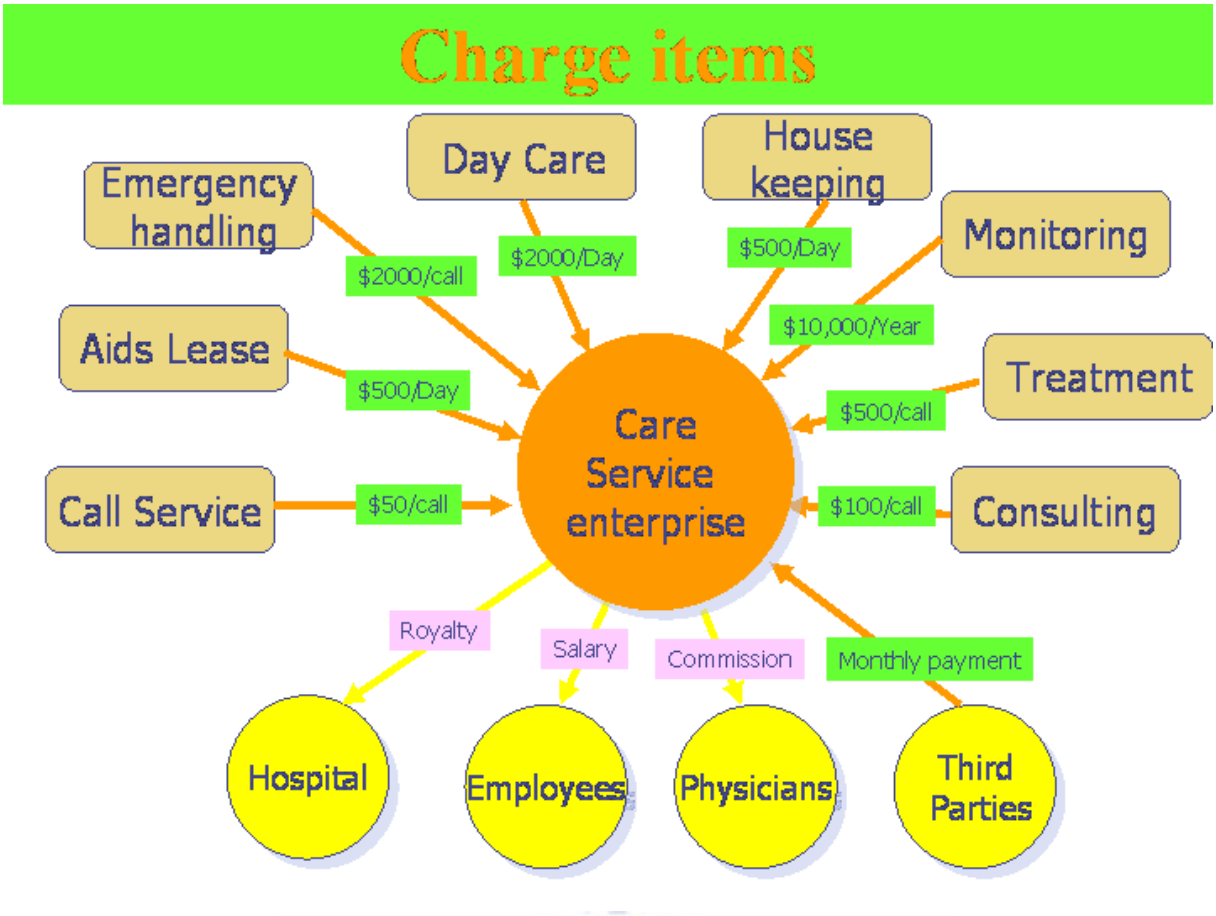


Figure 11 Charge items and the proposed charge price.

3.2.1 Business development forecasting

Many individuals, particularly those living-alone people are interested in self care service. Based on marketing projections, this interest increased gradually, and more and more business plans are proposed in relative fields. Yet, few of the proposals are implemented. To meet the expected demand for aging population, it is planned to establish a new enterprise focusing on the

establishment and marketing such service system. The yearly payment (annuity) on users assumed to be 10,000 NTD. System maintenance and salary payment are assumed to be 20,000,000 NTD per year. Gross margin is assumed to be 30% of revenue. The potential clients are about 10% of the population in Hsinchu area, that is 6,00,000*0.1=60,000. Since some elders are living in some remote countryside, financial restriction and some personal issues, the target number of our clients will reach 30,000 in year 5. The average cost of the wireless physiological monitor is assumed to be 15USD. The device will be modified directly from n on-invasive blood pressure meter (NIBP), while the cost of NIBP is very cheap and easy to license the OEM device. Besides, some other kind of medical device will be used to monitor clients' specific physiological parameters. In the first year, we need to place resource in mould design and system setup. We prepare to spend 10,000,000 NTD in system fixed asset setup, another 10,000,000 NTD in system integration and running this business. No income or revenue occurred in the first year. Advertising and proper promotion will make the market size grow up gradually. The target numbers of potential clients in the following 5 years are assumed to be 0, 1,000, 3,000, 10,000, 15,000, and 30,000. Most importantly, few enterprises have experiences in this field, business opportunity is rich and waiting to be further explored.

3.2.2. Product

The hardware used in this study can be modified from the cheapest non-invasive blood pressure meter (NIBP). Bluetooth module is utilized to transmit clients' information to telephone or PC internet system. Cardiovascular device, oximeter, and glucose meter can also be added with wireless module for transmitting

clients' data to service center. While choosing the proper caring service, people always focus on the status of the diseases of the disabled body parts of the users. In fact, to help the users choose the proper service, it requires considering the users' physical conditions, mental conditions, and the social conditions around the users. Among these conditions, the physical conditions include movement abilities, stamina, coordination, disease assessments, and the types of disabilities; the mental conditions include the users' wishes to use, concentration, learning abilities, abilities to reflect, and the tolerance to his/her disability; the social conditions have to take the financial conditions of the users' families, residential conditions and inter-human relationships (social connections), etc. into account.

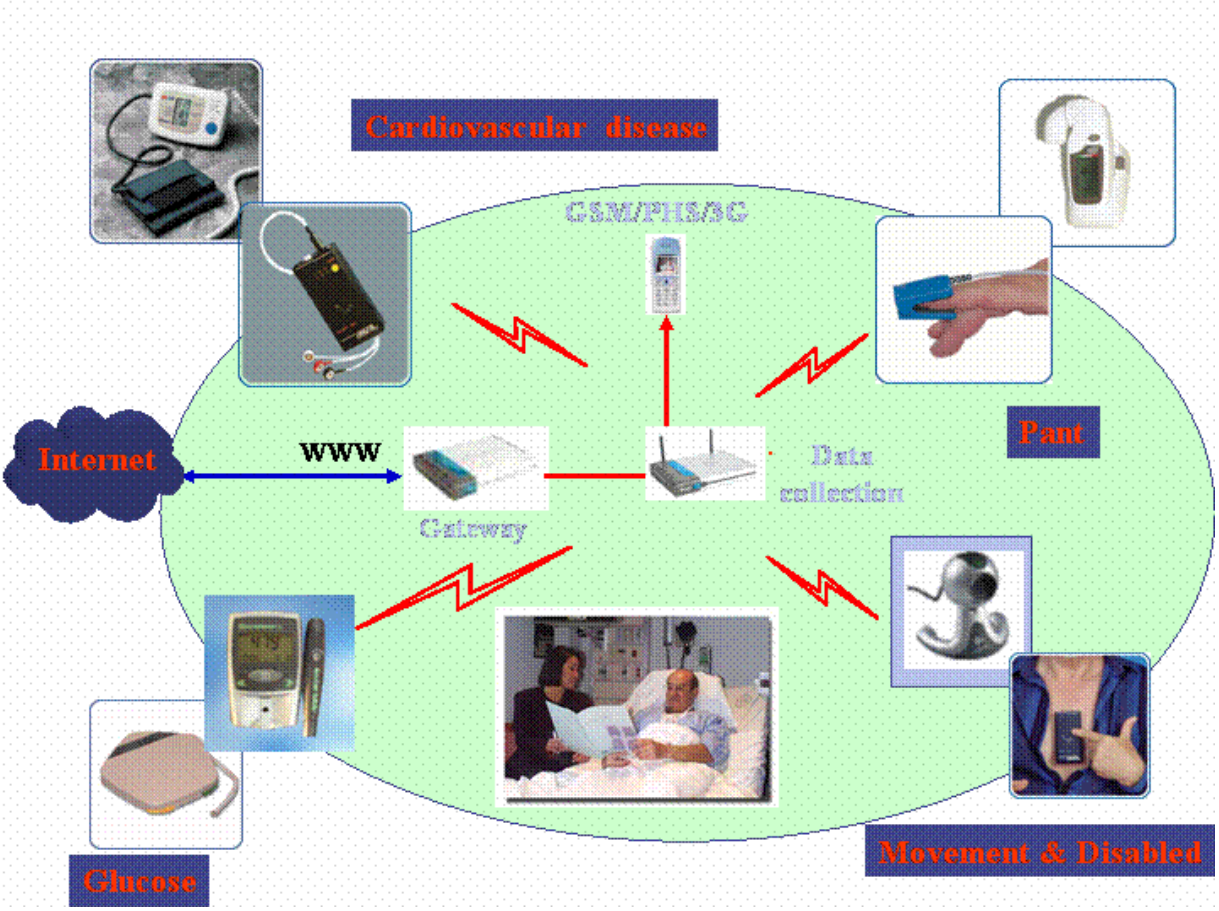


Figure 12 Hardware used to monitor the physiological parameters.

3.2.3 Business Structure

The business structure includes clients, service center, hospital and communication infrastructure provider. Service center will visit the clients periodically and handle emergency situation. Hospital will send the ambulances to transport the clients to hospital for clinical treatment and the infrastructure providers will transmit the information to service center and call to clients' relatives. Initial working capital of this enterprise will be about 60,000,000 NTD. The budget will be used to set up hardware system, arrange global marketing channel and pay salary. Employee number will be around 5, 6, 20, 22, and 23 in the following 5 years after the enterprise is established. The payroll is projected to labor expenses by average $60,000 per month per worker. Because the aids have a characteristic of more varieties and fewer quantities, it is very difficult to reach the desired market values for the profit-seeking industries. However, with universal design, the products can satisfy the needs of 80% of adults (Haigh, 1993). But the products that meet the universal design shall take the universality for users with different disabilities into account (E&C, 1996). Therefore, designers shall consider the products, facilities and environments that fit the mentally and physically disabled people and elder people from the perspectives of different users (the users, families and other unspecific persons) and different places to use (at home or in public places).

3.2.4 Enterprise organization composition

The business team should include hospital, communication infrastructure provider, hardware manufacturer, IT company, insurance company, security company, and third party subcontractor. All of them are leaguer and the core team will review each team member's performance periodically and determine if the contract will continue or not.

3.3 Scenario and Sensitivity analysis

Scenario analysis enables faster, more informed decision-making and better control over the timing of cash disbursements. If small and medium enterprises hope to continue its successful growth, it would have to use scenario analysis to explore the variation and to measure the duration. Small and medium enterprise executive teams and finance departments also frequently stumble over cash shortages, forcing the company to tap a costly line of credit rather than securing longer-term financing to fund strategic growth. Through scenario test, benefits are shown below:

- **Reduced costs**— saving time and allowing the company to focus on preventing the pessimistic situation occurred.
- **Improved planning**—this scenario enables faster and more informed decision-making and ultimately reduces short-term borrowing needs.
- **Increased profits**—Help manager's spot opportunities for capitalizing on accelerating sales and curtail rising costs in formerly hidden corners of the operation. Better insight into actual borrowing needs helped the company minimize its use of its lines of credit and reduce year-over-year interest costs. Better control over the timing of cash disbursements.

Typically a pessimistic case scenario is when all the changes in variables are worsening, and an optimistic case scenario is when all the variable changes are profitable. The scenario parameters are assumed in order to predict the best and worst situation of the enterprise by changing a number of key inputs and NPV of an investment is calculated. In this case, we assume clients' yearly payment (annuity) is 10,000 NTD. System maintenance and payroll are assumed

to be 20,000,000 NTD per year. Gross margin is 30% of revenue. Required rate of return is 12% per year due to high risk. The potential clients are about 10% of the population in HsinChu area, which is 6,00,000*0.1=60,000. Advertisement and promotion strategy will make the clients reaching 30,000 in year 5. In the first year, we need to spend 10,000,000 NTD in system fixed asset setup and another 10,000,000 NTD in system integration and running this business. Revenue is zero in the first year. The numbers of clients in the following 5 years are assumed to be 0, 1,000, 3,000, 10,000, 15,000 and 30,000.

At first, we try to analysis the normal situation of an investment in each year as shown in Table 5.

Table 5 Normal situation of pro formula financial statement

Year	Users Number	Net Profit	Depreciation	Net Working Capital	Fix Asset	Total Cash Flow	Net Present Value
0	0	(20,000,000)	0	(10,000,000)	(10,000,000)	(40,000,000)	(40,000,000)
1	1,000	(17,000,000)	2,000,000	0	0	(15,000,000)	(13,392,857)
2	3,000	(11,000,000)	2,000,000	0	0	(9,000,000)	(7,174,745)
3	10,000	10,000,000	2,000,000	0	0	12,000,000	8,541,363
4	15,000	25,000,000	2,000,000	0	0	27,000,000	17,158,988
5	30,000	70,000,000	2,000,000	0	0	72,000,000	40,854,734
Net Present value after 5 years							5,987,483

In optimistic situation assumption: Multi-system integration progress seems smoother than expected. Besides, this kind of service seems convenient and attracts elders to adopt this service. Hence, product retail price is 120% of prediction. Using the above assumption, we recalculate the financial statement as shown in Table 6

Table 6 Optimistic situation of pro formula financial statement

Year	Users Number	Net Profit	Depreciation	Net Working Capital	Fix Asset	Total Cash Flow	Present Value
0	0	(20,000,000)	0	(10,000,000)	(10,000,000)	(40,000,000)	(40,000,000)
1	1,000	(16,000,000)	2,000,000	0	0	(14,000,000)	(12,500,000)
2	3,000	(8,000,000)	2,000,000	0	0	(6,000,000)	(4,783,163)
3	10,000	20,000,000	2,000,000	0	0	22,000,000	15,659,165
4	15,000	40,000,000	2,000,000	0	0	42,000,000	26,691,759
5	30,000	100,000,000	2,000,000	0	0	102,000,000	57,877,539
Net Present value after 5 years							42,945,301

In pessimistic situation assumption: integration issues can not be solved. Besides, the market response does not seem as good as expected. Hence, there is a 1 year delay of revenue as shown in Table 7.

Table 7 Pessimistic situation of pro formula financial statement

Year	Users Number	Net Profit	Depreciation	Net Working Capital	Fix Asset	Total Cash Flow	Present Value
0	0	(20,000,000)	0	(10,000,000)	(10,000,000)	(40,000,000)	(40,000,000)
1	1,000	(18,000,000)	2,000,000	0	0	(16,000,000)	(14,285,714)
2	3,000	(14,000,000)	2,000,000	0	0	(12,000,000)	(9,566,327)
3	10,000	0	2,000,000	0	0	2,000,000	1,423,560
4	15,000	10,000,000	2,000,000	0	0	12,000,000	7,626,217
5	30,000	40,000,000	2,000,000	0	0	42,000,000	23,831,928
Net Present value after 5 years							(30,970,335)

According to the scenario analysis results, the investment return ratio is plotted out as shown in Figure 13. It is found that investment budget will be taken back in year 3 in pessimistic situation. Besides, it may take 1 year to take back the investment capital in optimistic situation. Hence, try to solve all technical troubles and promotion will shorten the investment break even point schedule.

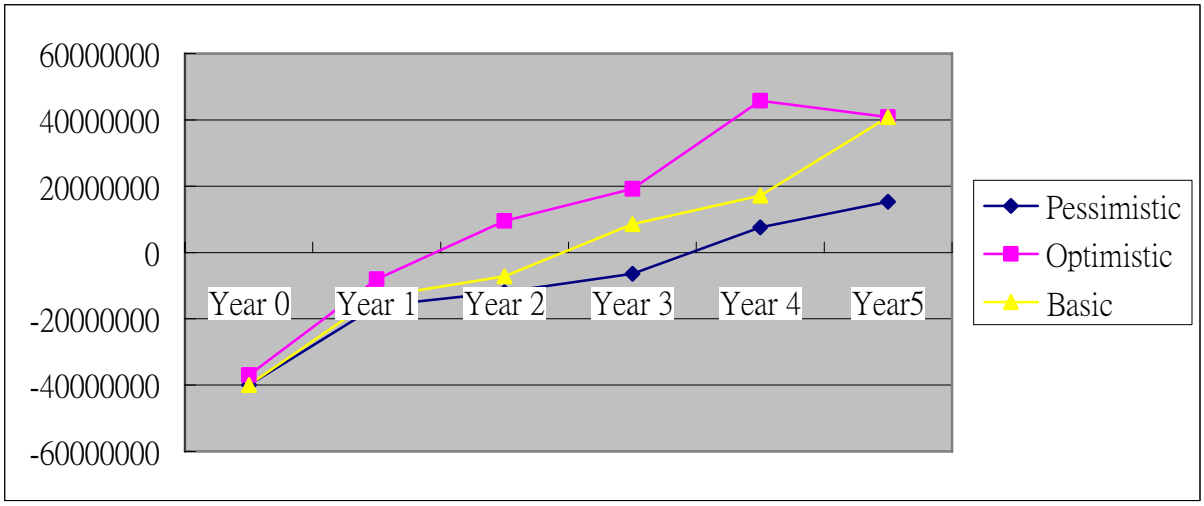


Figure 13 Scenario analysis results

3.3.2 Sensitivity analysis

We analyzed the sensitivity of the project by modifying profit margin from 10% to 30% and calculated the NPV percentage. Using this test, we found out the NPV of this enterprise in difference profit margin shown in Figure 14. According to the simulation, the capital will be taken back about 4 years after investment. The revenue is the key issue that the investment will be taken back sooner or later.

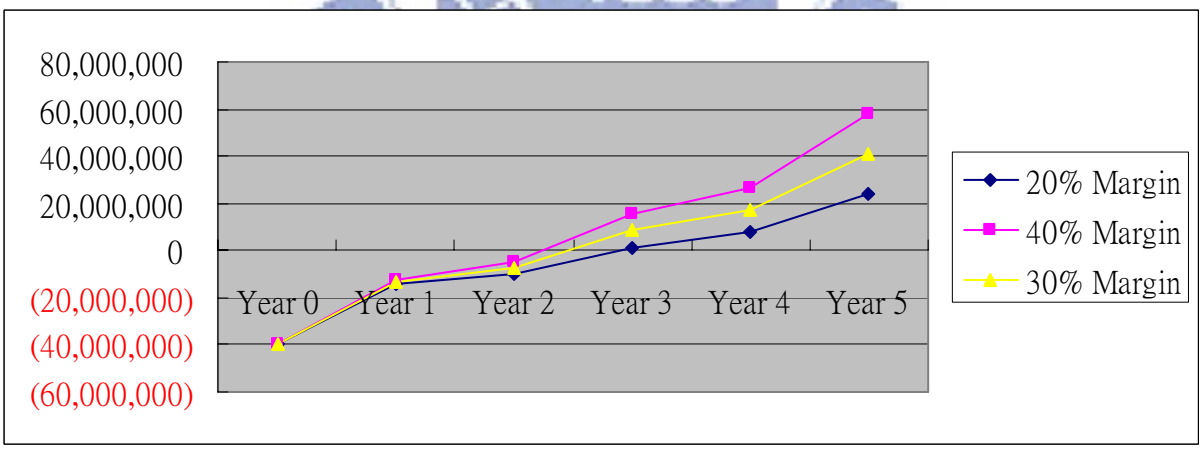


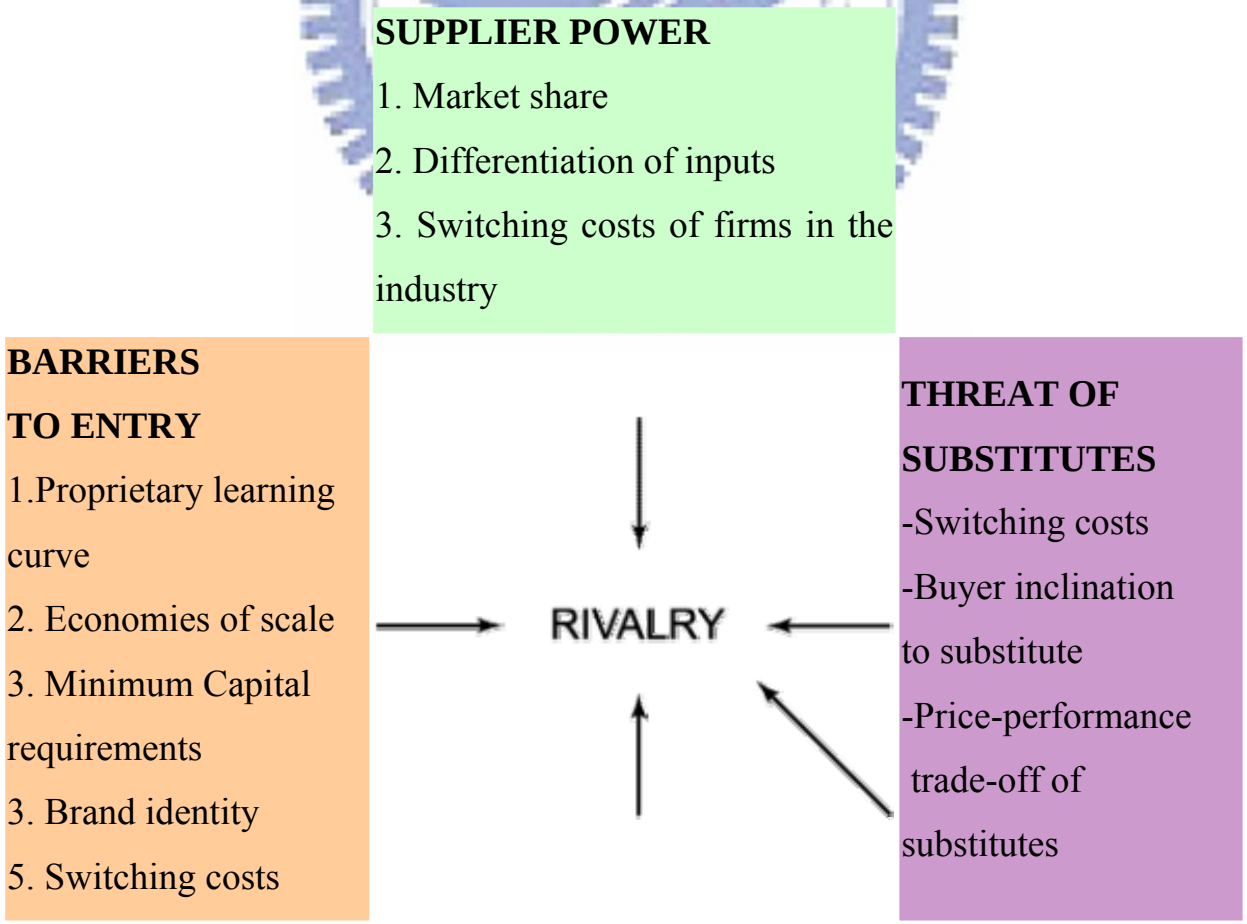
Figure 14 Sensitivity test results

3.4 Competitive strategy and Strength/Weakness analysis

Each enterprise needs to know his position in value chain. Michael Porter proposed a theorem to let the enterprise following the procedure to find out its position in value chain. Hence, 5 forces analysis, competitive advantage, and SWOT analysis are adopted in this thesis to explore the substantial risks and substitutes. We try to follow the procedure to analyze the strengths of and threats to the aids enterprise.

3.4.1 Michael Porter five forces analysis.

Michael Porter provided a framework that models an industry as being influenced by five forces. We try to use this model to better understand the aids industry context in which the firm operates. The model's framework is shown in Figure 15.



BUYER POWER	DEGREE OF
1. Buyer volume	RIVALRY
2. Buyer information	1. Exit barriers
3. Brand identity	2. Storage cost
4. Price sensitivity	3. **Fixed costs**

Figure 15 Analysis Aid industry using Porter's 5 Forces

a. Supplier Power: Most of the accessories are not special designs. Hence, the suppliers could be mechanism factory and PCB factory. The suppliers are replaceable, but low volume procurement causes weak bargain power.

b. The threat of substitutes: In Porter's model, substitute products refer to products in other industries. A product's price range is affected by substitute products - as more substitutes become available, the demand becomes more flexible since customers have more alternatives. A close substitute product constrains the ability of firms in an industry to raise prices. Aids tool or machine may be replaced by a servant. Hence, the retail price should not be higher than the value of the device. Besides, technical integration may cause the single-function aids be integrated to a multifunction consumer device, for example, mobile phone.

c. Barrier to entry: The entry barrier of aids is high economic scale, low ROI ratio, and huge switching cost. Besides, IP protection, international certification, and long investment return period will block new comers.

d. Buyer Power: Buyers are weak if products are not standardized and buyer cannot easily switch to another product. Buyers are fragmented (many, different) - no buyer has any particular influence on product or price. The

buyer power of end users seems weak in this industry. Yet, brand identity and price sensitivity will determine user's habit, if manufacturer faces huge channel enterprise, which means few buyers with significant market share. Buyers possess a credible backward integration threat - can threaten to buy producing firm or rival.

e. Degree of rivalry: With only a few firms holding a large market share, the competitive landscape is less competitive (closer to a monopoly). A low concentration ratio indicates that the industry is characterized by many rivals, none of which has a significant market share. These **fragmented** markets are said to be competitive. Due to high investment cost and high service cost, too many enterprises focus in this business will cause everybody lost money. Hence, few service companies in a population centre area may cause gentle competition. In addition, other industrial factories are familiar with mass production. They have rich experience in production and logistics. Nevertheless, they may not enter this area if a model of small quantity and wide variety is still the business style of aids industry. Yet, if market size expands to certain amount, it will cause other industrial rivalries to enter this industry.

3.4.2 Competitive advantage analysis

When a firm sustains profits that exceed the average for its industry, the firm is said to possess a competitive advantage over its rivals. The goal of aids' business strategy is to achieve a sustainable competitive advantage. Michael Porter identified two basic types of competitive advantage:

- Cost advantage

- Differentiation advantage

A competitive advantage exists when the firm is able to deliver the same benefits as competitors but at a lower cost (cost advantage), or deliver benefits that exceed those of competing products (differentiation advantage). Thus, a competitive advantage enables the firm to create superior value for its customers and superior profits for itself. Cost and differentiation advantages are known as *positional advantages* since they describe the firm's position in the industry as a leader in either cost or differentiation.

A *resource-based view* emphasizes that a firm utilizes its resources and capabilities to create a competitive advantage that ultimately results in superior value creation. Figure 16 combines the resource-based and positioning views to illustrate the concept of competitive advantage:

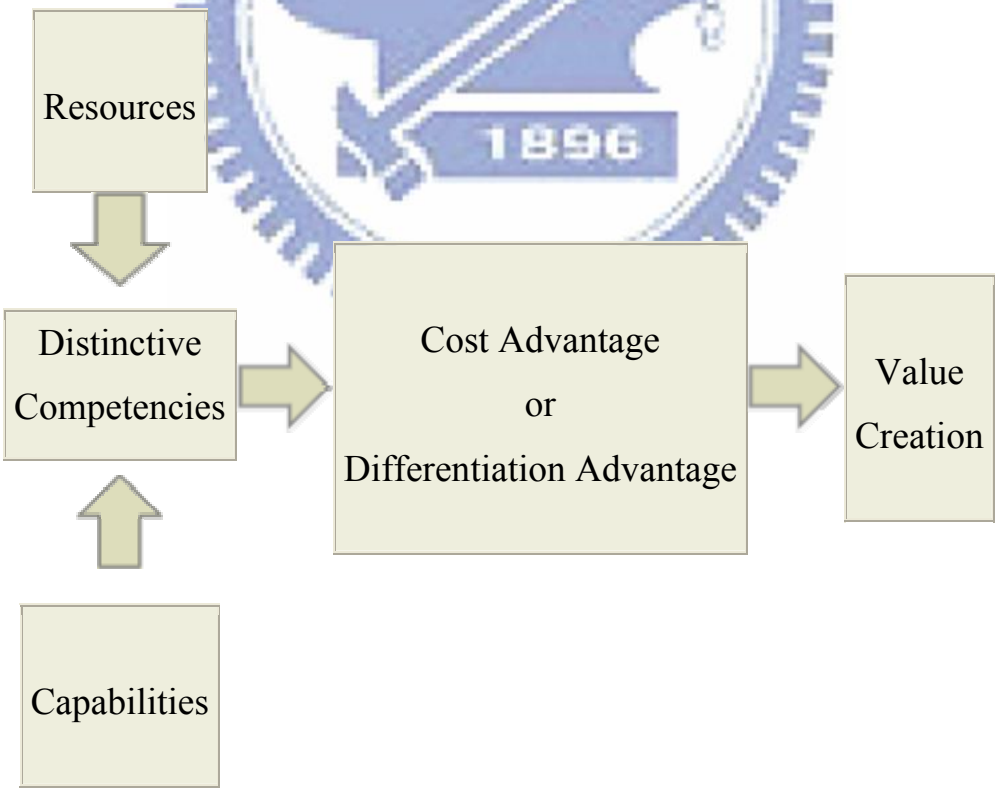


Figure 16 A Model of Competitive Advantage

Aids enterprise seems not able to provide cost advantage due to small quantity and wide variety. Stock and low cash flow will cause pressure on business. Hence, adding human engineering may provide difference advantage. Besides, just in time manufacture, web based selling, and adding some disposable materials in the device may provide extra value to the enterprise.

Strengths, Weaknesses, Opportunities and Threats Analysis (SWOT)

SWOT analysis provides a practical method to describe the present status of aids enterprise. The analysis results are shown in Table 8.

Table 8 Strengths, Weaknesses, Opportunities and Threats Analysis

S	● Long term and stable interaction with value chain enterprise. ● Collaboration team has common consensus ● Very good reputation with professional skill ● Possesses innovative approach in designing and building frames. ● Speed and great flexibility than potential competitors	O	● The demand for aging care device can be expected to increase by 20 percent in next decade. ● 2 to 3 percent of annual growth for the next four years. ● Anticipate at least a 15 percent increase in sales in 2006 and then 3 percent every year after that for the next four years. ● Light weight and cheap modules are developed. ● More and more elders live alone and they have enough budgets to buy service.

W	● Technology development needs more time and fund for support ● A substantial amount of work to do in order to obtain a large portion of the market. ● Currently competing with huge international enterprises in the U.S. and Europe who are dominating this market. ● National loyalty often is a factor in choosing aging care device. ● Budget constraints and resources need further integration ● Manpower fluctuation and technology IP protection await further effort ● Because of its relatively small size, this enterprise is not a common name among non-professional users.	T	● Financial constraints cause enterprises lacking long term development planning and strategy ● International enterprises in Europe and America may enter local market and threaten the development of local enterprise and survive opportunities. ● Numbers of the high-end medical device companies have retooled their facilities to take advantage of the sustained demand for health care device manufacture and have been aggressively pursuing market share in the U.S. and abroad.

3.5 Chapter Conclusion

The chapter illustrates the business model for aging care service enterprise. First, the bottlenecks, products, markets, economics, opportunities and risks were explored. Second, business plan, service model and business opportunities

were discussed. Then, we tried to count the revenue and gross profit margins in the first 5 years. The net present value was predicted and the investment taken back schedule in different profit margin was calculated using scenario analysis and sensitivity test. We assume system maintenance and payroll around 20,000,000 NTD per year. Gross margin is 30% of revenue and required rate of return is 12%. High fix cost and few clients number cause negative present value even profit margins is 30%. Hence, decrease fix cost, attracting group elders to order the service, enlarging market size are important issues for care service to break even. Leverage value chain enterprises' resources and lease their capacity we cost down fix cost of the service enterprise. Besides, home for the aged will be the potential group customers of this business. It may help the service center to well use its capacity to service several group users at a time and enlarge market scale.

Hereafter, the SWOT analysis, 5 forces analysis, and competitive advantage analysis of Michael Porter are used to estimate the environment climate. According to the simulation results of this chapter, caring business seems profitable. It is possible to reach break even point in 3 years after established. Yet, low ROI and Low MIRR ratio caused some troubles in managing enterprise cash flow. Hence, stable shareholder structure, focusing on the city population and profitable service will make the investment more economic and more affordable. The firm must perform value creating activities before making money from clients. Besides, keeping at least 30% of gross margin and creating extra value are still the most important core competence of aging care enterprise.

Chapter 4 Marketing strategy and value creation

As the aging of elders becomes reality, elders sometimes need some aid/assistance service for their daily living or life support. Besides, the children of these elders may move to other cities or can not provide living support during day time. Hence, aging care service can provide necessary help when needed. Yet, aging care service items are very sophisticated and need to integrate different fields of resources into a system. Therefore, how to manage such kind of business and create value seems important for aging care enterprises. This chapter discusses aging care service's marketing scope system and penetration strategy as shown in Figure 17. We try to use 4P strategies which are product, price, place (distribution), and promotion to analysis the marketing strategy. Besides, advantages and drawbacks of the agents, compitators, sun-contractors and other associated groups are analyzed. Then, proper pricing, suitable products, sales in the right place and good promotion skills will help the enterprises penertrate the target market. Finally, 4 fields have to be analyzed, which are political and legal regulation, economic, technology trend, and social culture. This chapter will try to discuss all marketing issues one by one in the following section.

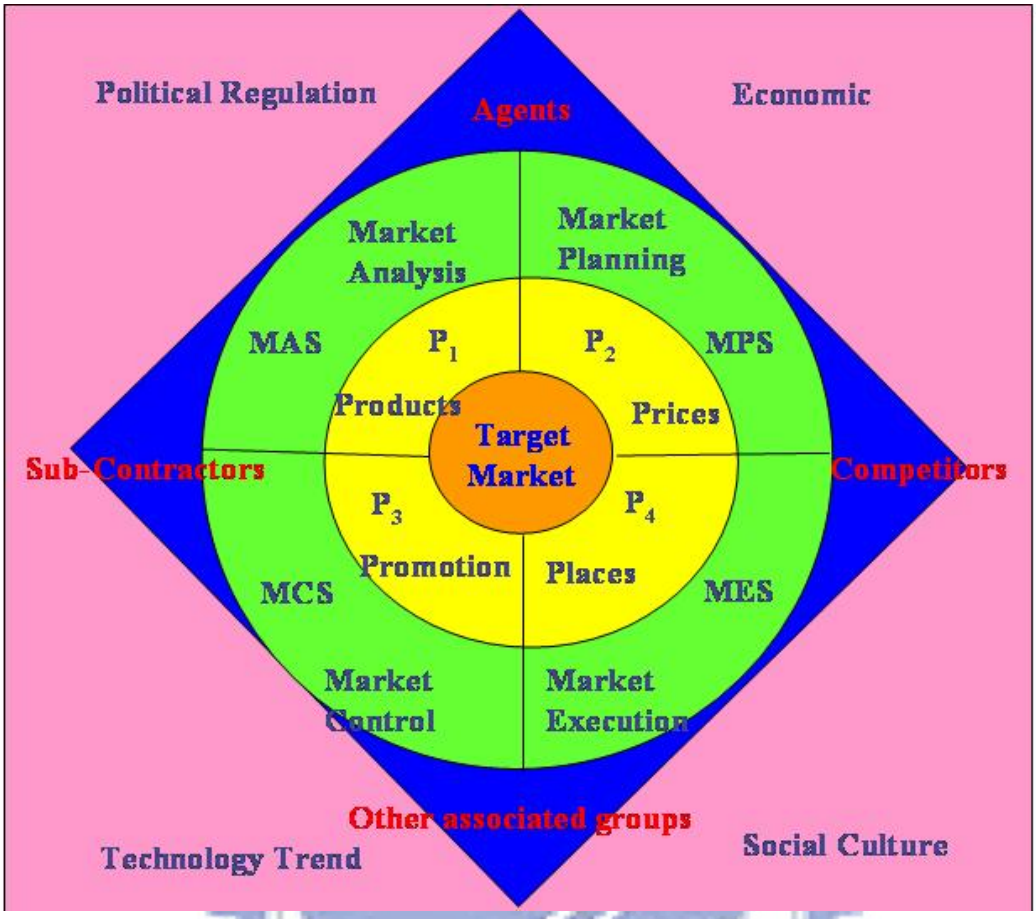


Figure 17 Market scope and penetration strategy

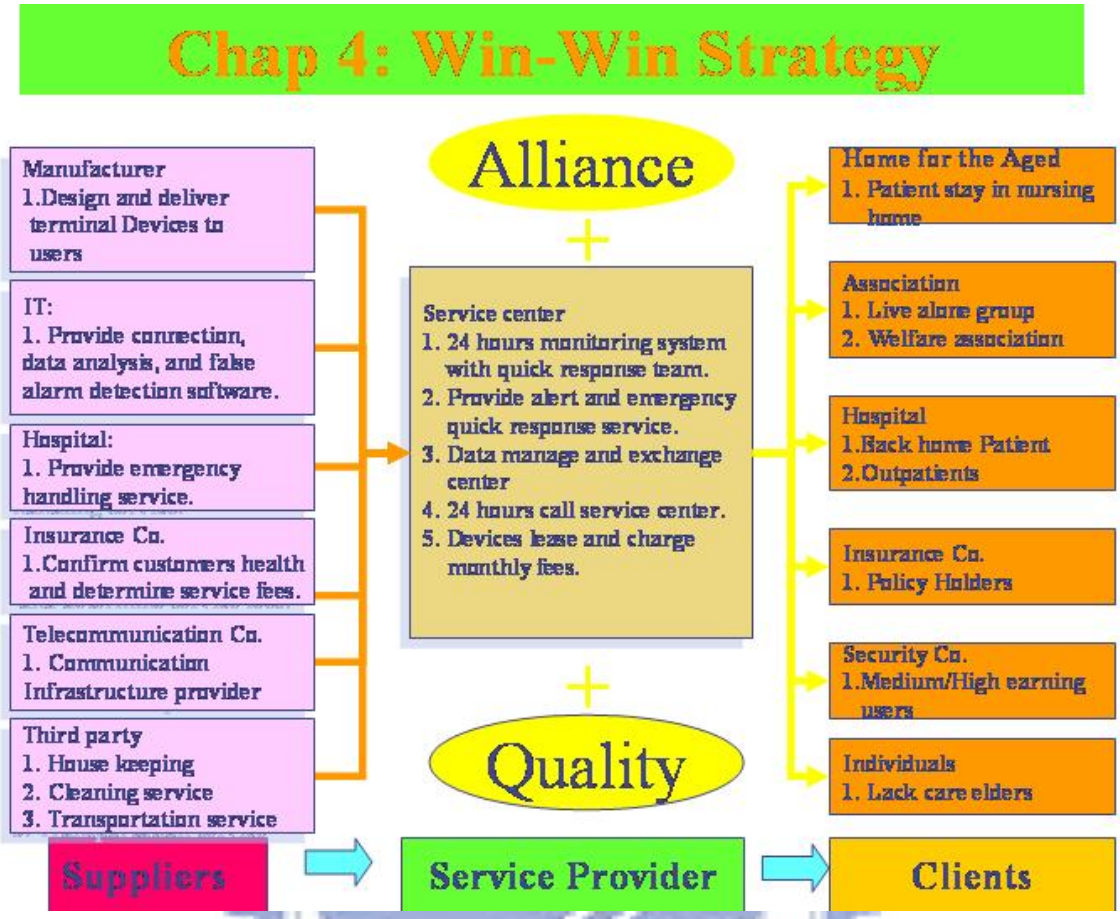


Figure 18 Role of value chain enterprises

4.1 Study structure and customer needs assumption

Home caring is the long-term rehabilitation and nursing measures that the groups of people, which are less or lacking in independent abilities in daily lives, such as the elders, chronic patients and the injured, can receive after disengaged for the acute state of disease and leaving the hospital. According to the definition of home medical caring given by Department of Health and Human Service, DHHS, of the United States, it is “part of continuous health care which provides caring services on individuals and at residences. The purpose of theses services is to instruct and demonstrate the nursing techniques to enable the chronic patient to have the abilities of independent self-caring and the families of patients to have the abilities to take care of the patients.” Medical care does not only relieve the pressures on the demands on wards, which are very common

in major medical facilities, but also provide the patients more varieties of options and more proper services based on humanity and industrialized management.

4.1.1 Application of products:

Home care means, by using new inventions and equipments, to provide services at residences, such as medical and health care to individuals and families and social works, etc., in order that those patients who have to be hospitalized now can have the intended medical attentions at homes, or other places, such as elder homes and nursing facilities, and to reduce the enormous costs on medical care for the elders in the future by providing home monitoring instruments for those who are having rehabilitation therapies to self-examine and for the patients' families to monitor the patients.

The purpose of home care is to provide those who do not have to be hospitalized with continuous medical attentions by keeping the communications between the patients and hospitals in order to reduce the anxiety of the patients and families after being released from the hospital, and help reducing the damages caused by the disabilities and diseases. At the meantime, it can also minimize the manpower of commuting between home and hospital and the inconvenience of going to hospital to reduce the risks of the complications due to long-term hospitalization. And the meantime, it can promote the effective uses of medical resources and reduce the huge economic burdens of aged people. The break-through of the medical diagnostic instruments enables homes to evolve into important places that can provide medical and health care. And the combination of innovating technologies, such as digitalization and communications, increases the effects of medical and health care. For example, the Intelligent Maintenance System (IMS), which

combines communication and physical monitoring system, has made monitoring instruments part of everyday lives and the system can acquire physical information through Internet and raise the alerts in emergencies. By using IMS, the whereabouts of the elders can be tracked and the walking modes can be analyzed. Once there is any abnormal situation, it can diagnose the disease at real time. Through the concept of beforehand prevention, the national budgets and the costs of personal insurance can be reduced. IMS, which combines biotechnology, electrical medical equipments and communication networks, can perform long-term monitoring on the daily lives of the healthy elders, and provide health assessment and consulting through the data transmission of the information systems in order to inform the medical personnel when there is any abnormality. This can not only reduce the costs of medical care for aged people, but also maintain the healthy and independent living qualities of aged people.

4.1.2 Service contents:

Home medical care services may cover the rehabilitation of acute and chronic diseases after cured and elder cares, etc. The products can be in both software and hardware. Software is the techniques, resources, professional and unprofessional personnel for medical cares, and the hardware is the various health care and nursing equipments. The following is the discussion of the software and hardware:

Software: This includes the human resources and services required for medical care, such as the orderlies for showers, house keeping and moving patients, cooks, doctors, nurses, nutritionists, psychological consultants, psychological therapists, linguistic therapists, artificial limb specialists, respiratory therapists, health consultants, physical therapists and occupational therapists, and the health

insurance for the middle aged people and the elders. In recent years, because of the progress of modern technologies, such as wireless communications, multimedia and wide band networks, many of these advanced technologies have been used for medical cares. The term “telemedicine” means that the patients can be closely monitored through the fast transmission of information, even though the patients are not in hospital.

Hardware: This includes the equipments and machines required for medical cares, such as medical instruments, the aids for those having trouble to move about, the tools to move the patients and medical consumables, etc. Based on the service contents, it can also be categorized as long-term care, out-of-hospital cares and high-tech medical cares. The long-term cares mean the rehabilitation, monitoring and cares for the elders and seriously ill patient. The out-of-hospital cares mean the linguistic, occupational and physical therapies and nursing services for the patients, after being released by the hospitals, which have muscle or neural injuries. The high-tech medical cares mean the therapeutic and medical services for the patients by using scientific technologies and instruments. In addition, in the past a few years, because the booming telemedicine, real time medical and care services can be provided for the patients through the remote data and figure transmission enabled by the IT and Internet.

Service: This includes the living supports that are needed by elders. Housing keeping, rehabilitation, transportation are included in the support. It can also expand to automatically monitor the status of the elders, records the life signals, and call for quick response help.

4.2 Caring items life cycle and product positioning

Each product has its own life cycle. Product life can be divided into four different stages, which are introduction, growth, maturity, and decline stages as

shown in Figure 19. Understanding the requirements in each stage will provide necessary information for marketing and promotion. During introduction stage, we need to promote the functions of service, popularity and let the users familiar the function of the device. During growth stage, we need to develop a strategy to expand the market size. As for the maturity stage, maintaining the market share is the most important object. Finally, cost down during decline stage and trying to develop a brand new product to replace old product are the priorities in the decline stage. Aging care service is still in the introduction stage. Hence, promotion, creating more popularity and comprehensibility are important business strategy. Shown in the below, we will focus on the introductory stage's marketing strategy analysis.

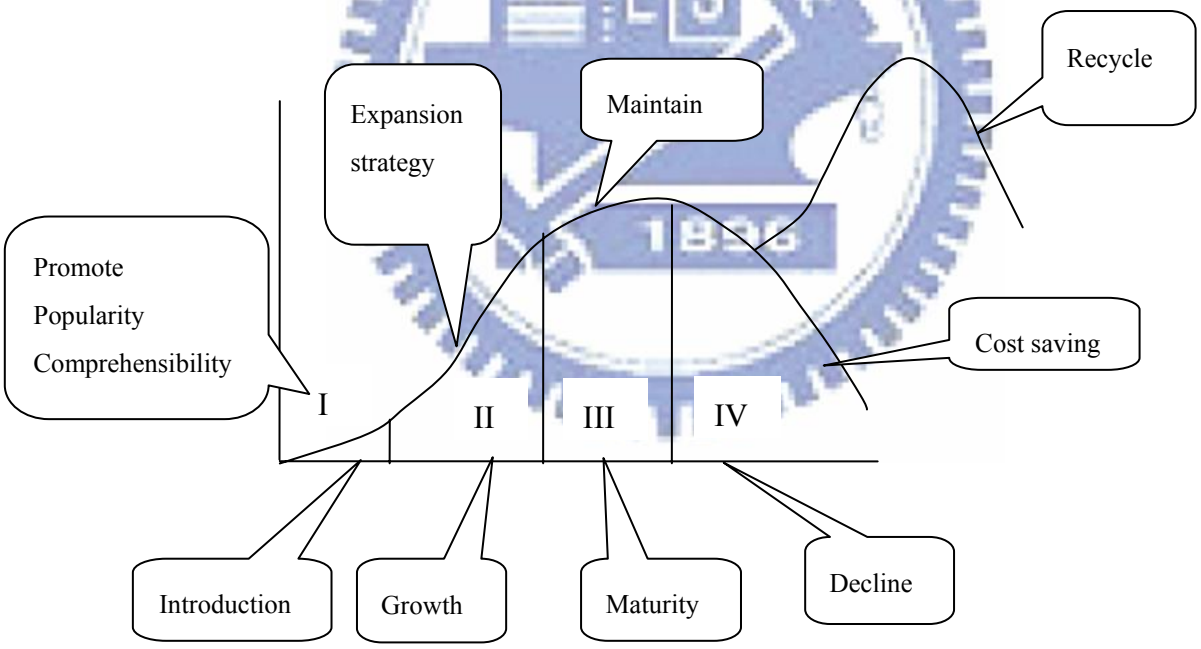


Figure 19 Product life cycle

4.3 Market data collection, process and analysis method

Market data is the most important decision information to the enterprise. Enterprise can join the related associations and establish standards to lead the

fashion. Besides, publishing the related technology in the journals and conference papers will let the professional to access the information and to provide some academic favor. It is an important promotion strategy in the introduction business. Organizing a new product presentation fair or attending the international fair allows enterprise to collect customer anticipation. Providing training courses, consulting windows, and providing necessary demo equipments will attract the customers to familiarize with the function of new device. Finally, integrating whole production line, providing full package services and having channels to provide after-sale services will provide more service items to customer.

According to David Louis' theorem about modern consumers' consumption behavior, most consumers lack time, attention and confidence. Hence, a motivation strategy for products needs to be developed for attracting users' interest and desire. Consumers will examine the following issues when purchasing a commodity.

1). Confirm the needs.

2). Determine product specifications.

3). Test product functions.

4). Evaluate suppliers.

4.3.1 Buyer groups' behavior analysis:

1). Join the related associations and try to establish standards.

2). Publish the related technology in the journals and conference papers. Form a leadership in this group.

3). Organize a new product presentation fair

4). Provide the training courses and consulting windows, and provide the

necessary demo equipments.

5). Integrate whole production line and full package services. Let the channel or agent approve company's capability and after-sale services.

6). Integrate agents and keep selling to the customers, and provide pull and push environment

3.3.2 Enterprise Positioning in the target market

1). Channels: Broadcasting, promotion, and attracting clients to buy the service are the main goals. Marketing cost is the main expense of the channels. Hence, shrinking the marketing cost and selling products through the internet is also a good idea. Besides, providing the necessary loan and paying by installments will provide good incentives to the users. Besides, providing new service items or outsourcing new devices will maintain the revenue.

2). Manufacturer: Provide ODM or direct B2B devices to channel. Channels will give manufacturers' product specifications, and manufacturers need to design & manufacture products in 6-8 months.

3). Agents: Face the clients and sell device or service to clients.

4).Clients: Most consumers lack time, attention and confidence. Hence, product promotion needs to develop a strategy in order attract users' interest and necessity of the device.

3.3.3 New service and new product

1). New product development: Providing added function to new products and applying intellectual property protection are very important. Enterprises need to apply IP protection before selling the devices if possible.

2). Services: Since some elders have troubles in reading or reasoning the manual, providing operation training seems necessary and it costs dearly.

Hence, fool proof is very important design to users, and simplified design and friendly interface should be designed into the product.

4.4 Value creation

Aging caring business is service oriented business. Functions of the service may assist the aging people to be more comfortable in their daily life and to help the aging people improve life quality. Hence, providing convenience service, cheap monthly fee, health monitor, and health management functions are essential issues to the aging care business. Therefore, using state of art technology and integrating existing service system will be important in elders caring service. According to the research of Lawler (1998), after many technologies have been used on the design of aids, consumers' demands are most important value creation that needs to be paid on the design of aids service:

1) Functionalization: Does the product meet the requirements for operating? Is it easy for users to operate? What about replacement and maintenance? Is it easy to install and deliver? Can somebody else use it? And so on.
2) Fitness: Is the product comfortable to touch and smooth to operate? Does it fit the dimensions of the user's body? Is it adjustable? And so on.
3) Appearance: Are the color and style of the products appealing and artistic? Will the product be labeled as for use of the mentally and physically disabled people? And so on.
4) General fitness vs. individual fitness: Would regular people use this product? And so on.

4.5 Customer consumption behavior analysis

When marketing a product, we have to analyze customer consumption behavior, competitor business model, potential collaborator, and the climate of

the product related environment. Each topic described above includes several items. The measurement items are described as shown below.

a. Consumption behavior

- Number: Clients can buy service every year.
- Type: Provide service for elders that they need in helpless situation or provide emergency care service.
- Value drivers: Provide convenient, quick responding services that are executed by qualified team.
- Decision process:

  1). Clients must confirm that the service fits their needs.

  2). Understand the service package and detail specification.

  3). Easy to test the products function.

  4). Evaluate the supplier's credit

b. Competitor Analysis

- Market position
- Strengths
- Weaknesses
- Market shares

c. Collaborators

- Subsidiaries, joint ventures, and distributors, etc.

d. Climate

- Political and legal environment
- Economic environment
- Social cultural environment
- Technological trend

4.6 Product 4P strategy

We use 4P strategy to describe the necessary promotion strategy. We describe Product's advantages, Brand name, Quality, Product line, Warranty and Packaging first. Second, we examine Pricing strategy, Expected volume, Discounts, Bundling, Payment terms, Financing options and Leasing options. Then, describe the Direct sale, retail, Distributors and intermediates. Finally, Advertising and Promotional programs are illustrated.

1. Product: The product decisions should consider the product's advantages and how they will be leveraged. Product decisions should include:

   - Advantage:

     a. Reliable wrist type physiology monitoring device.

     b. Signs of life detection and emergency connection to service center.

     c. Built-in auto-diagnostic program.

   - Quality:

a. Easy to use: Push one button to call emergency service

b. Reliable and water proof.

- Series:

a. Standard model: Provide a stand alone PC program to manage user's health.

b. Luxury model: Wireless connection to data analysis and exchange center.

- Warranty

a. provide 1 year warranty for the device

b. Provide discount if upgrading to newest model

2. Price: Discuss pricing strategy, expected volume, and decisions for the following pricing variables:

- Provide discounts to security and insurance enterprises' customer. Bundling security service or insurance contract. Charge extra service fees (10 NTD per call) through telecommunication service enterprises.
- Provide leasing options to hospital released patient or outpatients. Leasing fees will be 5000 NTD per year.
- Provide on-line health diagnosis service and alert monitoring. Charge extra service fees (50 NTD per call) through telecommunication service enterprises.
- Provide 30% discounts to upgrade model or users' relative.

3. Distribution (Place): Decision variables include:

- Existing channels:

  a. Security service sales channel

  b. Insurance sales channel

  C. Telecommunication service distribution

- Group Users:

  a. Users in sanatorium

  b. Hospital outpatient service

  c. Government supported societies/associations

  d. Non-profit welfare associations

- Retail:

  a. Convenient stores

  b. Pharmaceutical/medical device retail channels

4. Promotion

- Advertising:

  1. Leverage existing security advertising

  2. Publish papers to medical society conference.

- Public relations:

  1. Provide free samples to influential users or medical doctor

4.7 Chapter Conclusion

People have 5 basic needs as shown in Figures 20. For most healthy people, the career achievement is the self-esteem they hope to carry out. Yet, elders focus more on physiological health or security issues. Hence, caring service needs to provide added value that assists the elder to improve daily live quality. This chapter illustrates value creation process and marketing strategy.

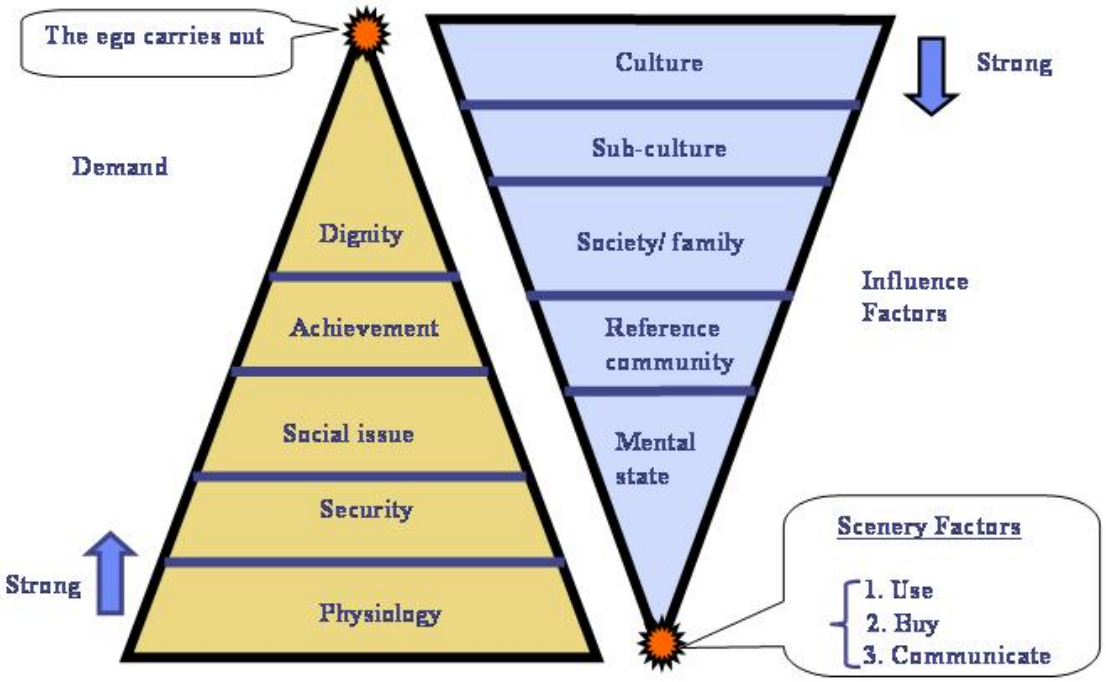


Figure 20 People have 5 basic needs

Chapter 5 Medical Enterprise financial health calculation

Financial health and financial performance are important indicators to an enterprise. Through analyzing the financial reports and calculating the indicators, it will let enterprises know how to measure the financial status of a business. We try to download the background and financial statement of 7 medical device enterprises first. The data are used to calculate return of invested capital (ROIC), weighted cost of capital (WACC) and extra value return rate. Then, their key value drivers are analyzed. Finally, we try to figure out aging care enterprise value based management system. These 7 companies analyzed in this chapter focus on some medical device manufacture, that is, clinical diagnosis disposable material (Apex Biotechnology), medical electronics (HEALTH & LIFE, ROSSMAX INTERNATIONAL, APEX MEDICAL, MICROLIFE CORPORATION, PIHSIANG MACHINERY) or disposable plastic materials (PACIFIC HOSPITAL SUPPLY)

5.1 Basic information of the compared enterprises

The comparison of basic information between companies is shown in table 9. According to major operation business statement, we find most medical device companies focus on small categories of device manufacture. Most of the medical companies IPO date is around AC1990. Capitals are below 1 billion NTD except PIHSIANG. Nevertheless, product gross margins are very low. Yet, they focus on single product manufacture and marketing.

Table 9 Basic information of medical companies Unit: 1000 NTD

Company Name	HEALTH&LIFE CO.,LTD.	PACIFIC HOSPITAL SUPPLY CO., LTD.	Apex Biotechnology Corp.	MICROLIFE CORPORATION	APEX MEDICAL CORP.	ROSSMAX INTERNATIONAL LTD.	PIHSIANG MACHINERY MFG. CO., LTD.
Company code number	1781	4126	1733	4103	4106	4121	1729

Major operation business	1. Electrical blood pressure meter	1. Medical gas connector and plastic accessory manufacture 2. Hospital central gas system construction and maintenance	1. Blood Glucose strips and meter manufacture	1. Electrical blood pressure meter Digital body temperature meter 2. Green environment device manufacture	1. Prevent bedsore cushion bed Welfare device 2. Medical electronics manufacture	1. Electrical blood pressure meter	1. Electrical power derived car for elders and deficient people
Establishing Date	1985/12/16	1966/8/6	1986/12/2	1970/11/10	1979/3/17	1977/11/2	1972/12/22
Collected Capital	212,150	301,315	717,680	993,050	604,000	430,661	1,705,412
Revenue	1,333,074	2,380,353	492,986	492,986	1,008,158	623,871	2,288,021
IPO date	1993/12/24	1993/2/9	1990/9/17	1990/3/29	1991/1/22	1992/7/25	1990/3/21

Financial statement and balance sheet of an enterprise can be decomposed into several items as shown in Figure 21. Using the items in financial reports, we can depict an enterprise value, health and profitability. In this following section, we calculate the financial indices of 7 medical device manufacture enterprises and try to compare and analyze the calculated data.

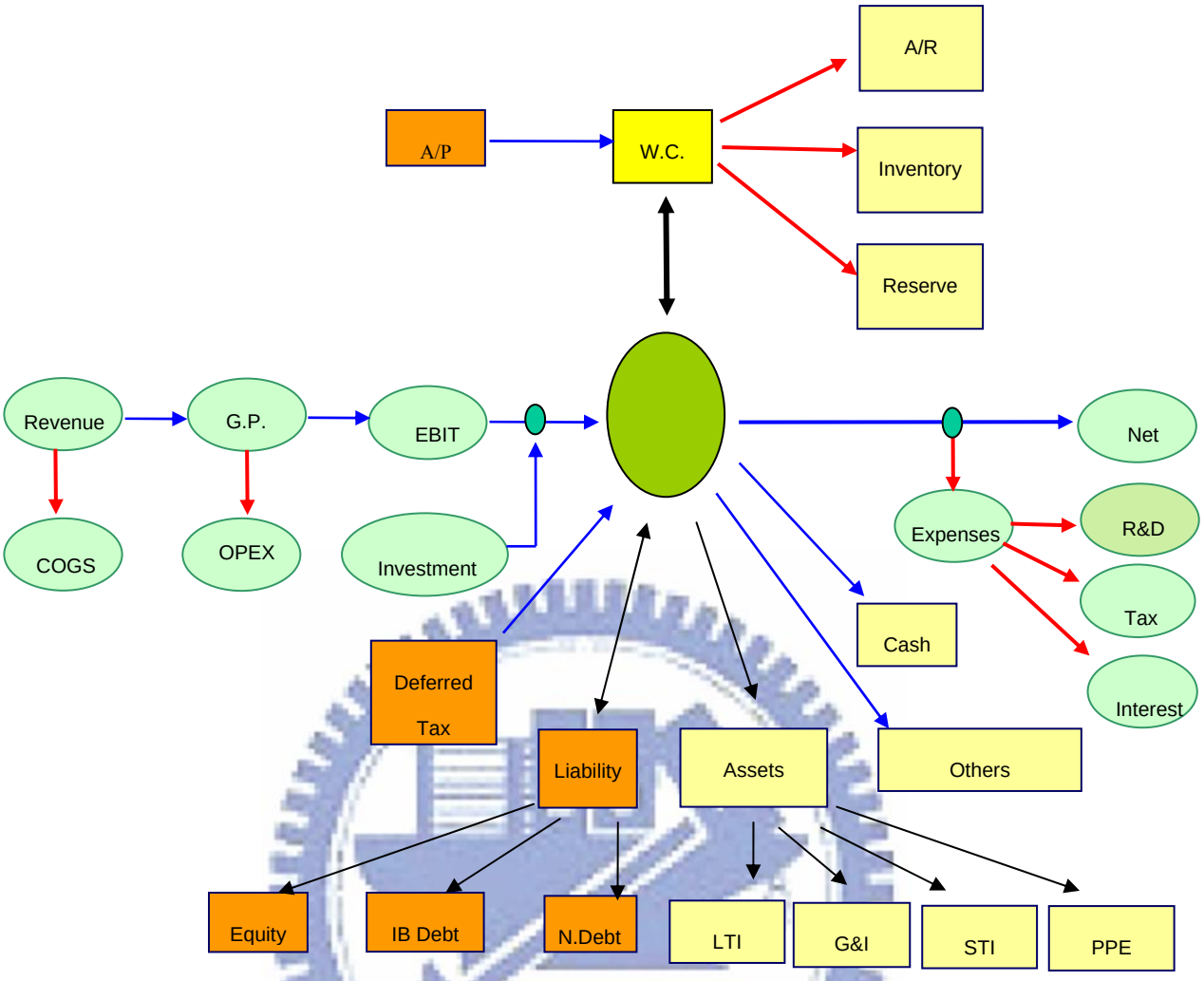


Figure 21 Decomposition of enterprise financial reports into segment (Excerpted from the powerpoint file of Jamues Liu)

5.2 Business valuation relative indices definition

There are several financial indices that can be used to describe the enterprise profitability, financial performance and value. These indices can be used to evaluate the enterprise management status. Index definitions are described in Table 10.

Table 10 Finance index definition

Earnings before	EBIT - Adjusted Taxes(Taxes	$	A measure of a company's earning power from ongoing operations, equal to

interest and taxes (EBIT)	adjusted for tax on interest).		earnings before deduction of interest payments and income taxes. EBIT excludes income and expenditure from unusual, non-recurring or discontinued activities. In the case of a company with minimal depreciation and amortization activities, EBIT is watched closely by creditors, since it represents the amount of cash that such a company will be able to use to pay off creditors, **also called** operating profit.
Net operating profit less adjusted taxes. (NOPLAT)	EBIT - Adjusted Taxes(Taxes adjusted for tax on interest).	$	An estimate of what a company would earn if it didn't have any debt, equal to operating income times (1 minus the tax rate). For companies which use leverage, NOPAT is an alternative measure for measuring operating efficiency. NOPAT is frequently used for calculating Economic Value Added (EVA).
Return on Invested Capital. (ROIC)	(Net income-Dividend)/ Total Capital	As % Capital	A measure of how effectively a company uses the money (borrowed or owned) invested in its operations. Calculated by: net income after taxes / (total assets less excess cash minus non-interest-bearing liabilities).
Weighted Averag	$WACC = R_e E/V + R_d (1 - t_d) D/V$	As % Total Value	An average representing the expected return on all of a company's securities. Each source of capital, such as stocks,

e Cost of Capital (WACC)	where: R_e = *cost of equity capital* R_d = *cost of debt* E = *market value of equity* D = *market value of debt* V = $D + E$ = *total value of* t_d = *investor tax rate on de*		bonds, and other debt, is assigned a required rate of return, and then these required rates of return are weighted in proportion to the share each source of capital contributes to the company's capital structure. The resulting rate is what the firm would use as a minimum for evaluating a capital project or investment.
Return on Assets (ROA)	Fiscal year's earning/Assets	As % Assets	A measure of a company's profitability, equal to a fiscal year's earnings divided by its total assets, expressed as a percentage.
Return on Equity. (ROE)	Fiscal year's earning/Assets	As % Assets	A measure of how well a company used reinvested earnings to generate additional earnings, equal to a fiscal year's after-tax income (after preferred stock dividends but before common stock dividends) divided by book value, expressed as a percentage. It is used as a general indication of the company's efficiency; in other words, how much profit it is able to generate given the resources provided by its stockholders. Investors usually look for companies with returns on equity that are high and growing.
Current Ratio	Total Current Assets/ Total Current	= x Liabilities	Current Assets are assets that you can readily turn in to cash or will do so within 12 months in the course of business.

	Liabilities		Current Liabilities are amount you are due to pay within the coming 12 months. For example, 1.5 times means that you should be able to lay your hands on $1.50 for every $1.00 you owe. Less than 1 times, e.g. 0.75 means that you could have liquidity problems and be under pressure to generate sufficient cash to meet oncoming demands. If the ratio is less than one then they have negative working capital. 2. A high working capital ratio isn't always a good thing, it could indicate that they have too much inventory or they are not investing their excess cash
Quick Ratio	(Total Current Assets - Inventory)/ Total Current Liabilities	As % Current Liabilities	Similar to the Current Ratio but takes account of the fact that it may take time to convert inventory into cash.
Working Capital Ratio	(Inventory + Receivables - Payables)/ Sales	As % Sales	A high percentage means that working capital needs are high relative to your sales.

We try to use these indices to calculate 7 medical device enterprises value. The latest financial statement and balance sheet (AC2003) can be downloaded from market observation post system website. The software Microsoft Excel is used to store the necessary financial information and calculate net operating

profits less adjusted Taxes (NOPLAT) as shown in Table 11.

Table 11 Basic financial parameters and NOPLAT calculation method

Unit: 1000NTD

Company Name	HEALTH &LIFE CO.,LTD.	PACIFIC HOSPITAL SUPPLY CO., LTD.	ROSSMAX INTERNATIONAL LTD.	APEX MEDICAL CORP.	Apex Biotechnology Corp.	MICROLIFE CORPORATION	PIHSIANG MACHINERY MFG. CO., LTD.
Stock No.	1781	4126	4121	4106	1733	4103	1729
Revenue	$1,333,074	$492,986	$492,986	$1,008,158	$623,871	$2,380,353	$2,288,021
Cost of Goods Sold	$1,060,340	$343,462	$343,462	$651,573	$333,878	$1,407,486	$1,227,335
Gross Profit	$272,734	$149,524	$149,524	$356,585	$289,993	$972,867	$1,060,686
(-)cost of Business activity	$96,656	$95,232	$95,232	$213,515	$118,923	$310,052	$218,331
EBIT	$176,078	$54,292	$54,292	$143,070	$171,070	$662,815	$842,355
Tax On EBIT	$27,117	$11,469	$11,469	$1,956	$5,729	$72,351	$47,000
Change in Deferred Taxes	$2,414	$2,128	$4,130	$9,091	$8,560	$0	$2,058
NOPLAT	$151,375	$44,951	$46,953	$150,205	$173,901	$590,464	$797,413
Rank	2	7	6	3	1	5	4

5.3 Enterprise financial performance analysis

In order to calculate the financial indices including ROA, ROE, ROIC, current ratio, quick ratio, and working capital ratio, we try to write down AC2003 balance sheet data in Excel as shown in table 13. These data can be used to calculate these indices.

Table 12 Enterprise profitability parameters abstracted from AC2003 balance sheet.

Company	HEALTH&LIFE CO.,LTD.	PACIFIC HOSPITAL SUPPLY CO., LTD.	ROSSMAX INTERNATIONAL LTD.	APEX MEDICAL CORP.	Apex Biotechnology Corp.	MICROLIFE CORPORATION	PIHSIANG MACHINERY MFG. CO., LTD.
Stock No.	1781	4126	4121	4106	1733	4103	1729
Receivable	73922	80771	126945	114062	104768	220646	196155
Payable	94810	28027	11205	40208	11394	5572	263681
Current asset	486,751	299,346	420,859	561,441	709,860	1,329,862	1,949,385
Current Debt	315,946	152,562	104,577	211,208	126,163	648,521	368,211
Current Liability	315946	152562	104577	211208	126163	648521	368211
Inventory	149898	83914	11356	78371	143109	78371	199615
Net working capital	170,805	146,784	316,282	350,233	583,697	681,341	1,581,174
Net PP&E	97,267	100,569	214,680	415,010	94,657	142,063	889,348
Net of Other Liabilities	12,894	55,026	4,701	67,397	25,047	62,258	57,597
Liability	252400	303733	657315	776056	836817	1342741	2897825
Total Operation Capital	280,966	302,379	535,663	832,640	703,401	885,662	2,528,119

ROIC value equals to NOPLAT divided by net investment capital. We try to use the following financial data to count the ROIC and the processing data are shown in Table 13.

Table 13 ROIC calculation					Unit: 1000 NTD		
ROIC=NOPLAT/Net investment capital							
Company	HEALTH & LIFE CO.,LTD.	PACIFIC HOSPITAL SUPPLY	ROSSMAX INTERNATIONAL LTD.	APEX MEDICAL CORP.	Apex Biotechnology Corp.	MICROLIFE CORPOR	PIHSIANG MACHINERY MFG.

		CO., LTD.				ATION	CO., LTD.
Stock No.	1781	4126	4121	4106	1733	4103	1729
Current asset	486,751	299,346	420,859	561,441	709,860	1,329,862	1,949,385
Current Debt	315,946	152,562	104,577	211,208	126,163	648,521	368,211
Net working capital	170,805	146,784	316,282	350,233	583,697	681,341	1,581,174
Net PP&E	97,267	100,569	214,680	415,010	94,657	142,063	889,348
Net of Other Liabilities	12,894	55,026	4,701	67,397	25,047	62,258	57,597
Net investment capital	280,966	302,379	535,663	832,640	703,401	885,662	2,528,119
ROIC Priority	54% 2	15% 6	9% 7	18% 5	25% 4	67% 1	32% 3

The above data can be used to calculate ROIC, ROA and ROE value as shown in Table 14.

Table 14 Enterprise profitability index

Company	HEALTH&LIFE	PACIFIC HOSPITAL	ROSSMAX	APEX MEDICAL	APEX BIOTECH.	MICROLIFE	PIHSIANG
ROIC	54%	15%	9%	18%	25%	67%	32%
ROA	36%	18%	13%	25%	24%	50%	43%
ROE	70%	18%	8%	18%	20%	49%	29%

The profitability index of comparison enterprises is plotted as shown in Figure 22. The figure depicts the level of profitability of these 7 enterprises and we find Health & Life and Microlife have better financial performance.

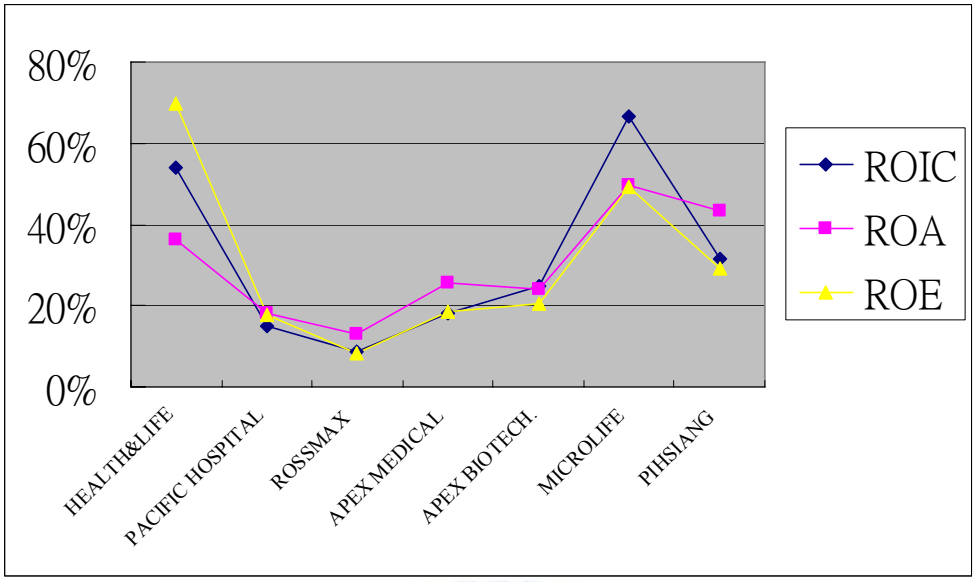


Figure 22 Enterprise financial performance analysis

5.4 Enterprise financial health analysis

In order to analyze and make sure that these enterprises do have good financial health, we also calculate current ratio, quick ratio, and working capital ratio as shown in Table 15.

Table 15 Enterprise financial health analysis

Company	HEALTH&LIFE	PACIFIC HOSPITAL	ROSSMAX	APEX MEDICAL	APEX BIOTECH.	MICROLIFE	PIHSIANG
Current Ratio/10	15%	20%	40%	27%	56%	21%	53%
Quick Ratio/10	11%	14%	39%	23%	45%	19%	48%
Working Capital Ratio	10%	28%	26%	15%	38%	12%	6%

The above index data is plotted and shown in Figure 23. Comparing the financial health among these 7 enterprises, it is found that H&L, Pacific Hospital, Apex Medical, and Microlife have smaller debt ratio so their quick and current ratios look good. Most of liabilities come from its accounts payable. Comparing

these 7 enterprises, H&L and Microlife show significantly better financial health.

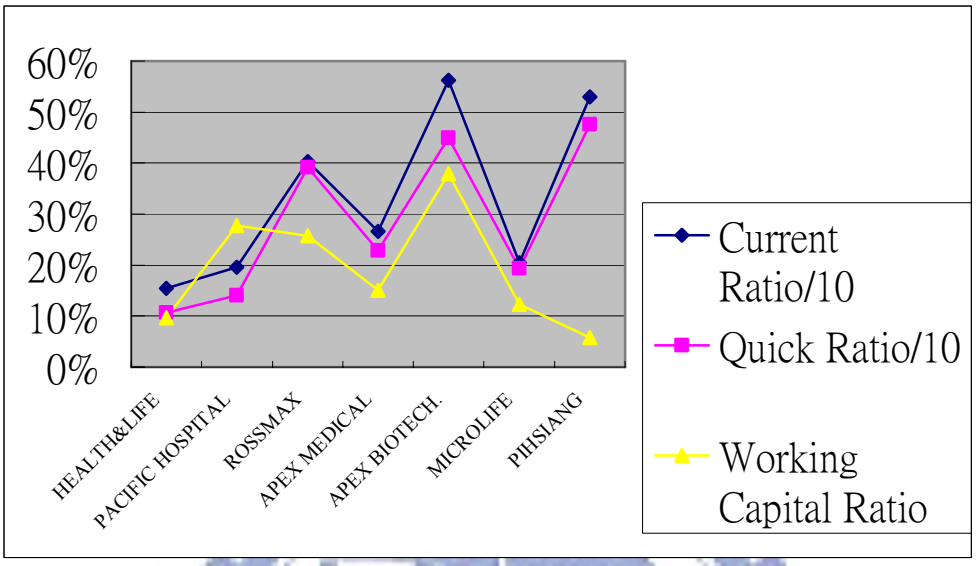


Figure 23 Enterprise financial health analysis

5.5 Enterprise value calculation and analysis

According to the financial statement of these seven enterprises, we calculate the WACC values of these 7 enterprises as shown in the following Table 16. We assume that the non-risk interest is Rf=3.81%, and Rm is the average reward of stock weighed index from 1996 to 2001.

Table 16 WACC calculation

$WACC=S/V*K_S+D/V*K_d(1-t_c)$

Where $K_s=R_f+\beta*(R_m-R_f)$

Extra Value Return Rate=ROIC-WACC

Company	HEALTH &LIFE CO.,LTD.	PACIFIC HOSPITAL SUPPLY CO., LTD.	ROSSMAX INTERNATIONAL LTD.	APEX MEDICAL CORP.	Apex Biotechnology Corp.	MICROLIFE CORPORATION	PIHSIANG MACHINERY MFG. CO., LTD.
Stock No.	1781	4126	4121	4106	1733	4103	1729

Stockholders' Equity	252,400	303,733	762,869	1,198,377	979,237	2,087,295	3,366,239
Ks	0.180	0.180	0.180	0.180	0.180	0.180	0.180
Kd	0.065	0.065	0.065	0.065	0.065	0.065	0.065
Tax Rate	0.250	0.250	0.250	0.250	0.250	0.250	0.250
D	348,357	167,724	105,554	422,321	142,420	744,554	468,414
V	600,757	471,457	657,315	776,056	836,817	1,342,741	2,897,825
WACC	8%	12%	21%	28%	21%	28%	21%
ROIC-WACC	46%	3%	-12%	-10%	4%	39%	11%
Rank	1	5	7	6	4	2	3

According to the index calculated, we find out that MicroLife has the best extra value return rate; the second is Health & Life. Both of these two enterprises focus on non-invasive blood pressure meter measurement. The ROIC, WACC chart of these enterprises are plotted as shown in Figure 24. PIHSIANG MACHINERY, H&L and Microlife prefer to invest only when return on invested capital is greater than cost of capital. That also means that they are willing to act on ***opportunities*** to create incremental value. These firms create value. Pacific hospital, and Apex biotechnology, these firms neither create value, nor destroy value. Based on the data of analysis results, it is found that Rossmax and Apex Medical might destroy value. Yet, they are still excellent enterprises in medical field. Hence, it is the author's opinion that they might invest and still not generate profits yet. Most of the medical device enterprises need to invest more budgets to develop new products, but investment return seems longer than other industries.

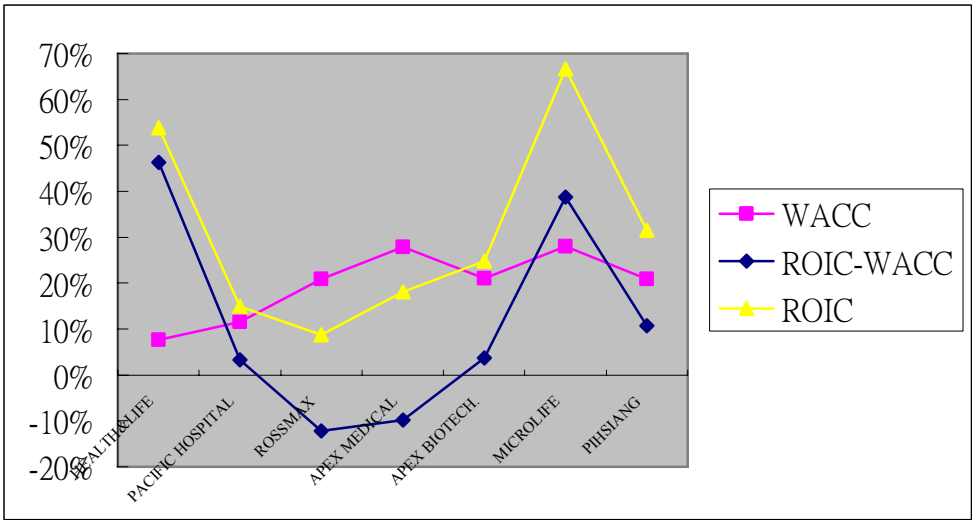
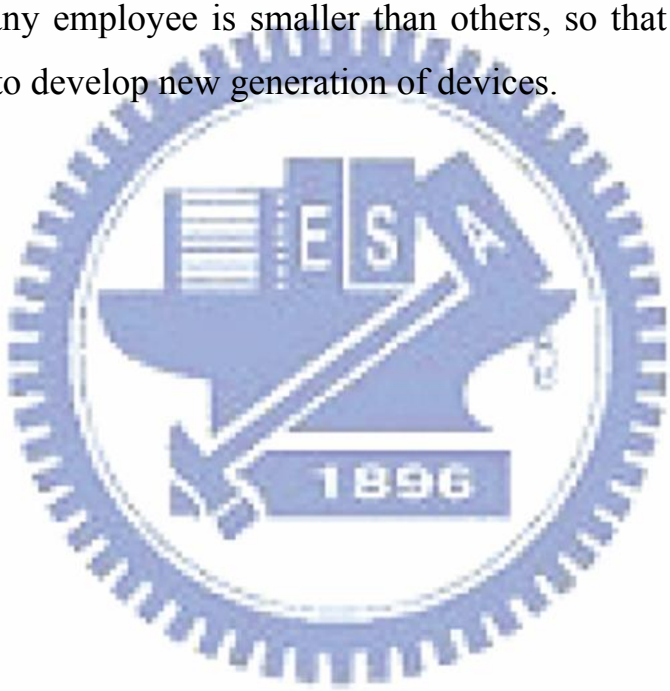


Figure 24 Enterprise value return rate analysis

5.6 Chapter Conclusion

We analyzed the values of these 7 enterprises by calculating NOPLAT, ROIC, WACC values. We found that the enterprises that have extra value return rate focused on medical electronics manufacture. Yet, most medical device companies focused on manufacture rather than brand channel. Besides, these companies focused on low price product manufacture, which means the entry barrier is low. Finally, we also found that the capital of these enterprises is still lower than electronics companies even though IPO date of medical device companies is similar to electronic companies. Due to lower revenue, the number of medical company employee is smaller than others, so that attracts less high quality engineers to develop new generation of devices.



Chapter 6 Summary and conclusion

This thesis preliminarily explores an elder care startup service model, marketing strategy, and finance calculation skills. Some articles could be further explored and discussed in the future. The results of this thesis may provide an example for the entrepreneurs to organize their home care business plan and use the financial formula to predict cash flow. In the following paragraphs, we will try to summarize the results and conclude the findings.

6.1 Analysis result description

According to the statistics, it shows that ratio of people aged over 65 will increase from 9.0% in 2002 to 10.4% in 2011, and then it will be a steep ascend to 29.8% in 2051. Due to more and more aged population, workers percentage is decreasing, and taking care aging population becomes more and more expansive in the future. Only few people, especially the rich can enjoy the benefits of servant service due to high service fees. Remote monitoring and quick response service can be used to reduce elders caring cost and medical treatment. Besides, a wide range of health and social services will gradually be delivered at home to recovering, disabled, chronically ill, or terminally ill people. Everyday health will be monitored through everyday devices, everything has a touch point connected to everything else, every device has a chip, and every chip has a radio transmitter attached. Hence, providing health monitoring device and quick response service will have a lot of business opportunities in home care markets. Yet, few companies can provide such service due to long development period and huge investment. Yet, competition in oligopoly market is relatively less than that in other industries, so it may produce extra benefits. Therefore, elders care industry will provide an excellent opportunity for small and medium size enterprises to play some role in it. New business opportunity awaits further exploration of the entrepreneurs. Nevertheless, entrepreneurs entering this field

need to integrate several technologies into a system. The tiny SOC sensor could potentially open new markets for proactive computing. Communications technologies have a big impact on future applications for healthcare, agriculture, public safety, transportation and environmental management. When alerts occur, quick response caring service can be used to assist the elders to solve their physical problems. Hence, elders care service may assist the elders to solve their problems when living alone and keep dignity when facing their children. Hence, economical service procedure and practical business plan determine whether an enterprise can survive in elder caring field. In chapters 3 and 4, a simplified business model is used to calculate the net present value of this business in the following 5 years after investment. The revenue is predicted and the net present values in different profit margins are calculated using scenario analysis and sensitivity test. According to the simulation, attracting elders to adopt this service is the most important goal of service based enterprises. The SWOT analysis, 5 forces analysis, and competitive advantage analysis of Michael Porter are also used to estimate the environment climate and analyze the opportunity of this business. Although low ROI ratio caused some troubles in management enterprise cash flow, leveraging value chain enterprises resources will decrease the investment. Keeping at least 30% gross margin and creating extra value are still the most essential core competence of service based enterprise. Finally, the financial values of these 7 medical enterprises in 2003 are calculated. We found that the enterprises which create extra value return rate focused on specific medical device manufacture. Hence, creating core competing advantage and maximizing the market share will keep this business profitable.

6.2 Conclusion

The criteria for the successful development of ageing care startups include matching clients' needs, reliable service procedure, proper marketing strategy and financial management capability. Among them, developing reliable service

flow seems to be the most important concerns of elders which create extra value. Technology development seems cost dearly from client's pocket. Aids require longer time to develop their technology. Hence, financial support becomes a major driving force for most of the enterprises to grow up. Yet, enterprise should not focus on low ROI product development unless they can leverage enough free resources. Besides, manufacture spends a lot of resources and it takes time to manage workers, inventories, raw materials ordering and product logistics. Hence, leveraging existing enterprises production capability and focusing more on service items design might be the survival strategy for small and medium size enterprises. Alliance and technology transfer from existing labs will save time and reduce the development risks. Finally, we believe home care or health care device enterprises need to find certain niche market. They need to keep gross margins higher than other industries. Besides, they should have patents to protect their IP in order to avoid competition. Finally, for keeping enough cash flow, enterprise should focus on few product development and marketing. Manufacture is not the core competitive advantage of the aging care enterprise; they should leverage the existing sources unless revenue reaches break even point.

6.3 Research contribution and suggestion

Internet and globalization make most of the enterprises' profit shrink rapidly. Hence, most of the manufacturers in Taiwan have no choice but move assembly lines to China in order to reduce mass production cost. Propose a service based business model to create value may provide an option for such enterprises to stay in Taiwan and find new development opportunity. This thesis describes elders care service flow chart, service models, bottleneck, promotion 4P strategy, and value creation strategy. Then, this thesis provides an example for service based enterprise to define their business scope, business plan and

predicts pro forma financial report. Besides, SWOT analysis, competitive advantage analysis provides an example for them to find their positions in the value chain. And also, this thesis also studies enterprises how to calculate financial performance and financial health. Finally, we sincerely hope all of the suggestions and information in this thesis will assist the government and the individuals with some directions in establishing elders care service business.

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