ABSTRACT

With the percentage of those over 65 in Ireland increasing, the current healthcare system is under severe pressure to meet this demand. The supply of hospital beds is already under immense pressure as it attempts to meet the growing demand. A new healthcare model has emerged in recent years which adopts the use of technologies as a platform for delivery healthcare to patients. This model is connected health and it is very topical at the moment.

There is no country currently using this as their primary healthcare model so this project undertakes the necessary research in order to determine the main barriers to entry for it in the Irish market. Due to the freshness of this model not a lot of literature exists on the topic so an interviewing approach was used to draw conclusions on the model.
This project has been conducted on behalf of PA Consulting Limited. PA Consulting is an international management consultancy firm. In Ireland they have strong interest in the healthcare system resulting in them taking a keen interest in the role of connected health in Ireland’s future. This report gives an insight into this sector, however due to time constraint and the freshness of the sector a lot more research is needed to certify any recommendations given in this report.

Research was conducted by analysing literature that was available and interviewing persons involved in the connected health sector. A series of interview questions was devised to enable relevant data collection. All interviewees were very willing to share their experiences and knowledge of the sector. Several conclusions were gathered from the interviews which provided great progress in identifying the objectives of this project.

Without the generous time given by the interviewees, this project would not have been done so it is on this note that I would like to give a strong thank you to Michael Murchan, Brian Christensen, Patricia Scanlon, Declan Bogan, Dr. Peter Donnolly, Paula Hicks, Rodd Bond, Ann Coyle and Sean Mulvany for their time and highly valued knowledge.

I would also like to thank Sile Ryan of PA Consulting for all her help and support throughout the project. Without her valuable input and support, it would not have been possible to conduct the project. Lastly I would like to extend my extreme gratitude to my Project Supervisor, Cathal Walsh for all the encouragement and advice throughout the course of the project. Without the continuous support received from Cathal, the project would not have been completed on time with the objectives fulfilled.
PA CONSULTING LTD.
Analysis of the role of Connected Health in Ireland’s Future

March 2011

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1. INTRODUCTION AND SUMMARY

This chapter introduces the overall objectives of the project by detailing the project background and terms of reference. An introduction to the client company is also given, which details a brief history of the company and its main interests. An outline of subsequent chapters is also provided.

1.1 The Client Company

PA Consulting is an international management consultancy firm that operates in more than 35 countries. They are an independent, employee-owned company that provides services to a wide selection of companies operating in both the private and public sector. The company has been established since 1940, and had its most productive period between 1950 and 1970 when it became the largest management consultancy firm worldwide according to headcount.

PA Consulting has two offices running out of Ireland, Dublin and Belfast. These are ranked as principal offices of the firm. PA Consulting has four areas of prime interest in Ireland, these are: Innovation and Enterprise, Energy, Health and Central Government. These areas link in with the project as Connected Health is such a new area that it would be an innovative project to launch and also the technologies fall into the health sector.

1.2 The Project Background

With the population of Ireland getting older, the demand for healthcare is increasing too. New ways of meeting this demand are required, as the supply of hospital beds cannot meet the demand. Connected health technologies appear to be an idealistic solution to this, but are struggling to launch in the Irish market. The technologies aim to provide an alternative to acute care, support independent living for the elderly and chronically ill and also the potential for post-operation care assistance. Determining and analysing the barriers to entry for connected health technologies is the main objective of this project.
1.3 Terms of Reference

The terms of reference of this project are:

- To conduct a market analysis to determine the need for Connected Health technology in Ireland.
- Identify the factors that are preventing the technologies from being adopted.
- If any alternatives to Connected Health are discovered make note of these and their advantages over Connected Health.

1.4 Summary of the Remaining Chapters

- **Chapter 2** provides a summary of the key findings and recommendations of the report.
- **Chapter 3** illustrates the methodologies used in conducting the research.
- **Chapter 4** outlines connected health’s ability to fit into FP7 and Fine Gael’s healthcare plans.
- **Chapter 5** discusses the barriers to entry for connected health that are discovered through the interview process.
- **Chapter 6** reviews other emerging healthcare models.
- **Chapter 7** looks at the potential for Ireland as a test-bed.
2. CONCLUSIONS AND RECOMMENDATIONS

This chapter outlines the main findings of the report along with some suggested actions to overcome the barriers to entry for connected health technologies.

2.1 Conclusions

Connected health is a large program and this project has only skimmed the surface of it. Many different factors are impacting on its deployment in the Irish market. Key conclusions drawn for this project are documented below; these give an indication of the challenges associated with the deployment of a holistic Connected Health program.

- There are structural barriers to implementation being experienced by the HSE’s lack of involvement in the connected health sector, see section 5.8. Whilst acknowledging this it is important to note that Fine Gael’s new government policies on healthcare provision and the leveraging of “Connected Health” do not appear to be inconsistent, see section 4.2.
- There is a lack of communication and coordination between the state bodies of Ireland. This results in key issues not being discussed to evaluate the benefit of each body.
- The initial investment required to launch a holistic program is significant; in the current economic climate it is difficult to see the Government through the HSE committing to such a program as connected health due to the large initial spend.

Whilst acknowledging the barriers above it is important to highlight a number of non Irish “Public Sector” considerations:

- Ireland is a domicile of choice for the technology and pharmaceutical industry. Ireland is a leading domicile for research and development in this sector in addition to being one of the highest exporters of medical technology in the European Union, see section 7.
- The “Seventh Framework Programme (FP7)” would appear to offer a source of funding to help offset the initial investment required to launch a connected health program, see section 4.1.
- There are a number of existing private sector participants operating in Ireland with a focus on connected health products, see Appendix C, p.C.1.

Taking the foregoing into account Ireland would appear to be well positioned to create through a public/private partnership a connected health “test program” to move to the next level of “Connected Health” deployment maturity. However as highlighted above this will require
significant political support as it is believed that the “Public “side of the partnership will need to take an initial leading role.

2.2 Recommendations

Prior to the launch of a public/private project, significantly more research is required on the sector. Timescales and the initial brief for this project did not allow for a comprehensive and detailed analysis. However from the research and interviews conducted a number of barriers to entry where identified (which are expanded upon in section 5) some of which include:

- Initial investment
- Payment and monitoring of the data
- Establishing objective efficiency studies
- Support of medical professionals
- Legislation
- Moral considerations

The key recommendations summarized below have been developed from the barriers to entry identified through interview research, see section 5.

- A lot more research is required into the area. It is a very broad spectrum with multiple levels to it which require detailed observations before any radical moves are made towards a connected health model.
- Encouraging the ABC (academia, business and clinical) collaboration network that BioBusiness are promoting will give valuable insight into the area while registering your interest as a party in the connected health sector, see section 7.2.
- Establishing a working relationship with the state bodies related to connected health is crucial. These are primarily the Department of Health and Children, Enterprise Ireland (and other funding bodies that support company growth), and the HSE. A working relationship with these three bodies could bring connected health forward.
- There are several levels of connected health that could be implemented. Developing a gradual but integrated program which facilitates incremental investment and execution would potentially address the initial investment concerns whilst ensuring each phase supports a strategic end state vision. Developing such a proposal will help de mystify “Connected Health”, increase awareness and potentially be more appetizing to the public sector.

Connected Health is still a relatively new area and a large amount of awareness building needs to occur on it. Initial funding to drive the sector into a more publically knowledgeable situation and to get it into the vocabulary of all medical professionals and healthcare providers will create
a bigger fan base for it. The more interest generated in the area the greater the demand for the industry when it goes to tender and development.
3. METHODOLOGY

This chapter details the methods used to complete the research. A literature review is included to help get a full rounded definition of connected health.

3.1 Research Overview

In order to commence this project a significant amount of research was needed. Knowledge was compiled and analysis performed on materials outlining connected health technologies and their usage provided by the client and through the internet. Not a large amount of research has been done in this area to date; most information available involved small scale pilot projects launched in Ireland.

A recently published document reviewing all connected health projects that had run in Ireland, (Connected Health in Ireland: An All Island Review published by BioBusiness) provided an abundance of information on the sector.

Consideration was given to progressing the study using a survey or interview technique to answer research questions. The nature of the questions and population of interest meant the more in depth and open instrument of interviews was preferred. It was felt that an interview approach complemented the freshness of the area. An outline of the interview questions was created, with all questions being open ended to enable the interviewees to share vast quantities of knowledge and experiences of the connected health sector. By identifying key persons in the area and areas related to connected health, a well rounded view of the area could be determined.

Identification of appropriate interviewees was challenging. An intended view of who to interview initially was deemed unsuitable as unless an expert in the area, they gave very trivial background and solutions to the connected health sector. The interviewee list had to be expanded on to gather more detailed information on the sector. Through the contacts of PA Consulting and rigorous internet research very well respected persons were secured for interviewing. On realization that not all interviewees were from a connected health background a short essay defining connected health and detailing examples of some projects that had launched in Ireland was completed to provide support for the interviews. Both the interview outline and essay were sent to the interviewees prior to the meeting to ensure an understanding of the area.
All interviewees were very enthusiastic about the prospects of connected health and they were very generous with the information and knowledge they shared of the area. The interviews were based on the interviewees providing a brief description of their background and any work they had done with regards to connected health and from here the list of proposed interview questions were asked. All interviews are documented in Appendix F, p. F.1. The extent of experience and knowledge those had on connected health expanded the difficulty of the project. An original feeling of an easily attainable solution gradually diminished the more deeply research went. It was recognized that this was not a trivial problem and significantly more research would be needed to properly address the deployment of connected health solutions into the Irish market, which timelines did not provide for this project.

3.2 Literature Review

3.2.1 Introduction

The Irish health system currently relies heavily on acute hospitals, PA Consulting (2007). The age of the Irish population is increasing along with the demand for hospital beds. The current bed capacity is under enormous strain and won’t be able to deal with the increasingly aging population. To deal with this a new healthcare system infrastructure is required. Moving from a secondary based health care system to a predominantly primary healthcare system is an effective solution. Primary care will significantly reduce the amount of people seeking acute care as it is the appropriate setting to meet 90-95 per cent of all health and personal social service needs, Department of Health and Children (2001). Connected health is a large scope area that is a primary based care initiative. It has the power, if successfully launched, to dramatically change the Irish health system for the better.

3.2.2 Definition

Connected health is a term that has come into use in the last number of years to describe the use of all aspects of information and communication technologies in the field of healthcare to improve the quality of care and outcomes, Bogan et al. (2010). Commonly used terminologies in relation to this area are: telemedicine, telehealth, eHealth, telecare, home-based-care and mHealth. Each of these differs in the delivery of the care provided or type of care it is providing. The main ambitions of this healthcare system are to decrease the costs of providing healthcare to patients while improving the quality of care that the patient receives. The model is patient centric to enable that the best care possible is provided to the patient. All of the technologies are
developed around the patients’ needs with the primary objective for them to be as user friendly as possible.

The primary targeted market for these technologies is those suffering from chronic diseases and the elderly. With the idea behind connected health being self management, this will actively reduce the number of hospital visits someone suffering from disease’s like diabetes, epilepsy and chronic heart failure while also improving the overall care they are receiving. Having a full range of vitals provided on a daily basis rather than the snippet they get on the day of hospital visits shows a much better overall health picture. To prevent patients from getting frustrated with continuous inputs, feedback is essential to maintain the system. Seeing how certain activities (such as eating habits) affect their health will allow them build up a profile of health deteriorating activities. A full circular system that transmits the data provided from the patient end to the specialist who is monitoring it, while giving feedback to the patient is the most beneficial way to operate these technologies.

For the elderly, these technologies will help them stay at home for longer periods before being admitted to nursing homes or hospitals. There has been a lot done surrounding this area in particular. Many projects falling under the title of “ambient assisted living” have run in Ireland. These projects adapt the homes of the elderly to make them more elderly friendly. Sensors and social alarms provide a safer environment for those to live in. These adaptations provide ease of mind for the older person along with their family.

Since connected health covers such a large area, activities had to be categorised to understand exactly what each are doing and who they are aimed for. Connected Health activities in Ireland are categorised as follows:

- Personal health records and informatics in support of acute care and in-hospital systems
- Medical devices / advanced diagnostics and point of care devices
- Telehealth monitoring of chronic conditions / home based monitoring systems
- Telemedicine and the use of telecommunication systems in clinical care
- Social alarms, Telecare, ambient assisted living (ageing well) systems and services
- Personal health, wellness and lifestyle support systems.
- mHealth (the use of mobile and smart phones in relation to any or all of above), Bogan et al. (2010).

These show the many areas that connected health tap into. A fully integrated system will encompass usage of devices in all these different sections, although initially costly, the savings gained over the years will be colossal.
3.2.3 History

Following the development of the internet, many new terms started to emerge in the world, such as email and e-governance. All of these provided new ways of doing previous activities; emails spend up mail delivery, while e-governance allowed for a new way of integrating many different departments together. Soon enough the term eHealth came along. As with most neologisms, the precise meaning of eHealth varied with the context in which the term was used, Oh et al. (2005).

The most basic definition of eHealth is the use of the internet to provide healthcare. One major area that is enclosed under this term is the development of electronic patient records. Since the topical conversations surrounding eHealth and its prospects for shaping the future face of healthcare, there has been an emergence of a new term, “Connected Health”.

Although both have similar definitions, there are some key differences between the two terms, as connected health implies the use of operational and integrated systems to deliver patient centered healthcare and to provide remote connectivity with healthcare professionals to improve outcomes while also reducing risk and achieving greater efficiencies, Bogan et al. (2010). In essence connected health builds on the usage of other electronic devices to deliver care, while also making use of the internet. eHealth contained a lot of complex global issues that had to be solved regarding privacy, connectivity, standards needing to be corrected, Hicks (2010). Many of these issues are still very evident under the connected health spectrum.

Connected health covers a much larger range of activities than eHealth. This has resulted in eHealth being slotted in as a subset of connected health. There is still lots of activity occurring in eHealth (Ireland attempted to roll out an integrated electronic patients record system but this has been shelved due to high risk identifications) but with the development of many new terms following the arrival of connected health it is not heard as frequently. Many projects that are covered as connected health would have previously been called eHealth. Since the emergence of connected health technology many pilot projects have launched across the island of Ireland. The majority of these have been very successful but with the financial funding drying up, the majority of the projects do not make it out of the pilot stage.

3.2.4 Current Status

Currently, the majority of activity being done with regards to connected health is awareness building. It is a relatively new concept with not a lot of details currently available. There is a great deal of activity being pursued in several of the universities and colleges across Ireland. The main education institutions engaged in this area are University of Ulster, Jordanstown and Dundalk IT. Both of these have established themselves firmly in the industry. Large scale projects and research have been prepared by both with very beneficial results.
Co. Louth is trying to establish itself as the first age friendly county in Ireland and lots of projects are being done to enable this. Many of these projects call on the products and services of the connected health sector. The NetWell centre which operates from Dundalk IT have secured large funding for the CASALA project. A unique housing project consisting of 16 apartments has been developed from this project. These apartments contain cutting edge technologies to support the elderly people who live in them. A multitude of sensors and devices assisting with daily living activities are found in the apartments. Each apartment is remotely monitored by a supervisor who can alter the temperature of the apartment, close doors and turn off lights all from a computer. This is all done to provide a more pleasant living experience for the person. The success of this project has led to counties Kildare and Kilkenny beginning their own similar ones with the help of those involved in the Dundalk project.

BioBusiness is doing a great deal of work in the area of connected health. They have set up an ‘ABC’ network. This aims to get academia, business and clinical people communicating about the potential connected health holds for Ireland as a healthcare model. BioBusiness recognise that close collaborative relationships between these people is essential for the development of the sector, Bogan et al. (2010). By getting all these people talking more ideas about tackling the barriers for a fully integrated system across Ireland can be addressed.

Enterprise Ireland is very interested in the potentials connected health hold for Ireland and launched an ‘Innovation Capability Building Programme in Connected Health’ in March 2010. This invites tenders for the provision of an Innovation Capability Building Programme for the Connected Health Sector. The goals of the project will be:

- To develop an understanding of the tools, techniques and standards that will allow companies develop a systematic and repeatable approach to technological and non technological innovation in this field.
- Up-skilling and preparation of companies on completing the regulatory pathway for approval of their products and services.
- To provide participating entities with complete understanding of the key technology, market, healthcare and government/legislative drivers in the sector.
- To increase participant understanding of internationally available innovation support mechanisms and provide strategies to maximise access to said supports, Mulvany (2010).

Enterprise Ireland will work closely with successful tenders to help develop their programme outline and hopefully make a big footprint on the creation of connected health in Ireland.
3.2.5 Future

There is a significant opportunity for companies to penetrate the Irish market. Smaller scale companies will find it significantly difficult to gain interest from the HSE or private healthcare providers, but large multinational companies are looked at by the HSE to provide infrastructure and creative approaches to developing healthcare networks.

Connected health has been identified as a key development area by many funding bodies of Ireland. Agencies such as Enterprise Ireland, Industrial Development Agency and InterTradeIreland have all expressed keen interest in providing financial and informative backing for innovative projects in the connected health area. This should attract new ideas and provide a good range of ideas on addressing the potential roll out of the technologies on a national level.

mHealth has started emerging as a new development area for healthcare provisions. mHealth is the provision of health-related services via mobile communications, Jaschke (2009). With millions of people mobile phone users it provides a good means of healthcare without large investment by the consumer. A large range of smart phone apps have begun to emerge which aid the user with personal healthcare dynamics. In Austria a system has been rolled out with mobile network Orange that monitors patients’ glucose levels. Larger and broader developments should come on board in this area in the near future. If a working relationship developed between mobile networks and healthcare providers, the possibilities are enormous. iPads could be seen at the end of all patient beds in hospitals to enable instant result recordings and any interactions a patient might need throughout the day.

Social media has the potential to play a part in the future of connected health. With large percentages of the global populations using social networking sites, it holds the ability to educate loads on these technologies and other forms of healthcare management. Virtual chat rooms and meeting areas can be created for patients to contact others suffering from the same illnesses as them. Doctors and clinicians can communicate via social networks to patients with regards treatment, health worries and tips on managing their illness. With the development of Web 2.0 all these possibilities can become realities. Web 2.0 is most commonly associated with web applications that facilitate interactive information sharing, interoperability, user-centred design, and collaboration on the World Wide Web, Hicks (2010). All of these are common traits to the survival of connected health and support the usage of social media as a form of healthcare provisions.
3.2.6 Conclusion

Connected health is a very topical area at the moment. It is gathering strength in its battle to be rolled out across Ireland, and indeed many more countries too. The Scandinavian countries appear to be more advanced at the moment but still have not adopted it as their central health care provider service. A significant initial investment will be needed by any country who wishes to transform their health care model to match that of connected health. It is difficult getting funding at the moment so the deployment of connected health will probably continue to be treated as opportunistic in the near term.

Ireland is very risk adverse when it comes to healthcare expenditure and investment. There is not a lot of financial backing available in these current times to launch significant change in the Irish healthcare model. Until another country completely transfers over to a connected health model, it appears the Irish system will remain. Lots of small scale projects will still emerge which will give a good starting point for a national roll out, but judging by current conditions it doesn't appear to be in the very near pipeline.
4. OUTLINE OF EUROPEAN FUNDING AND IRISH HEALTHCARE MODELS

This section looks at the Seventh Framework Programme introduced by the EU for funding allowances for the period of 2007-2013. An overview of how connected health may fit into this funding regime is outlined. With a new party being sworn into Irish government, a look at both Fine Gaels and Labour’s health plans from their manifestos is addressed.

4.1 Seventh Framework Programme (FP7)

The Seventh Framework Programme for research and technological development (FP7) is the European Union’s main instrument for funding research in Europe. FP7 relates to the period of 2007-2013. A larger budget than any other Framework Programme has been secured for these years, see Appendix D, p. D.1. The seven years the programmes runs for contains an impressive 52.3 billion euro budget.

There are some key differences between FP7 and its predecessors. FP 7 has listed its key areas of interest and with health included it contains a good starting point for connected health projects. A short outlook of FP7 illustrates its specific programmes:

- **Cooperation** – fostering collaboration between industry and academia to gain leadership in key technology areas.
- **Ideas** – supporting basic research at the scientific frontiers (implemented by the European Research Council)
- **People** – supporting mobility and career development for researchers both within and outside Europe.
- **Capacities** – helping develop the capacities that Europe needs to be a thriving knowledge-based economy.
- **Nuclear research (Euratom programme)** – developing Europe’s nuclear fission and fusion capabilities, European Commission Research Directorate-General (2007).

The Cooperation programme is of particular interest for the funding of connected health led projects. It addresses the willingness of working on a project that incorporates both the private and public sector of a country. With healthcare being a combination of the two it would be idealistic to operate a venture with both sectors. Under the Cooperation Programme, a Joint Technologies Initiative (JTI) is discussed. The JTI is a new objective of the framework programmes, which entails allocating large funding to projects that will be run over a considerable period with enhanced collaborations. This provides an ideal platform for connected health led projects.
A closer look at the health outlines for FP7 shows a keen interest in innovative projects, with prime interest topics including developing tools and technologies for high-throughput research, and the development of tools, technologies and devices for application in regenerative medicine. Both of these topics cover the usage of connected health and the objectives that it seeks to fulfil. The innovative side to connected health with regards to replacing current, strained health systems will give it an extra edge at securing funding.

4.2 New Government Health Plan Outline

Following the entrance of Fine Gael and Labour into government, a new healthcare model proposal has been outlined. Both Fine Gael and Labour had similar health outlines on their manifestos for the 2011 elections. A plan to have extinguished the HSE by 2016 is underway, following the introduction of a Universal Health Insurance system under the project, ‘FairCare’. The model is based on one implemented by the Dutch. In this scheme all residents of Ireland will pay health insurance, and those that can’t afford it will have it paid by the government. To completely integrate this systems, Fine Gael identifies it will take nearly 10 years so have divided their ultimate goal into two project plans.

The first project will introduce a higher rate of community care. Patients with chronic disease will be treated in or close to their own homes. This type of care will call upon the services of connected health applications in order to monitor the patients and provide the necessary care. This home based care will provide more business for local GPs which Fine Gael hopes will allow them to expand their services. A “money follows the patient” service will be introduced to allocate hospital funding. Rather than supplying hospitals with set budgets each year, they will be provided with money based on how many patients they actively treat. Labour believes this will make the hospitals more efficient with a higher rate of patients being treated. A full rounded patient care package will take into account any additional home care or monitoring that may be needed following hospital discharge. Physicians’ may wish to monitor patients let out early with selected connected health technologies.

Fine Gael has looked at the possibility of using IT in the healthcare industry to cut costs. They make a very valid point of the HSE’s poor track record with IT functionality in the past. A clear cut project outline that emphasises on making all deadlines and sticking to budget will be drawn up. If this goes ahead successfully, a fully integrated connected health model may establish itself in Ireland. This is the best opportunity that connected health has at establishing itself in the Irish market; the actions Fine Gael and Labour take will determine their commitment to their manifesto declarations.
5. KEY ISSUES IDENTIFIED THROUGH INTERVIEWS

The following summarises the key barriers to entry for connected health that were identified during interview research.

5.1 Initial Investment

Initial investment for a fully integrated connected health system is significant. Public sector funding at present is difficult to source to launch a new health system. With such a large investment needed, there would be serious issues if it failed. Ireland has not got a great reputation in deploying new technologies, with epolling been deemed a failure along with a one payment system for all those working in the HSE. Political will and leadership would be needed to advance this agenda; with competing priorities it is difficult to see connected health on the agenda.

With regards to eHealth, which is a subsection of connected health, a €60million electronic patient record system was rolled out by the HSE. The system was being used by “10 acute hospitals and 20 other HSE centres to manage patient records and was originally intended to link up all HSE records nationwide to aid treatment of patients”, Burke and Kehoe (2010). An audit of the system identified five high risk security issues. One of the most highlighted issues was in Kerry General Hospital, were catering staff had access to patient records. The project was shelved after this with no indication as to when it may resume. This is not a great start to having an all rounded connected health model in place.

A look at Irish healthcare expenditure compared to other European countries, see Appendix E, Section E.1, p. E.1, illustrates a below average percent of GDP being invested in the healthcare system. This reflects badly on the Irish economy, however when you look at how much of this expenditure is used on medical technology, see Appendix E, Section E.2, p. E.2, Ireland falls even further down the ranks with only three European countries below it. To establish a better system with more focus on technology in the healthcare system Ireland needs to allocate more funding to the IT side of its healthcare budget. To gain a strong step in this market a higher healthcare budget is needed for the first few years of implementation of this model so it can work in conjunction with the current system while viability is checked.
5.2 Payment and Monitoring of the Data

There is no payment model outline or indication of who monitors the abundance of data provided by patients using connected health technologies. A clear outline of the way this healthcare will be provided, along with reimbursement policies detailing payment methods for all involved in the area needs to be devised.

A key identification of required skills for those who work in the area of patient data monitoring needs to be outlined. If all the data is being sent to large data warehouse, should a healthcare professional be actively on site or is it sufficient for data analysts to detect issues with patient’s recordings? Algorithms can be recorded to alert data analysts of potential risks to a patient but should the ultimate decision of sending someone out to the patient be that of a data analyst or healthcare professional?

Reimbursement methods need to be offered to those doing the monitoring. Many nurses/doctors/clinicians see the monitoring as an extra workload and are reluctant to take it on, although any project that has run in this area has found it decreases workload as a decrease in patient engagement is experienced.

GPs operate on engaging with a patient and receiving payment for this, if they are remotely monitoring a patient they won’t received payment for this and their number of patient appointments a year will also decrease. Incentives must be offered for GPs who choose to engage in this form of work etiquette.

Along with GPs many other stakeholders need to be motivated and rewarded for their work with these technologies. The government must get behind the companies developing and monitoring these systems to properly govern the area and ensure standards are kept prior and post implementation. Support groups to protect monitoring companies from lawsuits over technology failures or misinterpretation of data received by patients need to be established.

5.3 Proving the Cost Savings against the Risk

In times of economic hardship, there must be evidence of cost savings to those in the public and private sector before they take on new strategies and business models. This is the same for all involved in the healthcare sector. Without details of cost savings being illustrated from the introduction of a connected health model, it will be very difficult to get it moving across the Irish market.

There is huge awareness of the costs of healthcare spiralling with the changing demographics of Ireland, but for any healthcare model reform the cost savings need to be proven as this is the
most vital element during these economic struggles. In order to move a project from pilot phase a substantial amount of money is required. Many small scale projects have been initiated in Ireland but the majority of these do not survive past pilot phase. Through a lack of funding the projects eventually fade away. The short timescales coupled with the technical scope of these pilots results in no proper cost/benefit analysis occurring.

The Irish healthcare system is very risk adverse and to invest such large quantities of money in a new healthcare model without proper cost savings data would be politically unattractive. A project manager that worked on the connected health project for Bell Labs cited their main reasons for dropping the project was the high risk of the initial investment and long term involvement required before benefits were seen.

5.4 Medical Personnel Reluctance

Connected health contains some valuable contributions to Ireland’s healthcare problems but if GPs and nurses are not interested it won’t work. The more reluctant healthcare providers are to changing their current care practices the less likely this model will work. Connected health will completely reinvent the provision of healthcare and open minded healthcare providers are necessary to encourage its development. A new mindset is mandatory for successful implementation but with doctors/clinicians dislike of change this will prove to be a very difficult barrier to overcome. These healthcare workers are essentially the glue to the whole healthcare system and without their willingness and motivation for this model it will probably never succeed.

It is currently in the interests of nurses to have sick/unstable patients in acute care as they can be reassured of patient care and ongoing monitoring. A huge drive is fundamental to verify the advantages of connected health and the reality of the position it could play in the Irish market. With a strong argument backing this drive and plenty of evidence it should promote the implementation of it nationally with nurses minds being eased and doctors more willing to learn about these new devices. Without a strong support network behind the connected health model, doctors are not going to take the time to familiarise themselves with the devices and actively use them in their surgeries.

5.5 Litigation and Security

There are a lot of security issues around technology devices and imputing data into them. People worry their details may be viewed by others and used against them. The highest levels of risk occur with electronic patient records. In America there have been cases of data
warehouses selling patient record information to insurance companies so they can decrease risky insurance policies. This inflicts on the doctor-patient relationship as patients will be reluctant to tell doctors of certain health details for fear it becomes more publically known.

No laws are contained in the areas surrounding connected health. In regards to electronic patient security there is not a lot of protection available in the legal sense. For community based healthcare there is no litigation present at the moment. In times of budget cuts, managers only follow what’s currently legalised and detailed in the law so not many healthcare managers are going to delve into this area until suitable legislation is put in place.

5.6 Training

Medical personnel are not technically skilled. A huge drive to ensure a suitable knowledge of IT applications by healthcare personnel to equip them to provide a high level of patient care will be an additional investment on top of the initial roll out project for connected health. Those currently employed in the workforce will need several crash courses on using technology devices before complete integration of the systems. To prepare for future entrants into the health sector an evaluation of college courses and training provided needs to occur. The introduction of some technology based modules in the college curriculum will enable some exposure and knowledge of the area before employment.

5.7 Lack of Academic Research and Awareness

Connected health is a relatively new area. There is no supporting academic literature to back up the viability of it. Majority of papers and articles on it are regarding pilot projects that have run on these technologies. All of these contain facts and information on relatively small scale projects that have run in the area, there are no journals giving a critical evaluation of the area and the potential it holds in Ireland’s future.

Many of the interviewees expressed their key role as developing awareness and productivity in the area, (Declan Bogan, Peter Donnolly, Ann Coyle, and Sean Mulvany). Structuring technology into college health courses and introducing masters and PhD courses on the topic to help build background knowledge on the sector is a valuable idea. Dundalk IT is launching a master’s course surrounding ambient assistant living next September which incorporates modules on connected health technologies. A large drive on this area to raise awareness of the devices so GPs and other clinicians are aware of their existents and usages is crucial for success in the market.
5.8 Lack of HSE Involvement

The HSE are not playing a leadership role in supporting connected health establishment in Ireland. They are not talking to the major stakeholders in the industry which will be required for guidance should they decide to get involved in the area. The HSE have had bad experiences with technology such as their attempt to roll out the payroll system which had significantly less people being registered on it. A more structured project outline than that of the payroll system along with help from large companies who are actively involved in the area will be a necessity if they do decide to get involved on a national scale project.

At present the HSE won’t invest in the technologies, their view is that their job is to provide care to patients and not to be a test-bed. Without the backing of the HSE it leaves Ireland in a limbo position in terms of a national project. The hope is that with other countries emerging as playing a role in connected health, the HSE may take some inspiration from them and begin structuring project plans. It is very unlikely that the HSE will take the initial leap forward with a new healthcare model in Ireland that is not established in any other country.

According to a HSE employee, they are not currently supporting any projects being done in the area of connected health. She addresses that it is not that they don’t believe it to be a good idea but it is not their highest priority at the moment. The healthcare system of Ireland is crisis driven and very much like a treadmill, with it being extremely difficult to come off this treadmill and roll out these technologies. There are also the concerns over money and how to get it for such a huge project.

5.9 How to do the Integration

No country has integrated a full connected health model as their healthcare model. There is no evidence displaying good practices for a roll out of this kind or the bad practices. The integration of these technologies is not a trivial problem and will incorporate a large degree of work. It is not a matter of making the decision to roll out the system and being able to do it. Significant planning and research into all the different devices that will make up the system needs to be done to great detail. A multitude of decisions and plans need to be conjured to ensure the highest chances of getting total system integrated done successfully.
5.10 **Self-Management Issues**

This method of care is not suitable for unstable, particularly depressed patients. Patients must be in the right frame of mind to treat themselves. These devices cannot force a patient to take their antibiotics, so if a patient won’t take them whilst not being monitored, the probability of them taking them whilst being monitored is dramatically low too. It must be noted that these devices are not a quick fix to difficult and reluctant patients.

For patients that are self-monitoring feedback is required in order to keep the patients attention so they continue to put their vitals in on daily/hourly basis. A full looped system is required with patients’ data going in at one side and a score or descriptive feedback is sent back to the patient based on their vitals. These enable patients to see what affects their health negatively and trains them to avoid these types of activities or eating habits.

5.11 **Interoperability**

With many old systems in hospitals a linkage problem between them is going to arise. This problem will develop further with new systems being integrated to allow for a large scale connected health model. Interoperability will become a huge concern as the systems are unable to communicate with each other. With many different systems being offered to doctor’s surgeries, hospitals and all other primary care services it will be difficult to provide a stable platform were all systems can work coincide each other.

5.12 **Doctors Professionalism**

The physical meeting with a doctor scenario is going to be very difficult to replicate. Without attending the doctors’ surgery and availing of an online consultation it will challenge the professionalism of health. The whole doctor patient relationship is one of high integrity with a very professional nature; by erasing the face to face contact a lot of this may be lost.

Doctors’ diagnosis’s are not just based on the readings of vitals and test results. In many instances there is a sense that when being diagnosed other indicators trigger a GP’s overall medical decisions. The overall appearance of a patient and frame of mind are not portrayed in the vital signs that a doctor receives online. Detection of sudden mood changes and other non-measurable statistics cannot be gathered through online consultations but only in the presence of the doctor were he can sum up a full patient profile.
If patients become more aware of their health through the ability to self manage they may begin questioning the knowledge of the GP. Patients believing they know more about themselves through additional knowledge and tracking may become reluctant to follow the advice of their GP and begin their own method of treatment. Patients being treated in these conditions need to be aware that as much as they know their own bodies and health, they don’t have the same qualification levels as their doctor and should always follow their recommendations.

5.13 What to Measure?

There are so many things that can be measured, but what are the crucial measurements. Trying to devise a plan of all vitals to be provided by a patient can be tedious. A patient is going to get exasperated of putting in an abundance of information everyday so selecting the critical vitals is essential. This will be a very difficult task as there is so much that contributes to a human’s health, necessities like measuring sleep is important but would probably not be deemed a priority in the realm of many other tests.

5.14 Technology Replacing Jobs

For the most valuable savings to be witnessed following the introduction of connected health, a look at what it will be replacing is required. Jobs of several healthcare workers will be replaced with the shift towards an area of connected healthcare provision. With many patients self monitoring consultants, nurses and care assistants will find themselves able to increase the amount of patients they care for. A decreasing in staffing levels in this area will be mandatory to experience the full cost savings of this model. Addressing appropriate redundancy packages in advance of this situation could help with decreasing staff numbers through voluntary leave.

5.15 Device Power

Power supply of devices is a cause for concern. A minority of devices are battery powered, raising conditions surrounding the life time of the batteries. Patients may lose device power at crucial monitoring periods, resulting in health deterioration or in worst case scenario death. A method of detecting battery lifetime must be clearly displayed on all these devices to avoid any cases of patients being monitored on a lifeless device.
6. OTHER EMERGING HEALTHCARE ALTERNATIVES

This chapter deals with other entrants to the healthcare market that may create competition for the connected health sector as it struggles to launch in Ireland.

6.1 Personalized Medicine

Personalized medicine is catered to adjust to each individual patient's need. It is a much larger scope than connected health and requires a lot of research into patients' lifestyle and particular type of illness. There are many different forms of each illness and how they affect each individual varies according to numerous different details. Many clinical trials are underway to encourage advancements in this area with a particular emphasis on breast cancer research. The wide range of breast cancer varieties gives a good insight into the individualism requirements of patients.

Unraveling the DNA make-up of people will give significant developments in this area. A look at each individual's DNA components will open the eyes of scientists to the world of both preventive medicine and more accurate treatments to provide the patient with. Dramatic advancements in the unraveling of DNA have occurred lately with a full DNA profile being able to be achieved from a human.

6.2 Smart Kitchens and Smart Cities

Pushing healthy living environments and eating habits to aid with health is an initiative currently underway in Ireland. Promoting healthy eating habits to avoid obesity and many other diseases with large linkages to food are well underway. Highlighting unhealthy components of food using a traffic light system is gradually making its way into Irish kitchen cupboards. Food with unhealthy levels of fat, salt, carbohydrates, etc. have this fact highlighted in red on its packaging. Those of a healthy nature are highlighted green while semi-risk levels are in amber. A drive to make it illegal for restaurants not to publish their food calories on their menus is gathering a stable fan base.

A clean environment free from harmful pollution and fumes promotes longer lives for people. IBM has launched both an environmental and healthcare project at the moment in Dublin and
Galway. Dublin is a test-bed being investigated as a smart city while Galway as a test-bed for a smart bay. With the increased urbanization of people, a decrease in healthy leaving conditions and unsuitable city infrastructures is causing major problems. IBM have situated their Smarter Cities Technology Centre in Dublin which will contain lots of international activity as it maintains previous Smarter Cities projects, new ones and the local one in Dublin.

At the centre, IBM will build a highly skilled and cross-disciplinary team to help cities around the world better understand, interconnect and manage their core operational systems such as transport, communication, water and energy, O'Keefe (2010). Through better integrated services being installed in highly populated areas, a strong infrastructure will promote easier lifestyle coordination with less stress being experienced. Through better practices of carrying out business activities lower pollution levels will be witnessed, promotion of using public transport as opposed to private transport is one beneficial recommendation in this area.

6.3 Regenerative Medicine

Regenerative medicine is still in very early developmental stages. It encompasses the regrowth of human tissues and organs following damage or certain defects. Tissues that are too badly damaged can be grown in a laboratory prior to implantation into a human body. This will eliminate the quantity of organs being rejected by the host’s body as they are grown using the tissues and cells of the individual receiving the organ. This will reshape the face of medicine with more lives being saved through organ salvation and reductions on transplant waiting lists.

This area holds no real competition for connected health at the moment. It is still in a very early developmental and trial stage. Connected health is more of a current healthcare advancement while regenerative medicine is about another generation away.

6.4 Ambient Assistant Living

Ambient assistant living is a subsidiary of connected health. This calls upon the devices of the connected health industry but with other advancements not as widely used in the connected health industry. Ambient assistant living enables the elderly and disabled to remain at home for longer periods before going into long term care. It allows a greater sense of independence to be experienced by all who enlist in its programmes.

In Ireland a great degree of work has been done in this area in Co. Louth. Co. Louth is trying to establish itself as an age friendly county. A very impressive housing facility in Dundalk presents age friendly living conditions. With sensors and devices installed throughout the two bedroom
apartments, elderly people can live comfortably without assistance from family or friends. All electronic devices can be controlled remotely from a computer system to aid with the overall friendliness of the apartments. Adjusting heating conditions alone can aid with the comfort of the person.

Further research in this area is underway through detecting patients’ moods by touch. Sensors in tables, couches and other pieces of furniture that can read the mood of the patient will help keep them happy and at ease at all times. This is quite a difficult advancement but action is currently underway to enable development in it. All these impressive advancements are being coordinated by CASALA.
7. IRELAND AS A TEST-BED FOR CONNECTED HEALTH

Due to Ireland’s low population, it has been identified as a potential test-bed for the introduction of connected health as their main healthcare model. This chapter looks at the infrastructure currently available in Ireland for this purpose.

7.1 Industry Status

Ireland has an excellent profile for attracting foreign company location. Many multinationals have set up operations from Ireland. Some of the factors that make Ireland attractive include:

- A favourable tax environment
- A well educated workforce
- English as a primary business language
- Ease of access to Europe

Ireland has positioned itself as a strong player in innovative technology projects when compared to their European counterparties, see Appendix G, section G.1, p. G1. These factors have resulted in Ireland attracting a number of medical technology companies.

Ireland is now the second largest exporter of medical products in Europe, behind only Germany, with exports climbing by over nine per cent in 2009, Irish Medical Devices Association. Appendix G, section G.2, p. G.2, contains a graph of the medical technology exports and imports in the EU for 2006, which demonstrates the excelling export position Ireland is in with regards to medical technology.

Some of these medical technology companies are playing large roles in the connected health industry. These range from monitoring companies to device development, see Appendix C, p. C.1. Manufacturing of medical devices is one of the key sectors detailed in the National Recovery Plan 2011-2014 for helping Ireland’s economic recovery.

Although a lot of development is being done in Ireland at an industry level, there is still plenty of room for market penetration. No large-scale project has run in Ireland to date so in some ways the market is untapped.
7.2 Research Academies

Ireland has a highly educated population with a very high rate of the population having at least upper second level education, see Appendix G, section G.3, p. G.3. This is reflected in the impressive research that comes from Ireland. There are several institutions of research in Ireland, with a centre of excellence for connected health in Belfast.

There is a lot of academic work being done in the area of connected health, although a lot of this does not transform to business. There are 17 institutions in Ireland currently engaged in activities in this area, see Appendix G, section G.4, p. G.3. All is beneficial to publicity and development in the area but unless a higher turnover to deployment occurs it will remain at an academia level.

Researchers are the key drive to launching activities as they provide the necessary background. BioBusiness have noted this and are taking an ABC network project on board at present. This intends to provide linkage with Academia, Business and Clinical persons to get connected health up and moving. The exchanging of views and concerns between these will benefit the sector as a whole.
APPENDIX A: ORIGINAL PROJECT OUTLINE

Client: PA Consulting Ltd.

Project: Analysis of the role of Connected Health in Ireland's future model of healthcare

Location: Embassy House, Herbert Park Lane, Ballsbridge, Dublin 4

Client Contact: Andrew McHenry (Andrew.McHenry@PACONSULTING.COM) & Sile Ryan

School Contact: Aideen Keaney

Client Background

PA Consulting Group has been operating in Ireland for over 50 years. They have offices in Belfast and Dublin. They work for public and private clients in Ireland and offer ethical, objective and independent management advice to their clients.

Project Background

Irish demand for healthcare is increasing. Achieving financial sustainability in the healthcare system requires new ways of meeting this demand and a shift away from the current over-reliance on acute care. New connected health products and approaches could provide a viable alternative to acute care, supporting healthcare delivery and independent living in the home and community. Several products and solutions have been developed by Irish companies, and multi-nationals are viewing Ireland as a potential demonstrator country for connected health, however adoption to date has been small scale.
Client Requirement

The client would like a

- Detailed analysis of current and future demand for connected health (e.g. based on demographic and condition analysis)

- Market analysis, inc barriers to entry, capability assessment of the players in the Irish market

- Consideration of cost models for connected health solutions and pathways (as this is a barrier to implementation)

What is in it for the student?

This is a challenging project for a student who would have to gain an understanding of the connected health market and develop models for connected health solutions.
APPENDIX B: INTERIM PROJECT REPORT

Project: Role of Connected Health in Ireland
Client: PA Consulting
Student: Orla Carey
Supervisor: Cathal Walsh

Review of Background and Work to Date:

PA Consulting is an international consulting firm that provides both management and technology consulting to their clients. They have been operating in Ireland for over 50 years, where their main areas of interest lie in Innovation and Enterprise, Energy, Health and Central Government.

The main objective of this project is to determine why Connected Health has not developed as effectively as initially anticipated. The products and solutions are currently available to the Irish market, but have been very unsuccessful to launch to date.

A report by BioBusiness was prepared in April 2010 detailing all initiatives that have been launched to date in Ireland with regards to Connected Health. A review of this report and several other topical reports along with daily updates on the Connected Health facebook page have helped to gain insight and understanding into this topic.

Terms of Reference:

- To conduct a market analysis to determine the need for Connected Health technology in Ireland.
- Identify the factors that are preventing the technologies from being adopted.
- If any alternatives to Connected Health are discovered make note of these and their advantages over Connected Health.
- If possible prepare a cost model to show how Connected Health can save the HSE money.
Further Work:

- More research on the topic is needed, with particular detail to Connected Health projects that have run successfully.
- Interviewing experts in the Connected Health sector and those that are connected to this industry (e.g. Department of Health).

Conclusions:

- This is a very large scope project that is relatively new to society resulting in not a lot of information available to do proper analysis surrounding the issues connected with Connected Health.
- It is very evident from all documents that are currently available that an alternative to the current healthcare system in place in Ireland is needed; it is currently a question of whether Connected Health is the right form to fit the Irish population.
Companies involved in service delivery and product development for connected health in Ireland

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APPENDIX D: FUNDING ALLOWANCES

A graph of the evolution of EU Research Framework Programme Budgets from 1994 to the present one. A greater budget than ever before is allocated for the current period.

The Seventh Framework Budget: Taking European Research to the Forefront

APPENDIX E – HEALTHCARE EXPENDITURE

Section E.1

A comparative graph of European countries healthcare expenditure as a percentage of GDP in the year 2005. A line through the graph demonstrates the European average. Ireland is below this average.

Section E.2

This graph illustrates how much expenditure each European country spends on medical technology in 2005. Ireland is below the European average of 6.3%, with the fourth lowest expenditure in Europe.

APPENDIX F: INTERVIEWS PROCESS: QUESTIONS AND ANSWERS

List of interviewees:

1. Michael Murchan, Assistant Principal Officer, Services for Old People, Department of Health.
2. Brian Christensen, Managing Consultant, Pharmaceutical and Connected Health, Lifesciences Recruitment
3. Patricia Scanlon, Alcatel Lucent, Bell Labs Ireland.
4. Declan Bogan, Project Manager, Connected Health and Personalised Medicine, BioBusiness
5. Dr. Peter Donnelly, BioBusiness
6. Rodd Bond, Netwell Centre, DKIT
7. Ann Coyle, HSE
8. Sean Mulvany, Enterprise Ireland
INTERVIEW 1: MICHAEL MURCHAN, ASISTANT PRINCIPAL OFFICER, SERVICES FOR OLD PEOPLE, DEPARTMENT OF HEALTH&CHILDREN

Interviewer:
Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:
The current health system in Ireland is mix and match, between private and public. The state did not have the money to set up hospitals properly so they were built by religious orders. Personal services, disabilities, psychiatric and public health are all provided by the state. There is increased talk of a universal health system.

Interviewer:
In your opinion, what would you identify as potential advantages/ disadvantages of Connected Health?

Interviewee:
It holds more advantages than disadvantages. It would keep people at home longer while freeing up existing resources and reduce costs. By installing these technologies in the home of elderly, care assistants wouldn’t need to spend as long with them meaning they could care for more people, reducing the costs of hiring new care assistants.

Interviewer:
Why, in your opinion, has Connected Health not launched successfully to date in Ireland?

Interviewee:
It is a very new area with initial costs being expense. The shelf life of the technologies is also unknown.

Interviewer:
If Connected Health took off in Ireland, could you see yourself having an active role in this industry, and if so, what role might you play in it?

Interviewee:
The Department of Health would have no direct role in the industry except to say they support the technologies and have no objections to it.
Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

No, the only alternative would be having care at home or going into a long term residential home that they fund themselves.
INTERVIEW 2: BRIAN CHRISTENSEN, MANAGING CONSULTANT, PHARMACEUTICAL AND CONNECTED HEALTH, LIFESCIENCES RECRUITMENT

Interviewer:

Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:

Yes. The administration times in hospitals is too long and costs loads. To continue to have a good reputation for healthcare in Ireland a new system needs to be put in place to work in conjunction with what is currently in place.

Interviewer:

In your opinion, what would you identify as potential advantages and disadvantages of Connected Health?

Interviewee:

Advantages would be in admin, patient care, safer, quicker and cost savings in the future. Disadvantages would be the initial costs, older doctor’s reluctances to take up new technologies and the amount of training that would need to be conducted to use the technologies

Interviewer:

Why, in your opinion has Connected Health has not launched, successfully to the date in Ireland?

Interviewee:

The costs, as it is very expensive initially. Connected Health is not pushed an awful lot by the HSE, reorganisation on the upper management level is needed.

Interviewer:

If Connected Health took off in Ireland, could you see yourself having an active role in this industry? And if so what role might you play in it?

Interviewee:

We would have a role in the recruiting of people to work in this industry. Have done some work in this area already
Interviewer:

What sort of business would you currently have with people looking for jobs within the Connected Health sector as opposed to other areas of health?

Interviewee:

Not a lot of work in this area. Some smaller companies have approached us, some offer small-scale solutions to merge their IT pedigree.

Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

Not really as Connected Health is such a large area that many different topics fall into it. I am aware of some iPhone apps that are currently under development that will help with healthcare.
INTERVIEW 3: PATRICIA SCANLON, ALCATEL-LUCENT, BELL LABS IRELAND

Interviewer:

Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:

Yes I do.

Interviewer:

In your opinion, what would you identify as potential advantages and disadvantages of Connected Health?

Interviewee:

Advantages would be in the cost saving in administration. By monitoring elderly in home or offering post-op care at home more hospital beds are freed up. Self monitoring gives patients more independence and makes them feel involved. The more feedback they received the more they are encouraged to take their medications.

Disadvantages are the massive barriers to entry, systems currently in place having legacy, doctors using different systems. How to integrate the systems needs a lot of effort, not a trivial problem. All the trials that are taking place end, resulting in some patients being very upset as they are losing out on the security they feel from these technologies.

Interviewer:

Why, in your opinion has Connected Health has not launched, successfully to the date in Ireland?

Interviewee:

- Big problem proving that money will be saved with the integration of these technologies and with the initial spend being massive, definite proof of these savings is needed. In the U.S. Obama is having a problem with this as he is struggling to provide definite proof of future savings.
- Centralised patient records, remote patient monitoring, client technology in hospitals and patient centric care should revolve around patient not around doctors.
- Systems are pushed to the brink in the current health system. New technologies won’t be implemented until these are on their very last legs. People don’t know where to start with the implementation of these technologies.
• In the UK, the NHS is run locally so is much more hands on as not trying to do the whole country at once. The HSE will probably wait for the UK to implement this and then start. The HSE are currently not talking to any big companies involved in this sector.
• Companies are creating systems that individuals buy themselves. This works in US as they pay their health insurance. The issue in Ireland is who pays for these?
• Primarily though the main barriers are cost, willingness and scared of failure (such as e-polling). France, which has around 60million people, twice has tried to roll out e-records. It is very difficult. To enable centralised patient records there needs to be changes in legislation and security laws.
• Government are not on board, as want to know the point in investment? The main problem for Ireland is simply the HSE, as when they tried to change the payroll system which didn’t have as many people it went bad. It will never be rolled out successfully until the HSE are involved. All current projects are local but will not go beyond the trial stages without HSE backing. There is no reimbursement currently available to companies who develop these technologies by the Irish government.
• The risks are huge as technologies can fail resulting in potential deaths in patients.

Interviewer:

If Connected Health took off in Ireland, could you see yourself having an active role in this industry? And is so what role might you play in it?

Interviewee:

Bell Labs are a multi-national company so it would not be relevant if Ireland suddenly started being actively involved in Connected Health. Would question if Ireland was a good market for these technologies and consider a small pilot project there to test it.

Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

An alternative would be to purchase a phone with a Bluetooth attachment and take readings using this which can be uploaded to a centralised database.

Austria has rolled out a system with ‘Orange’ network that monitors glucose levels in patients.

Interviewer:

Would the technologies need to be updated regularly and if so would this be costly?
Interviewee:

If the technology works and does the job it is intended to do, there is no reason why updates should be needed on it. It may come down to the technology itself in some cases, but these would need updates to be backward compatible. A technology for measuring software would not have to be changed, the only thing is the algorithm for identifying low or high blood pressure may change but this update should be able to be performed from a centralised location. The technology does the job it is intended to do, everything else is just infrastructure.

Interviewer:

Why did Bell Labs not go ahead with the Connected Health project they were considering running?

Interviewee:

It was too risky to get involved in. Benefits from involvement in this sector would not be seen for about 5 or 10 years. People were afraid of doing it; there was a fear of getting it wrong. If a technology went wrong the company who made it would get the blame. Governments need to get involved so companies can’t get blamed. They also need to set out who pays and supports the groups launching the technologies. I believe someone will launch it right and many other governments will copy.
Interviewer:

Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:

Is it adjacent or complimentary? Need to consider the piece of technology; is it replacing someone’s job or a centre, thus resulting in cost savings. Need to consider all these factors. Look at HealthSink Doc, doctors send bloods to be tested and results are emailed, but they are also mailed like originally done. This is just increasing costs and not replacing the previous system. I think connected health solutions should be put in as an alternative to replace current high costs. There is an issue around looking after and monitoring someone as when you find something wrong with them, they might not want to know and some will now want to have treatment. Where you put costs and how you manage them is the problem-do you pay now or later?

A new arrhythmia device I worked with detects patients’ arrhythmias and when it hits 10 it is seen as an issue, but now what do we do with this information? Also if someone dies with the device on and we have missed the detection of an arrhythmia who is to blame?

RANDOX tests patients for 90 things, but will your GP test you for all these if they come up positive?

Overall though, I do believe another form of health care such as connected health needs to be done but it must be done properly. It should either be done through an overall HSE system or your own GP.

Interviewer:

In your opinion, what would you identify as potential advantages and disadvantages of Connected Health?

Interviewee:

There are loads of advantages, the main ones being:

- People can stay at home and stay out of hospitals
- Connected health fits into the EU framework, FP7, which has funding of 43 billion, i69 AALs and a competence centre in Northern Ireland
- Better quality of Life
- Don’t want to be sick
- Can be in wellness
- Can be remotely monitored such as using the Philips remote monitoring system.
- Weightwatchers is like a connected health company as teaches people to be healthy.
- Gives people power to self-manage.
- Actively managing and participating in your own health makes you more aware

Disadvantages:

- It is more geared for people that are educated as they have a wider exposure to technologies and the finances to invest in the technologies if needs be.
- It requires active self management, which is up to the patient to do and no person or machine can make them do it.
- Questions over who you are connecting to? A large issue on who exactly sees your data and is monitoring it.

Interviewer:

Why, in your opinion has Connected Health has not launched, successfully to the date in Ireland?

Interviewee:

- The mindsets of people need to be changed and community nurses have to be enabled to use the technologies. The technologies need to be integrated into college courses in order to raise their awareness. Trying to engage the whole community to gain widespread awareness.
- I have not seen many improvements or changes in the last 2 years I have worked in it. Main aim at the moment is to raise awareness about the area and academic research. There are active centres currently in Ulster, NUI Galway, DCU and UCD but there is not a huge translation to business.
- Technology not all sorted still has a lot of growth potential, which many businesses will do well from. Need to have a continuous loop system that gives advice to those being monitored. The more feedback that is provided, the more thrust that will be placed in it.
- GPs are not aware or using the technologies and who is going to pay them if they do participate in patient monitoring? GPs are self employed so a payment system needs to be laid out for them.
- IDA investing in trials, many patients do not want to come off these trials.
- HSE won't invest in it, they are not a test-bed, their job is to provide care, and they are not there for the small guy and are too busy with public relations.
- Private hospitals are currently investing in telehealth as they have the finance to do it.
- In conclusion though the main barriers to entry are:
  - Awareness Building
  - Tendering
  - Not want to try it first
  - HSE reluctance
  - Lack of experience
Want see other countries do it first
Investment
Backbone of infrastructure
Fear of adding it to current workload
Who buys or pays for it?
Fear/reluctance of change
No literature available on what’s being done.

Interviewer:

If Connected Health took off in Ireland, could you see yourself having an active role in this industry? And is so what role might you play in it?

Interviewee:

I already have an active role in the area. My main role would be pulling together collaborative networks, sharing knowledge and awareness building.

Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

Personalised medicine is an area that is under discussion. It is much bigger than connected health in terms of scope. Clinical trials to determine the type of treatment patients require are currently being investigated; a good bit has been done in the area of breast cancer as there are many different types. At a biomarket level there is a drive to dynamics. Looking at an individual’s DNA make up is helping with this development. It fits in as part of connected health in some ways.

Pushing healthy living practices to avoid getting sick is another area. Tracking your personal nutrition and being aware of what you eat and keeping a ‘smart kitchen’ is a component of this. Dublin is currently a test-bed for IBM on a smart cities project and Galway is one on smart bays. These are both healthcare and environmental projects.

Applications can help to a degree but there is the issue regarding regulatory and legal implications as mobile phones were not originally designed as a healthcare device.
INTERVIEW 5: Dr. Peter Donnelly, BioBusiness

Interviewer:

Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:

Current healthcare system is that a patient gets sick and goes to hospital, but with connected health they can be scanned beforehand to discover the seriousness of their illness and can be discharged from hospital sooner. The patient is at the centre of the entire healthcare provided; it will change the whole going to hospital system.

I believe it should just be one healthcare model; the connected health route. There shouldn’t be a choice of two, as don’t see the point in assessing patients in hospitals when it can be done at home. Connected health should become the proper care pathway.

Interviewer:

In your opinion, what would you identify as potential advantages/ disadvantages of Connected Health?

Interviewee:

Advantages:

- Hospital costs will be reduced which are massive at the moment. Savings will be largely noticed on unplanned admissions to hospital.
- Connected Health is connecting a continuous model for the sake of your health.
- Healthcare costs are spiralling as demographics changing. There is an increase in those suffering from COPD, diabetes, CHF and asthma. COPD is irreversible; if your condition worsens it can’t be turned back. More monitoring is needed to control this and stop exasperation of hospital services by doing checks at home. 2% of costs are spent on preventive medicine, after diagnosis to stop it worsening.
- Will provide better overall patient care.

Disadvantages:

- Its interoperability is an issue. The technical devices don’t talk to each other and companies don’t want them for this reason.
- Blood pressure tests test the same thing but results could be mixed based on the outputs of different machines. They mean the same thing but might have different formatting.
- Patient knowledge, will it question the GP’s advice?
Interviewer:

Why, in your opinion, has Connected Health not launched successfully to date in Ireland?

Interviewee:

- Biggest problem is in care pathway, as the doctors way of providing this will have to change if connected health is brought in. Doctors/clinicians don't like change so a big mindset realignment needed on box shift of technology if infrastructure there.

- In the US, they pay for their own healthcare, therefore when they are released from hospital and later return for the same thing, their payment is covered, this is not the case in Ireland.

- In Northern Ireland the NHS is the equivalent of the Republics Department of Health and Social Services combined, transfer costs between the two should be looked at for potential savings by combining the two.

- Referring to the HSE in the south and the NHS in the North, they are people focused, with the introduction of connected health the technologies will replace people and they must be paid off. This needs to happen for all businesses to advance at some stage, but the healthcare agencies are extremely reluctant to do so.

- In the North, blood tests are done free of charge for doctors, however a closer look shows a massive fee for taxis collecting and delivery these blood samples and their results.

- Issues in the political sense as the cost savings must be realised by them.

- Some can understand savings but both systems must be run parallel for awhile resulting in larger healthcare costs initially.

- Litigation and compliance a big problem in the area.

- A survey on the expenditure of people showed that a lot of money was spent on housing and food, but relatively little on health.

Interviewer:

If Connected Health took off in Ireland, could you see yourself having an active role in this industry, and if so, what role might you play in it?

Interviewee:

From a BioBusiness perspective, they are a medical device company so yes. They would play a role in looking at the environment that’s untapped. Electronic devices in the medical sector are very behind consumer wise. Need them to be user friendly and peripheral. BioBusiness is one of the focal points in Ireland for bringing ABC collaborations together. Already have 10 collaborative networks ran and developed.
Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

Loads of different ways of doing things is being looked at. Connected health is not an alternative; it’s just using the best technology to support patients.

I don’t think the current healthcare model is right and it is becoming lean. There is only one business model in healthcare, no other sector or company operates in this way, there is a lot of rationalization to be done.
INTERVIEW 6: Rodd Bond

Interviewer:
Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:
It does a future healthcare model should focus on awareness more than waiting to get sick in order to get treatment.

Need a different one to what we have. My sense is we are facing an element of public sector retreat. There isn’t as much money and capacity anymore. The new insurance policy that is being looked at only addresses funding but not the providing of the healthcare. We need non profit providers that are driven by motivations that exist. Ireland does not know how to do well on a front line business service. A big reorganizational shift is needed from acute care to home care.

Primary healthcare is very badly structured. There is a massive role for technology there. Personal awareness needs to play a big role in this.

Interviewer:
In your opinion, what would you identify as potential advantages/ disadvantages of Connected Health?

Interviewee:
Advantages:

- Promotes self-awareness and management.
- A lot more flexibility and adaptability.
- Over the long haul it is very cost effective.
- The cyclical longitudinal of the data will make understanding conditions easier to do.

Disadvantages:

- There is ethical pressure, when we have consultation we are advised from the personal training of the doctor, and if we get bad advice, “I'll sue him”. There is a higher authority of advice. Issue of consultation nature when it is online. It will challenge the professionalism of health.
- Might all start becoming hypochondriacs.
- All stake holders have to be motivated and rewarded by these technologies usage. GPs must be paid for this. Payment model for these must be looked at.
- It is a cheaper system but the saved money must go somewhere else.
• In many instances we sense that when being diagnosed it’s not just vitals that GPs check. Substituting for their presence is a challenge.
• Must be able to measure stuff that is not as important but still essential such as sleep.

**Interviewer:**

Why, in your opinion, has Connected Health not launched successfully to date in Ireland?

**Interviewee:**

• What skills are needed by the people who observe the data?
• Issue with power as some of the devices are battery powered.
• Need very good analysis to see what works, quite personalised.
• Very few pilots launched as no funding research and innovation. There is no structural engagement from our pilots and the cost/benefit analysis is not being shown. Transition from the pilot stage of a project is like an energy state change. Lots of money is needed to get over this state change. Evidence is the thing that usually pushes the project on but leadership is also needed to pull the project forward.
• HSE are afraid of computer systems purchases as they might fail. They hope that consumers might buy it.
• Huge link with people’s health status and their income levels. Questions surround what market this health model is for. The Government are afraid to take on the responsibility of funding it meaning those with higher income rates will be the ones purchasing it only.
• There is no policy on the area at the moment. Europe are seeing public health as funding it. They believe we will buy it ourselves.

**Interviewer:**

If Connected Health took off in Ireland, could you see yourself having an active role in this industry, and if so, what role might you play in it?

**Interviewee:**

Already have an active role. This role is in:

• Market stimulation
• Product and service innovation
• Cultural and organisational change.

Assuming that the world doesn’t change drastically that role will be linking all three together. We need an advanced nurse practitioner to tie in the links with acute care and respite/rehab/nursing homes/etc. and home care. The services need more expertise about procuring them. An SME in aging health and environment has just been launched to help this.
**Interviewer:**

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

**Interviewee:**

Some of the stuff here is more context awareness. Looking at ambient assistant living which is a slightly different area.

Going to have a structure/landscape of home support services and become a more regulated service and I would not be surprised if telecare comes as part of this. While now this comes from somewhere else, this might provide a more preventive approach to telehealth.
INTERVIEW 7- ANN COYLE, HSE

Interviewer:

Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:

Everybody wants it different. A system based on wellness and not sickness is the ideal one but is very difficult to do. How do you close a hospital to free up resources to do the new system? They don't want to be seen as closing anything. There has been talk for the last 30 years on moving from acute to primary care. Fine Gael and Labour both want a social insurance model so maybe they will be able to do something else with it.

Interviewer:

In your opinion, what would you identify as potential advantages/disadvantages of Connected Health?

Interviewee:

It's hard to see and disadvantages except that it might not be appropriate for everyone but is good for those who can self monitor.

Advantages would be:

- Can do things remotely
- It will reduce people going to clinics/hospitals through self monitoring
- Consultants will be able to deal with more patients.
- It is good for the elderly as can assist them in staying at home for longer.
- There are very real advantages for the HSE with regards to man power. Having a swipe in and swipe out system will illustrate if the individual is where they say they are.

Interviewer:

Why, in your opinion, has Connected Health not launched successfully to date in Ireland?

Interviewee:

- In Dundalk I was the administrator of community services and did an alarm alert project. Old panic alarms were big pendants but altered them into a watch like device. Everyone involved in the project was very enthusiastic but there was an issue regarding who was going to monitor the system. For the pilot of this project a GP call centre did the monitoring. That was the first issue of the project the next one involved who the alarm triggered help from when it went off. The first respondent was a family member, next was a doctor and then the third was the HSE. If the first two responders didn’t note the
alarm you could have had ambulances coming out to the patient’s house for nothing. This raised lots of issues with the project eventually diminishing away.

- To make this type of health system work three state bodies need to be brought together which is very difficult.
- The funding and support structures are not there. It is a good idea but if GPs, nurses, etc., not interested it won’t work.
- It is very hard to move resources from acute to primary. Its in a nurses interests to have sick/unstable people in acute care as they can go home from work and know they are being monitored. Incentives must be offered for GPs or whoever it is taking on the extra work of monitoring the patients.
- Money must follow the patient, at the moment if they need care, they get homecare package or go into residential care. There is legislation surrounding residential care but there is none for community based care. In times of budget cuts, managers just follow legislation. Traditionally homecare packages only seen as the home career. If use careers, can’t really substitute the money for technologies instead due to monitoring issues with economies of scale. Department of health are saying to use the homecare allowance to buy these technologies but too drastic to take careers off people straight away. Local managers haven’t been convinced of the possibilities that connected health hold yet. Cost savings cannot be proven which the most important element is at the moment.
- I believe technology will save money but hard to show diffused costs. Many of the devices are still seen as add-ons at the moment and not the core system.

**Interviewer:**

If Connected Health took off in Ireland, could you see yourself having an active role in this industry, and if so, what role might you play in it?

**Interviewee:**

I am already involved. Main involvement would be in:

- Creating and enabling policy
- Make sure funding goes in the right directions
- Evaluating connected health projects and see if their working.

**Interviewer:**

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

**Interviewee:**

At the end of the day, trying to get current system to adopt technologies that are out there but must change the way people work to enable this. Public nurses are paper based and hands on.
We need some technology skilled people but healthcare people aren’t. This puzzles me as all these professional use technologies in their private lives.

**Interviewer:**

Some people have said that the HSE is not backing connected health projects at the moment can you provide any insight to this?

**Interviewee:**

It’s true. It’s not that we aren’t backing it but it would not be the highest priority of the HSE at the moment as our system is crisis driven. It is very much a treadmill and hard to come off and do these technologies.

It’s not that they don’t think it’s a good idea but stuff perceived as soft nice stuff. Where do you get the money for it?

There is a dilemma on how to do it.

Northern Ireland got a huge upfront budget for it but we don’t.

Older people need range of options, as they are not all the same.
INTERVIEW 8: SEAN MULVANY, ENTERPRISE IRELAND

Interviewer:
Do you believe an alternative healthcare system needs to be put in place in Ireland?

Interviewee:
The word alternative worries me as it can mean loads of things. We currently have a two tier system. I don’t believe wholesale complete change is needed, as in other countries this has caused many issues and problems. The current government needs to monitor current healthcare and move it local away from NHS

Interviewer:
In your opinion, what would you identify as potential advantages and disadvantages of Connected Health?

Interviewee:
Advantages:

- It gives patients ownership and control of their own illnesses. This will help with day to day business. By knowing tools to manage their conditions it can help improve it. Diseases like diabetes 2 can be cured with proper management and cardio vascular is reversible at early stages.
- 70% of healthcare costs go on chronic diseases. Connected health could save money for the economy and then directly for individuals and family.
- Sensors can augment and maintain lives of those with chronic diseases or the elderly. It enables independent living.

Disadvantages:

- It is easy to go too far with lumping all of the responsibility on someone. An overall healthcare strategy is needed that uses healthcare professionals. It is very easy to have too much confidence in technologies.
- There are issues around old proliferations around different technologies. There needs to be a standardisation around what is measured and how it is analysed. This should be driven by a clinician.
- We need standards of care and these must be reviewed often. There are so many things that can be measured, but what decision does all this data allow me to make now? What patient quality will we have now?
Interviewer:

Why, in your opinion has Connected Health has not launched, successfully to the date in Ireland?

Interviewee:

- Worldwide there are individual clinicians who are champions at connected health, they secure cash from somewhere, set up a pilot which goes well, they then run out of money resulting in it then finishing.
- It’s not the way of conducting medicine at the moment, need to see proof of connected health and only have pilot results at the moment.
- Who pays for it? Need a payment model outlined.
- Where is the money to be found to do it? Ireland is a cash-strapped country at the moment.

Ireland could become leaders at it if we become a test-bed for it. We are a small integrated country with one healthcare system plus excellences of research, medical devices and software. We have all the resources here.

Interviewer:

If Connected Health took off in Ireland, could you see yourself having an active role in this industry? And is so what role might you play in it?

Interviewee:

I have an active role already. It is to generate jobs and wealth in the country, help companies to grow in scale and provide their products to countries across the world. We are a public sector of standard settings. We invest in many areas and have offices all over the world to provide support.

Interviewer:

Are you currently aware of any other alternative healthcare models currently being investigated in Ireland?

Interviewee:

From a strategic point of view now, major issue is: Take US entitlements system, Medicare/Medicom which back up the US. Chronic diseases are driving this along with aging well. The vast majority of people have one or two diseases. How to manage the costs of these is getting difficult at present. Another problem is how to cure the diseases, such as regenerative medicine. Remedi is a regenerative medicine company in Ireland—if implemented this would take care of a massive burden in Ireland. Connected health is today though while regenerative medicine is a generation away. There are demographics for connected health at the moment. It is the future.
APPENDIX G: EUROPEAN UNION COMPARISON GRAPHS

Section G.1

Graph of EU enterprises by country that are engaged in technological innovation in 2008. Ireland is highlighted in green.

![Graph of EU enterprises by country that are engaged in technological innovation in 2008. Ireland is highlighted in green.](http://www.forfas.ie/media/The_National_Recovery_Plan_2011-2014.pdf)
Section G.2

This graph demonstrates the exporting and importing habits of European countries for medical technology in 2006. Ireland has the second highest rate of exports after Germany. They are big players in the export market of medical technology.

Section G.3

A demonstration of the population proportion of European countries with at least upper second level education. Ireland has the highest level across all the European countries with Sweden coming a close second.

A table of all the academic Institutions of Ireland currently engaged in Connected Health Research

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<tr>
<th>Dublin City University</th>
<th>NUI Galway</th>
<th>SAAL Group Projects</th>
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<td>Queens University</td>
<td>University of Dublin, Trinity College Dublin</td>
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<td>The Tyndall Institute</td>
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