Information Systems and Technology in Agriculture: Improving Work-Life Balance for Irish Farmers?

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A dissertation submitted to the University of Dublin

in partial fulfilment of the requirements for the degree of

MSc in Management of Information Systems

2014

Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

Signed: _____

Mairéad Slater

29th August 2014

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29th August 2014

Acknowledgements

Thank you to my family and friends for their support over the last two years.

I would like to thank my supervisor, Diana Wilson for her advice and guidance.

Also, thank you to of those who participated in the interviews and to the members of staff at Teagasc for their assistance.

Abstract

Information Systems have been designed to improve the connectedness, way of life and standard of living of users. Information Systems also impact the work-life balance of workers as they enable workers to be "always on". Work-life balance itself is now morphing into work life integration as both elements are now so interconnected there are no discernible boundaries. This research aims to identify if and how Information Systems and technology improve the work-life balance of workers, with a particular focus on Irish farmers. This dissertation is using Irish agriculture as its main focus, however it can be applied to other disciplines as an examination as to how IS/IT improves the quality of life for users as part of their work-life balance or integration. It also demonstrates how workers adapt to new technology as part of positive change management.

Available literature and secondary data sources were used in conjunction with qualitative data from interviews to review this research question and to draw the conclusions in this dissertation. This study shows that the modern farmer is making a conscious decision to spend more time off-farm with family or pursuing additional income than working on the farm. This study also shows that Information Systems do enable a positive work-life balance for farmers so that they can spend more time off farm. Information Systems and technology also remove the need for additional labour on the farm which means that the farmer must be more independent and work on their own. This independence can make the farmyard a lonelier place for the farmer. Without additional outside pursuits, the farmer may become insular and separated from the rest of society.

Contents

List of Tables and Diagrams

Abbreviations

AI	Artificial Insemination
BVD	Bovine Viral Diarrhoea
CAP	Common Agricultural Policy
CSO	Central Statistics Office
EU	European Union
GDP	Gross Domestic Product
GPS	Global Positioning System
ICBF	Irish Cattle Breeding Federation
ICT	Information and Communication Technology
IS/IT	Information Systems/Information Technology
OECD	Organisation for Economic Co-Operation and Development

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Chapter 1: Introduction

1.1 The Context of and Rational for the Study

Information Systems have enjoyed a rapid growth and are in use in most industries nowadays. Technology use has increased steadily over the years. Advances in agriculture and the global demand of increased food productivity means that Irish farmers must invest in technology and in new ways of managing their information.

IS/IT use in Irish agriculture has not been reviewed from an academic standpoint and likewise, IS/IT is not used to its full potential in the agricultural sector. This area is ripe for research, not only to explore what is available but also to encourage more widespread and even use of IS/IT across the agricultural sector.

1.2 Background

The Irish agricultural sector is responsible for a significant proportion of the country's net foreign earnings. The agri-food sector firms are predominately Irish owned and the profit repatriation to other countries is lower than in the wider Irish manufacturing sector. A report estimates that for every €100 of agri-food exports, about €50 is added directly to the gross national product compared with only €19 for non-agri-food exports (Hynes and Hennessy, 2012). This research focuses mainly on one particular sector in Irish agriculture – beef production. Ireland is the 20th largest beef producer and the 5th net exporter of beef in the world. This accounts for 30% of gross agricultural output, valued at €2.1 billion in 2013 (O'Kiely et al., 2014). Despite this, profits are not felt at farmer level (O'Kiely et al., 2014) and the farmers must constantly adapt to changing policies and customer demands.

Throughout the recent Celtic Tiger years, the contribution of agriculture to Irish GDP and employment declined as other sectors of the economy flourished. However, since the downturn in the economic fortunes of Ireland in late 2007, there has been a renewed interest in the sector (Hynes and Hennessy, 2012). The publication of the Department of Agriculture "Food Harvest 2020" report has set targets for the expansion of the Irish agricultural sector such as a 33% increase in agricultural output, a 40% increase in value added and a 42% in exports up to the year 2020 (Hynes and Hennessy, 2012).

1.3 The Research Question

The question attempts to determine if IS/IT improves the work life balance for the agricultural industry in Ireland with a particular focus on beef farming. This area has been selected due to its diverse nature and potential exposure to new IS/IT and new uses for existing IS/IT.

Work life balance is of increasing importance for workers and the impact of work on life has generated interest with academics and employers alike. However, there is very little research into the area of how IS/IT impacts work life balance and the improvements, if any, it may have on the Irish farmer.

1.4 Why the Research is Important and interesting

This dissertation relates to Information Systems and technology with agriculture as the case study due to the multi-skills that are required in this industry – such as finance, horticulture, animal husbandry and technology. In essence, this dissertation could be applied to any discipline in reviewing how IS/IT improves the quality of life and work life integration for workers. It explores how they welcome new ways of working and use technology to change for the better.

1.5 To whom it is Important

IS/IT agricultural vendors do not enjoy a large market in Ireland (Leveque et al., 2007).This research could help explore why farmers do not use specific Information Systems to help them in their management decisions.

New reforms and payment criterion being brought about by the CAP and the Department of Agriculture entails that farmers need to remain well informed about these changes. As the Department of Agriculture and other agricultural bodies turn to the internet to deliver key messages, the farmers need to invest in personal computers and the internet to obtain these messages. In addition, the CAP payments and subsidies are now also being paid directly into farmers' banks instead of by cheque. Farmers need to then adapt using online banking, credit cards and debit cards.

The use of the online registration of cattle now means that groups such as the Department of Agriculture, Teagasc, discussion groups and the beef factories

have data to hand at all times, such as how many cattle are in the country at any point, the breed and age of the cattle. This data can be used to set and control beef supply into the market. The Irish beef farmer has the potential to also use this data to make key management decisions to run the farm, however at present, this area is largely untapped by the average farmer.

Supermarket chains and other food producers are now setting a new maximum size for steak cuts (O'Kiely et al., 2014). This means that cattle must now be presented to the factories at an earlier age. Previously, farmers would have bred cattle as the bigger the better, now they must breed cattle so that they do not go above a certain weight and age if they wish to receive the quality assurance bonuses that go with adhering to the set standards. The farmer must utilise available technology such as weighing scales and automatic diet feeders to effectively manage and control the weight gain of the cattle.

This research will be of importance to farming bodies such as Teagasc and the Department of Agriculture and to farmers. It will also be of use to agricultural database and software vendors.

1.6 The Scope of the Study

The scope of the study limits itself to the impact of Information Systems and technology on work life balance for workers with the main focus of the research on Irish beef farmers. It draws examples from industries such as other self-employed persons and office workers. However these are used as comparisons or where alternative data is not available.

1.7 Roadmap of Chapters

Chapter 1 *Introduction* outlines the research question and provides background information for the dissertation.

Chapter 2 *Literature Review* discusses previous work on work life balance, Information Systems and technology and the role of ICTs in achieving a work life balance for the Irish farmer. Work life balance and Irish agriculture are not normally topics referenced together in academic literature; however the key ideas from this literature are reviewed, critiqued and discussed.

Chapter 3 *Methodology* outlines the approaches considered and ultimately selected for the research. It outlines the primary and secondary data sources as the specific research tactics used.

Chapter 4 *Findings and Analysis* reports the key outcomes of the dissertation. These outcomes include:

- How the participants describe work life balance
- The type of Information Systems and technology in use
- The drivers for investment
- The overall impact on work life balance.

Chapter 5 *Conclusion and Future Work* completes the dissertation by demonstrating that the research question has been answered, outlining the limitations of the research and identifying interesting areas for future research.

Chapter 2: Literature Review

2.1 Introduction

The purpose of this literature review is to analyse the available literature pertinent to the role of ICTs in achieving a work-life balance with a particular focus on Irish farmers.

It begins with a review of work life balance in general. Turning to the use of ICTs in work life balance, the chapter analyses the various ways in which ICTs can enable or hinder a quality lifestyle and meaningful work life balance.

The chapter then concentrates on the work life balance in Irish farming and the current use of ICTs in agriculture. The chapter concludes with an analysis of the special constraints and conditions that modern farming presents in achieving a work life balance.

While there is a wide range of literature regarding Information Systems, work-life balance, agricultural technology and agriculture as separate domains, there is little which links Information Systems, technology, agriculture and the work life balance for Irish farmers. The available data is quite dated with the majority of the literature published prior to 2011, making the area is ripe for research and exploration. This chapter will discuss the available literature based on these topics.

2.2 Work Life Balance

Work-life balance is defined by Greenhaus et al. (2003) as an absolutist model which includes time balance, involvement balance and satisfaction balance, that is, "the extent to which an individual is equally engaged in and equally satisfied with their work and family role" (McMillan et al., 2008, p1, Evans et al., 2013) It is seen as "the absence of unacceptable levels of conflict between work and non-work demands" (Jain and Nair, 2013, p43). Chang et al., 2010 defines work-life balance as the day-to-day management of paid work and other non-work activities. Chang et al. (2010) also cites Greenhaus and Powell (2006) as defining work-family enrichment as the extent to which experiences in one role improve the quality of life in the other role. Sarker et al. (2012, p144) cites Hill et al., (2001) in defining work-life balance as the degree "to which an individual is simultaneously able to balance the temporal, emotional

and behavioural demands of both paid work and family responsibility" and cites Netemeyer et al. (2004) that a lack of work-life balance as the "inter role conflict where the demands created by the job interfere with performing family-related responsibilities". The researchers are mainly in agreement that work and personal life represent two different domains of an individual and these domains are seen as controllable elements in person's life. Employers will promote and support this as best suits the organisation, however from the reading it is up to employees to instigate and manage their own work life balance. This seems to be left to the employees and organisations to manage how it best suits them as there is little government policy relating to the subject bar working hours and parental leave. Although special arrangements between organisations and its employees to support work life balance are described in the research papers, they are conspicuous in their omission of there being little by way of government policy to support these initiatives with the exception of the aforementioned parental leave and the working hour's directive.

Greenhaus et al. (2003) and Greenhaus and Powell (2006) are mainly referenced by other researchers in work life balance. This subject is moved forward with alternate theories as described below.

The theories above describe clear delineation between work and home, however, an alternative theory of work-life integration is also being proposed which maintains that work and personal life are so interconnected that they are inseparable and the boundaries between them are meaningless (Sarker et al., 2012). This is further expanded by Sarker et al. (2012) in the use of the three perspectives that individuals hold about the relationships between work and personal life:
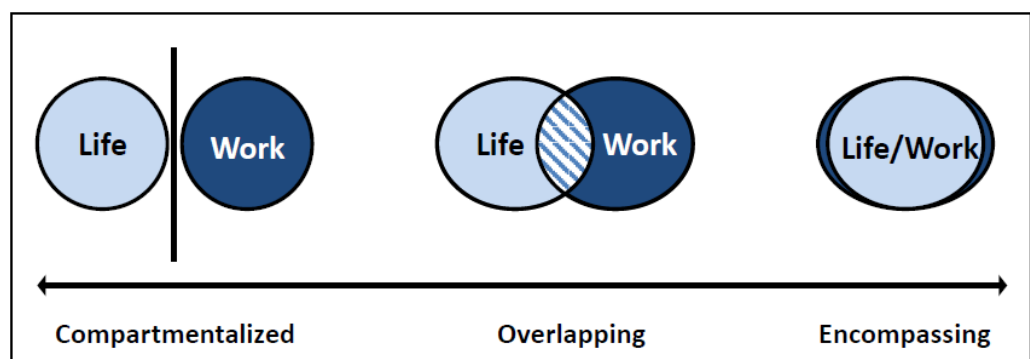
Figure 2.1: Work and Personal Life Perspectives (Sarker et al., 2012)

Descriptions of the perspectives held by people:

- Compartmentalised: People demand or prefer a total separation of work and personal life and any spill-over of work into personal life is regarded as undesirable or even unacceptable. People who hold the compartmentalised perspective tend to see personal life as primary and work as secondary.
- Overlapping: A clean separation of work and personal life is neither feasible nor necessarily desirable. Individuals may accept the overlap however; they tend to face greater degrees of conflict as they attempt to balance the two areas. People who hold the overlapping perspective seem to view work as a necessary aspect of a fulfilling life.
- Encompassing: with this perspective, the entirety of a person's life is completely encompassed within his/her work domain and success at work equates to success at home. Integration of work and personal life is natural and work is prioritised over home and family life (Sarker et al., 2012).

APA (2004) and Reiter (2007) describe a situational definition of work-life balance which focuses on an individual defining balance and engagement across roles in a way that has meaning to them (Evans et al., 2013) in a similar vein as the overlapping model. (Hayman and Rasmussen, 2013, p47) cites Staines' (1980) spillover model where "what happens at work can 'spillover' and impact personal or family life or alternatively personal life can spillover and influence the work domain". This model is further epitomised with work's tangible extensions into family life such as it taking up family time and its intangible incursions into personal life such as exhaustion (Russell et al., 2009). This can also be defined as work-life conflict where a central element of this concept is that meeting demands in one domain can make it difficult to meet obligations in the other. Work to family life conflict can be measured by:

- Worrying about work problems when not working
- Feeling too tired after work to enjoy the things they like doing at home
- Finding that work prevents the worker from giving the time they want to their partner/family
- Finding that the partner/family gets fed up with the pressure of the work (Calvert et al., 2009).

Further research shows that work pressure has the most negative impact on balancing work and family demands and that the rising levels of work pressure has contributed to a greater strain in managing work-life balance (Calvert et al., 2009). It is important from both an employer's and an employee's perspective that this is recognised and managed effectively as workers with

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better mental health are generally more productive, less likely to suffer from illnesses and less likely to take sickness leave (Cottini and Lucifora, 2013).

2.2.1 Self-Employed Workers

This subsection discusses the how self-employed workers who have their place of business in the same location as the family residence manage their work life balance. Self-employed here refers to both those who have setup their own business and those who have inherited the family business, such as farmers. The distinction between the self-employed and the organisationally employed is made as the self-employed are found to have higher job commitment, longer working hours and more irregular work schedules than the organisationally employed (Tuttle and Garr, 2009). Thus, maintaining a work life balance proves a tougher challenge for the self-employed under discussion here.

Self-employment may increase the tendency of life to interfere with work because the boundaries between the two areas become blurred (Tuttle and Garr, 2009). Working from home for the self-employed can lead to greater intrusion of work into family life because of "its constant omnipresence" – it can be difficult to "leave work at work" (Russell et al., 2009, p80). Contrasting with organisational employees who have a psychological boundary at the start and end of their working day as they commute to and from work (Cousins and Varshney, 2009) and they have a physical boundary of work and home life as they are in different locations. Not only that, the success of the business for the self-employed directly relates to the success of the person.

In addition, the partner and children of the self-employed may be expected to be involved in the running of or responsible for certain activities within the business and this can also impact on the work life balance for the entire family. This is compounded with self-employed workers who tend to work unsocial hours at weekends or during the evening may have detrimental effects on the experience of work-life balance as such schedules which prevent workers from being available when family activities tend to take place. This then impacts negatively on the financial contribution that the person is making for the family as the family sees the person as undependable for family activities (Steiber, 2009).

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On a positive note the self-employed who have control over when, where and how they work enables them to better co-ordinate their schedules with family duties and other activities thus reducing strain (Steiber, 2009). In addition, control over work and personal life leads to feelings of satisfaction and accomplishment (Cousins and Varshney, 2009).

Working from home may leave more time for family life and other activities, more flexibility and a greater sense of control than organisational employment (Tuttle and Garr, 2009, Bonet et al., 2013). Flexible working arrangements controlled by the self-employed reduce work-life conflict by increasing choice and flexibility over work demands (Russell et al., 2009). However, when work seeps into home life as can happen more readily in self-employment, work life balance needs to be closely monitored and managed to ensure that there is a true balance for all stakeholders, i.e. the customers, the business owner and the business owner's family.

2.2.2 Measuring Quality of Life for the Self-Employed

Traditionally, men have been defined by work as a central component of their identity, however, this is now shifting and research shows an increase in the number of men reporting a desire to be more actively engaged in family roles and child-rearing (Evans et al., 2013). Research supporting this shows that "male employees expressed substantially higher levels of work conflict with personal life and personal life interference from work" than female employees (Hayman and Rasmussen, 2013, p52).

Unlike other areas of self-employment where the decision to be self-employed, is made "by persons with the ability, education and previous work experience who find self-employment a desirable and viable option" farmers often have to enter farming through inheritance or taking over management of a farm – as illustrated in table 2.2 (Tuttle and Garr, 2009, p285). In addition, life-style motivations relating to the opportunity to live in a rural area, work outdoors and to retire on a farm indicate the strong influencing factor these have on decisions to invest in and stay in farming (Mishra and Gillespie, 2011).

Goals considered important to farmers are family and family farm experiences, environment, leisure time, maximising profit, maintaining land and minimising debt (Mishra and Gillespie, 2011). However, they also desire a balance that

incorporates work, family life and other dimensions of their lives such as volunteer time and other activities (Evans et al., 2013).

An American survey demonstrates the reasons why people enter farming (Mishra and Gillespie, 2011).

Table 2.1: Reasons for Entering Farming (Mishra and Gillespie, 2011)

Ranking	Reasons for entering farming
1	Take over farm from family member or other person
2	Develop business to generate additional income
3	Investment in property
4	Live in rural area
5	Retirement residence or activity
6	Outdoor activity opportunity
7	Other

The first reason is also reflected by the participants in the interviews where each participant inherited the family farm, took it over from a family member or came from a farming background.

2.3 Information Systems and Work-Life Balance

The demand for workplace flexibility and the rapid expansion of information technology allowing work portability has shifted attention to the way that individuals balance their work and non-work lives (Chang et al., 2010). Information technology is no longer the reserve of large organisations and individuals are now reaping the benefits of mass production of these systems and the availability and utility of information from multiple sources – work activities can be completed at home and home activities can be completed at work. Organisations are starting to recognise that utilising Information Systems to enable employees to work in this fashion is mutually beneficial. This is seen to reduce work pressures by allowing workers to manage their workload more flexibly (Russell et al., 2009) and workers feel that organisations are more in touch with their needs.

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People need to feel a sense of achievement and personal fulfilment in their working and personal life to be more productive. They positively associate the ability to blend working and home life activities with stress relief, increased effectiveness and control over their work and personal life leading to feelings of satisfaction and accomplishment (Cousins and Varshney, 2009).

2.3.1 Technostress

The alternative argument as presented by some researchers is that the availability of information from multiple sources is causing an information overload that is described as "technostress" (Tarafdar et al., 2011, p113). Technostress is described as a "modern disease caused by one's inability to cope or deal with ICTs in a healthy manner" (Ayyagari et al., 2011, p832). Ayyagari et al. (2011, p833) cites Cooper et al, (2001) and Lazarus (1991) that stress arises when "an individual appraises the demands placed by the environment as exceeding the individual's resources, thereby threatening the individual's well-being".

Mobile computing, communication devices, collaborative software and computer networks connect people in more ways possible than ever before. The constant connectivity may blur the home and work contexts and thus decrease productivity and create difficulty in maintaining a work-life balance (Sarker et al., 2012, Tarafdar et al., 2011, Ayyagari et al., 2011, Cousins and Varshney, 2009). This omni- and multi-connection capability makes workers feel that if the systems have been made available by the organisation then they have to stay connected, respond to queries in real-time and multi-task in order to meet the demands set by the organisation (Tarafdar et al., 2011). Workers may be distracted by the constant incoming information, constantly try to process this information and result in ignoring the deep thinking necessary for innovation and creative decision making (Tarafdar et al., 2011). Over time, workers could lose their innovative and creative skills leading to job and general life dissatisfaction which would have a negative impact on their quality of life.

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2.4 Information Systems in Agriculture

The modern farmer needs to be more attentive of the interaction with the surroundings, environmental impact, the growing conditions of crops and animals and the quality of output. This change has been brought about by governments and consumers applying increasing pressure on the agricultural sector to change production from a focus on quantity to a focus on quality and sustainability (Sørensen et al., 2010). Prior to the advent of ICTs, farmers traditionally obtained information from trial and error and from their peers (Aker, 2011). Farmers nowadays utilise agricultural and business experts and ICTs in addition to trial and error and information from their peers. Several studies have shown that over the previous decades it has been "maintained that information and knowledge play a key role in ensuring (sustainable) development" (Koutsouris, 2010, p23). The farmer needs to manage large amounts of information in order to make economical and environmentally sound decisions (Sørensen et al., 2010). Without quality Information Systems, this process can prove difficult and labour intensive. The research tends to point out issues faced by the farmers in trying to process and manage information. Further research would be beneficial here as to how the farmer can manage this information and the new information sources.

The below model from Sørensen et al. (2010) depicts the incoming and outgoing information flows that the farmer needs to handle in order to run a successful business:

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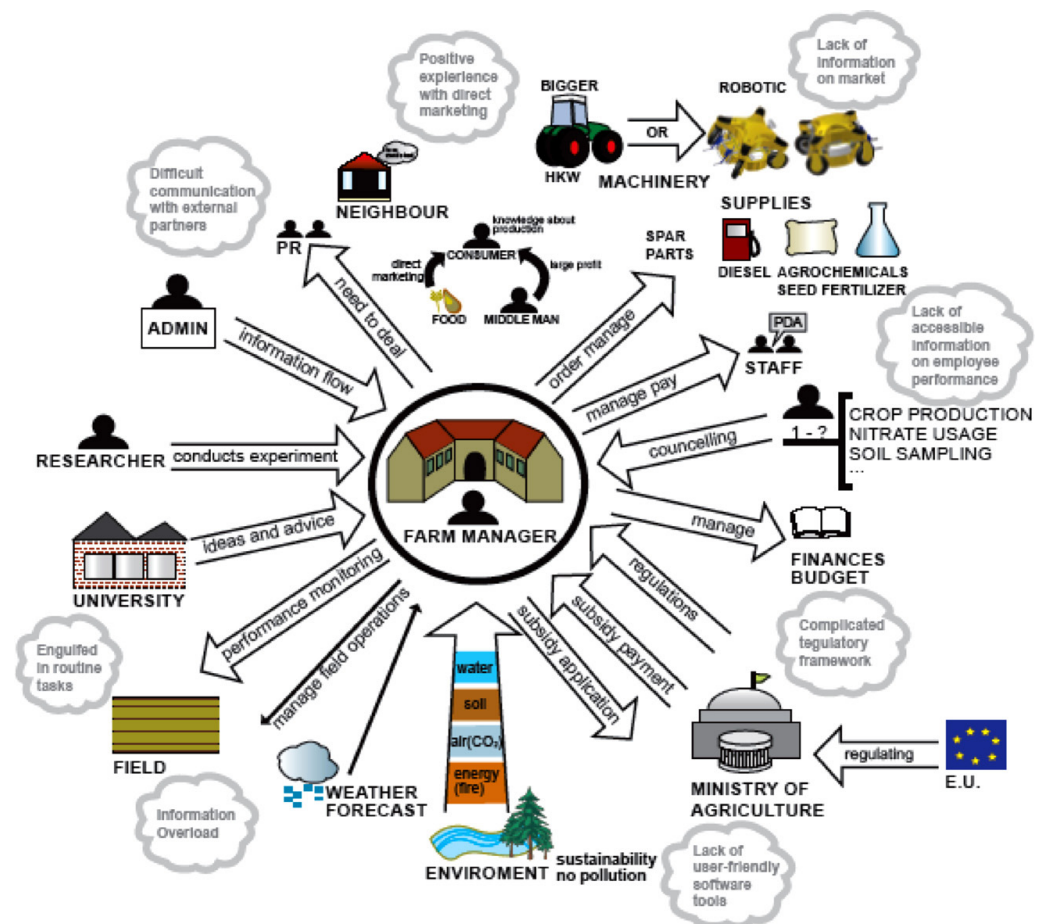
Figure 2.2: Information Channel Model (Sørensen et al., 2010)

In 2011 there were 105,535 farms in Ireland, of these, 63% of all Irish farmers owned a PC and 33% used it for farming purposes (Teagasc, 2013). This is an increase on the 2004 figures where 42% of all Irish farmers owned a PC and 15% used it for farming purposes, lagging behind the USA, UK and France (Morrow et al., 2004, Leveque et al., 2007). The bigger the farm or the higher the potential for production or economic efficiency and the more time spent on administration, the more farmers were likely to use a PC for farming purposes. A survey from 2004 also showed that different types of farmers had different ownership and usage rates of PCs as outlined in table 2.2 (Leveque et al., 2007).

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Table 2.2: PC Usage Among Farmer Types (Leveque et al., 2007)

Farm Type	% Owning a PC	% Used for Farming Purposes
Dairy	54%	26%
Tillage	55%	23%
Cattle	33%	9%

The differences among farmers could be explained by different views of farm management. Dairy farms tend to be larger with a higher income and therefore increased management requirements. The use of a PC could be seen as a choice in an efficient management tool that supports farmers in decision making (Leveque et al., 2007).

The Irish government is committed to extending the benefits of information and communication technologies to all areas of Irish society, including agriculture (Morrow et al., 2004). In 2008, the Irish government rolled out the national broadband scheme with the objective of delivering a broadband service to areas where previously coverage was deemed to be insufficient. This scheme was completed in 2010 with the delivery to 1,028 areas with broadband service to 235,000 premises. In addition, the rural development plan is in development with the Department of Agriculture to roll-out broadband to areas that were not able to take advantage of the broadband delivered under the national broadband scheme (Department of Communications, 2010). These schemes have been heavily criticised in the media due to the lack of delivery as outlined in the initial proposals.

The government ICT policy and support means that Teagasc, the Irish Agricultural Body, could use ICT in the delivery of agricultural information to farmers where it would be available at any time to the farmers. Farm management systems could then be developed to integrate the information in order that farmers could make informed decisions based on accurate and timely information. These systems also have the benefit of reducing paper work and data duplication (Morrow et al., 2004). Farmers interested in accessing their own or other agricultural data could be related to their interest in "making better decisions by themselves" and "to save time" (Leveque et al., 2007, p3, p4). As per figure 2.3, in 2006, 65% of farmers used the internet to consult their own data. The data collected in the interviews support this with

62% of the farmers interviewed utilising farm software. The farmers interviewed stated that they found the internet and the farm software invaluable for decision making and time saving.
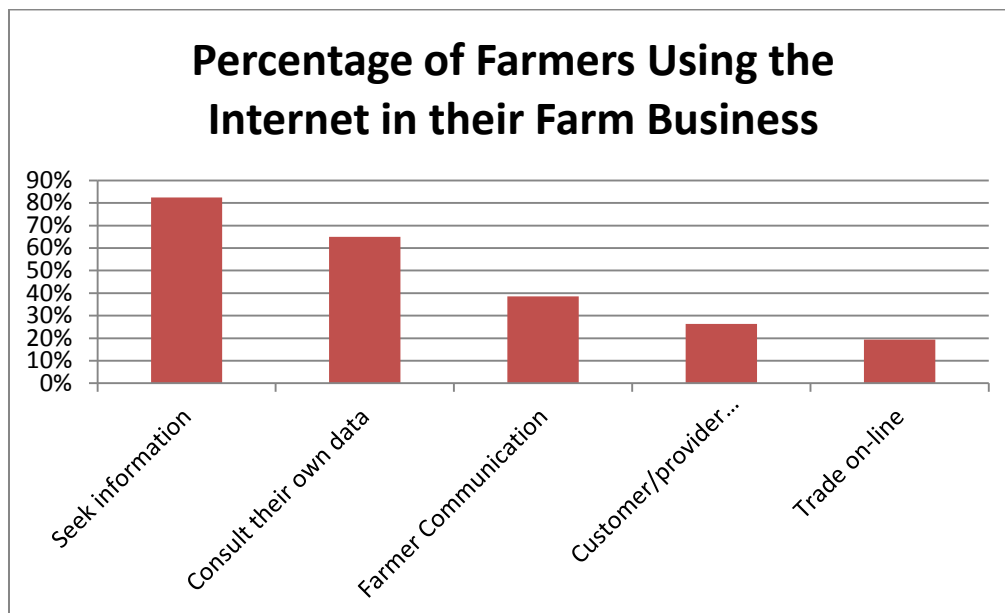
Figure 2.3: Internet Use in Farm Business 2006 (Leveque et al., 2007)

As the availability of the internet increases and software is developed specifically for farm use, a gradual rise in the use of computers by farmers for farming business purposes can be observed. The results of the 2011 Teagasc survey demonstrate this increase:

Table 2.3: Main Farming Business Purpose (Teagasc, 2011)

Percentage of all farms	2004	2008	2011
Internet and Communication	6%	12%	21%
Herd Register	7%	11%	15%
Farm Accounts	8%	8%	5%
VAT Returns	1%	1%	1%

The drop in use for farm accounts could be due to increasing employment of accountants or the farm accounts function being absorbed into other farming software. As VAT calculation is quite specialised, the use of computers to make the VAT returns would not be expected to change during this short period.

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2.5 Value of ICT Use in Agriculture

To be successful, the modern Irish farmer needs to be able to respond quickly and accurately to changes in the immediate and global environments, such as changes in farm input and output prices. Access to quality information takes on increasing importance where perceived risk increases (Whelan et al., 2008).

Good technical tools, broadband access and good presentation of available information are key requisites that farmers need to see any value of using the internet as a decision making or management tool for their farms (Briggeman and Whitacre, 2010). As per the 2011 Teagasc survey, 53% of farm households had broadband access, this compares favourably to the increase to 65% of Irish households that have broadband access (Teagasc, 2013).

The 2011 Teagasc survey also highlights the main farming business purposes of a PC and the internet employed by farmers (Teagasc, 2013). This is outlined in table 2.4:

Table 2.4: Main Farming Purposes of a PC and the Internet (Teagasc, 2013)

Main Farming Purpose	Percentage of All Farms	Percentage of Farms with a PC
Internet and Communications	21%	64%
Herd Register	15%	47%
Submitting Forms	10%	32%
Online Banking	10%	32%
Purchasing products and services	7%	21%
Selling products and services	4%	12%
Farm accounts	5%	14%
VAT returns	1%	4%

ICT usage involves not only communication between the farmer and advisors. Dedicated websites also provide training that is of direct benefit to the farmer such as the food assurance website that includes an assessment after a training module has been completed. Interactive services have also been developed to enable complete transactions to be conducted via electronic channels. Teagasc have a technical information website that has farm

management tools and online calculators for use by its clients. Mobile phones provide new opportunities for rural farmers to obtain access to information on agricultural technologies and to use ICTs in agricultural services (Aker, 2011). There are a number of mobile phone based applications and services in the agricultural sector providing information on market prices, weather, transport and agricultural techniques via text messages, radio and the internet (Aker, 2011). The research is very descriptive on what ICT is out there and how it can be used to the benefit of farmers. There is a gap in how to encourage farmers to utilise the ICT in the first place.

ICT usage enables the timely delivery of information to farmers so that it can be acted upon as required during the farming calendar. Aker (2011) is in agreement with other researchers that farmers have different types of information needs during each stage of the farming calendar and process. For example, soil analysis is available to the farmer as soon as it is available in an online facility. This is important to the farmer for fertiliser spreading given the limiting factor of weather conditions in Ireland. Also, as the EU Nitrates Directive demands that Irish farmers adhere to strict calendar dates when spreading fertiliser and slurry (Hynes and Hennessy, 2012), real-time weather information is crucial to adhere to these timelines. As the soil analysis is stored in an online database, the nutrient profile for the fields can be built up over time and this allows for updates to fertiliser recommendations particularly if the target crop is changed (Morrow et al., 2004). Other benefits provided to the farmer by the Internet include real-time weather updates and forecasts, market prices, bulk purchases online, online sales and the exposure to new markets (Briggeman and Whitacre, 2010). Some farmers have made efforts to produce their own marketing strategies but find it difficult to determine how and to whom they should direct their marketing materials (McGehee, 2007). This is an example where direct training of the use of ICT to suit the farmer will be of benefit.

The developments in ICT enable farmers to attend training courses that are held online where their farm and off-farm work commitments inhibit time to attend classroom courses (Morrow et al., 2004). This is particularly beneficial for young part-time farmers who require agricultural qualifications to avail of EU or government subsidies. However, it is restricted to farmers who have access to broadband either in their home or in an alternative location.

Developments are in place to integrate the services available with the aim to deliver the services based on end users' needs. There are significant amounts of data being digitally recorded by different organisations including the Department of Agriculture, Teagasc, farm software suppliers, farming organisations and farming co-operatives. This integration of data is imperative if ICT uptake is to continue to progress within the farming community. However, "farmers are willing to share information so long as confidentiality of data can be maintained and will result in the farmer becoming more competitive and better able to secure his/her future" (Morrow et al., 2004, p332).

2.6 Digital Divide in the Irish Farming Sector

Research indicates that there is a digital divide across farmers regarding their production activity, their profitability, their view of farm management and their access and interest in available information (Leveque et al., 2007). Older research indicates that "farmers are one of the groups most at risk of exclusion from the Information Society in Ireland" (Morrow et al., 2004, p327). The digital divide is seen as a technological and a social problem: after the roll out of the national broadband plan, there are still 900,000 homes that have insufficient broadband access. The intention by the government is to roll out the rural broadband scheme to reach these homes, or specifically homes within a three mile radius of a village (Department of Communications, 2010). Koutsouris (2010, p23) argues that the existing socio-economic inequalities do not allow for ICTs, particularly the internet, to "create new economic, social and political opportunities". Research also shows competence and motivation as inhibiting factors for adopting ICT for farm business use (Koutsouris, 2010).

Greater farm experience is negatively correlated with farming efficiency as the greater farm experience equates with the age of the farmer. Research in this area demonstrated that older farmers are less likely to adopt new technologies and therefore do not take advantage of efficiency advances that come with technological advances (Goodwin and Mishra, 2004). The use of email and websites to communicate key messages to farmers is now being employed by advisors and public organisations as this method is proving cheaper and easier to use than traditional postal services. Some advisors surveyed had admitted exclusive use of the Internet as the method of communication to

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farmers therefore putting farmers not using the Internet at a disadvantage (Leveque et al., 2007).

A pre-2004 survey of internet access and use show farmers as one of the most marginalised sectors in the information society and that 85% of workers in the agriculture, forestry and fishing sector are late adopters – defined as "adults without internet access or using it less than once a month" (Morrow et al., 2004, p333). However, the latest Teagasc survey highlights an increase in usage of a PC for farm business from 14% in 2004 to 21% in 2008 to 33% in 2011. This compares favourably to farmers in the US with usage increases from 30% to 35% to 37% in the same period (Teagasc, 2013).

It is found that ICTs are not favoured by farmers due to time and financial constraints, family and work commitments and the responsibilities of running the family farm, also farmers prefer personal communication and printed publications and media for receiving information (Koutsouris, 2010). This is at odds with the data gathered during the interview process as the participants who used the online agricultural databases for recording their cattle stated that this allowed them to spend more time with family and they also found more convenient to use than the paper method.

2.7 Technology in Agriculture

The continuing trend towards labour-saving technology in agriculture such as fencing, combine harvesters, housing and feeding facilities for livestock (Murphy, 1987) has enabled a scaling up in farm production and a reduction in the requirement of additional farm labour. Technological advances in agriculture have also changed the face of agriculture and the way it produces products dramatically over the last century. The potential mechanism for increasing yields and production is brought about by the use of improved agricultural technologies such as fertilisers, seeds and cropping techniques (Aker, 2011).

The Irish government have also stepped in with the availability of grants for farmers to construct technologically advanced silage bases and slatted sheds for feeding and housing. These are not only environmentally sound but also increase the work life balance for farmers as they dramatically reduce the time

spent in feeding housed cattle during the winter. This area will be explored in more depth in the findings and analysis chapter.

The agricultural production function implies that farmers need information on a variety of topics at various stages before adopting new technology (Aker, 2011). If farmers are to use new technology then a number of conditions must be met:

- They have sufficient information about the technology
- A favourable attitude towards the technology
- Financial means to acquire the technology
- Access to the technology
- Sufficient net return from using the technology
- Willingness to adjust current management practices to integrate the technology
- Positive view of the applicability of the technology to the farm business (Briggeman and Whitacre, 2010).

In addition, the availability of government grants or incentives are key decision drivers for investment in new agricultural technology for farmers.

For many farmers, the spread of labour-saving technology in agriculture is a welcome development which removes much of the "back-breaking drudgery from farming" (Murphy, 1987, p332). However, despite advances in agricultural technology, the human presence will still be required in the farmyard (Harrison, 1976), as cattle not used to human contact tend to be more difficult to control. The farmer can also be a source of comfort to an animal that is in distress or ill.

2.8 Off-Farm Employment

The challenges facing agriculture such as globalisation, poor commodity prices and rising input costs are eroding small farm incomes throughout the world. Because of this, farmers may need to sell their farms, obtain off-farm income or explore alternatives to be successful while remaining on their farm (McGehee, 2007).

The number of farms where the farmer or spouse had off-farm employment peaked at 59% in 2006 and has been declining since with the figure at 49% in 2012 (Teagasc, 2013). Off-farm work by any family member could serve to increase cash-flow which in turn enables adoption of technology (Mishra and

Gillespie, 2011). This is especially relevant in a sector where up to 86% of income for beef farmers comprises of single farm payments and that total of direct payments to the beef farmer can be in excess of 100% of income (Teagasc, 2013) – i.e. subsidies to maintain the economic sustainability of the farm.

Off-farm income has played a substantive role in stabilising farm household income (Mishra and Goodwin, 1997) and it is seen as an important means by which farm households can manage risk through diversification of income sources (Goodwin and Mishra, 2004). Off-farm employment can be taken up by two sets of farmers in Ireland: the farmer who can afford to work in another job (due to available time e.g. use of technology), and the farmer who cannot afford to work the farm only for an income. Farm type can also be influenced by the farmer having off-farm employment. The less labour-intensive beef farming or seasonal crop production may be chosen by the farmer who works off-farm and has limited labour resources (Mishra and Gillespie, 2011). Farms that are not economically viable but the farmer and/or spouse participate in off-farm work are classified as sustainable as the farm household may be sustainable in the longer term because of the off-farm income. An economically viable farm is defined as "one having the capacity to remunerate family labour at the average agricultural wage and the capacity to provide an additional 5% return on non-land assets" (Hynes and Hennessy, 2012, p1349). In non-viable farms where neither the farmer nor the spouse has off-farm income, the farms are considered economically vulnerable (Hynes and Hennessy, 2012).

However, a study by Smith K. R. (2002) has shown that increased reliance on off-farm employment may imply less attention to important issues in farm productivity such as adoption of best management practices and precision farming. As the farmers pull away from farming to earn income off-farm, adoption of technologies may be inhibited and less efficient farming could result (Goodwin and Mishra, 2004). Additional research by Goodwin (2004) backs up this study. The latest Teagasc (2013) survey shows that off-farm employment is on the decline and that market income before the receipt of total direct payments is on average €4,949 so the possible conclusion is that there is simply not enough cash-flow for the farmer to justify investing in the latest technology thus inhibiting efficient farming and adding to the cycle of reliance on subsidies. The reduction in off-farm work that the farmer could

traditionally be employed in such as construction would also play a factor in reduced cash-flow.

2.9 Health and Safety

The health and safety aspect relates not only to the safety of the farmer while they are at work, but also how unsafe or unhealthy practices can have a long term impact on their health and reduce their working life as a farmer. Farmers generally give up, slow down or stop farming due to injuries, old age or ill-health (Whelan et al., 2008).

Research shows that self-employment does not have significant health benefits because of high job demands and low employment security (Tuttle and Garr, 2009). The effect of working conditions on health has traditionally been measured in terms of physical hazards (Cottini and Lucifora, 2013). The change to computerisation and mechanisation of tasks has increased concern regarding mental health rather than physical health. (Cottini and Lucifora, 2013) cites Warren (2004), Robone, Jones and Rice (2011) and Cottini (2012) that studies show that jobs with high demand and low interpersonal support are associated with worse health conditions. In addition, self-employment can counteract the positive influence of job satisfaction and autonomy (Tuttle and Garr, 2009) as there are additional strains on the (self-employed) farmers such as a higher uncertainty in steady income, job burnout and social exclusion. The research here indicates differing opinions than those in section 2.2.1 on whether self-employment is good or bad for a person's health. The participants in the interviews stated a general satisfaction and wellbeing in working outdoors and on the farm.

Results from a 2011 Teagasc survey indicated that 19.5% of Irish farm households reported disability of the farmer and this was mainly the result of ill-health or physical injury. Additional analysis shows a greater proportion of beef farmers (59.8%) having a disability relative to all farms nationally (52.1%) (Whelan et al., 2008). This is most likely due in part to dealing with live animals and heavier machinery. A 2013 Health and Safety Authority (HSA, 2013) report shows fluctuation in non-fatal agricultural accidents:
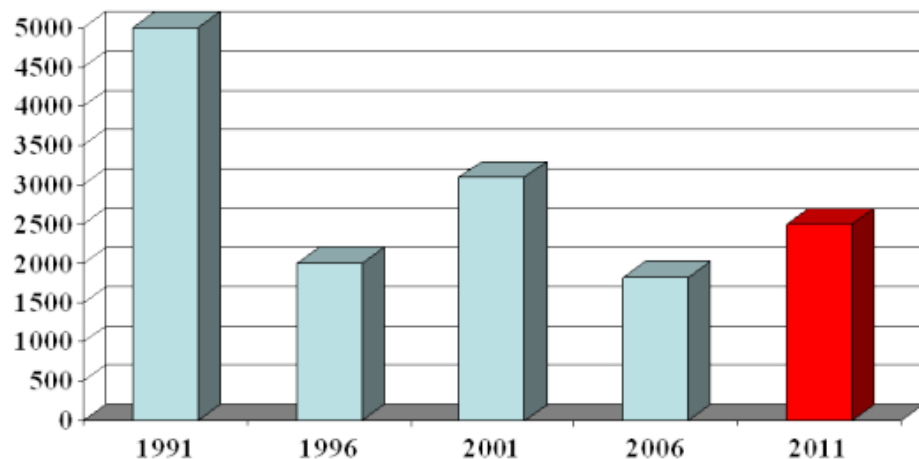
Figure 2.4: Non-Fatal Agricultural Accidents (HSA, 2013)

The fluctuations may be attributed to health and safety promotions in the media, safer machinery, machinery that the farmer is not used to using and the age of the farmer – the older the farmer, the more prone they are to injuries.

Disability to the farmer showed a reduction in family farm income versus equivalent farmers without disability (Whelan et al., 2008). In addition, analysis of the 2006 national farm survey shows that one in five farm operators ceased off-farm employment following disability as they believed that they were unable perform the off-farm employment tasks following disability (Whelan et al., 2008). Over half of farmers reporting disabilities from farming work on traditional farms. Traditional farms are seen as static, not progressive in expansion or adoption of new farming methods (Whelan et al., 2008). It can be concluded that adoption of modern farming techniques can reduce or prevent injuries to the farmer that have an adverse effect on their work life balance and quality of life.

2.10 Agricultural Industry in Ireland

Agriculture makes a substantial contribution to the economic and social viability of rural areas (Hynes and Hennessy, 2012). There are 105,535 farms in Ireland with 70% of the land dedicated to farming or forestry (Hennessy et al., 2011). Primary agriculture in Ireland accounts for 3% of Irish GDP and 6.5% of employment (Morrow et al., 2004) with 110,000 individuals employed directly in primary agriculture (Hynes and Hennessy, 2012). Later figures show

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that primary agriculture now accounts for 2.5% of GDP and employs about 150,000 people (Teagasc, 2014).

The beef sector which is of special focus in this paper is comprised of a large number of small farmers (Hynes and Hennessy, 2012). Livestock and livestock products account for 71% of total Irish agricultural outputs. This reflects the climatic suitability of Ireland for grassland versus crop production (Hynes and Hennessy, 2012):
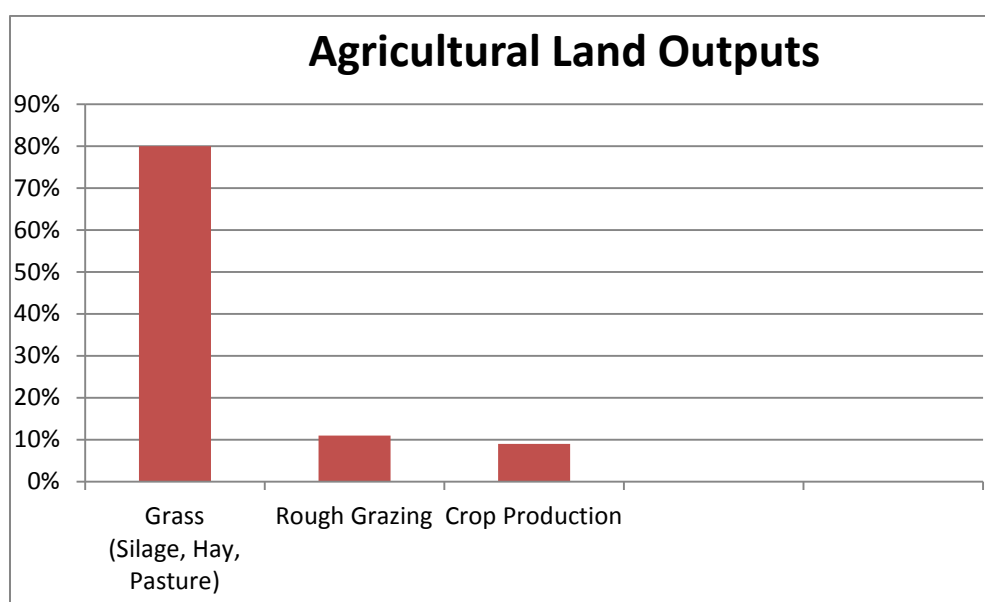
Figure 2.4: Climatic Suitability (Hynes and Hennessy 2012)

Irish agriculture is regulated under both local and EU wide policies. The EU Common Agricultural Policy (CAP) had had the most influence on the sector. The CAP was established by the original EU member states with efficient agricultural production, a fair standard of living for farmers and their families, stable markets, food security and produce reaching consumers at reasonable prices as its objectives (Hynes and Hennessy, 2012).

2.11 Summary

As work takes up a considerable part of life, meaningful work is very important, as is a balance between work and time for other personal activities and family (Anderson et al., 2009).

Work life balance is seen as an ideal by both employers and employees as achieving a sense of work-life balance is physically and psychologically necessary to promote life satisfaction, wellness and occupational success

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(Evans et al., 2013). Research also suggests that a sustained lack of work-life balance can affect workers' health, psychological well-being, commitment and productivity over time (Sarker et al., 2012).

For all the promises made by the information sector, the advances in ICT means that information can be an intruder in an employee's home life rather than a welcome guest. The "always connected lifestyle" (Cousins and Varshney, 2009, p117) means that employees can be contacted at any time and they feel that they should respond to all connections made. Studies have found that individuals experiencing technostress have lower productivity and job satisfaction and decreased commitment to the organisation (Sarker et al., 2012, Ayyagari et al., 2011).

The implication of being able to work anywhere, anytime is that people do work all the time and everywhere thus reducing the personal time people require for rest and renewal (Cousins and Varshney, 2009). In addition as workers utilise Information Systems and connectivity tools more and more, human contact is reduced bringing about loneliness and social disconnectedness.

However, organisational employees do have the physical boundary between work and home not enjoyed by the self-employed whose place of work is also the family residence. For the self-employed in this area, they are always at work even when they are at home.

Modern farming presents special constraints in achieving a work life balance including conditions that relate to the home being the place of work, off-farm employment and health and safety.

In summary the key points from the literature review are:

- Work life balance is something that needs to be co-ordinated by both employers and employees for the mutual benefit of both
- Stress in the workplace can contribute to health and quality of life issues that could have far reaching consequences
- Farmers as being self-employed and working from home need to guard against work encroaching onto their personal lives
- The digital divide between farmers and the Irish population is closing and PC ownership in farm households is on the rise
- The benefit and view of the Internet as a farm management tool needs to be promoted.

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Chapter 3: Methodology and Fieldwork

3.1 Introduction

This chapter describes the approaches considered for the research. The approaches selected are discussed and justified in this chapter.

3.2 Research Question and Objectives

The main goal of this research is to discuss and to determine if the use of Information Systems and technology improves the work life balance and quality of life with a particular focus on Irish farmers. The determination should also provide clarity as to why farmers consider leaving farming and what would encourage them to return or to stay in agriculture. This focuses primarily on the beef farming sector in Ireland.

3.3 Approaches Considered

A number of different research approaches were considered. The literary review highlighted that there is a lack of academic research focussed on the quality of life or its enhancement and its connections with Information Systems and technology for the Irish farmer. A number of other reviews have also been undertaken to determine the number and types of farmers in Ireland. These are primarily based on CSO results, Teagasc and the Government Department of Agriculture. The approach adopted is one that refers to this collected data and also to conduct first hand interviews with selected farmers within the beef farming sector to discover their views on how Information Systems and technology has provided enhancements, if any, to their quality of life and work-life balance. This combination of quantitative and qualitative research methods is becoming widespread in social science research (Hayman and Rasmussen, 2013). In addition, Hayman and Rasmussen (2013) cite work-life researchers Hill et al. (1998) and Pocock (2003) that they have suggested the use of both quantitative and qualitative methods to address the complex interrelationship between work and home.

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A research approach considered was the use of an online survey as this would provide the means to collect a large amount of data. This approach was ruled out due to the impersonal nature of data collection.

Semi-structured interviews with guiding questions were considered for the technological providers. Marketing data is available online from the providers detailing their own research for sales purposes and so therefore it was decided that secondary data for technological providers could be collected from marketing campaigns. The qualitative approach of a semi-structured interview with guiding questions with the farmers was decided on as this would give both the interviewer and the interviewee the opportunity to explore the subject further to gain a deeper understanding of how and why farmers use Information Systems and if it enables their work-life balance and quality of life. The philosophical approach for this research is inductive as the research seeks to build up a theory of Information Systems enabling work life balance that is grounded in the data (Saunders et al., 2009).

3.4 Semi-Structured Interview

The interview is used to gather valid and reliable data that is relevant to the research question and interviews may be categorised as one of:

- Structured interviews
- Semi-structured interviews
- Unstructured or in-depth interviews (Saunders et al., 2009).

Structured interviews use questionnaires based on a predetermined set of questions known as "interview-administered questionnaires" (Saunders et al., 2009, p318). As the answers are recorded on a standardised schedule and often pre-coded, the structured interview is also known as quantitative research interviews.

The unstructured or "in-depth interviews" are informal and are used to explore a general theme in-depth. There are no pre-determined questions and the interviewee often drives the progress of the interview.

The semi-structured interviews are non-standardised and a set of themes and questions are followed and these can vary from interview to interview depending on conversation flow of the interview. These are also referred to as qualitative research interviews (Saunders et al., 2009).

After careful consideration, the semi-structured interview was decided upon as the method of primary data collection. This method was selected as there was a need to collect qualitative data that neither the literature review nor the secondary data sources could provide. The method selected to conduct the interviews were face-to-face on a one-to-one basis to enable freedom of expression by the participant.

The focus for the research for this dissertation is both exploratory and explanatory. The exploratory focus concentrates on finding new insights into phenomena such as why Irish farmers do not invest in new technology even if it is proven to assist them positively in their work life balance, as put forward by the interviews. The explanatory focus looks at particular problems to infer causal relationships between variables (Saunders et al., 2009).

3.5 Data Types and Analysis

A key component of research is data collection and analysis. Use of both quantitative and qualitative techniques for data collection has been used for this research. The interpretive approach was adopted for the data analysis as this provides a deeper understanding of the subject and also portrays the perspectives of the interviewees within a coherent framework.

Documented secondary data sources such as the Teagasc surveys, Department of Agriculture research results and the Central Statistics Office survey results are used to gather the quantitative data for this research.

3.6 Limitations

There are recognised limitations with the two data collection techniques used in this research – secondary data sources and semi-structured open interviews. The main disadvantages of secondary data sources are:

- The data collected may be for a purpose that does not match the needs of the research
- Aggregations and definitions may be unsuitable
- No real control over data quality (Saunders et al., 2009).

These limitations are offset as the secondary data source employed is data compiled in previous research specific to the Irish agricultural sector.

The main disadvantages of using semi-structured interviews for primary data collection are:

- Reliability
- Forms of bias
- Validity and generalisability (Saunders et al., 2009).

The concerns with reliability relate to the non-standardised approach of the semi-structured interviews and if alternative researchers would reveal similar information. Bias can relate to the interviewer and interviewee bias. Interviewer bias can be revealed using tone of voice to indicate weight of a question or expected response. Bias on the part of the participant can be expressed by perceived perceptions or perceived interviewer bias. The interview results can be open to interpretation and the interviewer could infer meaning not intended by the participant based on language or tone used. Due to the limited number of participants generally used for semi-structured interviews, the results cannot be used to make statistical generalisations about the entire population of the subject matter.

The semi-structured interview technique is used due to its non-standardised approach as it allows the participants in the interviews to explore areas more deeply than would be allowable in a structured interview. The bias can be overcome by developing trust between the interviewer and the interviewee (Saunders et al., 2009).

3.7 Ethics

Ethical issues concerning the interviews and the secondary data collection were considered very carefully. Areas that would be considered sensitive by the participant were avoided, such as farm size and farm income. Data of this nature volunteered during the interview process was not included in the final analysis. Participation in the interviews was voluntary, with informed consent and the participants had the right to withdraw from the interview at any stage.

Ethical approval for this research was sought and granted by the Research Ethics Committee of the School of Computer Science and Statistics, Trinity College, Dublin. No ethical issue was identified. The participants were informed that they could terminate their participation at any point and the anonymity and confidentiality of the study findings were assured.

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3.8 Population and Sampling Frame

The population of the semi-structured interviews were full and part-time Irish farmers primarily in the beef sector. The population size of farmers in Ireland was 105,535 as per the Teagasc report of 2012 and the sampling frame of beef farmers of 41,291 was taken from this (Teagasc, 2013). The sample size was 13 full or part-time beef farmers and these were in-depth interviews which allowed exploration of ideas and expansion of points made throughout the interview. This sector was selected as they are least likely to be impacted by rapid advances in technology and ICT and yet they are subject to a high number of information channels to complete their scheduled tasks throughout the farming calendar (Teagasc, 2013, Leveque et al., 2007, Sørensen et al., 2010). The sample selection process was snowball where the interviewees suggested another potential participant.

Samples are selected from populations for purposes of research under circumstances such as:

- When it is impractical to survey the entire population
- Time and budget constraints preventing the surveying of the entire population
- All the data has been collected however the results are required quickly (Saunders et al., 2009).

Due to the size of the population, the spread of it around the country and the use of the semi-structured interview for data collection, it would be impractical and time consuming to interview the entire population. Teagasc and the Central Statistics Office conduct regular surveys that relate to the subject and the results are utilisable for the research.

Collecting data from fewer sources is advantageous as it can be more detailed and more time can be spent analysing it than using a wider sample spread (Saunders et al., 2009). This is important especially for semi-structured interviews as more time can be given to the participant and therefore they will be more detailed in their responses.

3.9 Design

The semi-structured interview method was chosen as it gives the participants the freedom to discuss areas in further detail than with a structured interview

within the framework of guiding questions. In this way, the interview could be conducted in line with the research and the participants had the opportunity to also discuss areas that enhanced the research process. The semi-structured interview was also chosen as the participants would be more responsive to answering questions and discussing details in a face-to-face format and the interviews were conducted in a place of the participants' choosing and therefore they had a comfortable environment. The main disadvantages of an semi-structured interview is of the participants going on a tangent, saying what they feel the interviewer wants to hear and holding back on pertinent information. The interview consisted of three sections: The guiding questions, the informed consent form and the information sheet for participants as shown in the appendix.

3.9.1 Semi-Structured Interview Design

The semi-structured interview consisted of 22 optional questions in 3 sections. The questions were given in advance to the farmers as an opportunity to pre-read; however there was no expectation that they had done so.

The interview was structured into sections which covered: social questions, technology questions and farm background. The social questions attempted to address the research topic of work-life balance and quality of life. The technology questions were aimed at discovering the current in-use technology on the farm, the technology wish-list and the key drivers for adopting new technology.

The final section then dealt with the farmer and the farm structure itself, whether the farmer farmed full or part-time, what time of farm that was worked and if the farm was a different type previously.

Although guiding questions were used there were some variations in some of the issues discussed and due to the evolution of understanding of the agricultural technologies over the course of the interviews.

3.10 Field Research

The goal of field research is to collect data that assists in answering the research question. Both qualitative and quantitative data was collected from

secondary sources. The resource that is mostly referred to is the Teagasc database which is the agriculture and food development authority of Ireland. Statistics developed by the Department of Agriculture and the Central Statistics Office have also been utilised. Teagasc and the Department of Agriculture have primary interest in agriculture development and enhancement in Ireland. They are also representative bodies for farmers and Ireland on larger arenas. The Central Statistics Office (CSO) conducts research and compiles data on areas of interest and complete analysis based on this research for public consumption.

3.11 Secondary Data

This section discusses the secondary data source used for collecting qualitative and quantitative data for the purposes of this research. Secondary data is data that has already been collected for another purpose and this is re-analysed for the research question (Saunders et al., 2009).

The secondary data used for the purposes of this research question and forming the quantifiable data is sourced from the farming body, Teagasc, the government agricultural department, the Central Statistics Office (CSO) and census data. This data is typically used in explanatory research. The censuses are unique in that they are obligatory and conducted by the government. As such they are usually clearly defined, well documented and of a high quality.

Data collected by Teagasc and by the CSO are collected on a continuous and regular basis and may have exclusions in the data collected, for example the latest Teagasc survey (2012) excludes farms below €8,000 of standard output. Prior to this, the threshold had been €4,000. This represents an exclusion of 18% of the total farm population from the survey. This could lead to misinterpretation of data if compared to previous years where the inclusion threshold had been lower.

The documentary secondary data that forms qualitative data is sourced from non-written sources such as documentary programmes, written sources such as agricultural journals and periodicals and other research previously undertaken in this area.

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This data is analysed both quantifiably and qualitatively and is then used to triangulate findings based on primary data collection through the semi-structured interviews.

3.12 Semi-Structured Interview

Semi-structured interviews were selected as the method to collect qualitative data for this research. This method was selected as the interviewees would be able to provide information based on experience that could not be provided by the secondary data source or the literature review.

Thirteen beef farmers were interviewed over a course of 8 weeks. The farmers ranged in age from 25 to 67. Their working arrangements on the farm and with off-farm employment varied as outlined in the table:

Table 3.1: Participant Employment Type (Slater, 2014)

Employment Type	Number of Farmers Interviewed
Full-time Farming - No Off-Farm Employment	7
Full-time Farming - Part-time Off-Farm Employment	1
Full-time Farming - Full-time Off-Farm Employment*	3
Part-time Farming - Full-time Off-Farm Employment	2
Total	**13**

*These farmers said in the interview that they partake in as many hours on their farm as they do for their full-time off-farm employment.

3.12.1 Interview Preparation

Planning and preparation is the key to successful interviews (Saunders et al., 2009). The steps taken to prepare and conduct the interviews are outlined in the following sections.

3.12.2 Theme Development

The questions prepared for the interviews were developed during the initiation of the literature review. These themes were:

- Farm background – type of farm, farm continuity plan
- Social – work-life balance, quality of life

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- Technology – impact of technology on their work, decision drivers.

3.12.3 Identification of Participants

The initial interviewee was selected and interviewed. This person then recommended the next phase of interviewees. The snowball technique was employed as a number of interviewees also identified potential interviewees. Thirteen farmers were identified for interview and there was a 100% acceptance rate. All interviewees work in the beef farming sector, either full or part-time and six of them also have off-farm employment.

3.12.4 Informed Consent

Details relating to the interview process were disclosed to the interview participants prior to the interview commencing. The details provided meant that the candidates gave informed consent as they were fully informed and their consent to participate was given freely. The template used to fully inform the participants is included in the Appendix and a number of the key details provided are listed:

- Purpose of the research and who is taking it
- How the data will be collected
- A statement that participation is voluntary and the participant can withdraw at any time
- The duration of the participant's involvement
- Assurances of storing the data collected anonymously
- The anticipated benefits to the participant.

3.12.5 Interview Execution and Equipment

The interviews were conducted between 15th March 2014 and 15th April 2014. Nine of them were held in the interviewees' homes, two were held in a convenient location and two were held in the interviewees' place of full-time off-farm employment. Oral permission was received from the owner-manager of the full-time employment prior to the interviews being conducted. All thirteen interviews were face-to-face.

Notes were hand-written during the course of the interviews and a tablet computer with voice recording software and in-built microphone was used to

record the interviews. The equipment was tested before each interview to ensure that the interview would record successfully.

3.12.6 Dialogue and Duration

Each interview commenced with the interviewer going through the informed consent forms, the interview structure, answering any questions that the interviewee had and co-signing of the consent forms. Each interviewee was reminded that they could withdraw at any time, the interview would be recorded and that written notes would be taken. Each interviewee was also informed that as a semi-structured interview, additional interesting themes brought up by the interviewee may be explored more deeply during the interview. The discussion of each theme was initiated by asking an open-ended question from the list of pre-determined questions or as follow-on from a topic raised by the interviewee. The interviews were fluid and the majority of the dialogue came from the interviewee.

The average duration of the thirteen interviews was an hour and fifteen minutes. Nine out of the thirteen were over the hour that had been allocated for the interview, four were just under the hour and two of those were at 50 minutes. One of these was due to the interviewee needing to be someplace else after the interview and so was conscious of the time and the other one due to the rapid pace that the interviewee spoke at. Three of the interviews exceeded an hour and a half and this was due to the wealth of information that they were willing to impart. They were also very animated on the subjects raised during their interview.

3.12.7 Scheduling

The interviews took place over an eight week period; these were conducted during weekends as the interviews were conducted in the interviewees' homes or place of work, with the exception of two of the interviews which were conducted midweek in a convenient location. The approach taken was to interview the participants where there was close relationship with first so that confidence could be built up in the subject matter and in the linguistics that are particular to the farming sector. The interviews took place towards the end of the busy calving period and coming into the next busy period in the farming

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calendar, taking into consideration the time constraints that farmers would have at these two times of year.

3.12.8 Post Interview Tasks

Immediately following each interview, the audio sessions were saved with the first name only of the interviewee and the time and date stamp retained in the tablet computer. This was for ease of reference and there was no personally identifiable information in the filename. The tablet computer is password protected and retained safely for the duration of the interview period. Each recording was replayed to assess its quality. Each recording retained the expected volume and quality and therefore, no further editing was required to listen to the interviews.

During April and May 2014, each recording was replayed and the key points were transcribed into a summary narrative (Saunders et al., 2009). There was over sixteen hours of audio to listen and transcribe. Often the recording needed to be stopped so that the points being said could be transcribed accurately and also the recordings needed to be rewound during the course of transcribing so that the full information could be transcribed. The recordings were used as the primary source for the transcribing as these were very clear to use. The written notes were referred to in cases where there were additional points for follow-up during the course of research.

Once the primary narratives were completed a summary of summaries (Saunders et al., 2009) was created. The key and common points from the narratives were included in the secondary narratives. This process of reviewing the primary narratives was completed a number of times to ensure completeness and accuracy.

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Chapter 4: Findings and Analysis

4.1 Introduction

This chapter discusses the main findings and analysis from the interviews and secondary data sources. It links the correlation if any, between Information Systems and other technologies and enhanced work life balance for Irish farmers. This chapter discusses what work life balance means to the farmer, Information Systems and technology and the key driving factors in the decision to invest.

4.2 Farm Background of Interview Participants

Thirteen full and part-time beef farmers were interviewed for the purposes of this research, 11 of these were from the midlands region and 2 were from Limerick/Tipperary. The majority of the participants have 100% beef farms with 2 of the farmers diversifying to include sheep or dairy on their farms. The farmers all volunteered information such as age, family type and if their partner worked. This is collated in the table 4.1 below:

Table 4.1: Farmer Background (Slater, 2014)

Farmer	Age Range	Family Type	Partner
A	65 - 69	Grown Up Children	Partner Not Working
B	35 - 39	No Children	Partner Working
C	40 - 44	No Children	Partner Working
D	45 - 49	Dependent Children	Partner Working
E	30 - 34	No Children	Partner Working
F	35 - 39	Dependent Parents	No Partner
G	25 - 29	No Children	No Partner
H	50 - 54	Dependent Children	Partner Working
I	60 - 64	Grown Up Children	Partner Not Working
J	60 - 64	Grown Up Children	Partner Not Working
K	45 - 49	Dependent Children	Partner Working
L	35 - 39	Dependent Children	Partner Working
M	35 - 39	Dependent Children	Partner Working

4.3 What Does Work Life Balance Mean to the Farmer?

A key goal of the research is to discover if and how Information Systems and technology improve the work life balance for Irish farmers. In-depth interviews were held with 13 farmers over the course of eight weeks. They were all asked

what work life balance meant to them and how they measured it. Work-life balance is defined in section 2.2 as "the extent to which an individual is equally engaged in and equally satisfied with their work and family role" (McMillan et al., 2008, p1). Work life balance is highly subjective, perceptual phenomenon that is achieved when an individual perceives his or her major life domains and the different roles s/he plays in them to be compatible with each other (Steiber, 2009). Each participant had a particular work life perspective that they desired, however work demands often determined their actual work life balance or integration.

4.3.1 Measuring Quality of Life for Farmers and their Families

During the interview, the farmers described how they measured work life balance; each farmer had different criteria for measuring this. The qualitative criterion was categorised in the post interview process to show how many times the individual criteria featured as a measurement of work life balance for each participant. This was then quantified in the below graph:

Measuring Work Life Balance

■ % of Farmers Interviewed

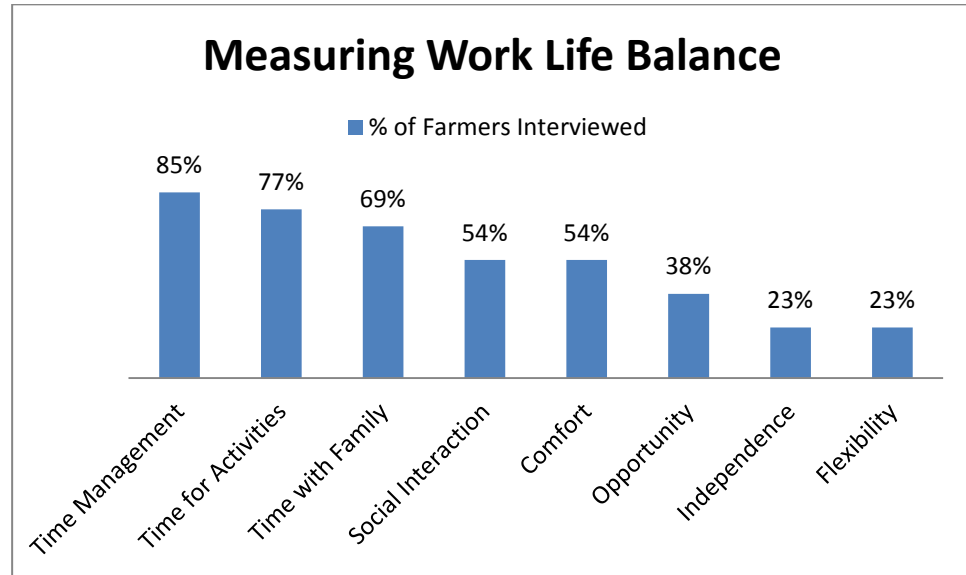| Time Management | 85% |
Time for Activities	77%
Time with Family	69%
Social Interaction	54%
Comfort	54%
Opportunity	38%
Independence	23%
Flexibility	23%

Figure 4.1: Measuring Work Life Balance (Slater, 2014)

- Time Management

    o Time management featured as the highest ranking quality with 11 out of the 13 participants using this in their description what work life balance means to them. This is an indication of being able to be in control of their work and the rate of allowable spillover into their personal lives.

- o "Time management is very important, farmers could work 20 hours a day on the farm and still get nothing done and some farmers who work 6 hours a day would get twice as much done simply because they have better management skills, better setup, better focussed" (Farmer B).
  - o "The farmer who has not adopted (new technology) is not as content or does not have as much spare time" (Farmer A).

- Time for Activities

  - o Time for activities ranked second with 10 out of the 13 participants noting that this was an important factor in their work life balance. Having interests outside of the farm and having the time to pursue these interests are seen as important to the psychological wellbeing of the farmer. This is backed up by research where achieving a sense of work-life balance is physically and psychologically necessary to promote life satisfaction, wellness and occupational success (Evans et al., 2013).
  - o Having some interests outside of farming is very important to keep a participant "socially and psychologically happy" (Farmer C).
  - o "Very important mentally to be able to switch off from the farm and not be a slave to it and have an outside interest from the farm" (Farmer B).
  - o "All the making life easier would allow for an interest in other things such as the tidy villages and ploughing championships" (Farmer A).

- Time with Family

  - o Time with family featured third on the list with 9 of the 13 participants agreeing on its importance. Of these 9, 7 had children and the other 2 were recently married. The participants who did not rate time with family generally had no partner or no children. The "self-confessed workaholic" bucked the trend here though as he has a partner and dependent children and did not mention time with family as being of importance to him.
  - o The focus also shifted positively towards the family when a farmer got married and had children. One participant stated that before his children arrived he would have worked longer into the evenings, now he gets things done quicker: "You have to be more efficient with your time when you have less of it" (Farmer M).
  - o Another participant makes an effort to be at his children's sporting events and the children expect their parents to be there also. He also makes sure that he has breakfast with them before seeing them off for school and ensures that he is in the house when they return. For this farmer, "family life comes first" (Farmer D).

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- Social Interaction

    o Social interaction means meeting up with or communicating with other people during the working day for the farmer. Just over half of the participants stated that this is important for them. The 7 participants are all full time farmers and 4 out of this 7 do not have any off-farm employment and therefore having the social outlet is of high relevance to them and their mental wellbeing.
    o "Nowadays with the advent of technology, farming is becoming a more solitary profession" (Farmer D).
    o Typically, one the participants interviewed "would not see anyone else during the day" once his wife goes to work and his children go to school. He maintained that having the mobile phone stops him getting "totally depressed" as it enables him to have someone to talk to during the day (Farmer D).

- Comfort

    o Comfort featured in 7 out of 13 participants responses to what work life balance meant to them. The comfort they refer to relates to being safe, warm and dry while they tend to their farming duties.
    o For example, having a cab on the tractor means that the farmer is warm and dry in all conditions. Also when feeding cattle in the shed "can be done in my slippers" (Farmer E). In contrast, without the shed and tractor, feeding silage would be a mucky and smelly activity. Use of a calving camera enables a participant to "view any activity from his bed and not have to get up if he does not need to tend to the cow" (Farmer C).

- Opportunity

    o Opportunity is seen as important in work life balance for 5 of the 13 participants. Opportunity affords the farmer to either invest in their own education where they normally could not or refers to future opportunities that they wish for their children.
    o Improvements in farm technology "meant that farming family offspring can go to third level education" (Farmer A). According to the same participant, he did not go to secondary school as there was a fear by his parents that he would not come back to farming.
    o The farmers encourage their children to "go to college, get their profession and regular pay" (Farmer D) and then come back to farming if they still want to.

- Independence

    o For the 3 participants who cited independence as a quality of work life balance, this meant independence from labour, time and weather. The participants learned to be independent and have to be in a lot of cases – having technology means that the farmer can

be independent – "it is a one man show" (Farmer F). Prior to technology such as electric fencing, the farmer would need "an army of men" to move cattle (Farmer H). Now he can do it on his own and in less time.

- o One participant switched from diary to beef farming and this meant enjoyment in his life – he could go somewhere with his wife and not have to come back to milk the cows, this equated simply to "domestic bliss" (Farmer A).
- o Another participant stated that "automation (of labour) enables independence" (Farmer C).

- Flexibility

    - o Flexibility for the 3 participants is not just about the amount of hours worked and how they are worked it is also about not needing to give notice to anyone and being able to get somebody to help out if required. In addition, technology gives the farmer the flexibility to manage the farm in a way not previously possible. For example, fencing means that the farmer can strip graze meadows (i.e. allow cattle to graze a portion of a meadow at a time) thus increasing growth and recovery in the meadow to enable better farm management and decisions.
    - o Being flexible in their working hours means that the farmer can "take off where he pleases during the week" or "fall asleep on the couch for an hour" (Farmer D).

It is interesting to note that the top three characteristics that the participants use to describe work life balance are time management, time for activities and time with family. These different aspects of time seem to be luxury items to them. This is demonstrated succinctly by one of the participants: "Everything that I invest or manage on the farm is to minimise the time spent on the farm and to maximise the time spent off the farm" (Farmer B). Having control over when, where and how they work enables them to better co-ordinate their schedules with family duties and other activities thus reducing strain (Steiber, 2009).

4.3.2 Work Life Perspective versus Work Life Reality

Farm work is conducted directly from the family home so as soon as the farmer puts on their wellies or steps out the back door, they are at work. This is in contrast to other types of labour where a journey needs to be made to get to the place of work. This non-physical separation of home and work life can

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make it difficult to maintain a psychological separation of home and work life. The participants do try to make an effort to not allow the farm work to spillover too much into their personal lives. However, as they are "at work and at home at the same time" (Farmer H) this can prove difficult. They generally work to a planned time-table, i.e. they go out for a few hours after breakfast, come back to the house at midday and go again between then and the evening meal. At this stage, they should stop working as would be routine for the organisationally employed. Oftentimes, the participants would find themselves "tipping around doing jobs" (Farmer M) as there is "no time to shut off and close the door and forgetting about it – your whole life revolves around farming when you are a farmer" (Farmer J).

The majority of the participants try to have compartmentalised or minimised overlapping work lives however sometimes the work takes over "work is not everything but it has to be there" (Farmer G) and can extend into their personal lives more than they had planned or expected.

4.3.3 Farm or Family?

When work spills over into their personal lives, the participants need to then decide which takes priority – the farm or family. The participants were asked this or volunteered the information during the interviews and the response of the majority was "farm". This was surprising in one sense as they had already stated that they valued work life balance and spending time off the farm. However, considering the farm is their livelihood and "without farm there could be no family" (Farmer I) they were placing value in one element (the farm) so that they could enjoy the other (the family). "Your farm and your family are one and the same – family farm" (Farmer H). This is a true assertion of those with an overlapping work life integration perspective as they view work as a necessary aspect of a fulfilling life (Sarker et al., 2012).

Having time with family is very important and the families also feel that they like having the participant at home as much as possible. "You could be doing work on the farm and be tipping around all day where you have to make time for the family. When I didn't have sons I would always do a few jobs on the farm. Maybe when you have family you have a better work life balance" (Farmer M).

Two out of the thirteen felt that work life balance was not that important as one placed all importance on working, he is a "self-confessed workaholic" (Farmer K) and the other felt that work took over his life and that he "needs to be there all the time" (Farmer F). As per Sarker et al. (2012), these farmers have an encompassing work perspective where success at work equates to success at home (Sarker et al., 2012).

4.4 Information Systems in Agriculture

The participants interviewed use specific types of Information Systems for running their farming business. They described the drivers and incentives for change and also described how the information system brought improvements to their farming practices. The sub-headings are derived from information received during the interviews as a result of direct questions asked or volunteered information.

4.4.1 Mobile Phones

- Drivers and Incentives for Change

    o Prior to the mobile phone, if the farmer required assistance, they would need to go back to the house to use the house phone or to find their family/labourers. If they had an accident on the farm and was immobilised, they would have no way of alerting anybody.

    o It is seen as a life-saver by some farmers due to being able to call for help in emergency situations or being able to call to talk to somebody if they are feeling lonely. The mobile phone "takes away the loneliness of farming as farming can be a very lonely life" (Farmer M). "The mobile bill can be quite high, but this is better for me to get the bill than to get totally depressed" (Farmer D).

- Improvements to Farming Practices

    o The mobile phone has been recognised by the farmers as not just a communication tool, but also a time saving and information sharing device. It is used for knowledge sharing, for booking services – vets, contractors, AI and for paying for these services. The identification tag can be texted to the vet prior to their call out so that the vet has all of the details to hand beforehand, receive text messages for BVD (disease) results.

    o The mobile phone is used to check the weather and to then contact contractors based on the weather updates. The farmer can also subscribe to the local mart where they will text to let the farmer

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know how many calves will be on sale that week – in this way, the farmer will know if it is worth their while to go to the mart or not. Farmers can also subscribe to receive text messages relating to beef prices and the beef market.

- o The mobile phone also enables the existence of the farm discussion groups as it enables the functionality of the groups. The discussion groups are generally Teagasc administered and they meet regularly to discuss best farming practices, prices and other subjects that help enhance farm management and set benchmarks. They are an important decision enabling and social group for the farmers. "Overall, the discussion group and ICBF are useful programmes for examining the herd against the national average which had not been available 20 years ago" (Farmer B).

4.4.2 Computer/laptop/tablet – computerised farm records (herd profile)

- Drivers and Incentives for Change

  - o The widespread use of personal computers means that farmers are also investing in this technology. Applications such as grant payments registration and herd registers are now available on line.
  - o The online herd register system which is available from the Department of Agriculture is intended as a replacement of the physical herd register that the farmer traditionally needs to keep.
  - o The online herd register monitors any blood tests, medicines and diseases the animals or the herd may have. This information can be used to alert the farmer of any movement restrictions they may have in their herd thus enabling disease control.
  - o There is also paid for software available which provides more detailed information for the farmer that can be used for management decisions for running their farm.

- Improvements to Farming Practices

  - o The farmer can now record the herd profile online for ease and convenience. The online system does not allow duplication of records therefore reducing human error with recording of details. The farmer uses this system to record cattle movements into (purchases or births) and off (sales or deaths) their farm. If the farmer deals directly with the mart, any sales or purchases are automatically registered to the system via the mart database thus saving additional time. The online register negates the need to have a physical herd register book that can get mislaid. The online register is easily accessible for the farmer at any time and is up to date when the farm inspector visits. "From a management point of view, the computerisation of records is terrific as it is easy to do and is error free" (Farmer B). The records are available for the

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farmers' use and they also feed into the Department of Agriculture database for further dissemination for example to the factories and to the marts.

- o The herd register is also a useful tool to analyse when animals are fit for sale based on age, blood tests, or withdrawal period from any medicines. The farmer can use this system to accurately determine when and how many animals are fit for sale at present or in the future when he knows he will require an injection of cash.
- o The farmer can invest in specialist software that provides information relating to the number of calves per cow, for example. This is information is also benchmarked against the national average so that the farmer can use this to make management decisions to take measures to ensure that the farm meets or exceeds the averages. The computer can be used to record weight trends of the cattle and uses this then for future analysis. It is also used to research items of interest for the farmer such as new tractors, parts or to check cattle prices. "Having the mobile or tablet means that I am able to do a lot of research and price around before making a purchase" (Farmer M).
- o One participant uses Google Earth to take measurements of his fields to see how much fencing he needs or for determining how much pipe is required to lay new pipeline.
- o "There is no big investment in purchasing a laptop – the investment was in learning how to use it" (Farmer B).

4.4.3 Profit monitor

- Drivers and Incentives for Change

    - o The profit monitor is an online system utilised by the Teagasc representative at the farm discussion groups to compile the farm data which is used to inform the farmer if they are making a profit or loss from the activities performed.

- Improvements to Farming Practices

    - o The analysis gives the farmer decision power so he knows what he needs to do next or to change on the farm. "Anything outside of the average indicates that there is something wrong with the herd or else the farmer's management practices are poor and these would need to be examined" by the farmer (Farmer B).

4.4.4 Bull register: Bull and Artificial Insemination (AI) Technology

- Drivers and Incentives for Change

- o The farmer uses the data available on the online bull register such as breed, sire, age, beef suitability, easy calving, etc to select a bull to buy for the farm or the type of bull he will use for AI on the cows.

- Improvements to Farming Practices

  - o The farmer can plan the calving season using the bull or AI. He can select a bull that will produce the type of calf that he requires for the type of herd that he currently has. Using the specific technology means that he can expand or contract the herd as required.
  - o AI technology also includes sexed semen to determine the gender of the calf – this is important if the farmer only breeds in bull beef for example.

4.4.5 Soil Analysis

- Drivers and Incentives for Change

  - o Soil analysis is used to determine the quality and chemical levels of fields in advance of ordering and spreading fertiliser and grass seed. Samples are sent to a laboratory for analysis and the results are communicated via email or post. The soil analysis results are used for decision making purposes by the farmer to determine the level nutrients required for optimum grass growth.

- Improvements to Farming Practices

  - o The soil analysis provides accurate and timely readings of the chemical breakdown of the fields. This information is used by the farmer to determine how much and what type of fertiliser and grass seed is required for the fields for grass growth. This system reduces wastage and time and saves money.

4.4.6 GPS Mapping and Acre Meters

- Drivers and Incentives for Change

  - o This is used to take accurate measurements of a field enabling a farmer or contractor to make decisions such as how much fertiliser would be required for the field or how much it would cost to have the silage cut (as they are charged by the acre).

- Improvements to Farming Practices

  - o Accurate spreading of feed or fertiliser minimises waste and saves money. Accurate field measurements using an acre meter mean

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that the farmer knows how much he can expect to be charged for services charged by the acre thus saving money.

4.4.7 Calving Cameras and Ultrasound

- Drivers and Incentives for Change

    - Advances in animal husbandry and better feeding result in larger animals requiring that cows sometimes need human intervention when they are calving. Calving can occur at any time of the day or night and can take a number of hours to complete. This means that the farmer needs to keep an eye on the cow and may need to step in to help the cow with the calf. Therefore, utilisation of calving cameras that feed directly to the house or lately to a mobile phone means that the farmer can keep an eye on the cow from afar.

- Improvements to Farming Practices

    - The calving cameras give the farmer a degree of independence from this key part of farm management. Ordinarily, they would need to stay by the cow's side or physically check her every few hours to see if she needs assistance. The calving camera means that they can watch this activity from their house or bed. If the camera is connected online, they can even watch it over the internet via the mobile phone. "I can check on the cattle using the internet on my phone when I'm travelling and ring my friend to drop in if any of the cows need assistance" (Farmer M). This is a valuable time and energy saving device.
    - Specialist technicians are hired to scan the cows to confirm that they are in calf. The farmer uses this information to decide what to do with the cow for example use AI or sell the cow, if she is not in calf.

4.4.8 Animal Medicines and Vaccinations

- Drivers and Incentives for Change

    - Cattle being sick during their lifetime or calves getting ill during the early stages of growth can cause them to become ill or die. If the calf survives, the farmer needs to invest a lot of time and energy in bringing the animal back up to weight so that he can make a profit from the animal. Any set back at birth will be seen at 6 months of age – the farmer cannot afford a lengthy recovery time as the cattle are sent to the factory at ~20 months.

- Improvements to Farming Practices

- o Use of an in-utero vaccination prevents early illnesses in the calves. This prevention saves on a huge amount of time and resources especially during the busy calving period. This decision to invest means that the calves are leaving their mothers in a healthy state and there is no lack of thrive (weight gain). The vaccinations also prevent losses of calves which mean more livestock to sell.
  - o The vaccination and medicine history is retained on the online cattle registration database for each individual animal. This information is used by the farmer and any potential purchaser of the animal of any withdrawal period for administered medicines prior to the animal being moved or slaughtered.
  - o In addition to connection to the Department of Agriculture, the online cattle registration database is linked directly to the databases of the veterinary service, the cattle marts and the meat factories. In this way, the full medical history of the animal is disclosed to all relevant stakeholders.

4.5 Additional Agricultural Technology and Use in Work Life Balance

There are other technologies that the farmer uses for key management decision purposes and they also tie in with enabling a positive work life balance. The participants described the drivers and incentives for change and how technology investments improved their work life balance.

4.5.1 Farm Infrastructure

- Drivers and Incentives for Change

  - o This includes for example: slatted sheds for in-wintering animals with special slatted flooring to draw animal waste away from the cattle while they are eating, drinking and resting. The slats are often rubberised to provide extra comfort for the cattle. Silage pits which contain the winter feed supply (silage) for the cattle and are usually placed beside the slatted shed for ease of access and as they share an effluent tank. These also have specialised flooring and gutter systems to protect the local environment from the effluent produced by the fermenting silage.
  - o The government brought in grants for winter housing for cattle, silage pits and effluent tanks to help combat environment pollution caused by silage and slurry run-off.
  - o Farmers are liable for prosecution if their farming activities cause pollution.

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- o The slatted sheds are used to house the cattle in the winter which enables the farmer to rest and rotate the land.
- o As "farmers would consider the slatted shed as the equivalent of a new piece of land" (Farmer B) it enables them to increase the number of cattle that they can farm.

- Improvements to Work Life Balance

  - o The slatted shed technology and silage means that the farmer can fodder cattle for two days at a time; instead of twice a day which means that the hours spent feeding is cut back dramatically. The farmer is then free to re-invest this time saved elsewhere.
  - o In-wintered animals enable easier handling and feeding and independence from the weather for the farmers. The sheds also reduces the amount of labour required to feed and manage the animals over the winter.
  - o Pit silage production is not weather dependent and is produced in a fraction of the time that it takes to produce silage bales. Pit silage is the favoured harvest as it is less labour intensive to harvest, less labour intensive to use, lasts longer and there is less waste. As it is finely cut it is also easier for the cattle to eat and digest.

4.5.2 Farm Machinery and Equipment

- Drivers and Incentives for Change

  - o The farm machinery and equipment includes but is not limited to: tractors, quad bikes, topping machine (for cutting grass), shear grabber (for handing silage) and front loaders (for feeding), diet feeders (for mixing food), electric fencing (for land management and herding animals), dosing guns (to administer oral vaccinations directly to the animals) and water dosing technology (for administering minerals and other nutrients to water supplies for the cattle).
  - o Research and investments into grass productivity brought about increased grass production and heavier meadows. Improved topping machines and stronger tractors were then required to cut this grass for silage production.
  - o Using the speed clock on the tractor to set the maximum that the tractor should travel at when fertiliser spreading means that an even application is spread over the fields leading to a reduction in waste and cost.
  - o Handling and foddering the silage required investment in a stronger tractor, shear grabber and a front loader.

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- o Beef cattle are sold at a specific age at a specific weight range to factories. The scales are used by the farmer to ensure that target weights are achieved in the correct time frame for optimum profit. These are normally used in conjunction with a diet feeder for precision feeding.
- o Using a diet feeder means precision feeding of animals. For one participant the main driver had been loss of animals and others not recovering due to him inadvertently overfeeding them too much meal and insufficient straw. The human error cost him a number of cattle and the feeder eradicates this error. The diet feeder ensures that the cattle eat all components of the food and "in this way, the bulls could not avoid the straw and then not get sick" (Farmer F).
- o The water dosing technology is used to administer water to troughs in fields that do not have a direct water supply and to add the required minerals to the water supply for the cattle to maintain their health and fertility. One participant experienced the loss of ten animals due to mineral deficiency.
- o Electric fencing allows the farmers to control the Continental animals which are less docile and bigger than the traditional Irish breeds. Handling and controlling facilities are of critical importance for the safety of the farmer.
- o Strip grazing of land (using electric fencing to control access to parts of the meadow) entails allowing cattle to eat from set areas of land during grass growth rotation. This ensures that the cattle always have fresh grass in front of them which means that they thrive better. It also means that the cattle cannot pick and choose what they eat i.e. ignoring the grass they do not like the taste of.

- Improvements to Work Life Balance

  - o The larger machinery enables the farmer to complete the farm work in less time. It also enables the farmer to complete more work giving the option to either upscale for increased profits or to get time back for other non-farm activities or off-farm work.
  - o The machinery and fencing provides enhanced safety for the farmer as it means less physical handling of products or animals. This leads to improved or maintained health for the farmer as they are less prone to injury or strain.
  - o The machinery and fencing means that less labour (people) is required to complete the farming tasks. "Where it used to take me an army of men to move cattle, I can now move them myself using the fencing" (Farmer H).
  - o The investments often lead to the farmer being able to for example, feed the animals without having to change their clothes first. This means time saving and comfort for the farmer.

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- Using precision tools such as a diet feeder means that the farmer is more confident in completing their work correctly and safely for both the farmer and the animals. "Using the feeder means that I am more measured in what I am doing and more confident that the cattle won't get sick. It is also a lot less work and I am happier that I am doing the job better" (Farmer F).

4.5.3 Contractors

- Drivers and Incentives for Change

  - Contractors who provide their own technology and staff are often utilised by farmers as an "efficient and cheaper way to manage their farms" (Farmer B).
  - The contractors have the bigger, better technology and the knowledge and training to use it. In addition, contractor fees are tax deductable year on year.

- Improvements to Work Life Balance

  - Use of the contractors is also safer as farmers and their families may not know how to use the machinery safely.
  - Contractors can provide necessary company and social meetings for what could otherwise be a lonely day for the farmer.

4.6 Drivers for Investment – Do I Need This?

Technology is not usually invested in unless it is "fairly well thought out and I ask myself 'do I need it' first" (Farmer F). Oftentimes, the farmer would not actually invest as "it's been alright up until now" (Farmer F). They would need either external incentive to invest such as new legislation or grants or an internal incentive such as animals becoming sick or dying in order to upgrade or invest in new technology. The reason for this is usually not having money in the first place "when money is scarce, you cannot afford to be impulsive" (Farmer H).

Due to the conservative nature of the participants, they did not have many experiences of technologies not working for them. It is more likely that the investment did not suit a particular type of farm. For example, "buying a tractor that is too big or too small for a farmer's needs would usually be a bad idea" (Farmer J). When asked if there was any technology that they wish they had

invested in sooner than they actually had, the majority of the participants said no and that they were happy with the timing of their investment when it was made. The two participants who stated that they wished they had invested in a particular technology sooner was due to them losing animals to sickness that was easily preventable by use of the technology. When further probed, they admitted that they would not have invested at all had the animals not been impacted.

When the participants do invest, they were asked in the interview what encouraged them to invest in IS/IT or farm technology in the first place. They would read about new technology in specialist publications such as the farmers' journal, from farm trade shows, from their peers – "peer encouragement is the best stimulant; move on or you are left behind" (Farmer A). The farmers are more strongly influenced in their intention to use farming software and websites by people that they perceive as being important to them rather than by neighbouring farmers (Connolly and Woods, 2010). In addition, involvement in the farm discussion groups means that the farmer is exposed to the new technology and this has enabled them to make the decision to invest in the new technology. The farm discussion groups are voluntary membership groups supported by Teagasc. They provide output information by comparing and contrasting farming methods that each farmer can then use for administering their own farm. Farmers' contact with outside advisory and support agencies impacts positively on technology adoption (Heanue and Macken Walsh, 2013). This is backed up by the results of the interviews where the 8 out of the 13 farmers were involved in discussion groups and all 8 had invested in computers and used the Department of Agriculture online cattle registration system or other available farm software packages. The other 5 farmers were not part of any farm discussion group and did not utilise online farm software systems.

The farmer will review the decision to make an investment in technology based on farm type, farm needs, future potential, expansion/contraction plans and available land mass. With advancing technology, the farmer can now decide if they are to invest in the technology or to hire contractors to complete the work using their technological investments. "When you don't have the time, you need to allocate resources and this is where contractors or technology would come in" (Farmer M). This is a key management decision for the farmer for a number of reasons:

- Tax relief on investments versus contractors - Capital investment versus expenses. Contractor fees are tax deductible yearly, whereas tax relief on the investment is only for 7 years.
- Confidence and competence with using the new technology – does the farmer know how to use the new technology?
- Capacity to invest in the first place – does he have the cash (savings, grants, loans) to invest?
- Economies of scale – will the investment make a return, does he have the land mass or income to justify the income?
- Return on investment – will the farmer retire before he has made full use of the investment, does he have a successor to take over the farm while the investment is still active?

The contractors will provide their own technology and labour so therefore "all the farmer needs to do is book and pay them" (Famer C). Where a farmer can afford contractors or cannot afford to not use them, this proves a worthwhile alternative to investment in their own time and technology.

4.6.1 Information Systems and Technology as an Influencer

IS/IT keeps the farm up to date and gives the farmer the confidence to know what s/he is doing and that s/he is "doing it right" (Farmer F). Utilising the farm software packages that available means that it is easier for the farmer to stay compliant with legislation. Maintaining farm records on-line means that the records are up to date and that the farmer can receive their subsidy payments on time.

Technology does not enable a farmer to scale up – only the availability of land can do this. However, the farm technology investments enable the farmers to retain and improve their current practices.

However, the heavy investment in one area can prove to be a barrier to entry for another area, for example switching from beef to dairy.

4.7 Off-Farm Employment

Of the 13 participants interviewed, 6 of them have off-farm work to supplement their farm income as it is "not economically viable for the farmer to give up the job and to only maintain the farm" (Farmer F). As beef farmers, these

participants are most likely to have off-farm income as this type of farm is easier to manage with limited labour resources (Mishra and Gillespie, 2011).

The latest national farm survey shows that 27% of all farmers in the survey population in Ireland have off-farm income (Teagasc, 2013). The participants interviewed are above this average with 46% of them having this additional income. This contrast is more likely down to the limitations imposed by the target number of interviews and that only beef farmers were interviewed rather than a difference in trend. Three of the farmers are both full-time farmers and have full-time off-farm employment. They stated during the interviews that the work on their farm takes up as much time as their full-time job, as they work into the evenings and over the weekends on the farm.

Table 4.2: Off-Farm Employment (Slater, 2014)

Employment Type	Number of Farmers Interviewed	% of Total Interviewed
Full-time Farming - No Off-Farm Employment	7	54%
Full-time Farming - Full-time Off-Farm Employment	3	23%
Part-time Farming - Full-time Off-Farm Employment	2	15%
Full-time Farming - Part-time Off-Farm Employment	1	8%
Total	**13**	**100%**

The participants with off-farm income cited that even though necessity was the reason for the additional income requirements, they would not be able to pursue this off-farm income without the use of technology or contractors who in turn employ their own technology. The reason for this is that the technology enables automation and gives back time that the farmer can use for other activities such as off-farm work. Technology and the use of contractors enable farmers to have off-farm work. "In a way, the farmers are nearly becoming guardians of the land and maintaining it for the next generation" (Farmer L).

Of the farmers interviewed, 8 of them have partners who also work – 5 of these farmers have young families and 3 of these are newly married. At 62%, this is contrasting with the Teagasc survey that 49% of farmers' households where either the farmers or spouses have off-farm income. This is most likely to do with the age group of these interviewees and their partners – they are all their 30s or 40s, which is in line with the Central Statistics Office with bulk of

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female employment in this age bracket (CSO, 2014). It is interesting to note that the 3 participants interviewed who have partners who do not work, are full time farmers, at the retirement age and have grown up children.

4.8 Health and Safety

Health and safety can have a limiting factor on the quality of life for the farmer. This includes not only injuries from machinery, heavy lifting but also the impact of working long hours and the isolation felt from not having human contact during the working hours of the day.

The advent of technology means that jobs are completed in a quicker time or in the same length of time but there is less human effort therefore not impacting the body as much. This would increase the quality of life of the farmer over the long term as there is less damage to the body. For example, the introduction of the 500kg bags of fertiliser means that the farmer uses a machine to lift and empty the bags instead of manually lifting and emptying 50kg bags. Silage production instead of bales means that the farmer does not need to physically carry the bales to the cattle for feeding. It also reduces the necessity to be out in all weathers to draw them in as the silage is usually stored near to where the cattle are housed for feeding during the winter months.

Due to the intensification of silage production, this is often completed by contractors instead of the farmers themselves. In this way, skilled operatives manage the machinery keeping the farmer and their family safer. For one participant, safety was the main driver for hiring contractors as his family had previously suffered a tragic accident due to their inexperience with machinery.

The mobile phone is seen by the participants as a business tool and as a means of keeping in contact with other people – "it is a social and functional tool for farmers" (Farmer C). A number of the participants recounted experiences where they used the mobile phone where they or another person was in trouble. Each of the participants ended their account wondering what would have happened had they not had the mobile to hand. For one participant, having the mobile means that he can make and receive calls to his wife and other farmers so he has someone to talk to. For him, "this is very

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important especially with depression, the mobile phone could be saving lives"
(Farmer D).

4.9 Impact on Work Life Balance

The use of technology in the participants' every day work does indeed bring
about improvements in the work life balance of the farmer. From the
interviews, it was established that the farmers could complete their tasks much
quicker, for some of them in half the time. Having the enclosed cabs on the
tractors for example improved their comfort level and quality such as not
having to change their clothes, thus reducing time, waste and "not having his
wife give out to him" (Farmer B).

The most prevalent negative impact of Information Systems and technology
use in farming is the increased isolation and the reduction in human contact,
conversely, they use it to stay in touch. As technology automates a lot of the
functions on the farm allowing it to become "a one man show" (Farmer F), it
reduces the necessity of having additional labour on the farm. Even where the
farmer hired contractors or worked with family members, "they would be in one
field and I (the farmer) would be in another" (Farmer G).

This isolation is counteracted by the farmers having outside interests such as
joining farm discussion groups, tidy town committee, ploughing association
etc. However, the capacity to join these groups is only possible by employing
technology use on their farm.

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Chapter 5: Conclusions and Future Work

5.1 Introduction

This chapter discusses the conclusions and future work from the findings and analysis chapter. The goal of this research was to discover if Information Systems and technology improve the work-life balance of Irish farmers. This research was conducted using available literature and semi-structured interviews of farmers in the beef agricultural sector. The participants defined what work-life balance means to them and also what impact if any IS/IT and technology has on their work life balance. Their work life balance was defined primarily by how much time and energy they had left over for off-farm activities, particularly time with family, and the impact was measured in improvements to their farming practices. The improvements had a positive knock-on effect as they meant improved efficiency, time back, less manual labour or manual intervention in their work.

5.2 Has IS/IT Helped or Hindered

The use of Information Systems and technology in agriculture and technology to agriculture, in particular to the Irish beef sector, is making huge strides as demonstrated in section 4.6 which showed that 62% of the participants in the interviews used and saw value in Information Systems and technology for their farm administration tasks. This is in stark contrast to the latest available data from 2007 which states that only 4,500 Teagasc clients use the Teagasc website and only 5,000 farmers use specialist online farming software (out of a potential +105,000 farmers) (Leveque et al., 2007). For the participants who do use IS/IT in their agricultural work, they have been positively impacted by the use of it. The perceived benefits for them included being able to complete administration tasks much quicker and with less errors. Use of the online cattle registration tool meant that they were also more inclined to update farm movement details in a timelier basis than using the traditional paper based method. They were also more likely to use the internet for additional research prior to making any purchases specific to the farm. Input and output systems such as the Teagasc supported discussion groups were invaluable to the farmers for management decision making. By taking part in these and maintaining the two-way communication channel, they were the benefactors

and contributors to bench-marking exercises designed specifically for their product area.

In addition to the perceived benefits outlined above, IS/IT provides improvements to the quality of life for the farmer as it also removes the element of loneliness experienced by the farmers during their day to day work. The mobile phone is seen by all participants as a functional and social tool that enables the farmer to talk to someone during the day as often there can be no one else around the farm on a normal farming day. As also noted by the farmers, it is an invaluable tool when the farmer is in the fields especially if he gets into any trouble such as being injured.

Human capital (age, education, experience), financial capital, income, farm size, access to information and land ownership are positively associated with the likelihood of farmers adopting best practices or technologies (Heanue and Macken Walsh, 2013).

5.3 What does it mean for the Next Generation?

The off-spring of current farmers has a clear view of what farm work and life is like. This gives them an advantage over the off-spring of workers in other industries that generally need to leave the home in order to attend their employment. From this perspective, if the next generation are to be encouraged to stay in farming and also have an option with regards to taking over the family farm or not, it is important that this career choice is made as attractive as possible. The next generation of farmers "do not want to spend all of their time farming" (Farmer B). IS/IT can be used to enhance the role of farmers by increasing automation in tasks and reducing or replicating the necessity of manual intervention in the work. IS/IT needs to be utilised and shown in a positive light by the current farmers, the farm advisory services and the IS/IT providers.

It is important that the next generation does continue with farming. The knowledge base and technical skills have been built up over generations and have been passed on from farmer to the next generation. If the heirs on the family farms exit the industry because of unattractive income levels or quality of life, then the knowledge, skills and experience of Irish farmers which are

essential for the high standards of livestock and quality of produce could be severely diminished (Hynes and Hennessy, 2012).

The farmers interviewed were in agreement when it came to continuity of the farm – they all hoped that a member of their family would take over the farm, although they were all conscious of the reality that they may not wish to. In contrast to their own way of receiving the farm, they did not want to make their children feel obliged to take over the farm. Some of the participants interviewed stated that they had unexpectedly inherited the farm although there may have been a more interested or deserving relative to inherit it.

The participants in the interviews do not wish for their own children to go straight into farming. They would prefer for the children to go to college, to travel the world and to get other jobs before they come back to farming, if ever. The farmers understand that the future for agriculture as for many businesses is diversification. Irish farmers are better enabled for diversification if they have relevant experience outside of mainstream agricultural production, a positive attitude, a strong work ethic and a 'love of the work' (Mulhall et al., 2013). In addition, the farmers also give a number of reasons that their off-spring should not rely solely on farm life:

- Lack of profits from the farm
- Hardship and drudgery of the work
- They wanted their children to choose the farming life and not have it chosen for them.

Despite this, they would like their children to farm at some stage, but not to have to rely on the farming for income. As the participants felt that they were simply guardians of the land for the next generation, they would not like to see the farm sold and would prefer that it stays in the family. The farmers are confident that their children will come back to farming. "If it is in them to farm, they will farm – no matter how much hardship is in it, they still like to be at it" (Farmer L).

5.4 Generalisability in the Findings

The focus of this research is specific to the use of Information Systems and the impact of work life balance particular to the Irish agricultural industry, however, it should have broad applicability to other sectors that are reliant on

Information Systems and technology to function. Statistical generalisations about the entire population of the subject matter cannot be made based on the results of the interviews alone.

5.5 Limitations

The limitations brought about to resource constraints relate to the 13 participants as not being representative of the full catchment of beef farmers in Ireland. However, the data collected during the interview process provided a rich base for the research process and influenced the majority of the findings and analysis chapter. Examples of IS/IT use by other farmers were brought up during the interviews and follow up interviews would be beneficial to measure if the participants adopted any of the introduced topics in their farming. Unfortunately due to the time constraints within this research, this follow up would not be possible, however this does represent any area of potential future research.

The participants selected for the interviews were all male farmers. Female farmers may have different perspectives and priorities relating to the impact of Information Systems and technology on their work life balance.

Due to the limited number of participants used, the quality and representation of the population could not be guaranteed. However using in-depth interviews provides the opportunity to gather personal anecdotes not necessarily readily available from other data sources.

The literary review and secondary data research is limited due to the availability of combined literature on how Information Systems and technology impact the work life balance of Irish farmers. There may be a perception of little value-add and a reality of little funding in conducting research in this area. Future research could indicate how improvements in the quality of life for farmers could attract and retain people in this important food producing sector.

5.6 Advances of Current State of Knowledge and Thinking

The research completed reiterates that technology provides automation of tasks in agriculture that saves time, energy and money. The main research finding is that the advanced technology reduces the need of other labour on

the farm and that this reduction in labour requirements increases the isolation felt by farmers. This in conjunction with the hardship of the actual work could be limiting factors in future generations choosing to stay working on the farm.

Technology use is making farming lonelier and seems to take away the social aspect of work in this area. Where previously, farmers would gather around during harvest season which could last a few weeks, contractors are now employed for a couple of days to complete the task. Due to the commercial nature of this business, the contractors do not stop to socialise with the farmer, instead they rush off to the next job. However technology use is enabling the farmer to have more time to complete off-farm activities and off-farm work. ICT such as the mobile phone increases connections between farmers and other people which help to stave off the loneliness and isolation.

Farm records are being encouraged to be filed online in order that the Department of Agriculture can review them in their office. Previously, representatives would have needed to visit farms to view the physical farm records that the farmers maintained. This in itself is another step towards the continued isolation that the average Irish farmer is now feeling due to the technological advances in machinery and Information Systems.

Farmers tend to be reactionary to events and very risk adverse and often need to have a bad experience on the farm before they will invest in Information Systems or technology. For a group that deals with changing seasons and volatile markets, they tend to shy away from making enhancements that will improve their work, profitability and ultimately improve their way of life.

Despite all the advances in technology, technology does not replace the necessity for humans on the farm. Cattle need to be counted, checked and observed for ill health. The participants in the interview enjoy this aspect of their work anyway and may not welcome systems that take over from them checking the cattle such as remote controlled cameras or on-site cameras. "It is lovely to go out to the fields to see the new calves; it is very up-lifting" (Farmer H).

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5.7 Future Directions for Research in this Area

This area is ripe for future research – does IS/IT actually help improve the work life balance of the majority of Irish farmers? This paper has highlighted a number of areas where future research could prove beneficial:

- This research focussed on a tiny sample of farmers out of the total population in Ireland. Future research could conduct more widespread interviews with follow ups at intervals to determine if and how IS/IT enables work-life balance.

- The interview participants were all male. The more widespread interviews could include females in the selection process for a differing perspective on Information Systems and technology use and work life balance.

- The Irish beef farmer has the potential to use data obtained from the cattle database to make key management decisions to run the farm, this untapped area can be exploited by farmers to determine the best time to sell cattle at the best price based on the supply going into the factories at any point in time. They could link into world events such as the Olympics and the rugby/football world cup and European events such as the Tour de France to evaluate when there will be a big demand for beef in the global arena. The potential of using data collected during farm work will reach its full potential when suitable Information Systems are developed to achieve beneficial management practices (Sørensen et al., 2010).

- Technology use is making farmers more isolated as technology reduces additional labour requirements. Research in this area combined with the farmer not having pursuits outside of farming could identify if technology use makes the farmer become more insular and isolated from the rest of society.

- Research could be conducted to discover how to encourage farmers to invest in technology before they need it rather than after they have had a bad experience which entails that they must now invest. Farmers seem to need to have an "eye-opener" in order to invest rather than a view for the future. This attitude should be analysed and the resistance to change challenged if a real and profitable future is to be enjoyed at ground level by farmers.

- As demonstrated in the interviews, there is a positive correlation between active membership in the farm discussion groups and adoption of Information Systems for farm administration and profit monitoring. A review could be taken of this area to review why farmers have not joined discussion groups and how to encourage them to join. This can be further extended to research how to encourage farmers to utilise the IS/IT that has been developed specifically for agricultural use. Research could also be

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undertaken to review what IS/IT, software and databases are available for farmers to use and how to promote its use to farmers.

- A potential aspect of future farming is selling directly to the consumer on a more widespread scale. The utilisation of IS/IT can enhance this such as direct marketing via social media. This is an area that could be explored more fully and then cascaded to farm discussion groups for implementation at local level.

- As farming is such a vital sector of the Irish economy, it is important to review how and why people enter farming, how to get them to stay in farming and to encourage people to return to farming especially where holdings are left vacant.

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Appendix

List of questions for semi-structured interview:

Title of Research Project: How do Information Systems/Technology Improve Work/Life Balance for Irish Farmers?

Each question is optional. Feel free to omit a response to any question; however the researcher would be grateful if all questions are responded to.

Please do not name third parties in any of the responses during this interview. Any such names will be anonymised.

<u>Interview – Open Questions for Farmers</u>

Farm background

Do you farm full or part-time?

What type of farm do you have, for example dry herd

Had it been a different type of farm over the years?

How long has the farm been in the family?

Please describe the farm continuity plan, if any to the next generation?

Social questions

How do they measure work-life balance, for example – number of hours working, time with family, time for holidays?

Is a work-life balance something they consider important to have?

Is this something that their family would consider as important?

Do you think a work-life balance would be a factor in encouraging the next generation to continue farming?

Technology questions

How did the decision to invest in new technology come about – was there encouragement from family members, neighbours, did you feel that it would make your work easier or is it purely to keep up with legislation?

How do changes in farming practices/legislation require you to update/adopt to new technology?

What type of technology do you currently use?

Can you describe changes in farming practices that have attributed to new technology being required?

Can you describe new technologies that have changed (your) farming practices?

How has technology influenced you to maintain the type of farm you have or has it encouraged/enabled you to switch to from one farm type to another, for example from dairy to dry herd?

Can you describe technologies that did not work for you?

Is there a technology that you would have preferred to have adopted earlier?

Is there an existing technology that you have not taken on that you wish you had?

Does technology enable you to have off-farm activities?

Does technology enable you to have off-farm work?

How does technology make the farm work easier for you?

Do they prefer the new technology – would they return to the old methods? Why/why not?