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The impact of introducing electronic health record systems in residential aged care

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University of Wollongong

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School of Information Systems & Technology

The Impact of Introducing Electronic Health Record Systems in Residential Aged Care

Yiting Zhang

This thesis is presented as part of the requirement for the Award of the Degree of Master of Information Systems and Technology by Research of the University of Wollongong

August 2012
CERTIFICATION

I, Yiting Zhang, declare that this thesis, submitted in fulfilment of the requirements for the award of Master of Information Systems and Technology by research, in the School of Information Systems and Technology, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The documentation has not been submitted for qualifications at any other academic institution.

Yiting Zhang

August 2012
ABSTRACT

Resident health record is an essential information source for the management and delivery of aged care services. Paper-based record is beset by many defences, such as illegibility, missing data, double data entry and difficulty in information retrieving. Electronic health records (EHRs) have been introduced into residential aged care facilities (RACFs) to improve record management. However, to date, the actual impacts of EHRs in RACFs have not been systematically studied. Therefore, the aim of this study was to identify the impacts of EHR systems in RACFs and their causes, and to examine how to overcome the challenges for the implementation of EHR systems.

A qualitative, interpretative research was undertaken. The empirical data was collected from semi-structured interviews of 110 care staff members working in nine RACFs belonging to three organisations. The audio records were transcribed in Microsoft Word. Content analysis was conducted using Microsoft Excel. The updated DeLone and McLean Information Systems Success Model was used as the theoretical framework for data analysis.

The study has identified three categories of impacts, both positive and negative: the impacts on individual care staff members, on residents and on the RACFs. The top 10 frequently mentioned benefits are: quick data retrieval, ease and speed of data input, ease of access, improved format and content of records, enhanced communication with external health care providers, more information about the residents, motivation of staff to enter data, better communication among staff and improved performance appraisal by management. The most obvious negative impact was negative staff attitudes toward documenting resident records in the EHR systems.

The factors leading to these impacts were also examined. The benefits were realised because of the nature of the aged care EHR systems in comparison with paper-based records, the way the systems were used by the staff and the fact that one benefit could lead to another. The negative impacts were caused by the quality of the EHR system, an inadequate approach to the implementation of the system – including lack of training and support – and technical problems with third party products.
Strategies for the introduction of the system that might overcome the challenges of implementation were classified in three categories: hardware allocation, useful additional functions, user interface redesign and training and support.

Although the negative impacts discouraged the care staff members from using the system, the overall benefits led to a smooth organisational transition to electronic documentation practice.
ACKNOWLEDGEMENTS

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My heartfelt thanks go to Dr Madeleine Strong Cincotta for her selfless dedication, energy and profound knowledge. I am grateful to have had the benefit of her valuable input during the process of content analysis. As my language consultant, as well as a rich experienced linguist and researcher, she demonstrated her expertise and greatly increased the validity of the data analysis.

I also want to thank my colleagues at the health informatics research lab (Siyu Qian, Xiaojun Zhang, Malatsi Galani, Ning Wang, Esther Munyisia, Kieren Diment) and office-mates (Xing Su, Juncheng Cui) for their friendship, encouragement and time spent together discussing and sharing ideas on various topics of study and living abroad.

I thank my dear mother, Min Du, for her ‘telesupport’ and my father Hui Zhang, for his economic support of my daily life in Australia. I would like to give my special thanks to my loving husband Chi Zhang, who accompanied me on the long journey during one and a half years living and studying overseas.
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACAT</td>
<td>Aged Care Assessment Team</td>
</tr>
<tr>
<td>ACFI</td>
<td>Aged Care Funding Instrument</td>
</tr>
<tr>
<td>ACT</td>
<td>Australian Capital Territory</td>
</tr>
<tr>
<td>AHP</td>
<td>Allied Health Professional</td>
</tr>
<tr>
<td>CAQDAS</td>
<td>Computer-Assisted Qualitative Data Analysis Software</td>
</tr>
<tr>
<td>CHC</td>
<td>Complex Health Care</td>
</tr>
<tr>
<td>D&amp;M IS Success Model</td>
<td>DeLone and McLean Information Systems Success Model</td>
</tr>
<tr>
<td>EEN</td>
<td>Endorsed Enrolled Nurse</td>
</tr>
<tr>
<td>EHR</td>
<td>Electronic Health Record</td>
</tr>
<tr>
<td>EN</td>
<td>Enrolled Nurse</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HIT</td>
<td>Health Information Technology</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>PCW</td>
<td>Personal Care Worker</td>
</tr>
<tr>
<td>RACF</td>
<td>Residential Aged Care Facility</td>
</tr>
<tr>
<td>RAO</td>
<td>Recreational Activity Officer</td>
</tr>
<tr>
<td>RN</td>
<td>Registered Nurse</td>
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<tr>
<td>WHO</td>
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Chapter 1  Introduction

Australian’s population is ageing. Increased longevity is associated with increased occurrence of long-term health conditions and complex chronic diseases such as dementia (Australian Institute of Health and Welfare 2010). The increasing number of older people needing personal assistance for their activities of daily living increases the burden on Australia’s aged care system (Productivity Commission 2011). Together with this, shortage of workers in the field adds to the challenge (Department of Health and Ageing 2011a). Aged care staff is in short supply and the formal aged care system is facing difficulties in attracting and retaining them (Chaudhry et al. 2006; Productivity Commission 2011). Direct aged care services are labour intensive, however the wages and conditions of care staff are generally less favourable than public health care staff (Productivity Commission 2011; Australian Nursing Federation 2010). In residential aged care facilities (RACFs), there is a skill shortage among care staff as well as a low ratio of registered nurses (RNs) to other care staff (Department of Health and Ageing 2011a; Chaudhry et al. 2006). Furthermore, there is limited after-hours access to general practitioners (GPs) and some communication problems with them (Chaudhry et al. 2006).

Documenting resident health records is one of the essential yet challenging tasks for care staff members in RACFs (Martin et al. 1999). Staff is often dissatisfied with care record management (Daskein et al. 2009) because of a perceived conflict with directly delivering care services to residents, which is seen as the primary duty of care staff. The inconvenience and inefficiency of writing on paper; the poor quality of the records, that are often illegible, easy to lose and difficult to find, are other reasons causing staff member dissatisfaction with records (Cheevakasemsook et al. 2006; Martin et al. 1999; Munyisia et al. 2011c; Yu et al. 2008).

Electronic health record (EHR) systems, an important type of information and communication technology (ICT), are thus being introduced into many RACFs to relieve the burden of care record management. The EHR systems are expected to provide resident-centred information for aged care staff (Dorda et al. 2005). It is anticipated that the adoption of these systems will improve the quality of resident
health records and care staff’s access to high quality information, will enhance data accuracy, reduce paper work and save time for staff (Häyrinen et al. 2008).

A review of the literature suggests that there is a paucity of evidence to validate these expected benefits of EHR systems in RACFs. The EHR systems are not yet widespread in the aged care sector in Australia and paper records still prevail (Yu et al. 2009). There are a number of factors which make decision-makers in aged care services reluctant to introduce EHR systems. These include the following three broad social and technical issues: cultural issues (Alexander et al. 2007; Resnick et al. 2009), cost barriers (Cherry et al. 2008) and the risks of unintended negative impacts (Burns et al. 2007; Sockolow et al. 2012). A lack of understanding of the impacts of EHR systems in the aged care setting has caused conservative decision-makers to abandon the idea of adopting the innovation or has led them to lose confidence in the EHR system once difficulties are encountered during implementation (Menachemi and Brooks 2006). To date, there is a lack of evidence about whether the overall benefits of EHR systems can outweigh the negative impacts in RACFs (Yu and Comensoli 2004).

Health care providers, policy makers, aged care organisations and system users consider EHRs to be critical to transforming health care (Chaudhry et al. 2006). Therefore, evaluating the impacts of EHR systems in RACFs is a highly relevant study at the current stage of technology adoption in aged care. Filling an essential knowledge gap about the overall impacts of EHR systems in residential aged care, it can provide evidence to help organisations, policy makers, system users (care staff members) and system developers to choose a good quality EHR system, set up strategies for implementing and maintaining the system, adopt an EHR system and learn to improve the function and user interface of EHR systems (Yusof et al. 2007).

1.1 Research aim
To fill the identified knowledge gap, the aim of this study is:

- To identify the impacts of EHR systems in residential aged care and their causes, and to examine how to optimise the benefits.

To achieve the research aim, the following specific research questions need to be answered:
1. What are the benefits and negative impacts of introducing EHR systems into RACFs?
2. What are the factors and actions that lead to the realisation of the benefits and negative impacts?
3. Are the overall perceived impacts predominantly positive or negative?
4. Are there any strategies for system introduction that may overcome the challenges to acquire these optimal benefits? If so, what are they?

1.2 Research methods

The following four step study procedure was designed to achieve this aim.

1. Choose a theoretical framework to facilitate the researcher to understand and explain phenomena in the research setting. The framework had to be one which was widely accepted by other researchers in the field of health care intersecting with evaluating the technology.
2. Identify the empirical data needed to answer the research questions and achieve the aim of the study.
3. Analyse the empirical data using a content analysis technique.
4. Organise the findings into themes, groups, categories and sub-categories to provide answers to the research questions and aims.

This research takes an interpretative interview approach (Klein and Myers 1999). Because of the limited knowledge about the impact of EHRs in residential aged care, the qualitative paradigm with an interpretative approach was considered the best choice (Walter 2010). The updated DeLone and McLean Information Systems Success Model (D&M IS Success Model) (Delone and McLean 2003) has been adopted as the theoretical framework to guide the interviews and the subsequent content analysis.

Nine RACFs (Facility 1 to 9) belonging to three organisations (Organisation 1 to 3) participated in the study through a formal research partnership with the university. Two commercial aged care EHR systems (System X and Y) from two companies were used by the RACFs. 110 aged care staff members in all types of positions in the RACFs participated in the interviews.
Content analysis was conducted to analyse the interview data. Different types of content analysis, including conceptual analysis, relational analysis (Walter 2010) and directed content analysis (Hsieh and Shannon 2005), were conducted to develop categories of impacts, causes, and suggestions to optimise the benefits and the relationships between the impacts and the causal factors.

Microsoft Word and Excel information systems (IS) were used to conduct the content analysis. The semi-automated content analysis methods of using the highlighting cells, data sorting, filtering, counting cells and the PivotChart functions of Excel is a creative way to develop a content classification system.

1.3 Organisation of the thesis

This thesis is organised into seven chapters. Following the introductory chapter, an extensive review of the literature on the topics relevant to this study is presented in Chapter 2, which leads to the identification of the knowledge gap that provides the rationale for this study. Chapter 3 discusses the research methods and approach. Chapters 4 and 5 present the results of the content analysis. Chapter 6 compares in detail the findings from this study with those of previous studies. It also recognises the contributions and limitations of this study and provides recommendations for further studies. Chapter 7 concludes the thesis.
Chapter 2 Literature review

2.1 Introduction
A review of the literature was conducted to gain a detailed understanding of: (1) the ageing population and their health status in Australia; (2) aged care services in Australia and the challenges; (3) resident health records in RACFs; and (4) application of information technology (IT) in the aged care sector and its impacts.

The literature review includes original scientific research papers, reviews of previous studies, official government websites and reports, reports from professional institutions and published books.

Research for the literature published from 1990 to 2012 was conducted using databases and search engines including: PubMed, ScienceDirect, Web of Science, Summon, Google and Google scholar. The search process used the following key words individually or in combination: aged care, long-term care, electronic nursing documentation, electronic health record, EHR, health information technology, HIT, residential aged care facility, RACF, nursing home, information and communication technology, and ICT. The articles meeting the following criteria were included in this review: (1) full-text of the literature should be available online, (2) the website and reports from official Australian Government websites or nationally or internationally recognised organisations.

Archived web pages and reports were excluded. The focus of the study is on EHR systems in residential aged care, within the context of health informatics applications for the health care of older people. Studies on ICT solutions in public health, primary care and hospital settings were, therefore, also excluded.

2.2 Australian’s ageing population
The World Health Organization (WHO) (2012) defines ‘older people’ in developed nations as the population group aged above 60 or 65, the official retirement age. At present, it is generally accepted that the ageing population in Australia refers to those
people who are at the qualifying age for the Age Pension for males (Australian Institute of Health and Welfare 2011a), which is 65 years and over (Cubit and Meyer 2011).

There is no doubt that the demographic trend in Australia is continuously ageing because many Australians are living better and longer than ever before (Healy 2004). There were over three million older Australians in June 2010, an increase of 14% since June 2005. The proportion of this group in the total population in Australia also increased from 12.9% in 2005 to 13.5% in 2010 (Australian Bureau of Statistics). The life expectancy of Australians is among the highest in the world (Australian Institute of Health and Welfare 2010). Today’s older Australians are generally highly skilled with more formal qualifications than previous generations and are more likely to continue to participate in social duties (11%) or volunteering activities (27%) even after retirement (Australian Institute of Health and Welfare 2011a).

2.2.1 The health challenge for the ageing population in Australia

68% of older people self-assessed their health status as excellent, very good or good according to the results of an Australian national survey in 2007-2008 (Australian Institute of Health and Welfare 2010). However, this self-reported assessment data excludes people in hospitals and RACFs who represent a large population that is likely to be in poor health (Australian Institute of Health and Welfare 2010).

In fact, more than half of older Australians experience some type of disability (Australian Institute of Health and Welfare 2010). Over 1.5 million of this cohort had a disability in 2009 (Australian Bureau of Statistics 2009). Approximately 590,000 people have a severe or profound disability (Australian Institute of Health and Welfare 2011a). The rate increases with age. 88% of people aged 90 years and over have a disability (Australian Bureau of Statistics 2009).

In addition, the rate of multiple long-term conditions, which are diseases or health problems that have lasted or are expected to last for at least six months (Australian Institute of Health and Welfare 2011a) also increases sharply with age. Australian Institute of Health and Welfare (2011a) statistics show approximately half of people aged 65-74 years have five or more long-term conditions and the number increases to 70% of people aged 85 years and over. The most common long-term conditions
affecting older people are long-sightedness, deafness, circulatory diseases, musculoskeletal conditions and endocrine diseases (Australian Institute of Health and Welfare 2010).

Last but not least, mental problems such as dementia and Alzheimer’s disease are significant among older Australians (Australian Institute of Health and Welfare 2010). Although the updated number of the ageing population with dementia has not been published, it has been estimated that the number would have risen to 269,000 in 2011 (Department of Health and Ageing). Other than dementia, in June 2009, over 150,000 people living in aged care facilities had long-term health conditions (Australian Institute of Health and Welfare 2010).

2.3 Aged care services in Australia
The majority of ageing Australians prefer to live in private homes (Courtney et al. 1997) or self-care accommodation. However, deteriorating health associated with the ageing process, such as disability, long-term health conditions (Australian Institute of Health and Welfare 2011a), mental health problems, frailty, cognitive difficulty and related social issues greatly challenge the social support systems (Australian Institute of Health and Welfare 2010). With the increasing age and deteriorating health, more and more people lose their ability to care for themselves and need support and care for their daily living. This results in an increasing demand for aged care services. In 2009-2010, there were over one million older Australians who received some form of aged care (Productivity Commission 2011).

2.3.1 The aged care system in Australia
Aged care services in Australia are a mixture of government and non-government services. It reflects the Australian history of commitment to a welfare state. Aged care, also known as elderly care or long-term care, includes a wide range of care and support services delivered to individuals who have, or are at high risk of having, progressive and/or chronic conditions, and require assistance to meet their needs over the long term (Thompson and Chochinov 2006). Although affected by high levels of cognitive deficits or long-term health conditions, these health problems may not necessarily be terminal (Carriere and Pelletier 1995). The Australian Government recognises that greater support services to older people allow them to maintain their
connectedness to the community and to be actively engaged citizens, particularly maintaining their health and wellness (Productivity Commission 2011).

After the Aged Persons Homes Act (Cth) took effect in 1954, the care of frail and older people with disabilities shifted from home and community care towards institutional care, such as nursing home care (Department of Health and Ageing 2001). In response to the growth and redevelopment of formal community services as well as changing needs of older people and concerns about the high level of government aged care expenditure, two reforms were undertaken. These were Home and Community Care program in 1985 and the Aged Care Act 1997 (Cth) (Australian Institute of Health and Welfare 2011b). The key aims were to transfer the long-term care of dependent older people from hospitals to less costly residential care and nursing homes (Healy 2004), while shifting the balance away from the dominance of nursing home care to an increasing emphasis on greater choice by consumers as to their care, such as hostels and community care (Courtney et al. 1997).

In 2012, the Australian Government undertook the initiative of ‘Living Longer. Living Better.’, a 10-year aged care reform program which commenced on 1 July 2012 and which gives priority to providing more affordable support and care in the home, better access to residential aged care across the country, more support for those with dementia and strengthening the aged care workforce (Department of Health and Ageing 2011b; Department of Health and Ageing 2012a).

Today’s older Australians are able to access assistance from various types of carers after receiving approval by a multidisciplinary Aged Care Assessment Team (ACAT) (Australian Institute of Health and Welfare 2011b). If the person can stay at home, ACAT may recommend in-home and community services including domestic assistance, personal care, food services, community respite, transport, home maintenance or modification, and home nursing (Lajoie 2004). Where a person needs residential care, residential aged care services will be recommended. It is these RACFs which are the setting of this study.

2.3.2 The types of residential aged care services in Australia

Residential aged care services provided by RACFs include suitable accommodation, laundry, cleaning and meals as well as personal care services and nursing care
(Australian Institute of Health and Welfare 2011b) for those people (referred to as residents) who require on-going health and nursing care because of chronic impairments and a reduced degree of independence in their activities of daily living (Productivity Commission 2011). Respite care and permanent care are the two types of residential aged care programs that are provided by government, private and not-for-profit providers (Australian Institute of Health and Welfare 2011b).

Respite care is short-term care for people who need temporary care but intend to return to their own homes (Australian Institute of Health and Welfare 2011b). The types of respite care include half-day, full-day or long-day care in day care centres; and planned or emergency based short-term care in aged care homes (Department of Health and Ageing 2011c).

Permanent residential aged care is provided to people who are no longer able to be supported living in the community (Australian Institute of Health and Welfare 2011b). It is offered at two levels based on the assessment of the ACAT (Lajoie 2004). High care is provided for people who need a high level of assistance with most activities of daily living (Productivity Commission 2011). It includes accommodation services as well as personal care. Low care is provided for people who need a low level of assistance with activities such as meals, laundry and cleaning as well as additional help with personal care (Productivity Commission 2011).

Skilled nursing and trained carers play a major role in delivering culturally appropriate care in RACFs to meet the high standard of aged care services required (Department of Health and Ageing 2011a). Routine care practices include initial and on-going assessment, care planning and execution, daily and emergency assistance, and care management. All this is labour-intensive and requires a good skill mix in a facility that aims to cater to the changing needs of the residents (Department of Health and Ageing 2009).

**2.3.3 Challenges for care staff members delivering high quality aged care services in RACFs**

Person-centred care for residents in RACFs requires skilled care staff who is able, and willing, to spend time communicating with residents (COTA Australia 2012). This becomes problematic because of the skill shortage of care staff and an increasing
complexity of resident health conditions at both high and low care facilities. For example, RACFs are increasingly providing care to people with advanced forms of dementia who have far greater care needs than patients in hospitals (Martin et al. 2002).

Non-professional PCWs are only supposed to provide basic personal care to residents in RACFs, such as assistance with activities of daily living in low care or managing incontinence in high care (Department of Health and Ageing 2011d). However, they are increasingly providing complex aged care services which were once performed by professional nurses, such as pain management (Holloway and McConigley 2009) and medication management (Productivity Commission 2011). Furthermore, there is limited after-hour access to GPs and some communication problems with them (Chaudhry et al. 2006).

In addition, in order to acquire funding from the Australian Government, RACFs need to provide written care plans and documentation to demonstrate that they have delivered an individualised, high standard of care to residents (Andrews-Hall et al. 2007). For these reasons, it is common that aged care staff members feel under a high degree of pressure to complete their work tasks and provide adequate care services to residents (Martin 2008).

2.3.4 The workforce shortage challenge

The residential aged care workforce is large. There were almost 175,000 people who worked in this sector in 2007. 133,000 were employees working in over 2,500 RACFs across Australia (Australian Institute of Health and Welfare 2011b), who directly provide or manage aged care service delivery (Australian Institute of Health and Welfare 2011a).

The wages and conditions of direct aged care staff are generally less favourable than those of public health care staff (Australian Institute of Health and Welfare 2011a), however the services are labour intensive (Productivity Commission 2011; Australian Nursing Federation 2010).

The workforce shortage is one of the most obvious challenges in the aged care sector (Chaudhry et al. 2006; Productivity Commission 2011). Not only is the number of
overall working-age adults in decline in Australia, but care staff, in particular, is in short supply. There are decreasing ratios of RNs, Enrolled Nurses (ENs) and Allied Health Professionals (AHPs) working in RACFs. This has led to the increasing use of non-professional care staff members such as Personal Care Workers (PCWs) (Department of Health and Ageing 2011a; Chaudhry et al. 2006). In addition to a perceived lack of opportunity for advancement and heavy workload (Brannon et al. 2007), spending a significant amount of work time on non-nursing tasks is one of the top causes of nursing staff stress-related burnout and job dissatisfaction (Hassmiller and Cozine 2006).

2.4 Application of ICT in residential aged care

Information and communication technology is often seen as an enabler to improve the quality of care and efficiency in health and aged care (Irvine and Kroeger 2010). It can provide a partial solution to the problems associated with the workforce shortage by relieving the burden of manual processing often required of aged care service delivery (Loh et al. 2009). Scientific analysis and evaluation of the introduction of ICT solutions in the aged care sector started in the early 2000s and the original studies took place both in developed countries such as the USA, Australia, Japan and European countries, and developing countries such as China (Koch and Hägglund 2009; Nebeker et al. 2003).

To date, different types of ICT solutions have been applied in residential aged care, ranging from a stand-alone system that records patient health information to a complex system with a full range of dynamic functions for health care providers to use (Cherry et al. 2008). To our knowledge, the health technologies that have been applied and studied in the aged care sector include health consulting services via tele-health video conference (Loh et al. 2009) and health information systems such as EHRs (Cherry et al. 2008; Munyisia et al. 2011a; Sockolow et al. 2012; Yu et al. 2008; Yu et al. 2006), electronic medical records (EMRs) (Lindner et al. 2007), electronic prescribing (Bollen et al. 2005; Burns et al. 2007), electronic comprehensive medical assessments (Irvine and Kroeger 2010), clinical information/management systems (Alexander et al. 2007; Celler et al. 2006), handheld care management systems (Chau and Turner 2006), computerised decision support systems (Fossum et al. 2011) and health administration systems for the

Resident records systems are a fundamental component of aged care, however there are big challenges for care staff members recording resident health information in Australian RACFs (Daskein et al. 2009; Yu and Comensoli 2004). Electronic health record systems are able to provide resident-centred information and hold the promise of solving the challenges of documenting health records (Dorda et al. 2005; Häyrinen et al. 2008). Therefore EHR systems are currently being introduced as a core IS in aged care organisations in Australia (Cherry et al. 2008; Munyisia et al. 2011b). To improve the relevance of the research, given the rapid rate of EHR systems introduction in aged care in Australia, this study focused on researching EHR systems, a specific type of ICT solutions.

In order to understand the importance of EHR systems, the following section reviews in detail the importance of resident health records and the challenges for information management in aged care.

2.5 The importance of resident health records and the challenges of managing those records in aged care in Australia

Resident health records in the residential aged care sector, also called nursing record systems or nursing documentation, are defined by Urquhart et al. (2009, p.2) as ‘the record of care planned and/or and given to individual patients/clients by qualified nurses or by other health care givers (including nursing students) under the direction of a qualified nurse.’ It is a fundamental component of nursing (Oroviogoicoechea et al. 2008) and one of the most important tasks nursing staff in RACFs undertake (Martin et al. 1999).

Resident health records in RACFs include all the information that is relevant to the care of individual residents. These include demographic information, nursing assessments, care plans, progress notes, health history, forms and charts entered by nursing staff and visiting health professionals (Daskein et al. 2009; Martin et al. 1999). They provide a clear picture of a resident’s history (Nebeker et al. 2003) and needs as well as nursing goals, actions and outcomes for the resident (Martin et al.
1999). It is an important source of reference and communication between nurses and other health care providers such as GPs (Nebeker et al. 2003).

Quality health records underpin sustainable high quality aged care services (Martin et al. 1999). They are necessary to improve chronic disease management and daily-life care for residents, many of whom suffer from complex chronic health conditions (Canada Health Infoway and Health Council of Canada 2006). In addition, they also serve legal purposes in the event of a lawsuit (Munyisia et al. 2011a).

Health records are also used for the Aged Care Funding Instrument (ACFI). This is a funding tool used to appraise a resident’s dependency or need for care in the domains of Activities of Daily Living, Behaviour (BEH) and Complex Health Care (CHC) (Australian Institute of Health and Welfare 2011b). This instrument was introduced in March 2008 by the Australian Government. It is now an important part of resident health records in RACFs (Department of Health and Ageing 2012b). Therefore, resident health records also provide essential evidence of care for auditing by the aged care accreditation agency (Martin et al. 1999), and supports RACFs in claiming government funding of aged care services (Andrews-Hall et al. 2007; Daskein et al. 2009).

Care staff members in RACFs are often frustrated with the resident record management system (Daskein et al. 2009). There are many reasons for this: the heavy workload and time-consuming nature of resident-centred aged care service delivery deprives care staff members from spending adequate time on resident health records; records can be difficult to access, enter or distribute; information can be difficult to retrieve from the records (Yu et al. 2008; Yu et al. 2009); resident health records may be inaccurate, incomplete (Cheevakasemsook et al. 2006) and out-of-date, and these cannot support care decision making (Martin et al. 1999); the time consuming nature of recording (Martin et al. 1999; Munyisia et al. 2011c), which may be seen by some carers as taking them away from their core duty of providing direct care to the residents (Jeong and McMillan 2003).

It is widely understood that paper records cannot meet the requirements of modern healthcare organizations (Oroviogoicoechea et al. 2008), which are constantly required to update information about the changing needs of residents and to enable
information exchange between health care providers for multidisciplinary collaboration to enable continuity of care (Dorda et al. 2005). The challenges of managing paper-based records have drawn many aged care organisations towards introducing EHR systems to replace them.

2.6 EHR systems in residential aged care

‘Electronic health record’ was defined by the International Organization for Standardization (ISO) as ‘a repository of patient data in digital form, stored and exchanged securely and accessible by multiple authorised health care professionals and administrative staff’ (cited in Häyrinen et al. 2008, p.293). Core functions of an EHR in health care include general health information and data, results management, order management, decision support, patient support, administrative processes, reporting, and electronic communication and connectivity (Cusack 2008).

Koch and Hägglund (2009) and Häyrinen et al. (2008) have provided extensive reviews of the impacts, barriers and facilitators of introducing EHR systems in healthcare. To date only a few such studies have been conducted in the aged care settings (Brandeis et al. 2007; Cherry et al. 2008; Diment et al. 2011; Munyisia et al. 2011a; Munyisia et al. 2011b; Munyisia et al. 2012; Sockelow et al. 2012; Yu and Comensoli 2004; Yu et al. 2008; Yu et al. 2006). Although introducing EHRs in an organisation can be a risky endeavour (Yu et al. 2009), EHR systems are increasingly being introduced in RACFs in Australia (Munyisia et al. 2011b) because care providers see them as one potential solution to the challenges of aged care. However, a lack of understanding of the impacts of the EHR systems may hinder the successful adoption of the system, particularly when there is no evidence that the overall benefits outweigh the negative impacts (Menachemi and Brooks 2006).

Sections 2.6.1 and 2.6.2 review the benefits and challenges of introducing EHR systems in various health care settings to provide a frame of reference for EHR systems in RACFs.

2.6.1 Benefits of introducing EHR systems in various health care settings

The benefits of EHR systems have been evaluated in clinical and hospital settings (Dorda et al. 2005). An identified benefit of EHRs is that they enable care staff to quickly access all available patient clinical information at the point of care. This is
identified by Cusack (2008) in her study of gynaecology and obstetrics in the USA. Sub-specialty referrals which require coordination and interactive communication among the primary health care providers and sub-specialists have been facilitated by an EHR system introduced in the USA (Hysong et al. 2011). Increased revenues, lower cost and improved quality of care were also realised using an EHR system in an acute care hospital in the USA (Menachemi and Brooks 2006). A study conducted by Cresswell et al. (2012) identified that in the UK, AHPs felt that using the EHR system had helped them to communicate more effectively over long distances. A review of the literature by Häyrinen et al. (2008) has led to the conclusion that the use of EHR systems can improve completeness and accuracy of records. The contexts of the reviewed studies included tertiary care, secondary care, primary care and home health care but not residential aged care.

Resnick et al. (2009) suggest that health information systems such as EHR systems are an expanding field of interest in aged care because there is potential for aged care providers and residents to benefit substantially from their use. Electronic health record systems show promise in enabling the safe and effective delivery of quality aged care (Oroviigoicoechea et al. 2008). They are also expected to reduce the work burden and improve the quality of care (Productivity Commission 2011). In addition, given the fragmented nature of aged care, EHRs are expected to manage and integrate a great volume of and complex information as evidence to support care delivery (Chaudhry et al. 2006).

Three questionnaire survey studies in the aged care sector show care staff members generally hold positive attitudes toward, and are happy using EHR systems (Sockolow et al. 2012; Yu et al. 2008; Yu et al. 2006). Three studies (Cherry et al. 2008; Diment et al. 2011; Munyisia et al. 2011a) identify the benefits of introducing EHR systems in RACFs. These benefits include ease of access, improved quality of care and improved quality of information in terms of legibility, completeness and accuracy.

The first study was a questionnaire survey focused on care staff perceptions about the quality of information and other benefits associated with the introduction of an EHR system in an RACF. The increased quality of information/records was significant, but the study was unable to find conclusive evidence about other benefits (Munyisia et al. 2011a). The second study was a semi-structured interview which focused on the
organisational change caused by the introduction of EHR systems in RACFs. The study provides limited evidence to support the benefits and the findings are yet to be generalised to other RACFs (Diment et al. 2011). The third study focused on identifying the factors affecting EHR adoption in nursing homes in the USA through focus group discussion (Cherry et al. 2008). Both studies (Cherry et al. 2008; Tang et al. 2006) advocated the investigation of the impact of EHRs on residential aged care services to promote the adoption of EHR in the sector.

2.6.2 Challenges of introducing EHR systems in residential aged care

Despite a pressing need to introduce EHR systems in residential aged care to improve quality and efficiency in information management, such systems are not common and paper-based records are still widely used (Yu et al. 2009). This is caused by many perceived challenges to the introduction of the system by aged care decision-makers. These challenges can be broadly grouped into three categories: cultural issues, cost barriers and the risk of negative impacts.

First, according to historical records, residential aged care has adopted new technology innovations more slowly than other health care settings (Alexander et al. 2007; Resnick et al. 2009). Aged care organisations have little experience using IT to direct staff activities and monitor the clinical indicators. Computers are reserved for administrative and billing purposes in the aged care sector. The Australian Government published the results of a national survey in the community and residential aged care sectors – IT Readiness of the Aged Care Sector Survey in 2006 (Department of Health and Ageing 2010). According to the results of the survey, only 35-40% of participating services had at least one computer used for assessment and accreditation purposes, around 30% of participating services used computers in care planning and to store/access resident clinical information, and less than 20% used a computer in clinical documentation and needs analysis for residents. Only 30% of the participating services were assessing their ability to use IT to support clinical care delivery and exchange information with external providers, with under 2% demonstrating this capacity. Only 30% of the participating services have a wireless network connection.
Second, implementation cost is another barrier to adopting EHRs in RACFs (Cherry et al. 2008). There is limited government funding for RACFs. As funding of residential aged care is claimed based on resident dependency (Andrews-Hall et al. 2007), there is little funding to purchase electronics. In addition, RACFs traditionally have neither the experience nor the budget to recruit IT experts to manage the technology and the capacity to conduct the implementation, such as providing staff with training and support in using the new EHR systems (Alexander et al. 2007).

Third, decision-makers in aged care settings may face even more challenges if the promises of the introduced EHR systems are only partially fulfilled (Besdine et al. 2005) and there are significant negative impacts. Some nurses in clinical settings perceive an increase in workload with the introduction of an EHR (Wyatt et al. 2012). Linder et al. (2007) found that an EHR system used in a hospital in the USA brought neither an obvious return on investment, nor an improvement of quality of daily ambulatory care, despite the high cost of introducing the system. In the study by Cresswell et al. (2012), hospital nurses thought that they had to spend more time on running paper and electronic records in parallel because of the limited functionality of the EHR system. Previous studies have also shown GPs’ fear and anxiety with using EHRs in private practice in Austria because of their concerns about data accuracy, privacy and security as well as the change of workflow, without experiencing any obvious benefits (Hackl et al. 2009; Hackl et al. 2011).

One previous study in the aged care setting shows the EHR systems reduced records accessibility (Burns et al. 2007), decreased efficiency of documentation (Munyisia et al. 2011b; Munyisia et al. 2012; Sockolow et al. 2012) and led to poor quality of records with decreased completeness and increased error rate (Sockolow et al. 2012). There are concerns about loss of human contact, information security and privacy in using technologies by aged care staff members (Loh et al. 2009). However, the negative impacts are yet to be systematically evaluated and there is a lack of evidence as to whether the overall benefits of EHR systems are able to outweigh the negative impacts in RACFs (Yu and Comensoli 2004). More studies are needed to answer these questions.

A number of causes for the negative impacts of EHRs have been identified. They may be caused by the limited usability, capacity and customisability of an EHR
system to meet end users’ needs (Loh et al. 2009; Sockolow et al. 2012). A system may disrupt or inhibit practitioners’ workflow on the floor (Cusack 2008; Sockolow et al. 2012). A lack of training (Burns et al. 2007; Chau and Turner 2006; Cherry et al. 2008; Loh et al. 2009) and other technical difficulties (Burns et al. 2007) have also been identified. The technical difficulties include: a shortage of computers in the workplace (Yu et al. 2006), the location of the computers which could hinder system usability (Burns et al. 2007) and an unstable networking environment for mobile devices (Chau and Turner 2006). Due to these reported negative impacts and their causes, ICT solutions have not been introduced as widely as could be expected in aged care settings and this limits the realisation of their full potential (Chau and Turner 2006; Reuben 2007). Although these studies have identified the problems, none of them have systematically analysed how to overcome these in order to optimise the benefits of EHR systems.

Masso and McCarthy (2009) and Cherry et al. (2008) suggest that the demonstrable benefits of EHR systems are a key factor affecting their adoption and usage by health care staff. In order to increase the rates of use of EHRs in residential aged care and to facilitate the adoption of other emerging health technologies in RACFs, it is important to understand the real impacts of introducing EHR systems in RACFs (Brandeis et al. 2007). Therefore, this study focuses on investigating these impacts.

2.6.3 Measuring the impacts of EHRs in residential aged care

DeLone and McLean’s Information Systems Success Model (D&M IS Success Model) has been employed in scientific studies measuring the success and the impacts of IS since the 1990s (Jen and Chao 2008). The components of the original model include system quality, information quality, use, user satisfaction, individual impact and organisational impact (DeLone and McLean 1992). They updated the model in 2003 (see Figure 2.1) to provide a comprehensive taxonomy of IS success variables: system quality, information quality, service quality, use, user satisfaction and net benefits (Delone and McLean 2003).
System quality measures the characteristics of an IS and is measured in terms of adaptability, availability, reliability, response time and usability. Information quality captures the content of an IS. The common metrics for measuring it are completeness, ease of understanding, personalisation, relevance and security. Service quality is the overall support delivered by the service provider. The service may be provided by the IS department, the outside system vendor or a third party service provider such as an Internet Service Provider (ISP). It is measured by assurance, empathy and responsiveness. Use or usage measures everything from a visit to an IS, to navigation within the IS, to information retrieval or execution of a transaction. User satisfaction means system users’ opinions of the IS. It should cover the entire experience cycle from log-in to log-out. Net benefits are the most important IS success measures. They are the balance of positive and negative impacts of the IS. Net benefit measures are determined by context and objectives of each IS and cannot be individually analysed and understood without the context and objectives.

The model also provides the causal relationships of the various success factors that led to both the benefits and the negative impacts of the introduction of an IS (Jen and Chao 2008). If we view IS success from the perspective of technical success, semantic success and effectiveness, the D&M model also provides us with adequate reference points. Technical success is measured by ‘system quality’. Semantic success is measured by ‘information quality’. Effectiveness is manifested by ‘use, user satisfaction, individual impacts and organisational impacts’ (Delone and McLean
2003). As DeLone and McLean (2003) note, the variables in the model will be positive and negative according to the context.

The D&M IS Success Model has been widely adopted to study the impacts of IS implementation (Gable et al. 2003; Häyrinen et al. 2008; Karahanna et al. 1999; Liu and Arnett 2000). It has been used as the source of reference for the subsequent studies of health information system success by various authors (Chatterjee et al. 2009; Golob Jr et al. 2008; Jen and Chao 2008; Paré et al. 2005; Petter and Fruhling 2011). Thus, it has been adopted as the theoretical framework to evaluate the impacts of introducing EHR systems in RACFs in this study.

2.6.4 Research gap, aim and research questions of the study

The literature review has identified only a handful of scientifically rigorous evaluations in peer-reviewed academic publications of the benefits of EHR systems in RACFs and how the benefits have been achieved. Buntin et al. (2011) suggest that more studies are needed to understand the challenges of implementing EHRs in aged care and how these challenges might be addressed because policy makers and residential aged care managers need this information in order to introduce EHRs effectively and successfully (Koch and Hägglund 2009; Yu et al. 2009). There is also a lack of knowledge about how the technology should best be designed for this sector. There is, therefore, a pressing need to understand the impacts of EHR systems, how the impacts were received and how to optimise the benefits of introducing the system, in order to help aged care organisations, policy makers, aged care staff and other stakeholders make important decisions as to the adoption of EHR systems (Chaudhry et al. 2006; Tang et al. 2006).

To fill the identified knowledge gap, the aim of this study is:

- To identify the impacts of EHR systems in residential aged care and their causes, and to examine how to optimise the benefits.

To achieve the research aim, the following specific research questions need to be answered:

1. What are the benefits and negative impacts of introducing EHR systems into RACFs?
2. What are the factors and actions that lead to realisation of the benefits and negative impacts?

3. Are the overall perceived impacts predominantly positive or negative?

4. Are there any strategies for system introduction that may overcome the challenges to acquire these optimal benefits? If so, what are they?

2.7 Summary of the literature review

This chapter started with background information that supports the current study on the impact of introducing EHR systems in RACFs. The literature review shows the benefits and challenges of EHR system introduction in primary care, secondary care and tertiary care. The impacts of the introduction of EHR systems in RACFs, and their causes, are yet to be systematically evaluated. There is a lack of knowledge of whether the overall benefits of EHR systems are able to outweigh the negative impacts (Yu and Comensoli 2004) and how to optimise the benefits of the systems in RACFs.
Chapter 3  Methods

The research gap identified in the last chapter suggests that there is a real need to understand end users’ perceptions of the impacts of EHR systems in RACFs and their causes. Answering these questions can help aged care organisations implementing ICT solutions to learn from previous experience to optimise system implementation strategies and maximise the benefits. This chapter describes the research methods used to answer the research questions.

The research methodology is the theoretical lens through which the research is designed and conducted (Walter 2010). It includes the theoretical framework, paradigm and a group of research techniques or practices that are used by researchers to gather and analyse research data (Walter 2010). The following sections will discuss the procedure followed to conduct the study, the theoretical framework, research paradigms and methods.

3.1 The study procedure

The primary aim of the study is to understand the impacts of introducing two EHR systems in RACFs, including both the benefits and the negative impacts as well as their causes. The following procedure was followed to achieve this.

1. A theoretic framework was chosen which was capable of facilitating an understanding of the phenomena in this study setting, one which has been widely accepted by other researchers in the field of health care technology evaluation.
2. The empirical data to answer the research questions were identified.
3. The identified empirical data was copied into an Excel workbook for further analysis.
4. The relevant data was analysed and organise into themes, groups, categories and sub-categories in three Excel spreadsheets.

The study procedure is discussed in detail in the following sections.
3.2 Theoretical framework

A theoretical framework is the theory that will guide a researcher to analyse and interpret the empirical data (Walter 2010). The literature review process regarding evaluation of introducing new technology in health care (see Section 2.6.3), showed that the D&M IS Success Model has been widely used in other peer reviewed studies. The six variables in the updated D&M IS Success Model are system quality, information quality, service quality, use, user satisfaction and net benefits (Delone and McLean 2003). The rich content of this model helps provide a clear picture of the impacts of introducing IS into organisations as well as their causes. The D&M IS Success Model was therefore identified as the theoretical framework to use in the study.

3.3 Research paradigm and methods

3.3.1 The qualitative paradigm and interpretative approach

Quantitative research, also known as statistical research, is better used to answer ‘what’ and ‘how many’ questions, whereas the qualitative research paradigm focuses on people’s opinions about what people do, and how and why they do it (Walter 2010).

Because of the limited understanding of the impacts of introducing EHR systems into RACFs, a hypothesis could not be proposed in the research. The study focused on understanding what the end users of the aged care EHR systems think of the systems and how and why they came to these conclusions. A qualitative study provides a better understanding of people’s opinion and this research is primarily situated in the qualitative paradigm.

An interpretative approach was chosen for the study, as researchers gain knowledge of reality only through social constructions such as language, consciousness, shared meanings, documents and tools (Klein and Myers 1999). In IS research the interpretive approach particularly aims to generate an understanding of the impact of IS in certain contexts (Walsham 1993).
3.3.2 Interview study

A trend towards a subjectivist approach has been identified in an increasing number of evaluation studies in health care (Yusof et al. 2007). The subjectivist approach assumes that the complex phenomena in the social world lead to various perspectives about the systems under evaluation among different groups. The phenomena involving people are complex and there is no single truth. Therefore, verbal descriptions by the stakeholders of the system in their natural environment, without manipulation, are a vital source of evidence for researchers (Yusof et al. 2007). Interview study is valuable in providing verbal descriptive data that answer the research questions in the specific setting.

Qualitative interview is one of the most common research methods employed within the social sciences to explore social meaning (Walter 2010). It is useful in answering extensive questions in IS research (Myers and Newman 2007). Therefore, the qualitative interview was adopted in this study to provide exploratory answers to the research questions within the scope of the theoretical framework of the D&M IS Success Model. There are two types of interviews: structured interviews and semi-structured interviews, also known as in-depth interviews.

In structured interviews, the same set of questions, mostly closed questions, will be asked by a researcher or a team of researchers to obtain an adequate amount of data from the population of interest (Walter 2010). In semi-structured interviews, less formal questions which are guided by pre-set themes will be asked to explore issues as the interviewee raises them (Walter 2010). The strengths of semi-structured interviews are allowing a researcher to (Walter 2010):

- address meaning in depth with more attention to complexity;
- explore people’s experience or perspectives in a variety of social settings; and
- deal with a wide range of topics.

3.3.2.1 Introduction of the empirical data

Text transcriptions of semi-structured interviews were the source of research data for this study as they provide access to care staff managers’ subjective perceptions (Lee and Lings 2008) of the impacts of the EHR Systems in the participating RACFs.
The interview study is part of a large project led by Dr Ping Yu between 2008 and 2011 evaluating the success of aged care EHR systems. A multi-method approach to evaluation was undertaken in the project: qualitative interviews, quantitative questionnaire surveys, work activity measurements and auditing of both paper and EHRs. The semi-structured interview questions were framed according to the D&M IS Success Model and were designed to elicit care staff’s perceptions of the performance of each of the six success variables of the EHR systems as well as the EHR implementation processes, training, support mechanisms and system maintenance. Thus the content of the interview was appropriate to answer the research questions of this study.

### 3.3.2.2 Participating organisations

Nine RACFs belonging to three organisations were selected in the study through a formal research partnership with the university. The RACFs, located in the Australian Capital Territory (ACT), New South Wales (NSW) and Queensland, provided either high or both high and low levels of care services to the residents. The size of the RACFs ranged from 60 to 152 beds. Six RACFs were located in urban areas, two were located in suburban areas and one was located in a rural area. Table 3.1 shows the characteristics of each RACF.

### 3.3.2.3 Two EHR systems implemented

Two commercial aged care EHR systems (System X and Y) from two companies were used by the RACFs. The EHR systems contained resident demographics, assessments, care plans, progress notes, vital signs, past medical history and current medical diagnosis. One system (System Y) had a shift hand-over module and a module for calculation of funding levels according to the ACFI used by the Australian Government in determining funding allocation to RACFs.

### 3.3.2.4 Ethics approval

Ethics approval was obtained from the University of Wollongong Ethics Committee. Access to the interview data was made through amendment to the previous ethics clearance in March 2011.

The interview data was treated as confidential and was only stored in the researcher's password-protected office computer.
Table 3.1 - The facility characteristics

<table>
<thead>
<tr>
<th>Organisation No.</th>
<th>Facility No.</th>
<th>Facility Type</th>
<th>Facility Bed Size</th>
<th>Facility Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Mix</td>
<td>60</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Mix</td>
<td>120</td>
<td>Urban</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Mix</td>
<td>120</td>
<td>Suburban</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Mix</td>
<td>152</td>
<td>Suburban</td>
</tr>
<tr>
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<td>5</td>
<td>Mix</td>
<td>74</td>
<td>Urban</td>
</tr>
<tr>
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<td>6</td>
<td>Mix</td>
<td>108</td>
<td>Urban</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>High care</td>
<td>62</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Mix</td>
<td>90</td>
<td>Rural</td>
</tr>
<tr>
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<td>Mix</td>
<td>101</td>
<td>Urban</td>
</tr>
</tbody>
</table>

Mix = both high care and low care services

3.3.2.5 Interview participants

110 care staff members participated in the interviews. Table 3.2 shows the number of different levels of participants in each RACF.

Theoretical sampling (Glaser and Strauss 1967) was the sampling method used for identifying interviews. The first theoretical criterion was to select the end users in all types of positions to fully understand their perceptions. Thus the informants included all levels of aged care staff: PCWs, endorsed enrolled nurses (EENs) or ENs, RNs and managers. In this research, care staff members who worked at the same level as PCWs were also included and included into the PCW level. These include assistants in nursing (AINs), care service employees (CSEs) and some staff who function in a variety of roles, such as physiotherapist assistants or recreational activity officers (RAOs) in addition to their PCW roles. In addition, team leaders, supervisors and nursing directors were included and grouped into the manager level. The second criterion was to include informants with varying characteristics which could influence their experience with, and views of, the EHR system. These included the type of aged care facility in which the staff member worked (high care or low care), their gender.
and age, the years they worked in RACFs, previous computer literacy level and their training experience with the EHR system.

Table 3.2 - The number of different levels of participants in each RACF

<table>
<thead>
<tr>
<th>Organisation No.</th>
<th>Position Category of Participants</th>
<th>Total Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Manager</td>
<td>RN</td>
</tr>
<tr>
<td>1</td>
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<td></td>
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<td>1</td>
<td></td>
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<tr>
<td>Total Number of Participants</td>
<td>28</td>
<td>14</td>
</tr>
</tbody>
</table>

3.3.3 Content analysis

3.3.3.1 Definition of content analysis

Berelson (1952, p.519) initially defines content analysis as ‘the objective, systematic and quantitative description of the manifest content of communication’. Over time, many researchers from a variety of disciplines and traditions expanded the definition of content analysis to also include qualitative interpretations of latent content (Graneheim and Lundman 2004). Content analysis is regarded as a flexible method for analysing text data (Hsieh and Shannon 2005).

The subject for content analysis is text data. The source of text can come from books, essays, historical documents, newspapers and transcriptions of speeches, interviews or discussions (Walter 2010). A unit of analysis should be determined by the objects of a study (Graneheim and Lundman 2004). It has been suggested that the whole record
of interview can be a unit of analysis in health research (Graneheim and Lundman 2004). A meaning unit, which is also known as a content unit or a coding unit, refers to the constellation of words or statements that relate to the same central meaning (Graneheim and Lundman 2004).

3.3.3.2 The use of quantitative and qualitative methods in content analysis

Content analysis has been applied to a variety of data and to various depths of interpretation in health research (Graneheim and Lundman 2004). It is evident that both quantitative and qualitative principles are used in content analysis (Graneheim and Lundman 2004). Researchers conducting content analysis can count and analyse the presence, meanings and relationships of the words and concepts in a text sample (Walter 2010). Although the purpose of counting is to describe text data coded into categories using mathematics, it is not the primary focus of the content analysis in this study (Hsieh and Shannon 2005). Qualitative content analysis is applied in this study to classify large amounts of text into an efficient number of categories that represent similar meanings and provide knowledge and understanding of the phenomenon under study (Downe-Wamboldt 1992).

3.3.3.3 Different types and approaches in content analysis

Different types and approaches can be chosen by researchers in content analysis based on various theoretical interests and the research objectives (Hsieh and Shannon 2005). Sproule (2010) divided content analysis into two types, conceptual analysis and relational analysis. Conceptual analysis is to identify the occurrences of both explicit and implicit concepts, and quantify and tally the presence of a concept within the selected text(s). A category system should be built with a codebook which explains the patterns that form the categories. To ensure consistency, a researcher must develop further rules to guide the translation from implicit concepts to explicit ones. To increase inter-coder reliability, two or more independent individuals should agree on coding, categories and designation of concepts to categories. This approach was adopted in this study to develop categories of impacts, factors of impacts and suggestions to optimise benefits.

Relational analysis begins with conceptual analysis and seeks to go beyond presence by exploring the semantic relationship between the concepts identified (Walter 2010). Three aspects can be explored in relational analysis: strength of relationship, sign of a
relationship which refers to the positive or negative relationship between concepts and direction of the relationship, for example, to identify the factors and its impacts in causal relationships. This approach was adopted to analyse the relationship between the impacts and their causative factors.

Hsieh and Shannon (2005) distinguished three approaches based on a review of previous health research which conducted content analysis: conventional content analysis, directed content analysis and summative content analysis. The difference between conventional and directed content analysis is whether there is an existing theory or prior research into a phenomenon that is incomplete or would benefit from further description. Summative content analysis aims to explore and understand the contextual use of certain words or content, particularly in journals or textbooks. Directed content analysis was used in this study. The D&M IS Success Model was adopted as the theoretical foundation to guide the content analysis.

The approaches of content analysis that were chosen in this study were determined by the research aim and nature – to extend the previously incomplete understanding about the research topic.

3.3.3.4 General content analysis steps

There is no single set of rules and procedures for researchers to follow when conducting content analysis (Downe-Wamboldt 1992). Downe-Wamboldt (1992, p.315) suggests that the following general steps should be followed in conducting content analysis:

1. Selecting the unit of analysis
2. Creating and defining the categories
3. Pretesting the category definitions and rules
4. Assessing reliability and validity
5. Revising the coding rules if necessary
6. Pretesting the revised category scheme
7. Coding all the data
8. Reassessing reliability and validity

Sections 3.4 and 3.5 discuss the detailed procedures for content analysis.
3.4 Text data mining from the empirical interview data

3.4.1 Identifying target quotations in the transcripts

The audio records which were transcribed by four professional transcribers were stored in Microsoft Word documents. The unit of analysis was each interview transcript. Each transcript was read carefully and thoroughly. First, all the transcripts from Organisation 1 were read to gain a sense of the issues discussed in the interview. Due to the nature of semi-structured interviews, the questions related to one topic were asked in various ways according to the situations arising in the interview. The interviewees also provided the answers to questions in various ways. Therefore, a thorough reading was necessary in order to identify the relevant information in the transcripts. Meaning units were highlighted in the Word documents. The length of the meaning units ranged from one word to several sentences. All the words or sentences stated by the interviewer were excluded from use in the meaning units.

The study aims to understand care staff members’ perceptions of the impacts of the EHR systems in residential aged care and their causes, and to examine how to achieve optimal benefits.

The questions to capture care staff members’ perceptions of the impacts of the EHR systems and their causes were:

- What are the benefits of EHR? Is there any improvement in residential care using EHR? How?
- Which aspect of the EHR are you frustrated with? What is the risk of using the system?
- Are there any changes in work practices that are brought about by using the EHR in comparison with the paper-based documentation? How?

For RNs and facility managers, the following additional questions were asked:

- What are the biggest challenges you face in delivering good care to the residents? Is there any help in solving these difficulties using the EHR? How? Please give an example.
- Does the EHR facilitate communication with outside health care providers, such as doctors? How?
• Does the EHR impact on nursing judgment? How?

Text describing benefits was colour-coded in yellow and text discussing negative impacts was colour-coded in pink in Word documents.

The questions identified to capture care staff members’ suggestions about how to improve the implementation strategies to optimise the benefits were:

• What training and support have been organised for staff? Are you satisfied with them?
• How can the system be improved? Is there any function that you would like to have in the EHR system in the near future?

For facility managers, the following additional questions were asked:

• How had the EHR been implemented? What strategies did you use in implementation?
• How was the system maintained?
• What have you learned from the process of the implementation? If you will do it again, what would you do differently?

The text describing the strategies and suggestions in the transcripts was colour-coded in green in Word documents.

These above-listed questions helped the researcher to identify the relevant information in an efficient way, but it should be noted that the interviewees could make statements relevant to these questions in answering other questions in the interview. Therefore, the process of colour-coding meaning units did not fully rely on the specific questions asked, but also on answers given by the interviewees during the course of the interview.

3.4.2 Microsoft Excel IS used to conduct content analysis

Qualitative researchers are faced with two choices in selecting an IS to analyse and process the qualitative data: to use computer-assisted qualitative data analysis software (CAQDAS) or to manually organise the sets of information (Shin et al. 2009). The use of software to assist qualitative analysis is essential (MacMillan and
Koenig 2004). CAQDAS refers to a group of computerised methodological systems such as Atlas.ti, NVivo and Nud.ist (MacMillan and Koenig 2004). A CAQDAS can be helpful when dealing with large and diverse data sources (Shin et al. 2009), however it has also been criticised as alienating researchers from their data (Webb 1999). ‘Manual analysis’, which may use a computer but not CAQDS, is still adopted by a number of researchers (Webb 1999). Popular techniques of manual analysis include copy/cut and paste as well as colour-coding the text to categorise data or develop theoretical explanations (Webb 1999).

In this study, the targeted quotations were copied from Word documents and pasted into a Microsoft Excel workbook. Excel provides a set of functions including highlighting cells, data sorting, filtering, cell counting and PivotChart which can facilitate data analysis. A previous study also showed that Excel is acceptable for conducting content analysis (Shuyler and Knight 2003).

The quotations were copied into particular columns titled ‘What is it’ in the standard spreadsheets. The aggregated concepts (Graneheim and Lundman 2004) were recorded in the next column of the same entry. In each entry, only one meaning unit was recorded. In other words, only a quotation with a single concept was entered in one cell. In some cases, a long sentence in the transcripts generated multiple concepts. Efforts were made to avoid putting the same long sentence in multiple entries by only entering the relevant part of the sentence into one cell, and replacing the irrelevant content with ellipses ‘…’. However, when a sentence would lose its comprehensibility by replacing too much of the content with ellipses, the choice made was to put the same long sentence in multiple entries and to colour-code the key words which represented the concepts of the sentence in red.

3.5 Data analysis

The principles followed for the selection of the units of analysis and the target of meaning units were discussed in Sections 3.3 and 3.4, respectively. The process of developing a category system and assessing its validity and reliability is detailed in the following sections.

A trial category system (Downe-Wamboldt 1992) was created during the process of reading all the transcriptions from Organisation 1. 10 categories of impacts and
strategies for system introduction were developed based on previous studies and the analytical framework – the D&M IS Success Model. The categories were accessibility, quality of information, quality of care, user satisfaction, communicational impacts, other impacts on staff, other impacts on managers and organisations, system quality, training and support and use of the system. Sub-categories were also developed in the trial system based on the researcher’s primary understanding of the transcripts.

A pre-testing process (Downe-Wamboldt 1992) was conducted by coding the transcripts from Organisation 1 based on a provisional category. The analysis file was shared with the supervisor Dr Ping Yu to obtain her feedback. The following problems were identified with the trial category system:

- Accessibility should not be separated from the impacts on staff;
- Some impacts on managers should be categorised as impacts on care staff, while others should be grouped into impacts on organisation;
- The sub-categories under user satisfaction are also about the impacts on staff;
- The sub-categories under dissatisfaction were in fact the negative impacts on staff;
- Communication impacts belonged to organisational impact, however the impacts of communication between care staff members and residents could be grouped elsewhere;
- The categories of system quality, training and support, and the use of the system were incomplete;
- The category system was extremely large which might increase mental burden and cause overlap and confusion.

The analytical strategy was further refined to address the problems identified. The content analysis was repeated three times to fully code the benefits and their causes, the negative impacts and how they were received, and the suggestions to improve future implementation. Therefore, three category systems recorded by three main Excel spreadsheets were created to conduct the analysis. The spreadsheets have the same format to keep consistency of analysis. The first rows are the headers and the first columns record the serial numbers of each entry.
The detailed procedure followed for analysing benefits of the EHR systems is given as an example to show how content analysis was conducted in order to answer the relevant research questions.

3.5.1 Analytical procedure for identifying benefits and how they were realised

After refining the category system, the coding process was continued for all the transcripts. The benefits of introducing EHRs in RACFs and how they were realised were analysed in the first Excel spreadsheet.

3.5.1.1 Identifying the stakeholders ‘who gained the benefits’

The common list of stakeholders of an EHR system identified in previous studies includes developers, users, patients and purchasers (Yusof et al. 2007). They are the people who may be impacted by system implementation. In this study, because the system developers are not the people who work on the floor and use the system, and the research interest is the impact of the EHR system on the aged care sector, the developers are excluded from the study. The systems were purchased by the residential aged care organisations, thus the stakeholder ‘purchaser’ was identified as the organisations. The ‘patients’ were the residents. The ‘users’ were care staff members, including managers at all levels of the aged care organisations. Therefore, the stakeholders ‘who gained the benefits’ included three groups:

- Care staff members
- Residents
- The facilities and/or organisations

3.5.1.2 Identifying the benefits

Given the interviewees’ varying ways of describing what they saw as benefits, ‘condensation’, a process of shortening while still preserving the core (Graneheim and Lundman 2004), was conducted to generate a tentative first-level code for each benefit. A constant comparison (Glaser and Strauss 1967) and aggregation process (Graneheim and Lundman 2004) led to the abstraction and refining of first-level codes to describe the benefits. To keep consistency, a codebook with a set of further rules (Walter 2010) was developed during the coding process to:
• Explain the meaning of the first-level codes;
• Examine into which categories or higher level codes the first-level codes should be grouped;
• Identify those cases in which the quotations could be translated from an implicit meaning to an explicit concept.

Dr Madeleine Strong Cincotta, Honorary Senior Research Fellow in the Faculty of Informatics, UOW, a native English speaker whose background is in language studies, was involved in the process of refining the codebook in an attempt to increase its validity. Using the constant comparison approach (Glaser and Strauss 1967), the concept which was extracted from a new quotation was compared with the rules in the codebook. If the quote could be grouped into an existing category, it was assigned an existing first-level code. If this could not be done, a new first-level code was given and the new code and its concepts were entered into the codebook. The names of the codes and their concepts were continually refined during the process. Second-level codes were generated based on grouping similar first-level codes, and those second-level codes which could not be further grouped were compared with the 10 categories in the trial category system and then became final categories in the refined category system. If they could be further grouped, higher level codes were generated, until no further grouping was possible.

The following example shows the process of developing the benefit categories. For example, a manager stated that he was ‘able to look up all the information’. Provisionally, we coded this as referring to an advantage of ‘access to all information’. An interviewee stated that ‘go through things from my office’ was the advantage. A PCW called it ‘for staff, allied health to be able to access it’. It gradually became obvious that all three of these interviewees were referring to what we then called ‘ease of access’, so all three statements were placed in the category of ‘ease of access’, but under different sub-categories of ‘access to all the information’, ‘access at a convenient location’ and ‘access by all staff’. ‘Ease of access’ became a final category under the benefit category system. The original transcripts were recorded as evidence to support the classification.

To increase inter-coder reliability (Walter 2010), the tentative first-level code and categories were discussed among three individual researchers (Dr Ping Yu, Dr
Further comparison, aggregation, abstraction and classification led to 13 categories of benefits. Thus the original first-level and second-level codes became the sub-categories of the 13 categories of benefits. The number of categories of benefits is considered ideal because they are manageable and broad enough for the researcher to embrace a large number of codes (Hsieh and Shannon 2005).

3.5.1.3 Investigating ‘how the benefits were realised’

The theme about ‘how the benefit was realised’ was generated by analysing the text to understand its underlying meanings and relationships (Graneheim and Lundman 2004). Linguistic connectors (such as ‘because’ and ‘for example’) and the ‘why’ and ‘how’ questions that interviewer asked after getting the information of ‘what was the benefit’ were the prompts used to identify the sign and the direction (Walter 2010) between the factors and benefits. The target quotations were copied to the ‘how’ column in the same entry for the benefit in the spreadsheet. In the case that the ‘how’ quotation could not be targeted, the cell would be left blank. Coding process for ‘how’ was conducted after finishing coding process for ‘what’ by using the same approach. The same codebook helped guiding the coding process as well.

3.5.1.4 Finalisation of the content analysis of benefits

The process of constant comparison, aggregation and classification was iterated repetitively for three months to finalise the category system for the benefits and the themes about how the benefits were realised as well as who gained the benefits. Data sorting, filter and PivotChart functions in Excel were utilised to facilitate analysis in an attempt to avoid duplication and/or overlap.

Table 3.3 shows an excerpt of four entries in the spreadsheet. As can be seen in this example, the information recorded in the original analysis table includes the file name of the transcript; the date of the interview; the organisation and the facility the interviewee worked for and the level of care it provided; the interviewee’s demographic information including gender, age group, position, computer literacy level before being introduced to the aged care EHR system (if this information was given in the interview); a direct quotation of what the interviewee said about a particular benefit; the sub-category and category the benefit belongs to. Information
Table 3.3 - An excerpt of content analysis of the transcripts

<table>
<thead>
<tr>
<th>Entry</th>
<th>File Name</th>
<th>Data Collection Time</th>
<th>Org+ No.</th>
<th>Facility No.</th>
<th>Care Level</th>
<th>EHR System</th>
<th>Gender</th>
<th>Age Group*</th>
<th>Computer Literacy Level§</th>
<th>Position</th>
<th>Whose gain?</th>
<th>What is it? (transcript)</th>
<th>Sub-category</th>
<th>Category</th>
<th>How was it achieved? (transcripts)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>153</td>
<td>300192</td>
<td>12/2010</td>
<td>1</td>
<td>2</td>
<td>High</td>
<td>X</td>
<td>F</td>
<td>Older</td>
<td>Confident</td>
<td>PCW</td>
<td>All staff</td>
<td>Facilitated communication between team members</td>
<td>Internal communication</td>
<td>Communication</td>
<td>But the people that come on say they’ve been up until quarter past six, and they can sit and look through that and they can say, well that’s what happened in the morning.</td>
<td>Awareness of residents</td>
</tr>
<tr>
<td>515</td>
<td>300151</td>
<td>03/2009</td>
<td>3</td>
<td>8</td>
<td>High</td>
<td>Y</td>
<td>F</td>
<td>Other</td>
<td>Zero</td>
<td>RN</td>
<td>All staff and outside health providers</td>
<td>Facilitating communication with external health care providers</td>
<td>External communication</td>
<td>Communication</td>
<td>Because you have your information at hand. If they ask you about anyone you can get it immediately, before you’d have to go to the cupboard and pull it out files and find where they are.</td>
<td>Quick data retrieval</td>
</tr>
<tr>
<td>267</td>
<td>300068</td>
<td>01/2009</td>
<td>1</td>
<td>2</td>
<td>Low</td>
<td>X</td>
<td>F</td>
<td>Other</td>
<td>Basic</td>
<td>PCW</td>
<td>All staff</td>
<td>You get to see the note…faster on the computer than to find it on paper</td>
<td>Quick data retrieval</td>
<td></td>
<td>Because you’re not trying to remember the door number to find the resident, to find the page to read up on it in the paperwork, you just find the file and read the notes</td>
<td>Nature of computer system</td>
</tr>
<tr>
<td>325</td>
<td>300143</td>
<td>12/2009</td>
<td>2</td>
<td>6</td>
<td>High</td>
<td>Y</td>
<td>F</td>
<td>Other</td>
<td>Basic</td>
<td>RN</td>
<td>Interviewee</td>
<td>And it [input data in EHR system] spent less time than handwriting.</td>
<td>Easy and quick data input</td>
<td>Convenience and efficiency in data entry, distribution, storage and retrieval</td>
<td>Because before usually we didn’t have time to hand write it down, and also we had to go upstairs and find the residents folder every time we would have needed to document. This is much more efficient.</td>
<td>Quick data retrieval and access from anywhere</td>
</tr>
</tbody>
</table>

+ Org = Organisation

* Older = Self-identified as an ‘older’ member of the care staff. Other = All the other participants.

§ Self-identified computer literacy level before the EHR system was introduced. Zero = Never used computer before; Basic = Limit computer experience and novice; Confident = Computer literate and confident.
about who gained this benefit and how this benefit was realised was also recorded in the analysis table whenever it was mentioned by the interviewee.

It should be noted that information about the level of care provided by each RACF and the computer literacy level of each staff member before the EHR system was implemented was obtained by asking the participants directly.

In the final stage of content analysis, a PivotChart was automatically generated based on the data in the spreadsheet to show the number of participants and times that each category and sub-category was mentioned.

### 3.5.2 The analysis of negative impacts

Content analysis of the negative impacts was conducted in the second Excel spreadsheet. All the quotations which related to ‘what are the negative impacts’ and ‘how are the negative impacts received’ from the transcripts were considered, copied to and directly coded in the spreadsheet. The coding process was directed by the category system of the benefits, but the concepts were reversed to the opposite of benefits, that is: negative impacts. For example, ease of access was reversed to difficulty of access and effectiveness of data entry was reversed to time consuming and inconvenience of data entry.

The quotations and their codes were constantly compared with the opposite benefits for the purpose of maintaining consistency of the concepts in both benefit categories and negative impact categories. They were constantly compared with the previous coded negative impacts as well to increase the validity of the analysis.

Agreement on the category system between two individual researchers (Dr Ping Yu and the author) was reached after one-month of constant comparison and discussion.

### 3.5.3 The analysis of implementation strategies

Content analysis of the implementation strategies was conducted in the third Excel spreadsheet. The content analysis process was directed by the results of ‘realisation of benefits’ and ‘causes of negative impacts’ which are presented in Sections 4.5 and 4.6. Using the same approach as above, the transcripts were carefully read again. The causes of impacts actually suggested how to optimise the benefits of the EHR systems. Thus the suggestions regarding identified causes were collected to further analyse how to overcome the challenges
and acquire optimal benefits of system implementation. The suggestions were grouped into three categories.

Aggregation (Graneheim and Lundman 2004), the process of generating the tentative first-level codes, was conducted for all the quotations belonging to the three categories. The process took three weeks to arrive at agreement on the category system between two individual researchers (Dr Ping Yu and the author).

3.6 Summary
In this chapter, the methodology used to answer the research questions was described. The first step was to situate the study within the theoretical framework of the D&M IS Success Model. A qualitative paradigm with interpretative approach was then applied to explore what were the impacts, and what were their causes. Based on these causes of the benefits and negative impacts, suggestions about how to overcome the challenges to acquire optimal benefits of the EHR system introduction were reached. Following that, a detailed process of content analysis was discussed with the emphasis on the ‘manual’ approach and the efforts made to increase reliability and validity of data analysis.

In Chapters 4 and 5, the evidence-based results are presented in detail. Chapter 4 presents the benefits and negative impacts. Chapter 5 discusses the implementation strategies and give suggests strategies for optimisation of the benefits and elimination of the negative impacts.
Chapter  4   Impacts of introducing EHR systems into RACFs

4.1  Introduction

527 entries of benefits from 108 care staff members (98%) were derived from the transcripts. Figure 4.1 shows the 10 most frequently mentioned benefits. In descending order, they are: Quick data retrieval (mentioned by 58, or 53% of, care staff members), easy and quick data input (mentioned by 43, or 39% of, care staff members), ease of access to aged care EHRs (39, or 35%), improving format of records (29, or 26%), improving content of records (26, or 24%), facilitating communication with external health care providers (20, or 18%), more information about the residents (19, or 17%), motivating staff to enter data into EHR systems (18, or 16%), facilitating communication among the staff members (18, or 16%) and facilitating performance appraisal by management (16, or 15%).

Figure 4.1 – Top 10 mentioned sub-categories of benefits
228 entries of negative impacts from 72 care staff members (65%) were derived from the transcripts. Figure 4.2 shows the 10 most frequently mentioned negative impacts. In descending order, they are negative impacts in terms of: staff attitudes toward using the EHR system (mentioned by 36, or 33% of, care staff members), access (mentioned by 30, or 27% of, care staff members), quality of documentation (19, or 17%), time-consuming for data entry (17, or 15%), managing information on both electronic and paper-based documentation systems (13, or 12%), quality of care (seven, or 6%), data storage (seven, or 6%), time-consuming for data retrieval (six, or 5%), external communication (five, or 5%), internal communication (four, or 4%) and access to funding (four, or 4%).

The impacts were organised into three groups based on the subjects of the impacts: aged care staff, residents and the RACFs (including the organisations). Both the positive and negative impacts are discussed in the following sections.

4.2 Perceived impacts on aged care staff
Most care staff members reported their satisfaction with the EHR and the process of implementing the system. Good acceptance of EHRs by staff was shown by 305 entries of
benefits from 96 (87%) of the staff. The most commonly mentioned benefits for individual care staff members were time efficiency, ease of access to the system, and more information to better understand the residents, to assess staff performance and to foster the delivery of better care.

Negative impacts on the aged care staff member were mentioned by 123 entries from 62 (56%) of the staff. They are the time-consuming nature and inconvenience of the documentation process, as well as the problems of access and adapting to use the system.

4.2.1 Impacts on convenience and efficiency in data entry, distribution, storage and retrieval

4.2.1.1 Benefits

All levels of care staff members saw a reduction of paperwork and time saving after the system was implemented. There was a total of 154 entries from 89 care staff members (81%) who reported that the EHR system had improved time efficiency in documentation. The explanation given by the staff of how the benefit was realised was that they gradually got rid of paper and saved time which they used to have to spend in writing by hand, searching for and filing documents. One of the RNs who did not even know how to type before the introduction of the aged care her system told us:

[The time that documentation takes is] not that long because we are getting very proficient at using the computer...It is quicker. – RN 509

The benefits of convenience and efficiency were manifested by easy and quick data input, quick data distribution and quick data retrieval.

4.2.1.1.1 Easy and quick data entry

41 care staff members (37%) reported that entering data into the computer was easier and quicker than writing on paper. This benefit was mentioned 49 times. It was reported that the computer worked better for note entry because it stopped hands being tired from writing and messy corrections of handwriting mistakes. It also enabled a simple copy/paste when information needed to be recorded again. Moreover, the care staff could create a new document at the click of a mouse instead of needing to look for blank paper forms. Once a care staff member became familiar with typing and using the electronic system, data entry was very efficient.
I think the computer is quicker because you can get to delete stuff and you can fix it. – PCW 71

...care plans on paper are very time-consuming, and the computers make it faster, since when it’s written once, you don’t need to write it again. – Manager 329

...it’s easier for them [the care staff members] to do it [data entry] even if they’re only typing with two fingers. – Manager 494

4.2.1.1.2 Quick data distribution

Another benefit of the EHR systems which was noted was quick data distribution. Because the system was real-time, it allowed care staff members to access records instantaneously through various terminals. This was mentioned by 10 (9%) 12 times. The information could be read immediately by others on all terminals and critical information about a resident could be printed out in multiple copies more quickly than by filling out paper forms. The system enabled managers to publish announcements. It also allowed sharing of residents’ information, such as care plans, at all levels of the organisation. A manager stated that:

I just need to enter it into the computer and then that information is there for the staff to see...So it saves a lot of time. – Manager 29

4.2.1.1.3 Convenient data storage

11 entries from nine care staff members (8%) reported convenient data storage. A number of reasons were given for this. All the records were in digital form and stored in servers with backup. This ensured the records were less likely to be lost than paper records if the organisation managed the system appropriately. Unlike hand-written paper records, electronic records did not deteriorate over time. Also, saved records could not be edited or deleted by unauthorised persons, thus preventing actions which could breach the law.

4.2.1.1.4 Quick data retrieval

Quick data retrieval was another well-recognised benefit of the EHR system. 58 care staff members (53%) saw the benefit after the system had been implemented. They found it was quicker and easier to find both up-to-date as well as historical data without walking to the store room and flicking through folders. The user interface of the system was well designed to show the retrieved information in a logical order, as one care worker described:
...being able to scroll through and the way the notes are broken up into different categories where you can select whatever it is you are looking for and be done fairly quickly. – PCW 82

The system also provided a useful function that enabled care staff to track through the progress notes for a resident to get a holistic view of the person’s behavioural changes over time, making it easy to identify potential triggers such changes or any issues which might need to be followed up.

4.2.1.2 Negative impacts

37 entries from 30 care staff members (27%) reported that it was inconvenient and inefficient to use the EHR system, explaining that it is: time-consuming and/or inconvenient for log-in, data entry and data retrieval; or citing problems with data storage.

4.2.1.2.1 Time-consuming to log-in

Some care staff members complained that log-in speed was slow.

\[ I \text{ think that they [the doctors] do have some complaints, saying the log in process is too long and with that process, they would have already finished their handwriting.} \quad \text{– Other 203} \]

4.2.1.2.2 Time-consuming for documentation

The slow speed of computer and care staff members’ inadequate computer skills were also reasons it was considered time-consuming to use the EHR systems.

\[ \text{It is good because the RN uses the one at the desk, and these notebooks are slow.} \quad \text{– RN 29} \]

4.2.1.2.3 Time-consuming for data entry

17 care staff members (15%) thought using the EHR system was too time-consuming for data entry. Some charts were perceived to be complicated enough to confuse care staff. Some care staff members were unhappy because the EHR system provided a different process and poor workflow of documentation in comparison with their previous paper-based system, which caused them to spend more time in finding the relevant pages for entering the data. It was reported that some relevant information had to be entered into different pages of the EHR system, which was perceived to be illogical and inconvenient for data entry. It was also
reported that there was a long process in the EHR system that a user had to go through before entering data into the relevant page.

Some particular types of data were perceived to be quicker to write down than entering into computers, such as bowel charts and progress notes. This is because accessing a piece of paper was easier than moving between a computer and a ward, and waiting for log-in. To save time, some care staff members chose to take a piece of paper with them to note the important information right after finishing the task, then enter the data into the computer at the end of a shift.

I don’t think it [the EHR system] is quick because when you are on the job and something happens, it is better to make notes on your piece of paper that you have with you, with the resident’s name than to stop what you are doing and then go make progress notes. No, you have to do it at the end of the shift. – PCW 12

I find sometimes the computer doesn’t work quickly enough. – Other 183

I'm particularly slow. I usually leave my documentation until the last thing so that if I need a bit of extra time I can stay a bit later. – RN 167

4.2.1.2.4 Time-consuming for data retrieval

Six entries from six care staff members (5%) stated that it took time and many steps to open up the charts and forms care staff members intended to review. A PCW reported dissatisfaction with search results. A manager reported that when she found the form she wanted to retrieve, the system automatically took her back to the form creation page. Difficulties in retrieving all of the charts and assessments for completing the funding instrument ACFI were also reported.

You’ve got to click down to another page and when you’ve found it, it automatically goes back to creating a new form – it’s just a bit cumbersome, it isn’t difficult but it’s the only thing that is a little bit time-consuming, particularly when I’m doing ACFI assessments and I want to see what charts and assessments have been done and I want to see that they’re all in there. – Manager 175

4.2.1.2.5 Problems of data storage

A few care staff members felt frustrated when they encountered problems in data storage. Two managers from Organisation 2 mentioned that they lost data such as care plans and some charts they had entered but which have not been saved by the system. The reasons might be
user error caused by care staff members who did not save the records; or error with EHR System Y itself.

Other complaints were about whether a saved EHR could be changed or not. A manager who used System Y reported that the error she made in documentation could not be deleted when she wanted to. However another PCW who used System X expressed her concern when she saw the record could be modified by other staff members. As she said:

_The only thing I am not happy with is how you can go in and edit someone else’s work if you want to. You can go into someone’s work and edit without them knowing...you shouldn’t be able to go into someone else’s notes. Like you can’t do that on paper but you can on computer._ – PCW 36

Discussion with the managers suggested that although changes were allowed to be made to the recorded data in EHR System Y, any changes, along with the ID of the person who made the change and the date of the change, were recorded in the system permanently to comply with legal requirements for resident health records.

### 4.2.2 Access to EHR systems

#### 4.2.2.1 Benefits

Ease of access to the EHR system was one of the frequently reported benefits. There were 53 entries from 39 care staff members (35%) who stated that they were able to access all the information they needed. The system was running 24 hours a day so that they could access it at any time during their shift. All of the staff were given the authority to log on to the system by using computers in any nurses’ station, so the staff members on the floor were able to access the information they needed at the nearest nurses’ station after logging in. The managers and RNs could access the system, check information and prepare documentation in their offices instead of walking out onto the floor to get paper forms. In addition, it was reported that the relevant staff members in the corporate office of the organisation were given authorisation to access the information of every facility owned by the organisation.

#### 4.2.2.2 Negative impacts

In comparison with the benefits mentioned in 53 entries, 40 entries from 30 care staff members (27%) reported their concerns about access to the EHR system. There were three
causes for access difficulties: an inadequate number of computers, technical problems and end-user mistakes.

4.2.2.2.1 Inadequate number of computers

14 care staff members (13%) from five facilities (Facility 1, 2, 3, 7 and 9), perceived an inadequate number of computers on the floor as the problem, especially on day and afternoon shifts in high care facilities. Care staff members used to document at the end of a shift, however the available computers would all be occupied by then. Therefore, some PCWs tried to document during break time or any time they could squeeze in for documentation, but they reported that they could not always get on computers. The care staff members would either ask their colleagues to let them use the computers, run around to find other computers, or choose not to document at that time. They reported that the AHPs and RNs had priority to use computers, so sometimes it could be harder for a carer to access the EHR system.

*We have three on south wing. I think there are two in the RN’s office. There’s I think two in the staff room and then there are many on the other side of the wing.
I don’t know. But there are times when we are running around trying to find a computer.* – PCW 224

*It is only sometime when special people come, like speech pathologist, podiatrist, GP. So, when they come at the same time, we have to divide time to use the computer, but it is not always, it’s occasional.* – RN 214

4.2.2.2 Technical problems

Technical problems were either caused by the EHR system itself or third party products. These problems were usually solved quickly. The other technical problems included inappropriate use of the system and a lack of portability of the devices used to access the system.

4.2.2.2.2 Third party product failures

The technical problems caused by third party products included temporary power outages, lack of internet access and hardware breakdown.

When the EHR system broke down, the care staff members could only rely on limited information in their paper-based backup records, which caused frustration with the EHR system.
[Person A] can’t do it [the documentation] because the computer has been overhauled. So the hard drive’s been replaced ... – RN 56

4.2.2.2.2 Inappropriate use of the system

Inappropriate use of the system was reported when a vacant computer was sometimes logged on by one care staff member for a long period of time without use, which blocked access by others to the EHR system.

When you do have time and you do find that five-minute window, somebody is already [logged] on the computer...I have to switch it off, and then you have to wait for it to reboot again. And by the time you’re ready to start, the buzzers are going again and you’ve got to go...it’s very inconsiderate I think, that somebody hasn’t logged off. – PCW 52

4.2.2.2.3 Device portability

There were five care staff members (5%) who had concerns with the portability of the devices that were used to access the EHR system – computers were simply more cumbersome than a piece of paper. When staff members took notes while in a ward or conference room, paper records were convenient to carry. It was difficult to carry a computer for data entry while walking and meeting. In addition, a manager reported that she could not access the system when she went with a resident to a hospital.

But if you’ve got a piece of paper on you, you can be walking and still jotting down really quickly as you go. – PCW 11

If I go with a resident to hospital I can’t write the progress notes until I get back, so I had to write it early the next morning. – Manager 101

4.2.3 More information to better understand residents and their care services, support peer learning and facilitate performance appraisal for managers

It was reported that because of the ease of access, staff felt able to read more information in the EHR than they did in the paper-based record system, and this was perceived to have improved their understanding of residents care needs. 65 entries from 41 care staff members (37%) from all levels of the organisations reported a significant increase in the amount of information they acquired about the residents and the care services. It was also believed that the information had supported peer learning or facilitated staff appraisal by managers.
4.2.3.1 About the residents

The staff appeared to get a broader and more holistic view of residents. The convenience of quickly accessing information and finding the details of what was happening to the residents enabled the staff to gain a better understanding of a resident’s needs. A manager said:

…sometimes it wasn’t written anywhere [when we used paper records], so they [the care staff members] might say they didn’t know. Now there is no excuse for not knowing what’s happening. – Manager 375

By viewing the photos of a resident in the EHR, a new staff member was able to call a resident by name at their first encounter and start a conversation on a more personal basis. For residents with the same first name, staff members were able to add information to note that there was a person with a similar name besides the photo, so they would not mis-identify a resident.

4.2.3.2 About the care services

Care staff members reported that the system enabled them to easily check what care had been delivered by others. As long as a staff member was comfortable using the system, the completeness and accessibility of information would facilitate a better understanding of what was happening on the floor. Care workers were more aware of the updated care plan developed by RNs because soft copies of care plans in a real-time system could be easily accessed at every computer terminal, unlike the usual single copy paper-based care plans. Care workers expressed their satisfaction with the ease of access to care plans and knowing what to do and why they needed to do it, instead of simply following workflow without thinking.

…if staff log on to the documentation, look at the care plan, that will build them a picture about what they should do with the person. – Manager 442

We do care plans so that we can print them out for the staff so they know if a resident needs to be lifted by a hoist or can feed herself, or is on a normal diet. – RN 512

4.2.3.3 Supporting peer learning

Several care staff members reported the benefits of increased working knowledge after using the EHR system, because they could learn from each other by reading the records entered by
their colleagues. Also, some particular user groups such as managers were given authority to access the records of other aged care facilities within the same organisation. This allowed these managers to learn how the care or the management of similar cases at another facility was being conducted.

For instance if I am unsure of how to do the palliative care, I can easily just click a button and find out it has been done for a similar patient at another facility. – Manager 24

We’re all still learning I feel, we’re learning something new every day. – Other

4.2.3.4 Facilitating performance appraisal by management

The aged care EHR systems helped managers to monitor staff work performance. Managers had authority to check who created and modified the documents. They were able to check frequently and in a timely way whether carers had completed the work as well as the documentation. This was much more convenient than walking on the floor, asking others and shuffling papers. In addition, it helped managers to identify the learning needs of the staff and to provide more targeted training courses.

...able to see if something has been identified, has somebody done something about it, if there is a gap and ensure that is corrected. – Manager 12

It helps me identify what is needed by the staff. – Manager 26

4.2.4 Staff attitudes toward using the EHR systems

4.2.4.1 Benefits

Easy accessibility of the EHR system was seen as enabling care staff to enter data into the computer as soon as they finished the task at hand, while the issue was still clear in their mind. This was reported to encourage care staff to enter data more often.

In seven facilities belonging to the three organisations, it was mentioned by 18 care staff members (16%) that they put more effort to input data in the EHR system than they did when writing in a paper-based record system, where there might only be RNs taking the role of documentation.
My experience is here people make that little bit more effort to document well and regularly. In a paper system it tended to be the RN that documented and not the carers. – Other 285

4.2.4.2 Negative impacts

In contrast, some staff attitudes toward reading and entering data in the EHR system were found to be less positive than others. There were 47 entries recorded from 36 (approximately one third) of the care staff members who reported resistance to using the EHR system by their colleagues or themselves. Their reasons for reluctance are analysed in the following sections.

4.2.4.2.1 Identifying those reluctant to use the system

17 entries from 15 care staff members (14%) mentioned that they thought there was still a small number of care staff members at all levels who were reluctant to use the EHR system.

15 care staff members (14%) reported some of the GPs who visited the facility never used or were reluctant to use the EHR system in the RACF. Two staff reported a physiotherapist did not record in the system. A manager self-reported that she preferred the old way of documentation in the paper folder and forms. Three reported RNs’ difficulty in accepting the new EHR system. In particular it was said that one older RN ‘will come to work as long as we don’t have to use the computer’. Five care staff members (5%) reported some PCWs were resistant to documenting in the EHR system.

So we have to be careful that we refer to in written notes...They [the doctors] would rather you hand them the written note, and they scribble what they want to do. On computers they have to put in the password, then flick, and do a few procedures before they can start writing their progress notes. Sometimes it’s too hard. – Manager 67

She [the physiotherapist] has good computer skills, she has a laptop of her own but she doesn't particularly want to. She charges us about $110 an hour. She came for three hours and she said you'd need an extra hour if you wanted her to use a computer. That's why I transfer it [her documentation work] over because obviously I cost them a lot less than she does. – Other 154

4.2.4.2.2 Why the adoption process of the system was slow
36 care staff members (33%) expressed their opinions about why the processes of adopting the EHR systems were slow. The reasons included the age of the care staff, a lack of computer skills, a lack of documentation skills and a combination of time limitations as well as staff preferring to spend time in direct care. The age factor was mentioned by eight care staff members (7%). Low computer literacy or lack of typing skills was mentioned by 10 (9% of) care staff members; this problem happened at all levels of care staff members and outside health care providers. Limited time and preference for providing direct care over documentation were also mentioned by 10 care staff members (9%), who believed that the problem occurred with GPs, the physiotherapist, ENs and PCWs. The language barrier and lack of documentation skills were also mentioned by some care staff members. RACFs recruited staff members whose first language was not English, as well as some cleaners, catering staff and PCWs. A few care staff members suggested that these people might not be fully skilled in documentation because they were more likely to encounter problems using correct English.

It was said that the outside health care providers, such as doctors, were the group of people who were most likely to not use the EHR system. The reasons for GPs not using the system included: wanting to use their own electronic or paper-based system and not wanting to record duplicate information in two systems; concerns about information security; being unused to using computers; forgetting their account name and/or password; or being too busy to record.

Among the 36 care staff members (33%) who reported slow adoption of the EHR system, 13 (12%) of them did not give a specific reason. Instead, they suggested that some care staff members were not willing to change or could only change very slowly.

When you have got people in the workforce who have been here for 20 years they are not as familiar with computers as the younger generation are so it is a little bit of a fear factor...I think that the big risk is that we have half of them using it and half of them not, so there is not that collaboration...The younger staff would have gone ‘oh this is fantastic’ because for them it is what they do. Whereas for the older staff who have never turned a computer on it is very, very daunting. – Manager 73

The doctors we are having a lot of problems with them. They are very reluctant to use them because they believe there are too many systems everywhere they go,
and they are too busy. They only want to scribble on a piece of paper and zoom out again...All up it is about 13 doctors [come to our facility]...They all have access, and I even ask them if they would like me to show them how to use the system, as it might be easier for them, and they always reply that they are in a rush. – Manager 82

4.2.5 Empowering care staff

Many staff who had limited computer skills or did not use computers prior to the introduction of the EHR system expressed their willingness to use the computer as a part of their job. They improved their computer skills after using the system for several months. Some of the older care workers gradually gained confidence with using the system, especially for typing, which they saw as a personal achievement. Some felt that their newly acquired computer skills would contribute to their CV and other aspects of their life. Seven care staff members (6%) reported this benefit.

It’s a part of the job and it’s good to learn for future references. – PCW 124

It’s a good learning experience. I feel like I can keep up with the generation a bit, with the grandkids. – Other 604

...the software contributes to making your life easier. – PCW 262

Some PCWs felt they empowered, because they could enter notes in the system and those notes were more likely to be read by other care staff members in an EHR system than in a paper-based record system, where it was the RNs’ role to record. Their contributions were noticed by the managers and what they had recorded about a change of a resident was helpful for RNs to redesign a care plan. As an RN mentioned:

...get the information from people you can’t talk to at the moment – what they think – so it does improve what you want to do because you get the whole picture, not just what’s happened on your shift...it does impact on how I deal with a resident. – RN 227

Another PCW also expressed her feeling of confidence in delivering care services after using the EHR system:

So it is really good feedback instead of someone just giving a handover and saying so and so has been aggressive today. So you can look more into depth of the person that it happened with. – PCW 69
4.3 Perceived impacts on residents

59 entries of benefits from 37 care staff members (34%) belong to this group. It was reported that the improvement in the quality of residents’ records led to improvement in the quality of care and better communication between staff and residents.

Only ten entries from eight care staff members (7%) mentioned any negative impacts on the quality of care.

4.3.1 Impacts on quality of care

4.3.1.1 Benefits

Delivering high quality care to the residents is the aim of every care staff member and 33 (30%) reported that the EHR could assist them to achieve this goal, by facilitating the following actions: a quick response to residents’ care needs; supporting the development of care plans; facilitating quicker and easier care decisions, resident-centred care and better care follow-up; and limiting the number of incidents of undesirable behaviour.

4.3.1.1.1 Quick response to residents’ care needs

Staff members in RACFs were able to respond more quickly to residents’ care needs due to up-to-date information and significantly improved internal communication. They were also able to communicate with outside health care providers with timely information and quick responses because of the system.

*We take photos, we store them in [System X] on the computer so we can e-mail off to the doctors and it's a lot quicker response.* – Other 554

When a new resident came in, initial assessment of the person could be distributed to all of the staff members through the system, so that correct care could be started immediately instead of waiting for the next shift.

*Now correct care can start immediately instead of maybe the next shift. I can get initial assessments out to the staff members that are on the floor.* – PCW 477

4.3.1.1.2 Supporting development of care plans

The care staff members reported that the EHR system made the development of better care plans easier because the information was more accessible. Through quick data retrieval, the compact information was shown on the screen and an RN could quickly switch among the
notes in an assessment and efficiently combine all the information together to formulate a care plan.

*I can combine notes together and use your high thinking skills in assessment and from your own knowledge of the resident, formulate a plan of care.* – Manager 91

[It is] very easy [to develop care plans in the aged care EHR system] because you literally select the resident, and check all forms if you are looking for a particular accident or incident for a date range, and it’s there. – Other 568

4.3.1.1.3 Quicker and easier care decisions

Interviews with RNs and managers revealed that the EHR systems had a definite impact on clinical judgement and decision making because of the ready availability of quality information. Seeing GPs’ notes and assessments of the residents in the system enabled RNs to think more critically about their care plans. It was easier for nurses to formulate a care plan with the information from both internal and external sources shown quickly on the screen. It was also helpful to be able to notice some behavioural changes by checking historical progress notes quickly and thus be able to change the care plan accordingly and in a timely way. Care staff members reported an improvement in quality of care when using the system.

*You can see the doctor’s notes, the staff’s and any assessments. This way you can make judgments a lot more quickly and thoroughly.* – RN 301

4.3.1.1.4 Resident-centred care

The timely and complete information in the system helped staff to better understand the needs of residents. This enabled them to better meet a resident’s needs by paying more attention to what would be really helpful to the person.

*...they [the care staff members] know what that person needs. So all they need to do is deliver that need.* – Manager 443

*And I think [System X] does give you that person centred focus, because you get that holistic view so it is much more person centred than meeting funding needs.*

– Manager 9

4.3.1.1.5 Better care follow-up
It was more convenient for a staff member to look into a resident’s record and check the care given to this resident by other staff members. Electronic handover was used in some of the participating facilities to replace a paper handover. The staff who worked in a facility which still kept a paper or oral handover was able to check such information too. The care staff members said that although they preferred oral communication, if they could not get the detailed information they wanted, they would check on the EHR. Staff felt there had been a significant improvement in care follow-up.

*There’s a lot more follow-up with resident care because there’s more accessibility of information.* – Manager 489

4.3.1.1.6 More time spent with residents

Because less time was required for documentation, care staff members felt they were able to spend relatively more time on the floor in the direct delivery of care. They were very happy to have this extra time with the residents.

*...so you have more time on the floor with the residents. I think it [documentation in the aged care EHR system] is quicker.* – Other 507

4.3.1.1.7 Fewer incidents of undesirable behaviour

The ease of going through many records in the system compared to paper files was reported. Staff took advantage of this benefit to analyse the common occurrences of certain undesirable behaviours in order to understand why they had occurred. They felt that the results of such analysis had enabled them to avoid the triggers for this kind of behaviour and thereby minimise the number of such incidents.

*...we can alter something to prevent it happening again. It has individual behaviours and we can go into the files and see if this is a common occurrence and why it is occurring...It’s not easy to go through lots and lots of paper.* – PCW 132

4.3.1.2 Negative impacts

Not all care staff members thought that the implemented EHR system helped them to improve the quality of care. Some care staff members agreed that the system facilitated their documentation process, however they thought the system did nothing in respect of clinical processes and care services; there was no difference before and after implementation. In fact,
five care staff members (5%) commented that the system made their job more difficult compared with the paper-based system. The negative impacts were grouped into sub-categories of care decision making, care follow-up and less time spent with residents.

For carers on the floor, I don’t think the software itself makes their job any easier or worse. I think it makes documentation easier. For me the clinical process or the caring, documentation whether paper based or electronic, it’s just a component of that, the actual care is not different. – Manager 20

4.3.1.2.1 Care decision making

Those care staff members who thought there was no difference before and after EHR implementation in terms of quality of care all focused on the impact of the EHR system on care decision making. Three entries from three care staff members (3%) were recorded. One reason was that older nursing staff did not use the system because they were not computer literate. The care staff member who reported the issue came from Organisation 1 using System X. The other two came from Organisation 3 using System Y. They believed that the system they were using would help them to retrieve previous records but had no direct impact on their care decisions; it was not the system, but nursing staff members who made the decisions.

No, [System Y] does not help you make decisions as far as your nursing decisions go. That’s something that I think we do. I suppose if you are looking at what you’ve done in the previous week or something, then [System Y] can help but it’s only about the documentation that nurses put in there anyway. – Other

4.3.1.2.2 Care follow-up

There were also problems related to care follow-up. A manager reported difficulty experienced by her staff in regard to giving out medication. It is the signature on the medication chart which certifies that the medication has been given, but it was inconvenient for staff to access the computer after giving medication to each patient. They tended to do this either before or after medications had been given to all the residents so at times the information might not be up-to-date and it was not known whether the medication had been given or not. She also reported the risk of missing signature: staff had given the medicine but there was no signature in the system. In Organisation 2, care practice involved staff members
putting hardcopy care plans in the wards. A manager from this organisation reported the risk of staff accessing out-of-date hardcopy care plans in the ward while the electronic care plan had been updated in the system. A physiotherapist expressed her concern about the staff on the next shift or the next day might not be aware of changes and where the changes had been made on residents’ records. The staff could follow up the wrong care services because they were not always accessing real-time information.

It’s hard enough for the staff to write on the medication chart, to follow it up. And for someone to check all the time to see if the signatures are there or not, and then the department comes and we have signature missing, and we get trouble. You know, with the signatures missing, then that means you haven’t given the medication. You might have given but you haven’t signed. – Manage 227

4.3.1.2.3 Less time spend with residents

The problems mentioned above complicated the care staff member’s job. One RN stated that she spent more time on documentation after the system was implemented and this took her away from the residents.

4.3.2 Enabling better communication between care staff and residents

It was believed that the system was especially helpful for new staff members because they could see photos of the residents, and thus learn their name easily. In addition to the photos, by using the system to easily access personal information, staff had a better personal understanding of their residents. This helped to connect a care giver to a care recipient. One PCW expressed it in this way:

It’s great because we can look up on the system to find out a little bit about their background, it assists us make a topic of conversation when go in to them. – PCW 149

4.4 Perceived impacts on the RACFs

The benefits to the RACFs were identified as improvement in information management, and the associated benefits of improving accessibility to funding, monitoring changes in residents’ behaviour and/or level of mental acuity, facilitating care quality improvement, improving the work environment and providing a better learning experience for nursing students. 124 entries of benefits from 68 care staff members (62%) identified these benefits.
59 entries of negative impacts from 36 care staff members (33%) were categorised into this group. They included risks and problems of information management and the communication system, inability to access funding, more space required and problems of new staff education.

4.4.1 Impacts on information management

4.4.1.1 Benefits

One manager expressed his satisfaction with the result of an accreditation report issued by the government inspectors because it showed a significant improvement in the quality of records.

Now, in our accreditation report these surveyors (sic.) talk about [System X] and how useful it was, and they saw that as a plus to our documentation. – Manager

Information management was improved in terms of increased accessibility to resident health records, convenience and efficiency in data entry, distribution, storage and retrieval and improved quality of the health records. For instance, relevant staff members could easily conduct internal audits in the corporate office because they were authorised to access the EHRs which belonged to all the branch facilities. The first two sub-categories of benefits have already been discussed in the section regarding benefits to the aged care staff in Sections 4.2.1.1 and 4.2.2.1, but there was also an improvement in the quality of health records.

4.4.1.1.1 Improved quality of health records

There were 108 entries from 68 care staff members (62%) who reported such benefits. Resident health records are more than the records of care planned for and given to individual residents (Urquhart et al. 2009). They can be the evidence used for quality assurance, legal purposes, health planning, allocation of resources and nursing development and research (Wang et al. 2011). Therefore, high quality resident health records are essential for an aged care organisation. Both of the format and content health records were improved.

4.4.1.1.1 Format

Data items on the electronic form were laid out in a logical order. Printed text was much easier to read than untidy or even illegible handwriting. The interface for data entry for
assessments would pop-up straight away when a user logged in. This provided staff members with quick access to the data entry form.

*Once you go in, it flashes up the focus assessments straight away. You need to be doing this focus assessment and that focus assessment, so you can start doing it.* – Manager 56

As more content could be displayed on one screen, it allowed information in one place for the staff to switch between residents and/or different types of records at the click of a mouse. 13 people reported this benefit. Better legibility improved reading speed and encouraged care staff members to read the records, thus improving their usefulness.

*Previously that had been a problem with orientation because the paperwork used to be pages and pages, put in a folder, stashed away and not likely to be read.* – Manager 343

*I see a benefit of it being typed over handwritten as it can be more legible.* – PCW 548

### 4.4.1.1.1.2 Content

The records were more accurate, up-to-date and complete than paper records because of the easy accessibility and improved efficiency in data entry, distribution, storage and retrieval.

One care staff member reported the photos of the residents were put into the system and shown in a prominent position. This enabled her to avoid the mistake of mixing the records of residents with similar names.

Care staff members also reported that the records became more concise and they contained fewer mistakes. The reason could be that they were legible and it was also easier to make corrections on computer than by hand as staff tended to do proof reading before saving the records. More staff chose to delete or simply not enter the information that was not relevant, as well as checking for typographical and spelling mistakes, as two PCWs mentioned:

*...if you write something in and think, no it sounded better this way, you can change it.* – PCW 468

*...you are typing it up, if you make an error you can correct it. Whereas if you hand write it, it’s a different issue.* – PCW 467
4.4.1.2 Negative impacts

The implementation of EHR systems was expected to improve information management in terms of enabling more information electronically, reducing paper documents as well as improving the quality of health records. However, not all the care staff members agreed the system realised such benefits. 44 entries from 32 (29%) staff members mentioned negative impacts of the system on the RACFs.

4.4.1.2.1 Risks to information confidentiality

One manager expressed her concern about the system enabling staff members from head office to access the information in her RACF but she gave no reason for this. The reason might be the risk of disclosing residents’ confidential information.

_I understand that other facilities can access your information, and I don’t really believe that is a good thing._ – Manager 94

The CEO of an aged care organisation, however, explained that this was not a valid concern. The CEO explained that when a resident first entered an RACF, information was provided to a resident or the person’s representative about the possibility that the organisation might disclose necessary personal health information to internal or external health care providers for the purpose of providing timely optimal health care services. The residents or their representatives signed a consent form giving explicit consent for the organisation to use the information for this purpose. Therefore, accessing a resident’s records by the corporate care service managers for the purpose of improving healthcare services is a legitimate use of resident information. The above concern of the manager suggests that staff awareness of policy for information use in the organisation may need to be improved.

4.4.1.2.2 Different versions of same document used by different RACFs in the same organisation

Another manager from Organisation 2 expressed her frustration in auditing health records in System Y. There were multiple facilities belonging to Organisation 2, however different facilities were using different versions of the system. The manager felt confused and felt that the problem would consume more time when she went through the same type of document but in various versions.

_We need to be consistent throughout the region to eliminate different versions of [System Y]...when I’m auditing someone else’s progress notes, and doing clinical_
research use and I have to think, what version are they using? Are they using the old version, the new version? That’s what can be time-consuming on my part. – Manager 129

4.4.1.2.3 Problems of managing information on both electronic and paper-based documentation systems

None of the facilities surveyed changed their paper-based documentation practice to a fully electronic practice. Some of the paper documents were kept because care staff members thought it was not practical to enter certain types of records on computers. Such documents were still only on paper in Organisations 1 and 3, and included (not applicable for all the facilities) the communication book (for example, records of haircuts and fingernail cutting), the nursing diary (for example, records of visitors and appointments), incident forms (accident reports), resident’s files (for example catheter changes), attending doctor’s book or other documents that were prepared for use by outside health care providers, medication charts, bowel charts, showering and washing charts, wound charts, pain assessments and dressing charts. One of the reasons identified was the inconvenience of accessing the EHR system because there was a shortage of computers and staff members were too busy to access the computers at nurses’ station during the care delivery process. Other reasons included lack of functions for AHPs to initiate their assessments or draw diagrams in the system, inefficiency of entering data and system downtime. Therefore, aged care staff members still could not entirely avoid paper-based documentation systems.

Personal care records are still on paper because nurses have to fill them in on every shift and it just wasn’t practical to have 4 nurses at 3 o’clock trying to get on a computer. So we keep on a paper basis. – Manager 176

And we tend to still do our bowel charts on paper. And personal care records such as the fact that staff have showered on that day, we find that if it was on the computer, it would be very slow and haphazard. Plus you have to go into each individual resident to do that, whereas you can have that on one piece of paper for the staff. – Other 204

All the facilities had paper-based documentation backup systems in case the EHR system went down. In some facilities staff recorded on paper when the system was shut down and scanned the paper documents into the system afterwards. In other facilities staff just entered ‘the system was down on the day’ in the EHR system. Staff members were also using printed
health records. Printed care plans were put into wards for easy access by care staff members or just for RNs to evaluate. Some care staff members thought that having a paper documentation system and the EHR system at the same time had increased the difficulty of managing information.

*One that I find difficult that we do is a nursing care plan - not the formulation of, but when you do the evaluation. And we take a hard copy, but if you do that every 2 months you think 'look at all this paper' which to me is defeating the purpose of having an electronic system. – Manager 178*

*I suppose eventually when everything’s moved over to the computer, and there’s no more paper – well I mean there has to be some paper – but when everything’s that goes on there... um... yeah. I think it will be a lot less confusing when it’s all on one thing. – RN 192*

4.4.1.2.4 Quality of health records

There were 20 entries from 19 care staff members (17%) who reported that the quality of health records was not improved. Compared to the perceived improvement in quality, the complaints focused on the content of health records being inaccurate, incomplete or out-of-date.

4.4.1.2.4.1 Accuracy

The accuracy of the EHRs was perceived to be lost to some extent by nine care staff members (8%). A manager reported that newly recruited staff using System X could not get their own log-on account so they logged on through a generic account. From the manager’s point of view, this removed responsibility for quality documentation because it meant that there was no individual signature. The manager also mentioned that the system was not updated since its initial introduction in 2006 and the lack of technical support from either the vendor or the IS services in the organisation caused this situation. Meanwhile, according to some staff members using System Y, some electronic forms asked for wrong information to be filled in and gave wrong options. This meant that the essential information these staff should have been entering could not be entered in the system.

*They [new recruited staff] have to do it through generic login. So in some ways, it removes some of their responsibility...traceable from a quality point of view,
that [it's not good because the documents are meant to be signed individually] is not correct. – Manager 64

Except sometimes when you are filling out forms there isn't an option that is appropriate, and if you could scrub out the options and write your own... You know, for wound care or something you might have several different options, none of them was exactly the right one. – RN 164

4.4.1.2.4.2 Completeness

There were six care staff members (5%) who thought the information in the system was incomplete, possibly because the scope and content of the electronic form were not designed properly for them to enter rich and complete information in comparison to the previous paper documents. Also, as mentioned previously, at times there were signatures missing in the EHR system because of the inconvenience of accessing the system. In addition, staff members were just too busy to finish all the documents or a few staff members did not treat all types of health records seriously.

Sometimes you don’t get time to do your progress notes. Always get your bowels done. Whether they’ve had their bowel charts, that’s pretty important. But progress notes they don’t, depended whether you get time.’ – PCW 135

4.4.1.2.4.3 Out-of-dateness of documentation

The information in the EHR system is not always up-to-date. In Organisation 1, four staff members reported that they encountered synchronisation problems when using System X. Care staff reported that the information they saved into the system disappeared for two weeks, or the transition of information they entered from a notebook to a desktop computer was too time-consuming. Another staff member said that because of a limit on the number of computers, she could not access one during her shift. When that happened, she would document one day later so the information was not up-to-date.

Like it [the EHR system] worked fine every morning, then the last part of the day it [the laptop] didn’t connect to the wireless. It saved everything I put on. But then I had to hook it up in [person X]’s office, with the cable, and then we had to wait for it to download everything that I’d typed so I could run off a sheet for every unit as to what happened on doctor’s day. – RN 54
4.4.2 Impacts on the communication system

4.4.2.1 Benefits

Improvements in both internal and external communication were also seen as benefits of introducing EHR systems. Compared to a paper-based record system, the EHR system made it easier for staff to exchange clearer information. Expedited communication facilitated much greater collaboration. 37 entries from 33 care staff members (30%) reported the benefit of improved communication. This could be seen in three areas: facilitating internal communication among staff members, facilitating communication between staff members and residents and facilitating communication with external health care providers. The benefit of improved communication between staff members and residents has already been discussed in the section concerning benefits to residents, but other areas of improved communication were also perceived as important.

4.4.2.1.1 Facilitating internal communication among the staff members

19 care staff members (17%) recognised a benefit in this sub-category. The system helped staff to be more aware of what others were doing and why because of the ease of data retrieval. The handover function in the system had already substituted a handover book in some of the participating facilities. The important information was highlighted to draw everyone’s attention. Care staff members who went on leave could read the notes and catch up with the events which had happened while they were away. This was reported by five care staff members (5%) as the major benefit.

*If you’ve had a few days off, it’s easier to go and look at what’s happened while you’re not here.* – Manager 374

*Because we are 24 hour, if we have to write notes we can enter them and someone can come along at any stage of the day and read them. It’s communicating with other team members that are working on a different shift.* – PCW 256

4.4.2.1.2 Facilitating communication with outside health care providers

Communication between staff in the aged care facilities and outside health care providers was also facilitated by timely data input and frequent record retrieval. When the providers came into aged care facilities, they could easily be shown all the information they needed in the
system and this gave them a clear picture of the residents. Staff could take photos of wounds and store them in the system. They could email health care providers and receive a quick response. This greatly improved communication with outside health care providers. 20 care staff members (18%) recognised this benefit.

...with their [nurses’] clinical notes as well you can print out a page and shoot it off in an e-mail to a doctor and they will get on a lot quicker than having to wait for them to come back here and attend. – Other 554

4.4.2.2 Negative impacts

There were nine care staff members (8%) who suggested that the introduction of the EHR system did not facilitate communication either internally, among staff, or externally, with outside health care providers. It was reported that some care staff members still relied on verbal communication. In particular, some PCWs preferred to ask RNs to get up-to-date information rather than accessing the system by themselves because the RNs were already on the computer, asking was quicker than checking on the computer, or perhaps, this was simply the culture in the RACFs. One manager expressed her worry about staff losing the sense of belonging with the introduction of the EHR system. The low adoption of the EHR system by the doctors hindered communication between the doctors and care staff. In addition, it was reported that some staff did not send a resident’s care plan when the resident was sent to hospital because they were not familiar with the system and could not use it correctly.

However I know of other staff who aren’t that familiar with [System X] who don’t use it in that way. They wouldn’t send that information to hospitals, so that’s when we get phone calls ‘does so and so normally communicate in this way’. – Other 5

4.4.3 Access to funding

4.4.3.1 Benefits

The ACFI was also integrated into System Y. Most of the managers expressed the view that the system assisted the facilities to obtain funding. The income of some facilities had improved, particularly in the case of high care facilities.

...with this introduction of ACFI...the income of...facility...is definitely up...When we went into ACFI we had all high care on high money. – Manager 400
4.4.3.2 Negative impacts

The ACFI was introduced on March 2008 as the means of allocating Australian Government subsidies to RACFs (Department of Health and Ageing 2012b). As mentioned in the previous section, funding in some participating facilities was increased by using ACFI in System Y, however four care staff from Organisation 1 mentioned that this funding instrument was not implemented in System X. This was because System X was introduced before the advent of the ACFI and the version of the system was years out-of-date. Nursing managers and RNs perceived this as a big challenge.

_The government has changed the ACFI and I don’t feel that it is implemented yet in [System X]. That is a big challenge._ – Manager 6

4.4.4 Facilitating care quality control

The EHR system facilitated the auditing of internal documents since the records of each facility in an organisation could be easily accessed from the corporate office. The EHR benefited the managers because it provided complete information and the convenience of tracking the historical records of residents and staff work performance. One manager stated that they easily collected the clinical indicators and reported them at monthly quality meetings in the RACF where he was working. They added graph information in the reports and compared it with the previous records to see trends in the quality of care. Based on the results of these observations, they could control the quality of care by adjusting the management strategies appropriately.

_I’m finding there are a lot more involved in observation and report writing going into the [System X]._ – Manager 494

_[Person A] uses it for clinical indicators and our clinical indicators are reported to a quality meeting every month and we’re also able to graph information and compare it with the previous months or the same month last year so we can develop trends._ – Manager 593

4.4.5 Impacts on work environment

4.4.5.1 Benefits

The use of the EHR system limited the amount of paper documents, which saved all the physical space which used to be needed for paper files as well as the cost of buying paper and
cabinets. The staff working environment was also tidier. Interestingly, one care staff member reported that one benefit was to avoid bringing in insects or a fire hazard.

4.4.5.2 Negative impacts

Compared to handwriting on paper-based records, computers required more space in nurses’ stations or offices. With several computers the office could be crowded as reported by one manager. She realised that the facility needed more computers for staff members, and it was a challenge to find more space for computers in the facility.

4.4.6 Impacts on educating practice nursing students and new staff members

4.4.6.1 Benefits

Providing better opportunities to educate practice nursing students about health records and documentation practice in an RACF was also seen as a benefit by one care staff member. Because of the completeness of information in the system and the high computer literacy of most students, teaching students how to document health records was easier than before and the students could go into the system to find all the information they needed to learn about issues related to nursing care with little staff direction.

> Opportunities to like I said, all the information that we need or help out with the students today. Like they wanted to know a little bit about all the resident’s conditions and stuff, so I just set them up on my [System Y], and they sat on there for a couple of hours and they really enjoyed it. Say a thing, they were able to find out everything they wanted to know about all the residents as well. – PCW 150

4.4.6.2 Negative impacts

Because System X was out-of-date, new users could not get new accounts to log into the system. One manager from Organisation 1 reported the difficulty of educating new recruits in how to use the system. This feedback was contrary to the educational benefit which was mentioned in the previous section.

> As I said, new users can’t be taught to use it because they can’t get a log in because there’s no room for them on the database. – Manager 63
4.5 **Realisation of benefits**

Various factors contributed to the realisation of the benefits discussed in the previous sections. The factors were categorised into three interconnected and interrelated groups: the nature of the EHR systems, the way the system was used by the staff and the way that realisation of one benefit often led to further benefits.

4.5.1 **Nature of EHR systems compared with paper-based records**

This section includes discussion on the ease of learning and use of the EHR system and the customisable nature of the EHR. Regardless of their age or computer literacy level, all participating care staff felt they had benefited from the ease of learning and use of the computer system. As the EHR system was user-friendly and self-explanatory, it did not take long for the trainer to teach and the user to learn. Some care staff members reported that they could use it the first time they logged in, without any orientation. As the documents and charts were logical, staff had no problem understanding and following through. Another aspect of the electronic system was the flexibility for authorised staff to customise the system. This meant that there was autonomy for each organisation to design and update its own forms.

*That has been more of an in-house update, not something that [the EHR vendor] did themselves... [person B] actually designed the form like our shift handovers, and actually put it into [the aged care EHR system]... and we use it to communicate any changes to the managers. – Other 535*

EHRs are more legible than paper-based records because printed text is easier to read. The digital storage media reduced paperwork and the real-time system was internet-based, thus enabling quick data retrieval and transfer.

4.5.2 **The way the system was used by staff**

Certain benefits occurred because staff members were more willing to enter data into the EHR systems than writing on paper. They accessed related records to learn how to deliver care for similar cases and tracked the clinical indicators for further studies and care quality control. For example, staff could take photographs of wounds and store them in the system, so that they would be able to email outside health care providers and receive a quicker response. These actions greatly improved communication. With the assistance of the system, the staff also thought more critically, rather than mechanically following the workflow
without thinking why they needed to do what they were doing or how they could improve the services they were delivering.

‘The strengths are that I can read back on the progress notes to see what’s happened to people for the last few days...you hope it’s all there and everyone documents as well all the time.’ – RN 171

‘It [the aged care EHR system] makes it very easy to be able to use their critical thinking if they use it properly...all the information is there. If they think to read the progress notes for the last 3 months or categorised them according to what they want to review, look at the assessments and see if there is a decline or increase then it does allow critical thinking.’ – Manager 221

4.5.3 The realisation of one benefit often led to further benefits

The flow-on effect of realising a benefit included the ability of the staff to enter data quickly, which, in turn, enabled them to record data immediately rather than at the end of a shift. This led to quicker and better care decisions based on more timely and complete information. Managers realized the benefits of reduced administrative load as they spent time at the start of a shift to review and audit EHRs to gain an accurate picture of what was going on in the facility. This enabled them to provide more specific, accurate directives to the whole care team.

4.6 Causes of negative impacts

Three factors were considered to result in negative impacts in introducing EHR systems in RACFs: problems of the EHR system itself, technical problems with third party products, and the inadequacy of system introduction.

4.6.1 Quality of the EHR systems

Not all care staff members perceived that the EHR software was easy to learn. There were 10 care staff members (9%) who said that it took them more than a month to gain confidence in using the system. There were some essential data that were recorded in the paper-based system, not in the EHR system, causing inconvenience in using the data. In addition, care staff members considered the design of some user interfaces untidy and confusing. Some of them also felt frustrated with the slow running speed of the EHR systems and system crashes.
My concern with [System X] is that not all assessments or forms are there. Some of the forms are irrelevant and we don’t use them...Some of the forms on [System X] we do not utilize them last year because it was too confusing to be doing ACFI behaviour assessment and also use this one. – Manager 17

Implementing an EHR system in an RACF involved the establishment of technical infrastructure, including wired and wireless network and hardware devices. It was suggested that the devices should be placed at a location convenient for use. The reported technical problems of the third party products included server shut down, computer crashing or running slowly, network failure and the occasional power failure.

*When the system’s down there is a weakness. And it’s happened a few times. It’s a pain. Sometimes it runs slow.* – PCW 193

### 4.6.2 Inadequate approach of introducing EHR systems

Some care staff members believed that staff members were not fully trained and supported. There was inconsistency in health records and there was also room to increase the adoption and use of the EHR system in RACFs. Lack of training and support was frequently mentioned by care staff members.

*I don’t think the current lot of new staff are given enough training when they are coming through.* – PCW 104

*We had basic training at orientation, which at the time I felt it wasn’t enough.* – Other 130

*No, when you would like it to be done there and then, it is not easy [to get help].* – EEN 39

In addition, it was reported that the inadequate implementation strategies might also cause negative impacts. For example, several versions of the same EHR system were used in various RACFs belonging to the same organisation. Another example was the implementation of the system in one wing of the facility building while the other wing continued paper documentation. They were considered difficult to manage, which could impede comparison of data captured in different facilities.

*It was very difficult as a site having one wing having [System X] document and one wing with paper based document because all our AHPs coming on site and*
for me trying to access residents records its easier for us to be systematic throughout the whole facility doing the same thing. – Manager 18

I ordered the forms and charts [from other facilities]. Different facilities are using different versions of [System Y]...when I’m auditing someone else’s progress notes and doing clinical research and I have to think, what version are they using? Are they using the old version, the new version? That’s what can be time-consuming on my part. – Manager 129

4.6.3 The way the system was used by staff

Some care staff members believed the realisation of benefits was hindered by the inappropriate way the EHR system was used for documentation by some staff members and the lack of understanding of the importance of using the system to its full potential. However these opinions may also reflect the problems mentioned in Section 4.6.2, the lack of training for staff to use the system as well as to document resident records appropriately.

I don’t think the staff are properly using it [System X] because of the fear they haven’t got time... because they haven’t been taught properly. And not everyone is computer literate. – Manager 43

I don’t believe they have the full understanding of the importance of using [System Y] to its fullest...I mean I know they do a lot of things for the residents, but in terms of documentation it doesn’t match up. It doesn’t reflect the good work that they do out there. Hopefully that will improve. – Manager 80

One example of the inappropriate use of the system was failure to log out by staff members while delivering care services to their residents. Another example was hardcopy care plans which were not updated in a timely fashion being placed in words while the care plans in the EHR system were continuously updated.

4.7 Summary

This chapter presented the results of the content analysis of the impacts of introducing the EHR systems in the participating RACFs in this study. Both the benefits and negative impacts have been described.

The impacts can be divided into three categories according to who was affected: the aged care staff, the residents and the RACFs. There were 13 categories of impacts in total. The
perceived impacts on the aged care staff were convenience and efficiency in data entry, distribution, storage and retrieval; access to aged care EHRs; more information to better understand the residents and care services, to support peer learning and facilitate performance appraisal for managers; staff attitudes toward using the EHR systems; and empowering care staff. The perceived impacts on the residents were the quality of care and enabling better communication between care staff and residents. The perceived impacts on the RACFs regarded information management, the communication system, access to funding, facilitating care quality control, the work environment and educating practice nursing students and new staff members. Under each category and subcategory, the findings were described with original oral descriptions presented in quotations as supporting evidence.

The factors that led to both benefits and negative impacts were also examined and classified. The factors resulting in benefits were the nature of EHR systems in comparison with paper-based records, the way the system was used by staff and the flow-on effect where realisation of one benefit often led to further benefits. The factors resulting in the negative impacts were the quality of the EHR systems, inadequacy of their introduction and the way the system was used by staff.

The next chapter will present the perceptions of care staff members about how to improve the strategies for EHR system introduction in order to overcome the challenges.
Chapter 5  Implementation strategies suggested by care staff members to overcome negative impacts of EHR systems

When discussing the factors causing negative impacts, some care staff members mentioned the circumstances when the negative impacts occurred and provided recommendations about how to eliminate the negative impacts and improve performance of the EHR systems. There were 308 entries from 83 care staff members (75%) which provided various recommendations for system improvement and implementation strategies. This chapter will present these recommendations. They were grouped into three categories: hardware allocation, additional useful system functions and user interface redesign.

5.1 Hardware allocation

65 entries from 40 care staff members (36%) discussed issues related to the allocation of computer hardware including problems of related hardware as well as suggestions for improving hardware allocation and maintenance. These suggestions were grouped into three sub-categories: the kinds of devices the staff preferred to use, how many computers the staff needed and where the computers should be placed.

5.1.1 The kinds of devices preferred by staff

During the interviews, 28 care staff members (25%) discussed the devices they usually used and preferred to use for documentation. A PCW reported that in her facility, there was an unwritten rule that PCWs used laptops and RNs used desktop computers. But the results showed a few PCWs also used desktops. 12 care staff members (11%) were using or preferred to use a desktop computer because they were more comfortable with a big screen, a mouse, stable performance and smooth operation.

*I prefer to have a mouse and the small computers, to me, are too small, I can’t use them.* – PCW 99

Two PCWs expressed their preference for using a paper note pad to record at the point of care because they were used to carrying it around and it was convenient, however 11 care staff members (10%) preferred to use devices such as laptops or tablets because they could
carry the device while moving around. Other mobile devices, including a computer on wheels and a palm pilot, were also suggested by care staff members as their preferred mobile devices. Height-adjustable computers were also suggested by one care staff member.

To take a new admission to take a laptop to the bedside would be fantastic. So it would be wonderful to have laptops, so we could access that. – Manager 420

5.1.2 How many computers were needed?

There were 20 care staff members (18%) who reported on the current number of computers in their RACFs or the number they would like to have. 11 of them suggested that they needed more computers so that they could document more frequently. Nursing managers, RNs and AHPs could occupy all of the laptops or desktop computers at the same time, leaving PCWs without access to any devices. PCWs thought that having at least one computer or laptop on each floor in each wing of the building was the minimum requirement. It was important to ensure the availability of at least one computer all the time for staff to access the EHR system.

[I document] in the nurses’ station. Well at least I would like to have one [computer] of my own. – Other 224

I would say both, [lack of] equipment and time...Maybe [we need] one more [computer] on each floor. – PCW 175

There was no final conclusion about the exact number of computers that an RACF needed. The number of computers staff needed varied among RACFs according to the number of staff and their documentation habits.

5.1.3 Placement of the computers

The computers were usually located in nurses’ stations and offices, however 11 care staff members (10%) suggested other locations. Apart from the suggestion of evenly distributing the computers in the building, an overwhelming majority suggested placing the computers in quiet areas so they could sit down and concentrate while entering data into the system, especially for lengthy documentation. This would be conducive to reducing time on documentation. On the other hand, even though more computers were needed, there was sometimes no room to place them. One manager suggested that computer space may need to be considered in the designing of an RACF.
So a couple more [computers] in quiet areas would be good. Like when you’re doing normal notes or progress notes on the floor, it’s not a problem. But when you are doing a long job, it becomes a problem. – PCW 570

5.2 Useful additional or improved functions and user interface redesign
47 care staff members (43%) suggested additional useful functions and user interface redesign issues 75 times. The main functions which were considered useful to add included certain types of electronic forms, functions which could support care plan development, quick location of certain sections of a form, interoperability, report generation, trend prediction and a spell checking function. Staff members’ suggestions about user interface will be discussed next.

5.2.1 Additional electronic forms
23 entries from 16 care staff members (15%) mentioned this problem. More than half of them came from Organisation 1 because handover functions and the ACFI assessment forms were not built into System X even though these two functions were essential. Care staff members felt strongly that these were necessary. There was also a variety of additional forms suggested. These included fall risk assessments; medication management charts; an electronic version of the maintenance book; restraint charts; urinary output charts; pain assessments and particular forms for AHPs such as initial physiotherapy assessments, leisure interests for diversional therapists letters and lifestyle assessments for RAOs. It was suggested that the forms or functions in the EHR system should be continuously updated to remain relevant to the needs of recording daily care routines and outcomes.

So unless there can be a handover, using [System X], I don’t think it would improve things straight away. – RN 256

A few charts we do, that would be to say the restraint charts, the urinary output chart, pain assessment chart that we use. The output chart on [System Y] would be awesome. – PCW 453

5.2.2 Care plan development
Seven care staff members (6%) suggested that the procedure for the development of the electronic care plan could be improved. One RN wished to switch care plans among the residents and copy useful information from one resident to another who needed similar care
One PCW and one manager wanted to see related information that had already been entered into progress notes in the EHR system be automatically populated into the care plan page. Resuscitation and safety issues were suggested as additions into the EHR system during the process of care plan development. In one physio assistant’s opinion, the electronic care plans could be shorter and more concise, so that RNs and nursing managers could evaluate them more quickly and easily.

*I would like the progress notes to go into the care plans because a lot of the behaviours are captured in the progress notes. So for instance if a pain chart hasn’t been done it is not captured in the care plans.* – PCW 276

*I would like the system to automatically generate a care plan based on what is already entered into the system about one person. Because all the information is there but we then still have to put together the care plan. That would be fantastic, and it would save so much time.* – Manager 305

Another manager reported that the system did not change the review date of a care plan when she evaluated it. The only way of updating a care plan was to create a new one, however it was difficult and time-consuming to do that because when she wanted to refer to the original care plan, she had to go through the archives. The manager expressed the view that it was easier to review and update a care plan on paper.

*…on the paper-based you would have your list of evaluations, and you can see where it has been crossed out, and the number of times a person has been to a specialist has been recorded and when they had been to a dentist. It was easy to determine when they needed to go to the dentist next.* – Manager 325

### 5.2.3 Quick location within the form

One RN expressed her frustration because she perceived that the layout and design of the forms had slowed her down:

*[When] moving between say each bowel chart, you have to go a long way round instead of having a quick link in between.* – PCW 588

Eight care staff members (7%) expressed their need to move quickly from the current view to any information they would like to see. The needs could be: moving to another resident’s information within the same type of form/chart; jumping to another section within the same form by either keyword search or initial letter of the name of the section; or scrolling
backward to the information on the same type of form/chart for the same resident at the previous date by simply clicking a button on the screen.

5.2.4 Interoperability

There were also other useful suggestions to improve the convenience of the EHR systems. Three managers and one customer service officer mentioned their concern with the poor interoperability of the EHR systems with other IS systems used in the organisation. They suggested that the outside health care providers, especially the GPs, would like to access the aged care EHR system as it would be easier for the GPs to input data from their own system and so that aged care staff members could access the information in the aged care EHR systems.

Another manager wanted to access to the system when she accompanied a resident to hospital and wrote the progress notes the same day, however she could only write the notes when she came back to the aged care home. Establishing interoperability between the aged care EHR system and the IS in a hospital could be one way to solve the problem.

As technology expands I think [the EHR system] should hopefully expand and I guess link in with other allied health and doctors and things like that. – Manager 279

5.2.5 Report generation and trends prediction

A physiotherapist assistant expressed her hope that the reporting and graph generation functions could be improved. A report or graph generated as a Microsoft Excel spreadsheet would be preferred. Managers had to review a large amount of documentation to find information. Two managers suggested a function which could show a trend or a pattern from the change of patient data (e.g. weight) during a certain period of time.

...when you are looking at weight, you can’t easily see oh they have lost half a kilo in a week. Sometimes it’s difficult to have to click through a dozen pages to find the information. If some information was all on one chart that would be better. – Manager 326

5.2.6 Changing records and tracking the changes

As mentioned in Chapter 4, care staff members held different opinions about whether the saved records in the system should be changeable or not. Some of them suggested that once
the records were saved, they should not be able to be changed, while others thought that such changes could be enabled as long as there was a track-change function. This function should be able to record who changed the information and how the information was changed. A duplicate or wrong form which was entered accidentally should be able to be deleted with a comment such as ‘written in error’ added by way of explanation.

Once the notes are logged on and they’re set they can’t be changed but they can be added to, and if you load up the wrong notes for the wrong resident you just put into the old notes ‘written in error’ and then you go into the new notes so you leave a clear trail of our work and how we’ve done it. And if we’re not sure then they can show us and help us. – PCW 559

5.2.7 Spell-check

Seven care staff members mentioned they would like to have a spell-check function in the EHR system. One reason was that spell-check could save care staff members’ time spent proof reading and changing wording and it would also be convenient for care workers who have a lower level of English literacy.

Then only problem I think which is people’s spelling...also when you are typing really quickly, the fact it doesn’t give you a line when you spelt something wrong like in Word. – Other 578

5.2.8 Other additional functions

Documentation at the point of incident was mentioned as a useful function by one manager. She recommended implementing buttons in residents’ rooms to automatically record the incidence of falls, including time and patient’s name into the related documents. The difficulty of having and following up signatures in the EHR system was mentioned by one manager and one RAO. It can be seen that this problem merits a solution in future.

Like in older times we were told to put your name, and then your signature and then your designation. These things don’t happen with [System X]. – Manager 146

Another manager suggested a form validation function when care staff members filled in charts and forms. There are a number of blanks in charts and forms which could be defined as required fields which must be filled before the form can be saved. In addition, some
documents could also be defined as required to be created or updated after a certain period of time. If they were not finished in time, the system could notify the care staff to do it. This function would be useful when managers reviewed the documentation.

*Perhaps if a progress note hasn’t been filled in after a certain time, a notification would pop up, or an alarm or something; or something like blood pressure, if somebody’s blood pressure is not put in, it will alert us...That would be good rather than me having to manually double check to make sure everything is filled in; or something like the program restricts you from filling in your progress notes until other important tasks such as blood pressure have been recorded.* – Manager 349

After a system update, a manager found one of the useful functions had disappeared. The information in assessments used to be linked with the progress notes and she would like to see it reinstated.

*I mean before the [System Y] upgrade a lot of the assessments we did were directly linked with the progress notes, and now it’s not and I don’t like that.* – Manager 341

### 5.2.9 Redesign of the forms

During the interviews, care staff members complained about many problems using the system. One PCW reported that the place where they needed to enter the information was ‘odd’, while another manager thought the forms were too long, and could be simplified. It is important to understand care staff members’ information needs and design the forms based on those needs.

There were four care staff members at different levels who raised problems with filling in the forms. The options in the assessment were too ‘black and white’ to represent a true picture of a resident. Many options in draw-down lists were inappropriate in the pain and wound chart. And free text was not allowed to be inputted in this kind of field.

*For example with wound care it simply says what colour is the wound – red, yellow or black. That was all the information you could provide...you often can’t put your own information in.* – Manager 324

Another manager pointed out that after a system update she could no longer see at a glance who had wounds, so they stopped using the charts in the system.
For example the sacrum... that's one of the biggest wounds and we can't even click on it. We go back to the C11. – Manager 371

These were problems that needed to be improved in the EHR system.

5.3 Implementation strategies and actions

174 entries were collected from 73 care staff members (66%) who made suggestions about implementation strategies and actions, including training, support and other actions that could have been taken to facilitate the implementation process. These quotations were grouped and discussed in four sub-categories: more training is needed, the type and form of training, who can be the trainer and the need for support.

5.3.1 More training needed

There were 18 care staff members (16%) who reported that there was a lack of training for staff. 15 of them were from Organisation 1. Individuals reported that they had not been trained since they joined the organisation and that they learnt by themselves or by asking other staff. More training was required for new staff members and those who were not computer literate. When new functions were added into the system, training was also required on the floor. Because of the lack of training, staff members might input inaccurate data or create redundant forms.

5.3.2 Type and form of training

28 care staff members (25%) commented on the type and form of training. Suggested types of training included mandatory basic training and on-going follow-up training. Basic training was identified as essential for newly recruited staff. The RACFs should provide training based on the need of care staff members. The content of training which was perceived to be helpful included training related to the EHR system operation as well as computer skills, English language skills and documentation skills. Staff members did not fully utilise the system because of dissatisfaction with the quality of the system as well as a lack of ability to use the system.

The need for follow-up training was highlighted by 18 care staff members (16%) for the purpose of refreshing staff knowledge of the functionality of the EHR system and learning the new updated functions. Managers believed that every care staff member should take follow-up training.
The training could take place in the form of training classes or one-on-one training. It was reported that some staff missed out on training classes because they were on leave or too busy. Thus a care staff member suggested a smaller training class would give better flexibility for staff members. It was suggested that the content of training should meet the needs of staff members from different job roles and job-related skills. One-on-one training was conducted in all participating RACFs and it provided maximum time flexibility.

The managers in Organisation 2 printed the blank electronic forms on paper to show the staff members how the electronic forms would look. It gave staff time to get used to the new format. This was noted as a successful strategy for increasing care staff members’ familiarity with the EHR system at the beginning. A self-directed workbook or handouts about the EHR system instead of training were also welcomed by two care staff members. In addition, training on an e-learning system was suggested by one care staff member.

[For] staff who have never written a progress note, staff that have never even turned a computer on, how to log in to a computer...I mean they should have done a basic skill typing course or something like that before we implement this...There needs to be a lot more pre-training. There needs to be a lot more thought about people who have never used computers, people who have never written progress notes. – Manager 282

I think because [System Y] is continually changing, little things change all the time, they could do with having more refresher courses...they are not often enough. There are update courses probably once a year...I think we could use it a lot more efficiently if we had more often refresher courses. – Other 458

5.3.3 Choosing appropriate trainers

All participated RACFs adopted a train-the-trainer strategy. There were approximately five staff members in each of the RACFs who became the pioneer coach or trainer in the three organisations. They were either volunteers or chosen by the organisation based on the results of a computer skills test. The criteria of appointment as a pioneer trainer were self-reported high computer literacy and interest in learning the system and helping others to learn. On the one hand, it was reported that the person’s job role or educational level was not a crucial factor for being a successful trainer but on the other hand, two managers preferred to choose RNs to undergo train-the-trainer course and teach everyone else. This was because RNs were
the group of people who might be less computer literate, but were clinical leaders on the floor who had more documentation tasks and also better knowledge about nursing documentation.

One manager and one RN from Organisation 2 complained that the staff could not concentrate on the train-the-trainer course because they still had to complete their daily jobs, whereas in another facility belonging to Organisation 3, the selected trainers and coaches were off duty to attend the off-site training full time, while all the positions on the floor were filled.

What we haven’t done is just allowed time for staff to concentrate on training on [System Y]. I mean they have had to fit it in with their daily tasks. – Manager 281

5.3.4 Support needs

The results show that care staff members had a strong need for support in using the EHR system. There were 33 entries from 28 care staff members (25%) which discussed the support issue. The interview results suggested that there was a good culture of peer and supervisor support in the participating RACFs. The pioneers who went through the train-the-trainer course as well as the other staff members who used the system well provided support to their co-workers. When there was a problem that was outside a normal system user’s understanding, the care staff would report it to the IT support staff in Organisation 2 and 3. The IT staff managed the relationship between the organisation and the vendor of the EHR systems. The interview results suggest that the staff members in Organisations 2 and 3 were satisfied with the support from the IT services in their organisations.

The important thing is once it’s implemented and has gone live, you’re very careful about your support, because that’s when people will come for you and look for that. – Manager 288

In Organisation 1, however, there was no support from the IS services and no contact with the EHR system vendor. The staff members from all levels expressed strong feelings of helplessness in the face of the lack of support and failure to update the system. They were frustrated with the ignorance of the IS Services about the EHR system that had been introduced and used in the RACFs.

No when you would like it to be done there and then, it is not easy [to get help]. – EEN 39
If you’ve got a problem and you can’t quite connect [to IT support], I’ll ask my partner for the day. – PCW 115

The corporate doesn’t understand. Nobody there understands [System X] and how to do it apparently. Yeah so that’s frustrating. That’s one of the difficulties I have now. – RN 194

None of the technicians know how to fix things now. We can’t have any users now, because they’ve filled up the new users. – Manager 209

5.3.5 Other suggested implementation strategy improvements

Nursing managers were asked to share their experiences and make suggestions for improving the strategies for implementing a similar EHR system in the future, other than training and support. 22 quotations from 15 managers (14% of the care staff members) as well as a few staff members in other positions from the three organisations were collected. Care staff members from the same RACF with the same implementation process made similar suggestions.

The care staff members from Organisation 1 had experienced the confusion and difficulty of managing an EHR system in one section and using paper-based nursing documentation in another section and having half of the forms and charts on computer while the other half were on paper. They suggested that the EHR system should be implemented throughout a whole site and with all forms and charts integrated into the system from the beginning.

The care staff members from Organisation 2 and 3 provided suggestions about change management. First, a plan should be well designed. It was considered important to ensure that different wards in the same RACF had the same goal and moved at a similar pace. Second, the speed of implementation should be driven by the local situation, not mandated and standardised. A steady but not too slow progress was suggested. The managers from Organisation 3 agreed that it would be better if the progress notes and assessment functions could be introduced either simultaneously or closer together. Meanwhile, in Organisation 2 and 3, it was perceived that implementing the system concurrently with other organisational change initiatives could be confusing. A clear cut-off date for paper use was set in two RACFs in advance and the whole care team was notified. This was seen as a good strategy to give staff members time to be prepared and ready for the new EHR system.
Commit to the communication, making sure that there is a process. Not that one person is saying one thing and then another person says another thing. There is actually a bit of a plan. – Manager 289

We need a little bit more time to get used to the forms, and to learn basic computer skills and how to use emails, so they learn how to talk to each other. – Manager 332

They [the care staff] had no choice they had to use it [the EHR system]. From a certain [cut off] date we went live on [System Y] and all progress notes had to be entered into [System Y] from that date. – Other 461

The managers in Organisation 2 shared a top-down strategy in their introduction of the EHR system. The corporation provided funding support for the provision of training and professional support by the EHR vendor. The facility managers strongly pushed the introduction of the EHR system by setting up the benchmark and measurements for the care staff members to conduct electronic recording. The effort was made to link EHR and funding together in the staff members’ mind and closely monitor the quality of records. Friendly competition in EHR implementation was encouraged among the RACFs belonging to the same organisation.

We really had to push it strongly through. We had been measured and benchmarked against all other facilities within [Organisation 2] to assess how we were going at putting out care plans on. We were being monitored closely and we were doing well. So we just had a real big push and got it done. – Manager 355

5.4 Summary

This chapter presented recommendations by care staff members for the improvement of the EHR implementation strategy. The strategies for improving the accessibility and usability of the hardware were using devices with stable performance and smooth operation, either a PC with a big screen or a mobile device that could be easily carried; installing an adequate number of hardware devices based on the number of care staff members and their documentation habits and evenly distributing the PCs in quiet areas.

The additional functions and improvements suggested included mandatory electronic forms, care plan development, quick location of, and within, the form, interoperability, report
generation and trend prediction, changes and tracking changes to the records, spell checking and other useful functions. The aspects of user interface that could be improved to facilitate documentation included simplifying the electronic forms based on the real information needs of care staff members, placing useful information on one screen for care staff member to access information at one time; and optimising options in draw-down lists.

The recommendations by care staff members to improve strategies for the introduction of similar EHR systems in the future were: organising more training based on staff members’ various documentation skills and computer literacy to facilitate their adoption of the EHR systems (both mandatory basic training and frequent follow-up training where required); one-on-one training to provide flexibility in staff training – RNs could be suitable trainer candidates, and other trainers could be either volunteers or chosen by the organisation based on the results of a computer skills test – working closely with IS staff; implementing the same version of the EHR system in all sections within the same RACF as well as in all RACFs in a region that belong to one aged care organisation; implementing the processes from the top-down and ensuring it is well planned and implemented at a steady but not too slow pace.
Chapter 6  Discussion

This chapter will first discuss the contribution of this study by comparing its findings with similar studies conducted by previous researchers; including the fit of the results with the D&M IS Success Model. It will then review the implications of the study for future EHR system design, implementation and use. Limitations of the study and recommendations for future research are also given.

6.1 The contribution of this study

The results of this study suggest that the care staff members had both positive and negative attitudes toward the introduction of two aged care EHR systems in three organisations. They thought that the system had helped to improve the quality of resident records, the fundamental communication system in RACFs. Others felt that the system had neither helped nor hindered them to improve the quality of resident records. The research provides insights into the actual impacts of the EHR systems and the causes for these. Up until now there has been little in-depth, systematic analysis of the impact of the use of EHR systems in aged care, therefore our study helps to fill this knowledge gap.

The following sections provide a comparison of the impacts of EHR systems identified in this study with those identified by previous researchers in similar studies.

6.1.1 Benefits to the aged care staff

Most benefits identified by the previous studies were also appreciated by various care staff members in this study. The first of these was easy access to data on every computer at any time the care staff member wants, and this was also identified in the previous studies (Alexander et al. 2007; Burns et al. 2007; Diment et al. 2011; Munyisia et al. 2011a). As in three previous studies (Burns et al. 2007; Munyisia et al. 2011a; Reuben 2007), quick data retrieval was also noted by different levels of care staff. Consistent with the findings by Munyisia et al. (2011a) from a questionnaire survey at one of the facilities participating in this study, the ease of both learning and using the system was noticed even by staff who initially had limited computer skills. The documentation burden on care staff members was
reduced after the implementation of the EHR systems and this was similar to the findings by Irvine and Kroeger (2010).

In addition to the benefits of data retrieval, this study detailed for the first time care staff members’ perceptions of the benefits of the EHR systems to staff members through improving the convenience and efficiency of essential health data processing, including data entry, storage and distribution. Staff members were empowered by the EHR systems because the systems enabled them to acquire a holistic picture of the residents for whom they were providing care. They preferred entering records in a computer rather than writing on paper; they were motivated by the thought that the EHR would allow them to influence the process of care decision making of other staff members because legible electronic records were more likely to be read by others.

The heavy burden of documentation in the daily work life of nurses and carers must be acknowledged (Martin et al. 1999; Munyisia et al. 2011c). Martin (2008) finds that care workers gain greater satisfaction by spending more time with the people they looked after than documenting records. With reduced documentation time, it is logical to expect a more satisfied workforce, thus better retention rates. In this manner, the EHR systems would contribute to relieving the pressure brought about by the documentation burden on the RACFs studied.

6.1.2 Negative impacts on the aged care staff

The negative impacts of the EHR systems on the care staff members identified by the previous studies were also mentioned by the participants of this study. These included: difficulties accessing in the EHR system (Burns et al. 2007), increased time (Munyisia et al. 2011b) and decreased efficiency of documentation (Munyisia et al. 2012; Sockolow et al. 2012). The causes for difficulties of access to a computerised order entry system were identified by Burns et al. (2007) as the inconvenient location of computers and technical difficulties which end users experienced in using the system. These barriers were also identified in this study. However, barriers such as the availability of pre-printed prescription paper and the location of the printer (Burns et al. 2007) were not experienced by the care staff in this study of EHR systems. The possible reason is that the only purpose for PCWs to interact with the EHR systems was to enter data into the computer. The PCWs were not often retrieving data from the computer. The more senior nursing staff, such as EENs, RNs and
managers seemed to be comfortable reading data from the computer, instead of the printed paper records. Consistent with the findings by Munyisia et al. (2011b; 2012) and Sockolow et al. (2012), some care staff members in this study felt that more time was spent on documentation using the EHR systems. Limited by their design, the previous studies only suggested a trend of increasing time spent on documentation, but unlike this study did not provide details on where the extra time was used: log-in, data entry and the data retrieval process. This information is useful for improving the performance of the EHR systems.

For the first time, this study detailed who was reluctant to use the EHR systems and why their adoption process was slower than their co-workers. GPs were perceived as a significant group of people who did not use the EHR systems in RACFs, and this is consistent with the findings of Hackl et al. (2011) in the private practice setting. A small number of care staff in RACFs was also reluctant to use the EHR systems because of a combination of factors, such as lack of computer and documentation skills, time limitations, and their preference for maximising their face to face time with residents.

6.1.3 Benefits to the residents

Urquhart et al. (2009), cited in Oroviogoiocehea et al.’s review (2008), suggested that the quality of health care is directly related to the quality of information available to healthcare workers and thus information management is essential for health care delivery. The interviewees felt that their documentation time was reduced, allowing them to spend more time with residents. This finding is similar to that found by Chau and Turner (2006). The aged care EHR systems were thought to enable care staff members to observe and prevent incidents caused by undesirable behaviour of residents, such as falls, and this was also identified in the previous study (Bollen et al. 2005). Hence, EHR systems could facilitate the improvement of aged care outcomes if properly designed and used (Celler et al. 2006; Fossum et al. 2011; Munyisia et al. 2011a).

Because of easy access to residents’ information in legible form, some care staff members believed that the EHR systems helped them to develop better care plans and they could follow up with the identified needs, make care decisions faster and responding to care needs quickly, thus delivering more resident-centred care.

Staff felt that the up-to-date information enabled them to understand what had happened to a resident and why. The high quality information enabled them to think instead of simply
following the routine workflow as they might when using a paper-based record system. The continuous use of the system had enabled staff members to better understand the holistic nature of care service delivery. This had facilitated their access to care outcomes and continuous improvement of quality of care.

6.1.4 Negative impacts on residents

The major negative impact of the EHRs identified in this study was consistent with the previous studies: increased complexity of documentation after the implementation of the EHR system, particularly when both electronic and paper-based systems were used together. This may lead to RNs spending less time with residents. Alexander et al. (2007) made a similar finding. In their study, PCWs viewed the technology as increasing their accountability and workload, while reducing time with residents. The difficulty of following up care by using the EHR systems was identified as another negative impact. Follow-up with medication is difficult because it was inconvenient for staff members to access the real-time medication information during the process of giving the medication. Managers saw a high risk of missing signatures on medication charts. There were also risks of following up the out-dated care plans which had been printed in the wards while the electronic ones were updated. If the changes on the residents’ records were not prompted or highlighted in the system, staff might not be aware and might not respond to the relevant changes in a timely manner.

Some care staff members thought their decision making abilities were no different before and after EHR implementation, as found by Munyisia et al. (2011a).

6.1.5 Benefits to the RACFs

Care staff members saw providing legible, accurate, complete and concise records as a benefits of the EHRs to the RACFs (Burns et al. 2007; Lindner et al. 2007; Munyisia et al. 2011a; Schnelle et al. 2004). There were fewer mistakes in the EHRs as it was easier to change data on computer than on paper before the data was saved. Despite the desire of management, however, documentation at point-of-care was not found in this study, although it was thought to be the most important advantage of a wireless hand-held clinical care management system in Chau and Turner’s study (2006). Due to the intense personal contact in delivering care services, it was thought difficult to use mobile devices for data entry.
Frequent audits were facilitated by ease of access to the records (Celler et al. 2006; Schnelle et al. 2004). By providing an easily available channel for all users to share and exchange accurate and high quality information, both internal (Munyisia et al. 2011a; Pierce and Fraser 2009) and external (Celler et al. 2006; Dick and Steen 1997) communications were improved. It was noted that ICT solutions offered the potential to reduce cost (Bollen et al. 2005; Irvine and Kroeger 2010). Another benefit of EHR systems to RACFs was that the storage space for paper files did not need to be continually expanded as in the past and this would be an on-going cost-saving.

The EHR systems enabled authorised personnel to customise the systems to fit the organisations’ information needs and work practices. The organisation was able to provide a better work environment to their employees by reducing the number of paper files stored. The organisation also gained educational benefits, as motivated staff members were more willing to put effort into recording, encouraged by the thought that their records would be read by their peers and managers; as well as providing a better learning experience for computer literate nursing students.

The system helped managers to monitor the information, staff performance and quality of care delivered. Communication between staff members and residents was improved by the empathetic manner staff members displayed in conversation derived from their improved knowledge about a resident gained from quickly retrieved data. Because the evidence was readily available, the systems also improved the ability of the aged care facilities to access funding.

6.1.6 Negative impacts on the RACFs

Some risks for information management using the EHR systems were identified in the study. First, different versions of electronic forms, charts and care plans were used by different RACFs in the same region of an organisation. This was time consuming and confusing when clinical nurse consultants in a facility were auditing the resident records in another facility. Second, some facilities duplicated documentation in paper and computer form until the systems were fully functional in the previous study (Alexander et al. 2007). Some organisations in this study continued to use a paper-based documentation system, and this was also found by Saleem et al. (2011). This was caused either by a lack of function in the system or because the system did not match the workflow. It increased the difficulty of
managing information. Third, decreased accuracy and completeness of resident records (Sockolow et al. 2012) were perceived by care staff members because the system did not provide adequate functionality to enable the capture of needed care information in the system. The synchronisation process transferring information from a notebook to a desktop computer was seen to be slow (Alexander et al. 2007). Internal communication was not facilitated because the care staff members still relied on verbal communication (Munyisia et al. 2011a). The negative impacts of losing human contact (Loh et al. 2009) and oral communication for sharing information among staff was reported by some care staff members in this study. In System X, the number of users that the system could accept was saturated and new accounts could not be allocated to new staff members. Given the high turnover rate of staff members in the facility, this inability of the EHR system to accept new end-users clearly posed a risk to information management in the facility.

The other negative impacts of the system included the fact that external communication was not fully facilitated by the EHR system simply because of the low adoption rate of doctors using it. It was mentioned that System X did not support access to funding as the ACFI module was not included in the system at the start. Although the ACFI module was added in the later version, to ensure the proper processing of funding claims, one organisation continued to use manual processing for funding calculations. The introduction of the EHR system required more space for end-users to use computers in the facility. It was difficult for some managers to find such space, as places for computers were not considered in the original design of the facility.

### 6.2 Comparing identified benefits and negative impacts – mixed positive impacts

In this study, both benefits and negative impacts were identified. 108 of the care staff members (98%) reported benefits while 72 (65%) reported negative impacts. Although they experienced mixed feelings with the introduction of the system, the care staff members were in general positive towards it. Table 6.1 gives an overview of the number (percentage) of participants and entries mentioning benefits and negative impacts of the EHRs.

As can be seen in Table 6.1, except in the category of staff attitudes toward using the EHR systems, more positive than negative perceptions regarding the impacts of introducing the EHR systems in RACFs were identified in this study. Only positive impacts of the EHR systems were identified in regard to the quantity of information, care staff empowerment,
communication between care staff and residents, and care quality control. Therefore, these four items were listed positively in Table 6.1. The benefits of convenience and efficiency in documentation and information management were the most significant benefits. The majority of care staff members felt that the system helped them to document in a convenient way and manage information effectively. Approximately one third of the participants agreed that the system improved their access to the documentation system. Increased quantity of information can support care staff members to understand residents’ care needs, thus facilitating communication and care quality improvement.

Both positive impacts on educating practice nursing students and negative impacts on educating new staff members were reported by one staff member. 36 care staff members reported some resistance to using the EHR system by their colleagues or themselves. 16 care staff members reported that they observed that their colleagues put more effort into inputting data in computers than writing on paper.

The result suggests a certain degree of negativity towards using the EHR systems in RACFs. According to DeLone and McLean (2003), end-users’ lack of intention to use an information system is caused by poor system quality, lack of training and support for them by IT services, and their dissatisfaction with the quality of information from the system. These three factors can affect end-users’ level of satisfaction with the system, which influences their intention to use the system.

It has been identified that the care staff members who were reluctant to use the EHR system were those above 40 years of age. This was caused by a combination of factors: lack of computer skills and documentation skills, time limitations and the preference of staff to maximise their time spent in direct care of residents. A lack of necessary skills such as computer skills and documentation skills suggest the problem was lack of training. This suggests that training programs need to be provided to system users during the implementation phase. This finding lends support to the role of ‘service quality’ for IS success, as suggested by DeLone and McLean (2003).

The quality of EHR systems affected care staff members’ intention to use the system. Shutting down of servers, small bugs or inadequate system functions all caused frustration for care staff members using the EHR system. Technical problems as well as limited accessibility of the system affected staff members’ intention to use it.
Table 6.1 – The number (percentage) of participants and entries mentioning each category

<table>
<thead>
<tr>
<th>Impact</th>
<th>The number of people (%)</th>
<th>The number of entries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benefits</td>
<td>Negative impacts</td>
</tr>
<tr>
<td>Convenience and efficiency in documentation</td>
<td>89 (81%)</td>
<td>30 (27%)</td>
</tr>
<tr>
<td>Access to aged care EHR</td>
<td>39 (35%)</td>
<td>30 (27%)</td>
</tr>
<tr>
<td>Quantity of information which can support care staff members’ work</td>
<td>41 (37%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Staff attitudes toward using the EHR systems</td>
<td>16 (15%)</td>
<td>36 (33%)</td>
</tr>
<tr>
<td>Empowering care staff</td>
<td>7 (6%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>The quality of care</td>
<td>33 (30%)</td>
<td>7 (6%)</td>
</tr>
<tr>
<td>Communication between care staff and residents</td>
<td>1 (1%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Information management</td>
<td>68 (62%)</td>
<td>30 (27%)</td>
</tr>
<tr>
<td>Communication system</td>
<td>33 (30%)</td>
<td>9 (8%)</td>
</tr>
<tr>
<td>Access to funding</td>
<td>7 (6%)</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Facilitating care quality control</td>
<td>2 (2%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Work environment</td>
<td>6 (5%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Educational impacts</td>
<td>1 (1%)</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>

The impact of information quality in EHRs on the staff members’ intention to use the system was positive in this study. For example, the legibility of EHRs significantly motivated care staff members to read the documents on computers. It should be noted that the EHR implementation was a top-down organisational initiative. The corporate offices of the aged care organisations made the decision to introduce the EHR system, formulated the policy and planned the implementation process. Use of the system was mandated and staff members had
no option but to comply. In addition, the convenience of using the computer in comparison with writing on paper made most staff members willing to transfer to electronic documentation practice. However, there is a clear acknowledgement that the quality of information reflects the capability of care staff members in documenting care, so some less than optimal records in the EHR systems were believed to have been entered by less capable staff, and not caused by the EHR system itself.

The DeLone and McLean IS Success Model also suggests that positive feedback from the use of an IS can increase users’ intentions to use the system, whereas negative impacts might reduce such intentions. In this study, many more benefits (527 entries, 108 care staff members, 98%) were recorded than negative impacts (228 entries, 72 care staff members, 65%). Therefore, it is logical to infer that the positive impacts of the EHR systems outweighed their negative impacts. Although the negative impacts discouraged care staff members from using the system, the overall benefits led to the smooth organisational transition to electronic documentation practice.

6.3 Future improvements for the introduction of EHR systems

By qualitatively gathering and interpreting care staff members’ perceptions of the introduction of the EHR systems in their RACFs, this study provides insight into future improvements for the introduction of EHR systems in other RACFs that should be considered by decision-makers in RACFs and EHR system developers. The insights were organised into three aspects: the quality of the system, the quality of services and the way staff members use the system.

6.3.1 The quality of the system

System quality is one of the independent variables that determines the success of IS according to DeLone and McLean (2003). A useful IS with high adaptability, availability, reliability and low response time will lead to end-users’ satisfaction with the system, their intention to use it and the realisation of the benefits of the system. The favourable characteristics of the EHR systems suggested by care staff members include easy accessibility, high availability, stable network connection, reliable performance, ease of use and full functionality to meet care staff members’ needs, and compliance with their work processes.
This study has identified the aspects of the systems that need to be improved. From a hardware perspective, there is a desire for handheld mobile devices such as laptop computers for accessing up-to-date information and making records at the point-of-care. It was suggested that the mobile devices could be put into a satchel leaving their hands free to care for the residents (Chau and Turner 2006). The major advantage of such devices was the high availability of offering and recording care information around the wards and potentially across facilities which could improve the timeliness of information collection (Chau and Turner 2006). Accessing data in real-time medication charts and care plans can facilitate care follow-up, however a poor wireless network frustrated users and reduced system availability. There were also problems with data synchronisation due to lost connections. Therefore, stable and seamless wireless connectivity for the passage of data in real time needed to be established (Chau and Turner 2006) to ensure system quality. Desktop PCs could be more suitable for RNs and managers who are responsible for managing information and care in the facility and have to spend time on documentation. They prefer to use a PC with high performance, a big screen and a mouse.

A lack of computers (Loh et al. 2009) was found in this study, including the reported challenges of finding a suitable location for them. Therefore site preparation, which begins by assessing facilities for any special accommodation requirements (equipment space, network wiring and end user space requirements) (Alexander et al. 2007), is suggested in the design of a new RACF. The number of computers an RACF needs varies according to the number of care staff and their documentation habits. A quite place where care staff can concentrate on documentation is required by many for optimal electronic documentation.

From a software perspective, a functional and easy-to-use EHR system is the key to realising the benefits (Yu et al. 2009). In this study, many care staff complained about system performance due to bugs, unfriendly user interface design (Saleem et al. 2011) and lack of functions (Sockolow et al. 2012) either specific for an EHR system or common functions the staff had seen or used in generic software, such as spell checking, drawing diagrams and interoperability of the EHR system with other organisational systems. Some problems can be fixed in a short time frame whereas others need structural changes in the software. Some aspects of information flow (when entering and retrieving data) in the EHR systems did not match care staff workflow. It was suggested that local customisation of the interfaces of the EHR systems was useful for fitting the system to specific workflow in an RACF, thus
improving the efficiency of nursing documentation. Customisation should also be allowed to increase accuracy and completeness of information, such as increased options in drop-down lists in charts or forms for care staff to choose.

It was suggested by the care staff using one system that there be a highlight of the latest updated information appearing in a pop-up window when a user enters information in the EHR system. This function existed in the other EHR system and was greatly appreciated by the care staff who using that system. This function can facilitate communication of key organisational messages to care staff members on the floor, who often had no opportunity to communicate with the management team in the organisation.

6.3.2 Implementation strategies and actions

Service quality is another variable in the updated D&M IS Success Model. In the study, ‘service’ for the introduction of the EHR systems includes the implementation strategy and actions, training and support mechanisms used to help care staff members use the EHR system.

To achieve optimal outcomes for system implementation, a well designed plan is required to guide system implementation (Masso and McCarthy 2009), and a top-down strategy of introducing the EHR system was perceived to be useful and effective. It was suggested that the same EHR system should be implemented consistently across different sections of an RACF, not having one section continuing to use paper and the other section using the electronic system because this will increase the complexity of information management. The version of the system implemented by the different facilities belonging to the same aged care organisation should be the same. The strong support, engagement and push from top leadership down to the floor will encourage care staff members to commit to and engage with the system (Masso and McCarthy 2009). Printing out EHR forms for staff members to become familiar with the new format was suggested by one manager as useful for them to adopt EHRs more easily and quickly.

The barriers to the adoption of the EHR systems were perceived as staff computer literacy, age, English language skills and documentation skills. Some care staff members reported that they were resistant to change, possibly due to their unfamiliarity with, or fear of, computers (Cherry et al. 2008). Therefore, an adequate training program was widely
accepted as a facilitator for the adoption of any new technology, including EHRs (Alexander et al. 2007; Cherry et al. 2008; Loh et al. 2009).

A perceived lack of both basic and follow-up training (Loh et al. 2009) was identified in this study. The PCWs were less skilled in documentation than RNs. The level of staff member adoption of the system is determined by the level of necessary skills they learned in the training session and through practice. The skills required for documenting nursing records include critical thinking skills when developing a care plan and good typing skills that help care staff members enter data more efficiently. A properly designed training program will help the end users who may be reluctant to use the system to acquire the necessary skills and gradually use the system (Masso and McCarthy 2009). To improve training outcomes, the training program should consider care staff members’ cognitive capacity (van Merrienboer and Sweller 2005).

The need for training space (Alexander et al. 2007) was not suggested by care staff members in this study. Technical difficulties increased care staff’s apprehension regarding the IS and time required for them to use the EHR systems (Loh et al. 2009). End-users could be frustrated when technical problems were not resolved in a timely manner or when there was a lack of support from technology staff (Alexander et al. 2007). A strong need for technology support by off-site technicians as well as on-site support staff was identified in Organisation 1. If the EHR system is customisable, it is suggested that the IT supporting staff can take the responsibility of customising it to meet care staff members’ needs, otherwise they communicate their needs to the vendors of the EHR systems to improve the system. In this way, the system will fit into the workflow and the documentation policy of an RACF.

6.3.3 The way of using the system

Our results provide support for the investment in aged care EHR systems and in the way staff should use them. It is suggested that staff members at all levels of the organisation should be encouraged to use the system because the more they use it, the greater the benefits they will gain from the system.

To use the system at the optimal level, the care process in an RACF may need to be re-designed (Attaran 2003). For example, for the convenience of accessing care plans, some facilities continued the practice of printing hardcopy care plans and locating them in a prominent position for easy access by the care team. The problem with this practice was that
the care plans in the EHR systems were continuously updated, whereas the paper-based care plans were left behind. An out-of-date care plan might be used as the guide for care provision instead of the updated one, and this could be detrimental to the delivery of appropriate care. This negative impact can be avoided by a redesign of the work process, for example setting up a work process whereby staff who updated the care plan in the EHR system print the new plan out and replace the paper copy immediately after each update.

6.4 Limitations of the study
One limitation of our study is that the findings were drawn from interview data which reflect the subjective perceptions of the interviewees. This, like all subjective data, would have been influenced by the experience of the individual care staff members. A mixed method study which combined objective observational research with interview study, thereby generalising subjective results, could add rigor to the research. The results were also limited by the single, aged care setting and the specific ethnicity of the sample.

Other limitations might be caused by the method of content analysis. According to Hsieh and Shannon (2005), using the D&M IS Success Model may present challenges for a researcher to approach the data neutrally. Efforts were made to avoid overemphasis on the model by focusing on the contextual evidence collected from transcripts in order to increase the conformability of trustworthiness of the results. Relational content analysis allows researchers to develop the relationship between identified concepts (Walter 2010). Beyond the relationship between the impacts and their factors, there may be interrelationships within identified factors or impacts that are yet to be identified due to the limited time frame of this study.

6.5 Future research directions
The current research has identified the benefits and negative impacts of EHR systems and their causes through systematic content analysis. Further research can follow up on how the impacts of the EHR systems may lead to other impacts. Graphical networks can be applied to illustrate the relationships of the identified benefits and negative impacts of the EHR systems.

A previous study has suggested that Australian general practice has achieved near-universal clinical computerisation (McInnes et al. 2006). GPs use clinical software for prescribing, checking drug-drug interactions, ordering laboratory tests and recording progress notes. However it was reported that most GPs did not use the EHR systems in their visits to RACFs.
Further study may focus on how to effectively engage GPs in using the EHR systems because their effective use of the EHR systems will substantially increase the benefits of the systems for providing quality care.

The methods, particularly the content categorisation system developed in this study can be applied to other qualitative studies.

6.6 Summary
The aim of this study was to identify the impacts of EHR systems in residential aged care and their causes, and to examine how to optimise benefits. This chapter discussed and compared the impacts of the EHR systems in this study with previous studies. Both the positive and negative impacts were discussed in terms of who experienced the impacts – staff, residents and organisations. A comparison between the benefits and the negative impacts in this study shows more positive than negative perceptions of the impacts of EHR systems in RACFs. Although the negative impacts tended to discourage the care staff members from using the system, the care staff members perceived that the benefits outweighed the negative impacts and were happy to adopt the electronic documentation practice.

In order to overcome the challenges and optimise the benefits, many improvements were suggested by care staff members and were compared with those gathered from the previous studies. The suggested areas for improvement were quality of both hardware and software, implementation strategies including training and support, and the way the systems should be used.
Chapter 7  Conclusion

This research aims to identify the impacts of EHR systems in residential aged care and their causes, and to examine how to optimise the benefits. An innovative use of the various functions in Microsoft Excel, including highlighting cells, data sorting, filtering, cell counting and the PivotChart, has led to the development of a content classification system. The research aim has been achieved by systematic content analysis based on methods including conceptual analysis, relational analysis, directed content analysis and constant comparison.

Three categories of impacts were identified according to who was affected: the individual care staff members, the residents or the RACFs. The impacts on individual care staff members included increased convenience and efficiency in data entry, retrieval, storage and distribution; access to the EHR system; information and knowledge growth; empowering the staff and the impacts on care staff attitudes toward using the system. The impacts on residents are impacts on the quality of care and smoother communication between the residents and aged care staff. The RACFs were affected in regard to information management, accessing funding, the working environment and educating practice nursing students and new staff members; as well as an increased ability to control the quality of care.

In this study, many more benefits (527 entries, 108 care staff members, 98%) were recorded than negative impacts (228 entries, 72 care staff members, 65%). Therefore, it is logical to conclude that the benefits of the EHR systems outweighed their negative impacts. In descending order, the top 10 frequently mentioned benefits are: quick data retrieval (mentioned by 58, or 53% of, care staff members), easy and quick data input (mentioned by 43, or 39% of, care staff members), ease of access to aged care EHR (39, or 35%), improving format of records (29, or 26%), improving content of records (26, or 24%), facilitating communication with external health care providers (20, or 18%), more information about the residents (19, or 17%), staff being motivated to enter data into EHR systems (18, or 16%), facilitating communication among the staff members (18, or 16%) and facilitating performance appraisal by the management (16, or 15%).

Electronic health record systems were perceived to reduce documentation time, and it is logical to expect a more satisfied workforce, thus better retention rates in the workforce. Therefore, the EHR systems would contribute to relieving the pressure on the studied RACFs
brought about by the documentation burden. The EHR systems also provided legible, accurate, complete and concise information to aged care staff. Increased quantity of information in the EHR systems can support care staff members to understand residents’ care needs. Also, because of easy access to high quality information about the residents in legible form, staff members believed that the EHR systems facilitated communication and continuous improvement of the quality of care. The system also helped managers to monitor the information, staff performance and the quality of care delivered.

It should be noted that the benefits were realised because of the nature of the EHR systems in comparison with paper-based records, the way the systems were used by the staff and the fact that one benefit could lead to another. However, if the quality of the systems is low; if the approach to introducing the system is inadequate, because of a lack of training or support; if technical problems of third party products happen from time to time, the aged care staff members, the residents and the RACFs themselves may be impacted negatively by the use of an EHR system.

The most obvious negative impact which has been identified in this research was negative staff attitudes toward documenting resident records in EHR systems. GPs were seen as a significant group of people who did not use the EHR systems in RACFs. A small number of care staff in RACFs were also reluctant to use the EHR systems because of a combination of factors, such as lack of computer and documentation skills, time limitation, and preference of the staff for maximising the time spent in the direct care of residents.

In order to overcome the challenges and optimise benefits, many improvements were suggested by care staff members and these were compared with those gathered from previous studies. The suggested areas for improvement were quality of both hardware and software, implementation strategies including training and support, and the way the systems should be used.

Although the negative impacts discouraged care staff members from using the system, the overall benefits led to the smooth organisational transition to electronic documentation practice.
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