

Towards the Development of Telecare Business Model-Service Design Approach

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Abstract: Aging society became a mutual issue across the world in recent years, many developed countries attempted to ease relevant social problems and reduce tremendous medical cost through telecare service model. Taking telecare managers, providers and demanders as samples, this research conducted analysis through business model blueprint and AHP after determining key factors of telecare service. The main purposes are: 1) Determining the key factors for telecare service through business model blueprint, 2) Defining customer's need through AHP and 3) Providing customer's need to telecare service practitioners as reference for service innovation model. Comprehensively, the most significant customer needs are ranked in order: "emergency help service", "in-time sensory warning response", "solitary or people with disability", "living in remote areas" and "reduce overall patient time" through the results of this research, as reference for relevant practitioners.

Keywords: Aging Society, Telecare, Business Model, Service Design, Analytic Hierarchy Process.

1. Introduction

Taiwan's average life expectancy has increased, with its social demographic structure reaching an aging society. Meanwhile, social welfare institutions and private nursing homes cannot meet the needs of nursing care. In view of the huge gap in care demand, what services are available in society? How can we connect the aspects of the medical profession, service platform, and care demand? What technical support do these services need? Are Taiwanese individuals and enterprises prepared for these? This study attempts to explore the abovementioned queries. Furthermore, the motivations of this study are as follows:

First, this study is an exploratory study on the Telecare Service Innovation Model. It collects relevant theories and literature on telecare, the medical profession, service science, new service development, and service innovation from all over the world. Considering that most previous research on telecare focused on technical aspects (Agarwal & Lau, 2010; Maglaveras, Bonato, & Tamura, 2010) and professional medical analysis (Turner, Thomas, & Gailiun, 2001), the facets of demand and enterprise supply were not included and integrated into one field for study. Further, through secondary data collection, comprehensive integration, and questionnaire distribution, this study will include the demand dimension factor to telecare service. Compared with previous telecare studies, it added a discussion on the telecare business model demand and service model innovation to expand and clarify the innovative content of telecare services. It also referred to various service innovation models and provided different aspects of correction and development. Thus, the innovation of the telecare service model merits further continuous study.

Second, medical progress, population structure changes, and telemedicine and long-term care demand have increased with the development of science and technology. In addition, due to the Taiwan government's attempts to promote the policy on aging locally, developing home telecare services has become necessary in the foreground. Furthermore, this study's second motivation emanates from whether telecare services can effectively reduce the burden of nursing manpower, achieve the purpose of advance prevention and immediate crisis management, reduce the average unit cost of use, and improve social stability and home safety.

Third, based on the original infrastructure, different services for telecare are under development. In addition to home services such as regular measurement, aggregation, blood sugar analysis, blood pressure, heart rhythm, and other physiological references, some manufacturers have employed ICT information technology, such as the P2P technology, so that monitoring centers and family members can grasp the dynamics of the care recipient in real-time. How do these new technologies affect the infrastructure, service model, and consumer behavior of existing telecare services? Hence, the necessity to construct, analyze, and innovate a business model.

Telecare mainly focuses on the "preventive medical" mode of collecting, integrating, and analyzing physiological parameters at home. It provides network transmission and database management services and distinguishes services according to differentiation and convenience. Based on the value proposition of taking the key factors of case-based telecare as business model innovation and reconstruction, the objectives of this study are as follows:

(1) To understand the needs of the care recipients by studying the collection and analysis of cases using the key factors of telecare services.

(2) To construct a business innovation model for telecare by proposing new key factors based on the demands of the care recipients.

(3) To form conclusions based on research analysis and provide suggestions for academia and the industry.)

2.Literature Review

2.1 Definition of Telecare

(1) Origin of telecare

Telemedicine care took place in the 1960s. With the National Aeronautics and Space Administration (NASA) and the Soviet Union entering the Cold War stage after World War II, the battlefield was transferred from the Earth to space for space warfare. In addition to space technology development, related physiological signals of astronauts in space were also transmitted back to the ground command center through instruments. These signals were analyzed and assessed by professional medical teams to ensure the health of astronauts and the execution of missions, demonstrating the initial application of telecare.

(2) Definition of telecare

Telecare is a composite term consisting of telephone and care. It was first used to transmit medical information by telephone. Later, with the progress of communication technology and the popularization of the Internet, remote communication technology and electronic information service began to be used in medical technology. Meanwhile, long-distance health care services were developed under the information technology framework (Doughty et al., 2007; Norris, 2002). With the increase in telemedicine cases, Demiris et al. (2009) have proposed that telecare services refer to an emerging care model using tele-video equipment or communication technology to promote communication between health care providers and care recipients from two different places.

2.2 Application and Development of Telecare Services

Telecare is an emerging care model that adopts information and communication technology to provide services. By adopting technological methods, patients and medical staff can communicate without the restrictions of time and space (Hersh et al., 2006). Through wired and wireless communication technologies, such as telephone and Internet, electronic information with physiological data, images, pictures, and other digital information can be communicated between care recipients and professional medical staff through e-mail, real-time video, and wired audio-visual telephone services. These innovative service solutions require sound information and communication hardware construction, advanced medical instruments, and a high degree of user acceptance. Hence, most emerging service models come from more developed regions, such as North America and Europe.

The telecare medical monitoring system ICT is a key factor in improving the quality of life of the elderly and reducing medical care costs. This platform conducts health, psychological, and mental state assessments for the elderly. However, the integration of life monitoring (Telehealth) and behavioral analysis based on home care sensors (Telecare) has not yet been established on a large scale. Describing the design and implementation of such a platform, it can deploy services to track patients' health based on a set of monitored parameters for each disease, analyze users' habits, and diagnose the deviations in their daily activities. By collecting data from telemedicine and telemedicine gateways, the integrated data of telemedicine and telemedicine data and alarms can be assessed and monitored by clinicians and family members (G.C. Lamprinakos et al., 2015).

2.3 Empirical Research on Telecare

With the aging of society, more people suffer from chronic diseases. Assistive technology and the self-management of patients and caregivers will help monitor, treat, and even prevent such diseases, thereby improving the quality of life and longevity and relieving the increasing stress on health and medical capacity (Greenhalgh, T., Procter, R., Wherton, J. et al., 2015).

Telecare technology affected healthcare in progressive ways, especially having changed its spatial dimensions. As interactions were already carried out through ICT, patients no longer needed to go to the hospital frequently, and doctors did not have to regularly visit patients' homes to diagnose and monitor chronic diseases. However, although telecare technology introduced virtual contact between healthcare providers and patients, these care practices with technology served as an intermediary (Oudshoorn N., 2011).

Nowadays, the number of elderly patients with degraded self-care ability or chronic diseases is steadily increasing. In addition, the cost of living in a hospital or nursing home is extremely expensive. In recent years, we have witnessed the development of programs that keep these people at home while providing them with the needed telecare and assistance. Thus, the research projects that have emerged around the world in the past few years are significant. Hence, we are interested in investigating some of them. This study focuses on European projects, given their similarities with other projects, such as those of the U.S., Asia, and Africa. After studying various European research projects in the field of patient telecare in detail, we determined the main requirements for telemonitoring systems and subsequently introduced the common components of these systems. Then, we conducted comparative studies on the services provided, technical issues, supported functions, and tools involved in implementing the proposed system. Finally, we introduced some interesting perspectives in patient telecare research (Hamdi, O., 2014).

3. Research Framework

3.1 Research Structure

This section mainly discusses the research of “Adopting service design methods to develop telecare business models”. According to the above definitions of telecare, business models, and service design and the theoretical foundation of the BMG business model blueprint, empirical research was conducted using case study methods, referring to the domestic and overseas countries, enterprises, and medical institutions promoting telecare and engaging and providing telecare services. Meanwhile, combined with the collection and analysis of secondary data, the actual service situation of the enterprise was analyzed from different perspectives to summarize the components of the secondary dimension of the hierarchical structure of this study. The relevant service experience and the opinions of demanders were drawn out from the AHP questionnaires, with the insights from professionals, operators, and demand sides. The research procedure is shown in Figure 1.

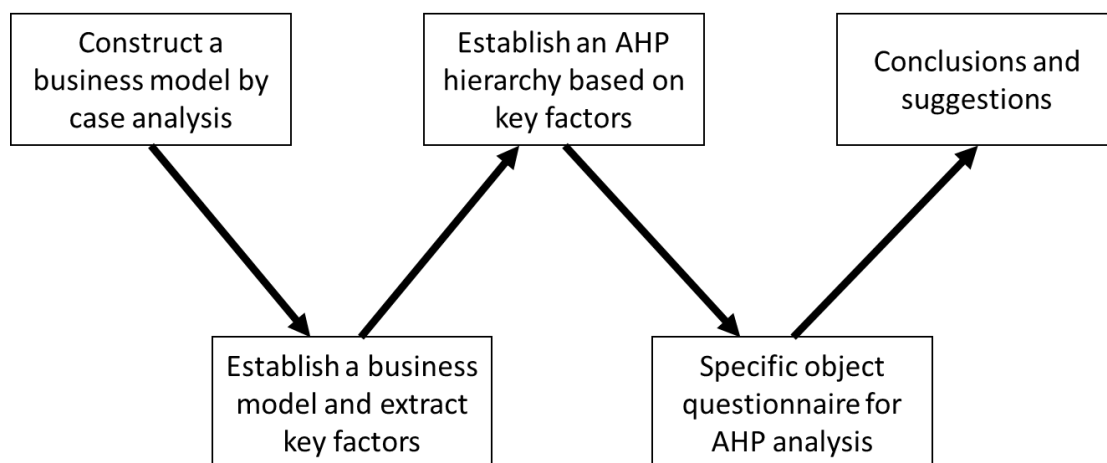


Figure 1 Research Framework

3.2 Research Case and Questionnaire design

In this study, the key factors and questionnaire design of telecare service cases can be divided into three analysis steps after referring to relevant literature.

(1) Establishment of hierarchical structure

First, the business models were established by referring to the 17 cases listed in this study and based on the equipment, services, value, sharing platform, experience sharing, and other factors provided by these cases. Then, a preliminary level structure was established through business model analysis. Subsequently, the establishment and revision of the primary dimension factors and the secondary dimension factors were carried out based on the preliminary level structure, and the establishment of the determined hierarchical structure was completed.

(2) Subjects of the AHP questionnaire

This study selected personnel who can conduct in-depth discussions (e.g., business managers with practical experience in telecare services and medical personnel who passed the national examination and had practical care experience). Noteworthily, individuals who had remote service needs, including those living alone or with limited mobility (including family members) and residents in remote areas, were also included in the “Determined Hierarchical Structure of the Key Success Factors of Telecare Services” for measurement. The researcher expected that this study could improve the calculation accuracy of the weights of key influencing factors by considering multi-faceted factors. Therefore, a total of 12 AHP questionnaires were issued in this study. The list of tested persons is shown in Table 3-1.

Table 1 List of research sample

No.	Tested person	Industry / attribute	Service units
1	Ms. Tseng	Medical care services	Affiliated Hospital of National Cheng Kung University
2	Ms. Shih	Medical care services	Medical staff of care center
3	Mr. Lee	Medical care services	Licensed doctor
4	Ms. Huang	Medical care services	Head of a care center
5	Ms. Hsieh	Medical care services	Operator of a care center
6	Ms. Liu	Medical care services	Social worker of a care center
7	Mr. Tseng	Demander	Medical demander in remote areas
8	Ms. Lai	Demander	Medical demander in remote areas
9	Mr. Chiu	Demander	Medical demander in remote areas
10	Ms. Huang	Demander	Families of elderly people in need of care
11	Ms. Shih	Demander	Families of elderly people in need of care
12	Ms. Liu	Demander	Families of elderly people in need of care

4. Research Results

4.1 Research Subjects and Scope

Based on the above definition of telecare services, this study adopted samples from domestic and overseas countries, enterprises, and medical institutions, engaging in and promoting telecare services. A total of 17 representative enterprises have been selected to conduct empirical research adopting the case study method. Through the collection and analysis of the secondary data, it is expected that the difference between practical supply and demand could be explored from different perspectives, which will serve as the basis for summarizing business model views obtained in this study. Based on the limitations on the knowledge and understanding of telecare, this study refers to the exploratory analysis points and puts forward subjects and propositions. In addition, in the part of the case study, the bidding would be selected based on two criteria: (1) the case has a successful service experience and can provide services continuously; (2) there must be a complete description of the service content and a remote service case with the available record documents. Based on the above considerations, this study selected 17 medical service and equipment suppliers, such as Trinity Health in the United States, Tunstall Group in the United Kingdom, Netown Corp. in Taiwan, and Veterans General Hospital in Taiwan, as the research targets. The sources of secondary data collection include known case studies, published publications, reports, articles, and government and corporate websites.

4.2 Data Collection and Analysis

(1) Case description

The sample cases of this study were selected from domestic and overseas countries, enterprises, or medical institutions engaging in and promoting telecare services with a total of 17 representative enterprises. The description of the service content is as follows:

Table 2 List of Research Cases

No.	Country/Company	Telecare service content
1	United States/Trinity Health	Telecare service management
2	United Kingdom/Tunstall Group	Emergency response service
3	Japan/Fujitsu	Community care service
4	Taiwan/Netown Corp.	Baby machine and health cloud
5	Taiwan/Chunghwa Telecom	Cloud smart health management system
6	Taiwan/Taiwan Secom	Three-in-one service of “care housekeeper”
7	Taiwan/Quanta Computer	Telehealthcare cloud system
8	Taiwan/Guider	Smart wearable and medical technology integrated supplier
9	Taiwan/Far Eastern Memorial Hospital	Anxin Card
10	Taiwan/Kaohsiung Veterans General	Multinational health care joint

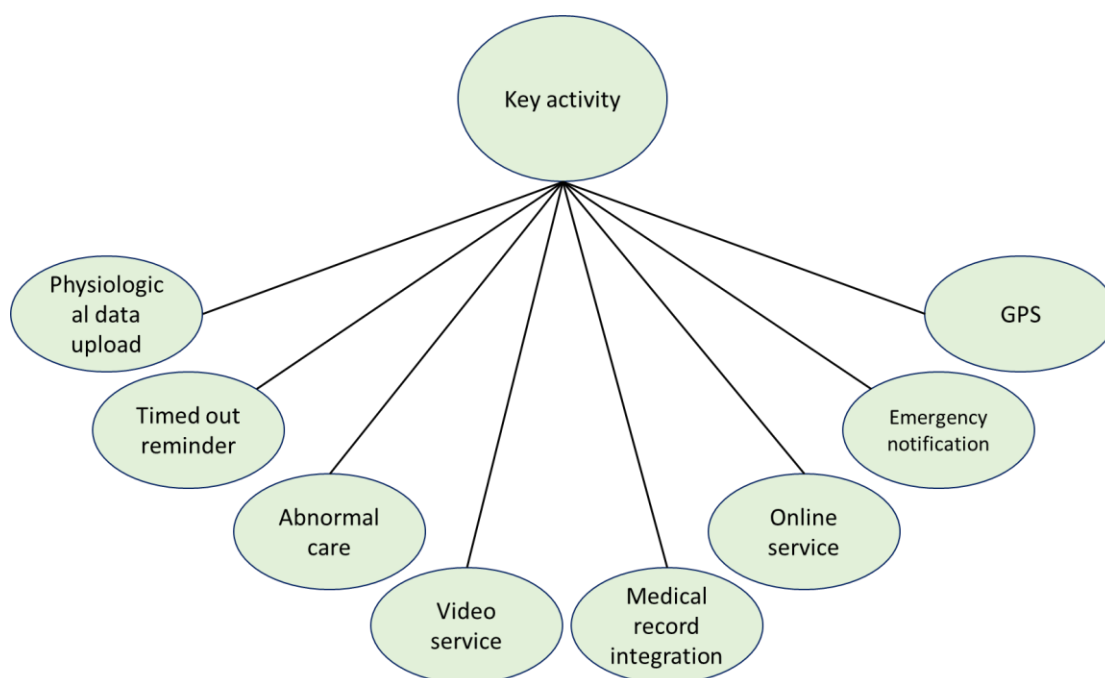
	Hospital	outpatient center
11	Taiwan/Ray Tai Medical Care Consultation Agency	Telecare system integration
12	Taiwan/Chu Shang Show Chwan Hospital	Telehealthcare center services
13	Taiwan/Asia University	RFID fall accident notification system
14	Taiwan/SYSTEEX	Medical information service
15	Taiwan/Changhua Christian Hospital	Telehealth consultation center services
16	United States/Lifeline Program	Personal emergency rescue system
17	Denmark	Family medical system

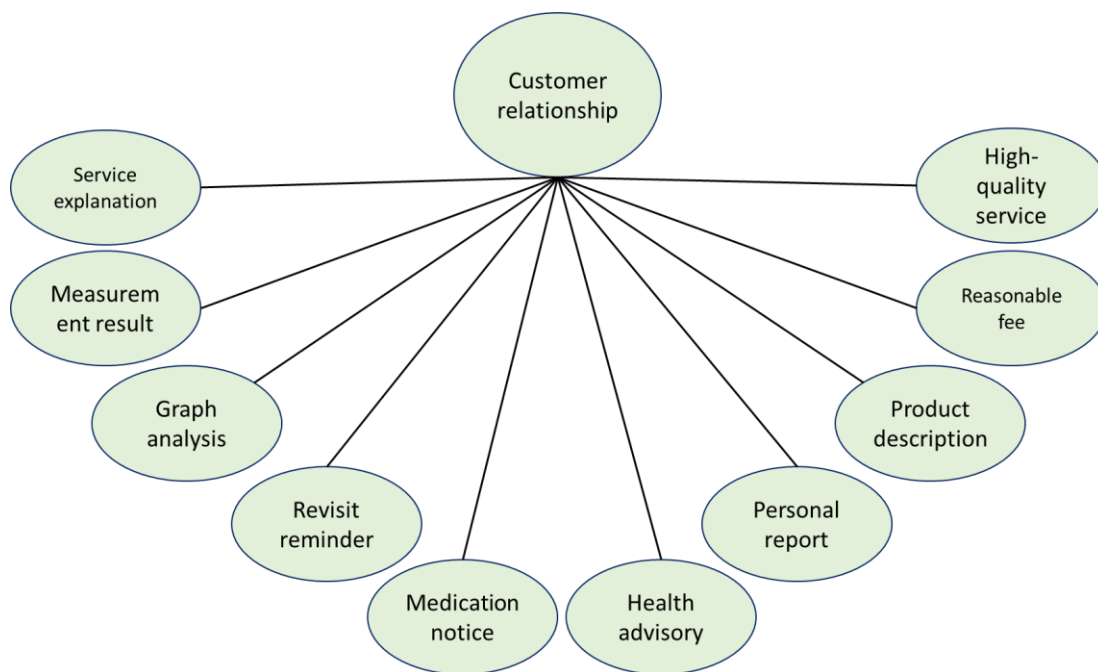
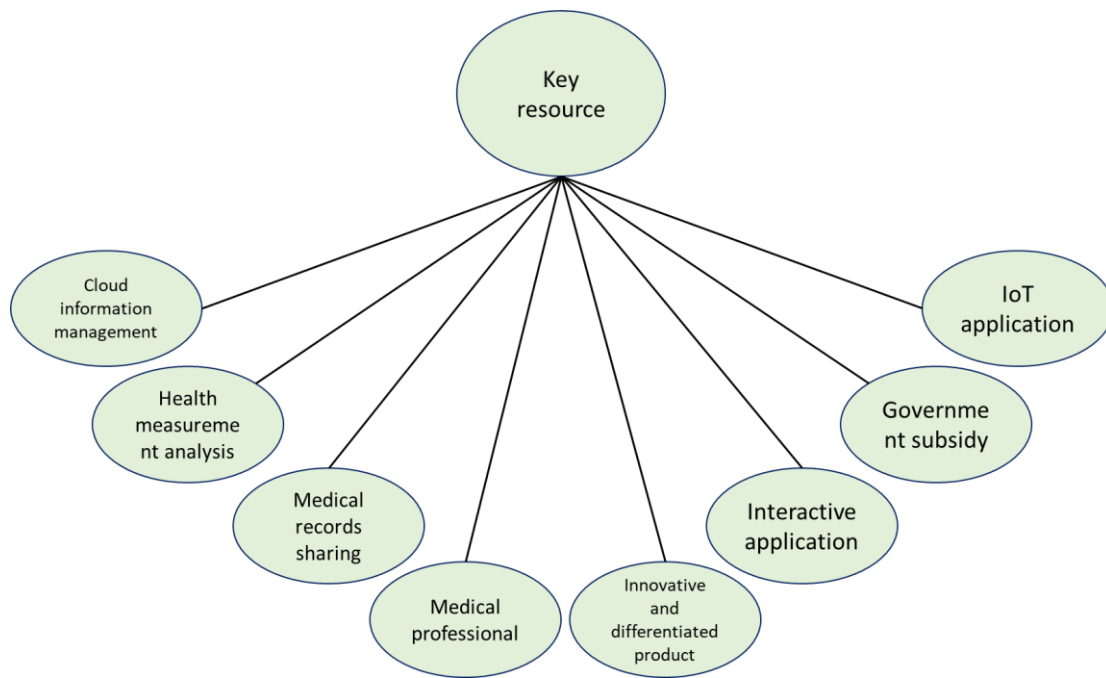
(2) Key extracts of case analysis and establishment of hierarchical structure

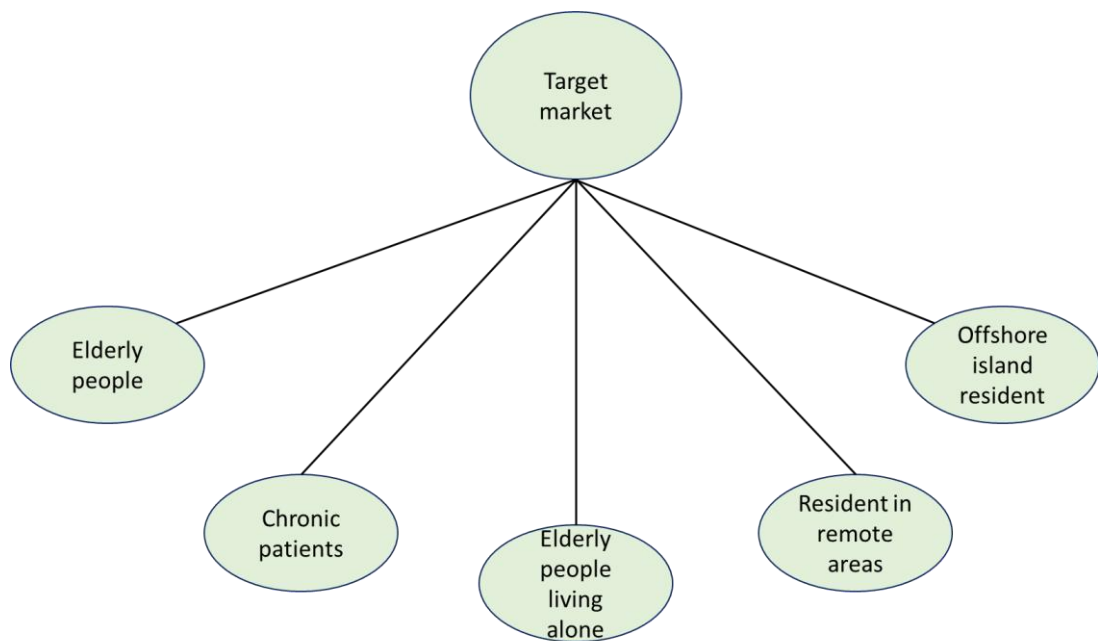
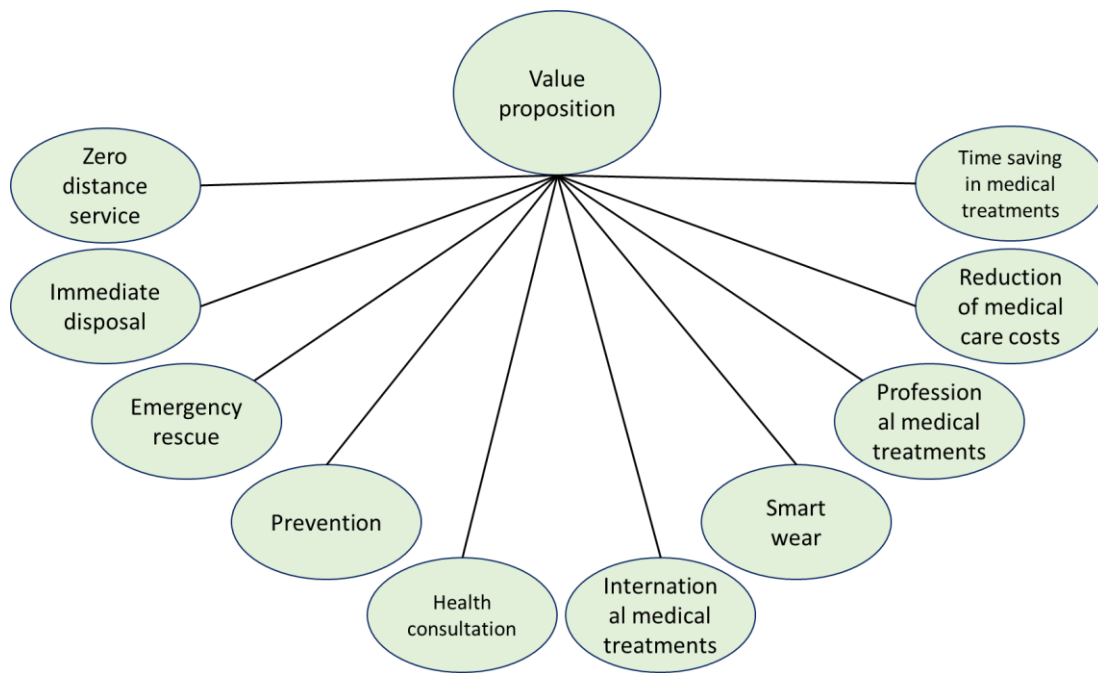
This study explores the key factors and customer pain points of telecare services. After case analysis and related literature review, the following four viewpoints were obtained:

1. Analysis of key factors of research cases

Based on the above case analysis, after category analysis and coding, this study screened out the effective subcategories according to each aspect and drew inferences statistically as shown in Figure 2:







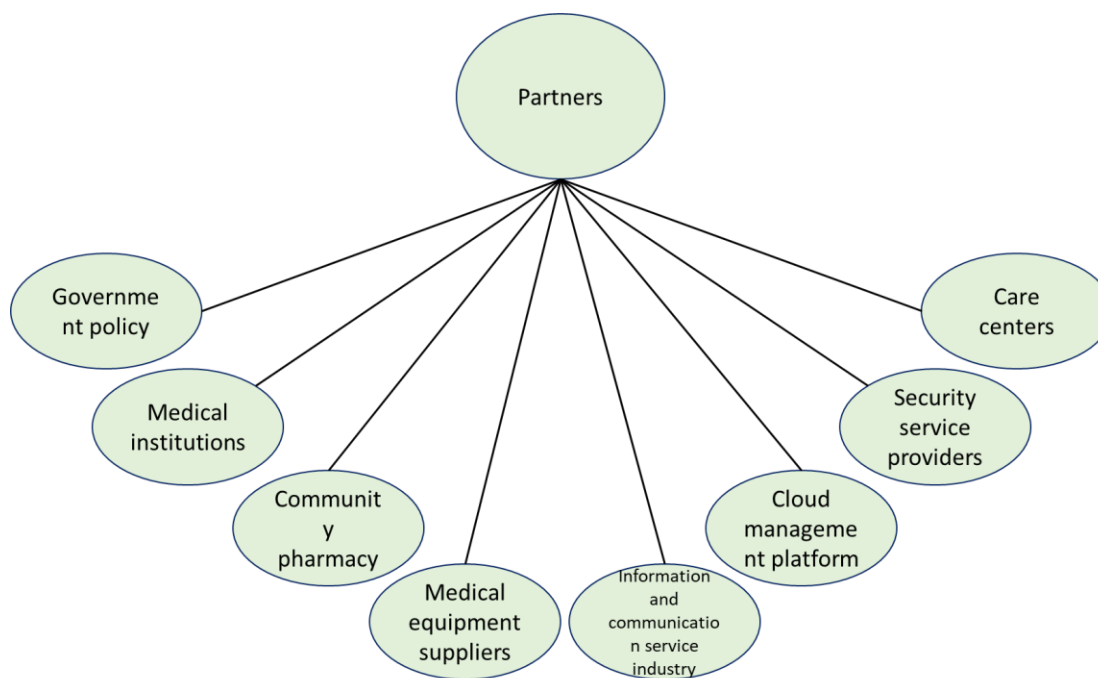
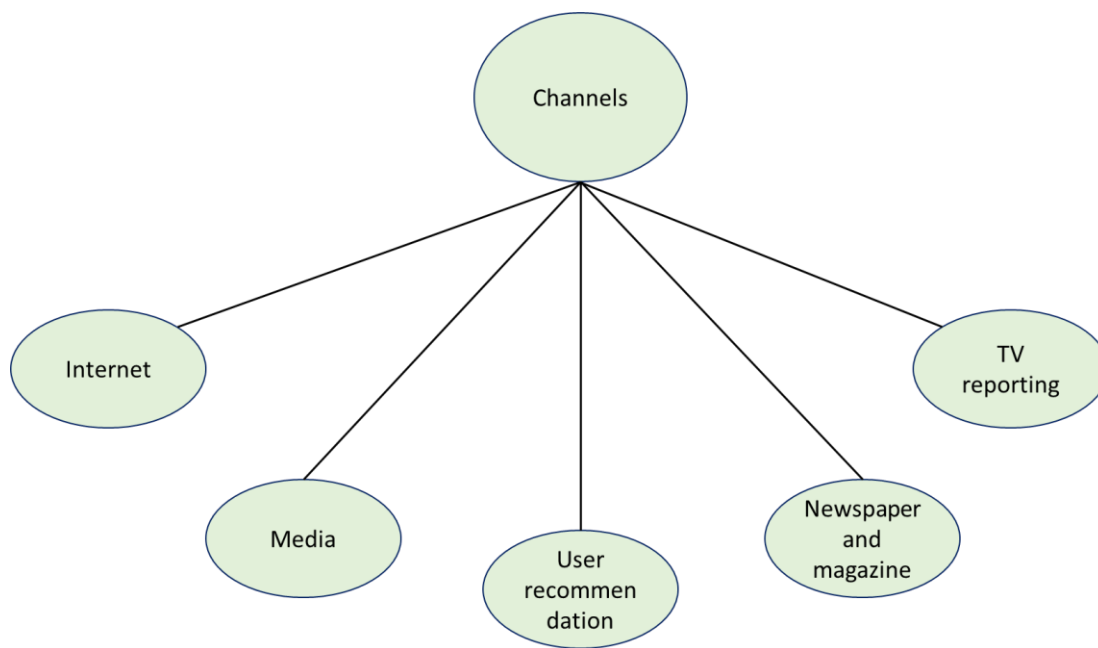


Figure 2 The Static Model of the Key Factors of Telecare Service Model

After summarizing the key factors of its business model and following the BMG business model proposed by Osterwalder (2010), the following model is obtained as shown in Figure 2.

KP Key partner	KA Key activity	VP Value proposition	CR Customer relationship	CS Target market
1. Government policy	1. Physiological data upload	1. Immediate disposal	1. Program feedback	1. Elderly people
2. District medical institution	2. Timed out reminder	2. Emergency rescue	Measurement result	2. Chronic patients
3. Community pharmacy	3. Abnormal care	3. Prevention beforehand	Graph analysis	3. Elderly people living alone
4. Medical equipment supplier	4. Video service	4. Health consultation	Revisit reminder	4. Resident in remote areas
5. Information and communication service industry	5. Case integration	5. International medical treatment	Medication notice	5. Offshore island resident
6. Cloud management platform	6. Online service	6. Smart wear	2. Face-to-face service	
7. Security service provider	7. Emergency notification	7. Professional medical treatment	Health advisory	
	8. GPS	8. Reduction of medical care costs	Personal report	
		9. Time-saving in medical treatment	Product description	
		10. Zero distance service	Service explanation	
			3. Reasonable charges for users	
			High-quality service	
KR Key resource			Channel	
1. Cloud information management			1. Internet, such as official website, mobile APP, FB, LINE, and other communication media	
2. Health measurement analysis			2. Word of mouth and recommendation from actual users	
3. Medical records sharing			3. Newspaper and magazine	
4. Medical professional			4. TV reporting	
5. Innovative and differentiated product				
6. Interactive application				
7. Government subsidy				
C\$ Cost structure			R\$ Revenue stream	
Telecare equipment production equipment (production side), R&D costs, cloud data software equipment, 24-hour service center maintenance, trademark patents, marketing, product improvement and innovation, and maintenance of professionals and administrative personnel.			Equipment rental, sales, monthly service fee Frequent home care accidents for the elderly, increasing public inquiries	

Figure 3 The Business Model of Telecare Services in This Study

2. Establishment of hierarchical structure

The business model is analyzed based on the key factors of the selected cases in this study, and the primary dimensions and secondary dimensions factors are distinguished as follows (see Figure 4):

The first-level “primary dimensions” factors include key activities, key resources, value propositions, customer relationships, and target market. Considering that partner and channel dimensions are less critical, and the information of cost and revenue dimension is the enterprise’s business secrets that are not easily obtained, these four dimensions are not included in the study’s scope of discussion for the time being.

The second level “secondary dimensions” factors include automatic upload of measurement data, video diagnosis and treatment, 24-hour service, physiological measurement analysis and application, cloud database management, real-time sensor warning report, reduction of medical treatment time, emergency rescue service, reduction of medical care costs, system feedback, face-to-face communication, economic considerations, people living alone or with reduced

mobility and requiring care, and chronic patients at home and remote areas with inconvenient transportation.

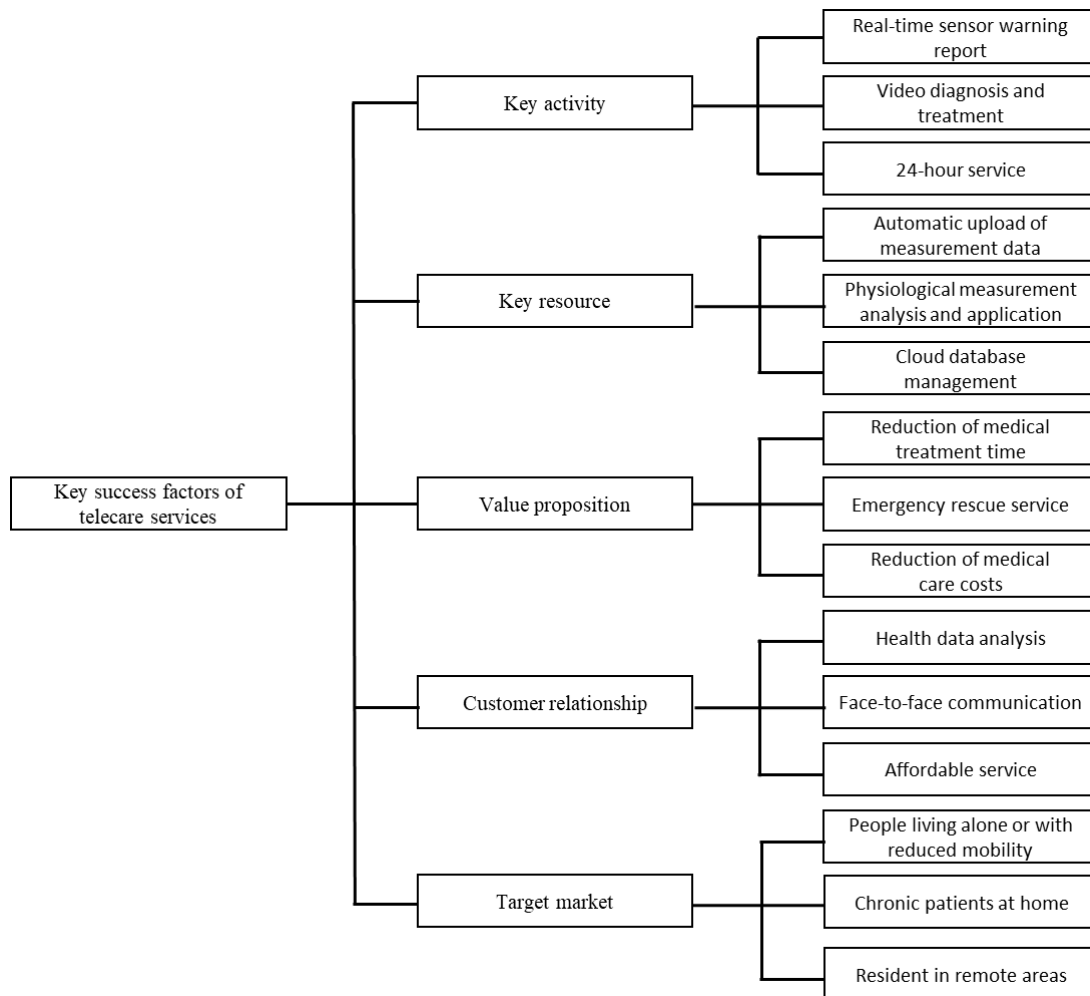


Figure 4 Dimension Model of Key Factors in Telecare Services

3. Operating factors and definitions:

The following are the operational definitions and documents collected from the “telecare service cases” in this study combined with the business model as shown in Table 3:

Table 3 Operating Factors and Definitions of Telecare Services

Secondary Dimension	Operational measurement elements
Real-time sensor warning report	The positioning function of the sensor is adopted to observe and monitor personal behavior patterns, surrounding environment, and home activities. When behavior patterns change and abnormal signs are detected, an early warning can be issued.
Video diagnosis and treatment	Network technology is adopted to provide real-time video and audio for both parties, and high-resolution video is adopted to provide doctors with a basis for visual diagnosis.

24-hour service	Patients and their families can get professional medical and health consultation services at any time when they have doubts or need assistance.
Cloud database management	The wireless physiological signal sensing module is adopted to collect various physiological signals and transmit them to mobile devices via Bluetooth or Wi-Fi to provide health information of the observed person.
Automatic upload of measurement data	The cloud server and internet are employed for communication and connection. The computing power of the cloud is adopted to store various measured physiological data in the database simultaneously for future inquiries or for doctors to track the condition.
Physiological measurement analysis and application	Medical equipment, including heartbeat, blood pressure, blood glucose meter, is connected with the communication standard “converter” and “gateway” to send out its measurement information. On the receiving end, a computer or smart cell phone can be adopted.
Reduction of medical treatment time	Telecare can reduce hospitalization and treatment time.
Emergency rescue service	GPS satellite positioning can detect changes in behavior patterns or abnormal signs of daily home activities, immediately deal with emergencies, provide emergency services, and improve home life safety.
Reduction of medical care costs	Reducing medical care costs can help patients gain better control of their health and save costs, which is in line with the concept of low cost and high value.
Health data analysis	Through cloud analysis technology, the information of the care recipients, such as medical records and measurement data, is collected.
Face-to-face communication	Individuals from separate ends can communicate face-to-face directly.
Affordable service	Affordable services refer to those that save money, time, or energy
People living alone or with reduced mobility	In the event of an accident or sudden illness, those who have insufficient self-rescue ability or are unable to save themselves will endanger their lives.
Chronic patients at home	Chronic disease is a long-term disease that cannot be completely cured. It requires long-term treatment and may have complications or sequelae.
Resident in remote areas	Remote areas refer to mountain areas, offshore islands, remote areas, and areas with insufficient medical resources.

4.3 An Empirical Analysis of AHP for Telecare Service

After verification, the “key factors of telecare service” calculates the relative partial weights and overall weights and explains them based on the calculation results. The analysis results are shown in Table 4:

Table 4 AHP Analysis Results of Telecare Services

Dimension	Primary dimension	Hierarchical weight	Secondary dimension	Partial weight	Overall weight	Hierarchical sorting	Overall sorting
Key factors of telecare services	Key activity	0.226	Real-time sensor warning report	0.5841	0.132	1	2
			Video diagnosis and treatment	0.1814	0.041	3	9
			24-hour service	0.2345	0.053	2	7
	Key resource	0.117	Automatic upload of measurement data	0.3248	0.039	2	12
			Physiological measurement analysis and application	0.3248	0.037	3	13
			Cloud database management	0.3504	0.041	1	10
	Value proposition	0.304	Reduction of medical treatment time	0.2993	0.091	2	5
			Emergency rescue service	0.4539	0.138	1	1
			Reduction of medical care costs	0.2467	0.075	3	6
	Custom	0.118	Health data	0.296	0.035	3	14

	er relations hip		analysis	6			
			Face-to-face communicat ion	0.355 9	0.042	1	8
			Affordable service	0.339 0	0.04	2	11
	Target market	0.236	People living alone or with reduced mobility	0.440 7	0.104	1	3
			Chronic patients at home	0.135 6	0.032	3	15
			Resident in remote areas	0.419 5	0.099	2	4

The order is as follows. The first most important key factor is “value proposition” with a hierarchical weight of 0.304, followed by “target market” with a hierarchical weight of 0.236. Meanwhile, “key activity” ranks third and “customer relationship” fourth, respectively, with hierarchical weights of 0.226 and 0.118. Finally, the fifth most important factor (see Figures 4-3) is “key resource”, with a hierarchical weight of 0.117. It must be noted that these key factors’ hierarchical weights refer to the primary dimension, thus, it can be inferred that the “value proposition” is the most important factor among the primary dimension factors, followed by “target market”. Moreover, the overall $CR=0.02 \leq 0.1$. This finding indicates that the judgment before and after is consistent, and the degree of matrix consistency is satisfactory.

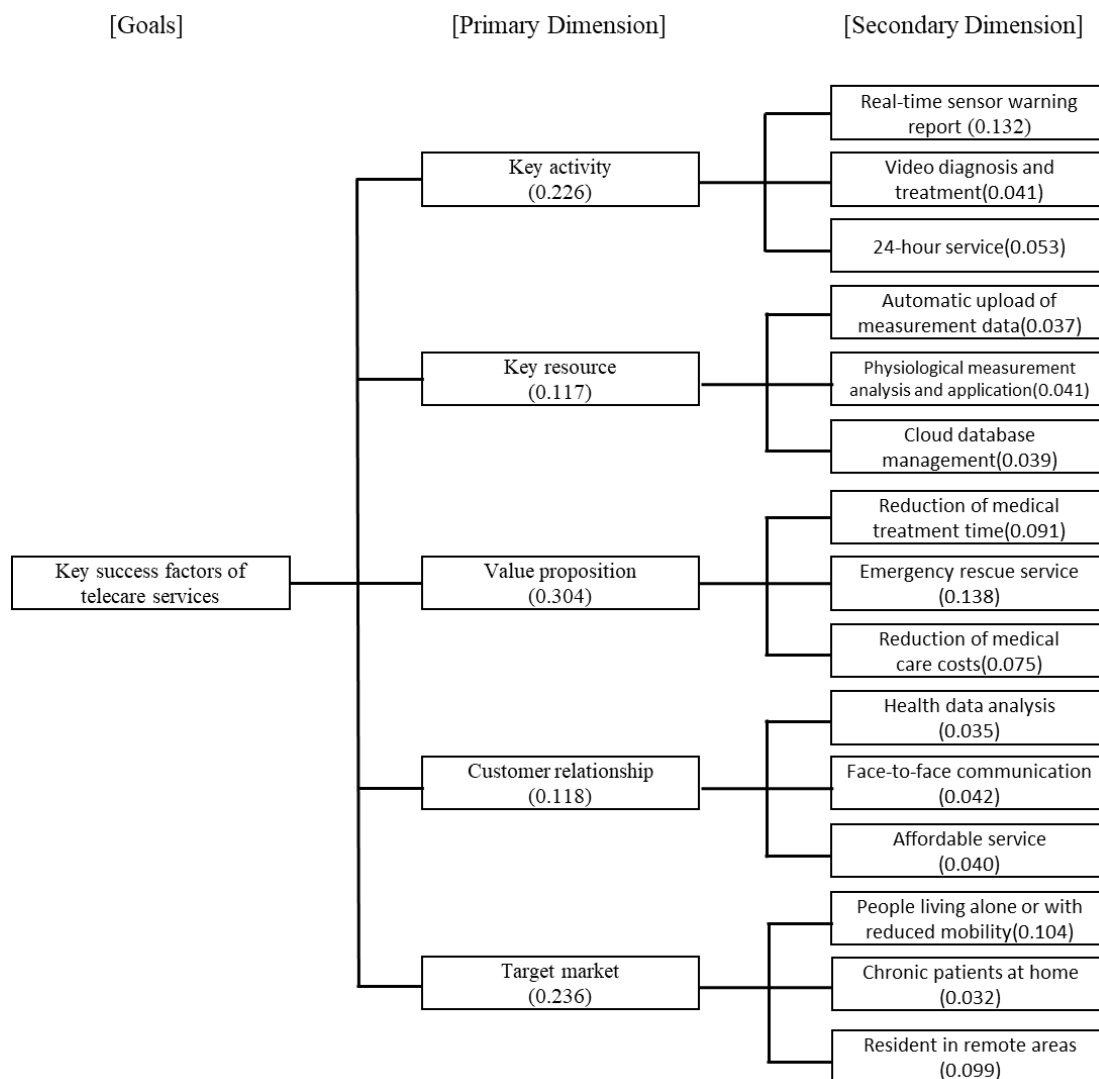


Figure 5 The Weight of Key Factor Dimension of Telecare Service

(1) Value proposition and its evaluation indicators

The value proposition is in the secondary dimension. Based on the AHP analysis, the most important key factor is “emergency rescue service”, with a secondary dimension weight of 0.138. The second in importance is “reduction of medical treatment time”, with a secondary dimension weight of 0.091. Lastly, “reduction of medical care costs” ranks third, with a secondary dimension weight of 0.075. Furthermore, the importance of the emergency rescue service system belongs to the emergency rescue service, which can effectively reduce home risks and improve life safety and quality. In addition, when the user is lost, the positioning system of the transmitter can also be used to successfully locate the user, increasing the probability of finding a missing person.

(2) Target market and its evaluation indicators

The target market is in the secondary dimension. Based on the AHP analysis, the most important key factor is “people living alone or with reduced mobility”, with a weight of 0.104 for the secondary dimension. The second in importance is “residents in remote areas”, with a secondary dimension weight of 0.099. Lastly, “chronic patients at home” ranks third, with a

weight of 0.032 for the secondary dimension. The telecare service allows family members to know the home situation of their elders at any time and provides medical consultation services, reducing the burden of family care.

(3) Key activity and its evaluation indicators

The key activity is in the secondary dimension. Based on the AHP analysis, the most important key factor is “real-time sensor warning report”, with a weight of 0.132 for the secondary dimension, followed by “24-hour service”, with a secondary dimension weight of 0.053. Ranking third is “video diagnosis and treatment”, with a weight of 0.04 for the secondary dimension. The integration of the real-time sensor warning report data system provides real-time reminders and daily, weekly, and monthly data analysis instructions. In this way, users and their families can understand the current physiological condition of the person being cared for and achieve the results of reminders and early warning.

(4) Customer relationship and its evaluation indicators

The customer relationship is in the secondary dimension. Based on the AHP analysis, the most important key factor is “face-to-face communication”, with a weight of 0.042 for the secondary dimension. “Affordable service” ranks second, with a secondary dimension weight of 0.040. Ranking third is “health data analysis”, with a weight of 0.035 for the secondary dimension. This study considered that face-to-face communication is the most important in customer relationships. Therefore, the interaction between two or three parties (including family members) allows them to clearly understand and cooperate, paving the way for transparency on the health status of the care recipients and health information to achieve a better quality of life and environment.

(5) Key resource and its evaluation indicators

The key resource is in the secondary dimension. Based on the AHP analysis, the most important key factor is “physiological measurement analysis and application”, with a weight of 0.041 for the secondary dimension. “Cloud database management” ranks second, with a secondary dimension weight of 0.039. Third in rank is “automatic upload of measurement data”, with a weight of 0.037 for the secondary dimension. The data demonstrated that the key resources—physiological measurement analysis and the application—are the most important. All measurement data must be transformed into usable information in order to achieve the effect. The management analysis of big data and long-term medical knowledge simplifies the physiological parameters into diagrams, explanations, and suggestions—in essence, the purpose of providing telecare services.

5. Conclusion and Suggestions

5.1 Research Conclusions and Propositions

Telecare service is a new service model that combines information and communication technology, cloud computing, the medical profession, and medical technology. The contribution of this study is the discussion on the requirements of telecare and the provision of reference for future entrepreneurs who want to engage in telecare services. In addition, it allows existing businesses to understand the demand factors of the care recipients and strengthen the overall service to improve business performance and the success rate of developing new service areas.

Furthermore, this study makes research propositions for the business model and future development of telecare by adopting “telecare service providers and demanders” as the subject

of questionnaires, discusses “issues and conditions that have not been considered in the past”, and is measured and validated by literature analysis and the Analytic Hierarchy Process (AHP).

Proposition 1: Among the key factors of the primary dimensions of telecare services, the “value proposition” dimension is more influential than “other dimensions (four items, such as target market, key activity, customer relation, and key resource)”, which means that it is necessary to “build value proposition to solve real problems”.

Telecare services are not limited by time, space, and geographical factors. More so, its value lies in the fact that it can also utilize the effects of medical and nursing care at any time. Thus, it reduces the risk of residential safety and solves the potential problem of insufficient housing in social welfare institutions and the aging of elderly people locally. Further, a value proposition with a clear goal is necessary. All service activities, service design, and management models must follow this principle. The demanders must also recognize, receive, and use the service to achieve family care, medical service, and life continuity balance.

Proposition 2: Among the primary dimensions in the field of telecare services, the “value proposition” dimension has the most important feature of “emergency rescue service”, which means “rescue lives in emergency situations”.

In the process of telecare services, the only thing that cannot be predicted is the occurrence of emergency hazards. Falling, slipping in the bathroom, and transient dizziness caused by lowering blood sugar and blood pressure may endanger life and safety. Therefore, the main service scope of the Lifeline System in the United States and the Tunstall Group in the United Kingdom is emergency rescue service, which has more than ten million users. In view of unpredictable accidents, it is necessary to build a safe environment with reduced risk factors and emergency response capabilities to protect life and health. Meanwhile, there is a complete management method for care recipients and their families, and a 24-hour monitoring system and an immediate response system are worthy of reassuring.

Proposition 3: Among the primary dimensions in the field of telecare services, the “target market” dimension has the most important feature of “People living alone or with reduced mobility”, which refers to “People living alone or with reduced mobility, and people with difficulty in seeking help”.

The main target of telecare services is the elderly who live alone or with limited mobility. The most important point of successfully promoting telecare services is: “To whom do you want to provide services?”. In the “ultra-aged society”, the most important point in the public service class and creating services that meet the requirements of an aging society and reduce its deterioration, is to allow the demanders to appreciate the spirit of service and make them understand the convenience and life security brought by telecare services, thereby increasing acceptance and service popularity.

Proposition 4: Among the primary dimensions in the field of telecare services, the “key activity” dimension has the most important feature of “real-time sensor early warning report”, which refers to “real-time sensory monitoring and abnormal detection early warning”.

The difference in telecare modes can be roughly divided into dynamic monitoring and static care services. The dynamic monitoring service consists of equipment, such as sensors, monitors, and radio transmitters. Whether at home or walking outside, there are systems and dedicated personnel that observe the life behavior of the care recipients for 24 hours to respond to emergency processing. On the other hand, static care service collects daily physiological data, analyzes its health status, and gives appropriate advice when necessary. Its purpose is to obtain due protection in health management and life safety through the content of remote care services.

Proposition 5: Among the primary dimensions in the field of telecare services, the “customer relationship” dimension has the most important feature of “face-to-face communication”, which refers to “face-to-face explanation strengthening medical and patient communication channels”.

In addition to conveying the health information of the care recipient through the analysis charts of the measurement data, the telecare service industry can also adopt the 24-hour online consultation service or personalized health report to allow the professional medical staff to describe the care recipient’s health in detail and provide appropriate suggestions. With the medical profession and face-to-face communication, the communication and trust between the doctor and the patient are strengthened. Meanwhile, the service satisfaction is improved.

Proposition 6: Among the primary dimensions of telecare services, the “key resource” dimension is more influential with the feature of “physiological measurement, analysis, and application”, which means the “collection of physiological parameters and effective data analysis”.

Among the key factors of primary dimensions of telecare services, the key resource dimension is more influential with the feature of physiological measurement, analysis, and application. The case studies in the research revealed that the analysis and application of measurement data is a service provided by the majority of telecare service providers, showing that such is a relatively mature service. After data are integrated and analyzed in the cloud, it is transformed into a simple and easy-to-understand chart to promptly demonstrate the health information of the care recipient. This method is the fastest way for users to check their health status—a service used every day. Therefore, the user experience in this field is quite high.

5.2 Research Suggestions

There are many telecare service applications currently. However, not all of them meet consumer requirements. This study found that the most important key factors are “emergency rescue service”, “real-time sensor warning report”, “people living alone or with reduced mobility”, “residents in remote areas”, and “reduction of medical treatment time”. Thus, the following suggestions are proposed in order:

(1) “Emergency rescue services” are critical to users’ lives, especially in preventing falls and loss of the elderly. Through active seeking for help and passive rescue services, dangers can be detected immediately, and the chances of successful rescues can be increased. The United States and the United Kingdom have developed fairly mature service models and related supporting measures with ten million users. However, there are only a handful of enterprises that can provide this service in Taiwan. This study suggests that enterprises can develop new service models in this direction in the future. The information communication industry in Taiwan is well developed, and the WIFI penetration rate in metropolitan areas is relatively high. Therefore, AGPS (GPS + WIFI) precise positioning function can be adopted to increase the chances of a successful rescue.

(2) “Real-time sensor warning report” is a service that most enterprises can provide. A safe and easy-to-track-and-observe living environment is built through physiological data analysis and various sensing devices. In view of the “real-time sensor warning report”, it is a service item commonly provided in telecare services. Therefore, this study recommends that all businesses adopt this service, provide more accurate sensors, have clearer health analyses and suggestions, and strengthen consumers’ good impression of the service.

(3) In this study, “people living alone or with reduced mobility” and “residents in remote areas” are the most important groups in demand. It is recommended that the enterprises refer to the results of this study and focus their business development on elderly villages, care centers,

remote villages, mountain areas, and offshore islands to promote home-based telecare services. Alternatively, they can cooperate with local governments, community management committees, and remote tribes to develop a multi-person public service model. In this way, they can provide the most economical service model that best meets the requirements of consumers to promote telecare services effectively.

(4) “Reduction of medical treatment time” is the most sincerely anticipated factor for every patient and family member, especially in the areas with inconvenient transportation, such as mountain areas and offshore islands. When life is endangered, every minute and second is precious. Therefore, this study recommends the subsequent sustainable development of new medical technology, such as “Anxin Card”, to shorten the time for patients to seek medical care, thereby increasing the chance of medical survival.

5.3 Research Limitations

There are two research limitations in this paper:

(1) Although the questionnaire subjects for this study included 12 individuals, such as doctors, nurses, care center operators, care demanders, and those in remote areas, the number of samples was slightly insufficient. The lack of samples may cause deviations in demand judgments, which will affect the final analysis results.

(2) The current medical regulations in this country can only agree to conduct medical assistance activities without diagnostic content or partially agree to the operation of medical equipment by qualified medical personnel to conduct telecare diagnosis and treatment. Remote diagnosis and treatment, as well as prescription writing, have not been consented to yet. Thus, there is still a considerable gap between the telecare services provided and the successful cases of advanced foreign countries. Further related studies can be based on the degree of openness of future regulations. Moreover, the deficiencies of this study will be further discussed. The college environment plays an important role in shaping sustaining healthy eating habits among youngsters. Since prospective teachers are the upcoming teachers who will be the role model for their school children they can promote valuable nutritional information through their own daily food practices. College campus, canteen and college dining halls plays a crucial role in guiding dietary eating environments among students. Display of information about healthy diet in the college notice boards provides knowledge to a large number of socio economic and cultural backgrounds. The continuous healthy eating habits effective policies and managerial strategies followed inside the college campus helps to fight malnutrition such as obesity, anorexia, and micro-deficiency. Proper diet and physical activity will lead to maintain healthy weight and lifestyle among Prospective teachers. Diets rich in high fibre reduce the risk of obesity and various health problems. Healthy dietary habits help to maintain good physique, relieve stress, stroke prevention, improve learning, mental health, build better mood, and self esteem. Parents also influence more in their children’s food preference through their verbal dietary comments and restrictions employed in consuming un healthy food items. Consuming fruits and vegetables is one of the important healthy behaviors to achieve one’s optimal physical function. Social media plays a vital role in encouraging healthy eating behaviors through various traditional cooking programs, advertisements, talk shows, debates, panel discussion etc. Parents continuous monitoring of their wards is very important in maintaining good health. Thus constant practice, knowledge and monitoring of the health practice of the college students will create a healthy nation.

References

- Chaffee M.(1999): A telehealth Odyssey.American J. of Nursing 1999; 99(7):27-33.
- Chao, H. C., Zeadally, S., and Hu, B., Wearable computing for health care. *J. Med. Syst.* 40(4):87, 2016.
- Christine et al. (2011).Telecare and older people: Who cares where? *Social Science & Medicine*, Volume72, Issue 3, P347-354.
- Daniel, R. D. (1961), Management information crisis, *Harvard Business Review*,39(5),pp. 111-121.
- Dermiris G, Marilyn JR, Myra AA, et al(2004): Older adults' attitudes towards andperceptions of smart home technologies:a pilot study. *Medical Informatics andthe Internet in Medicine* 2004; 29(2):87-94.
- Greenhalgh, T., Procter, R., Wherton, J. *et al.* What is quality in assisted living technology? The ARCHIE framework for effective telehealth and telecare services. *BMC Med* **13**, 91 (2015).
- Hamdi, O., Chalouf, M. A., Ouattara, D., and Krief, F., eHealth: Survey on research projects, comparative study of telemonitoring architectures and main issues. *J. Netw. Comput. Appl.* 46:100–112, 2014.
- Mahoney DA, Tarlow BJ, Jones RN:Effects of an automated telephonesupport system on caregiver burdenand anxiety: Findings from the REACHfor TLC intervention study. *Gerontologist*2003; 43: 556-567.
- Magretta, J. (2002). Why business models matter. *Harvard Business Review*, 80(5), pp.86-92.
- Osterwalder, A., &Pigneur, Y. (2010). Business model generation-a handbookfor visionaries, Game changers and challengers. John Wiley & Sons Inc.
- Teece, D. (2010). Business model, business strategy, and innovation. *Long RangePlanning*, 43(2/3). pp. 172-194.
- Oudshoorn N. (2011) Telecare Workers: The Invisible Profession. In: *Telecare Technologies and the Transformation of Healthcare*. Health, Technology and Society. Palgrave Macmillan, London.
- G.C.Lamprinakos et al.(2015). An integrated remote monitoring platform towards Telehealth and Telecare services interoperability, *Information Sciences*, Volume 308, 1 July 2015, pp 23-37.