Post-implementation training of eHealth services facilitating patient-provider communication: Good practices and the supporting role of software vendors

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Abstract of the master's thesis

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Abstract

Training has been identified as one of the prerequisites for successful adoption and usage of eHealth services. However, existing research primarily studies training at the time of implementation, despite the dynamic nature of eHealth services and healthcare staffing making post-implementation training similarly necessary for reaping the benefits of eHealth. Furthermore, eHealth services are diverse and their usage involves multiple stakeholders, yet current research is largely fixated on electronic medical records and the perspective of healthcare providers.

Thus, this thesis aims to expand on existing research by examining what practices promote successful post-implementation training of healthcare staff on eHealth services that facilitate patient-provider communication. Moreover, the role of software vendors in supporting such training efforts is explored.

The study was approached through a combination of empirical research and scoping reviews of eHealth post-implementation training and vendor support literature. The empirical research was conducted as a qualitative multiple case study based around semi-structured interviews with a mix of trainers (n=4) and end-users (n=4) from two cancer centers as well as customer success managers (n=2) from a software vendor.

Nine good post-implementation training practices for services facilitating patient-provider communication were identified. With regard to software vendors, the results indicated that vendors should provide support in ways that enable healthcare providers to follow good training practices, rather than primarily organising training for healthcare organisations in their stead. This general stance was fleshed out in the form of seven vendor support principles. In addition to equipping healthcare providers and vendors with good practices and principles, the thesis revealed multiple compelling avenues for future research. In particular, training related to software updates arose as a type of ongoing training that is seemingly not evident in existing research. Similarly, the study suggests that, despite typically being researched separately, implementation and post-implementation training are interconnected, with implementation training interventions having the potential to support post-implementation training as well.

Keywords eHealth, post-implementation training, end-user training, patient-provider communication, vendor support

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Tiivistelmä

Terveydenhuollon digitaalisten palveluiden onnistunut käyttö edellyttää koulutusta. Alan tutkimus pääasiassa käsittelee koulutusta palvelun käyttöönoton yhteydessä. Silti myös käyttöönoton jälkeinen koulutus on tärkeää, sillä digitaaliset palvelut päivittyvät jatkuvasti ja terveydenhuollon työntekijöiden vaihtuvuus on merkittävää. Lisäksi, vaikka terveydenhuollon digitaalisia palveluja on monenlaisia ja niiden käyttö koskettaa useita sidosryhmiä, nykyiset tutkimukset keskittyvät suurelta osin ainoastaan sähköisiin potilastietojärjestelmiin ja terveydenhuollon organisaatioiden näkökulmaan.

Tämä työ pyrkii syventämään olemassaolevaa tutkimusta tarkastelemalla, millaiset käytännöt tukevat käyttöönoton jälkeistä henkilökunnan koulutusta, kun on kyse potilaiden ja hoitohenkilökunnan välistä viestintää edistävistä digitaalisista palveluista. Sen lisäksi työ tutkii palveluntarjoajien roolia koulutuksen tukemisessa.

Työ toteutettiin empiirisen tutkimuksen sekä kahden kartoittavan kirjallisuuskatsauksen muodossa. Kirjallisuuskatsaukset perehtyivät terveydenhuollon digitaalisten palveluiden käyttöönoton jälkeiseen koulutukseen sekä palveluntarjoajien tukeen. Työn empiirinen osuus suoritettiin laadullisena tapaustutkimuksena. Teemahaastatteluihin osallistui kouluttajia (n=4) ja loppukäyttäjiä (n=4) kahdesta syöpäkeskuksesta sekä kaksi asiakkuuspäällikköä palveluntarjoajan puolelta.

Tutkimus tuotti yhdeksän hyvää käytäntöä käyttöönoton jälkeisen koulutuksen toteuttamiseen. Palveluntarjoajien kannalta tulokset viittasivat siihen, että palveluntarjoajien tulisi tukea terveydenhuollon organisaatioita hyvien koulutuskäytäntöjen seuraamisessa sen sijaan, että palveluntarjoaja pääosin järjestäisi koulutuksia asiakkaidensa puolesta. Tätä yleistä asennoitumista täsmennettiin seitsemän tukiperiaatteen muodossa. Hyvien käytöntöjen ja tukiperiaatteiden lisäksi, tutkimustulokset tarjoavat suuntia jatkotutkimukselle. Ohjelmistopäivityksiin liittyvä koulutus nousi esiin käyttöönoton jälkeisen koulutuksen muotona, jota ei nykyisessä tutkimuksessa ole erityisesti käsitelty. Lisäksi työ osoittaa, että koulutustoimenpiteet käyttöönoton aikana voivat tukea myös käyttöönoton jälkeistä koulutusta, vaikka näitä tutkimuksissa tyypillisesti tarkastellaankin erillään toisistaan.

Avainsanat terveydenhuollon digitaaliset palvelut, käyttöönoton jälkeinen koulutus, potilaiden ja hoitohenkilökunnan viestintä, palveluntarjoajien tuki

Preface

Writing a thesis can often feel like a solitary pursuit. While the main responsibility for this thesis has naturally been mine to carry, it would be far from the truth to imply that the thesis was completed by me alone. As such, some thank yous are in order.

First of all, thank you, Juha, for the interesting thesis opportunity. Thank you, Matti, for connecting me with Juha and setting me on the path.

A special thank you to my advisor, Julie, for the weekly meetings to discuss my progress and taking the time to read through my work as it evolved. Thank you to the entire design team for helping me familiarise with the eHealth service and for the fun activities and discussions along the way. Thank you, Veera, for helping me navigate the organisation and identify who to possibly interview and how to arrange it. Thank you, Kate, for reviewing my work in such a detailed manner.

Thank you, Johanna, for supervising my thesis. Thank you for providing your input, but also always challenging me to think for myself. Thank you for being available on short notice, when urgent questions arose.

Thank you to all the participants in the study for taking time from your busy schedules to share your insights and experiences with me. The work you do is important and I appreciate being able to learn from you.

Thank you to my family as well as Daniel and Rolle for pulling me away from writing and reminding me that there are other things in life than the thesis. Thank you, Jussi, for your medical advice and support, when my wrists could not handle any more transcribing.

Above all, I would like to thank my mom for keeping me (somewhat) sane throughout the process. As with anything else in life, I could always turn to you for support, advice and an ear to listen. For that I am grateful.

The thesis is now complete. Not necessarily perfect, but as complete as it can be. And if there's one thing I hope I've learned during all my studies, it is to let go of perfection and simply do your best with what you have.

Espoo, February 1, 2023

Mark Laukkanen

Contents

Abbreviations

BMT	behavior modeling training
CSM	customer success manager
EHR	electronic health record
EMR	electronic medical record
ePRO	electronic patient-reported outcome
EUT	end-user training
GDPR	general data protection regulation
LMS	learning management system
PIT	post-implementation training
PPC	patient-provider communication
PRO	patient-reported outcome

1 Introduction

eHealth refers to "health services and information delivered or enhanced through the Internet and related technologies" (Eysenbach, 2001, p.1). These types of technological services are becoming increasingly prominent, with developments such as the COVID-19 pandemic only accelerating the digitalisation of healthcare (Bestsennyy et al., 2021; McBride, 2021). Beyond just individual healthcare providers, interest towards eHealth is evident on national and global levels. Indeed, the World Health Organization has published a global strategy on digital health and notes that more than 120 of their member states have eHealth-related strategies in place (World Health Organization, 2021).

This widespread interest towards eHealth is unsurprising in light of its alluring potential. Studies have connected eHealth services with positive effects on medical outcomes and revealed them as being beneficial for small and large healthcare providers alike (Buntin et al., 2011; Kruse & Beane, 2018). Identified benefits of eHealth range from, for example, increased efficiency and patient satisfaction to improved safety (Bates & Gawande, 2003; Buntin et al., 2011; Kruse & Beane, 2018). Furthermore, eHealth offers ways of facilitating interaction between patients and healthcare providers through services like patient portals that can enable electronic messaging and sharing of information. Such eHealth services facilitating patient-provider communication (PPC) have been found to, for example, improve efficiency, care satisfaction, health outcomes and quality of life, while also reducing unnecessary clinic visits, symptom anxiety and costs (Hong et al., 2020; Wallwiener et al., 2009).

Despite all this potential, the benefits of eHealth are not always reaped. In fact, it can be argued that in the grand scheme of things eHealth has not produced expected increases in healthcare quality, efficiency and safety (Kellermann & Jones, 2013). Even high profile figures like Joe Biden, vice president of the Unites States at the time, have lamented issues with electronic health records (EHRs), for example (Bowman, 2016). There certainly are a range of prerequisites that need to be met if eHealth is to be used to its fullest potential. These prerequisites include, for example, the need for systems to be interoperable, easy to use and aligned with clinical work practices (Gagnon et al., 2012; Kellermann & Jones, 2013).

Among these prerequisites, training has been consistently identified as a substantial facilitator of successful adoption and usage of eHealth services (Ash & Bates, 2005; Gagnon et al., 2012; Lorenzi et al., 2009; Pantaleoni et al., 2015; Terry et al., 2008). Training has been connected to outcomes ranging from improved attitudes towards an eHealth service to increased usage efficiency (Samadbeik et al., 2020). Notably, however, existing eHealth training research tends to place attention primarily on training during the initial implementation of an eHealth service, thus commonly overlooking post-implementation training (PIT) efforts (see Chapter 3 for scoping reviews of existing research).

While implementation training is certainly important, the dynamic nature of eHealth and the healthcare environment make ongoing training after implementation equally necessary. Like other software products, eHealth services are updated consistently, meaning that knowledge and skills gained during implementation training may

become outdated. Furthermore, new staff members require training as part of their orientation. This is a particularly significant need in light of healthcare staff turnover rates being on the rise. McKinsey & Company report increased nursing turnover rates in US private-sector hospitals during 2021 (Berlin et al., 2021). Similarly, a survey study conducted by NSI Nursing Solutions reports an increased turnover rate for all employees at US hospitals, with the 2021 figure reaching 25,9% (NSI, 2022). According to their findings, between 2017 and 2021 "the average hospital turned over 100,5% of its workforce" (NSI, 2022, p.3). This amounts to a great deal of new employees being hired to replace old ones – employees who need post-implementation training on the eHealth services being used.

In addition to the need for eHealth training to extend beyond initial implementation, it is worth noting that not all eHealth applications are alike. There are indications that eHealth services that facilitate patient-provider communication, and are as such used by both parties, have unique training needs that must be fulfilled, if they are to be used to their fullest potential (Avdagovska et al., 2020; Bennett et al., 2012; Hefner et al., 2018; Howell et al., 2020; Sieck et al., 2017; Wintner et al., 2021). Therefore, reaping the benefits of eHealth requires an understanding of not only effective training practices in general, but also more specific nuances of training. These include an awareness of how eHealth services differ in terms of training needs and how training may be handled on an ongoing basis to respond to the dynamic nature of eHealth services and healthcare staffing. It is these nuances that this thesis seeks to shed light on.

More specifically, this thesis aims to support adoption and effective usage of eHealth by developing our understanding of post-implementation training of eHealth services facilitating patient-provider communication. The study takes a holistic approach in aiming to account for the diversity of stakeholders involved in training: beyond the trainers and end-users within a healthcare provider, the software vendor also has an incentive to ensure adoption and usage of its tool by supporting training. These aims and the multi-stakeholder perspective are crystallised in the following research questions:

1. What practices promote successful post-implementation training of eHealth services facilitating patient-provider communication?

2. How should software vendors support healthcare providers in order to aid successful post-implementation training of eHealth services facilitating patient-provider communication?

The first question looks to uncover practices and approaches that healthcare establishments may find helpful in organising training for their staff. The second question, on the other hand, shifts the focus to software vendors, seeking to help vendors with finding their role in supporting healthcare providers. Together the questions lay a foundation for undertaking post-implementation training in a way that contributes to reaping the benefits of eHealth services that facilitate patient-provider communication.

Both of the questions are approached through a qualitative multiple case study, focusing on the subjective experiences and perceptions of end-users, trainers and

software vendor staff alike. The aim is to engage the topic with a "richness and holism" characteristic to qualitative data (Miles et al., 2014, p.11). In light of this, the research questions deliberately examine success broadly, instead of defining success more specifically as effectiveness in gaining specific skills, for example, and attempting to measure it quantitatively. With this framing and the qualitative multi-perspective approach, the thesis aims to acknowledge and embrace the diversity of what good or successful training may entail for different stakeholders and individuals. To supplement the empirical research, scoping reviews of eHealth post-implementation training and vendor support literature were also conducted.

The research is generally situated within the areas of eHealth and end-user training (EUT). More specifically, however, the thesis is focused on the intersection of PIT, software vendor support and eHealth services facilitating PPC. As such, implementation training and eHealth services that are not used collaboratively by patients and providers alike fall beyond the scope of this research. Similarly, the thesis explores solely the training of staff members at healthcare establishments – eHealth training directed at patients is not examined. Finally, while the research questions are concerned with healthcare organisations more broadly, the research is undertaken in the specific context of cancer centers as the software vendor for whom this study was conducted operates around cancer care-related technology.

The thesis is structured as follows. Chapter 2 introduces the conceptual and theoretical background of the thesis. Chapter 3 presents two scoping literature reviews that synthesise existing research findings relevant to the research questions. Chapter 4 details the chosen research approach and methods for data collection and analysis. In addition, the chapter describes the research context in terms of the software vendor, eHealth service and cancer centers the study examined. Chapter 5 reports on the results of the empirical research, while Chapter 6 answers the research questions and draws practical implications for the software vendor. Furthermore, the study and its theoretical contribution are evaluated and avenues for future research identified. Finally, Chapter 7 concludes with a summary of the central outcomes of the thesis and its value for healthcare providers, eHealth software vendors and academia alike.

2 Background

This chapter introduces the conceptual and theoretical background of the thesis. First, eHealth and services facilitating patient-provider communication are defined and discussed. Thereafter, an overview of the field of end-user training is provided.

2.1 eHealth services facilitating patient-provider communication

A leading definition for eHealth is proposed by Eysenbach (2001), who describes eHealth as a field revolving around "health services and information delivered or enhanced through the Internet and related technologies" (p.1). Examples of eHealth services include patient portals, electronic medical records (EMRs) and virtual consultations. Beyond being simply a technological term, Eysenbach (2001) sees eHealth as a networked way of thinking that embraces information technology for the improvement of healthcare. While Eysenbach's definition is the most widely used, tens of competing definitions exist (see Oh et al., 2005 for a systematic review of eHealth definitions), and the term can remain hard to grasp due to its broad nature.

As such, Shaw et al. (2017) seek to operationalise the term by developing a practical model of eHealth consisting of three overlapping domains. First, *health in our hands* refers to the "personal, accessible, and mobile nature of eHealth technologies" (p.5). Second, *interacting for health* describes the use of technology for communication between health stakeholders. Third, *data enabling health* "encompasses the collection, management, analysis, and application of health data" (p.8). These three domains help describe the types of technologies and functionalities that fall under eHealth.

While other similar competing and overlapping terms, such as health information technology exist, eHealth arguably is more comprehensive in nature. For example, Kruse and Beane (2018) describe health information technology as technologies used for storing, sharing and analyzing health information. Despite generally covering similar ground as the definitions of Eysenbach (2001) and Shaw et al. (2017), the definition from Kruse and Beane (2018) fails to explicitly account for how data is collected or inputted into a system in the first place - something that the model developed by Shaw et al. (2017) includes. As the specific digital service studied in this thesis features collection of data from patients and generally aligns well with the three domains proposed by Shaw et al. (2017), the term eHealth is used in this study over other possible terms.

This thesis focuses on eHealth services that facilitate patient-provider communication. Such services include the domain of *interacting for health* proposed by Shaw et al. (2017), by enabling collaboration and interaction between patients and healthcare providers. The service specifically studied in this thesis (described in greater detail in Section 4.2.2) combines elements of two types of eHealth services that facilitate patient-provider communication: patient portals and electronic patient-reported outcome (ePRO) systems. These service types are described next.

Patient portals are systems that are linked to a healthcare provider's electronic health record, thus enabling patients to access some of the records, such as their

lab results and problem list (Irizarry et al., 2015). Patient portals may also feature electronic messaging and, for example, allow requesting appointments (Ancker et al., 2011; Neuner et al., 2015). In these ways, information travels between patients and providers and interaction is facilitated.

Patient-reported outcomes (PROs) refer to information regarding a patient's health situation, such as symptoms or quality of life, that patients assess and report themselves (U.S. Food and Drug Administration, 2009). Electronic patient-reported outcome systems enable collecting such information through digital surveys instead of on paper (Bennett et al., 2012). ePRO systems have been found to have positive effects on patient-provider communication (Detmar et al., 2002; McCann et al., 2009; Velikova et al., 2004).

2.2 End-user training

While training and education are vast areas of research of their own, the field of end-user training focuses specifically on teaching information technology-related skills to end-users, typically in an organisational setting (Gupta et al., 2010). EUT naturally draws from these wider research areas, with theories such as social learning theory (Bandura, 1971) being often cited, despite not being specifically focused on technology. The following sections examine end-user training in terms of training outcomes, methods and individual differences between learners.

2.2.1 Goals and outcomes

End-user training is not an arbitrary pursuit. Training tends to be undertaken and provided with various goals or desired outcomes in mind. Gupta et al. (2010) suggest that the "goal of an end-user training program is to produce a motivated user who has the skills needed to apply what has been learned to perform a job-related task" (p.10). This statement highlights that EUT is not solely about learning mechanical skills, but involves, for example, emotional or affective dimensions such as motivation as well as the meaningful application of what has been learnt to a particular context.

Researchers both within EUT as well as in wider training literature have sought to develop frameworks and models that categorise the outcomes of training, typically with a focus on enabling the evaluation of training programs. One of the most widely cited classifications was developed by Kirkpatrick (1970), who divides training outcomes into 4 categories: *reaction*, *learning*, *behavior* and *results*. *Reaction* is concerned with a learner's perception and satisfaction with the training. *Learning* refers to the acquired skills or knowledge. *Behavior* considers changes in a learner's behavior and the ability to apply learnt knowledge in practice. Finally, *results* describe the effects of the training on a more organisational level, for example, in terms of cost savings or improved quality.

In addition to being widely cited, the classification by Kirkpatrick (1970) has served as the foundation for many alternative models of training program outcomes. While Kirkpatrick (1970) examined general training outcomes, Mahapatra and Lai (2005) apply the model to the context of end-user training specifically. They seek to

acknowledge the growing usage of technology in training programs by expanding the original model with a new category for *technology*, referring here to how successfully technology is utilised in providing training. Furthermore, Mahapatra and Lai (2005) explicitly consider and suggest evaluating the outcomes from the perspective of three stakeholder groups: training providers, trainees and managers. Some categories can be viewed from multiple stakeholder perspectives, while others apply to a single stakeholder. For example, the *technology* category may be evaluated by training providers and trainees, while *organisational effect* (labeled *results* in the original Kirkpatrick, 1970, classification), is examined from the perspective of managers. This multi-stakeholder approach to evaluating training is mirrored in this thesis by involving trainers, trainees and software vendor staff alike.

While Mahapatra and Lai (2005) transfer the original classification by Kirkpatrick (1970) to the context of end-user training, Issenberg et al. (2005) apply it to and tweak it for a medical setting. They expand to a total of six outcome levels:

- Level 1 - participation in educational experiences
- Level 2a - change of attitudes
- Level 2b - change of knowledge and/or skills
- Level 3 - behavioral change
- Level 4a - change in professional practice
- Level 4b - benefits to patients

Perhaps most interesting in this classification is the inclusion of the patient benefit perspective that extends the range of considered stakeholders beyond the organisation in which training is happening. In addition, the model separates changing attitudes from gained knowledge and skills. Overall, then, the additions made by Issenberg et al. (2005) arguably result in a more complete and holistic typology of training outcomes. As such, other researchers have also adopted the six-level model, such as Samadbeik et al. (2020), who applied it to reviewing EMR training literature.

Even though the classification by Kirkpatrick (1970) and variations of it are prominent in training literature, they do not represent the only way of examining training outcomes. Gupta et al. (2010), for example, take an alternative approach and seek to integrate desired outcomes evident in EUT literature into four categories influenced by educational psychology and information systems research: *skill*, *cognitive*, *affective* and *meta-cognitive*. Despite the different foundations and terminology, most of the categories are reminiscent of those from Kirkpatrick (1970). *Skill*-based goals or outcomes relate to being able to use the target system, similar to *learning* in the Kirkpatrick (1970) categorisation. *Cognitive* refers to the user's ability to apply the tool to actual work-related processes and judge how and why to use the system in a contextually meaningful way - much like Kirkpatrick's *behavior* category. *Affective* outcomes overlap with the *reaction* category from Kirkpatrick (1970) with both focusing on emotional dimensions like satisfaction with the training. The final

category of *meta-cognitive* outcomes is, however, unique in examining the learner's understanding of their own learning, for example a user's judgement of their own skills and abilities.

As such, the classification by Gupta et al. (2010) does include some unique elements. It is also worth noting that even within the categories that seem to mirror Kirkpatrick (1970), Gupta et al. (2010) tend to have a wider consideration of outcomes. For example, the category of *affective* outcomes does not solely focus on satisfaction with training, but also includes factors such as motivation. On the other hand, the classification does lack some of the perspectives offered by Kirkpatrick (1970) and derivatives. Most notably, Gupta et al. (2010) focus only on the learner, with no consideration of the organisational level or the perspectives of training providers, managers and customers or patients.

Overall, then, there are many ways of classifying training program outcomes. These classifications tend to overlap on some accounts, but also often include unique perspectives that can be used to evaluate training programs or set goals for them. Just as outcomes have been actively researched within end-user training, the training methods used to reach or produce these outcomes have also received substantial attention. The following section examines training methods and their characteristics.

2.2.2 Training methods

To make sense of the breadth of training methods represented in literature and practice, researchers have sought to identify and describe central dimensions or attributes that differentiate methods. One such approach is presented by Bostrom et al. (1990), who propose two key components of training methods: *training approach* and *conceptual model*. The *training approach* can either be applications-based, meaning that training revolves around tasks and is exploration-oriented, or it can be construct-based, meaning that training revolves around system features and is instruction-oriented. The *conceptual model*, on the other hand, is concerned with how the target system is conceptually represented. Analogical models represent the system "in terms of another system" (p.104), while abstract models represent the system in a synthetic way.

Gupta et al. (2010) note based on their literature review, that historically training techniques were based on a wide range of theories, while contemporary training methods are rooted in social cognitive theory (Bandura, 1971). Bandura (1971) proposes that people learn in two ways: from direct experience and from observing the behavior of others. Learning from direct experience, also referred to as enactive learning by Gupta et al. (2010), is about observing your own actions and the feedback those actions produce. Learning from observing others, however, is the primary focus of social cognitive theory as most human behavior is argued to be learned through observing the example of others.

Bandura (1971) presents four processes that govern this type of learning: *attentional*, *retention*, *reproduction* and *reinforcement*. *Attentional* processes refer to the need for attending to or paying attention to modeled behavior in order for learning to be possible. *Retention* processes revolve around memory and the need to be able

to recollect modeled behavior after observation. *Reproduction* processes concern a learner's capacity to repeat or replicate modeled behavior. Finally, *reinforcement and motivational* processes consider whether there are positive incentives for performing learnt behaviors.

One of the most prominent training methods in literature and practice, behavior modeling training (BMT), is based on social cognitive theory and these processes. The method consists of five key components summarised by Taylor et al. (2005):

- Precisely describing for learners the skills or behaviors to be learned
- Modeling the behaviors in some form, for example a video
- Practicing the new behaviors
- Offering feedback and social reinforcement after practice
- Attempting to maximise the transfer of learned behavior to actual work

BMT has been applied to a wide range of contexts and types of skills, including training on technology use (Taylor et al., 2005).

In the conceptualisation of Gupta et al. (2010) an approach like BMT is only one part of a training method. They label this part *learning techniques*, which involves both the training materials used for training as well as the training activities undertaken. In addition to this, they propose two additional dimensions of a training method: *information technology* and *team*. These are discussed next.

Drawing upon the work of Jonassen and Reeves (1996) and Salomon et al. (1991), Gupta et al. (2010) distinguish between two types of technology use in training: *learning-from-computers* and *learning-with-computers*. *Learning-from-computers* refers to technology being the medium through which training is provided. This is commonly also referred to as computer-based training. Web-based courses or even help components within a software system supporting its use (Nelson & Cheney, 1987) are examples of this type of training. Gupta et al. (2010) state that the majority of contemporary end-user training falls under the category of *learning-from-computers*.

Learning-with-computers, on the other hand, is about technology functioning as a tool that supports training. For example, a teacher may utilise various online resources in their teaching. As such, *learning-with-computers* can pair with otherwise non-technical training approaches such as classroom training. More broadly, it is worth noting that the usage of information technology for training is not typically a binary of being either entirely technological or entirely without technology. Rather, blended training combining both approaches is evident in practice. Samadbeik et al. (2020), for example, found blended training approaches combining classroom training with computer-based training to be common in EMR training efforts.

The third and final component of a training method in the conceptualisation of Gupta et al. (2010), *team*, revolves around the different people involved in providing training. A multiple-case study of EHR implementation training by McAlearney et al. (2012) illustrates the diversity of possible training providers. Across the six examined sites, some relied on information technology department trainers and

trained super users, while others sought out support from the EHR vendor or hired temporary support staff. It is also worth noting that the *team* can involve peers and collaborative learning (Gupta et al., 2010). Indeed, educational psychologists have found peers to function as models and motivators for learning (Rohrbeck et al., 2003). These types of members of the training team are not necessarily formally sanctioned. Even the simple act of an employee seeking help from their peers can be seen as a type of self-arising collaborative learning (Gupta et al., 2010).

In the end, the three components of *learning technique*, *information technology* and *team* allow for a wide range of training methods and approaches. This diversity of potential options can be highly valuable, as the same methods may not work equally well for all learners. The next section shortly discusses the notion of individual differences between learners.

2.2.3 Individual differences

Individual differences in end-user training describe characteristics of learners that may influence learning. These differences can be categorised into *traits* and *states* (Bostrom et al., 1990). *Traits* refer to lasting characteristics such as learning style or personality. On the other hand, *states*, such as emotions or motivation, are transient in nature.

End-user training research shows such traits and states impacting learning outcomes. For example, Bostrom et al. (1990) found learning style to be connected to learning performance. Their results indicate that training methods should optimally be matched to individual differences between learners. More broadly, Gupta et al. (2010) did an extensive review of existing research on individual difference variables. The review shows not only the diversity of research on such differences, but also that many differences, such as perceived self-efficacy and motivation, have been shown to significantly correlate with learning outcomes.

3 Scoping reviews of related research

Scoping reviews are an approach to synthesising research in a way that can help "determine the scope or coverage of a body of literature on a given topic and give clear indication of the volume of literature and studies available as well as an overview (broad or detailed) of its focus." (Munn et al., 2018, p.2). Moreover, scoping reviews may be used to both identify central factors related to a concept as well uncover gaps in existing research (Munn et al., 2018).

Two scoping literature reviews were conducted in this thesis to gain an overview of existing research findings relevant to the two research questions:

1. What practices promote successful post-implementation training of eHealth services facilitating patient-provider communication?

2. How should software vendors support healthcare providers in order to aid successful post-implementation training of eHealth services facilitating patient-provider communication?

Furthermore, early exploratory literature searches indicated that there may be a lack of research on post-implementation training especially as it relates to eHealth services facilitating PPC and the supporting role of software vendors. Thus, scoping reviews were used to further probe the veracity of these early indications.

Figure 1 below illustrates the positioning of the two research questions (RQ1 and RQ2) and the conducted scoping reviews in relation to the central concepts of this study.

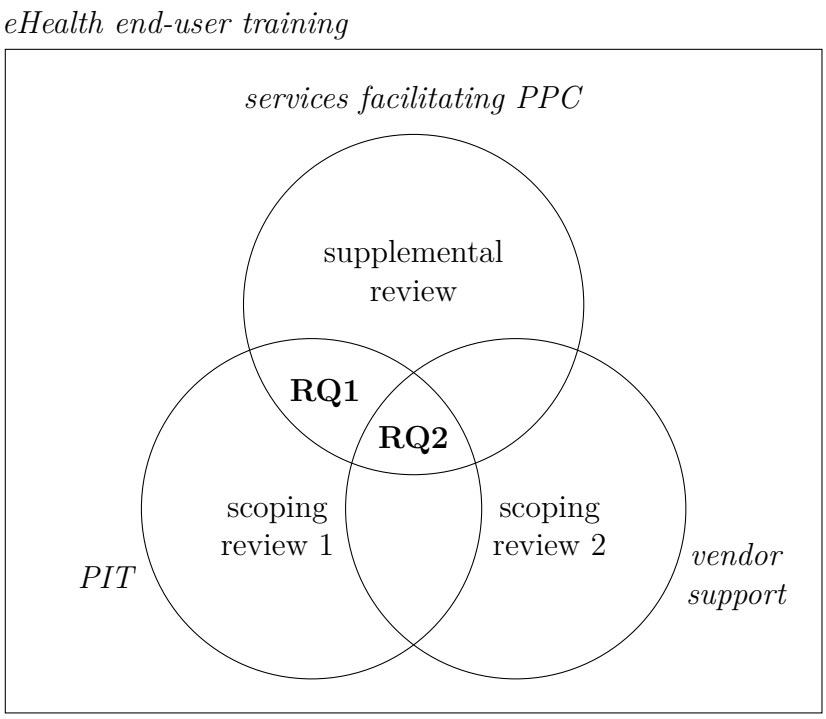

Figure 1: Positioning of research questions and scoping reviews

As illustrated in Figure 1, both of the research questions are located at intersections of concepts. However, as exploratory searches indicated a lack of research at these intersections, the scoping reviews were conducted slightly more broadly, not fixating solely on these areas of intersection. This ensured that at least some research would be found, even if the found studies would not match the questions posed in this thesis precisely in all dimensions.

More specifically, for the first research question, post-implementation training was considered to be the highest priority concept. As such, the scoping review for RQ1 was focused on post-implementation training of eHealth services in general (not only services facilitating PPC). This scoping review was then supplemented with literature on PPC service training (not PIT specifically). This supplemental review was less systematic in nature, in particular in terms of reporting, to keep thesis workload manageable. Section 3.1 below reports on the scoping review and supplemental material for the first research question.

For the second research question vendor support was considered to be the central concept. Therefore, the conducted scoping review searched for literature on vendor support within the context of eHealth training in general. This scoping review for RQ2 is described in Section 3.2 below. To conclude, Section 3.3 synthesises the examined related research both in terms of relevant findings and identified gaps.

3.1 Successful post-implementation training of eHealth services

This section begins by describing the search strategy for the scoping review related to RQ1. Then, findings of the review are discussed, in particular highlighting identified factors or approaches that promote successful post-implementation training of eHealth services. Finally, supplemental research findings on services facilitating PPC are outlined.

3.1.1 Search strategy

The literature search was run in November 2022 in five databases: Scopus, ACM, ProQuest, PubMed and SAGE Premier. Out of these, Scopus was used for initial exploratory searches that helped define and tweak search terms.

The search phrase was based on four key concepts and their synonyms drawn from the first research question: training, post-implementation, eHealth and best practices. As noted earlier, the more specific category of eHealth services facilitating patient-provider communication was left out due to exploratory searches indicating a scarcity of relevant research at this intersection area. Instead, eHealth was treated broadly including also tools used solely by providers.

To increase the relevance of search results, the four key concepts were prioritised and targeted at different search fields based on priority. For example, to ensure that training was the main focus of the found studies, the training concept had to be present in the title. On the other hand, discussing best practices and implications was deemed a lesser priority and thus was searched in any field, including the full

text. The four key concepts, their search strings and the targeted fields are presented in Table 1.

Table 1: Search strings for key concepts in RQ1 scoping review

Key concept	**Target field**	**Search string**
Training	title	training
Post-implementation	abstract	"post-implementation" OR ongoing OR refresher OR continuous OR orientation OR onboarding OR induction
eHealth	abstract	ehealth OR "health information technology" OR "health IT" OR "electronic medical record*" OR "electronic health record*" OR emr OR ehr OR "patient portal*" OR "electronic patient reported outcomes" OR epro
Best practices	all fields	recommendations OR implications OR "best practices" OR "good practices" OR effective OR success*

The titles and abstracts of the search results were examined to initially identify relevant articles. The full manuscripts of this subset of articles were then read to further confirm relevance or exclude from the review. Studies were included if they focused specifically on post-implementation training of an eHealth service and could provide implications or recommendations for how such training should be conducted. The references of relevant articles were also explored to identify additional studies. This process and the number of studies at each phase are illustrated in Figure 2. The included articles are presented in Appendix A.

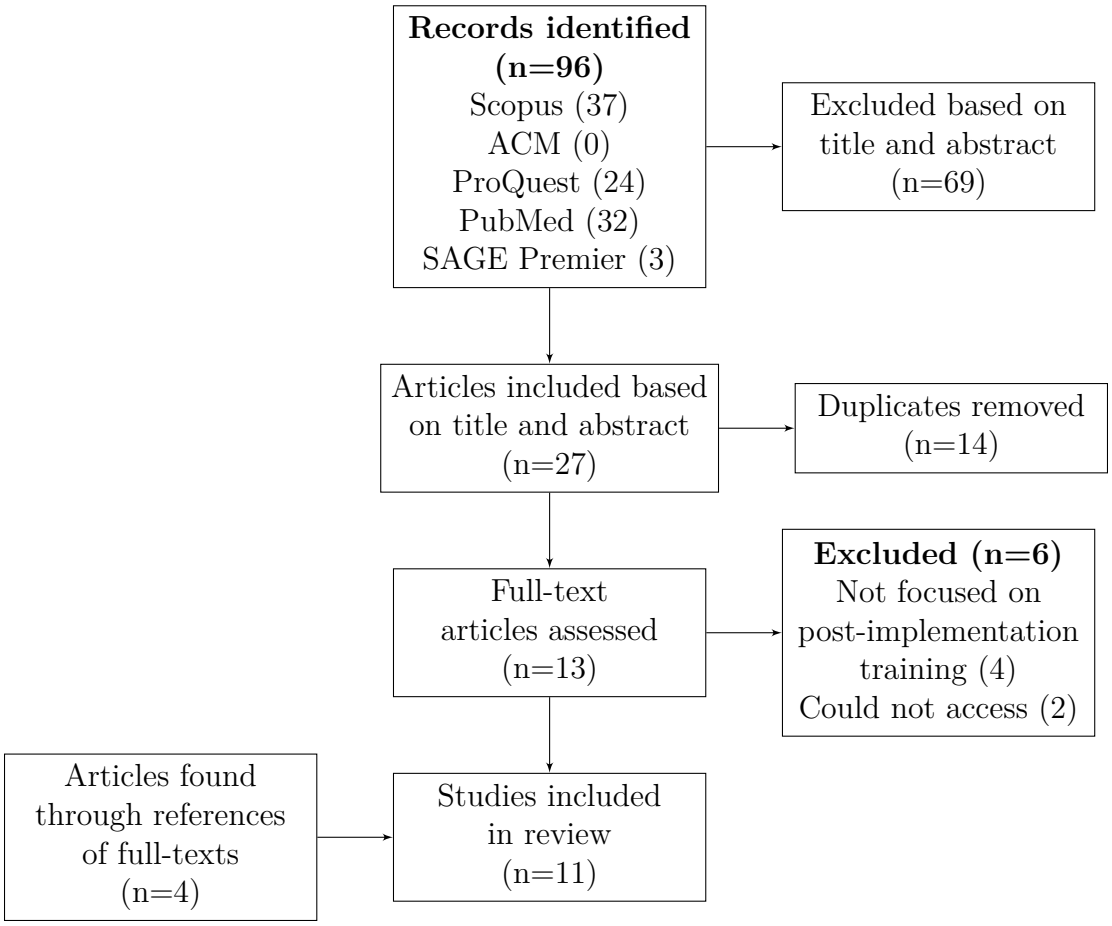

Figure 2: Article selection process in RQ1 scoping review

3.1.2 Summary of findings

The reviewed literature focused primarily on electronic medical records. Nine of the eleven reviewed studies examined post-implementation training directly related to EMRs (Alkureishi et al., 2018; Benwell et al., 2017; Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Maddocks et al., 2011; Randhawa et al., 2019; Sharp et al., 2017; Smailes et al., 2019). Furthermore, out of the remaining two studies, one explored a computer information system, which included an EMR as a component alongside, for example, email and a medical library (Kirshner et al., 2004). The final study inspected an emergency department information system (Edwards et al., 2012). Overall, none of the studies related to patient portals or other eHealth services facilitating patient-provider communication, thus highlighting a gap in post-implementation training research.

Research was spread evenly between two main types of post-implementation training. Six of the studies looked into advanced proficiency training that sought to further improve practitioners' skills with an eHealth service (Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Kirshner et al., 2004; Maddocks et al., 2011; Randhawa et al., 2019). The remaining five studies investigated training as part of new employee orientation processes (Alkureishi et al., 2018; Benwell et al.,

2017; Edwards et al., 2012; Sharp et al., 2017; Smailes et al., 2019).

The reviewed literature suggests that healthcare workers appreciate and desire eHealth training beyond what they may receive during implementation. In particular, participants in the study by Bredfeldt et al. (2013) explicitly expressed wanting training to be provided more often. Similarly, Gordon et al. (2022) found practitioners to be interested in ongoing education. The examined training course or camp was originally intended only for super users, but was opened later for others as well due to demand.

While learner appreciation towards post-implementation training was evident, there was no single dominant or superior way of providing such training in the reviewed literature. Rather, the studies reflect a diversity of approaches that function well in terms of different dimensions. Indeed, some studies evaluated training in terms of learner satisfaction and perceptions (e.g. Alkureishi et al., 2018; Dastagir et al., 2012; Edwards et al., 2012), while others examined organisational cost-effectiveness (Sharp et al., 2017; Smailes et al., 2019) or the impact of training on usage behavior or efficiency (e.g. Bredfeldt et al., 2013; Maddocks et al., 2011; Randhawa et al., 2019). As such, the reviewed studies cover most of the training outcome levels proposed by Issenberg et al. (2005), with only changes in participant attitudes (level 2a) and benefits to patients (level 4b) being omitted.

Eight successful approaches to post-implementation training, presented in Table 2 below, were identified in the reviewed literature. These approaches and the evidence for and against them are discussed next.

Table 2: Successful approaches to post-implementation training

Training approach	**Sources**
Hands-on practice	Alkureishi et al. (2018), Benwell et al. (2017), Bredfeldt et al. (2013), Dastagir et al. (2012), Edwards et al. (2012), Gordon et al. (2022), and Sharp et al. (2017)
Relevance to real work	Alkureishi et al. (2018), Bredfeldt et al. (2013), Edwards et al. (2012), Gordon et al. (2022), and Sharp et al. (2017)
Learning from other practitioners	Bredfeldt et al. (2013), Dastagir et al. (2012), Gordon et al. (2022), Kirshner et al. (2004), and Randhawa et al. (2019)
One-on-one support	Dastagir et al. (2012), Edwards et al. (2012), Gordon et al. (2022), and Kirshner et al. (2004)
Computer-based training	Randhawa et al. (2019), Sharp et al. (2017), and Smailes et al. (2019)
Evaluation and monitoring	Bredfeldt et al. (2013) and Gordon et al. (2022)
Materials and documentation	Bredfeldt et al. (2013)
Combining methods	Bredfeldt et al. (2013), Dastagir et al. (2012), Edwards et al. (2012), Gordon et al. (2022), and Sharp et al. (2017)

Hands-on practice

Hands-on interaction with an eHealth service as part of post-implementation training was valued by learners in the reviewed studies. Bredfeldt et al. (2013) found that for advanced proficiency training of an EMR, participants deemed hands-on exercises as the most helpful part of training. Similarly, Edwards et al. (2012) reported direct interaction with the eHealth service to be important and desirable for learners. Beyond these participant perceptions, Benwell et al. (2017) discovered hands-on practice in the form of real day-to-day usage to be an effective way of improving usage performance – in fact, more effective than the poorly received training intervention that was the actual focus of the study.

In addition to these direct reports of the value of hands-on training, multiple studies included hands-on practice as one component of a generally successful training approach (Alkureishi et al., 2018; Dastagir et al., 2012; Gordon et al., 2022; Sharp et al., 2017). The training in these studies was well-received (Sharp et al., 2017) and

seen as effective (Alkureishi et al., 2018). Such training was found to improve factors ranging from proficiency and user confidence (Gordon et al., 2022) to job satisfaction and self-perceived efficiency (Dastagir et al., 2012). However, as hands-on practice was not separately highlighted by participants and was just a single part of larger training interventions, it is impossible to judge its individual impact in these studies.

In contrast to these positive findings regarding hands-on practice, Maddocks et al. (2011) found training involving hands-on practice to be unsuccessful in producing desired change in EMR usage behavior. The influence of hands-on practice in particular on the lack of effectiveness is, again, difficult to judge due to it being part of a wider training intervention.

Relevance to real work

Successful post-implementation training in many of the reviewed studies placed emphasis on ensuring the relevance of training content to actual work (Bredfeldt et al., 2013; Edwards et al., 2012; Gordon et al., 2022; Sharp et al., 2017). Training in these studies focused on common workflows, tasks, processes and patient scenarios that were relevant to the role receiving the training. Bredfeldt et al. (2013) describes such relevance as being critical to the success of their training program. Similarly, Alkureishi et al. (2018) found that their training was not equally effective for all receiving roles, which was taken as implying a need for tailoring training more to each role to ensure effectiveness. Participants in these studies were satisfied with the training and the training improved feature usage, proficiency and confidence in skills. In contrast, it is worth noting that Benwell et al. (2017) found the training examined in their study to be poorly received by participants, despite it having an element of practical application. However, the details of why participants did not see the training as valuable are unclear in the paper and details are limited on the training approach as a whole. As such, specific causes are difficult to judge, but it seems unlikely that practical relevance would have been the cause of the training's shortcomings. Overall, then, the reviewed literature suggests that an *applications-based approach* (Bostrom et al., 1990) with an emphasis on relevant tasks rather than system features may be a good practice to follow.

Learning from other practitioners

Five of the reviewed studies had practitioners providing the training or being involved in designing and planning it (Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Kirshner et al., 2004; Randhawa et al., 2019). This similarity between trainers and learners helped ensure trainers had a proper understanding of the day-to-day work of learners (Randhawa et al., 2019). Furthermore, practitioner involvement could enable a sense of ownership for practitioners regarding the training and its content (Gordon et al., 2022). This type of training was connected to increased confidence and proficiency (Gordon et al., 2022; Kirshner et al., 2004), usage of specific features (Bredfeldt et al., 2013; Randhawa et al., 2019) as well as improved EMR satisfaction, self-reported efficiency, job satisfaction and work-life balance (Dastagir et al., 2012).

One-on-one support

The notion of providing one-on-one support was part of successful post-implementation training in multiple studies (Dastagir et al., 2012; Edwards et al., 2012; Gordon et al., 2022; Kirshner et al., 2004). In fact, Kirshner et al. (2004) specifically focused their research on one-on-one advanced proficiency training and found such training to be preferred by participants over classroom training, computer-based training and small group training. Moreover, participants perceived one-on-one training to be more effective than these other methods.

In the other studies, one-on-one support was simply one component of a wider training approach (Dastagir et al., 2012; Edwards et al., 2012; Gordon et al., 2022). Training resources were allocated in these studies to be able to provide one-on-one attention when necessary to individual people in a group setting. For example, the training intervention studied by Gordon et al. (2022) included co-instructors who could provide personalised attention in a classroom environment. The training in these studies was well-received (Edwards et al., 2012) and found to improve, for example, usage confidence and proficiency (Gordon et al., 2022) as well as self-reported efficiency and job satisfaction (Dastagir et al., 2012).

Computer-based training

Three of the reviewed studies explored computer-based training (Randhawa et al., 2019; Sharp et al., 2017; Smailes et al., 2019). The studies suggest that such a technological approach to post-implementation training can be valuable, especially from an organisational efficiency and cost-effectiveness perspective. Sharp et al. (2017) and Smailes et al. (2019) examine converting from instructor-led training to a computer-based learning management system (LMS) with training modules for EMR onboarding of new employees. The computer-based approaches in the studies allowed for self-paced learning and in the case of Sharp et al. (2017) participants had the option of skipping entire sections by completing a test to confirm you already possess the relevant knowledge and skills. Both studies found computer-based onboarding to be more efficient with Sharp et al. (2017) reporting an approximately 45% reduction in training time compared to instructor-led training and Smailes et al. (2019) reporting a similar figure of 50%. Beyond this efficiency, learners were satisfied with the received training. Smailes et al. (2019) reported participants being less satisfied than with instructor-led training, but nonetheless satisfied. Sharp et al. (2017), on the other hand, found participant satisfaction to be greater for learning management system courses than for instructor-led training.

It is worth noting that the studies do not necessarily imply that computer-based training is the best way to approach training in all cases. Sharp et al. (2017) specifically describe having to carefully consider which instructor-led courses were worth converting to a learning management system equivalent. This involved evaluating matters such as the amount of staff for whom a course was relevant and the stability of the EMR workflows in question.

In addition to these studies regarding conversion to learning management system courses, Randhawa et al. (2019) researched the use of video tutorials for teaching

advanced EMR usage. The created videos followed good practices for software application video tutorials and a physician was involved in their creation. Consistent with the positive picture of computer-based approaches painted by Sharp et al. (2017) and Smailes et al. (2019), the video tutorials were found to be effective in increasing advanced usage.

In contrast to these positive findings, Benwell et al. (2017) found a training intervention including some computer-based components to be seen by participants as "inefficient and of little value" (p.482). However, computer-based training was just one part of the training and with limited information on training details, it is impossible to judge the effect of computer-based elements specifically on how the training was received. As such, the reviewed literature depicts computer-based training in a generally positive light, with only a minor and ambiguous indication from Benwell et al. (2017) that such training may not always be perceived as helpful.

Evaluation and monitoring

Multiple healthcare organisations in the reviewed studies included evaluation of learner experience or ongoing monitoring of eHealth service usage as part of their post-implementation training operations (Bredfeldt et al., 2013; Gordon et al., 2022; Maddocks et al., 2011). Gordon et al. (2022) describe such evaluation and monitoring as cornerstones of the training intervention they studied – training that was successful in improving user confidence as well as usage proficiency. In the study by Bredfeldt et al. (2013), training participants were shared regular reports of their usage after training to remind participants of training-related goals and lessons and allow the participants to track their progress. The training approach was successful in increasing usage of key EMR functions. While the training in the aforementioned studies was effective, Maddocks et al. (2011) found a similar approach to produce no difference in desired eHealth usage behavior. In the study, along with hands-on activities and learning materials, feedback on physicians' current behavior patterns was provided. Notably, however, the feedback was provided a single time rather than the regular reports in the study by Bredfeldt et al. (2013). This may imply that such monitoring of usage and behavior may be more effective when done on an ongoing basis.

Materials and documentation

The reviewed literature contains limited and mixed findings on the value of materials and documentation in training. Bredfeldt et al. (2013) found ancillary materials such as quick reference guides and keyboard shortcut cards to be critical to the success of the training program they studied. Maddocks et al. (2011), on the other hand, found a training intervention involving instructional materials alongside hands-on training and feedback to be ineffective in increasing desired EMR usage behavior. Other reviewed papers mostly did not mention the usage of any materials or documentation. Nonetheless, in a more broad perspective, computer-based training materials such as learning management system modules and video tutorials can arguably be seen as training documentation, especially with the possibility to refer back to them over time. As established above, these types of interventions were found to be valuable

in the reviewed literature. Thus, overall, there are indications that materials and documentation can be valuable components of post-implementation training.

Combining methods

Most of the reviewed studies had a training program consisting of multiple different methods and approaches, rather than relying on a single method for everything (Benwell et al., 2017; Bredfeldt et al., 2013; Dastagir et al., 2012; Edwards et al., 2012; Gordon et al., 2022; Maddocks et al., 2011; Sharp et al., 2017). Training programs commonly combined, for example, observational lecture-style teaching with more active hands-on activities. On one hand, such combining of methods limits the capacity to judge the impact of each individual element, as has been evident in the previous sections attempting to examine individual training approaches. On the other hand, the general effectiveness of such combinations seems to imply that combining different training methods may in itself be a valuable approach to post-implementation training. Indeed, participants were satisfied with training that combined different methods (Edwards et al., 2012; Sharp et al., 2017). Such training was also found to increase usage of key EMR functions (Bredfeldt et al., 2013), improve confidence and usage proficiency (Gordon et al., 2022) as well as EMR satisfaction, self-reported efficiency, job satisfaction and work-life balance (Dastagir et al., 2012). This effectiveness is in tune with people learning through both observation and direct experience (Bandura, 1971) as well as the reality of individual differences between learners (see Section 2.2.3). Nevertheless, training combining different methods did not necessarily automatically guarantee success, but could also be poorly received (Benwell et al., 2017) or ineffective (Maddocks et al., 2011).

3.1.3 Successful training of eHealth services facilitating patient-provider communication

As noted above, none of the reviewed studies on post-implementation training of eHealth services covered services that facilitate patient-provider communication. Thus, a supplemental review of research on training of such services was conducted. The studies and findings discussed below do not match the focus of this thesis on post-implementation training specifically, but nonetheless provide insight on what training of eHealth services facilitating patient-provider communication may entail.

Generally, training has been found to be an important and necessary component of implementing services that facilitate patient-provider communication (Haverman et al., 2014; Laukka et al., 2020; McAlearney et al., 2021). Training of such services shares similarities with training of other types of eHealth. For example, McAlearney et al. (2012) developed best practices for EMR implementation training based on a case study of six exceptional best practice sites. Hefner et al. (2018) found most of these best practices to be applicable in similar ways to an inpatient portal facilitating patient-provider communication. Nonetheless, there are also unique dimensions and needs for training of such services to be effective. These are discussed next.

The unique training needs for eHealth services facilitating patient-provider communication naturally relate to communication. These needs can be divided broadly into those concerning digital communication and those concerning face-to-face communication that is altered or shaped by an eHealth service. With regard to digital communication, Sieck et al. (2017) found that both patients and providers require training on appropriate use of electronic messaging for communication, in order to establish shared expectations and messaging etiquette. Furthermore, they note that providers could benefit from training on how to write clear and helpful messages as electronic communication is different in nature from in-person communication.

In terms of in-person communication with patients, training on how to discuss information that has originally been shared electronically has been found to be necessary, in particular for electronic patient-reported outcomes (Bennett et al., 2012; Howell et al., 2020). In addition, the need to train providers on how to promote a service to patients and how to train and support patients in its use has been identified, both for ePRO systems and patient portals (Bennett et al., 2012; Hefner et al., 2018; Wintner et al., 2021). This entails allowing providers to interact with an eHealth service from a patient's perspective to help them understand the patient experience (Avdagovska et al., 2020; Hefner et al., 2018; Sieck et al., 2017).

Beyond these unique training needs, the actual approaches and methods found to be effective for providing training are largely similar to those identified for post-implementation training of eHealth services in general. Bennett et al. (2012) and Wintner et al. (2021) highlight the value of training being role-specific in nature and tailored to the institution in question. This is similar to the notion of training being relevant to real work, discussed in Section 3.1.2. In tune with the successful post-implementation approach of learning from other practitioners, Howell et al. (2020) found champions and peer learning to be conducive to the uptake of an ePRO system. Finally, Ly et al. (2019) recommend quizzes and immediate feedback on learning as best practices for training of ePRO systems for clinical trials. This echoes the successful approach of evaluation and monitoring discussed earlier. Furthermore, Ly et al. (2019) mention utilising more than one medium for providing training as a best practice, which ties into the general post-implementation approach of combining training methods.

To summarise, eHealth services facilitating patient-provider communication create unique training needs such as the need to understand the patient-facing elements of the service to be able to provide support for patients and promote usage of the service. However, the specific training approaches and methods that have been found to be effective for such services are similar to those discovered for post-implementation training of eHealth services that are used solely by providers.

3.2 Vendor support for training of eHealth services

Software vendors were mentioned in only two of the studies reviewed above on post-implementation training of eHealth services and training of services facilitating PPC. These references to vendors were minor with Randhawa et al. (2019) noting that video tutorials may be a cost effective way for providers to provide training

for users and Ly et al. (2019) mentioning vendor-designated trainers and learning materials provided by the vendor. In order to augment this lack of relevant reviewed literature on the second research question, a separate scoping literature review was conducted focused on vendors. The search strategy and a summary of findings are described below.

3.2.1 Search strategy

The literature search was run in December 2022 in the same five databases as for the first research question: Scopus, ACM, ProQuest, PubMed and SAGE Premier. Out of these, Scopus was used for initial exploratory searches that helped define and tweak search terms.

The search phrase was based on three concepts and their synonyms drawn from the second research question: training-related support, eHealth and software vendor. Because research found and discussed above did not contain substantial insights on software vendors, this search was broader in nature by including training and eHealth services in general, rather than limiting the search to post-implementation training and services facilitating PPC specifically.

To increase the relevance of search results, the three key concepts were prioritised and targeted at different search fields based on priority. To ensure that support or training was the main focus of the found studies, the support concept had to be present in the title. The other concepts were searched for in the abstract. The three key concepts, their search strings and the targeted fields are presented in Table 3.

Table 3: Search strings for key concepts in RQ2 scoping review

Key concept	**Target field**	**Search string**
Training-related support	title	support OR training
eHealth	abstract	ehealth OR "health information technology" OR "health IT" OR "electronic medical record*" OR "electronic health record*" OR emr OR ehr OR "patient portal*" OR "electronic patient reported outcomes" OR epro
Software vendor	abstract	vendor OR "software provider"

Consistent with the search for the first research question, the titles and abstracts of the search results were examined to initially identify relevant articles. The full manuscripts of this subset of articles were then read to further confirm relevance or exclude from the review. Studies were included if they focused on eHealth service training or training-related support and contained findings or implications related to the involvement of software vendors. The references of relevant articles were also explored to identify additional studies. This process and the number of studies

at each phase are illustrated in Figure 3. The included articles are presented in Appendix A.

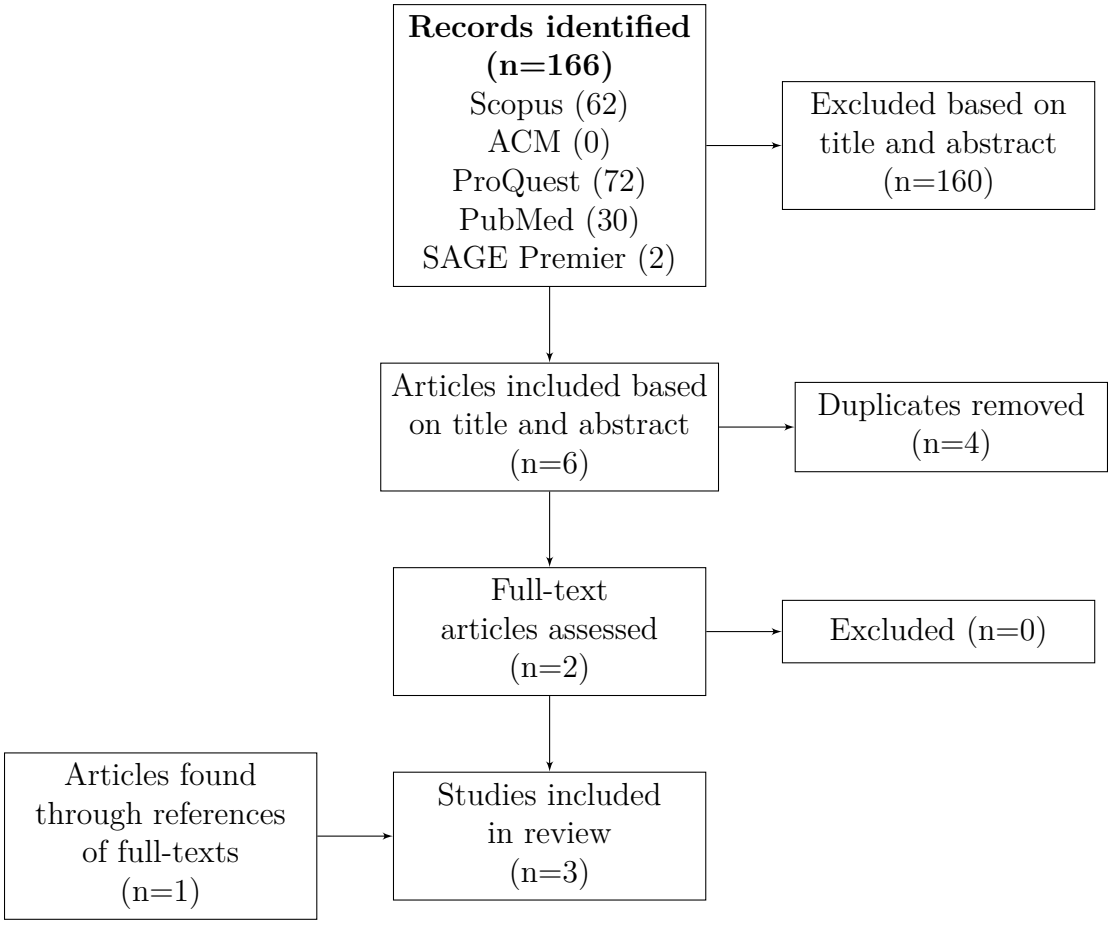

Figure 3: Article selection process in RQ2 scoping review

3.2.2 Summary of findings

Only three relevant studies were discovered through the search process described above. This indicates a lack of research on the role of vendors in eHealth service training, with the attention falling more commonly on the perspective of healthcare providers or patients. All three of the reviewed studies concerned electronic medical records (Humphrey-Murto et al., 2022; Shachak, Barnsley, et al., 2013; Shachak, Dow, et al., 2013). This reflects the prominence of EMR-related research in eHealth literature. One study examined user manuals (Shachak, Dow, et al., 2013), while the others researched implementation-related training more broadly. One of the studies discussed post-launch training efforts in addition to the initial implementation (Humphrey-Murto et al., 2022).

The most common theme evident in the reviewed studies was the need for vendors to understand a healthcare provider's operations and workflows to provide valuable training and related support (Humphrey-Murto et al., 2022; Shachak, Barnsley, et al.,

2013; Shachak, Dow, et al., 2013). Generic vendor training materials were found to be ill-suited for preparing users for actual clinical workflows (Humphrey-Murto et al., 2022). Instead, materials such as manuals should be adapted to the characteristics of an organisation based on an awareness of workflows and user roles (Shachak, Dow, et al., 2013).

A second common theme discussed in two of the studies was the sharing of training-related responsibility between the vendor and the healthcare establishment. Shachak, Barnsley, et al. (2013) found that delegating some of the training responsibility to super users at a healthcare organisation can be a helpful approach for vendors, especially if the vendor lacks personnel to cover all training and support-related needs. With regard to the aforementioned need to customise materials for organisations, Shachak, Dow, et al. (2013) proposed a similarly collaborative approach of sharing responsibility between the parties. Instead of the vendor attempting to tailor training materials for each healthcare provider themselves, they suggest, for example, involving users in the process or preparing modular manuals that enable users to rearrange and adapt the content to their context. While not directly connected to the distribution of training responsibility, in a related manner Shachak, Barnsley, et al. (2013) note the importance of interpersonal communication skills for vendor support personnel, highlighting that vendor support is not solely about technological know-how.

In addition to these two main themes, the study by Shachak, Dow, et al. (2013) provides insights into what type of training materials healthcare providers find helpful. The study compared user-created materials with official EMR vendor materials and discovered that user-created materials placed greater emphasis on actionable work process information and actively used visual cues on images to highlight relevant areas of the user interface. This implies that vendor materials may have a tendency towards including more explanatory information for understanding an eHealth service in general, which may not always serve the practical needs of users at healthcare establishments.

3.3 Synthesis of related research

The conducted scoping reviews provide an overview of the state of research with regard to the two research questions in this thesis. The reviewed studies revealed eight approaches that have been found successful in post-implementation training of eHealth services in general: hands-on practice, relevance to real work, learning from other practitioners, one-on-one support, computer-based training, evaluation and monitoring, materials and documentation, and combining methods.

The approaches that have been found to be effective for training of services facilitating patient-provider communication are similar in nature. Nonetheless, training of such services entails unique needs in terms of training content and focus. Providers need training on messaging etiquette, how to write clear messages, how to discuss electronic communication in-person and how to promote eHealth service usage to patients and train and support patients in usage.

Vendors and their role are often overlooked in research about eHealth service training. Reviewed existing research indicates that vendor support needs to be

tailored to customer organisations, while the responsibility for training and user support may be shared between vendors and customers.

Notably, the amount of relevant research that was found was quite limited. The review suggests there is an emphasis in existing research primarily on implementation training, electronic medical records and the healthcare provider or patient perspectives. Only 11 studies were discovered for post-implementation training of eHealth services and none of these concerned services facilitating patient-provider communication. Similarly, only three studies were found on vendor-provided support and these were focused solely on EMRs. Thus, based on the conducted reviews, there are gaps in existing research in terms of post-implementation training, services facilitating PPC, the vendor perspective and in particular the intersection of these elements. It is these gaps that this thesis seeks to contribute towards filling.

4 Methods

This chapter begins by describing the selected research approach for the study. Next, the studied software vendor, eHealth service and cancer centers are introduced. Finally, the used methods for data collection and data analysis are presented.

4.1 Research approach

This thesis was approached as a qualitative embedded multiple case study. This approach and the reasoning behind it is discussed next. Yin (2009) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context" (p.18). He proposes three conditions for when a case study may be the preferred approach to conducting research over other alternatives. Firstly, case studies are well suited to "how" and "why" questions, such as the ones posed in this thesis. Indeed, the second research question in this thesis is a "how" question. Moreover, while the first research question concerns itself with *what* practices promote successful post-implementation training, the question is being examined by seeking to understand *how* trainers, end-users and vendor representatives perceive training. Secondly, case studies are preferred when the researcher has little control over the studied events as was the case in this thesis - the researcher did not and could not influence the ongoing post-implementation training practices at the studied cancer centers. Thirdly, case studies are apt when focusing on contemporary events in a real-life context. The topic of this thesis matched this condition, with post-implementation training being a contemporary phenomenon occurring in the real-life context of cancer centers. Overall, then, the case study approach was selected as the thesis aligned well with the three conditions proposed by Yin (2009).

The thesis was approached specifically as a multiple case study rather than a single case study. Yin (2009) notes that multiple case studies are generally preferable, due to the vulnerability of relying entirely on a single case. He argues that even just a two-case study can improve the quality of research substantially. Having multiple cases creates the possibility for replication between cases and can lead to more compelling conclusions as a result. A two-case study approach was deemed suitable for the thesis due to keeping the workload manageable, while still being able to reap some of the benefits of having more than one case.

Yin (2009) distinguishes between holistic and embedded case studies. Holistic studies have a single unit of analysis, such as an organisation on a general level. Embedded studies, on the other hand, involve multiple units of analysis within a single case and can thus include subunits such as the staff within an organisation. As noted in the introduction, this thesis aimed to embrace the diversity of stakeholders involved in training, from trainers and end-users to software vendor representatives. As such, an embedded approach that could include these different subunits of analysis was selected for the study.

More broadly, the thesis was undertaken with a qualitative research approach. Qualitative research is concerned with understanding people's experiences and how

they interpret and perceive those experiences (Merriam & Tisdell, 2015). Along with seeking to understand people, qualitative research helps make sense of the social contexts in which people operate (Myers & Avison, 2002). Where quantitative research is numerical in nature and benefits from precise findings, qualitative research is characterised by comprehensiveness, holism and rich descriptions (Merriam & Tisdell, 2015). Qualitative data may be collected in the form of, for example, interviews, questionnaires, observation and examining existing documents (Myers & Avison, 2002).

The qualitative research approach was selected due to the characteristics and strengths of such research aligning with the focus and goals of the thesis. It is worth acknowledging that arguably the study could have also been approached quantitatively, especially with regard to the first research question examining practices that promote successful post-implementation training. In fact, qualitative approaches are not necessarily that common or prominent in eHealth EUT research. For example, Samadbeik et al. (2020) reviewed 46 EMR training studies and found that only two of the studies utilised qualitative methods. There certainly are benefits to taking a quantitative approach, especially in terms of the precision of results. However, with this thesis the focus and goal was to engage training comprehensively as a complex social phenomenon that involves multiple stakeholders, each with their unique needs and preferences, operating in a social context. A qualitative approach was deemed apt for capturing this complexity and seeking to understand what successful post-implementation training and vendor support may be characterised by in light of how the people involved perceive and experience it.

4.2 Research context and case selection

This section describes the software vendor and eHealth service studied in the thesis. In addition, the two cancer centers selected as the cases for the study are presented along with discussion on the selection process.

4.2.1 Software vendor

The thesis was conducted for a large, global company operating around cancer care technology. The company develops and produces both hardware and software solutions, such as linear accelerators and treatment planning tools. The study examined an eHealth service produced by the company and the training and support offered by the company with regard to the eHealth service. Due to the focus of the thesis on a software product, the company is referred to as a software vendor, despite its wider offering.

4.2.2 eHealth service

The studied eHealth service combines elements of electronic patient-reported outcome systems and patient portals in order to support cancer patients, engage them in their care and facilitate patient-provider communication. The service was originally designed primarily for symptom management. Key features include the collection of

PROs, such as symptoms and quality of life, through questionnaires or the patient reporting these of their own accord. In addition, the system allows patients to message their care team regarding symptoms or other care-related concerns. Over time, the service has evolved and expanded beyond PROs and symptom management to include common patient portal functionalities such as accessing health records and appointments.

The service consists of two interfaces – one for patients and one for clinic staff. The patient interface can be accessed through a website or a mobile app. The clinic interface is web-based and enables care teams to see, manage and respond to patient messages, symptom reports, questionnaire responses and more. In addition, staff can, for example, share patient education documents with their patients. Through the two interfaces, the service is used collaboratively by both patients and providers and communication is facilitated.

4.2.3 Case cancer centers

As described earlier, the thesis was undertaken as a two-case study. This section reports on how the two case cancer centers were selected and introduces them.

Sampling in qualitative research tends to be purposive rather than random in nature as this enables "focusing on a case's unique contexts" (Miles et al., 2014, p.32). However, many different purposive sampling strategies exist and what is appropriate depends on the goals and purpose of the research (Crabtree & Miller, 2000). In this thesis, the software vendor was interested in capturing some of the diversity of their customer base, gaining an overview of PIT practices and support needs at cancer centers, and identifying practices that may be widely helpful for many cancer centers. Maximum variation sampling was determined to be the most suitable sampling strategy to fulfil these goals. Maximum variation sampling is well-suited to capturing diverse variations and discovering significant common patterns that apply across multiple cases (Patton, 1990). Furthermore, Gerring and Cojocaru (2016) outline that such diverse sampling is apt for exploratory studies attempting to identify many or most potential causes behind an outcome. As such, maximum variation sampling presents a way of gaining a diverse overview of successful PIT and vendor support practices, while also uncovering practices that may be applicable more widely across different types of cancer centers and healthcare providers.

Crabtree and Miller (2000) propose that diversity can be pursued in maximum variation sampling by developing selection criteria that seem relevant to the topic at hand and then selecting cases that vary across the selection criteria dimensions. Diversity between cancer centers was pursued along four dimensions that were thought to be relevant and interesting for PIT and vendor support based on discussions with vendor customer success managers (CSMs), who work with cancer centers: enthusiasm, size, amount of experience and treatment type. First, enthusiasm refers to how actively a cancer center seeks to make the most of the vendor's eHealth service. This was evaluated by the CSMs based on their experiences engaging with a cancer center. Second, size was considered in terms of the amount of cancer center staff using the vendor's eHealth service. Analytics data on the amount of unique

users at the center in the past 90 days (at the time of sampling in July 2022) was consulted for this dimension. Third, the amount of experience refers to how long a cancer center has used the eHealth service. Finally, the aim was to ensure that the selected cancer centers would be diverse in terms of the treatment types they offer, covering both medical and radiation oncology.

In addition to mapping potential cancer centers along these four dimensions, there were three additional foundational criteria for a cancer center to be eligible for the study. Firstly, cancer centers had to naturally be a customer of the software vendor and use the studied eHealth service. Secondly, due to the vendor's interests, cancer centers had to be located in North America. Thirdly, cancer centers had to have used the eHealth service for at least a year at the time of sampling, in order to ensure that they had had time to transition into a post-implementation phase and establish some related practices.

Based on this sampling strategy and criteria the following two cancer centers were selected:

Cancer Center A

Cancer Center A is a large cancer care organisation based in Canada, with over 1 000 staff members. It provides cancer care services for an entire province as well as neighbouring regions. Sites are spread across the province, with core sites located in the capital of the province. Cancer Center A offers a diverse range of services from screening to survivorship, with treatments covering chemotherapy, radiation therapy and more.

The organisation took the vendor's eHealth service into use in September 2020. The service was initially used only within the radiation floor department of the organisation, specifically for distributing a COVID-19 questionnaire. Over time, feature usage expanded and the service was implemented more widely in the organisation to include also medical oncology operations.

Cancer Center B

Cancer Center B is a cancer care organisation based in the United States serving more than 30 000 patients each year. It operates within a single state, with locations spread across the state. The center provides services ranging from imaging to medical, radiation and surgical oncology.

The software vendor's eHealth service was taken into use at Cancer Center B in January 2021. The service is used only in the radiation oncology side of operations.

4.3 Data collection

This section discusses the selection of semi-structured interviews as the data collection method for the study. In addition, interview participants, their selection and the interview procedures are described.

4.3.1 Semi-structured remote interviews

Yin (2009) presents six major sources of evidence in case studies, each with their own strengths and weaknesses: documentation, archival records, interviews, direct observations, participant-observation and physical artifacts. Using multiple of these data sources is recommended. Interviews were selected as the main data collection method for this thesis due to the method's strengths aligning with the goals of the study. Interviews are appropriate for understanding behavioral events and exploring people's opinions, feelings, attitudes and interpretations (Merriam & Tisdell, 2015; Yin, 2009). Furthermore, interviews benefit from enabling focusing specifically on topics relevant to a study (Yin, 2009). The goal in this thesis was to examine the research questions specifically from the perspective of how the people involved perceive and feel about their experiences with eHealth PIT and vendor support. Interviews were deemed to be the best way of eliciting this type of information that cannot be observed externally.

Interviews were supplemented by limited examination of training-related documentation. Specifically, if interviewees referred to some documentation, access to the documents was requested, so as not to rely solely on participant descriptions. Using documents in this way to corroborate or augment other data is according to Yin (2009) the primary function of documents in case studies. While observation would have been another valuable supplement to interviews, especially in terms of gaining contextual understanding of the clinical environment, observation could not be undertaken due to geographical reasons. Similarly, physical artifacts, while not necessarily central to the topic of the thesis, were not available as a data source due to the researcher not being able to visit the case cancer centers.

Qualitative interviews are often categorised based on how structured they are in nature (DiCicco-Bloom & Crabtree, 2006). Structured interviews are based around predetermined questions that are asked in a predetermined order with minimal deviation from the script (Merriam & Tisdell, 2015; Qu & Dumay, 2011). This rigidity simplifies organisation and analysis of results (Qu & Dumay, 2011). However, a highly structured approach to interviews can limit responses and findings to the pre-conceived notions of the researcher that are embedded into the interview structure (Merriam & Tisdell, 2015). Furthermore, structured interviews do not account for the diversity of people in how they may interpret the same questions and the words used in them (Merriam & Tisdell, 2015).

Unstructured interviews, on the other hand, do not have a predetermined script with questions formulated ahead of time, but flow more like an informal conversation (Merriam & Tisdell, 2015). Such interviews tend to be exploratory in nature and can be particularly helpful when there is insufficient understanding on the topic to enable planning of questions ahead of time (Merriam & Tisdell, 2015; Qu & Dumay, 2011). However, the flexibility of such interviews can be challenging to work with, specifically in terms of making sense of the potential heterogeneity of the results (Merriam & Tisdell, 2015).

Semi-structured interviews exist between the two extremes of structured and unstructured interviews. Some questions and themes for discussion are prepared, but

the interviewer is free to adjust the exact wording and order of questions, while also posing additional questions that arise from the evolving discussion (DiCicco-Bloom & Crabtree, 2006; Merriam & Tisdell, 2015; Qu & Dumay, 2011). Semi-structured interviews are the most common form of qualitative interviews (DiCicco-Bloom & Crabtree, 2006) and align with how Yin (2009) describes interviews in case studies as "guided conversations rather than structured queries" (p.106). The semi-structured approach benefits from enabling the researcher to respond dynamically to how an interview unfolds and the viewpoints raised by the interviewee (Merriam & Tisdell, 2015). Furthermore, interviewees are afforded freedom and flexibility to express their thoughts and experiences in ways that make sense to them (Qu & Dumay, 2011). In light of these noted benefits, semi-structured interviews were selected as the specific interview method for the study.

Crucially, also the extent of existing research on the study topics pointed towards the semi-structured approach. As established in the scoping reviews (Chapter 3), some research around vendor support and post-implementation training of eHealth services exists. As such, preparing relevant questions and themes for interviews was possible, thus rendering the exploratory unstructured interview method unnecessary. On the other hand, the scoping reviews uncovered gaps in research, especially with regard to the intersection of PIT, vendor support and eHealth services facilitating PPC. This indicated the potential for new and unpredictable discoveries that a more structured interview approach would have limited. Overall, then, semi-structured interviews struck a suitable balance between structure and flexibility for the purposes of this thesis.

Due to geographical reasons the interviews had to be conducted remotely. While in-person interviews have commonly been preferred by scholars (Johnson et al., 2021), there are indications that the remote alternative is not necessarily inferior. For example, in terms of duration and amount of cancellations, remote interviews can be comparable to in-person ones (Jenner & Myers, 2019; Johnson et al., 2021). Notably, rapport can be harder to establish and matters like technical failure and data privacy need to be planned for, but collecting quality data and building trust is nonetheless possible remotely (Jenner & Myers, 2019; Valkonen et al., 2021). Interviewing remotely has also unique strengths. Beyond efficiency and not being limited by geography (Johnson et al., 2021; Merriam & Tisdell, 2015), remote interviews can be popular with participants and may even increase participation, especially if participants are generally busy (Deakin & Wakefield, 2014; Jenner & Myers, 2019). Therefore, while conducting interviews remotely in this thesis was fundamentally driven by geographical necessity, the decision was also supported by the capacity of the method to produce quality data and the potential to attract busy cancer center staff, who may have otherwise not been able to participate.

4.3.2 Interview participants and procedure

As discussed earlier, the thesis aimed to investigate training and vendor support in a holistic way that accounts for the variety of stakeholders involved. Therefore, three types of participants were recruited for the interviews to represent different

perspectives: trainers and end-users from the cancer centers and customer success managers from the software vendor. In this way, both people organising training as well as those receiving it could be heard. This is in line with the end-user training evaluation framework proposed by Mahapatra and Lai (2005) that includes both training providers and trainees as relevant stakeholders for evaluating training. The perspective of customer success managers was pursued to gain information on the relationship between the case cancer centers and the vendor and to gain insights on providing support from the vendor's point of view.

Trainers to be interviewed were selected and recruited with the assistance of vendor customer success managers. This took place in two primary ways. CSMs directly knew trainers from the cancer centers who could be invited to participate. Alternatively, CSMs established contact with cancer center representatives, who could in turn identify available trainers responsible for the vendor's eHealth service.

End-user selection was based largely on convenience sampling, due to the general busyness of cancer center staff. Participating trainers identified end-users who could possibly be freed from their regular work responsibilities to take part in an interview. Two main criteria were provided for identifying suitable users. Firstly, they naturally had to actively use the vendor's eHealth service in their work. Secondly, the users should have joined the cancer center only after the implementation of the eHealth service. This was to ensure that they had received their training during the post-implementation phase, which was the focus of the study. In addition, newer joiners who had received training recently were preferred to attempt to minimise recall bias in the interviews. Initially, only nurses and radiation therapists were pursued. However, over time, the opportunity arose to interview also front desk staff. Consistent with the study's general aim of seeking diverse perspectives, this opportunity was taken.

Vendor customer success managers did not require selection and recruitment as such. Each CSM at the vendor was responsible for certain cancer center customers. Therefore, the specific CSMs responsible for the case cancer centers were interviewed.

In the end, a total of 10 interview participants were recruited. The majority of interviewees were female (n=8), with only two male participants. The age distribution of interviewees is reported in Table 4.

Table 4: Age distribution of interview participants

Age range	**n**
Under 25	2
25 - 34	1
35 - 44	3
45 - 54	4
Total	**10**

Participants were evenly distributed between Cancer Center A and Cancer Center B. An overview of the number of participants for each organisation and role is presented in Table 5 below. A more specific list of each participant and their organisation, job role and more is not provided to protect participant anonymity.

Table 5: Interview participants by organisation and role

Participant organisation/role	**n**
Cancer Center A	**4**
Trainer	2
End-user	2
Cancer Center B	**4**
Trainer	2
End-user	2
Software vendor	**2**
Customer success manager	2
Total	**10**

Out of the cancer center staff, six operated in radiation oncology, while two in medical oncology. End-users were a mix of two front-desk clerks, a nurse and a radiation therapist. None of the users had previous experience with the vendor's eHealth service before receiving training on it at their cancer center. The users had generally joined their respective cancer centers within nine months of the time of interview, with two of the users having joined only a couple of months before. Notably, however, due to a misunderstanding one of the interviewed users was a longer term employee who had joined already before the implementation of the vendor's eHealth service. Despite this not entirely matching the recruitment criteria, the interview produced information relevant to the study and as such was not discarded. In particular, the user had gone through elements of training that were common between implementation and post-implementation training and was also able to share more generic thoughts on learning the vendor's eHealth service.

All communication before the interviews, including recruitment and scheduling, was handled via email. Participants were provided a research data privacy notice and consent form to read and sign electronically before their interview. The data privacy notice, compliant with General Data Protection Regulation (GDPR), was developed based on Aalto University's guidelines for processing personal data. A template provided by the university was used as the foundation and then modified to meet the needs of the study and the software vendor. The privacy notice was a central component of ensuring the research was conducted ethically and respectfully

with regard to participants. Foundational principles behind the notice included protecting participant anonymity, minimising the collection of data to only the essentials, limiting data access solely to those people who truly need it and deleting data when it is no longer necessary. Participants were offered the opportunity to ask questions regarding the notice and consent form and the main points were also summarised at the beginning of each interview. The full data privacy notice and consent form are available in Appendix B.

Due to the three different participant types or roles, unique discussion guides were developed for each role, focusing on the specifics of their perspective. Trainer interviews explored how post-implementation training is organised and evaluated, what practices have been helpful or problematic and what experiences with vendor support have been like. End-user interviews revolved around personal experiences with training received for the vendor's eHealth service. Finally, the discussion guide for customer success managers examined experiences and views on working with the case cancer centers, especially in terms of supporting post-implementation training.

Reviewed research and end-user training frameworks such as those by Gupta et al. (2010) and Mahapatra and Lai (2005) were used to ensure that relevant dimensions of EUT were not overlooked in the discussion guides. In addition, existing user feedback collected by the vendor from the case cancer centers was consulted to identify potentially interesting themes to discuss in the interviews. The discussion guides were shared with the thesis supervisor and advisor for feedback and were iterated on subsequently. Notably, the guides also evolved after the first interviews were conducted. In particular, the discussion guide for end-users was tweaked to better match this group of participants. It became evident after the first user interview that, while the study explores *training*, from a user's or trainee's perspective the process is one of *learning*. Despite perhaps being a subtle difference, questions in future interviews with users were phrased more around learning than training. In addition, direct questions and discussion regarding vendor support were reduced for end-users, as it became clear that users were less likely to know of or be involved in any direct contact with the vendor. The discussion guides for trainers, users and customer success managers are available in Appendix C.

The interviews were conducted between the end of August and the beginning of October 2022. The interviews were held remotely via the Microsoft Teams service. The researcher had his video camera on for all interviews, while interviewees were free to choose whether or not to use a camera during the call. The interviews were by default scheduled to last an hour, but in practice were longer or shorter depending on participant availability and the extent of their responses. In order to enable transcription and to allow the sole interviewer to engage in conversation with reduced need for extensive note-taking, the interviews were recorded. Only the audio from these recordings was kept as non-verbal cues were not considered to be relevant for analysis in this study.

4.4 Data analysis

The 10 conducted interviews lasted in total approximately 8 hours and 11 minutes. Each interview on average took around 49 minutes, with individual interviews ranging from 34 minutes to 90 minutes. Interview audio recordings were transcribed for analysis purposes and anonymised in the process. This resulted in approximately 124 pages or 59 000 words of transcripts. Transcribing was done manually by the researcher, which functioned also as a useful way of becoming increasingly familiar with the data. The transcripts were not entirely verbatim as filler words and repeated words were omitted in places. This was deemed reasonable as such details of language use were not a relevant object of analysis in this study. The following sections describe the selected methods for analysing the transcripts and present the step-by-step process taken.

4.4.1 Abductive coding

The interview transcripts were analysed using a coding process. Coding at its core refers to labeling parts of data with summarising words of phrases (Linneberg & Korsgaard, 2019). These codes enable condensing the data and support organising it in ways that ultimately facilitate the identification of patterns, categories and themes that are meaningful to the topic of study (Linneberg & Korsgaard, 2019; Miles et al., 2014; Saldaña, 2016). Coding is a cyclical process rather than a linear one and, as such, involves continuous iteration and rethinking of already created codes (Saldaña, 2016). This means that data may require re-coding and codes may need to be renamed, merged with each other or dropped entirely as analysis unfolds (Saldaña, 2016).

Coding as a process can be conceptualised as consisting of two main cycles. In the first cycle of coding, codes are typically applied to the raw data and reflect the explicit details of the data (Linneberg & Korsgaard, 2019; Saldaña, 2016). In the second cycle of coding, it is common to work on organising and coding the first cycle codes rather than working directly with the raw data, thus leading to more abstract or higher level categories or themes (Linneberg & Korsgaard, 2019; Miles et al., 2014; Saldaña, 2016). While coding is sometimes seen as a mechanical procedure of preparing data for analysis, Miles et al. (2014) and Saldaña (2016) stress that coding *is* analysis – an interpretive act, where the researcher continuously makes choices and draws out meaning from the data through deep reflection. Analytic memos, i.e. notes of researcher reflections on the data and its meaning (Miles et al., 2014), were used in conjunction with coding in this study. Such pairing of coding and analytic memos is proposed by Miles et al. (2014) and Saldaña (2016).

Coding can broadly be approached deductively, inductively or abductively (Linneberg & Korsgaard, 2019). Deductive coding relies on a list of codes that has been developed ahead of time based on concepts from existing literature, thus helping ensure coding remains focused (Linneberg & Korsgaard, 2019). Inductive coding, on the other hand, allows codes to emerge directly from the data itself, therefore prioritising loyalty to the data and avoiding forcing data into predetermined codes (Linneberg & Korsgaard, 2019; Miles et al., 2014). Combining these two approaches

is referred to as abductive or blended coding. In this thesis, an abductive coding approach was taken. The choice was driven by two main factors. Firstly, ample existing literature on end-user training exists, thus providing an opportunity to build on this foundation through deductive coding. Secondly, while EUT literature exists, the focus of this thesis on the intersection of post-implementation training, vendor support and eHealth services facilitating PPC is unique in nature and was thought to benefit from the openness of an inductive approach. Overall then, an abductive approach enabled drawing on existing literature, while also maintaining an exploratory openness and loyalty to the data.

Beyond the general deductive, inductive and abductive approaches, a wide range of more specific individual coding methods exist. One or more may be used to direct the types of codes that are created during analysis (Saldaña, 2016). For first cycle coding in this thesis four coding methods introduced by Saldaña (2016) were selected: descriptive, in vivo, process and evaluation. Codes in descriptive coding, as indicated by the term, aim to describe what the coded passage is about, typically as a noun. In vivo coding, on the other hand, uses expressions and words from the data directly as codes to preserve the voice and language of participants. Process coding relies on gerunds (words ending with "-ing") as codes to capture actions in the data. Finally, evaluation coding focuses on participant judgements by, for example, labeling passages in the data as positive or negative.

These four coding methods were selected for first cycle coding for the following reasons. First, descriptive, in vivo and process coding are all recommended by Saldaña (2016) as good options generically applicable to most qualitative studies. Second, descriptive, process and evaluation coding are helpful, when exploring epistemological questions concerned with processes and the actions and perceptions of participants (Saldaña, 2016) – factors that this study is interested in exploring. Overall, the four methods were thought to be well-suited to provide an overview of the data (descriptive coding), capture participant perceptions in a loyal way (in vivo and evaluation coding) and help piece together a picture of training-related procedures (process coding).

Pattern codes were used for the second cycle of coding. These are "explanatory or inferential codes, ones that identify an emergent theme, configuration, or explanation" (Miles et al., 2014, p.86). Pattern coding was applied as the approach would help responding to the study's research questions by enabling the development of major themes and by uncovering meaningful causes and explanations from data (Miles et al., 2014).

4.4.2 Analysis process

Coding of interview transcripts began, when the first seven interviews were conducted and transcribed. At this point, there was a gap in conducting further interviews due to scheduling issues, thus creating an opportunity to begin coding in parallel with ongoing data collection. Beyond coding, analytic memos were noted down after each interview, during transcription as well as during the formal coding and analysis process.

Coding of transcripts was done using the ATLAS.ti software. As noted above, coding was adbuctive in nature meaning that an initial codebook based on literature was established for first cycle coding in addition to any codes that would emerge from the data directly. This codebook relied on EUT outcome classifications from Gupta et al. (2010) and Issenberg et al. (2005) as well as a range of reviewed ways of conceptualising training methods and facets of training. The initial set of codes and the literature behind them are displayed in Table 6. Once the codebook was established, first cycle coding began using those codes as well as descriptive, in vivo, process and evaluation codes that arose while going through the transcripts. Notably, however, in practice the initial codebook was not used extensively and instead coding primarily revolved around codes created while going through the transcripts.

Table 6: Initial codebook developed based on literature

Source	**Code**
Bandura (1971)	direct experience
	observation
Bostrom et al. (1990)	applications-based approach
	construct-based approach
	individual differences
Gupta et al. (2010)	Gupta outcomes: skill
	Gupta outcomes: cognitive
	Gupta outcomes: affective
	Gupta outcomes: meta-cognitive
	learning from computers
	learning with computers
Issenberg et al. (2005)	Issenberg outcomes: 1 Participation in educational experiences
	Issenberg outcomes: 2a Change of attitudes
	Issenberg outcomes: 2b Change of knowledge/skills
	Issenberg outcomes: 3 Behavioral change
	Issenberg outcomes: 4a Change in professional practice
	Issenberg outcomes: 4b Benefits to patients

All transcripts were coded together as a single set of data. This is in contrast to the option of separating transcripts based on, for example, cancer center and

participant role, analysing these groups independently and then comparing the findings. This choice was made due to there being so few representatives for each potential group that extensively reading into the differences between, for example, front desk workers and the single interviewed nurse did not seem warranted. Instead, the focus and interest in analysis was more in capturing the diversity of views and discovering findings that potentially cut across the cancer centers and different types of participants. It is, however, worth noting that transcripts were attribute coded in a way that the interviewees organisation and role were always available when working with the transcripts and going through codes and individual quotes. As such, while not the primary focus of the analysis, comparison of different subgroups in the dataset was possible and contextual factors could be taken into account.

First cycle coding of the first seven transcripts resulted in approximately 200 codes in total. To reduce the number of codes to a more manageable quantity, codes were reviewed to identify ones that could be merged, organised into code-subcode hierarchies or deleted entirely. For example, most codes related to vendor support were collected under one parent code, which aided responding to the second research question. This reduced set of codes, then, enabled coding the final three interview transcripts at a more suitable level of detail.

Once first cycle coding was complete for all transcripts, further reviewing of codes ensued. Similar codes were merged and some codes renamed for more consistent and clear use of language. Furthermore, descriptive notes were written for many of the codes to summarise and clarify their meaning. The transcripts were also re-examined at this point to ensure consistent use of codes and that important passages had not been overlooked. The distribution of quotations and codes across the interview transcripts is presented in Appendix D.1. Before moving into second cycle coding, initial reflections on findings and themes emerging from the data were presented to the software vendor. In addition to keeping the vendor updated on the progress of the research, this functioned as a way of validating and gaining input on the ongoing analysis.

In the second cycle of coding, codes from the first cycle were grouped into higher level categories and themes. This was done in two ways. Firstly, a more descriptive approach was taken to simply group the data and codes into different facets or dimensions of training, such as training materials or people involved in training. Identifying and establishing these categories enabled having a structured understanding of how the case cancer centers organised training and how participants perceived it. These categories serve as the foundational structure of the reporting of results in the following chapter. The categories, the individual codes they consist of and details on the amount of quotations and interview appearances are available in Appendix D.2.

Secondly, themes were identified in the first cycle codes with a more evaluative approach, focusing on what participants appreciated and disliked, what training approaches were considered effective and were actively used and what approaches had been phased out. This angle was taken especially to support responding to the first research question by identifying practices that promote successful PIT. Taking such an evaluative angle was not entirely unambiguous. Indeed, individual first cycle codes

could include both positive and negative (and neutral) perspectives. This meant that drawing out good practices from the data required detailed engagement with the original passages from the transcripts. This way the nuances and more detailed characteristics behind what was appreciated or disliked in a training approach could be identified, instead of labeling an approach and related codes simplistically as entirely good or bad.

The aim was to explore practices on a more abstract level than specific individual training methods coded in the transcripts. For example, rather than fixating on the specific method of using test patients as part of training, the method could be abstracted alongside related codes to a more general theme or practice of aiming for realism in training. The identified good practices are reported in Section 6.1. In addition, a more detailed table of the good practices, related codes and the prominence of those codes in the transcripts is provided in Appendix D.3.

5 Results

This chapter reports on the results of the conducted interviews. The results are grouped into different dimensions of training based largely on the descriptive code categories reached during data analysis. The code categories and individual codes are available in detail in Appendix D.2.

The chapter begins by outlining the different types of post-implementation training evident at the case cancer centers. People involved in providing training are discussed, after which training methods and materials are reviewed. The chapter continues by describing the settings in which PIT occurs as well as the methods the cancer centers have used to evaluate the effectiveness of training. Finally, software vendor support, at the time of research and in the future, is examined.

Throughout the results, interview participants are referred to or quoted directly to maintain transparency and loyalty to the data. To protect participant anonymity, such references are made using a naming scheme consisting of the participant's general role, organisation and a unique number. For example, "Trainer A2" refers to a trainer from Cancer Center A, while "User B1" refers to an end-user from Cancer Center B. "CSM 1" and "CSM 2" are used to refer to the customer success managers from the software vendor.

5.1 Types of training and content

There were primarily three types of post-implementation training related to the vendor's eHealth service occurring at the participating cancer centers: (1) orientation of new staff members, (2) training related to updates and (3) reminders. Out of these, orientation of new staff was most common. In fact, training regarding updates as well as reminders were only evident at Cancer Center A, with Cancer Center B providing training solely for new staff members. Despite Cancer Center B's exclusive focus on new joiners, there were indications that more training after initial orientation could be appreciated. One of the end-users noted the value of learning more despite the initial orientation being sufficient as such:

> I mean, I feel that it's [training] sufficient as I'm able to work it [the vendor's service] and use it in a way that I need to for my job. But, I think it's always good to learn some more things. (User B1)

The following sections discuss the three types of training and their content in greater detail.

5.1.1 Orientation of new employees

The content of training for new employees regarding the vendor's service was role-specific in nature at both cancer centers. Rather than providing the same training for all staff, training was tailored to the responsibilities and workflows of the person being trained. As one of the people responsible for training-related matters at Cancer Center A stated:

> We've always trained by what your job is. So, the training that we provide for a clerical staff is not going to be the same as the training that we provide for a therapist. (Trainer A1)

The structure in which training was provided was similarly oriented towards work tasks and workflows rather than generic overviews of the different sections and functionalities available in the service. The learning management system modules in place at Cancer Center A (see Section 5.3.3) were a partial exception to this pattern.

Training directed to new joiners was focused strongly on the clinic-facing side of the service at both of the interviewed cancer centers. Information on and access to what patients see on their side of the application was typically not part of the training – none of the interviewed end-users had had any hands-on time with the patient application during their training. This absence of training on the patient application was not due to a lack of interest or not seeing its value. Both trainers and users alike highlighted that having an understanding of the patient application would be valuable for being able to assist patients (Trainer A1, Trainer A2, Trainer B1, Trainer B2, User A1, User A2, User B2):

> It was definitely hard, because our staff were expected to do some patient teaching and also patient troubleshooting with them and what they see on their side, but they really had no clue of what that [patient application side of the service] looked like. (Trainer A2)

> It would be nice to kind of know what it [patient application side of the service] looks like in case a patient asks. (User B2)

As such, not including the patient application as part of training was rooted more in cancer centers finding it difficult to arrange than not finding it valuable. CSM 2 stated that cancer centers do have access to the patient application in a demo environment, but thought that people do not take advantage of it "maybe because it's too hard". Supporting this viewpoint is Trainer A2's description that they are "not that tech savvy sort of to be able to go in and then flip back and forth [between the clinic and patient interfaces]". Furthermore, a trainer at Cancer Center B was not even aware of the possibility of accessing the patient application claiming that "there's not a way that we could see it [the patient application] for the new employees either until it kinda comes available from a patient" (Trainer B1).

There were some attempted workarounds in place at Cancer Center A, such as a video about the patient application and some screenshots included in training content. At Cancer Center B no such workarounds were attempted – people learnt about the patient application if patients happened to come up to them with questions, the likelihood of which depended on the role of the person to some extent. Indeed, it is worth noting that the value of understanding the patient application depended on a user's role and responsibilities at the cancer center. At Cancer Center A staff would be involved even in promoting the idea of using the vendor's service to patients. At Cancer Center B, front desk clerks were more actively engaging with patients and helping them with the service, while the nurse role was less likely to need to support

patients with usage, making the need to learn about the patient application less acute. In addition to these role-specific differences, there were also some participants who felt that they are able to help patients with issues related to the service despite not receiving training on the patient application (Trainer B1, User B1). These participants were relatively young and confident with technology in general in their own assessment, which may have influenced their view. Overall then, while learning about the patient application was seen as valuable, it was not considered equally necessary or relevant for everyone.

Despite orientation of new staff being the most common type of eHealth service training during post-implementation, the amount or extent of that training was relatively limited per person. Users described their training with expressions such as "very basic" (User A1) and "there wasn't very much" (User B2). Only one participant mentioned formal training content taking a "few hours" (User B1) – others described times in the range of 10-20 minutes. In fact, User B2 did not receive any formal training at all, but was directly provided access to the vendor's service to start using it with the possibility of asking for help if necessary. While they managed to learn the application this way, they thought that having some additional support would have anyway been helpful:

> Yeah, I mean I was able to figure it out that way. It would've been nice to have something kind of showing you "Hey, this is what a [name of vendor's service] card looks like. This is where it needs to go". (User B2)

Nevertheless, in general, users did not have issues with the limited time spent on training. They found training to be sufficient, especially in light of the service being perceived as easy to use and learn (User A1, User B1, User B2): "Honestly, [the vendor's service] has been probably one of the easiest systems I've learned since I started over here" (User B1).

5.1.2 Updates

The second type of training was evident only at Cancer Center A and had to do with updates. Content in this category of training involved informing and educating staff about changes to the vendor's service ranging from minor adjustments like icons, colors or wording to larger updates. So far, the updates Cancer Center A has encountered have been seen as being relatively minor (Trainer A1), but with the center looking to implement new feature functionality in a second phase of implementation, more substantial update-related training was expected to be undertaken in the future.

5.1.3 Reminders

The third and final type of training, reminders or refreshers, was similarly present only at Cancer Center A. This category of training was primarily concerned with keeping people on track and ensuring they continue to utilise the vendor's service in the desired or intended way. Indeed, Trainer A2 noted that people "tend to slide back into what they find easiest" and described ongoing education and reminders as

a way to "make sure that people stay on the right track". Therefore, the content of such training depends on what usage issues might be occurring at the cancer center instead of there being a fixed curriculum.

5.2 People involved in training

The case cancer centers had distinct approaches to how post-implementation training was handled organisationally and who was involved in the process. Cancer Center A had a centralised structure with three nurse educators dedicated to training-related matters for around 450 staff. At Cancer Center B, on the other hand, training responsibility was dispersed across the organisation with each team lead being responsible for training within their team. As such, each trainer operated on a significantly smaller scale than the nurse educators at Cancer Center A.

Cancer Center A also had super users or champions to assist and support with learning the vendor's service. For example, one of the interviewed users had been trained by a super user. It is worth noting that this user was part of the radiation floor department of Cancer Center A that generally operates separately from the rest of the organisation when it comes to the vendor's service and training. On Cancer Center B's side, the team leads who did training can arguably also be seen as super users even if participants from Cancer Center B did not explicitly use the term during interviews. More broadly, both cancer centers made use of peer support as part of the learning and training experience. Participants in both cancer centers explicitly mentioned asking for help or being able to ask for help from peers while learning (Trainer 2, User A1, User B2).

Overall, whether nurse educators, super users, team leads or peers, people involved in training and support were knowledgeable not only in using the vendor's service, but also the area of work and daily workflows the service tied into. In addition to this core group of people involved in training, at Cancer Center A the information systems department was also contributing through background assistance and help with some documentation-related matters. It is also worth keeping in mind that, beyond these internal stakeholders, the software vendor has also been involved in supporting post-implementation training at the cancer centers. This role is discussed in greater detail in Section 5.7.

5.3 Training methods

A fair diversity of training methods and approaches was evident at the two cancer centers. There were some common patterns in terms of how prominent and valued direct hands-on experience was, but also unique approaches such as the usage of learning management system modules at Cancer Center A. This range of methods as well as participants' perceptions of them are examined next.

5.3.1 Hands-on experience

Direct hands-on experience with the vendor's service was a prominent part of training and learning at both cancer centers. Centers emphasised letting users actually test and use the application as part of training rather than just passively observing a trainer demonstrating the service and how it works. Observation did often play a role in training as well, but this was typically combined with some direct usage. Purely observational formats, such as lectures, were considered to be a bad approach to training by trainers at both cancer centers (Trainer A1, Trainer B1). Trainer A1 describes earlier unsuccessful observational training: "just having staff in a group staring at a screen, listening to somebody. It wasn't great".

In contrast to pure observation, hands-on experience was seen as a useful and valuable practice. Participants from both cancer centers unanimously declared their preference and appreciation for learning through hands-on usage (Trainer A1, Trainer B1, Trainer B2, User A1, User A2, User B1, User B2, CSM 2). User B1 went as far as to say that what helped their learning the most was "me just learning it myself. Just sitting down and actually using it". Another user's opportunity to hands-on test the vendor's service was delayed due to technical reasons and they found this to hinder their learning (User A1).

Trainer A1 was keenly aware of this preference stating that "Our staff really are hands-on learners, the vast majority of them, that's what their preference is". The value of direct experience was also corroborated by one of the customer success managers who noted: "we hear that a lot, like 'I think it'll make sense when I get in and do it'" (CSM 2).

Despite the noted value of hands-on experience, it was occasionally not utilised in training at Cancer Center A. As mentioned above in the case of User A1, sometimes technical issues such as login details not being available could delay the possibility of gaining hands-on experience. Beyond this, Trainer A2 highlighted that arranging direct experience during a training session can be challenging in a larger group setting than when training one-on-one:

> Yeah, sometimes I'll get them to do it as well. Sometimes I login and I make them do the clicks, so that... it just depends. If there's one person, that's easier to do. If there's more, not so much. (Trainer A2)

CSM 2 had had similar experiences with vendor-organised training, noting that depending on the environment in which training takes place and the amount of participants, hands-on experience can be difficult to enable:

> One of the things we don't have the ability in most cases to do, just based off of where we're doing training is for staff to get in and touch it. So, we've had the ability in a couple places where we had smaller groups and we could pop open a laptop and say "Okay, come up and, I want you to work a case" or "I want" – you know we could cycle through small numbers. (CSM 2)

5.3.2 Simulation and real usage

Whether demonstrating the vendor's service for new users or allowing for direct hands-on practice, the cancer centers relied on a mix of simulated usage and real usage to organise training. A common element of simulated usage was test patients. Trainers from both cancer centers mentioned using test patients as part of training (Trainer A2, Trainer B1). Trainer B1 described their usage of test patients saying:

> We have a couple of test patients that we use to show them how to invite a patient, show them like if there's a phone message, how to do it, how to assign a nurse if it's actually a nurse message instead of a front office. (Trainer B1)

In practice, despite it being a part of the general training pattern at Cancer Center A, User A1 did not have test patients as part of their training, which limited the experience:

> There wasn't too much she [trainer] could show me, 'cause there's not like a fake patient that I can like look through. There was like real patients, so there wasn't anything that she could really show me live I guess. (User A1)

This description of missing test patients illustrates their value. While test patients may often be created in a simulated demo environment, CSM 2 noted that the creation of a small amount of test patients even in the real live environment is encouraged. According to CSM 2, test patients in the live environment benefit from greater realism due to interfaces and integrations to other systems, such as lab results, working normally.

While test patients in the real environment bring the simulation closer to reality, at Cancer Center B real usage with real patients was also a substantial part of how training and learning was handled. New employees, with the guidance or assistance of a trainer, tackled real patient cases in the service and learnt as they went. As such, the training experience could depend on the types of patient cases that happened to be active in the service on a particular day. Trainer B1 described this type of training rooted in handling an actual patient's case:

> That's a learning process as it comes. It's more of whatever that patient's calling about to seeing what they need and seeing how we handle it from there. We really just work on them, that's basically all the training-ish that we do, is just work on it as it comes. (Trainer B1)

Training through real usage like this supports and ties closely to the center's notions of role-specific training and focusing on workflows that are relevant to actual day-to-day work. On the other hand, while hands-on experience was considered an effective practice as noted above, User B1 felt that real usage with real patients was a less than ideal way of gaining that hands-on experience. Learning through real usage meant practicing in the midst of regular work and thus having a lack of dedicated or focused time for learning:

> Well, the only thing that hindered my learning would just be like the patient volume that's actually at the clinic. Nothing really [eHealth service]-related. It's kind of hard sometimes to learn something, when you've got a bunch of patients walking up and asking questions and checking in and it's kind of chaotic to learn a new system that way. (User B1)

5.3.3 Learning management system

One of the clearly distinct training methods at Cancer Center A was the usage of a learning management system with modules dedicated to the vendor's service. These modules were originally created during implementation of the service, but they have continued to be used for new staff members post-implementation as well. There was an element of enforcement to the system, with new joiners being required to complete the modules before they could receive their login details for the service. The modules themselves were interactive in nature, simulating usage to an extent. Consistent with the role-specific training mentality at Cancer Center A, the exact configuration of modules to be completed depended on the role of the employee.

Utilising LMS modules for training was seen as a valuable and helpful practice. The one interview participant who had gone through the material (albeit during implementation) had found it to be the most helpful part of their learning experience (User A2). A trainer from Cancer Center A as well as customer success managers similarly found the approach to be beneficial in multiple ways (Trainer A2, CSM 1, CSM 2).

Firstly, from a logistical perspective LMS was seen as enabling large scale dispersed operations (Trainer A2). For a center like Cancer Center A with hundreds of people to train across a substantial geographical area during implementation and afterwards, LMS had provided a way to lay a common training foundation:

> The LMS modules we really have to do, just because all of our people are all over the province. So, between 20 different sites, all over the province, we can't... there's no way to do that. And because we have so many people that we need to get trained, there's no way to actually do that in a classroom setting. So the modules will always probably be the primary, like the first part of it. (Trainer A2)

Secondly, CSM 2 noted that LMS modules provide an opportunity to split training into small chunks of information, making training more flexible. CSM 2 saw this as being a particularly important benefit as in their experience pulling people away from day-to-day operations to partake in extensive training is typically difficult to arrange. Finally, CSM 1 pointed out that there can also be a motivational dimension to LMS. If there is an element of testing knowledge gained from a module, this can motivate people to pay more attention:

> It's also making them actually pay attention. Because people can sit in class and do whatever they want, but if you have to take some sort of

> certification and quiz, then... that doesn't mean that they're gonna know it completely, but at least it's helpful. (CSM 1)

5.3.4 Email

Training could sometimes be approached using a simple email. At Cancer Center A in particular, reminders about correct usage or, for example, notifications about update-related changes could be handled through an email. These emails could at times be mandatory reads that would be tracked. As Trainer A2 described:

> We will sometimes also put in a code word at the end, that they have to submit to us afterwards, to ensure that they've actually read it through and then we actually document it on our spreadsheet of who completed it and who didn't, so that we know who's done it. (Trainer A2)

5.3.5 Ongoing support

An additional common element of the training experience at both cancer centers was providing ongoing support after the main formal part of training was complete. Practically this meant being accessible in case questions or issues arose and providing assistance on an as needed basis. At Cancer Center A, nurse educators could be accessed via email or phone, while help from peers or potential champion users could be received more directly face-to-face. At Cancer Center B, due to training being handled by team leads, even the trainers could be reached in person for ongoing assistance: "if they have questions they know I'm available and what not to help" (Trainer B1).

5.3.6 Combining methods

It is worth noting that both of the case cancer centers combined methods and approaches rather than relying solely on one approach. At Cancer Center A the learning management system modules may have formed the foundation for training, but this was typically followed by "a real time walk-through in [the vendor's service] of what it looks like" (Trainer A2), combining a mixture of observation and hands-on testing depending on the amount of participants present. At Cancer Center B the progression of training seemed to depend slightly on the trainer and user. It could, for example, begin with a trainer demonstrating the service, followed by guided real usage of the application and finally independent usage with support available if needed.

Combining multiple methods was seen as a particularly effective training practice by Trainer A2. They argued that different approaches can complement each other with different methods catering to the differences between learners:

> I think it's more the combination of everything, is what would be more effective, because some people don't learn in modules, where some people do. Some people will learn more in the meetings where we have the walk-throughs and the questions and answers than they will in the other one.

> So, I think having those different components is important depending on how they learn. (Trainer A2)

CSM 2 was similarly a proponent of combining different training approaches with regard to training provided by the software vendor. This is discussed in greater detail in Section 5.8.

5.4 Training materials

Despite both cancer centers utilising the vendor's service itself or a demo environment version of it as their central training material, there was also some use of additional documentation and material to support learning. The learning management system modules in place at Cancer Center A (discussed in Section 5.3.3) were an especially prominent collection of such training material. Other material was less extensive and less actively used.

At Cancer Center A, training material beyond the LMS modules included, for example, questions and answers documents, screenshots, a video about the patient application and cheat sheets with instructions for procedures like processing a patient case. For a limited time Cancer Center A also used script documents intended to assist staff with talking about the vendor's service with patients and promoting it to them. These scripts were eventually phased out as they were found to be unhelpful:

> I think some of the parts that didn't work was our initial scripts or kind of even scripts in general. While we thought it would be good to have a script, we find that people generally don't use them. So, I think probably having spent a little bit more time really introducing [the vendor's service] and like really getting them that feel for what [the service] is and the positive part of [the service] and where it's gonna go, might have been a better use of than the script. (Trainer A2)

It is worth noting that, while a range of documents and material existed at Cancer Center A, in practice one of the interviewed users did not have any documents as part of their training process, perhaps due to the department they were working in: "Yeah, there wasn't any... no, no documents to go through" (User A1).

At Cancer Center B, documents and materials were mentioned by trainers and users less than at Cancer Center A. Trainer B1 stated that they hand out a brochure about the vendor's service to new employees, although the brochure is directed "primarily for the patients" (Trainer B1). One user had also received a "[vendor] training packet" (User B1) that they referenced "a few times" initially, but that had since been lost. In general, the usage of documents and materials seemed to depend on the team, trainer and user. One of the interviewed users did not encounter any documents during training (User B2), while a trainer echoed this saying that "There's no like how-to guides or anything like that, step-by-step" (Trainer B2).

While documents and other materials played a relatively small part in training at both of the cancer centers (with the notable exception of LMS at Cancer Center A) their use was generally viewed favourably. Both trainers and users alike noted

the value of documents (Trainer A1, Trainer B2, User A1, User A2, User B1). User A1, for example, remarked:

> I think it would be helpful, for sure, if there was maybe... if they [trainer] had developed some type of formal documents to go through or specific steps and areas you should go through, kind of like a walk-through. (User A1)

One user in particular had found use for documentation when they were working alone and did not have anyone around to ask for help (User B1).

It is worth noting, however, that not all comments acknowledging the value of documents were necessarily actively enthusiastic. Trainer B2's expression of approval for having documents as part of training was more moderate in nature: "I think it could be helpful. I don't think it would hurt" (Trainer B2). Furthermore, it was also acknowledged that documents may have limitations and downsides as well. Trainer A2 noted the issue of overwhelming people with too many documents: "you try to make documents to be helpful, but now there's five-six documents for them to choose from, that's a lot to read" (Trainer A2).

5.5 Training setting

The settings in which training was organised at the two cancer centers varied slightly. The following sections examine these settings in terms of location, amount of people and the notion of utilising recurring events at a cancer center to administer educational information.

5.5.1 Location

Post-implementation training at Cancer Center A tended to be organised in a classroom type setting or generally separate from the space in which users will actually be working with the vendor's service. This was not necessarily considered to be a helpful approach. A user from Cancer Center A felt that being in the real context of use surrounded by peers and witnessing real usage could have been better:

> My training was like in a room on a computer, but maybe if I had the training on the unit with the other [users] actually using it to communicate, that might've been better, than on my own in a room. (User A1)

Indeed, in contrast, at Cancer Center B training was commonly handled at the actual space in which the vendor's service is used day-to-day, whether at the front desk or the nurses' room. This approach echoes the general mentality of real usage as part of training evident at Cancer Center B.

Training at both cancer centers was primarily done in person, except for the LMS modules at Cancer Center A or some vendor-led remote training that was organised for new Cancer Center B users early on after implementation. Participants widely appreciated having training in person rather than remotely, whether that training or support came from the vendor or was provided internally (Trainer A1, Trainer B1,

Trainer B2, User A2, CSM 2). User A2 described the simplicity of asking for help in a face-to-face setting:

> I find that in person you can run through examples, right. Like, you know, like we're gonna register Joe for [the vendor's service] or something and then everyone can work through it. If you have a question it's just a matter of putting up your hand or saying "Hey, I have a question". (User A2)

From the software vendor's perspective, on site training was seen as facilitating greater engagement:

> We prefer to train on site, just because you have better engagement when you can actually see people, because a lot of times our remote trainings, we can't see the other side and so sometimes we're like "Do you have any questions, are you still in the room?". (CSM 2)

5.5.2 People

Training related to the vendor's service at both cancer centers was typically handled on a one-on-one basis rather than a group setting. As an exception, group training was a possibility at Cancer Center A if there were many new staff members needing training at once. Similarly, reminders and information regarding updates were generally shared to all relevant employees at once.

One-on-one training was viewed positively by trainers at Cancer Center A, with Trainer A1 in particular considering one-on-one time supporting staff to be an especially effective training practice. Other participants did not make judgements regarding one-on-one training. There were two key benefits to the one-on-one approach mentioned by Cancer Center A trainers. Firstly, Trainer A1 noted that learning in a group setting does not suit everyone equally well:

> For our group we've really found that it's that one-on-one time that some staff just need. They don't necessarily do well in a group environment, even if they have that hands on time. They just need a little bit more time in a quieter environment to sit and go through something to be able to learn. (Trainer A1)

Secondly, as mentioned in Section 5.3.1, Trainer A2 felt that arranging hands-on experience for learners is easier when training is done on a one-on-one basis rather than in a group.

5.5.3 Existing recurring events

At both of the case cancer centers post-implementation training related to the vendor's service was typically done at times exclusively reserved for it. However, Cancer Center A also occasionally made use of existing recurring events at the center to educate staff on the service. The cancer center has recurring patient service rounds

and weekly education sessions that cover any topics that are relevant at the time. These events have sometimes been used to communicate also about the vendor's service, for example, in the form of reminders regarding correct usage. Cancer Center B participants did not mention having such recurring events where the service would be discussed as needed.

5.6 Evaluating training

Part of post-implementation training operations at both cancer centers was to evaluate and observe how effective training has been and how people have felt about it. This was approached in three primary ways with each center leaning on some approaches more than others.

The first way in which training effectiveness was evaluated was monitoring service usage. Practically this meant following analytics, metrics, reports, usage logs and the like to monitor whether people are using the vendor's service correctly and training has resulted in the desired behavior. At Cancer Center A this entailed relatively formal and detailed audits of usage that Trainer A2 has found to be "super helpful". They describe the audits:

> We have like, we have some people doing audits on [the vendor's service]. So, they'll go in to [the service] or they'll find out like, how long have cases been sitting in the queue for. And they'll look for different, you know, how many times have somebody entered the wrong treatment module or added questionnaires when they weren't supposed to and those sorts of things. (Trainer A2)

At Cancer Center B, monitoring usage was slightly less formal and detailed in nature. One of the trainers described checking a report weekly to ensure that patients have been invited to the vendor's service correctly, while the other mentioned observing the amount of incomplete patient cases in the service as an indication of whether or not everything is fine.

The second approach to evaluating the successfulness of training was casual interactions with staff. These interactions involved paying attention to how many questions relating to the service the staff have and generally asking how they are managing. This approach was particularly prominent at Cancer Center B, where each team lead is responsible for training within the team. Cancer Center A similarly utilised casual interaction, but to a lesser extent due to staff being spread out across a large geographical area, meaning that trainers could not be present everywhere to interact with staff.

The third approach to evaluating training was only used at Cancer Center A and involved sending out a questionnaire to training participants to discover how they felt about the training. As such, Cancer Center A uniquely had a way of collecting feedback and following not only whether staff had learnt, but also how they felt about the learning experience. This is something that was seemingly not measured or evaluated at Cancer Center B, at least formally.

5.7 Software vendor involvement and support

The case cancer centers were largely self-sufficient when it came to post-implementation training, showing limited need for support or involvement from the software vendor. CSM 2 recognised this as a common pattern: "it's not uncommon for a site not to – for them just to train their own" (CSM 2). Despite this self-sufficiency, the software vendor has been involved at both case cancer centers to some extent, and the centers did acknowledge needing support with some matters such as information regarding software updates. As Trainer A1 put it:

> So ongoing, it's, I mean we're fairly self-sufficient now. Questions still come up and we do still engage them [the software vendor] and ask them things for clarification or you know as there's been new releases we might ask them for, for some of that documentation or some more screenshots so that we can keep our staff training modules up to date. But for the most part, we're self-sufficient. (Trainer A1)

The following sections examine the types of support the vendor has been providing related to post-implementation training and varying perspectives and needs relating to them.

5.7.1 Training

The most direct way of being involved was organising and providing actual training. This was, however, not that common. There were no mentions of vendor-organised training sessions at Cancer Center A after implementation. At Cancer Center B remote training was organised shortly after implementation for some new staff members, but the center quickly shifted to handling training entirely internally.

Despite the rarity of post-implementation training organised by the vendor, Trainer A1 had a positive view of vendor training. They felt that training by the vendor can have unique value in terms of deeper contextual understanding of the eHealth service:

> Having the [vendor] team there, they're able to just give that little bit more context to staff, which sometimes they need just that little bit more to get that understanding. (Trainer A1)

Furthermore, Trainer A1 thought that vendor training carries additional authority and a sense of neutrality, compared to internally organised training:

> Sometimes it's just better to come from them [the software vendor] than it is from us, right? Like, if [the vendor] is telling you "This is how it is and this is why it's created", sometimes staff will just go "OK", whereas if we tell them, it's like they'll still continue to question it. So, just having that neutral third party there is sometimes helpful. (Trainer A1)

The interviewed customer success managers were proponents of directing any vendor training efforts at a limited subgroup of users such as super users rather than

attempting to train everyone at a cancer center (CSM 1, CSM 2). Training everyone was not considered a desirable course of action or even a realistic possibility (CSM 1). Trainer A1 echoed this sentiment of focusing training on super users when discussing the potential need for additional support from the vendor in connection with a larger service update:

> That sort of train the trainer mentality of, you know, my super users getting that information directly from [the vendor] and going through some of those scenarios to then work on what their skills are. And then pass them on to the rest of the staff. (Trainer A1)

5.7.2 Communication

More common than organising actual training was providing support through communication and the sharing of information in various forms. At its simplest, this was a case a of answering questions arising at the cancer centers. Other examples included participating in internal cancer center meetings to comment on matters or providing feedback for training content a center was developing. Both of the cancer centers have had a good relationship with the software vendor in this sense and have felt they are able to get the information they need. Trainer A1 stated that "We've always had really good relationships with our [vendor] team", while Trainer B2 noted that "they're [the vendor] always just a phone call away. They've been really quick to answer any questions we've had".

Providing information could also take the form of "metric monitoring" (CSM 1). By tracking metrics for their cancer center, CSM 1 could notify the center regarding any arising issues regarding service usage:

> Having discussions about things that I see start to slide, you know, whether it's the number of cases that are still open and then you have that dialogue and the managers can have the dialogue with their staff members. (CSM 1)

Updates or changes to the vendor's service create a particularly great need for support and communication with the vendor. This became evident with Cancer Center A, that does update-related training or spreading of information. While the center was generally quite self-sufficient, especially in terms of orientation of new employees, updates were acknowledged as requiring greater support: "So, every time there's an update, again, that's where communication with our [vendor] team is really important" (Trainer A1).

Despite the acknowledged importance of communication during updates, not everyone had been receiving sufficient information about updates from the software vendor. Trainer A2 stated:

> You don't really get any notification of updates. Like, you get told that they're coming, they're gonna happen. You don't really get told what's gonna be updated or what the changes are gonna be. And so we wait until the update happened and then we have to quickly go through it to

> kind of see, is there anything that's going to effect our workflow. (Trainer A2)

This lack of information has led the cancer center to attempt to reverse-engineer updates by emailing staff and asking them to notify the nurse educators of any changes to the service they may notice:

> We send out a generic one saying that "We have no..." like "There's gonna be an upgrade for [the vendor's service]. We don't know what it's gonna entail. If you guys notice any differences or anything that's changed, please let us know as soon as you can, so that if this is something we need to further evaluate and let other people know, let us know". (Trainer A2)

It is worth noting that some people at Cancer Center A had managed to receive the information they needed regarding updates. Trainer A1 described their experience:

> Again, recognizing the software is fairly new and oftentimes the [vendor] documentation on the upgrade comes out after the upgrade is done. We work with our [vendor] team to sort of say "OK, give us the top three or five highlights of what's changing". You know, they're usually minor modifications, but if we can know what they are ahead of time, then at least we can give staff a heads up of "hey, this icon is going to change" or, you know, "this color is going to change" or "you're going to see this wording is a little bit different", so that we can at least give them a heads up. (Trainer A1)

As such, Trainer A2's experience was one of not receiving information about updates at all, while Trainer A1 had had more of an issue with the timing of provided information, but had managed to work around this by engaging people from the software vendor. Discussions with people within the software vendor indicate that information about updates, such as release notes, exist and have been shared with cancer centers. The case of Cancer Center A, however, suggests that the information has not always been timely enough and has not reached everyone who could benefit from it. This has left Cancer Center A desiring improved support and communication related to updates: "a heads up on what will be changed, even if it was just a couple of days, would definitely be a huge help" (Trainer A2).

5.7.3 Materials

One of the ways the software vendor has supported cancer centers with post-implementation training efforts is providing documentation and materials as well as helping centers produce their own materials such as the LMS modules at Cancer Center A. A range of vendor-provided materials was mentioned by participants at both centers as well as the customer success managers. Mentioned materials included screenshots, a video about the patient application, a training packet, a brochure for patients and a quick-tip sheet.

Despite these types of documents being shared, their use was not evident in the training and learning experience of all the users. In fact, two of the users did not

have any documentation or materials as part of their training (User A1, User B2). Furthermore, according to CSM 2, cancer centers have independent access to a digital platform, where vendor-created documents, quick-tip sheets and the like are directly available to them. However, in CSM 2's experience cancer centers rarely use the platform and typically ask the vendor for documents instead.

A central challenge that arose related to the vendor's documents was the need for documents to be customised. Generic documents do not necessarily match a cancer center's needs and way of using the vendor's service. For example, the feature-set in use at Cancer Center A made some parts of documentation inapplicable or irrelevant: "it was really hard to know in those documents, which pertained to us and which didn't, because of specific features we were or were not using" (Trainer A2). The notion of tailoring documents for specific cancer centers was also acknowledged by CSM 1, who saw a need for the vendor to have ways of easily customising, for example, educational videos to include only relevant parts based on the features in use at a cancer center.

The need to have tailored documents that suit a center's unique characteristics led Cancer Center A to create their own materials: "a lot of the training materials that were made, weren't specific to how we were using it. So, we had to create our own material" (Trainer A2). While Cancer Center A has taken initiative to create their own materials, the software vendor has been involved in supporting the creation of these types of materials by, for example, providing feedback. Similarly, the LMS modules at Cancer Center A were custom content that the center created themselves, with the vendor playing a supporting role. CSM 1 describes the collaboration: "They had the resources to develop the actual content based off of our feedback and the information we shared, screenshots and things like that" (CSM 1).

Other mentioned issues regarding vendor documents included some documents being outdated or even contradicting each other:

> Some of the documents that they did have that we were given access to were really quite old. So, they were like very... Like, some of them they had already changed, they weren't using as they were in the documents. There's a couple of documents that kind of like, kind of contradicted each other in terms of like colors of case cards. (Trainer A2)

5.7.4 The vendor's eHealth service

The vendor's eHealth service itself and its characteristics were seen as playing a part in shaping the learning experience. Thus, in some ways the application and its design and development are a way in which the vendor supports and influences post-implementation training at cancer centers. Fundamentally, the service was seen as being easy to use and user friendly, making the learning experience less of a challenge (Trainer A1, Trainer B1, Trainer B2, User A1, User B1, User B2). User A1 described the ease of learning: "I think the layout of the program itself is pretty user friendly so I could pick it up pretty easily, how to use it". User B2 echoed this sentiment: "I didn't really have to do too much digging to figure it out. Like, individual questions would pop up, but nothing too difficult".

On the other hand, multiple participants had challenges with the terminology used in the application and the lack of clear definitions, which in turn hindered learning and providing training (Trainer A2, User B1, User B2). Trainer A2 noted that the terminology used in the service does not always align with what makes sense for the cancer center:

> They do have different terminology and the way that they've worded things is very, somewhat, confusing, in terms of just getting down the language. So like "treatment module", what does that mean versus like the questionnaires? (Trainer A2)

Furthermore, Trainer A2 felt there was not enough information on what different terms and functionalities mean, thus making it more difficult to create materials and support training:

> And they didn't really have definitions for what all the different things meant. So, when we were trying to create a lot of our documents and policies and stuff like that, we really had to create our own... our own definitions for these things. So, some sort of like definitions document, where it was very clear like what a treatment module means and what is, how is that different from the questionnaire, 'cause we always get really a lot of confusion between those two, even though they're totally different. (Trainer A2)

User B1 similarly found it challenging to learn the difference between similar functions relying solely on the names or labels of the functionality:

> Because you can consult somebody or you can process the case and assign it to someone and that part was confusing to me, because I was just like "Well, what's the difference?". I'm still not sure I completely understand the difference. (User B1)

Echoing Trainer A2, User B1 saw value in having clearer definitions for different functions and learning more about their intended usage:

> Going more in depth about what certain things are meant to be used for, like consulting someone, for example, or for reassigning a case. I think it would be helpful to have that explanation of what the difference is. (User B1)

5.8 Software vendor support in the future

In addition to what the software vendor has been doing to support cancer centers, customer success managers had ideas and visions for what future post-implementation training support could or should be like. This section reports on these reflections.

5.8.1 Learning management system

Both customer success managers saw value and potential in having learning management system modules about the vendor's service produced by the vendor themselves. These could be offered to and made available for cancer centers. This is in contrast to the LMS modules at Cancer Center A, that were created by the center themselves, with some support from the vendor.

In addition to the general benefits of LMS modules discussed in Section 5.3.3, CSM 1 highlighted some unique benefits from the vendor's perspective. Firstly, CSM 1 felt that providing cancer centers with LMS modules would ease or lessen the need for the vendor to organise training sessions by increasing the self-sufficiency of the centers:

> The customer doesn't have to come back to us and say "Oh, we have ten more employees, can you please train them". Right? If we had a similar scenario, where we could share that with other customers, it would save time post-implementation with that sort of effort, by sharing an LMS. (CSM 1)

Secondly, CSM 1 stressed that LMS modules created by the software vendor would help ensure information spread at cancer centers is accurate:

> I do see that that's a huge benefit, where the content, what you're driving from the [vendor] perspective is truth, right. If we're the creators of the product and we're creating the content, we have our truth. (CSM 1)

On the other hand, the customer success managers also identified two central challenges to having LMS modules provided by the vendor. Firstly, both CSMs noted that learning management system modules would require constant updating due to the vendor's eHealth service being frequently updated:

> I mean, it's [the service] constantly changing and yes, I mean, is that sustainable to maintain that? It would – maybe not and maybe that's why we haven't done this [LMS modules] so far. (CSM 2)

Secondly, similar to other materials (discussed in Section 5.7.3), the content of LMS modules would need to be customised to match the use of each cancer center. Tailoring content in this way was seen by CSM 1 as the largest challenge to providing modules for cancer centers:

> I think that's a real, that's the largest barrier, is how are you using it and how do we take those pieces out that aren't being used, in an efficient way. So the content needs to be applicable to each one of those organisations, I think that's the toughest part. (CSM 1)

5.8.2 Diversity of approaches

CSM 2 was a proponent of having a diversity of approaches to how cancer centers are supported with training-related matters. This would mean having multiple options

to offer and then determining which approach would best suit a particular center: "I think we have a lot of opportunity to create several avenues and then figure out what's the best approach for the specific customer" (CSM 2).

The best approach would not necessarily need to be a single method, but could be a combination of methods. CSM 2 mentioned, for example, the possibility of combining training through LMS modules with some face-to-face training for super users or pairing LMS modules with open sessions that staff could attend afterwards to discuss and ask questions. As such, CSM 2 did not see the possibility of LMS modules as a threat or replacement to other types of training, but more as a complimentary option that would also require substantial effort from vendor trainers to keep up to date:

> I don't think face-to-face goes away, I don't think what our staff who do the education would go away. That's always a big concern for that role, like "Oh my gosh, well then what do I do?", well you still have to do like a lot of training and somebody has to keep up with the material, because it changes over time. (CSM 2)

5.8.3 Hands-on experience

As discussed in Section 5.3.1, hands-on experience was an actively utilised and appreciated approach to training at both of the case cancer centers. This was echoed in CSM 2's hopes for future training provided by the software vendor. CSM 2 expressed a desire to ensure that vendor-organised training would be more consistently hands-on in nature, including hands-on experience with the patient application side of the service as well. This was a concern as often the settings in which vendor training sessions have been organised have not been conducive to hands-on experience:

> So, I think there would be – it's, you know, there's someway that we could work in a little more hands on for the users would be ideal. But most of the time we're, you know, big – you know, we're presenting off of a projector on a big screen in a conference room and you know we can ask like "Where would I click next?", but you know you'll get one person who's gonna be like brave enough to answer and then the rest are like, yeah, "Don't look at me, don't ask me" [laughs]. (CSM 2)

6 Discussion

This chapter begins by responding to the two research questions. Thereafter, practical implications for the software vendor are drawn along with discussion on the theoretical contribution of the research. The chapter closes by evaluating the study and identifying avenues for future research.

6.1 Good post-implementation training practices

The first research question in this study was concerned with identifying practices that promote successful post-implementation training of eHealth services facilitating patient-provider communication. In response to this question, this section proposes nine good post-implementation training practices. As described in Section 4.4.2 on data analysis, the nine good practices were developed by examining participants' evaluations of different aspects of training: what they valued and thought worked well and what they had issues with and hoped would be different. In addition, approaches that were treated neutrally were also considered if they were in consistent use at the cancer centers – active use was considered to imply that the approach was at the very least satisfactory due to it not being phased out. These different approaches evident in the results were then grouped into more generic or abstract themes that may be transferable to other cancer centers as well as other healthcare providers.

The practices are intentionally labeled as good practices rather than best practices. This is to acknowledge that, while the practices are rooted in what users and trainers valued in training and as such are likely to be useful, there may be other practices and approaches used at other healthcare providers that are superior to or expand on the ones identified here. Indeed, unlike for example McAlearney et al. (2012), who pre-selected exceptionally proficient sites to interview in order to identify best practices for EHR implementation training, the participating cancer centers in this thesis were not selected with any criteria for being exemplary at training-related matters. This arguably enabled learning also from the issues and challenges faced by the centers as these imply something about what good training would look like if those issues and challenges were overcome.

It is also worth acknowledging that the term "good practices" is rather broad. This too is an intentional choice, rooted in how data was collected. Rather than attempting to measure training effectiveness or specific outcomes of training, the thesis focused on the qualitative experiences and perceptions of people involved in training. In light of this, participants were free to discuss aspects of training they valued or disliked without a predetermined or precise definition of value. As such, participants could appreciate training approaches for a wide range of reasons from effectiveness in supporting learning to simply personal preference. Thus, rooted in these broad and diverse evaluations, the practices identified here are good practices in a similarly broad sense.

The nine good practices are listed in Table 7 below. The table also includes for each practice the number of interview quotations related to the practice, the amount of interviews in which the practice was evident and references to related literature.

A more detailed breakdown of the individual codes behind each practice is available in Appendix D.3.

Table 7: Nine good post-implementation training practices

Good practice	**Quotes**	**Interviews**	**Related literature**
Aiming for realism	69	10	Alkureishi et al. (2018), Bandura (1971), Bennett et al. (2012), Benwell et al. (2017), Bostrom et al. (1990), Bredfeldt et al. (2013), Edwards et al. (2012), Gordon et al. (2022), Sharp et al. (2017), Smailes et al. (2019), Taylor et al. (2005), and Wintner et al. (2021)
Accounting for people's differences	25	9	Bostrom et al. (1990), Bredfeldt et al. (2013), Dastagir et al. (2012), Edwards et al. (2012), Gordon et al. (2022), Gupta et al. (2010), Ly et al. (2019), and Sharp et al. (2017)
Accounting for organisational characteristics	30	5	Humphrey-Murto et al. (2022), Shachak, Dow, et al. (2013), Sharp et al. (2017), and Wintner et al. (2021)
Ensuring sufficient understanding of the patient perspective	38	9	Avdagovska et al. (2020), Bennett et al. (2012), Hefner et al. (2018), Sieck et al. (2017), and Wintner et al. (2021)
Learning from people knowledgeable in the context of use	22	8	Bredfeldt et al. (2013), Dastagir et al. (2012), Gordon et al. (2022), Howell et al. (2020), Kirshner et al. (2004), and Randhawa et al. (2019)
Matching training amount to eHealth service characteristics	21	7	Pantaleoni et al. (2015)
Ongoing training beyond just new joiners	36	8	Bredfeldt et al. (2013), Dastagir et al. (2012), Gordon et al. (2022), Kirshner et al. (2004), Maddocks et al. (2011), and Randhawa et al. (2019)

Utilising existing resources and knowledge	39	7	McAlearney et al. (2012)
Maintaining a close relationship with software vendors	17	7	Shachak, Barnsley, et al. (2013) and Shachak, Dow, et al. (2013)

6.1.1 Aiming for realism

The results suggest that aiming for realism may be a helpful and appreciated approach to training. This means attempting to achieve a close match between training and the nature of actual usage after training. Both cancer centers sought out realism in their training. Furthermore, methods that aimed for realism, such as the use of test patients, were seen as conducive to learning.

Gupta et al. (2010) propose that the goal of training is to produce a "user who has the skills needed to apply what has been learned to perform a job-related task" (p.10). In light of this definition, minimising the gap between what is being taught and what is actually done on the job seems a reasonable pursuit.

Realism can be pursued in terms of three dimensions that arose from the results: (1) hands-on experience, (2) training content and (3) training location. Firstly, hands-on experience refers to not relying solely on passive observation in training, but creating opportunities for users to practice and gain realistic usage experience during training. Hands-on usage was appreciated or preferred by all interviewed users and similarly vouched for by most of the trainers.

Hands-on experience has a solid foundation in literature and it's value is affirmed by existing research. Bandura (1971) proposes direct experience as one of the two primary ways in which people learn, with observation of others being the other. Moreover, hands-on practice is one of the core components of behavior modeling training, which has been found to be an effective approach to training for a wide range of skills including technical ones (Taylor et al., 2005). More specifically in the context of eHealth services and post-implementation training, hands-on practice was one of the eight successful training approaches identified in the scoping literature review in Section 3.1.

The second dimension of realism is that of training content. This refers to ensuring that the content of training is tailored to a person's role, workflows and tasks rather than being generic in nature. This notion of role-specific training was an actively maintained practice at both case cancer centers. Focusing on realistic work tasks echoes the applications-based training approach proposed by Bostrom et al. (1990), where learning is centered on tasks and what a system can be applied to rather than system features in and of themselves. Furthermore, aiming at realistic training content is not a new idea within eHealth-related post-implementation training either. Relevance of training content to real work was one of the eight successful training approaches identified in existing PIT research. Ensuring such relevance of content, by focusing on common workflows and tailoring training to different roles has been

found to be critical to effective post-implementation training (Alkureishi et al., 2018; Bredfeldt et al., 2013) and training of services facilitating patient-provider communication (Bennett et al., 2012; Wintner et al., 2021).

The third dimension in which realism may be pursued is the location or environment in which training is organised. Training at Cancer Center B was organised in the same exact space where users would be working on a day-to-day basis, making the transition from training to real work minimal. Cancer Center A did not follow this approach, but not doing so was seen as a less than optimal practice by one of the users. It is worth noting that, while a realistic environment may be valuable, this may not necessarily be viable for all healthcare providers in all situations. Larger group training sessions, for example, may necessitate and benefit from a classroom setting instead.

Reviewed literature did not explicitly discuss the realism of training environments. Benwell et al. (2017) found real day-to-day usage to effectively improve EMR usage performance post-implementation. This implies that learning was happening in the same space in which the EMR is also regularly utilised. Nevertheless, Benwell et al. (2017) do not single out the realistic learning environment as being of value. Such an environment can, however, create opportunities to learn from other practitioners in the space, as one participant indicated, as well as receive peer support – practices that are endorsed in existing research. Learning from other practitioners was one of the eight successful eHealth post-implementation training approaches identified in the scoping reviews, with Howell et al. (2020) also corroborating the applicability to services facilitating patient-provider communication.

In addition to the three dimensions of realism, the results point to two general ways of pursuing this realism: (1) simulation and (2) real usage. First, simulation here refers to the use of demo or staging environments, test patients and other such technical solutions to mimic actual usage of an eHealth service. Both cancer centers made use of these types of solutions in their training and when, for example, test patients were missing from training procedures, this was seen as a factor that limited learning. The notion of simulating usage is supported by existing research. Sharp et al. (2017) studied computer-based EMR onboarding using interactive learning management system modules that mimicked real EMR usage and typical work scenarios. Smailes et al. (2019), in a similar EMR onboarding setting, examined a training intervention that included a training EMR environment where learners could do exercises and practice workflows. Both of these studies found the training interventions to be more efficient than instructor-led training, while keeping learners satisfied. For post-implementation training aiming to improve EMR skills, training interventions involving simulated non-productions versions of the EMR have similarly been found to be effective (Bredfeldt et al., 2013; Gordon et al., 2022)

The second approach to pursuing realism is real usage of the live production version of an eHealth tool with real patient data as part of training. Cancer Center B relied on this approach, thus removing the gap between training and actual day-to-day use almost entirely. While this may be an effective way of ensuring realism in training, the results indicate that the approach is not without its issues. In particular, if training is in the form of real usage alongside regular work tasks, the pressures and

busyness of day-to-day operations may make learning difficult. Real usage as part of training was less common in the reviewed literature than simulating usage, but some studies did mention such solutions. Bredfeldt et al. (2013) describe a successful post-implementation training intervention, where the live EMR environment was used for most of the training, with only exercises involving patients being conducted in a training environment. Similarly, Benwell et al. (2017) discovered real day-to-day work to be effective in improving EMR usage performance, even if this was not necessarily an intentional component of the studied training intervention.

In summary, the results indicate that pursuing realism by minimising the gap between training and actual usage may be a valuable way of approaching post-implementation training. There are at least three dimensions of realism to consider and they can be pursued either by some degree of simulation or alternatively real usage. The discussed findings are evident also in existing eHealth post-implementation training research, with training in the real physical work space and real usage of a live production version of a tool being less common.

6.1.2 Accounting for people's differences

Acknowledging that people are different and accounting for how this may impact learning may be a good training practice to follow based on the results. Notably, this goes beyond the more general notion of role-specific training, which is primarily concerned with the content of training. Accounting for people's differences, on the other hand, is concerned with how training content is provided in an effective and appreciated way on the level of the individual. Trainers at both cancer centers showed an awareness of and attentiveness to people learning and preferring to learn in different ways. They believed that different training approaches, such as LMS modules or one-on-one time, may suit different people to varying degrees and sought to take this into account in how they provide training. Users also expressed personal preferences for certain training methods, such as hands-on experience and training in person. In light of all of this, a combination of multiple training approaches was commonly used at the cancer centers. This was seen as an effective practice to follow, due to it catering to people's differences.

The notion of individual differences between people and their effect on learning are widely acknowledged also in the literature. Bostrom et al. (1990) split these differences into lasting *traits* like learning style and transient *states* like emotions or motivation. Gupta et al. (2010) did an extensive review of how constructs like cognitive style and learning style have been found to impact learning outcomes in end-user training in general, illustrating how established individual differences are as a relevant variable in training and learning. Furthermore, the practice of combining multiple training methods, used by the cancer centers studied in this thesis to account for individual differences, is also described in existing eHealth PIT research. Indeed, combining training methods was one of the eight successful training approaches identified in the scoping reviews. Similarly for training of services facilitating PPC, Ly et al. (2019) describe using more than one medium as a best practice. Finally, one-on-one support was identified as one of the eight successful training approaches in

the reviewed literature, and could arguably be seen as way of accounting for people's differences in practice.

6.1.3 Accounting for organisational characteristics

Healthcare organisations can be quite different and the same methods, approaches and materials may not work equally well for all healthcare providers. As such, organisations are likely to benefit from acknowledging their own unique characteristics and seeking to tailor training to these characteristics. For example, Cancer Center A found LMS modules necessary for training due to the center's size and geographical dispersion, while Cancer Center B managed without such a system. Beyond variables like size, location and organisational structure, characteristics related to how an eHealth service is used at a healthcare establishment may also be relevant. Indeed, participants thought that documents and other materials need to be customised based on each organisation's usage patterns and active feature-set to be valuable.

Taking organisational characteristics into account is supported by the reviewed literature. Wintner et al. (2021) found lacking "institution-specific educational content" (p.7) to be a potential weakness in the training intervention they studied for ePRO system implementation. Sharp et al. (2017) note the importance of considering organisational characteristics, such as the amount of staff who require certain training and the stability of workflows, when deciding what courses may benefit from computer-based LMS training. Furthermore, the need for documents and materials to be tailored to an institution was also noted in the reviewed literature (Humphrey-Murto et al., 2022; Shachak, Dow, et al., 2013). More generally, ensuring relevance of training to real work (one of the successful training approaches identified in the literature), arguably requires understanding and accounting for the organisation in which training is organised.

6.1.4 Ensuring sufficient understanding of the patient perspective

eHealth services that facilitate patient-provider communication are unique in that they are used by not only healthcare practitioners, but also patients. The results of this thesis indicate that it is a good practice for training to cover also the patient perspective of such eHealth services. Staff should have a sufficient understanding of how patients use an application and how the service works and looks like on the patient end. Training staff on the patient application was not commonly done at the participating cancer centers due to, for example, the perceived technical complexity of arranging such training. Nevertheless, such training and understanding was seen as valuable and important, especially for some roles, where staff was more directly expected to help and support patients with the service or even promote its use.

The reviewed literature on training of eHealth services facilitating PPC similarly noted the importance of allowing staff to engage with an eHealth service from a patient's perspective in order to develop familiarity with the patient experience (Avdagovska et al., 2020; Hefner et al., 2018; Sieck et al., 2017). Echoing the findings of this thesis, this familiarity and understanding was seen as necessary for equipping

staff to promote and support patients in the use of services such as ePRO systems and patient portals (Bennett et al., 2012; Hefner et al., 2018; Wintner et al., 2021).

6.1.5 Learning from people knowledgeable in the context of use

The results suggest that it is valuable for people involved in training to not only have an understanding of the eHealth service at hand, but also be knowledgeable in the context of use. This means knowing what working at a healthcare institution is like, both in general as well as in a particular role. This type of understanding may help in having clarity on how a service ties into an organisation's workflows and day-to-day operations.

Both of the case cancer centers actively relied on people knowledgeable in the clinical context to provide and be involved in training. For example, Cancer Center B's trainers were team leads who operate as nurses or front desk clerks themselves. Similarly, super users, evident at Cancer Center A, are staff members who are personally using the service in the real context and are experienced with both the service and the context as well as their interplay. Even more broadly, this principle can be seen in peer support. While peer support might not be formally structured or sanctioned, the support is nonetheless coming from people immersed in the context of use. In the case of post-implementation training, peer support may even be especially valuable as peers have likely had the time to gain experience with the eHealth service at hand and are thus able to provide better support. This is in contrast to implementation training, where all employees are initially largely on the same line in terms of their knowledge and experience.

Practitioners providing and being involved in training was common in the reviewed eHealth PIT studies (Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Kirshner et al., 2004; Randhawa et al., 2019) and was one of the successful training approaches identified in the review. Similarly, Howell et al. (2020) found champions and peer learning to be conducive to the uptake of an ePRO system, thus supporting the applicability of this practice also for eHealth services facilitating PPC. More generally, the value of peer support is rooted in educational psychology, where peers have been found to function as models and motivators for learning (Rohrbeck et al., 2003).

6.1.6 Matching training amount to eHealth service characteristics

Attempting to maximise the amount of training is not necessarily desirable or even possible in a busy healthcare environment. Instead, the results indicate that a good practice would be to align the extent of training to the nature of the eHealth service at hand. Indeed, very limited time was spent training users on the vendor's service at the case cancer centers, yet the users thought this to be sufficient. This is to a great extent because the vendor's service was seen by users as being easy to use and intuitive to learn for the most part. Furthermore, the vendor's service is arguably less complex and presents less risks to patient safety than, for example, EMRs in terms of features. Accounting for these types of factors when deciding on the amount of training to provide is thus a worthwhile consideration. It is also worth noting

that not all time spent learning is necessarily equal. The results suggest that time exclusively dedicated to learning is especially helpful – trying to learn in the midst of real work can be challenging.

Reviewed existing research did not discuss or examine the relationship between service characteristics and training amount. References to training amount focused on practitioner interest towards additional and more frequent training (Bredfeldt et al., 2013; Gordon et al., 2022) or training time being reduced by the efficiency of computer-based training methods (Sharp et al., 2017; Smailes et al., 2019). However, expanding beyond studies exploring PIT and services facilitating PPC, Pantaleoni et al. (2015) discuss the relationship between intuitive software design and training need for EMR implementation. In line with the findings here, they note the value of intuitive design and acknowledge that this may reduce the need for training. Nevertheless, they argue that clinical workflows are too complicated and the stakes too high in terms of patient safety to forgo training entirely, regardless of how well designed a tool is.

6.1.7 Ongoing training beyond just new joiners

Post-implementation training is not solely about orientation of new staff members and may be better viewed as an ongoing and dynamic activity. Software gets updated and can require additional training or informing of staff. Similarly, people change, forget things over time and fall into old patterns of behavior, thus necessitating refreshers and reminders. Users may also simply be interested in learning more after initially getting up to speed, as some participants indicated. One of the case cancer centers provided ongoing training and education after initial orientation in the form of reminders and update-related communication. The center found these to be important components of post-implementation training. Both cancer centers also sought to have ongoing support available as needed in case users had questions or issues. Furthermore, both centers found value in monitoring service usage on an ongoing basis, thus evaluating training effectiveness and embracing the dynamic and changing nature of training needs. While neither of the cancer centers explicitly utilised them, training outcome classifications, such as those by Issenberg et al. (2005) and Mahapatra and Lai (2005), can act as useful frameworks for such ongoing evaluation of training effectiveness.

Support for engaging training with a longer term perspective was also present in the reviewed research. In fact, just over half of the reviewed eHealth PIT studies examined advanced proficiency training rather than initial orientation of new staff members (Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Kirshner et al., 2004; Maddocks et al., 2011; Randhawa et al., 2019). However, in contrast with the findings of this thesis, none of the reviewed studies focused specifically on training related to software updates. Nevertheless, Bredfeldt et al. (2013) did discover that EHR support requests at the site they examined were often related to features that were introduced in updates after initial training, thus highlighting the need for ongoing training that addresses update-related changes. Similar to some users interviewed in this thesis, Bredfeldt et al. (2013) and Gordon et al. (2022)

found practitioners to be interested in developing their skills further with additional and more frequent training.

With regard to the participating cancer centers finding value in monitoring service usage on an ongoing basis, evaluation and monitoring was also one of the successful training approaches identified in the conducted review of eHealth PIT literature. Multiple healthcare organisations in the reviewed studies incorporated ongoing monitoring of eHealth service usage as part of successful training interventions (Bredfeldt et al., 2013; Gordon et al., 2022). Notably, however, where the cancer centers participating in this thesis study used such monitoring to identify training-related needs, Bredfeldt et al. (2013) describe sharing personal usage reports directly with training participants to remind them of training-related goals and lessons and allow the participants to track their own progress. This presents another way of facilitating ongoing learning that was not evident in the cancer centers studied in this thesis.

6.1.8 Utilising existing resources and knowledge

Post-implementation training can benefit uniquely from the fact that implementation has already been undertaken. Materials and resources created during implementation as well as the knowledge and experience that were gained continue to be valuable also after implementation. For example, the LMS modules used by Cancer Center A were originally created for implementation training and similarly some of the super users providing post-implementation training were themselves trained during implementation. In this sense, the line between implementation and post-implementation is thin and it can be efficient to share resources between the two. Further blurring the line, one of the cancer centers had a phased approach to implementation, gradually implementing new features in stages. This creates opportunities to learn from each phase and improve training over time.

The reviewed eHealth PIT literature did not explicitly discuss the possibility of using existing resources and knowledge from implementation training also for post-implementation efforts. More broadly in eHealth training research, however, the notion of learning from past experiences can be found. McAlearney et al. (2012), for example, propose that recognizing an organisation's past experiences with IT implementation can be helpful for EMR implementation training. The proposition was partially supported by their findings, with some of the examined sites utilising what they had learnt from previous implementations to improve future training.

6.1.9 Maintaining a close relationship with software vendors

While healthcare providers can be quite self-sufficient in terms of post-implementation training, the results indicate that some factors may remain beyond an organisation's control and may thus require vendor support. This creates a need to maintain an active relationship and close communication with software vendors. Both of the case cancer centers appreciated having access to people from the software vendor and being able to ask for help as needed. The need for communication and support was particularly significant during situations that were destabilising in some way and outside a cancer

center's control. This was primarily evident in Cancer Center A's attempts to keep staff educated on update-related changes. This required communication and information from the software vendor and missing such information was a hindrance to update-related training.

Only two of the reviewed studies on eHealth PIT and training of services facilitating PPC mentioned software vendors. These studies did not extensively discuss the relationship between vendors and healthcare institutions. Instead, one study simply mentioned instances of vendor support (Ly et al., 2019), while the other considered the potential of a training method from the perspective of a vendor (Randhawa et al., 2019). As such, the findings in this thesis regarding the relationship between healthcare providers and vendors seem to be novel to some extent within eHealth PIT research. However, in wider eHealth training literature, some more direct discussion of the vendor relationship is evident. Indeed, both Shachak, Barnsley, et al. (2013) and Shachak, Dow, et al. (2013) propose that it may be beneficial to share training-related responsibility between vendors and healthcare organisations. This echoes the cancer centers participating in this thesis study – despite being quite independent with regard to PIT, they nonetheless felt like they could benefit from occasional vendor support.

6.2 The supporting role of software vendors

In response to the second research question, this section discusses the role of software vendors in supporting healthcare providers with post-implementation training of eHealth services facilitating patient-provider communication. Fundamentally, the results suggest that software vendors would be wise to take on the role of an enabler instead of being an active organiser of training sessions and doing training for healthcare organisations in their stead. Indeed, the interviewed cancer centers showed great capacity to be self-sufficient and similarly one of the CSMs noted the preference of many cancer centers to do training independently. Furthermore, for a vendor to train everyone at all customer sites is not necessarily viable nor desirable. Therefore, the following subsections propose seven principles specifically concerned with how a vendor might play an enabling role with regard to post-implementation training. Such a role entails supporting in ways that enable healthcare organisations to follow good PIT practices.

The seven principles were reached by examining each of the nine good PIT practices proposed in Section 6.1 and reflecting on the ways in which a vendor might uniquely be able to influence each practice and thus enable a healthcare organisation to follow it. In addition, CSM perspectives on what the software vendor's support should be like in the future were considered and compared to the developed principles, in order to inspect the alignment between the principles and CSM perspectives. The seven principles and the good post-implementation training practices they connect to are summarised in Table 8 below.

Table 8: Seven software vendor support principles

Software vendor support principle	**Connected good post-implementation training practices**
Ensure eHealth service quality	Matching training amount to eHealth service characteristics
Build a solid foundation during implementation	Utilising existing resources and knowledge
Provide tools, technology and access	Aiming for realism
	Ensuring sufficient understanding of the patient perspective
	Ongoing training beyond just new joiners
Ensure relevance of provided support	Accounting for people's differences
	Accounting for organisational characteristics
Train the trainers	Learning from people knowledgeable in the context of use
Focus support around updates	Ongoing training beyond just new joiners
	Maintaining a close relationship with software vendors
Utilise experience gained from other customers	Utilising existing resources and knowledge

The general proposed stance of supporting in a way that enables healthcare providers to follow good PIT practices is arguably in line also with the reviewed literature. In particular, as noted before, there were indications that optimally training responsibility is shared between vendors and healthcare institutions in a collaborative fashion (Shachak, Barnsley, et al., 2013; Shachak, Dow, et al., 2013). The seven vendor support principles proposed below expound on the division of responsibility and consider what the unique role of vendors should possibly be.

It is worth noting that healthcare organisations and situations are different and thus sometimes there may be a need for a vendor to take on a more active or direct role in post-implementation training. Moreover, even as part of an enabling role, some training may be directly organised by a software vendor. In fact, such training was even considered uniquely valuable by one of the interviewed cancer center trainers. In these scenarios, where training is organised by the vendor, much of the same good practices proposed for healthcare providers arguably apply for vendors as well. For example, just like a healthcare institution, a vendor should aim at making training realistic (Section 6.1.1) and account for people's differences (Section 6.1.2).

6.2.1 Ensure eHealth service quality

Perhaps the most fundamental way in which a software vendor can support healthcare providers with post-implementation training (and training more broadly) is ensuring the quality of the product itself. Healthcare providers have no control over the quality of an eHealth service, yet, as established in Section 6.1.6, the amount of training that is necessary depends partly on how intuitive and user-friendly a service is. Therefore, by focusing on the quality and ease of use of their products, software vendors can potentially reduce the amount of training needed at healthcare establishments.

Pantaleoni et al. (2015) acknowledge that intuitive software design is important and may reduce the need for training. Nonetheless, they argue that some degree of training is always necessary in a healthcare context, in order to ensure patient safety and deal with the complexity of clinical workflows. As such, focusing on product quality is not necessarily about removing the need for training, but reducing it and making the training process as easy as possible for trainers and learners alike.

6.2.2 Build a solid foundation during implementation

The proposed good practice of utilising existing resources and knowledge (Section 6.1.8) illustrates that implementation and post-implementation are not entirely separate from each other. Rather, implementation feeds into post-implementation in terms of resources, materials and people's knowledge and expertise. In light of this, software vendors should consider how they may approach implementation in a forward-looking manner that lays a solid foundation for post-implementation training as well. For example, the studied software vendor's involvement in supporting the creation of LMS modules at Cancer Center A proved to be a particularly good investment of time and effort due to the continued use of those same modules for post-implementation training.

The connection between implementation and post-implementation as well as the notion of forward-looking implementation were not evident in the reviewed literature.

6.2.3 Provide tools, technology and access

Software vendors can uniquely provide healthcare organisations with tools, technology and other resources that may enable them to follow good post-implementation training practices. Firstly, achieving realism in training (Section 6.1.1) typically requires demo or staging environment versions of the software at hand and the ability to, for example, create test patients – features and access that the software vendor can arrange. Indeed, multiple reviewed studies included simulated non-production versions of eHealth services for training (Bredfeldt et al., 2013; Gordon et al., 2022; Smailes et al., 2019) and, while they did not explicitly discuss vendor involvement, vendors likely did play a role in enabling those training environments. Secondly, software vendors can support sufficient understanding of the patient perspective (Section 6.1.4), by providing access to the patient side of a service in some form. Reviewed literature on training of services facilitating PPC, stressed the importance of this type of access (Avdagovska et al., 2020; Hefner et al., 2018; Sieck et al., 2017).

Thirdly, approaching training as an ongoing and dynamic activity (Section 6.1.7), can similarly be supported by software vendors by providing tools for monitoring and evaluating usage of their eHealth service. This type of monitoring was one of the primary ways in which the interviewed cancer centers dealt with the dynamic nature of training needs over time.

It is crucial to note that mere access or provision of such technological solutions is not enough. Making use of these solutions needs to be simple and easy and people need to be aware of the possibility. Indeed, the case cancer centers theoretically should have had access to, for example, testing the patient application side of the vendor's eHealth service. Nevertheless, this access did not get used at least partly because of people simply not being aware of the option or it being seen as technically difficult.

6.2.4 Ensure relevance of provided support

The results indicate that one size does not fit all with regards to supporting healthcare organisations. As such software vendors should take care to ensure the support they provide is relevant to each customer they are serving. This can mean, for example, working to keep documentation up to date and tailoring any shared materials to the way a healthcare provider is using the vendor's eHealth service. Failure to do so was noted as problematic by Trainer A2 and led the cancer center to create their own materials. More broadly, approaches to providing support and even training should match a healthcare organisation and the diversity of learners within. As CSM 2 proposed, this may mean having a range of approaches to offer and then selecting the most suitable way to proceed with a specific customer.

Related to this principle, notably the most common theme identified in the reviewed studies involving vendor support for eHealth training, was the importance of understanding the organisation in which an eHealth service is being used (Humphrey-Murto et al., 2022; Shachak, Barnsley, et al., 2013; Shachak, Dow, et al., 2013). Echoing the findings of this thesis, such knowledge of a healthcare organisation's operations and workflows was established as necessary for providing training and support that is actually valuable. Furthermore, Shachak, Dow, et al. (2013) highlighted the need to adapt training materials to each organisation in order to ensure relevance and value. Interestingly, however, they do not lay the responsibility for such customisation directly on the vendor. Rather they suggest a more collaborative approach, where customisation of materials may be undertaken together with healthcare providers or, alternatively, vendor materials may be structured in a way that enables users to adapt materials to their needs more easily.

6.2.5 Train the trainers

While it is generally recommended to take an enabling background role, some degree of vendor-organised training may be necessary and is likely to be done at some point. The results suggest that it may be worth directing these limited training efforts towards training trainers and super users specifically. Both CSMs were proponents of focusing on trainers and super users, partially because training everyone was

not seen as viable. Trainer A1 also mentioned that if a large update would require additional vendor training support, this could be handled by training super users, who would then spread the gained skills to others. In this sense, focusing on key individuals like trainers and super users, indirectly maximises the reach and impact of vendor-provided training. Furthermore, by equipping people within a healthcare organisation to train others, it acts as a way of helping organisations to follow the good practice of learning from people knowledgeable in the context of use (Section 6.1.5). It is also worth noting that, connected to the principle of building a solid foundation during implementation (Section 6.2.2), training trainers and super users can be done already during implementation and this can continue to have an impact post-implementation as well.

Involving practitioners in organising training and support is not new in eHealth training literature, but vendor support in training those practitioners is seldom explicitly discussed (see Bredfeldt et al., 2013; Dastagir et al., 2012; Gordon et al., 2022; Kirshner et al., 2004; Randhawa et al., 2019). In the reviewed literature, only Shachak, Barnsley, et al. (2013) specifically examined the notion of vendors training trainers or super users and delegating some of the responsibility for training to them. In line with the findings of this thesis, this was found to be a helpful approach to vendor support.

6.2.6 Focus support around updates

While it is good for an eHealth software vendor to be generally available to help customers and answer their questions, the results indicate that support should be especially focused around times when a service is updated and is undergoing changes. As discussed in Section 6.1.9, updates act as destabilising situations that are beyond a customer's control, thus making the need for vendor support particularly great. Based on the results, supporting smaller updates may simply be a matter of clear, timely and well-dispersed communication regarding the changes. Larger updates, on the other hand, may require or benefit from vendor-organised training, perhaps aimed at trainers and super users as suggested in the previous principle (Section 6.2.5).

Notably, none of the reviewed research examined training related to software updates. Bredfeldt et al. (2013), however, discovered that support needs at the healthcare institution they studied often connected to updates. As such, the notion that updates may create a need for training or support is not entirely new. The findings of this thesis expand on this by highlighting how software vendors as the instigators of updates are uniquely positioned and needed to provide update-related assistance.

6.2.7 Utilise knowledge and experience gained from other customers

Just like healthcare providers can learn from and utilise previous experiences with implementation and post-implementation training (Section 6.1.8), software vendors can also make use of experience gained from working with other customers. Indeed, in many ways vendors are uniquely positioned to collect and combine knowledge on

effective post-implementation training practices, common pitfalls and more from a multitude of healthcare providers. Moreover, the collected knowledge is specifically aligned with and applicable to the vendor's own software. Having a collection of such knowledge, perhaps even formally documented, may be a valuable asset in supporting customers with post-implementation training without needing to reinvent the wheel each time. The reviewed literature did not discuss the possibility for vendors to conflate knowledge and experience gained from customers as a way to provide better support.

6.3 Implications for the software vendor

This section draws out implications of the research for the specific software vendor for whom the study was conducted. This is done by examining how the general principles regarding the supporting role of software vendors in post-implementation training (Section 6.2) apply to this vendor in particular. As such, this section also illustrates how the vendor support principles can be used in practice also by other vendors to improve their support and identify strengths and weaknesses.

6.3.1 Ensure eHealth service quality

As established in the results, the software vendor's eHealth service was perceived as being easy to use and learn (Section 5.7.4). This meant that users could get by with a relatively small amount of training. As such, the vendor would fundamentally seem to be in a favourable position in terms of ensuring eHealth service quality.

The one area for improvement evident in the results has to do with terminology used in the application and the lack of clear definitions. Both users and trainers had issues with understanding what certain terms and functionalities meant. Therefore, the vendor could look at ways of making terminology in the service clearer for users. This could, for example, mean attempting to better align the language used in the service with the type of language and words cancer center staff typically use. It may also be a matter of making clarifying definitions and explanations available, perhaps within the service itself in the form of tooltips, documentation or other such approaches. These types of efforts could make learning and understanding the service even easier than it currently is, thus further reducing the amount of training and support required.

6.3.2 Build a solid foundation during implementation

The results indicate that the software vendor has been supporting implementation in ways that also benefit post-implementation training. This has taken the form of, for example, supporting the creation of LMS modules at Cancer Center A and training trainers and super users who continue to provide support during post-implementation. However, as this research has focused on post-implementation training, ultimately limited information was gained on the vendor's implementation training efforts. Therefore, there may be an opportunity for the vendor to examine their implementation support in greater detail, specifically through the lens of ongoing

impact on post-implementation training. This may reveal new and more forward-looking ways of approaching implementation.

6.3.3 Provide tools, technology and access

In terms of tools and technology, the software vendor does provide cancer centers access to demo or staging environments with the possibility for test patients and even testing the application from a patient's perspective. Despite having these tools available, cancer centers are not necessarily using them to their fullest potential. This is due to two key issues that the vendor should look into resolving.

Firstly, the results indicate that accessing and making use of demo or staging environments and the patient-facing application is not sufficiently easy and clear for all trainers. Making use of these opportunities can be perceived as being technically complex. In light of this, it could be valuable to consider how the user experience could be improved and simplified for these environments, so that trainers would be able to confidently create test patients, allow staff to explore the patient application and generally make use of the available resources for training.

Secondly, based on the results, not all trainers are necessarily aware of the existence of test or demo environments and the possibility of harnessing these for training purposes. Thus, the vendor could explore how communication about this topic is currently being handled and how information could reach all trainers who could benefit from it. This may be especially challenging to achieve with cancer centers, where training responsibility is spread widely across the organisation, as was the case with Cancer Center B.

As noted in Section 6.2.3, providing tools and technology can also be done to support healthcare providers with ongoing evaluation of training needs and generally monitoring software usage. The software vendor currently offers some operational analytics for cancer centers within their eHealth service, which can help centers get an overview of how staff is handling cases. Nevertheless, there is likely potential to develop this further as well. In particular, the vendor could explore how the analytics could more directly help cancer centers identify patterns, usage issues and maybe even individual users who may need additional training or support.

6.3.4 Ensure relevance of provided support

The results suggest that there are some issues with the relevance of materials provided by the software vendor. Firstly, some materials have been outdated or contradicting each other. The underlying reason behind this remains unclear based on the research. There is a documentation team that even from a regulatory perspective keeps materials up to date, so official documentation should theoretically always be up to date. The root of the issue may thus lie in, for example, how documents are shared with cancer centers and how centers access them. If cancer centers do not access documentation through an online source, but simply receive offline document files, this may lead to centers holding onto outdated documentation. According to CSM 2, this is actually often the case that, despite having access to an online platform with documentation, cancer centers rather ask for documentation directly

from the CSMs. Therefore, the software vendor could explore how to make accessing documentation online independently more attractive to cancer centers, thus ensuring they always access the latest versions. Having the documentation directly within the vendor's eHealth service may be an option to consider here. Furthermore, it may also be that the documentation shared with cancer centers by CSMs is not always the official latest documentation from the documentation team. Thus, it may be worth examining the collaboration between the CSM team and the documentation team to ensure they are aligned.

Secondly, some materials lacked relevance due to not being customised for the cancer center. For example, documentation could include content on features that a center did not have enabled. Therefore, the vendor could explore how customising materials for customers could be made easier. This could mean having an internal tool for CSMs that would generate documentation based on cancer center characteristics and feature usage. Alternatively, this could entail rethinking how documentation is structured. For example, if each feature had its own document, CSMs would be able to share a collection of documents including only the relevant features.

Beyond up to date and customised materials, ensuring relevance of support can be about offering a diverse range of approaches to support that cater to the differences between healthcare organisations and individual learners. The results indicate that the software vendor already supports cancer centers in quite diverse ways from on-site and remote training to providing materials, answering questions and attending cancer center meetings. Nevertheless, as proposed by the interviewed CSMs, having vendor-created LMS modules about the eHealth service to offer to cancer centers could be one way of further expanding this diversity of approaches. Choosing to invest into the creation and upkeep of LMS modules would, however, require further research and reflection. While options like partnering with the documentation team, who already produce materials and keep them up to date, may make such a project more viable, the investment would still likely be substantial. It would be important to have a better understanding of how many cancer centers would be likely to benefit from and actively make use of an LMS solution, because as the results of this research suggest, not all centers necessarily need LMS modules to meet training needs. This is also in line with Smailes et al. (2019) who describe evaluating matters such as the stability of relevant workflows and the amount of staff for whom training is relevant before establishing computer-based training solutions.

6.3.5 Train the trainers

Based on the interviews with CSMs, the vendor is already actively directing training efforts towards trainers and super users in particular. Indeed, the principle itself was to a great extent drawn from the vendor's existing practice. As such, it is recommended for the software vendor to simply continue the practice.

6.3.6 Focus support around updates

The results suggest that communication during updates is one of the main limitations in the support provided by the vendor. This hindered Cancer Center A's attempts

to keep staff educated on changes to the vendor's eHealth service. This is not to say that communication is not happening or that information regarding updates would be lacking. Instead, the results indicate that the issue is rooted in the timeliness of provided information and the dissemination of that information. In terms of timeliness, information may reach a cancer center only after an update is already deployed and active, not giving time for the center to prepare and inform staff. In terms of dissemination, information is not necessarily reaching everyone who would benefit from it. Some trainers may receive information about updates, while others do not.

This presents an opportunity for the vendor to consider how these two dimensions of communication could be improved. For the issue of timeliness, it may be worth examining when, for example, release notes are typically ready and if it would be possible to share them with cancer centers already before the release. For the issue of dissemination, it could be helpful to inspect what specific channels are currently being used for communication and what channels could help reach more of the relevant people at cancer centers. For example, sharing release notes or other information directly within the eHealth service could be explored. If this information were shared with all users, this could even alleviate the need for trainers to pass information onto staff – staff would be educated on the latest changes directly through the service itself.

6.3.7 Utilise knowledge and experience gained from other customers

The software vendor has an experienced team of CSMs whose combined experience with different cancer centers is substantial. This knowledge is being shared informally within the team and the team has also had an organised meeting to share lessons learnt. These are practices that are likely worth continuing, while also considering ways of documenting knowledge. In addition to sharing knowledge within the CSM team, the software vendor is facilitating meetings, where customer cancer centers are invited to share, discuss and learn from each other more directly. In this way, the software vendor is not only collecting useful expertise internally, but promoting learning across their customers. Overall, then, the software vendor is following this support principle effectively already.

6.4 Theoretical contribution

This study contributes to existing literature by uniquely examining the intersection of PIT, vendor support and eHealth services facilitating PPC. While studies relating to eHealth PIT exist and research on implementation training of services facilitating PPC can be found, studies combining PIT and PPC services were not evident in the reviewed literature. Similarly, literature on vendor support could only be found in a general eHealth context, but not more specifically in relation to PIT and services facilitating PPC. It is these gaps that this thesis helps shed some light on.

Nine good post-implementation training practices for eHealth services facilitating PPC were identified. These were largely supported by the reviewed literature, thus

suggesting that PIT of PPC services may share a great deal in common also with implementation training and training of other types of eHealth services. Similarly, all of the eight successful PIT approaches found through the first scoping review in Section 3.1 were to some extent evident at the case cancer centers. As such, the thesis acts as further evidence, while also indicating wider applicability of effective training approaches, such as hands-on practice, that have been identified originally outside the specific context of PIT of PPC services. Notably, the study also provides further support for unique facets of PPC service training identified in existing literature. More specifically, the importance of providers understanding an eHealth service from the patient's perspective (Avdagovska et al., 2020; Hefner et al., 2018; Sieck et al., 2017), was supported by the findings of this thesis as well, albeit uniquely in the context of PIT.

While the identified good practices were generally supported by existing research, some unique findings were also reached. For example, the notion of training related to eHealth service updates arose in the study, but was not evident in the reviewed literature. Reviewed existing research on PIT of eHealth services focused solely on advanced proficiency training and orientation of new employees. As such, the thesis has brought to attention an additional type of PIT, which presents a potentially interesting avenue for future research.

Another more unique contribution in the good practices was the identified possibility of utilising existing resources from implementation training to support PIT efforts. The connection between training in these two phases seems to be commonly overlooked, with studies placing their focus on one or the other. The findings of this thesis suggest that training during and after implementation are not necessarily entirely separate and that exploring the relationship between the two may be worthwhile both in terms of research and practice.

In addition to the identified nine good PIT practices, the thesis has explored the supporting role of software vendors and proposed seven principles for vendor support. Only three studies on vendor support for eHealth training were found in the literature review, making the present study a substantial contribution to the currently seemingly limited body of research, especially as none of the found studies were specific to PIT of services facilitating PPC.

The general stance proposed in this thesis of vendors taking on the role of an enabler instead of doing training for healthcare organisations in their stead is in tune with the notion of sharing training responsibility evident in the reviewed literature (Shachak, Barnsley, et al., 2013; Shachak, Dow, et al., 2013). Thus, the thesis functions as further support for such a relationship between vendors and healthcare establishments. Furthermore, this suggests that at least on a general level, vendor support for PIT and services facilitating PPC is not necessarily that different from support for implementation training and other types of services.

Beyond the general stance of being an enabler, the proposed seven principles for vendor support are largely novel contributions to literature. This is likely primarily due to the limited amount of research explicitly examining eHealth vendor support. Related issues may be discussed, but they are not examined from the perspective of software vendors specifically. Overall then, in addition to having practical value,

the principles provide a possible foundation or framework for further research and exploration in the area.

Finally, the thesis contributes to existing research through its methodology. EUT research within eHealth is not that commonly approached qualitatively. For example, only two of the 46 EMR training studies reviewed by Samadbeik et al. (2020) used a qualitative approach. As such, the qualitative approach taken in this study arguably helps balance the methodological leanings of existing research. In this way, the thesis contributes to our understanding of people's subjective experiences and perceptions of eHealth training and avoids reducing training to solely a matter of measurable outcomes.

6.5 Evaluation of the study

This section evaluates the study and discusses its limitations. First, the literature review is assessed, followed by reflections on the empirical research and the generalisability of findings.

6.5.1 Literature review

The conducted review of background theory in Chapter 2 generally covers they key areas of eHealth and end-user training comprehensively for the purposes of this thesis. No single perspective was relied on. Instead, various definitions and approaches to classifying training methods, outcomes and more are presented, reflecting on their relative strengths, similarities and differences. Discussion on related research is strengthened by having conducted two scoping reviews (Chapter 3): one on PIT of eHealth services and one on vendor support for eHealth service training. These systematic searches helped illuminate the current gap in research at the intersection of PIT, vendor support and eHealth services facilitating PPC. Furthermore, many relevant articles were discovered that initial, less formal, searches failed to produce.

Despite these strengths, it is possible that not all relevant references were discovered. Searching in other databases or using alternative search terms could have uncovered additional research relevant to the thesis, especially as many similar yet competing terms seem to exist within healthcare-related technology. While there were attempts to mitigate this by including a diverse range of similar terms in the search strings, it is likely that some potentially relevant terms (and therefore references) were missed. Moreover, it is possible that the prioritisation of key concepts and searching for them in different fields (title/abstract/all fields) based on priority, led to the exclusion of some potentially relevant articles. This was, however, helpful for increasing the general relevance of results and kept the amount of identified records manageable for the scope of this thesis.

Finally, it is worth noting that related research on training of eHealth services facilitating PPC did not receive a full scoping review. While similar search techniques and databases were used as with the scoping reviews, the search was not quite as rigorous, particularly in terms of documentation of the procedure. As such, some potentially useful research may have been missed on this topic. However, doing

three full scoping reviews would have expanded the scope and workload of the thesis excessively. Therefore, only PIT and vendor support, which were considered more central topics to the study, were examined through formal scoping reviews. Nevertheless, despite the lack of a separate scoping review, a robust set of relevant research on training of PPC services was found through the conducted supplemental review.

6.5.2 Data collection

The thesis is arguably limited by relying solely on interviews for data collection. While some training-related documents were also examined, this was minor compared to the interviews. As such, the study lacks methods triangulation, i.e. using multiple data collection methods and examining the consistency of their findings to increase confidence in reached conclusions (Patton, 1999). In particular, observation could have been a valuable addition to the thesis, in terms of generating a deeper understanding of the clinical contexts in which training occurs. This is of importance as case studies are ultimately about exploring phenomena within their real context (Yin, 2009). Unfortunately, geographical distance prevented conducting observation. It is, nonetheless, worth noting that, while observation could have been a valuable addition, the main focus in this study was people's perceptions and subjective experiences of training. For this purpose interviews were more important and appropriate.

It is worth noting that the conducted interviews were potentially subject to recall bias, as end-users in particular had to rely on their memory of training they had received in the past. Being able to interview people directly after their training experiences could have possibly produced more reliable data. There were, however, attempts to mitigate this in participant recruitment by prioritising staff members who had joined the cancer centers and received training recently. This helped minimise the gap between received PIT and the interviews. Notably, having a gap in time between training and the conducted interviews was not solely a limitation. On the contrary, it arguably was beneficial in enabling participants to reflect on their training with a longer term perspective, considering how it had actually supported their day-to-day work over time and how much they had needed to learn independently on the job. As such, approaching the research longitudinally by covering both the time of training as well as later reflections could have, perhaps, produced the most compelling results. This was, however, beyond the scope of this thesis study.

Beyond the timing of the interviews, naturally the discussion guides and questions asked were of great importance to the quality of the research. It is, of course, possible that some questions were leading or poorly formulated to some extent and/or some topics overlooked. To minimise the risk, the discussion guides were reviewed by the thesis supervisor and advisor, so as not to rely solely on the researcher's perspective. In addition, as noted in Chapter 4 on methods, the guides were further iterated based on the first interviews. Generally, the researcher is a relatively experienced interviewer, having conducted interviews both in an academic setting during studies as well as in professional contexts as a user experience design consultant. This

experience, including remote interviewing, laid a good foundation for being able to work with the semi-structured discussion guides and adapt dynamically to how each interview unfolded. Nevertheless, when reading through the interview transcripts, some occasions where further probing could have potentially led to more insights, were also identified.

Establishing trust and rapport with participants in remotely conducted research can be challenging (Valkonen et al., 2021). Despite this, the interviews generally seemed to have an open and relaxed atmosphere. Participants felt comfortable sharing also issues and problems relating to the vendor's products and support, thus indicating a considerable degree of trust. Building trust was facilitated in multiple ways. The researcher was directly in contact with participants throughout the process from scheduling and consent-related matters to the actual interviews. In this way, participants had one clear contact person to always turn to. During the interviews, the researcher always had his video camera on to enable non-verbal cues, regardless of whether participants did this too. Moreover, it is possible that, despite being employed by the vendor to do the thesis study, participants perceived the researcher more as a university representative, thus making them more comfortable discussing matters relating to the vendor freely. Finally, as the interviews were recorded, the researcher was better able to be present and engaged in the conversation, without worrying about extensive note-taking. On the other hand, it is worth acknowledging that, while all participants directly agreed to recording without any questions, it is difficult to say whether recording anyway caused a degree of reservation or discomfort for some. There were attempts to minimise any reservations by having clear data privacy principles, where only an audio-recording was kept, access limited to just the researcher and the recordings deleted after thesis completion. The full data privacy notice and consent form are available in Appendix B.

There were some notable challenges with interview-related practicalities. On multiple occasions participants did not join their interview as originally scheduled, thus requiring rescheduling for later. While participants generally had compelling reasons, such as being ill, there were also cases of simply forgetting about the interview. This was at least partly caused by the fact that initially just a calendar invitation was shared with participants, with no reminders about the interview closer to the actual occasion. This was rectified for later interview participants, by sending a reminder email a day before their interview. While having to reschedule forgotten interviews did not necessarily limit the quality of data, it did slow down progress in the data collection phase.

Another factor halting data collection was data privacy and consent-related preparations. The researcher's initial expectations for the required level of rigour were out of date, in particular with regard to GDPR. Once preparation of a data privacy notice began based on Aalto University guidelines, the process turned out to be much more time consuming than anticipated. This was exacerbated by a lack of clear pre-existing procedures, especially for a thesis study being conducted not only at the university, but also for a company. Ultimately, the process required the assistance and approval of legal representatives from both Aalto University and the software vendor. Due to delays in preparing the data privacy notice and

connected consent form, the first interviews that had already been scheduled had to be canceled and rescheduled for later. Rescheduling was successful and data collection as such not compromised. Nevertheless, it would have been preferable not having to reschedule any interviews in order to better respect participants' time and develop greater rapport. As such, the experience highlighted the importance of dedicating sufficient time for data privacy-related matters in research. Data privacy cannot be an afterthought in the midst of other interview preparations, but must be treated as a central factor that can help develop trust with participants and encourages considering upcoming data collection and analysis procedures and their ethics in detail.

6.5.3 Sample and interview participants

In terms of the sample and interview participants, the study practiced triangulation of data sources (Patton, 1999) by including trainers, end-users as well as CSMs from the vendor. However, only two cancer centers were studied. This was necessary for keeping the thesis workload reasonable, but also limited the extent to which it was possible to reflect on the relationship that support needs and successful training practices have with specific organisational characteristics. It is also worth acknowledging that the willingness of the case cancer centers to participate in the study arguably already implies something about their relationship with the software vendor. Other cancer centers, that would possibly be less eager to participate and partner with the vendor, could ostensibly have different perspectives on vendor support. These potential perspectives remain unknown in this study.

An equal amount of trainers and users were interviewed. It would have perhaps been preferable to skew the sample more towards users to reflect a more realistic ratio of trainers to users. From a practical perspective, however, it became evident during recruitment that it was easier for the cancer centers to free up trainers rather than users to participate in interviews. As noted in Section 4.3.2 on interview participants, while the goal was to recruit only users who had joined the cancer centers post-implementation, due to a misunderstanding one user who had joined already before implementation was recruited and interviewed. As such, one of the conducted user interviews could be considered to be of lesser relevance or quality. The interview was, nonetheless, used as data for the study, as the user had gone through elements of training that were common between implementation and post-implementation training and also shared generic thoughts on learning the vendor's eHealth service. Therefore, despite not entirely matching the recruitment criteria, the interview produced information relevant to the study.

In line with the goals of the thesis, a diverse range of user roles was represented in the interviews. This diversity combined with a relatively small sample size, meant that only one representative of each user role was interviewed in the case of radiation therapists and nurses. In light of this, little could be concluded about any specific user role. The taken approach worked well in terms of providing a diverse overview of perspectives and experiences with training, but there would also be value in exploring specific user roles in greater depth.

6.5.4 Data analysis

The data analysis process in this study is limited by only a single researcher coding the transcripts. This was compensated for to an extent by discussions with the thesis advisor and supervisor during analysis as well as presenting initial findings with software vendor staff while analysis was still ongoing. Nonetheless, while this invited outside perspectives into the analysis, it is not entirely the same as having another researcher coding entire transcripts and being able to compare and discuss codes in detail.

Beyond this limitation, rigour and transparency has been pursued in the process from interview transcripts to first cycle codes to higher level themes, practices and principles. Notably, throughout the process and especially once the proposed good practices and vendor support principles were reached, care was taken to reflect back to the transcripts and coded passages to ensure a solid foundation and loyalty to the data. Despite these attempts, it is possible that some relevant details were overlooked or interpreted poorly. Arguably, the study could have benefited from more extensive validation of interpretations and emerging themes with the interview participants themselves. However, based on the difficulty of recruiting participants and scheduling interviews with them, attempting to organise additional validation discussions would have extended the time frame of the study excessively.

6.5.5 Generalisability and transferability of findings

As a case study, this thesis is rooted in the particular contexts of the two North American case cancer centers, the software vendor and the vendor's eHealth service. As such, while methodological rigour has been pursued and the study may be of particular value for the vendor, broad generalisation of the findings is not warranted. Nevertheless, some degree of generalisability is suggested by the overall alignment of the findings with the reviewed literature. Indeed, similar good practices and stances on vendor support could be found in the reviewed studies, most of which were conducted in other healthcare contexts (not cancer centers, but e.g. hospitals, academic medical centers and emergency departments), relating to other types of eHealth services (primarily EMRs) and with medical workers also outside oncology. Furthermore, some findings, such as the practice of aiming for realism, align with well-established and widely applied theories and approaches such as social cognitive theory (Bandura, 1971) and behavior modeling training (Taylor et al., 2005). Therefore, there are indications that the findings may be transferable not only to other cancer centers and vendors, but also beyond to other areas of healthcare. Indeed, the proposed good practices and vendor support principles do not make reference to the particularities of cancer care, but are more abstract in nature.

At the same time, it is worth acknowledging that, while transferability to other healthcare providers and vendors in the cancer care space and beyond may be desirable, the thesis has not aimed to develop all-encompassing context-agnostic conclusions. On the contrary, the study has been working to contribute towards filling the identified gap at the very specific intersection of PIT, vendor support and eHealth services facilitating PPC. Thus, the proposed practices and principles are

rooted (some more directly than others) in the specifics of the post-implementation phase and the unique characteristics of PPC services. This, naturally, limits their applicability to other types of services and other phases of training. Furthermore, when looking to transfer the findings of this thesis to other contexts it may be important to recognise that the case cancer centers were North American and that healthcare operations and vendor support may be different in nature in, for example, Europe or Asia. Ultimately, then, this thesis is best considered as one additional piece to the wider puzzle of eHealth end-user training.

6.6 Future research

The conducted thesis study and its findings and limitations present a number of compelling avenues for future research. First, while the general alignment with reviewed literature indicates some degree of generalisability for the proposed good practices and vendor support principles, this warrants further validation and research. Exploring the applicability of the good practices and the support principles in the context of other healthcare establishments and software vendors would be of value. Indeed, the practices and principles reached in this study should not be treated as conclusive, but perhaps more as a helpful foundation and framework to build on in further research. Such further research may then enable iterating on the practices and principles.

Second, related to this potential to develop the findings further, there may especially be an opportunity to specify some of the proposed good practices. In particular, the practice of accounting for organisational characteristics would benefit from further study, as ultimately following the practice requires a deeper understanding of what specific characteristics are relevant and how they impact the nature of effective training. The findings of this study suggest that the size and geographical dispersion of an organisation may possibly be relevant characteristics and that larger organisations that are spread out widely may benefit from computer-based training approaches, as Cancer Center A did. In general, however, identifying such variables and drawing out such relationships reliably was beyond the scope of this thesis. Therefore, future research could study characteristics of healthcare establishments and the relationship these characteristics have to different training approaches and their effectiveness. This would, to some extent, mirror the type of research that has been done around individual differences between learners in end-user training.

Third, as noted in the evaluation of this study (Section 6.5), aiming at capturing a diversity of perspectives came at the cost of being able to draw conclusions about any specific user role reliably. Thus, it would be interesting to explore further whether different roles in healthcare possibly influence how training is perceived and what approaches are helpful. For example, are there possibly differences worth accounting for between directly medically involved roles (e.g. physicians, nurses) and more administrative ones (e.g. front desk clerks)? This likely depends greatly on the nature of the eHealth service people are being trained on, but there may also potentially be more general patterns to uncover. Knowledge of such patterns could further support successful PIT of eHealth services.

Fourth, as discussed earlier, the results of this study imply that implementation and post-implementation are not necessarily entirely distinct or separate phases. Instead, the two phases are interconnected and training interventions from implementation may feed into post-implementation as well. Despite this, based on the reviewed literature, it seems that studies (including the present one) tend to focus on either implementation or post-implementation training – not both in the same study. As such, it could be valuable to examine the relationship between training in the two phases in order to develop our understanding of how training may be approached holistically over time. In particular, a longitudinal study exploring both implementation and post-implementation training of an eHealth service at the same healthcare establishment could perhaps be especially insightful.

Fifth, the thesis revealed training related to software updates as an additional type of PIT that was not evident in the reviewed literature. Training related to updates could therefore warrant deeper examination. This could be especially interesting from the vendor support perspective as updates by their nature are instigated by software vendors. In this study, only one of the two cancer centers reported actively informing and educating staff about update-related changes. It would, thus, be interesting to further investigate how common update-related training is, while also exploring how healthcare establishments and software vendors approach it.

Finally, it would be valuable to have other studies contributing towards filling the current research gap at the intersection of PIT, vendor support and services facilitating PPC, but with different methodological approaches. For example, a study similar to this one, but including observation could be of interest to contextually flesh out the types of findings reached in this thesis. Moreover, as discussed in the evaluation of this study (Section 6.5), longitudinal research capturing participant reflections both directly after PIT as well as after a longer period of time could provide further insights. Similarly, a study combining quantitative and qualitative methods to collect both subjective perceptions and more objective measures of training effectiveness could be worthwhile. This could create opportunities to explore the relationship between perceptions and effectiveness, i.e. whether PIT approaches that are perceived positively are also effective according to more objective outcome measures.

7 Conclusion

This thesis explored post-implementation training of eHealth services facilitating patient-provider communication. The aim was to discover what types of practices promote successful PIT and what the role of software vendors may be in supporting PIT efforts. Nine good practices for PIT of services facilitating PPC were identified:

1. Aiming for realism
2. Accounting for people's differences
3. Accounting for organisational characteristics
4. Ensuring sufficient understanding of the patient perspective
5. Learning from people knowledgeable in the context of use
6. Matching training amount to eHealth service characteristics
7. Ongoing training beyond just new joiners
8. Utilising existing resources and knowledge
9. Maintaining a close relationship with software vendors

The identified practices generally align well with the reviewed literature, but unique discoveries were also made. In particular, training related to software updates arose as a type of ongoing PIT that, based on the reviewed literature, is not evident in existing research. Similarly, the study suggests that, despite typically being researched separately, implementation and post-implementation training are interconnected, with implementation training interventions having the potential to support PIT as well.

Regarding the supporting role of software vendors, the results indicated that vendors should provide support in ways that enable healthcare providers to follow good PIT practices. This is in contrast to actively organising training for healthcare organisations in their stead. This general stance was fleshed out in the form of seven vendor support principles:

1. Ensure eHealth service quality
2. Build a solid foundation during implementation
3. Provide tools, technology and access
4. Ensure relevance of provided support
5. Train the trainers
6. Focus support around updates
7. Utilise experience gained from other customers

Overall, the thesis highlights PIT as a collaborative effort involving multiple stakeholders. In line with this, the outcomes of this thesis support healthcare providers, eHealth software vendors and academia alike. Healthcare providers may utilise the nine good PIT practices to evaluate their own training operations and identify opportunities for improvement. Software vendors may benefit from the seven support principles and the example of how they were applied to the vendor in this study (Section 6.3). Furthermore, many of the proposed good PIT practices can be helpful also for vendors, in the case that they organise training for customers directly. Finally, from an academic perspective, the thesis has contributed towards filling the identified research gap at the intersection of PIT, vendor support and eHealth services facilitating PPC. In addition, the study presents multiple compelling avenues for future research, including exploring the relationship between implementation training and PIT and examining update-related training and support in greater detail. By supporting healthcare providers, software vendors and academia in these ways, the thesis promotes successful PIT of eHealth services facilitating PPC and by extension may at its best aid the adoption and effective usage of eHealth.

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A Articles included in scoping reviews

This appendix presents the articles that were included in the scoping reviews in Chapter 3. Table A1 lists the 11 articles included for the RQ1 scoping review, focused on PIT of eHealth services. In addition, the type of eHealth service and training each study examined is noted. Table A2 lists the articles for the RQ2 scoping review, regarding vendor support for eHealth training. The table also displays the type of eHealth service each study examined.

Table A1: Articles included in RQ1 scoping review

Article	**Title**	**Service**	**Training type**
Alkureishi et al. (2018)	Integrating patient-centered electronic health record communication training into resident onboarding: Curriculum development and post-implementation survey among housestaff	EMR	New employee orientation
Benwell et al. (2017)	Effectiveness and efficiency of training in digital healthcare packages: Training doctors to use digital medical record keeping software	EMR	New employee orientation
Bredfeldt et al. (2013)	Training providers: Beyond the basics of electronic health records	EMR	Advanced proficiency
Dastagir et al. (2012)	Advanced proficiency EHR training: Effect on physicians' EHR efficiency, EHR satisfaction and job satisfaction	EMR	Advanced proficiency
Edwards et al. (2012)	Innovative health information technology training: Exploring blended learning	Emergency department information system	New employee orientation
Gordon et al. (2022)	Outcomes of Mayo Clinic reBoot camps for postimplementation training in the electronic health record	EMR	Advanced proficiency

Kirshner et al. (2004)	An evaluation of one-on-one advanced proficiency training in clinicians' use of computer information systems	Computer information system (incl. EMR)	Advanced proficiency
Maddocks et al. (2011)	Feedback and training tool to improve provision of preventive care by physicians using EMRs: A randomised control trial	EMR	Advanced proficiency
Randhawa et al. (2019)	Evaluating a post-implementation electronic medical record training intervention for diabetes management in primary care	EMR	Advanced proficiency
Sharp et al. (2017)	Conversion of provider EMR training from instructor-led training to eLearning at an academic medical center	EMR	New employee orientation
Smailes et al. (2019)	An electronic medical record training conversion for onboarding inpatient nurses	EMR	New employee orientation

Table A2: Articles included in RQ2 scoping review

Article	**Title**	**Service**
Humphrey-Murto et al. (2022)	Training physicians and residents for the use of electronic health records – a comparative case study between two hospitals	EMR
Shachak, Barnsley, et al. (2013)	End-user support for a primary care electronic medical record: A qualitative case study of a vendor's perspective	EMR
Shachak, Dow, et al. (2013)	User manuals for a primary care electronic medical record system: A mixed-methods study of user- and vendor-generated documents	EMR

B Data privacy and consent

Starting on the following page is the data privacy notice and consent form that all interview participants signed electronically. The documents have been edited to remove any specific contact details and to keep the software vendor and eHealth service anonymous. Beyond these modifications, the documents are identical to the ones sent to participants.

[eHealth Service] Post-Implementation Training Thesis Privacy Notice

This privacy notice describes how your personal data will be used in the Master's thesis research study as an individual participating in the research study.

1. What is being studied in this research study and the purpose of processing personal data

The thesis examines post-implementation training of [eHealth service] provided by [software vendor]. Post-implementation training of [eHealth service] and the role of [software vendor] in supporting such training is studied in cancer clinics. The study aims to

- understand how post-implementation training is conducted at clinics,
- identify effective post-implementation training practices as well as challenges faced by clinics, and
- explore how [software vendor] should be involved in supporting clinics with post-implementation training.

The thesis is conducted for [software vendor] by Aalto University student Mark Laukkanen being employed by [software vendor].

2. What personal data is processed in the research study

The following personal data will be processed:

- Name, email and cancer clinic name
- Interview responses in the form of an audio recording that will be transcribed.

Data belonging to special categories of personal data or other specially protected personal data will not be processed in the research study.

Personal data is collected directly from the participant in a remotely conducted interview (approx. 1 hour) that will be recorded.

3. Processing of necessary personal data

The research study only processes personal data that is necessary for the purpose of the study.

The research data contained in the recorded interview audio file is transcribed by the student in such a manner, that you are not identifiable from the interview transcripts. Your name and clinic name will be replaced with a pseudonymised identifier (e.g. "clinic A, nurse 1"). Within six months after the thesis has been accepted, the recorded interview audio files will be deleted and after that only the pseudonymised transcripts will remain.

4. Legal basis for the processing of personal data

The processing of personal data is based on the data subject's consent.

5. Sharing personal data

Transcription and analysis of data is handled by the student.

Interview transcripts will be made accessible to the thesis advisor, the thesis supervisor and the [eHealth service] design team in pseudonymous form in which the data subject's direct identifiers, such as name, have been removed or replaced with a pseudonymised identifier (e.g. "clinic A, nurse 1").

Participants will not be personally identifiable from the transcripts or the results of the study.

6. Storage and protection of personal data

Research data is password protected and stored securely in [software vendor's] information systems. The student accesses data using [software vendor] equipment. Access to interview recording audio files is limited to the student, while access to pseudonymised transcripts is limited to the student, thesis advisor, thesis supervisor and the [eHealth service] design team. Information systems are provided by [company, company address]. Read more about how [company providing the used information systems] processes personal data: [link]

Data from interviews without identifiers are also published by Aalto University in the completed Master's thesis in the Aaltodoc platform. Participants will not be personally identifiable from the published thesis.

7. International data transfers

Personal data are stored by [software vendor] in information systems provided by [company, company address]. Read more about how [company providing the used information systems] processes data and international data transfers in [link].

8. Retention and deletion of personal data

Deletion of identifying information

Participant name and clinic name are replaced with pseudonymised identifiers (e.g. "clinic A, nurse 1") when the interview audio recording is transcribed in written form.

Deletion during and after the study

Participant name, clinic name and the interview recording audio files will be deleted within 6 months of the thesis being finished and published. The thesis is estimated to be complete in January 2023.

9. Rights of the research participant

According to the General Data Protection Regulation (GDPR), a data subject has the right to:

- receive information on the processing of their personal data
- right to access the personal data collected and processed
- right to rectification of inaccurate personal data
- request that the processing of personal data be restricted
- object the processing of personal data
- right to withdraw consent for the use of personal data
- right to erasure of personal data if the conditions of Article 17(1) of the Data Protection Regulation are met and processing is no longer necessary for archiving purposes in the public interest or for scientific research or statistical purposes in accordance with Article 89(1)

If the research purpose does not require, or no longer requires the identification of the data subject, the controller shall not be obliged to obtain further information so that the data or the data subject may be identified only for purposes to able the data subject to exercise his/her rights. If the controller is unable to link the data to a particular data subject, the data subject does not have the right to access or correct the personal data, object the processing, or delete the personal data. However, if the data subject provides additional information that allows their identification from the research data, the rights will not be restricted.

10. Contact details of the controller

The joint controllers of this research study are [software vendor] and student Mark Laukkanen.

[Software vendor name]
[Software vendor address]
[Software vendor phone number]

Questions regarding the conduct of the research study may be addressed to the person in charge of the study: Mark Laukkanen, [phone number], [email address].

Thesis advisor: Julie Pronzac, [email address].

Thesis supervisor: Johanna Viitanen, [email address].

Any updates to this Privacy Notice will be sent to the interview participant's e-mail address.

Data Protection Officer, [Software Vendor] Data Privacy Organization, Contact
[Information and details for contacting the Data Protection Officer and Data Privacy Organization of the software vendor]

Participation confirmation: [eHealth Service] Post-Implementation Training Thesis

I have understood that participation is voluntary and at any point in the research study, I am at liberty to notify that I no longer wish to participate in the study. Any information collected up until that point will be deleted and not used for the study.

I have received sufficient information about the research study, I have had the possibility to have my questions answered, I have understood the information and I wish to participate in the research study.

I give my consent to use my personal data in the manner described in the [eHealth Service] Post-Implementation Training Thesis Privacy Notice and I can withdraw my consent to use my personal data at any time.

_____

Signature and name of research participant

Contact details:
Mark Laukkanen
[phone number]
[email address]
[software vendor] / Aalto-University

C Discussion guides

The discussion guides used for interviewing trainers, end-users and customer success managers are presented below. As the interviews were semi-structured in nature, the discussion guides were not followed systematically – not all questions were necessarily asked and other additional ones could be posed depending on how the conversation unfolded. Similarly, the exact wording of questions varied across interviews. The questions presented in a bold typeface were considered to be of greatest importance and would be prioritised in case of limited time. Direct references to the name of the vendor or the eHealth service have been edited out in the discussion guides below to maintain anonymity.

Each interview, regardless of participant type, began with shortly introducing the researcher and the study. Participants had already familiarised themselves with the thesis data privacy notice and signed the consent form before their interview. Nevertheless, key points related to data privacy and informed consent were summarised, along with reconfirming that the interview can be recorded. Participants were also offered the opportunity to ask any questions they may have about the study and the interview. Finally, before beginning with the questions in the discussion guides below, each participant was asked what age range (under 25, 25-34, 35-44, 45-54, 55-64 or 65+) they belong to for the purpose of reporting on participant demographics.

C.1 Discussion guide for trainers

Background

1. Can you share shortly about yourself? What is your role at Cancer Center A/B and what does your work typically entail?
2. Can you tell a bit about the cancer center (treatment focus, number of patients/employees, structure, etc.)?
3. When did [the eHealth service] get taken into use at the cancer center?
4. How is [the eHealth service] currently used at the cancer center?
5. How has the cancer center felt about [the eHealth service] and its use and value?
6. How many IT tools are being used at the cancer center by nurses/clinicians? What are these tools used for?
7. How does usage of [the vendor's eHealth service] connect to the other tools used at the cancer center? How does it tie into the wider processes and ecosystem of technology?

Training in general

1. How is training handled organisationally?
    - Who is involved in or responsible for training?
    - Is there a separate team/department for training?
    - People exclusively focused on training?
2. How big part of IT-related operations is training? E.g. in terms of budget, time or employees devoted to training?
    - What about post-implementation training?

Post-implementation training of the vendor's eHealth service

1. **How is [the eHealth service] first introduced to new employees? How is [eHealth service] training provided for new employees?**
    - When?
    - What is the process? What sort of methods are used?
    - What sort of training materials? Any chance of gaining access to the materials?
    - Who produces materials? Who conducts training?
    - Independent study? Peer support?

- Where is training organised?
- What topics does training cover? Is the patient side of the application touched upon? How?
- [Software vendor] involvement?

2. How does the new joiner [eHealth service] training connect to the wider onboarding?
    - Is [the vendor's eHealth service] its own separate module or somehow connected to other onboarding topics or tasks?
    - Does the training coincide and combine with training of other technological tools used at the cancer center as well?
3. Is the provided training the same for everyone? Or is it somehow personalised/tailored?
    - If so, how and based on what criteria?
    - If not, is that something you are interested in and would see potential value in?
4. **Is there any other type of post-implementation training going on in addition to the onboarding of new joiners?**
    - Recap trainings? Trainings related to new features, etc.?
    - How are the trainings handled?
    - [Software vendor] involvement?

Evaluating training

1. How do you evaluate/measure the effectiveness or successfulness of training at the cancer center?
2. **In your experience, what practices / methods / materials / approaches have been particularly effective in post-implementation training of [the vendor's eHealth service] at the cancer center?**
3. **In your experience, what practices /methods / materials / approaches have been problematic or ineffective in post-implementation training of [the vendor's eHealth service] at the cancer center?**
4. **What sort of challenges do you possibly have related to post-implementation training?**
    - Have you had some challenges in the past? How were they resolved?

Relationship with software vendor

1. If it hasn't come up sufficiently before
    - In what ways has [software vendor] been involved in supporting training in general?
    - In what ways has [software vendor] been involved in supporting post-implementation training specifically?
2. Have you been satisfied with [software vendor's] support? Why / Why not?
3. **What type of support for post-implementation training would you want or need from [software vendor] in the future? Why?**

Final thoughts

1. Was there anything that I didn't ask about that you would like to still mention or talk about?
2. Thank you for your time and participation!

C.2 Discussion guide for end-users

Background

1. Can you share shortly about yourself? What is your role at Cancer Center A/B and what does your work typically entail?
    - Which department or part of the organisation?
2. When did you join the cancer center?
3. Earlier career / educational background?
4. How do you use [the eHealth service]? What features? How does it tie into your day-to-day work?
5. Did you have any experience with [the eHealth service] before joining the cancer center? What about other similar eHealth services?
6. How many different IT tools do you use in your daily work? How does using [the eHealth service] connect to these other tools?
7. Own assessment of confidence/skill/comfort with technology in general?

Onboarding experience

1. **How was [the eHealth service] introduced to you? How was training and support organised?**
    - When?
    - What was the process? What sort of methods were used?
    - What sort of training materials?
    - Where was training organised/undertaken?
    - What topics did training include?
    - [Software vendor] involvement?
2. How was the training connected to the wider onboarding?
    - Was [the eHealth service] its own separate module or somehow connected to other onboarding topics or tasks?
    - Did [the eHealth service] training coincide and combine with training of other technological tools you needed to learn?
    - How was training for other IT tools organised? Similar? Different?
3. What were the most difficult or challenging things for you to learn related to [the eHealth service]?
    - Why?

- How did you eventually learn and overcome the difficulty of learning?

4. **Have you received any training on [the eHealth service] after the initial onboarding?**
    - Are you aware of there being any such training available at the cancer center?
    - Would you want or need such training?

Evaluating the training/learning experience

1. What were your thoughts/attitude/feelings going into training?
    - Excited, annoyed, neutral, etc.?
2. How effective and useful did you find the training to be?
3. To what extent did you feel confident in using [the eHealth service] after the training?
4. To what extent did the training feel relevant to your actual job and tasks and day-to-day use?
5. Did you need to still learn more on the job after the formal training? If so, how?
6. Was there something missing in the topics covered in training that you would have needed or found helpful? Something you would've wanted more training on?
    - If it hasn't come up itself during the interview: Was the patient side discussed in some way? If not, would you find it valuable?
7. **Strengths and weaknesses of the provided training? What were the top things you liked about the training, and what were the top things that could be improved?**
8. Learning of course is not necessarily solely limited to "formal" training. Looking at the general process of learning to use [the eHealth service] and getting comfortable with it also beyond the formal training:
    - **What helped or aided your learning the most? What hindered your learning the most?**
    - How could've your experience of learning to use [the eHealth service] been improved? Is there something that could've helped you learn better/faster/more conveniently/etc?
    - Could something in [the eHealth service] itself be changed/altered to make it more easy to learn?

Software vendor

1. **How do you feel about [the eHealth service], after training and actual use?**

2. **Was [the software vendor] involved in any way in the provided training or support? Or more broadly in your learning of [the eHealth service]?**

3. **Would you want or expect any support from [the software vendor] (in addition to support provided directly by the cancer center)?**

    - If so, what? What do you think [the software vendor] would be better able to provide than cancer center alone?

4. Beyond training and learning, how could [the eHealth service] be made easier or more useful for you?

Final thoughts

1. Was there anything that I didn't ask about that you would like to still mention or talk about?

2. Thank you for your time and participation!

C.3 Discussion guide for customer success managers

Background

1. Can you share shortly about yourself? What is your role at [the software vendor] and what does your work typically entail?
2. How long have you been working with Cancer Center A/B?
3. At what stage of implementation did you start working with Cancer Center A/B? Before? During? After?
4. Can you describe Cancer Center A/B (size, treatment focus, etc.)?
5. Can you describe Cancer Center A's/B's relationship with [the eHealth service]?
    - How do they use [the eHealth service]?
    - How have they felt about it in your experience?

Software vendor relationship with Cancer Center A/B

1. How do you work with Cancer Center A/B? In what ways is [software vendor] involved at the cancer center?
    - Regular meetings or calls?
    - On an as-needed basis?
2. **How has [software vendor] been involved in training-related matters at Cancer Center A/B? What sort of support has been provided?**
3. **How has [software vendor] been involved in post-implementation training specifically?**
4. **Has Cancer Center A/B voiced any requests/hopes/needs related to training? Have there been things they have wanted help with?**

Views on providing support

1. **In what ways do you think [software vendor] should be involved in supporting cancer centers with post-implementation training in the future? Why?**
2. What do you see as the biggest challenges for [software vendor] in supporting post-implementation training at cancer centers?

Final thoughts

1. Was there anything that I didn't ask about that you would like to still mention or talk about?
2. Thank you for your time and participation!

D Codes and quotations

On the following pages, this appendix presents three tables that aim to illuminate and provide additional transparency to the data analysis process. For a full description of the analysis process see Section 4.4.

D.1 Distribution of codes and quotations across interviews

Table D1 displays the amount of quotations and codes for each of the interview transcripts. An additional column for the number of codes excluding subcodes is also included. For example, a code like "learning management system" had multiple subcodes, including "learning management system: usage" and "learning management system: value". The column excluding subcodes includes only the parent code (e.g. "learning management system") in the count.

To protect participant anonymity, the interviews in the table are labelled using the same naming scheme as in the results of the thesis (Chapter 5). Participants are referred to using the participant's general role, organisation and a unique number. For example, "Trainer A2" refers to a trainer from Cancer Center A, while "User B1" refers to an end-user from Cancer Center B. "CSM 1" and "CSM 2" are used to refer to the customer success managers from the software vendor.

Table D1: Distribution of quotations and codes across interviews

Interview	**Quotes**	**Codes**	**Codes excluding subcodes**
CSM 1	40	34	16
CSM 2	41	41	19
Trainer A1	55	62	33
Trainer A2	97	80	44
Trainer B1	36	47	26
Trainer B2	32	45	23
User A1	34	44	28
User A2	25	33	20
User B1	34	42	27
User B2	31	41	25

D.2 Descriptive code categories

Table D2 presents the descriptive code categories, which were reached through second cycle coding. The categories acted as the basis for how the reporting of results was structured (see Chapter 5). For each category, the individual codes it consists of are also displayed. In addition, the number of quotations and the number of interviews in which each category or code was evident is shown.

It is worth noting that the number of quotations for the code categories refers to *unique* quotations, not simply the sum of quotations in the individual codes within the category – i.e. duplicate quotations have been removed from the count. Furthermore, to maintain anonymity, direct references to the name of the vendor or eHealth service have been removed from the codes and replaced with "[vendor]" and "[eHealth service]".

Table D2: Descriptive code categories and the included individual codes

Category / Code	**Quotes**	**Interviews**
Cancer center characteristics	**22**	**4**
Canada vs USA	3	2
enforcement	5	2
implementation confidence	1	1
phased rollout	4	3
scale	10	3
Participant characteristics	**33**	**10**
age: 25-34	1	1
age: 35-44	3	3
age: 45-54	4	4
age: under 25	2	2
individual differences	8	4
not that tech savvy	1	1
pre-learning attitude	2	2
previous [eHealth service] experience	3	3
technology confidence	5	5
time since joining	4	4
People involved in training	**77**	**10**

collaboration within organisation	1	1
improvement ideas: enhancing support	3	2
team: IS department	1	1
team: nurse educator	7	2
team: others	1	1
team: peers	4	3
team: super users	8	4
team: team lead	4	4
team: trainer understands domain	2	2
team: [vendor]	1	1
train the trainer	4	3
[vendor] support: avoiding	1	1
[vendor] support: feedback	3	2
[vendor] support: good relationship	5	3
[vendor] support: limited amount	8	4
[vendor] support: limited need	7	3
[vendor] support: meetings	2	1
[vendor] support: on-site	6	4
[vendor] support: out of the ordinary requires support	2	2
[vendor] support: providing information	16	6
[vendor] support: training	7	4
Tools & technology	**45**	**7**
email	6	2
learning from computers	13	4
learning management system: demand	1	1
learning management system: hinderances	6	3
learning management system: interactive	2	2
learning management system: usage	10	3
learning management system: value	14	4
learning management system: [vendor] involvement	4	2

learning with computers	3	3
phone	3	3
Training effectiveness	**56**	**9**
+ learning in small pieces	2	1
- lack of dedicated time to learn	2	2
bad practices	8	5
effective practices	8	5
evaluating effectiveness: feedback questionnaire	2	1
evaluating effectiveness: interactions with staff	6	5
evaluating effectiveness: monitoring	11	5
lack of comprehensive understanding	1	1
low confidence after training	1	1
painpoints: training	18	3
Training materials	**45**	**10**
documents: cheat sheets	4	2
documents: customising materials	7	2
documents: posters	1	1
documents: Powerpoint	1	1
documents: problems	3	1
documents: q&a	2	2
documents: screenshots	2	1
documents: scripts	3	1
documents: training guide	1	1
documents: usage	16	8
documents: value	8	5
documents: [vendor]	17	6
documents: video	3	2
learning management system: demand	1	1
learning management system: hinderances	6	3
learning management system: interactive	2	2

learning management system: usage	10	3
learning management system: value	14	4
learning management system: [vendor] involvement	4	2
Training methods	**73**	**9**
applications-based approach	8	2
behavior modeling training	2	2
combination of approaches	8	3
construct-based approach	2	2
direct experience: hinderances	4	3
direct experience: missing	5	2
direct experience: used	13	6
direct experience: value	13	8
education sessions	2	1
lectures	1	1
observation	16	7
ongoing support	7	4
questions and answers	3	2
real usage	10	5
test patient	7	4
walkthroughs	3	1
Training setting	**24**	**9**
group training	2	1
in person training	8	5
one-on-one	7	4
training environment: classroom	2	2
training environment: computer lab	2	2
training environment: real workspace	6	5
Training type & content	**98**	**10**
applications-based approach	8	2
construct-based approach	2	2

make sure that people stay on the right track	2	1
more training after orientation	2	2
patient application training: approaches	6	3
patient application training: difficulty	6	3
patient application training: missing	9	8
patient application training: value	13	8
privacy	2	1
reminder	5	2
role-specific training	10	6
selling to patients	5	2
training amount	8	4
training content	2	2
updates: barriers to support	2	1
updates: missing information	9	2
updates: requiring support	11	4
updates: training approaches	2	1

D.3 Good post-implementation training practices

Table D3 displays the identified nine good post-implementation training practices, along with the individual codes the practices were rooted in. In addition, the number of quotations and the number of interviews in which each practice or code was evident is shown.

It is worth noting that the number of quotations for the good practices refers to *unique* quotations, not simply the sum of quotations in the individual codes within the practice – i.e. duplicate quotations have been removed from the count. Furthermore, to maintain anonymity, direct references to the name of the vendor have been removed from the codes and replaced with "[vendor]".

Table D3: Good post-implementation training practices and the included individual codes

Good practice / Code	**Quotes**	**Interviews**
Aiming for realism	**69**	**10**
applications-based approach	8	2
direct experience: missing	5	2
direct experience: used	13	6
direct experience: value	13	8
observation	16	7
real usage	10	5
role-specific training	10	6
test patient	7	4
training environment: real workspace	6	5
Accounting for people's differences	**25**	**9**
combination of approaches	8	3
individual differences	8	4
role-specific training	10	6
Accounting for organisational characteristics	**30**	**5**
documents: customising materials	7	2
learning management system: value	14	4
scale	10	3

Ensuring sufficient understanding of the patient perspective	**38**	**9**
more training after orientation	2	2
patient application training: approaches	6	3
patient application training: difficulty	6	3
patient application training: missing	9	8
patient application training: value	13	8
selling to patients	5	2
Learning from people knowledgeable in the context of use	**22**	**8**
team: nurse educator	7	2
team: peers	4	3
team: super users	8	4
team: team lead	4	4
team: trainer understands domain	2	2
Matching training amount to eHealth service characteristics	**21**	**7**
lack of dedicated time to learn	2	2
ease of use	11	7
training amount	8	4
Ongoing training beyond just new joiners	**36**	**8**
ensure people stay on the right track	2	1
ongoing support	7	4
reminder	5	2
updates: barriers to support	2	1
updates: missing information	9	2
updates: requiring support	11	4
updates: training approaches	2	1
Utilising existing resources and knowledge	**39**	**7**
collaboration within organisation	1	1
education sessions	2	2

learning management system: usage	10	3
learning management system: value	14	4
phased rollout	4	3
team: peers	4	3
team: super users	8	4
Maintaining a close relationship with software vendors	**17**	**7**
updates: requiring support	11	4
[vendor] support: good relationship	5	3
[vendor] support: out of the ordinary requires support	2	2