

Literature review:

Examining the extent to which digital literacy is seen as a challenge for trainers, learners and employees in the workplace



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Foreword

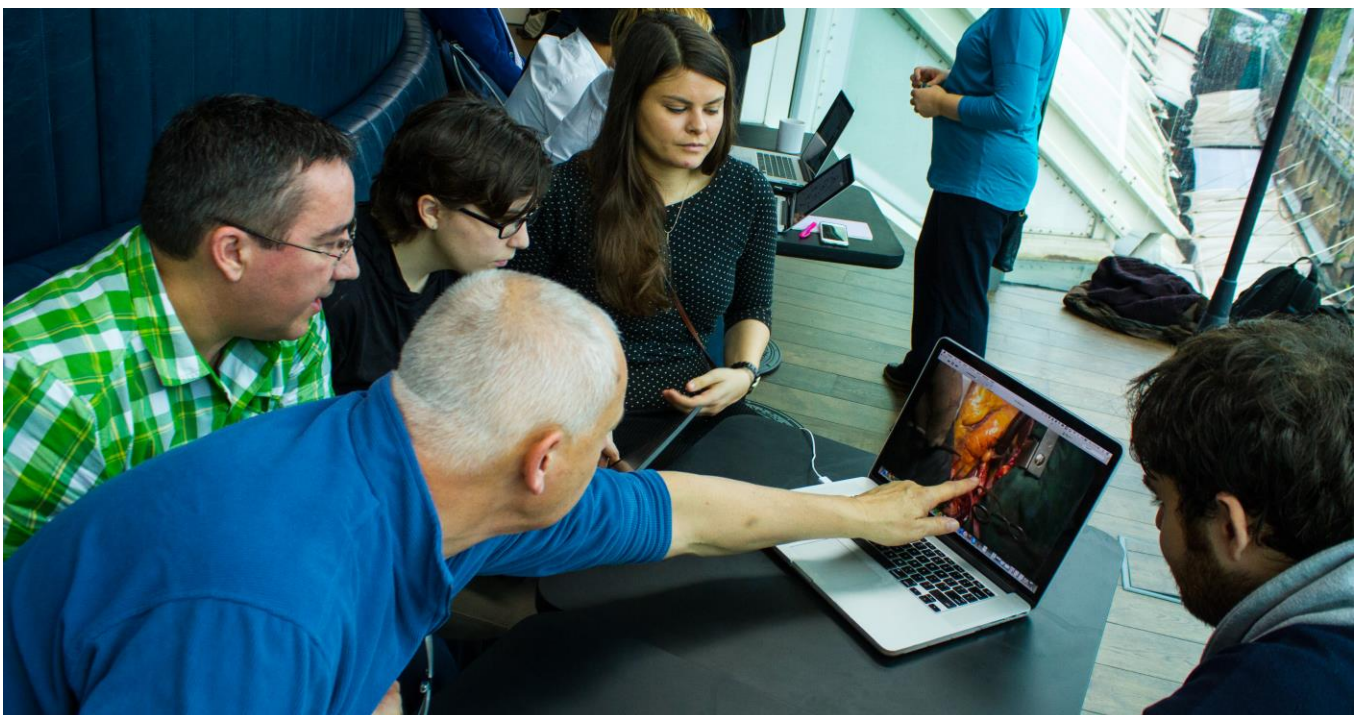
Health Education England (HEE) is the national body formed in 2012 to undertake leadership and co-ordination of education and training within both the health and public health workforce. This includes workforce development, planning and evolution in line with key changes, including the impact of technological advances.

We are responsible for delivering a better health and social care workforce for England. It is the organisation responsible for the education, training and personal development of every member of staff and for recruiting for values.

Our Technology Enhanced Learning (TEL) Programme was established in 2013 with the vision that healthcare in the UK be underpinned by world-class education and training that is enhanced through innovation and the use of existing and emergent technologies and techniques. The Programme has a wide remit and has a number of ongoing projects, one of which is the Digital Literacy Project.

The Digital Literacy Project concerns itself with the ability of all within healthcare to become, and to remain, digitally literate. This is so that all are able to learn, work and develop effectively in a digital workplace and society. The project aims to promote the adoption of clear education, training and development strategies that will enable this and which will also promote and support the adoption and spread of new technologies and techniques.

This paper is one of three undertaken by the Digital Literacy Project as part of its scoping and review work of the current landscape, in terms of digital literacy in the UK.



Executive Summary

This literature review was commissioned by Health Education England (HEE) and conducted by TrueBlueSky Social Enterprise Ltd (TBSSE) between May 2015 and August 2016. It is the second in a series of three reports, the first looking at digital literacy definitions (Kennedy & Scott, 2016) and the third a desktop review on the extent to which organisations and employers are actually meeting these challenges (de Normanville, Scott & Speake, 2016). This report sets out to provide a review of the recent UK and international literature related to the challenges of 'digital literacy' for trainees, learners and employees in healthcare and industry more widely.

The main purpose of this review is to answer the following question:

To what extent is digital literacy seen as a challenge for trainers, learners and employees in the workplace?

The review will inform the further direction of HEE's investment and advice, and will help to further the promotion of digital literacy across the health and social care workforce.

A range of academic databases were searched using search terms verified by HEE. In addition, papers from grey literature databases and online sources were incorporated into the search. All were critiqued with reference to various considerations integral to the question posed by HEE, with a focus on results indicating the strength of evidence and relevance of the findings to key groups, e.g. service providers, educators and policymakers. In total, 49 papers met the inclusion criteria and were included in this review, including 23 UK and 26 international papers.

There is a moderate-sized, but consistent, body of evidence that suggests key challenges in relation to identifying the capabilities and attitudes required that fit an individual for learning and working in a digital society. Studies looking at the current state of digital literacy in the workplace also consistently identify a mixed picture of digital literacy skills. In terms of the challenges employers perceive in the acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace, again there is consistent evidence around the challenges of training, digital infrastructure and organisational readiness. However, for all three, the evidence is of generally moderate to low research quality.

Key themes and messages

There is no clear consensus around the capabilities and attitudes required for fitting individuals for a digital society.

There is little clarity in the literature over what levels of operational capabilities are required and there is an acknowledgment that these are evolving and developing in line with technological change. Higher level capabilities and the requirements for being a responsible digital citizen are more stable but contextually bound.

The literature suggests that digital literacy is best referred to as 'digital literacies', thus an 'ideal' definition of digital literacy needs to encompass and reflect this.

The current state of digital literacy in the workplace across all UK sectors is mixed. Self-reported levels of digital literacy in the health and social care sector are generally described as basic, although UK nurses seem to express high levels of confidence with ICT skills.

There is a need for some kind of framework/taxonomy of digital literacy competences that is flexibly adapted to the learner at the point of need.

There is also a requirement for standardisation and recognition of certification for equity and transferability of skills across working boundaries. Employers need to have a baseline digital literacy professional entry requirement, and there must be a currency to this baseline standard.

Employers perceive three broad challenges in the acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace: training (approaches, resources, etc.); digital infrastructure (hardware, systems, etc.) and organisational (Human Resources (HR), leadership, culture, etc.).

A lack of digital literacy development is a factor in the poor adoption of digital health technologies resulting in missed opportunities to support clients, patients and carers to self-care.

To ensure that employees feel justified and empowered to use and harness digital ways of working, they need the confidence to know that these approaches are valued by their employers as 'legitimate work activity'.

Employers should not assume that younger workers have developed a rounded skill set in terms of digital literacy. Digitally savvy does not mean digitally literate. Trainers and employers need to embrace and harness the valuable resource of their employees' prior digital learning activities, thus enriching digital skills applicable in the workplace.

The need for leadership and a strategic approach to digital literacy acquisition is clear.

Further research is needed to: evaluate the impact of a digital literacy strategy upon the performance of any specific workforce; identify the digital literacy needs and status of other Allied Health professions and non-qualified employees; identify the relationship between digital literacy, use of digital technology and innovation.

Finally, there is a need for a systematic literature review on the subject of digital literacy for health and social care service contexts, including non-hospital settings.

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1. Introduction

The vision for the Health Education England (HEE) Technology Enhanced Learning (TEL) Programme is to ensure that:

'Healthcare in the UK is underpinned by world-class education and training that is enhanced through innovation and the evidence-based use of existing and emergent technologies and techniques.' (HEE, 2015)

Within the TEL Programme, there are a number of workstreams, including one focussing on digital literacy. To support this work, TrueBlueSky Social Enterprise Ltd (TBSSE) was commissioned by HEE to undertake a literature review that examined the themes and trends within workplace-based digital literacy.

Key question: To what extent is digital literacy seen as a challenge for trainers, learners and employees in the workplace?

The research questions guiding the review were:

- What are the capabilities and attitudes required that fit an individual for learning and working in a digital society?
- What is the current state of digital literacy in the workplace?
- What challenges do employers perceive in the acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace?

The review aimed to identify good practice, risks and costs and also identify any further areas for research, where appropriate.

2. Methodology

A search strategy was developed and used to identify relevant literature for the review. Search terms were selected so as to give as much coverage across the aims of the literature review as possible. All terms were searched for in the title and abstract fields and controlled vocabulary terms were used, where available. Boolean operators AND and OR were used, as was truncation and phrase searching. Potential key word and search parameters were tested until it was clear there was a likely yield.

Papers published between 2010 and 2016 and written in English were included. Any educational context-specific studies of primary, secondary or further education were excluded, with the exception of Higher Education Institution (HEI) studies focussed upon the education of health professionals. Research reports with clear study findings were favoured.

The search was conducted across a broad range of electronic healthcare-related databases, as well as Google Scholar and the OpenGrey database. All databases were selected on the basis that their scope matched the subject of this review. Snowballing from identified articles was also utilised and subject experts contacted for details of any additional papers. A rapid review of titles and abstracts resulted in a shortlist of 78 papers for full text review.

Shortlisted papers were reviewed with reference to their implication for the main research question and a judgment made on the quality of evidence. All empirical studies located were of variable quality, with the majority being small-scale studies. Three large-scale workforce surveys were included, although each had a number of methodological limitations. No existing systematic literature reviews on digital literacy were found. Ten literature reviews (four UK and six international) of varying quality were included within the 49 papers (23 UK and 26 international) reviewed.

Nevertheless, the review of the literature identified there is a moderate-sized, but consistent, body of evidence across different contexts, although the evidence is of generally moderate to low research quality. For the purposes of this review, this was considered to provide sufficient supporting evidence in the absence of better quality research.

Further details regarding the methodology are described in Appendix 1.

3. What are the capabilities and attitudes required that fit an individual for learning and working in a digital society?

The review highlighted the variety of terms used to describe or articulate 'digital literacy', for example:

- Computer skills (Ala-Mutka, 2011)
- Computer literacy (Turner, 2010; Campbell & McDowell, 2011)
- Digital capability (Dunn & Braddell, 2014)
- Digital literacy (Belshaw, 2012; Good Things Foundation (formerly Tinder Foundation) & NHSE, 2015)
- Digital skills (Ecorys UK, 2016)
- 21st century literacy (Galloway, no date)
- Informatics/information literacy (Bond & Procter, 2009; Hwang & Park, 2011)
- E-literacy (Klecun, Lichtner & Cornford, 2014)
- IT/ICT skills (Bunker, 2010; MacLure, 2014).

Other terms are evident in the literature around the technology available, such as 'Telehealth', 'Telecare' and 'Electronic Assistive Technology' (EAT). Whilst this diversity of terms was helpful in shaping the literature search, it presents a major challenge in articulating the required capabilities and attitudes for digital literacy per se.

Galloway's (no date) review of the literature suggested that these multiple terminologies reflect the multiple literacies related to 'digital' and are shaped by political and policy contexts. Galloway also points to the use of the term 'literacy' to denote 'competence'. Ala-Mutka (2011) seeks to clarify this interchangeability by suggesting that competence is an inherent element of literacy, concluding that literacy 'should be considered as a continuum' where an individual is:

"skilled, competent" in something, i.e. describing the basic abilities and then progressing to effective forms of using them for one's tasks and further learning.' (p17)

In terms of capabilities described in the literature, both Galloway (no date) and Ala-Mutka (2011) identify two broad distinctions; first, instrumental/operational skills that change over time as technology and applications evolve and develop; and second, higher order skills such as critical thinking, synthesis and analysis that will broadly remain stable.

Galloway (no date) suggested five areas of operational digital competence:

- Information
- Communication
- Content-creation
- Safety
- Problem solving.

In a study of digital literacy in the US Army (Mobley, 2011), a taxonomy of digital literacy terms was proposed that cover both operational and higher order skills (p52):

- Digital device competence (ICT skills, internet skills, etc.)
- Cognitive capability (critical thinking, evaluation, etc.)
- Literacies encompassed within digital literacy (media literacy, visual, etc.)
- Social/relational capabilities and responsibilities (collaboration, ethics, etc.).

Jisc (Joint Information Systems Committee) (2014) similarly identified seven elements of digital literacy:

- Information literacy
- Media literacy
- Communications and collaboration
- Career and identity management
- ICT literacy
- Learning skills
- Digital scholarship.

This has subsequently been revised to six elements where Information literacy and Media literacy have been combined to form a new element — Data literacy (Beetham, 2015).

A number of frameworks describing such skills are available, including the Go ON UK Basic Digital Skills Framework (2015) aimed at the whole UK population, and the workplace-focussed Skills Framework for the Information Age (SFIA) (2015). Through the DIGICOMP project, the EU has proposed a roadmap for a framework for digital literacy at all levels of learning that has citizenship-wide application (see Ala-Mutka, 2011; Ferrari, 2013). The Academy of Medical Royal Colleges (2011) published an E-Health Competency Framework that identified eHealth-related knowledge, skills and behaviours associated with:

- Clinical Leadership and Management
- IT Healthcare Projects
- Working with Information
- Clinical Care Records
- Clinical IT Systems and Technologies

- Knowledge Management
- Clinical and Health IT Standards.
-

Such skills-based frameworks can facilitate assessment and quantifying of skills. However, both Bunker (2010) and Turner (2010) identify that there is a lack of consensus on 'levels' of competence or skills. Moreover, as already stated, operational and instrumental skills will be constantly changing and adapting to new technologies. Therefore assessment of digital literacy may prove challenging. In this respect, Belshaw (2012) concludes 'literacy is a condition, not a threshold'.

Higher order capabilities for digital literacy are termed as 'strategic skills' (Bunker, 2010). Belshaw (2012:pp206–214) identifies eight alliterative elements:

- Cultural — 'the various digital contexts an individual may experience'
- Cognitive — 'conceptualising and interacting in digital spaces'
- Constructive — 'creating something new, including using and remixing content from other sources to create something original'
- Communicative — 'how to communicate in digital networked environments'
- Confident — 'understand that such [digital] literacies are mutable'
- Creative — 'doing new things in new ways'
- Critical — 'the reflection upon literacy practices in various semiotic domains'
- Civic — 'participation, social justice and civic responsibility'.

These elements can be seen in the only study found that addressed digital literacy (or e-literacy, in this case) capabilities within the health sector. Klecun, Lichtner & Cornford (2014:p846) concluded from their literature review that e-literacy consisted of six dimensions encompassing both instrumental/operational skills and higher order skills:

- **'Self-efficacy, motivations and attitudes to IT:** Attitudes to using IT. Beliefs regarding having (or not) the appropriate skills/abilities
- **Computer skills:** Set of (abstract) skills that an individual needs to acquire to use the system, such as typing, navigating sites, etc.; ability to 'input data'
- **Purposeful use/practical knowledge of IS¹ in work context:** Ability to use the system to perform health care related work. Higher level: understanding system's idiosyncrasies, anticipating problems, knowing what to look for and where
- **Whole-system understanding:** Understanding interdependencies of the socio-technical system. This may include understanding how the data will be used by other parts of the system, and by other HCPs, managers, researchers, etc.
- **Sense making:** Sense making or working out meanings and implications of IT for individuals, groups, or organizations (e.g. for professional identity)

¹ Information systems

- ***Innovating and transformation processes:*** Understandings and beliefs regarding IT potential to transform health care. Ability to innovate with IT’.

Implicit in all these taxonomies/dimensions are the attitudes required for digital literacy fluency. Much of the literature on attitudes for digital literacy refers to the attitudes of workers to the introduction and use of technology in the workplace. In this respect, Mobley (2011) anticipated an organic tide of change in attitudes towards digital literacy by the maturing of the Army workforce and the recruitment and progression of younger and more digitally comfortable entry-level soldiers. Most studies conclude that the higher an individual’s (often self-reported) level of digital literacy the more positive they are towards technology (for example, see Huryk, 2010; Alasmary, El Metwally & Househ, 2014; Gürdaş Topkaya & Kaya, 2015).

Meyers, Erickson & Small (2013) propose that:

‘a digitally literate person develop an understanding of themselves in relation to the technologies and services with which they engage’. (p361)

They suggest this develops attitudes of responsibility in terms of creating content and attribution; a sense of being part of a wider ‘socio-techno network’ that requires the individual to respect others’ ‘autonomy and privacy’.

In summary, it was evident that there is no clear consensus around the capabilities and attitudes required for fitting individuals for a digital society. There is little clarity in the literature over what levels of operational capabilities are required and acknowledgment that these are evolving and developing in line with technological change. Higher level capabilities and being a responsible digital citizen are more stable but contextually bound. The literature suggests that digital literacy is best referred to as ‘digital literacies’, thus an ‘ideal’ definition of digital literacy needs to encompass and reflect these factors.

3. What is the current state of digital literacy in the workplace?

The Ecorys UK (2016) study into Digital Skills in the UK concluded that there was a general lack of digital skills across the UK workforce. The research carried out for the Department of Business Innovation & Skills (BIS) and Department of Culture, Media and Sport consisted of a literature review, stakeholder interviews and sector-specific case studies, including healthcare. The study reported that 72% of large companies and 49% of small and medium-sized enterprises (SMEs) faced digital skills shortages and there was a 'mismatch in the types of skill offered by the labour market and those demanded' (p3). The study also found that the speed of technological development was not being matched by training and education providers. Indeed, the variable digital literacy skills of the education and training workforce were considered to be an issue in this respect. A further factor was the lack of digital skills in existing workforces that employers were not addressing in a systematic way.

The Ecorys UK case study on the healthcare sector identified that health-related digital technology was being adopted, most notably in the form of digital clinical records (often referred to in the literature as Electronic Health Records (EHRs)). In addition, a large number of apps are now available to support healthy living, with Tech City UK (2016) reporting that 100,000 such apps were now available. The case study highlighted, though, that technologies were not always successfully implemented owing to a shortage of managerial skills and a lack of digital skills. Additionally, data from clinical systems were not used effectively, compounded by a lack of specialist health analytic skills in the sector. This latter issue is, however, being addressed through the National Information Board's (NIB) Building a Digital Ready Workforce (BDRW) (2015). A significant factor that will be discussed further in the next section of this review was the culture of the NHS that 'does not really support the widespread implementation of 'digital solutions' or the upskilling of current professionals' (Ecorys UK, 2016:p40).

The lack of digital skills in digital industries was also highlighted by Tech City UK (2016). Forty-five percent of digital businesses felt that growth was being limited owing to skills shortages. The study reviewed datasets such as the Annual Population Survey (APS) and the Annual Business Survey, as well as undertaking surveys and interviews with business leaders.

Turning to the health and social care workforce, the evaluation of the Widening Digital Participation Programme (Good Things Foundation & NHSE, 2015) found that digital literacy skills in frontline staff were variable, and the culture of health and social care did not value the concept of digital health literacy in citizens, highlighting particularly the difficulty in engaging with general practice.

Only two large-scale studies were located that considered workforce digital literacy in any way. Ipsos MORI (2010) conducted a literature review, surveys and focus groups looking at the 'e-readiness' of the social care workforce to engage with e-learning. Employers reported that they were not convinced of the utility of e-learning owing to their perception that the workforce lacked

knowledge or confidence in ICT. This was not supported by the employee survey, however, that reported high levels of basic ICT skills although the employee survey had a very low response rate of 6% and should be interpreted with caution.

The Royal College of Nursing (RCN) (2012) study looked at the readiness of nurses in the UK to engage with 'e-health', identifying the barriers to such engagement and any progress since a similar survey in 2010. Eighty-five percent of respondents reported they were confident or very confident in using ICT. This varied slightly across different types of employers, with local authority and 'other public bodies' reporting slightly lower levels of confidence. Two-thirds of respondents reported that they had received ICT training at work. However, the study identified that ICT confidence did not appear to be related to ICT training nor confidence in using a specific information system. As with the Ipsos MORI study, the influence of personal access and use of ICT may have implications for skills and competence development, with 60% of respondents using social networking for personal use. In terms of progress from the 2010 survey, the RCN reported continuing issues with access to computers at work; low levels of telehealth awareness; improved confidence in data security; increased use of social media and no change in awareness of telehealth. These factors will be discussed further in the following section.

Whilst the RCN report offers a positive view of digital literacy in the nursing workforce, this was countered by four small-scale non-UK studies. Three studies looked at nurses' self-reported levels of computer skills and nursing informatics (Hwang & Park, 2011; Rajalahti, Heinonen & Saranto, 2014) and self-perceived computer literacy skills (Campbell & McDowell, 2011). Both 2011 studies found that respondents lacked basic skills. Campbell & McDowell found that nurses with higher educational attainment had higher levels of self-reported computer literacy. Both Hwang & Park and Rajalahti, Heinonen & Saranto identified a link between the level of basic skills and nursing informatics competence, although the two studies considered nursing informatics in slightly different ways. Aside from the limitations of these small studies, Rajalahti, Heinonen & Saranto noted that participants found it difficult to self-assess their skills.

The fourth non-UK study looked at Irish occupational therapists' views of assistive technology (Verdonck, McCormack & Chard, 2011). This very small-scale study reported low levels of self-reported competence in relation to assessing, prescribing and advising clients on assistive technologies. There is no specific comment on digital literacy in this study, but, as will be discussed in the next section, there would seem to be a relationship between levels of digital literacy competence and the acceptability/implementation of health technologies.

Four further UK studies gave some indication of the current status of digital literacy in the health and social care workplace. Dunn & Braddell's (2014) rapid evidence review, looking at the factors that inhibit or facilitate digital capability and the embeddedness of digital technologies in the social care workforce, highlighted the lack of any policy on digital capabilities in social care. They found definite gaps and inequalities emerging within the hierarchy of the social care workforce, reflecting national findings generally that white collar workers are more likely than

blue collar workers to use the internet at work (Dutton et al., 2013). As part of the review, Dunn (2014) conducted a small-scale survey of the workforce on digital capabilities. As with the Ipsos MORI survey, there was a mismatch between employers' and employees' perceptions of digital capabilities in the workforce, with employees again reporting higher levels of competence than the managers perceived the workforce to have. However, Dunn noted that this may be owing to the sample comprising mainly qualified staff. Managers in the survey reported gaps in their own digital literacy around basic skills and information literacy.

MacLure (2014) looked at the self-reported digital literacy skills of the pharmacy workforce in North East Scotland. The study identified that two-thirds of respondents assessed their skills as 'basic'. The study found no evidence of age or experience being a determinant of digital literacy levels. As will be discussed in the next section, the relationship of hierarchical position, qualifications and age and levels of digital literacy is not clear-cut and generalisations should be avoided. MacLure (2014) noted that pharmacy staff used IT equipment and systems at work on an almost daily basis, but there was only limited training that tended to be system-focussed. This resulted in 'surface level' (p196) usage whereby users could complete required tasks but not understand why they were doing so.

In summary, the current state of digital literacy in the workplace across all UK sectors is mixed and has raised concerns at governmental level about the impact on economic growth and development (House of Lords, 2015). The self-reported levels of digital literacy in the health and social care sector are generally described as basic, although nurses seems to express high levels of confidence with ICT skills. This section has alluded to a number of challenges that impact on the current state of digital literacy, which will now be considered.

4. What challenges did employers perceive in the acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace?

Employers were unanimous that a major challenge is the lack of digital literacy skills in the existing workforce and labour market. However, there was only limited evidence identifying the challenges they faced in addressing this. The Ipsos MORI (2010) employers' survey identified that the lack of digital skills in the workforce acted as a barrier to using and engaging with e-learning. Further challenges around training were identified, including the investment required to develop training and providing sufficient access to networked computers for training to take place. In addition, employers identified the investment needed in infrastructure and challenges in securing funding for employees to undertake training.

A 2014 survey of managers in social care identified little change from these findings (Dunn, 2014). Whilst technology was being used, this was primarily to support operational processes such as Human Resources (HR), rather than client care and decision making. Managers felt, though, that their organisations accepted the value of digital technology and had an ethos of encouraging employees to consider digital 'in everything we do' (p19), whilst acknowledging that they struggled to offer equal access to technology to all staff. However, managers reported that accessing specialist IT advice on the most appropriate technology and system security could be an issue and the pace of technological change makes it difficult to keep up to date. In terms of recruiting for skills and assessing the digital capabilities of new staff, managers conceded that this was not normal practice. They considered that the best approach to developing digital literacy skills was through coaching, but formal IT training was also important. Dunn & Braddell (2014) also pointed to the current lack of reference to digital literacy in policy and workforce development and qualification frameworks. Finally, there was a perception that younger learners required less support to use digital technologies than older workers.

Mobley's (2011) study of digital literacy in the US Army identified the challenges faced by a large diverse workforce that operates in increasingly complex settings. The report highlighted the challenge of developing a coherent strategy for digital literacy owing to the rate of technological change. They contended that organisations would need to adopt a 'flash and throw it away' (p19) approach to infrastructure, rather than the more traditional investment in a future-proof system. The existing digital literacy of the Army was difficult to assess, although it was noted that digital literacy decreased with seniority; however, the baseline of digital skills across the Army was unknown, as recruits were not routinely assessed on entry. The impact of device-savvy recruits was also considered in terms of the digital capabilities they brought with them, acknowledging that many of these were developed informally through social interactions and digital games, rather than from education.

A key focus of the Mobley study was on how digital literacy should be developed. The existing approach of taking the 'lesson to the learner' (p27) was being challenged by the sheer

complexity of lessons required. The study identified that developing digital literacy through a prescriptive programme to develop a series of hierarchical competencies was not supported. Instead, assignment-linked, purposeful ‘collaborative learning’, unstructured informal learning and formal instruction all facilitated increased competency with digital devices. In other words, ‘mentoring’, ‘play(ing)’ or ‘doing’ was found to be effective. For example, a separate initiative was described, whereby personnel were supplied with handheld devices so training can take place anytime, anywhere using open source apps. This reflects Knowles’s (1990) model of adult learning, which identifies that adults need a clear purpose to drive learning. In considering a new approach to training, the Army has to consider the blurring of boundaries between work and personal life that increasingly occurs in the digital sphere, particularly amongst younger personnel. Mobley contends that, until these boundaries have been removed, the Army cannot consider itself a digital organisation.

A survey of social care commissioners (Consilium Research & Consultancy, 2014) commissioned by Skills for Care, highlighted challenges in the commissioning process for assisted living technologies. Of relevance to digital literacy, the survey reported a cultural resistance in the health and social care workforces to technology and a lack of awareness and knowledge amongst commissioners about assisted living technologies to support their commissioning decisions.

The British Computer Society (BCS) reported on a focus group of employers (BCS, 2014) that highlighted the need for basic digital literacy, as well as sector-specific skills. Employers agreed that digital literacy training should develop confidence in employees so they are able to adapt quickly to any version changes in existing digital systems and to the introduction of new digital technologies. The focus group agreed that a cross-sector definition of digital literacy with an accompanying skills framework was needed to standardise assessment of skills. Training was agreed to be the responsibility of the employer, who should develop a coherent strategy for this, rather than relying on the education sector. The focus group also acknowledged the risks inherent of confusing digital literacy with being device savvy, particularly for younger employees.

In 2015, research by Brecher, Laurenceau & Sloman for Accenture concluded that a major challenge for employers was to prepare ‘the workforce to drive the desired business outcomes of agility, productivity and innovation’ (p4). They recognised that organisations should use a ‘test and learn’ (p4) approach to pilot incremental digital transformation across the organisation. Only 51% of business leaders had a workforce strategy for digital skills, including recruitment approaches, skills audits and developing the digital capability of the existing workforce. Only 34% reported being prepared to change leadership and management practices to create a digital organisation. The study concluded that strong leaders were essential for managing the change process and engendering a culture of innovation.

As well as the digital skills gaps across multiple sectors, Ecorys UK (2016) reported the challenge presented by the pace of technological change for organisations and educators in developing curricula to develop skills and knowledge that met the changing needs of business.

So far, the review has identified three employer-perceived challenges, namely:

- Training (approaches, resources, etc.)
- Digital infrastructure (hardware, systems, etc.)
- Organisational (HR, leadership, culture, etc.).

These are consistent with the three barriers to access for Technology Enhanced Learning (TEL) identified by Lafferty, Teague & Price (2015:p3):

- **'1. Ergonomics:** Digital literacy/competency and willingness to embrace TEL; Time to undertake TEL; Acceptability of devices.
- **Technical factors:** A suitable device: A network of suitable speed to connect the device, whether wired or wireless; Access to websites providing and supporting TEL; A suitable browser; Other software and hardware required by TEL; Physical spaces for learning.
- **Collaboration and information exchange.'**

These broad challenges were also evident as themes in a number of other studies located that, in the main, focussed on the implementation and/or the acceptability of digital technology in the workplace. Therefore this review will draw on these studies to identify some of the practical detail associated with these three challenges.

4.1 Training

Several studies reported that a 'lack of training' was a barrier to adoption of technologies such as handheld devices (Menzies & Thwaites, 2012); information systems (Klecun, Lichtner & Cornford, 2014; MacLure, 2014; Çetin et al., 2015) and 'digital services' (Fujitsu, 2015). It was not clear whether there was a complete absence of training or the perception that it was insufficient, although participants in the study by Çetin et al. (2015) reported that they had received training in 'information technology' as part of their nursing studies but found it inadequate and inconsistent with 'real life' (p564). The Royal College of Nursing (RCN) (2012) survey identified that two-thirds of respondents had received training but 20% had not had any for over three years. Barriers to training were primarily identified as lack of management support and a lack of funding (RCN, 2012). Bunker (2010) emphasised the importance of investing resources, including time for employees to undertake training, whilst Courtney-Pratt et al., (2012) highlighted the challenge facing employers and employees in trying to balance skills acquisition activities with existing workload. The need for regular updating was identified by Gripenberg (2011) and Pinerós-Leano et al. (2015), owing to the pace of technological change. Gripenberg suggested that, without continuous updating, individuals may 'drop-off' after initial training.

How training was delivered was also examined in the literature. Nicklaus et al. (2015) described a blended pathway designed to improve Electronic Health Record (EHR) usage. The pathway was based on Benner's 'novice to expert' model (1984) and identified entry points depending on an initial skills assessment. The pathway consisted of e-learning and practical learning labs where employees could practice using the EHR based on workflow scenarios. This resource-intensive pathway evaluated positively with increased confidence and more effective use of the EHR.

Burtney & Buddery (2011) cautioned that 'technology should not lead the training' (p11); this was supported by Klecun, Lichtner & Cornford (2014) who contended that employees should be supported to develop a whole systems understanding to move from 'what data needs to be entered and where' (p847) to understanding what is being communicated, the interdependencies in the system and the relevance of the system to the employee's role. They suggest a situated learning approach that would not only support the development of e-literacies, but also the capacity for innovation.

A 'Just in Time' learning approach was evaluated in the study by Jamu, Lowi-Jones and Mitchell (2016). QR codes were placed around the clinical area that could be scanned by practitioners using their smartphones to access policies and information regarding equipment use or subjects such as falls prevention. The study found that the content had to be high quality and relevant. Factors such as familiarity with the use of QR codes, access to IT equipment and organisational policies and culture around smartphone use in the clinical area needed to be addressed to make such an approach successful.

Gripenberg (2011) undertook a longitudinal interventional mixed method study of 50 digitally-excluded families. The study clearly identified the importance of a learning community in the development of digital literacy skills. This was tested within the family context with the additional input of technical support: equipment assembly advice, telephone helpline for troubleshooting and advice about ergonomics. This study explored a range of strategies that could potentially reduce ambivalence and non-adaption to a digital world. Strategies included the provision of 'master users' who could work alongside novices and offer peer support. The study advocated both formal and informal learning strategies, emphasising the value of face-to-face learning communities and online support. The investment of time is also an important provision in acquisition and embedding of digital skills. Moreover, Gripenberg concluded that strategic learning support processes work well, even within unstructured informal learning contexts such as the family home.

Galloway's (no date) selective literature review of academic and grey literature included interviews with representatives of public organisations in Scotland covering Further Education (FE), Higher Education Institutions (HEI), broadcasting media and cultural agencies. Galloway argued that access and technology is only part of the solution in delivering 21st century literacy. Teaching and learning processes, curricula, qualifications and assessment must drive this. Galloway also pointed to a gap between formal and informal learning, arguing that educators

must build upon 'out-of-school' literacies' (p35) within the curricula, rather than vice versa. Gripenberg (2011) echoed this view that valid digital literacy learning is not all formally delivered. Learners need varied learning strategies and peer support, and learning can be gained as effectively outside as inside an organisational context, if it is effectively supported in the community.

This mix of formal/informal digital learning environments was explored by Meyers, Erickson & Small (2013). They acknowledge the fluid boundaries between work/school and personal digital lives (see also Mobley, 2011) and posit that informal learning contexts can support the development of higher order digital literacy skills, such as problem solving, collaboration, participation, social learning and peer development. They conclude that the development of digital literacy skills is:

'moving into a period where formal and informal contexts of learning interact and work together to create seamless learning ecologies'. (p366)

This, combined with, as previously highlighted, the lack of consensus on standardised levels of digital literacy competence, makes assessment challenging. Turner (2010) suggests a framework based on Benner's (1984) 'novice to expert' model. Mobley (2011) describes levels of digital literacy competence required at different operating levels within the US Army, and went on to suggest that sufficient commercial assessment instruments were available to assess competence for all but specialist digital literacy skills in the US Army.

Other challenges related to training included the need for educators themselves to acquire a new range of information and digital competencies. Galloway (no date) voiced concerns about the existing capacity of educationalists to teach or embed digital literacy, particularly as new approaches, such as Gripenberg's (2011) use of multi-layered learning strategies, challenges traditional educational pedagogy. Moule et al. (2011) made a similar point about the need to address the challenge of nurse teacher preparation and for digital literacy to become a measurable qualification. They had evidence that teachers of nursing and health science disciplines showed little experimentation in adoption of new technologies. This kind of innovative and embedded digital literacy was only found in a few centres of excellence.

4.2 Digital infrastructure

The literature regarding digital literacy points to a situated learning approach whereby employees are able to develop skills in context using digital technology to work collaboratively with colleagues. However, studies from the UK and internationally suggest that there are barriers to this, associated with digital infrastructure in organisations. Physical access to a PC or handheld device was an issue identified by Ipsos MORI (2010) and the RCN (2012) employee surveys. Ipsos MORI described this as 'low hardware penetration' (p58). The study reported that managers were more likely than frontline staff to have access to a computer at work. Two-thirds of employees had access to a PC, but only 33% used them for work owing to computer

use not being seen as part of the job role. Employees, however, did report high levels of access to computers at home for personal use.

The 2014 survey by Dunn did not note any real change, with 66% of employees having access to a desktop PC and 30% using a work-supplied laptop. The survey reported that personal devices, particularly smartphones with internet access, were being used for work by 20% of employees. Tablets were being used by only 17% of staff, with only half of those being supplied by the employer.

The RCN (2012) survey reported that 39% of nurses regularly had to share desktop computers with more than five other people. Lack of hardware access was also reported in two other UK studies (Bullock et al., 2015; Jamu, Lowi-Jones & Mitchell, 2016), as well as international studies (see Dalton et al., 2014, for example).

However, even with access to hardware, further infrastructure issues were highlighted:

- Multiple systems requiring separate log-in credentials (see RCN, 2012; MacLure, 2014)
- System compatibility and impact of legacy systems (see Johnson, 2013)
- System usability (see Stevenson et al., 2010; MacLure, 2014)
- IT and security policies (see Renaud & Goucher, 2012).

Combined with a perceived lack of 'IT Support' in the organisation (see Ipsos MORI, 2010; Stevenson et al., 2010; RCN, 2012), these factors could result in staff attitudes to digital technology being adversely affected (Klecun, Lichtner & Cornford, 2014; Jamu, Lowi-Jones & Mitchell, 2016) and practices, such as duplication of paper and digital records (RCN, 2012; Courtney-Pratt et al., 2012; Çetin et al., 2015) and taking risks with digital security, such as writing down multiple passwords (RCN, 2012; Renaud & Goucher, 2012).

A further factor is the perception by employees that IT systems are imposed on them without any consultation (Huryk, 2010; Stevenson et al., 2010; van Gemert-Pijen et al., 2011; Çetin et al., 2015; Jamu, Lowi-Jones & Mitchell, 2016). This was identified as a factor that can adversely affect acceptance and adoption of new digital technology (Stevenson et al., 2010; Lafferty, Teague & Price, 2015), as was previous bad experiences of IT implementation in the workplace, that could lead to scepticism as new systems were introduced (Edgar, Grace & Dale, 2016).

The costs associated with investing in digital infrastructure have been acknowledged by Johnson (2013), Dunn & Braddell (2014), Consilium Research & Consultancy, (2014) and Shea & Belden (2016), with Johnson noting competing high value projects and the challenging financial constraints in the UK public sector.

4.3 Organisational

A key theme across a number of studies was the need for strong leadership and management support to facilitate a digital organisation. The RCN (2012) survey reported a perception that

nurse leaders were not supporting the development of digital literacy in the profession. Johnson (2013), Shea & Belden (2016) and Edgar, Grace & Dale (2016) all noted that a lack of digital literacy in senior teams could impact on organisational commitment. Dunn & Braddell (2014) also found evidence for:

‘... a lack of management support for using digital technologies in the social care sector, which in turn will inhibit the development and maintenance of digital literacy’. (p22)

The culture in health and social care has already been identified as a potential barrier to the uptake and use of digital technology (Consilium Research & Consultancy, 2014; Good Things Foundation & NHSE, 2015; Ecorys UK, 2016). Johnson (2013) contends that a culture of bureaucracy is inflexible and unable to support digital adoption. Moreover, such cultures are risk averse resulting in IT and information policies and procedures that inhibit employees from accessing the internet, etc. (Renaud & Goucher, 2012; Lafferty, Teague & Price, 2015).

The RCN (2012) survey reported that such policies and culture was seen as a barrier by nurses to accessing social media at work for professional development purposes. The Jamu, Lowi-Jones & Mitchell (2016) study of QR codes used as an access point for Just in Time learning reported that staff felt reluctant to use their smartphones in the clinical area because of organisational culture and policy, as did Menzies & Thwaites (2012) in their study of handheld mobile devices (PDAs) used by New Zealand doctors. Edgar, Grace & Dale (2016) reported ‘confusion and concern’ (p14) over information governance, and risk acted as a barrier to supporting service users with digital technology.

The prevailing culture of the workforce also needs addressing. Consilium Research & Consultancy (2014) identified that traditional approaches to care were preferred by workforces in health and social care as opposed to assisted living technologies (see also Verdonck, McCormack & Chard, 2011). A number of studies (see Stevenson et al., 2010; Huryk, 2010; RCN, 2012; Dunn, 2014) identified that this resistance may be owing to the perception that digital technology is ‘de-humanizing patient care’ (Huryk, 2010:p610). Gürdaş Topkaya & Kaya (2015) concluded that to improve attitudes towards the use of digital technology, nurses needed adequate digital literacy skills. An additional factor is the perception identified by Dunn & Braddell (2014) that some employees do not see the need for digital literacy skills in their role. They suggest that the requirement to use ICT affects all jobs and that data security and confidentiality of sensitive data will become the preserve of all employees.

Human Resources (HR) also presents challenges to the acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace. Dowding (2013) examined a random sample of 136 job and person specifications on the NHS Jobs database to see whether NHS employers are incorporating basic ICT competencies outlined in the Knowledge and Skills Framework (Agenda for Change Project Team, 2004) and those in Learning to Manage Health Information (NHS Connecting for Health, 2009). Dowding found that competency descriptions

were vague and that requirements were highly variable. Focus was often upon data security and confidentiality. Only 'basic' information skills were asked for and 28% of descriptions suggested that even these skills were either not required or not essential. Dowding identified that the important role of nurses in using digital tools to improve care, communication and cross-organisational liaison was not reflected in the sample of job descriptions.

A final organisational challenge is that of the generational blend of the workforce. There was general consensus that younger employees were more comfortable, confident and willing to adopt digital technology. Campbell & McDowell's (2011) study of community nurses found a statistically-significant relationship between year of birth and self-reporting of digital skills. Dunn & Braddell (2014) highlighted that social care staff over the age of 55 were less likely to report that they had skills to engage with e-learning. Mills et al. (2015) found that younger nurses were more computer literate, as did Duplaga (2016), who found that younger nurses were more confident IT users than older nurses in the sample. Two studies contradicted these findings; Putzer & Park (2012) noted that age was not associated with adoption of smartphones in clinical practice by physicians, and Alasmay, El Metwally & Househ (2014) found that older participants were more satisfied with the EHR than younger. They suggested that this was owing to older personnel valuing the time saved by using the system, as opposed to younger personnel who may find the system 'boring' (p7).

Bunker (2010) suggested that with the introduction of digital technology in the workplace, older workers may become 'marginalised' and leave the organisation with the resultant loss of experience and other skills. By investing in training older staff members to develop digital literacy, Bunker concluded that the organisation would benefit from increased engagement and commitment, as well as reducing costs associated with staff turnover.

In summary, employers have identified three key challenges (training, digital infrastructure and organisational) to acquiring and embedding of digital literacy skills, attitudes and behaviours in the workplace. These challenges are highly complex and will require significant financial investment by organisations, as well as a strategic approach, to bring about the necessary cultural change.

5. Discussion

In this final section of the review, a number of conclusions based on the evidence from the papers reviewed will be presented. Some limitations must be noted owing to the quality of much of the evidence. However, the commonality of themes seen across the papers reviewed gives some confidence to these conclusions. Recommendations for further research to address perceived gaps in the literature are also considered.

It is evident from the review that strategies do exist. These are supported in the UK by national policies and guidance, which have the potential to enhance the embeddedness of digital literacy within the health and social care workplace and productivity, but these are not being implemented in a systematic way. There is a need for some kind of framework/taxonomy of digital literacy competencies that is flexibly adapted to the learner at the point of need. However, the multiplicity of terms associated with digital literacy and the contested definitions in the literature make it challenging to develop a comprehensive overarching framework of knowledge, skills and attitudes, as well as associated assessment approaches. In addition, the rapid pace of technological change means that operational skills will constantly evolve. The literature does differentiate between operational skills and higher order skills, and it is in the latter area that work may be productively focussed to ensure that learners and employees develop appropriate attitudinal and critical thinking skills.

There is also a requirement for standardisation and recognition of certification for equity and transferability of skills across working boundaries. Not only do employers need to have a baseline digital literacy professional entry requirement, there must also be a currency to this baseline standard. It will need to be revised regularly to reflect school-leavers' typical preparation levels in an increasingly digital education system and society. By making such literacy a requirement and expectation, the espoused digital culture of an organisation becomes reality. A critical mass of the existing workforce are developed according to a 'standardised' digital literacy framework and all further appointees either receive the investment or already have the capacity to reflect and fulfil their role contribution to a digital organisation. This requires close partnerships between education providers, industry and employers to ensure that the business needs of the organisation are met. In the context of health and social care, this business need is essentially to support the delivery of high quality care.

The impact on care delivery was highlighted by studies that demonstrated the links between developing digital literacies and the adoption of and satisfaction with digital technologies such as the Electronic Health Record (EHR) (Alasmay, El Metwally & Househ, 2014; Gürdaş Topkaya & Kaya, 2015) and in increasing informatics skills, (Hwang & Park, 2011; Rajalahti, Heinonen & Saranto, 2014). Bunker's (2010) desktop review of digital literacy and productivity for the New Zealand Government concluded that an increase in ICT skills led to productivity gains. The report cited two examples from the NHS — NHS Wales and the former Manchester Health Authority. Both reported productivity gains after implementing the European Computer

Driving Licence (ECDL). NHS Wales reported increased time with patients owing to more efficient use of computers, and Manchester reported a return on investment (RoI) of 162%.

Both Verdonck, McCormack & Chard (2011) and Good Things Foundation & NHSE (2015) conclude that a lack of digital literacy development was a factor in the poor adoption of digital health technologies, resulting in missed opportunities to support clients, patients and carers to self-care. The challenge for employers is to work with employees, developers and suppliers to develop the value proposition associated with digital technologies so employees can see the usefulness to care delivery of digital systems and technologies, rather than seeing them as simply tools supporting organisational processes (van Gemert-Pijnen et al., 2011). Edgar, Grace & Dale (2016) suggest that employees should be encouraged to reflect on benefits that any new digital approach will bring to service users. The RCN (2012) describes this as a 'socio-technical approach' (p17).

Generational issues related to digital literacy have typically existed to variable degrees for each generation. To some extent, this differential will move like a wave through time over the next five to 10 years, even if there was no investment in training by institutions (Mobley, 2011). Bates (2013) contends that the so-called 'Google' or 'millennial' generation has great confidence and technical familiarity. Nevertheless, Bates found that this same familiarity unfortunately gave rise to students' unfounded self-confidence about their internet literacy skills. Bates suggests that this leads to a reduced likelihood of seeking resource instruction. Employers should not assume that younger workers have developed a rounded skill set in terms of digital literacy. They may be less critically analytical and skilled in searching for quality of evidence than older peers, and may be rather less inclined to apply critical thinking processes to evidence obtained on the internet. This is a phenomenon known as 'satisficing', whereby the first piece of information encountered is seen to satisfy the needs of the search requirement. It is prone to lead to inevitably shallow and narrow conclusions.

Approaches to digital literacy training are also a challenge. Undergraduate education in the UK, in terms of healthcare training, has made great progress and continues to ensure that digital literacy as a cross-cutting or transitional skill is embedded within its emerging curricula and teacher/tutor preparation. There are strong arguments for 'embedded curricula', such that digital literacy is truly incorporated throughout learning programmes as a transitional skill (Procter, 2015; Ferrari, 2013). An analogy of this could be the development of interpersonal and intuitive clinical assessment skills throughout an undergraduate nurse or medic's training. Ideally, a learner's existing communication skill will mature throughout a series of other taught modules, such as pulmonary disease or physiology, rather than rely purely on one stand-alone communication skills module to develop empathic and discerning clinical graduates. Similarly, a digitally-literate learner needs more than a taught course on data processing to become unconsciously competent as a sophisticated user of systems, processes and opportunities presented within the digital workplace.

Increased promotion of lifelong learning, as in learning 'how to learn', is as important as staying abreast of developments in one's specialist field or industry. Investment in the funding or provision of such generic training and self-awareness can be difficult to secure by individual workers (Telefonica, 2011). British Telecom's (BT) BT Learning Solutions (2013) was one of the pioneers of flexible online work-based learning that encompassed and valued the compound effect of skills developed in the grey area between work and play:

'We have gone further and encourage informal learning through a set of internal blogs, wikis and other ways for employees to share what they know and learn from each other'. (BT, 2013:p4)

Primary school educators already understand that young learners bring a wealth of digital skills and exposure that ought to be capitalised upon within the curriculum, rather than the curriculum needing to assume full responsibility for it. This 'curriculisation' of out-of-school literacies can exploit the potential of learning which is occurring organically as an outcome of 21st century life (Marsh, 2003). The educational media is currently debating how the global phenomenon 'Pokémon GO' game can be used as a platform for learning digital skills such as research, mapping, digital storytelling, etc., (Schrock, 2016).

Perhaps a similar approach could capitalise upon adult learners' digital activity through recreation and informal exposure in the home and community. Trainers and employers need to embrace and harness the valuable resource of their employees' prior digital learning activities so enriching digital skills applicable in the workplace; for example, skills in the use of social media and YouTube or the ability to create media for peer learning communities or work-based assignments. Employers and trainers might then actually acknowledge and equip learners' desire or ability to apply these skills to the digital demands of the workplace. To facilitate this, the use of coaching/Digital Champions may prove helpful (this is explored further in the Desktop review, the third paper in this series).

This blurring of boundaries poses challenges for employers and employees. Typically, workers are discouraged from access and usage of informal digital applications, such as social media and gaming within the workplace, for the obvious reasons of risk of distraction and diminished efficiency. Yet the value of these external activities should not be underestimated. There is wide variation between employers in health and social care about the merit and risks of employees privately engaging in social media activity as potential representatives of their organisation and their profession. This is apart from the diverse opinions about social media as a communication and marketing tool. Employers' attitudes can range from encouragement for full engagement to restrictive and gate-keeping moderation practices. The Government Digital Service (2015) has produced a comprehensive resource for the guidance of all civil servants in using social media safely and effectively that could be more widely adopted or emulated. To ensure that employees feel justified and empowered to use and harness digital ways of working, they need the

confidence to know that these approaches are valued by their employers as legitimate work activity.

The infrastructure challenges faced by organisations are not inconsiderable, such as limited broadband width, corporate restrictions upon access (firewalls/gateways) and the physical accessibility of a work-based PC. Even if an employer sanctions the use of YouTube as an employee community channel for best practice and innovation-sharing, it could place a significant broadband/Wi-Fi demand upon an already overloaded system and moreover pose corporate health, safety and confidentiality issues to a degree that has never previously needed such careful consideration.

There are consequences of not addressing the constantly evolving requirement for employees' digital literacy. Employers who do not perceive this as a priority potentially contribute to adding to existing social inequalities by creating newer digital inequalities (Ragnedda & Muschert, 2013). Automisation of lower skilled jobs increases the baseline or entry skill requirements for any viable alternative employment options. Consequently, individuals and workforces become demotivated, deskilled and unemployed in a competitive market. It is reasonable to suggest that addressing the need for employees' digital literacy will mitigate against such negative consequences, adding value to the human resources within the organisation and all the benefits of increased morale and retention that are well documented.

Compromised democratic rights are a consequence of exclusion of less digitally skilled members of the workforce. For example, an organisation-wide employee satisfaction survey may be delivered online and no provision made for the return of paper submissions. Digitally-unskilled employees may not pick up their email notification within the submission timeframe owing to common PC access issues and intimidating sophisticated log-in and firewall security checks. Others may suspect their anonymity is compromised by submitting the traceable response online. Their voice is lost and the underlying skill deficit goes unnoticed.

To meet the challenges identified in the workplace requires leadership. Maxwell (2001) stated 'Leadership is influence, nothing more, nothing less'. The requirement for future-proofing through strategic vision, implementation and operationalisation is essentially down to influential leadership. It may be that in the wake of digitisation in health and social care, there will be a need for 'Digital Literacy Leaders' to ensure digital fluency is embedded in local procurement processes, training and educational investment plans, workforce development, recruitment and service reconfiguration.

6. Gaps in the literature

A number of gaps in the literature were identified. First there is little, if any evidence of evaluation of the impact that a digital literacy strategy has upon any specific workforce's performance. More research is needed to find and examine the effect of strategies used by organisations who are leading the way in this kind of investment.

Second, there is a need for a systematic literature review on the subject of digital literacy for health and social care service contexts, particularly non-hospital settings. In addition, a useful enquiry would be to consider existing digital literacy frameworks suitable for adaptation for the health and social care workforces.

Third, much of the literature focusses on the social care workforce, nurses and doctors. There is little evidence of research into the digital literacy needs and status for other Allied Health professions or other non-qualified employees.

Fourth, whilst there is small-scale research on acceptability of digital technology to support care, there is little on evaluating how it impacts on improving care delivery. This lack of evidence of impact was noted as a rationale for slow uptake of telehealth by organisations.

Finally, there is a suggestion in the literature that there is a relationship between digital literacy, use of digital technology and innovation. This could be usefully explored to identify the factors that support this.

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References

- Academy of Medical Royal Colleges. (2011) *E-Health Competency Framework: Defining the Role of the Expert Clinician* [online]. Available at: http://www.aomrc.org.uk/wp-content/uploads/2016/05/EHealth_Competency_Framework_0611.pdf
- Agenda for Change Project Team, Leeds. (2004) *The NHS Knowledge and Skills Framework (NHS KSF) and the Development Review Process*.
- Ala-Mutka, K. (2011) *Mapping Digital Competence: Towards a Conceptual Understanding* [online]. European Commission Joint Research Centre, Institute for Prospective Technological Studies. Available at: ftp://ftp.jrc.es/users/publications/public/JRC67075_TN.pdf
- Alasmary, M., El Metwally, A. & Househ, M. (2014) The association between computer literacy and training on clinical productivity and user satisfaction in using the electronic medical record in Saudi Arabia. *Journal of Medical Systems*. 38 (8), 1–13.
- Bates, D. (2013) Are 'Digital Natives' Equipped to Conquer the Legal Landscape? *Legal Information Management*. 13, 172–178.
- BCS, The Chartered Institute for IT. (2014) *Digital skills from the employers' perspective* [online]. Available at: <http://dlfl.bcs.org/content/conwebdoc/52325>
- Beetham, H. (2015) Revisiting digital capability for 2015. *Jisc digital capability codesign challenge blog* [online]. Posted 11 June. Available at: <https://digitalcapability.jiscinvolve.org/wp/2015/06/11/revisiting-digital-capability-for-2015/>
- Belshaw, D. (2012) *What is 'digital literacy'? A Pragmatic investigation* [online]. Durham theses, Durham University. Available at: <http://etheses.dur.ac.uk/3446/>
- Benner, P. (1984) *From novice to expert*. Menlo Park.
- Bond, S. & Procter, P. (2009) Prescription for nursing informatics in pre-registration nurse education. *Health Informatics Journal*. 15, 55–64.
- Brecher, D., Laurenceau, C. & Sloman, C. (2015) *Digital Disruption: Embrace the future of work and your people will embrace it with you*. Accenture Strategy [online]. Available at: https://www.accenture.com/t00010101T000000_w_/gb-en/acnmedia/PDF-4/Accenture-Strategy-Digital-Workforce-Future-of-Work.pdf#zoom=50
- British Telecom (BT). (2013) *BT Learning Solutions Datasheet* [online]. Available at: https://www.globalservices.bt.com/static/assets/pdf/products/learning_solutions/BT_Learning_Solutions_datasheet.pdf

Bullock, A., Dimond, R., Webb, K., Lovatt, J., Hardyman, W. & Stacey, M. (2015) How a mobile app supports the learning and practice of newly qualified doctors in the UK: an intervention study. *BMC Medical Education*. 15 (1), 1.

Bunker, B. (2010) *A Summary of International Reports, Research and Case studies of Digital Literacy*. Knowledge Weavers NZ, for New Zealand Computer Society Inc.

Burtney, L. & Buddery, D. (2011) *Workforce Development for Assistive Technology, Telecare and Telehealth: what is the current landscape? Research Feedback* [online]. Skills for Care. Available at: <http://www.skillsforcare.org.uk/Document-library/NMDS-SC,-workforce-intelligence-and-innovation/Research/Research-Reports/ALT/AT-Research-Feedback-Nov-11.pdf>

Campbell, C. J. & McDowell, D. E. (2011) Computer literacy of nurses in a community hospital: where are we today? *The Journal of Continuing Education in Nursing*. 42 (8), 365–370.

Çetin, S., Ergün, M., Tekindal, M., Tekindal, B. & Tekindal, M. (2015) A Qualitative Evaluation of the Knowledge Levels of Nurses Regarding Informatics and Health Informatics: The Case of Atatürk Training and Research Hospital. *International Journal of Caring Sciences*. 8 (3), 555–566.

Consilium Research & Consultancy. (2014) *Supporting Commissioners of Assisted Living Services — Stage 1 Research Report* [online]. Skills for Care. Available at: <http://www.skillsforcare.org.uk/microsite/cat/SkillsForCare/media/SFC-Media/Images/ALT-Commissioners-Report-v2.pdf>

Courtney-Pratt, H., Cummings, E., Turner, P., Cameron-Tucker, H., Wood-Baker, R., Walters, E. H. & Robinson, A. L. (2012) Entering a world of uncertainty: community nurses' engagement with information and communication technology. *Computers Informatics Nursing*. 30 (11), 612–619.

Dalton, J. A., Rodger, D. L., Wilmore, M., Skuse, A. J., Humphreys, S., Flabouris, M. & Clifton, V. L. (2014) "Who's afraid?": Attitudes of midwives to the use of information and communication technologies (ICTs) for delivery of pregnancy-related health information. *Women and Birth*. 27 (3), 168–173.

de Normanville, C., Scott, G. & Speake, A. (2016) *Desktop review: Examining the extent to which employers and organisations are meeting the challenge of improving the digital literacy of their workforce*. TrueBlueSky Social Enterprise Ltd for Health Education England.

Dowding, D. (2013) Are nurses expected to have information technology skills? *Nursing Management*. 20 (5), 31–37.

- Dunn, S. (2014) *Digital capabilities in social care. Survey report* [online]. Skills for Care. Available at: <http://www.skillsforcare.org.uk/Document-library/NMDS-SC,-workforce-intelligence-and-innovation/Research/Digital-literacy/Digital-Capabilities-Survey-Report-300314-FINAL.pdf>
- Dunn, S. & Braddell, A. (2014) *Digital capabilities in the social care workforce. Rapid evidence review* [online]. Skills for Care. Available at: www.skillsforcare.org.uk/Document-library/NMDS-SC,-workforce-intelligence-and-innovation/Research/Digital-literacy/Digital-Capability-Rapid-Evidence-Review-300714-FINAL.pdf
- Duplaga, M. (2016) Searching for a Role of Nursing Personnel in Developing Landscape of Ehealth: Factors Determining Attitudes toward Key Patient Empowering Applications. *PLOS ONE*. 11 (4).
- Dutton, W. H., Blank, G. & Groselj, D. (2013) *Cultures of the Internet: The Internet in Britain. Oxford Internet Survey 2013* [online]. Oxford Internet Institute, University of Oxford. Available at: <http://oxis.oii.ox.ac.uk/wp-content/uploads/sites/43/2014/11/OxIS-2013.pdf>
- Ecorys UK. (2016) *Digital skills for the UK economy* [online]. Department for Business Innovation & Skills and Department for Culture Media & Sport. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492889/DCMSDigitalSkillsReportJan2016.pdf
- Edgar, M., Grace, K. & Dale, S. (2016) *Developing digital practitioners. Discovery report and model* [online]. Leeds City Council. Available at: <http://inspiringchangeleeds.org/wp-content/uploads/2016/07/Developing-Digital-Practitioners.pdf>
- Ferrari, A. (2013) DIGICOMP: A Framework for Developing and Understanding Digital Competence in Europe. *JRC Scientific and Policy Reports*. European Commission. [Last accessed 10th July 2015].
- Fujitsu. (2015) *Digital Inside Out: Creating a digital-first Britain* [online]. Available at: <http://www.fujitsu.com/uk/Images/Digital-Inside-Out-Report.pdf>
- Galloway, S. (no date) *C21 Literacy: What is it, how do we get it?* [online]. Centre for Cultural Policy Research, University of Glasgow. Available at: www.gla.ac.uk/media/media_231168_en.pdf
- Good Things Foundation & NHSE. (2015) *Improving Digital Health Skills in Communities: Findings from the Evaluation of Years 1 and 2 of the Widening Digital Participation programme*

[online]. Available at: <https://www.goodthingsfoundation.org/research-publications/improving-digital-health-skills-communities>

Go ON UK. (2015) *Basic Digital Skills Framework* [online]. Available at: <https://doteveryone.org.uk/digital-skills/digital-skills-framework/>

Government Digital Service. (2015) *Social Media Playbook* [online]. Available at: <https://gdsengagement.blog.gov.uk/playbook/>

Gripenberg, P. (2011) Computer self-efficacy in the information society: Design of learning strategies, mechanisms and skill areas. *Information Technology & People*. 24 (3), 303–331.

Gürdaş Topkaya, S. & Kaya, N. (2015) Nurses' computer literacy and attitudes towards the use of computers in health care. *International Journal of Nursing Practice*. 21, 141–149.

Health Education England (HEE). (2015) *Technology Enhanced Learning* [online]. Available at: <https://www.hee.nhs.uk/our-work/research-learning-innovation/technology-enhanced-learning>

House of Lords. (2015) *Make or Break: The UK's Digital Future* [online]. London, The Stationery Office. HL Paper 111. Available at: <http://www.publications.parliament.uk/pa/ld201415/ldselect/lddigital/111/111.pdf>

Huryk, L. A. (2010) Factors influencing nurses' attitudes towards healthcare information technology. *Journal of Nursing Management*. 18 (5), 606–612.

Hwang, J. I. & Park, H. A. (2011) Factors associated with nurses' informatics competency. *CIN: Computers Informatics Nursing*. 29 (4), 256–262.

Ipsos MORI. (2010) *E-Readiness in the Social Care Sector* [online]. London: Social Care Institute for Excellence. Available at: <http://www.scie.org.uk/workforce/getconnected/files/ereadinesssurvey2010.pdf?res=true>

Jamu, J. T., Lowi-Jones, H. & Mitchell, C. (2016) Just in time? Using QR codes for multi-professional learning in clinical practice. *Nurse Education in Practice*. 19, 107–112.

Jisc. (2014) *Developing digital literacies* [online]. Available at: <https://www.jisc.ac.uk/guides/developing-digital-literacies>

Johnson, M. (2013) Buy-side barriers to e-business technology in the healthcare sector. *International Journal of Healthcare Technology and Management*. 14 (1-2), 110–142.

Kennedy, S. & Scott, G. (2016) *Digital literacy: Towards a definition*. Health Education England, London.

- Klecun, E., Lichtner, V. & Cornford, T. (2014) *E-literacy in Health Care*. IOS Press Ebooks. 205, 843–847.
- Knowles, M. S. (1990) *The Adult Learner: a neglected species*. (4th edition) Houston: Gulf Publishing.
- Lafferty, N., Teague, M. & Price, R. (2015) *Barriers to Access for Technology Enhanced Learning (TEL)*. NHS HEE/HEA TEL Enablers Group.
- MacLure, K. (2014) *An exploration of ehealth and digital literacy in pharmacy practice* [online]. OpenAIR@RGU. Available at: <https://openair.rgu.ac.uk/handle/10059/1011>
- Marsh, J. (2003) One-way traffic? Connections between literacy practices at home and in the nursery. *British Educational Research Journal*. 29 (3), 370.
- Maxwell, J. (2001) The 21 Irrefutable Laws of Leadership: Follow Them and People Will Follow You (Brief Article). *Washington Business Journal*. 19 (42), 39.
- Menzies, O. H. & Thwaites, J. (2012) A survey of personal digital assistant use in a sample of New Zealand doctors. *The New Zealand Medical Journal*. 125, 48–59.
- Meyers, E. M., Erickson, I. & Small, R. V. (2013) Digital literacy and informal learning environments: an introduction. *Learning, Media and Technology*. 38 (4), 355–367.
- Mills, J., Francis, K., McLeod, M. & Al-Motlaq, M. (2015) Enhancing computer literacy and information retrieval skills: A rural and remote nursing and midwifery workforce study. *Collegian*. 22 (3), 283–289.
- Mobley, J. (2011) *Study to Establish Levels of Digital Literacy for Soldiers and Leaders in the U.S. Army* [online]. Mobley Associates for U.S. Army Training and Doctrine Command (TRADOC). Available at: <https://info.publicintelligence.net/USArmy-DigitalLiteracy.pdf>
- Moule, P., Ward, R. & Lockyer, L. (2011) Issues with e-learning in nursing and health education in the UK: Are new technologies being embraced in the teaching and learning environments? *Journal of Research in Nursing*. 16 (1), 77–90.
- NHS Connecting for Health. (2009) *Learning to Manage Health Information: A Theme for Clinical Education. Making a Difference*. Department of Health.
- National Information Board (NIB). (2015) Building a Digital Ready Workforce (BDRW) Roadmap: Support care professionals to make the best use of data and technology. Chapter 10 of *Personalised Health and Care 2020* [online]. Available at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/442827/Work_Stream_6.pdf

Nicklaus, J., Kusser, J., Zessin, J. & Amaya, M. (2015) Transforming education for electronic health record implementation. *The Journal of Continuing Education in Nursing*. 46 (8), 359–363.
Pineros-Leano, M., Tabb, K. M., Sears, H., Meline, B. & Huang, H. (2015) Clinic staff attitudes towards the use of mHealth technology to conduct perinatal depression screenings: a qualitative study. *Family Practice*. 32 (2), 211–215.

Procter, P. (2015) *Systems of eCare — Health Informatics Competencies*. Sheffield Hallam University, Department of Nursing and Midwifery. Unpublished curriculum document.
Putzer, G. & Park, Y. (2012) Are physicians likely to adopt emerging mobile technologies? Attitudes and innovation factors affecting Smartphone use in the Southeastern United States. *Perspectives in Health Information Management*. 1.

Ragnedda, M. & Muschert, G. W. (2013) *The digital divide: The internet and social inequality in international perspective*. (73). Routledge.

Rajalahti, E., Heinonen, J. & Saranto, K. (2014) Developing nurse educators' computer skills towards proficiency in nursing informatics. *Informatics for Health and Social Care*. 39 (1), 47–66.

Renaud, K. & Goucher, W. (2012) Health service employees and information security policies: an uneasy partnership? *Information Management & Computer Security*. 20 (4), 296–311.
Royal College of Nursing (RCN). (2012) *Positioning nursing in a digital world: RCN eHealth survey 2012 report* [online]. Available at:
https://www2.rcn.org.uk/data/assets/pdf_file/0020/530390/004_440.pdf

Schrock, K. (2016) *Pokémon Go in the classroom* [online]. Kathy's Katch. Available at:
<http://blog.discoveryeducation.com/blog/2016/07/13/pokemongo/>

SFIA Foundation. (2015) *Version 6 of the Skills Framework for the Information Age* [online]. Available at: <http://www.sfia-online.org/en/reference-guide>

Shea, C. M. & Belden, C. M. (2016) What is the extent of research on the characteristics, behaviors, and impacts of health information technology champions? A scoping review. *BMC Medical Informatics and Decision Making*. 16 (1), 1.

Stevenson, J. E., Nilsson, G. C., Petersson, G. I. & Johansson, P. E. (2010) Nurses' experience of using electronic patient records in everyday practice in acute/inpatient ward settings: a literature review. *Health Informatics Journal*. 16 (1), 63–72.

Tech City UK. (2016) *Tech Nation 2016* [online]. Available at: http://www.techcityuk.com/wp-content/uploads/2016/02/Tech-Nation-2016_FINAL-ONLINE-1.pdf

Telefonica ID. (2011) *How will be the world in 2020?* [online]. Available at: <https://youtu.be/XB0CORT1k9w>

Turner, M. P. (2010) Stratifying computer literacy: A competency measurement strategy. *CIN: Computers Informatics Nursing*. 28 (5), 291–296.

van Gemert-Pijnen, J. E., Nijland, N., van Limburg, M., Ossebaard, H. C., Kelders, S. M., Eysenbach, G. & Seydel, E. R. (2011) A holistic framework to improve the uptake and impact of eHealth technologies. *Journal of Medical Internet Research*. 13 (4), e111.

Verdonck, M., McCormack, C. & Chard, G. (2011) Irish occupational therapists' views of electronic assistive technology. *The British Journal of Occupational Therapy*. 74 (4), 185