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RESEARCH PAPER

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Evidence-Based Information Systems: A New Perspective and a Road Map for Research-Informed Practice

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Abstract

Despite the increasing sophistication and quality of published work, the development of a cumulative body of knowledge and an evidence-base for information systems (IS) research still represents a major challenge. IS research is still predominantly undertaken by IS researchers for other IS researchers and not utilized to its full extent by IS practitioners or policy-makers. We focus on this problem and express the need for a new evidence-based research perspective. It is argued that it is time to refocus the efforts of IS academics (and practitioners) to develop a new evidence-base for IS research whereby it can more routinely inform, develop, improve and support IS practice. We contribute to this debate by defining evidence-based practice (EBP), its relevance to IS, and the need to develop an evidence-based approach. We look in particular at its brief history, and its subsequent evolution, development and widespread acceptance in Medicine; making reference to recent arguments and critiques of EBP in other disciplines such as software engineering and management. We espouse the need to develop a similar evidence-based movement and infrastructure within the IS research and practitioner communities and then put forward a possible road map for the development of Evidence-Based Information Systems (EBIS) that comprises 9 key initiatives. We conclude our argument by stating that the current extent, severity and impact of IS failures are unacceptable, emphasizing the need for a new perspective for IS research that encourages and incorporates EBP as a guiding principle to inform better IS practice.

Keywords: Evidence-Based Practice, Evidence-Based Management, Evidence-Based Information Systems, Evidence-Based Medicine, Information Systems Research, Systematic Literature Reviews, Information Systems Failures

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1 Introduction

Research in the discipline of information systems (IS) has expanded and proliferated over more than five decades. Increasingly therefore, as the discipline matures, we would expect that IS practice would become correspondingly standardized, underpinned by rigorous and relevant research, and performed consistently to high quality professional standards. This should lead to more demonstrable productivity, measureable success and higher levels of impact. Paradoxically, and despite the large number of examples of excellent peer-reviewed academic publications from either individuals, multidisciplinary research teams, or high-profile funded research programs, the development of a cumulative research evidence-base to support good, or prevent bad, practice remains a subject of controversy, contention and increasingly lively debate. (Baskerville, 2009; Boell & Cecez-Kecmanovic, 2015; Oates, Edwards,

& Wainwright, 2012; Baskerville & Myers, 2009). These arguments and concerns are strongly mirrored in the related disciplines of software engineering (Kitchenham, 2004; Kitchenham et al., 2009) and also management (Rousseau, 2006; Reay, Berta, & Kazman Kohn, 2009; Morrell, Learmonth, & Heracleous, 2015). It could therefore be argued that there should, by now, be an IS research evidence-base that provides the basis to explain and provide insights to answer the many questions that practitioners or other IT stakeholders might ask, such as:

- What are the pitfalls to avoid when implementing a customer relationship management or enterprise system—and what can we do about them?
- Do telehealth technologies save costs and prevent hospital admissions?
- How do we overcome communication, cultural and political barriers between IT professionals and business managers, end users and policy-makers?
- How do we overcome common patterns of project failure in public sector IT projects?
- What are the best means of combating cyberbullying?
- Is there any evidence that an organization's social media presence increases profits?

Such questions may have been explored by IS researchers in many research forms, shapes and sizes. But, we argue, too little of the knowledge gained is used by IS practitioners or policy-makers to inform their decision-making. Studies have shown that IS practitioners are more likely to take the advice of an in-house expert or external consultant than turn to the academic research literature for empirically founded evidence about what did or did not work in similar situations to their own (Baskerville & Myers, 2009; Beecham, O'Leary, Richardson, Baker, & Noll, 2013; 2014; Wastell, 2011. In this paper we take a new and perhaps controversial research perspective and explore the idea and role of evidence-based practice (EBP) in IS; or what we also term evidence-based information systems (EBIS). Our research question simply asks: *"How can EBP improve decision-making and judgement related to the acquisition, design, development, implementation, management, use, and operation of information systems?"*

It has recently been argued that IS research is dominated by an "epistemic script," in which the aim is to borrow social theories originating in other disciplines and then adapt and apply them in an IS context (Grover & Lyytinen, 2015). Other forms of knowledge production may now be necessary, including high-level theorizing about IS and IT at one end of the spectrum, and inductive, data-rich enquiries at the other end (Grover & Lyytinen, 2015). We believe that the EBP paradigm offers a means for data-rich research to be synthesized and made available to IS practitioners and policy-makers to inform their decision-making. Researchers and practitioners can then be joint participants in our fundamental quest to answer the big question (Grover & Lyytinen, 2015, p. 272): "How can IS—as a semiotic and sociotechnical system—be effectively deployed in the human enterprise?"

A more relevant interpretation of this question for EBP might be: How can IS be effectively deployed, managed and used in the human enterprise? This paper therefore argues for the development of a new evidence-based IS research and practice perspective. At this point, before we begin, it is important to differentiate our argument concerning the concepts underpinning, and the utility of adopting, evidence-based practice (EBP) in IS from the common narrow focus on the efficacy of individual research methods such as systematic literature reviews (SLR). The current EBP discourse in IS, which relates to encouraging the use of more consistent, scientific, and repeatable research methods, is often dominated by discussions of the merits, perils, or critiques of SLRs (Boell & Cecez-Kecmanovic, 2015; Schultz, 2014; Chiasson, 2014, Oates, 2014), paying less attention to other alternative methods and approaches. SLRs are becoming more popular and are seen by some researchers as a preferred means of providing a comprehensive summary and appraisal of the literature resulting in a synthesis of evidence focusing on distinct research questions. To reiterate Oates (2014), the forgotten element seems to be the practitioner—as opposed to a current focus on building a research base and a body of knowledge for other researchers. This runs the risk of building a vicious spiral of academic studies that may have little effect or impact on practice. EBP is certainly imperfect, but it provides a way forward to help practitioners participate in narrowing the "relevance gap" that inhabits information systems (along with many other disciplines). This paper therefore focuses on the principle and practice of adopting EBP approaches for IS, with SLRs being just one of many methods that may be used as a means towards this end.

In the second section of this paper we provide some working definitions of EBP. In Section 3 we then express our argument for the need to adopt EBP in IS. Section 4 explains the concept and history of EBP, drawing upon its foundations in evidence-based medicine (EBM). EBM and evidence-based health care have a long history and are now well-integrated into clinical work and health service management, closely linking up peer-reviewed research and

practice. So, we look, in particular, to the lessons learned from the development of EBM and its interpretation in other disciplines, such as management, and their experiences for ideas about how to develop EBP. Section 5 provides a discussion of previous research in EBP focusing on the IS literature. In Section 6 we summarize some of the criticisms that have been made of EBP, but we strongly contend that we still need to explore and develop EBP in IS. Then, in Section 7 we provide a road map of the journey and areas that will need to be covered if EBP is to be developed in IS. Section 8 examines the challenges facing both academics and practitioners in the IS community for developing EBP, before we draw conclusions in Section 9, arguing that EBP in IS requires a new research perspective and a fundamental shift of mind-set by both practitioners and researchers.

2 Defining Evidence-Based Practice (EBP)

Whereas EBP in both IS and management are fairly embryonic, the concept has a more mature history of development in medicine/healthcare and is widely known as evidence-based medicine. Two key definitions are:

> *an approach to decision making in which the clinician uses the best evidence available, in consultation with the patient, to decide upon the option which suits the patient best.* (Muir Gray, 1997, p. 9)

> *Evidence-based medicine (EBM) is the integration of best research evidence with clinical expertise and patient values combining: relevant research conducted using sound methodology; clinical experience, education and skills; individual patient preferences, concerns, expectations and values.* (Sackett, Straus, Richardson, Rosenberg, & Haynes., 2000, p. 1)

Similar definitions are now becoming evident in related disciplines such as management (Pfeffer & Sutton, 2006), in what is becoming known as "evidence-based practice" (EBP) or "evidence-based management" (EBMgt). This is defined by Pfeffer & Sutton (2006) as: "the systematic use of the best available evidence to improve management practice" and by Briner, Denyer, and Rousseau (2009, p. 19) as:

> *about making decisions through the conscientious, explicit and judicious use of four sources of information: practitioner expertise and judgement, evidence from the local context, a critical evaluation of the best available research evidence, and the perspectives of those people who might be affected by the decision.*

This greater focus on knowledge transfer and educating practitioners is where researchers collate and synthesize the findings of previous high-quality empirical research to inform policy-makers and practitioners about the current state of knowledge on the use of a particular tool, method, or strategy (Baskerville, 2009; Tranfield, Denyer, & Smart., 2003; Rousseau, 2006). Combining these definitions from different but related disciplines, four fundamental themes emerge:

- use of the best available research evidence
- research conducted using a sound and rigorous methodology
- use of practitioner expertise
- inclusion of client views

Drawing on these definitions and the 4 themes above, we agree with Edwards, Childs, Oates, and Wainwright's (2014) definition of evidence-based practice for IS—or what we term evidence-based IS (EBIS)—as:

> *an approach to decision making in the design, adoption and implementation of information systems that uses the best evidence available, from both practitioner expertise and systematic research, in consultation with all stakeholders.* (Edwards et al., 2014)

3 The Need for EBP in IS

More than 50 years of IS research has yielded useful empirically based insights into the development, management and use of information and communication technology (ICT) systems. However, these are typically held in research publications which are mostly hidden from public view, mostly only accessible for a fee, and frequently inaccessible to practitioners and often, even other researchers. They are written *by* IS researchers *for* IS researchers, many of whom, for a plethora of reasons, maintain a remote and safe distance from practice. As a result, IS practitioners, managers, policy-makers, and IS users have not been able to make best use of the insights of IS researchers. They have not used the available, peer-reviewed evidence and findings to support their practice and decision-making. Consequently, IS researchers have not had the impact that they should and could have had, and have not played a more active role in delivering the results that governments, politicians, organizations, and funding bodies are increasingly demanding. In short, IS researchers and practitioners have not yet developed an evidence-based practice (EBP) approach to the development, management, and use of ICT systems.

This problem is amplified by the exponential growth in digital artifact innovation, development, use, and adoption, and the fact that digital artifacts underpin, enhance, and are embedded in, more and more of our work practices, social relationships, and leisure activities. Accompanying and compounding this massive digital expansion are the many highly publicized IT project difficulties and failures (e.g., King & Crewe, 2014). A recent U.S. example is the "ObamaCare" website that could not handle the volume of traffic and crashed shortly after its launch (Goldstein, 2014). Other U.S. examples include (Tricentis, 2014, 2015): the introduction of a SAP software system in 2012 by the National Grid Gas Company in New York State to streamline back-office processes, which after two years led to excess costs of $500M due to the failure of the software system to do its intended job; a software bug in the F-35 Joint Strike Fighter aircraft that causes the planes, when flying in formation, to incorrectly detect targets; and recalls of cars due to software bugs by Audi, Ford, General Motors, Honda, Nissan and most recently, unethical development of "cheat" emissions falsification software by Volkswagen (although the software itself worked spectacularly well) that has already cost the company its global reputation and potentially many $billions in fines and lost revenues.

Examples in the U.K. of public sector projects that that have cost £billions yet have been abandoned before implementation, or have failed soon after adoption, include the Student Loans Company (Hopkin, 2009), the FiReControl System (National Audit Office, 2011a), the Integrated Children's System (Shaw et al., 2009; Wastell, White, Broadhurst, Hall, & Peckover, 2009; Wastell, 2011), and the NHS's National Programme for Information Technology (NPfIT) (Campion-Awwad, Hayton, Smith, & Vuaran, 2014; Currie, 2012; National Audit Office, 2011b; National Audit Office, 2013). The chair of the U.K. government's public accounts committee commented on one large scale IT project failure "It is deeply depressing that . . . the same mistakes have occurred once again." (Public Accounts Committee, 2009, n.p.).

An example is provided by Currie (2012a) in Appendix 1, Table 2, where multiple sources of high quality research evidence can be found that can be used to identify and explain the reasons for why there is now a long history of very problematic or failed IS projects and IT systems in the English National Health Service (NHS). Table 2 shows an extract of current sources of publication relating to the large-scale U.K. NHS NPfIT program focusing on the development and implementation of electronic patient or health care records (EPR/EHR). Academic research findings are presented largely to the academic community through journal or university research group publication; practitioner research findings are presented through professional bodies such as the British Computer Society or the practitioner medical journals; and finally, formal government and civil service strategy, policy, assessment, and evaluation reports can be accessed via official agencies such as the U.K. National Audit Office and U.K. Parliamentary Accounts Committees.

These research and assessment publications concerning the development, implementation, adoption, and evaluation of EPR/EHR systems contain very similar content and largely agree on the key findings and actions for improvement. These are fragmented research projects and evaluation exercises/assessments, however, with no attempt to combine them to build an official evidence base or openly accessible repository, even though this was part of what was considered, at the time, to be the most ambitious and expensive IT project in the world. The combination of rigorous academic research, IS, and in this case, health professionals, practitioner research and reporting, and government evaluations provides the foundations and potential for conducting meta-analysis and systematic review. Then, and most importantly, this work should be provided in an understandable form, while being openly and freely available to IS practitioners. This would enable them to make more informed decisions and take relevant action.

Some other ICT projects may have been judged successful, but took too long to implement, or may not have been implemented in the most effective way (Brooks, 1987; Avison & Young, 2007). Other ICT projects have been perceived as successful for clients, but have caused deep unease in the wider society—e.g., concerns about how much personal data is stored, trawled, and used by business organizations and governments (Dinev, 2014). Again evidence-based IS should be able to take the lessons learned by IS researchers about such projects, and feed them back to IS practitioners so that better ICT systems are developed in the future.

Researchers and practitioners need to learn from the spectrum of IT projects—from failed to successful—and from the accumulated knowledge of researchers, in order to avoid project failures and to reap all the potential benefits of ICT systems. We contend, therefore, that IS should explore, adopt, and promote the EBP paradigm, so that decision-making about IS strategies, designs, implementations, and innovations draws on empirical research findings, and the accumulation of previous lessons, rather than on gut feeling, current fashion about the latest "silver bullet" (Brooks, 1987), or a simplistic belief in the "magic" of information technology (Wastell, 2011). An EBP paradigm in IS would inform decisions about the

design and adoption of new tools, methods, processes, and sociotechnical systems, because decision makers would be able to draw on the synthesized findings of empirical research studies on their previous use, use this evidence to diagnose the problem they need to address, and then integrate this knowledge with an understanding of their local contexts.

4 The Evolution and Development of EBP

The history, evolution and the development of EBP in medicine, termed evidence-based medicine (EBM) offers suggestions on how EBIS might be developed.

Professor Archibald Cochrane was a key influence on the EBM movement (Stavrou, Challoumas, & Dimitrakakis, 2013). He promoted the use of randomized controlled trials (RCTs) to determine the effectiveness of treatments and introduced the idea of cost-effective use of resources. He wrote a seminal book "*Effectiveness and efficiency: Random reflections on health services*" (Cochrane, 1972) in which he criticized the lack of scientific evidence, guidance for treatments and use of resources within the U.K. National Health Service (NHS). His work led to the construction of a register of clinical trials in perinatal medicine. In 1976, Iain Chalmers performed the first systematic literature review (SLR being an organized, traceable, and comprehensive literature search and synthesis), including a meta-analysis of these controlled trials.

In 1979, Cochrane called for RCTs in all areas of medicine to be collected and summarized. This eventually led to the establishment of the Cochrane Centre in Oxford (U.K.) in 1992, which shortly developed into the Cochrane Collaboration (http://www.cochrane.org/about-us/history). The Cochrane Collaboration (http://www.cochrane.org/) is now a nonprofit, international network of around 27,000 people from 120 countries, including health practitioners, researchers, and patient advocates. Its mission is "to promote evidence-informed health decision-making by producing high-quality, relevant, accessible systematic reviews and other synthesized research evidence" (http://www.cochrane.org/about-us). These reviews are made available via the Cochrane Library (http://www.thecochranelibrary.com/view/0/index.html) through a range of subscription models, with summaries of the reviews being freely available. Free access at the point of use for all U.K. citizens is centrally funded.

Another key influence on EBM was David Sackett, professor of medicine at McMaster University, Canada (Smith & Rennie, 2014). Working with colleagues from the late 1960s onwards, he developed a critical appraisal approach to the teaching of medical students, which developed into the EBM approach (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996; Sackett et al., 2000). Professor Gordon Guyatt, who took over the teaching program at McMaster in 1990 coined the term "evidence-based medicine." Muir Gray, a public health physician and NHS manager, and Iain Chalmers persuaded Sackett to move to Oxford in 1994, where he directed the Centre for Evidence-Based Medicine, and spread the idea of EBM internationally.

The messages we can take from the evolution and development of EBM are:

- The need for influential champions and evangelists
- The interrelationship between EBP (the underpinning philosophical approach), systematic reviews in general, and SLRs in particular (the research methodology approach)
- Embedding an EBP approach within the teaching program of future practitioners and academics
- The long time-scale needed to develop an EBP culture

These conclusions are supported by Sackett:

> *Evidence-based medicine quickly became popular, Sackett believes, for two main reasons: it was supported by senior clinicians who were secure in their practice and happy to be challenged and it empowered young physicians—and subsequently nurses and other clinicians* (Smith & Rennie, 2014).

EBM is now widely taught and practiced, and has been recognised as one of the 15 greatest medical milestones since 1840 (http://www.bmj.com/content/medical-milestones) (Dickersin, Straus, & Bero, 2007). It has widened beyond informing decisions about clinical treatments, to include also the wider management and policy of healthcare provision. For example, this includes approaches to change organizational culture to improve healthcare performance (Parmelli et al., 2011), strategies for encouraging healthcare professionals to adopt information and communication technologies (Gagnon et al., 2009), and evidence-based health informatics (Rigby et al., 2013). EBM has evolved and morphed into evidence-based healthcare, encompassing all health-related professions and aspects of health. The SLR methodology has also moved from a focus on the meta-analysis of *quantitative* research and randomized controlled trials to the inclusion of *qualitative* and case study–based research—methods and techniques which are often used in IS research.

EBP has also been adopted and adapted as necessary in other disciplines, including software engineering (Dybå, Kitchenham, & Jørgensen, 2005),

management (Rousseau, 2006; Pffefer & Sutton, 2006; Tranfield et al., 2003) social policy (Pawson, 2006), librarianship (Eldredge, 2000) and education (Petty, 2009). Other evidence-based collaborations and networks have also been established, including:

- The Campbell Collaboration (for social interventions in crime and justice, education, international development and social welfare; http://www.campbellcollaboration.org/)
- the Alliance for Useful Evidence (for social policy and practice; http://www.alliance 4usefulevidence.org/)
- Evidence-based Software Engineering (EBSE) (http://community.dur.ac.uk/ebse/)
- The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) (for public policy; http://eppi.ioe.ac.uk /cms/)
- The Evidence Network (for evidence-based policy and practice [EBPP]; http://www.kcl.ac. uk/sspp/departments/politicaleconomy/researc h/cep/network/index.aspx)
- The U.K. Government's "What Works Network" (of evidence centers covering different public policy areas; https://www.gov. uk/what-works-network).
- The Centre for Evidence-based Management; www.cebma.org

IS practitioners have to make multifaceted choices, which are not readily explored by RCTs or SLRs, but so do practitioners in other disciplines. If evidence-based health informatics, software engineering, management and public policy exist, there seems no overarching reason why evidence-based information systems (EBIS) could not also be developed.

5 Previous Research in EBP for IS

Evidence-based practice (EBP) is not a term that is commonly used or familiar within IS, neither in academic research nor in practice. A more recognizable attempt to incorporate concerns over the significance, relevance, veracity, and usability of IS research involves the ongoing debate over rigor versus relevance. In an editorial for the *European Journal of Information Systems,* Baskerville (2009) highlights these arguments and the debate and expresses a need for the IS discipline to prepare for evidence-based management. This moves the argument forward from one that was very "academic," focusing on the need to promote IS as a valid discipline with a set of core theories developed through the expert application and development of rigorous research approaches, to one that now highlights the need to solve urgent and real IS development, implementation, adoption, and diffusion problems. Baskerville (2009) perceives the need to promote rigorous IS research more effectively while also providing better ways to educate IS practitioners, in order to develop their research-based competencies and enable them to assimilate theoretical concepts and empirical research findings into their strategies, daily operations, and practice. It is therefore not just a narrow argument over rigor versus relevance, but one that tries to incorporate both of these ideals towards developing a better understanding of the usefulness and key messages from IS research for practitioners, and adopting a new research ethos of undertaking, delivering, and disseminating understandable research which can support evidence-based practice.

Pfeffer and Sutton (2006), also taking their inspiration and examples from the more established field of evidence-based medicine (EBM), advocate the adoption of EBP principles in management. They argue for management decisions and practice to be more informed by facts, logic, and evidence that are guided by new knowledge and insight. Using a myriad of powerful examples taken from leading U.S. firms, they also highlight the significant barriers to the adoption of evidence-based principles, where valuing personal firsthand experience over facts, blindly adopting practices pertaining to "excellence" taken out of context, following fashion and hype, or just maintaining pure dogma, can all inhibit learning from the available evidence and ultimately lead to business or organizational underperformance and failure.

Powerful expositions—such as those provided by Pfeffer and Sutton (2006) and other management researchers (Tranfield et al., 2003; Rousseau, 2006), and more recently consolidated by compilations such as the *Oxford Handbook of Evidence-Based Management* (Rousseau, 2012)—of the need to adopt evidence-based approaches to management research and practice have not yet occurred to the same extent in the discipline of IS. Neither has there been the same level of discussion or critique of its contextual applicability to the discipline (Morrell, Learmonth, & Heracleous, 2015; Tourish, 2012; Reay et al., 2009; Briner et al., 2009)

Baskerville & Myers (2009) and Gregor & Jones (2007) focus on the role of fashion, hype, and fads in both management and IS research and practice, a role potentially deflecting research efforts away from dealing with embedded and core IS development and implementation problems. They argue for a neutral position where IS research may interpret, explain, and add value to management fashion and therefore "synchronize" with practice in the real world, making research work more relevant to the practitioner

audience, and less of an "ivory tower." Baskerville & Myers (2009) conclude that IS researchers should be the *leaders* and not the *followers* of fashion, through more ready engagement with practice and coproduction with practitioners of relevant research. This implies taking a more evidence-based approach if the coproduction is to be successful in terms of more successfully influencing IS practice. Wastell (2006) illustrates this type of coproduction through an account of the use of a geographical information system (GIS) system to enable the development of an evidence-based policy for multiagency collaboration for crime reduction. Wastell (2006; 2011) argues for the adoption of evidence-based approaches to research, and, in particular, to support the development and implementation of large-scale information systems aligned with policy-making in the U.K. public sector.

An early expression of the need for evidence-based IS was made by Atkins & Louw (2000), who focused on the field of healthcare IS and the problem of integrating disparate "islands of information" into an "archipelago," highlighting the lack of research that had been joined together, as well as an evidence base similar to the one that was emerging in healthcare. They provide a framework in which an evidence-based IS culture could potentially flourish, based on advocating the need for more systematic literature reviews, the adoption of "hierarchies of evidence," and the development of more critical appraisal guidelines for research designs within the IS field. Booth (2003) also echoes this "call to arms," working in the field of both information sciences and healthcare. Here the focus is on educating practitioners to make more informed choices and critically appraising the available literature, thus becoming "reflective practitioners," adopting models of individual, self-directed, experience-based professional learning (Schoen, 1991). This closely aligns with Baskerville's (2009) and also Rousseau's (2006) views that the problem of diffusing evidence-based practice lies more in developing critical appraisal skills among IS or management practitioners than in "toning down" rigorous and theoretically informed IS research to make it more "text book" accessible.

Kitchenham et al., (2009) also argue for the adoption of an evidence-based approach in software engineering, our sister discipline, to mirror that of medical science. They argue for an adaptive approach to apply evidence-based approaches within the software engineering discipline, with most effort initially directed towards the adoption of SLRs within that discipline and the creation of something similar to the Cochrane Collaboration to make SLRs and their outcomes available to practitioners. However they recognize that software engineering does not have an equivalent homogeneous professional culture, long-standing institutions, unified scientific goals, or government support and funding, as does the Cochrane Collaboration, and that such an infrastructure will thus be harder to establish. This focus on the production of SLRs as the main mechanism for the development of evidence-based approaches to IS is now attracting more interest and acceptance within the mainstream of IS research (Goeken & Patas, 2010; Goeken, 2011; Oates, 2011; Oates et al., 2012), although it is not without its critics (Boell & Cecez-Kecmanovic, 2015). More SLRs are being published in the IS literature (e.g., Alwin, Anttila, Samuelsson, & Brandt, 2012; Childs, McLeod & Hardiman, 2013; Cruz, da Silva, & Capretz, 2015; Jeyaraj, Rottman, & Lacity, 2006; Karpovsky & Galliers, 2015). However, most of these, while described as SLRs, are still aimed at fellow academic researchers (Oates, 2014) rather than at providing empirically based evidence for practitioner decision-making (e.g., Davis, 2014).

It is also becoming more apparent that the interest in developing broader definitions and applications of evidence-based approaches, and not just limiting this to SLRs, is growing in the fields of both management and IS research. (Baskerville, 2009; Tranfield et al., 2003; Wastell, 2011; Rousseau, 2012). However, the issues and problems of developing a "Cochrane-like" infrastructure for IS or management research remain, as does the need to develop more creative research approaches and methods that embed an evidence-based philosophy. The issue of how to disseminate effectively rigorous evidence-based research to the IS practitioner community is also highly pertinent, as is the more effective development of research competencies for both management and IS practitioners (Baskerville, 2009).

6 Criticisms of EBP

6.1 EBP in Management

We do not assert that EBP is a silver bullet, guaranteed to prevent all future IS project failures; EBP has its critics too, especially in management (Morrell et al., 2015). Baskerville (2009) makes a strong point that EBP is a hotly contested and debated subject within other management disciplines such as accounting and finance, marketing, organizational studies and business education. From the beginning, Evidence based medicine itself faced problems. The seminal paper by Sackett et al. (1996) was written to answer criticisms which included:

- "everyone is already doing it"
- it is conducted in the domain of the academic "ivory tower"

- it is "cookbook" medicine
- it is impossible to practice
- it is giving managers the ammunition to cut healthcare funding
- it is restricted to RCTs and meta-analyses.

A lively debate, informed by critical theory and postmodernism, also ensues within the discipline of management (Morrell, 2008; Tourish, 2012). Morrell, et al. (2015) use a Foucauldian analysis as an archaeological critique of evidence-based management (EBMgt). They argue against the "ghettoization" or relegation of narrative as a poor relation to more empiricist research and scientific methods, exemplified by SLRs and RCTs in other disciplines such as medicine. They propose that little theoretical progress has been made by advocates of EBMgt and that empiricist research is, in fact, narrative, and that that there should be an equivalence between evidence and narrative, or rather an attempt at "recognizing narrative as evidence and evidence as narrative" (Morrell et al., 2015, p. 530). They also claim that it is too simplistic to compare management to medicine with the adoption of similar principles and ideas for an EBP approach and a hierarchy of research evidence, methods, and approaches. This argument is counter to that initially promulgated by Tranfield et al., 2003) and more recently by Pffeffer and Sutton (2006) and Rousseau (2006; 2012). There is little doubt, however, that similar arguments and critiques exist within the IS discipline (Boell & Cecez-Kecmanovic, 2015).

6.2 EBP in Information Systems

Similar problems have been identified for EBP in IS. Wastell (2006, p. 199) notes that "the diffusion of evidence-based methods into the real-world of policy-making (and professional practice in general) has been desultory." EBP has a strong basis of scientific realism and quantitative research, despite recent contributions from qualitative research to the evidence base (e.g., Pawson, 2006). Practitioners can find statistics unintelligible and lack the critical skills to evaluate the research evidence. They may privilege their direct experience over decontextualized evidence, and perceive threats to their professional autonomy. Political issues, particularly in multiagency activities, also act as barriers. Wastell (2006) looks to actor-network theory (Latour, 1987) to understand these barriers, framing EBP as "an emergent actor-network, populated by human and technical elements, configured by external "structural" influences interweaving with endogenous forces" (Wastell, 2006, p. 201).

6.3 EBP in Medicine

Also, in medicine, there are arguments that EBM has gone too far. Greenhalgh, Howick, and Maskrey (2014, p. 2) criticize the current overemphasis in healthcare on following algorithmic rules, such as computerized decision support systems, structured templates, and point of care prompts; all in the name of EBM. This rule-based approach sidelines clinical expertise and individual patient involvement. Greehalgh et al. (2014) call for a return to the principles of "real" EBM involving clinical judgement *and* individualized patient care. This would include research into how clinicians and patients find, interpret, and evaluate evidence and then apply it in decision-making in the real world. This understanding needs to be reflected in the education of clinicians and in the design of decision-aids. Even the epitome of EBM, the Cochrane Collaboration, faces problems. These have been identified as including the following (Smith, 2013):

- Coverage. It mainly covers treatments, and this coverage is still patchy. The challenge is to extend its role into other healthcare areas.
- Lack of suitable primary research to review. RCTs often fail to include patients with multiple conditions, who are increasingly becoming the norm. Additionally, some SLRs conclude that there is a lack of reliable evidence on certain topics.
- Concerns about the SLRs themselves. Some are of poor quality or not kept up to date.
- Efficiency of SLR production. SLRs are costly and time consuming to produce. Pared down SLR approaches could be used, but these raise concerns about the introduction of bias.
- Making the reviews more accessible. This would comprise, (1) providing complete open access, and (2) producing review summaries and other products aimed at the practitioner

6.4 The Need for Broader Views of Empirical Research

Empirical research may be seen as a contested term, dominated by classical science and positivist viewpoints. In science generally, and in engineering/computing in particular, scientific methods—hypotheses, experimental designs, and measurements that are usually quantitative and mathematically based, subject to peer and adversarial review, strengthened by the reproduction of results, and then disseminated through conference presentations and journal publications—are the accepted norm. However, as Pawson (2006) argues,

this is not the case for research in other disciplines, especially those focused on social research, where the "sine qua non" of evidence-based policy is a cumulative and progressive body of knowledge that takes into account the contextual conditions, generative mechanisms, and outcome patterns of realist evaluation research. In the disciplines of social science, politics, business, management, and information systems, mathematical and quantitative studies often do not meet these criteria, having too narrow a focus on closed systems, and being too reliant on more structured causal explanations between phenomena. This risks ignoring vital evidence that might be gained from other means and sources. Pawson (2006; 2013) argues for a shift towards systematic review and realist methodology (Greehalgh et al., 2011) as a means of building the evidence base that may be used more proactively to inform policy and practice—as opposed to traditional episodic evaluation research that explains policy decisions and interventions after the event, with little concern for determining outcome patterns enabling double-loop learning.

More recently, Greenhalgh (2016), was commissioned to produce a report for the World Health Organization that assessed the potential of qualitative research methods, such as narrative research, to complement and inform what are considered more accepted and classical science based approaches such as RCTs for medical and clinical research. The findings of the report was informed by an expert group convened by the World Health Organization (WHO) Regional Office for Europe in January 2015, which recommended that the use of new types of evidence, particularly qualitative and narrative research from a large variety of academic disciplines could improve health policy and clinical decision-making. In this report Greenhalgh (2016) also provides a hermeneutic analysis of three exemplar case studies that use narrative research focusing on contemporary challenges for public health and health policy. She finds that high quality narrative research can complement the findings of randomized control trials and observational studies, inform new hypothesis-driven studies and the refinement of survey instruments, explain the failures and potential successes of policy initiatives, and inform the development, introduction, and implementation of new health policies.

The recent development and a slowly growing acceptance of more eclectic and catholic views and approaches to empirical research in both social science and health/medical science is mirrored to an extent in business and management, as well as in information systems. However, the maturity of the debate is lagging, especially in the discipline of information systems where the argument for developing a greater emphasis on systematic reviews, meta-analyses, and collaboration between researchers, practitioners, academe, and publishers has not yet been developed. What is needed, is a much more collaborative research ethos and a willingness to perform a realist synthesis of empirical research in all its forms, particularly in terms of addressing the challenge of determining outcome patterns from multiple heterogeneous research studies of information systems interventions.

Despite these criticisms, while learning from and taking on board these competing arguments, we contend that we still need to explore and develop EBP in IS, because it offers us an important opportunity to incorporate the knowledge gained from high-quality IS research with real-world IS and IT decision-making. In the remainder of this paper we discuss a road map, which identifies some necessary steps and changes for a move towards EBP in IS.

7 Proposal for a Road Map Towards EBP in IS

EBP, in its simplest sense, refers to a form of professional activity where practical decisions are informed by empirical research and, conversely, where practices without evidence to support their efficacy can be challenged. To support the exploration and further development of EBP in IS, we put forward a "road map" of the areas that will need to be covered if the journey towards the realization of an EBP infrastructure and culture is to be achieved. We have added an explicit action to develop a practitioner research culture. Although this was implicit in the original road map (Edwards et al., 2014), we now believe it is fundamental to the success of EBIS and therefore needs to be highlighted. We expand on nine "road map" action points in this section.

- Conduct empirical research
- Undertake systematic literature reviews (SLRs)
- Develop a web-based knowledge base
- Transfer knowledge to practitioners and other stakeholders
- Develop a practitioner research culture
- Incorporate EBP in the IS curriculum
- Establish evangelists for EBP
- Conduct research into EBP
- Build an EBP community

7.1 Conduct Empirical Research

EBP requires carrying out empirical studies (using the wider definition covered in section 6.4) into the design and adoption of IS strategies, tools, methods, processes, or systems, so that the studies' findings can constitute the evidence informing practitioner decision-making.

This objective should be readily achievable, since the IS discipline has a long tradition of empirical research (Benbasat & Zmud, 1999; Orlikowski & Baroudi, 1991; Prashant, Pinjani, & Sibley, 2007). We do not argue that researchers should be constrained only to topics that are of immediate benefit to practitioners, but there needs to be more research undertaken whose findings can potentially be transferred to practice or IS use. Some IS journals require that authors include an "implications for practice" section in their papers (eg., *Information Technology & People, Journal of Enterprise Information Management*, *Journal of Systems and Information Technology*), and we recommend that all authors do this whenever possible. Journals published by Emerald, such as *Records Management Journal* and *Information Technology & People*, also have a structured abstract format for articles comprising: purpose, design/methodology/approach, findings, research limitations/implications, practical implications, social implications, and originality/value. There also continues to be a lack of a cumulative tradition in IS research (Eom, 1995; Baskerville & Myers, 2002; Wade, Biehl, & Kim, 2006; Gregor, 2006) meaning that many researchers view their studies as "one-off" projects. Such projects are seen as highly contextual with limited generic lessons or methods. To address these research problems, the development and use of more meta-analytic methodologies and mindsets will depend on higher standards and the transparency of data and analysis. In terms of quantitative studies, researchers (Schwab, 2015; Dybå, By Kampenes, & Sjøberg, 2006) state that much greater care must be taken to report sample and effect sizes, as well as confidence intervals of the effect size, in order to ensure acceptable levels of statistical power. For EBP, IS research needs to be more cumulative. Systematic literature reviews (see next section), which synthesize findings from previous research, can help IS to develop a cumulative tradition.

7.2 Undertake Systematic Literature Reviews (SLRs)

Systematic literature reviews (SLRs) aim to identify, evaluate, and summarize all relevant research (the evidence) on a topic to guide decision-making. They try to use an objective, rigorous, transparent, and auditable process. Objectivity and rigor come from establishing elements a priori and following a standard process. Auditability comes from fully documenting and publishing the process as well as the results. An SLR comprises the following stages:

1. Framing the question for the review. Questions should be focused, precise, and specific, and the question should be set out a priori.
2. Identifying relevant literature searches. These should be as comprehensive as possible and selection criteria should be established a priori.
3. Assessing the quality of the literature using criteria established a priori to allow the weighting of individual items based on the rigor of the work.
4. Summarizing the evidence using a data extraction form, established a priori, to extract data from individual items that will answer the review's question(s).
5. Interpreting the findings using analysis methods, established a priori, to give meaningful and practical answers to the review's questions(s), considering the strengths and weaknesses of the evidence; for quantitative data, a meta-analysis might be conducted.
6. Reporting the review via a narrative report, supported by a meta-analysis (if available), data tables, a bibliography of the selected items, and a detailed description of the review process itself.

Guides for conducting SLRS are available: e.g., Centre for Reviews and Dissemination (2009a); Kitchenham (2004); Okoli & Schabram (2010). The Centre for Reviews and Dissemination (2009b) has a section on the synthesis of qualitative data, listing a number of proposed methods, and notes: "General debate about the appropriateness of combining qualitative studies continues, and more specifically whether different types of qualitative research, based on different theoretical assumptions and methods should be combined." A recent investigation found that it is possible to synthesize across different traditions, and indeed some review teams consider combining data from multiple theoretical and methodological traditions to be a strength.

Many SLRs focus on the evidence of effectiveness using quantitative research studies. However, SLRs of qualitative studies are becoming more common, although the synthesis of qualitative data is challenging (Tranfield et al., 2003).

To achieve EBIS, SLRs on IS topics are required. However, so far relatively few SLRs have been conducted in the IS disciplines (Oates, 2011). In software engineering, more SLRs have been conducted, e.g., by 2011 there were around 150 (da Silva, 2011; Kitchenham et al., 2009, 2010). There

are a number of challenges related to conducting SLRs in IS. Firstly, SLRs are only as good as the research they cover. Is there sufficient empirical IS research into real-world problems? Secondly, some SLRs that have been conducted in IS can be criticized for lacking rigor—in particular, the lack of a comprehensive search—relying instead on a few key IS journals, which leads to bias. In fact, researchers have recently expressed caution in the claimed use of SLRs in IS (Boell & Cecez-Kecmanovic, 2015; Oates, 2014). Thirdly, much IS research is qualitative and idiographic, exploring multiple facets of the use of an IS method, tool, or system (Oates, 2011). Where medical practitioners need to know if a particular clinical treatment "works," IS researchers and practitioners need to understand and synthesize the evidence—which can apparently show that an IS-related change is perceived as successful in one organization, unsuccessful in another, and "a bit of both" in a third. Empirical IS research findings are often multifaceted, contextually situated, and more complex than the assessment of the effectiveness of a single medical treatment across a given population. For example, the headline findings from the AC^{+}erm project (McLeod, Childs, & Hardiman, 2011) noted that: the people, process, and systems/technology aspects of electronic records management (ERM) are inextricably linked; people issues are predominant, fundamental, and challenging; tactics and solutions for electronic records management are contextualized and complex; the success and/or failure of ERM implementations can be contingent on the presence/absence of small or accidental factors. Therefore, development and use of appropriate methods to analyze and synthesize such research is needed (Centre for Reviews and Dissemination (2009b); Oates, 2011; Oates et al., 2012; Pawson, 2006).

An SLR of SLRs in IS would be useful to establish a baseline and to identify and evaluate the approaches used and the rigor of the SLRs (Schultz, 2014). However, it is not always easy to identify IS SLRs, as they may have been described with different terminology, e.g., as a structured literature review or a survey. Additionally, many SLRs will have been produced by researchers from other disciplines looking at information systems and technology in their particular context—e.g., health-related IT. A culture change in IS will also be required in order to recognize SLRs as major scientific contributions and to allocate the resources needed to conduct them. SLRs are recognized in the health field as one of the highest forms of methodology in levels of evidence, e.g., http://www.cebm.net/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/.
However, in other disciplines SLRs are considered as no better than normal expert-driven and narrative-based literature reviews (Morrell et al., 2015) and there is a need to promote their development, acceptance and usage (Tranfield et al., 2003).

7.3 Develop a Web-Based Knowledge Base

One key characteristic of EBP is disseminating the evidence to all stakeholders in a form suitable for the target audience. For EBIS, stakeholders would include IS academics, IS students, IS practitioners, managers and system end-users. The health field demonstrates the kind of evidence products that could be considered for EBIS:

- Databases of SLRS, e.g., Cochrane Library http://www.thecochranelibrary.com/view/0/index.html; Centre for Reviews and Dissemination, University of York http://www.crd.york.ac.uk/CRDWeb/.
- Clinical guidelines, developed by expert panels with use of evidence sources such as SLRs, e.g., NICE (National Institute for Health and Clinical Excellence) http://www.nice.org.uk/.
- NICE also disseminates information about new evidence—e.g., "Evidence Updates" https://www.evidence.nhs.uk/about-evidence-services/bulletins-and-alerts/evidence-updates—a summary of selected new evidence relevant to a specific NICE clinical guideline. An individual on request can receive automatic notification of new updates—e.g., "Eyes on Evidence" https://www.evidence.nhs.uk/about-evidence-services/bulletins-and-alerts/eyes-on-evidence—covering interesting new evidence.
- Evidence summaries, e.g., "Behind the Headlines" http://www.nhs.uk/news/Pages/NewsIndex.aspx, produced by NHS Choices, which provides an unbiased, evidence-based analysis of health stories in the news; e.g., "Effectiveness Matters" http://www.york.ac.uk/inst/crd/effectiveness_matters.htm, produced by the Centre for Reviews and Dissemination. These summaries of reliable research evidence about important interventions are aimed at practitioners and decision makers.
- Clinical question and answer services, e.g., the Trip clinical search engine http://www.tripdatabase.com/, using evidence sources including SLRs and clinical guidelines.
- Online health information sites—e.g., Patient.co.uk http://www.patient.co.uk/—which draws on evidence resources such as SLRs and clinical guidelines that are repackaged by health practitioners for patients.

All these resources are available to practitioners, patients and their caretakers, as well as to members of the public.

To determine what needs to be done in disseminating the evidence base for information systems, we need to be clear about who needs to interact with whom, and why, and the kinds of research that interested parties may use or produce. Three main groups of stakeholders can be readily identified: IS researchers, practitioners, and students. These groups can be subdivided further. Researchers include those interested in systems in practice, as well as those focusing on the technical aspects of ICT. Practitioners encompass IS professionals or, more generally, those acting as decision- and policy-makers, as well as users of IT-based systems. Students—i.e., university-level students—can be subdivided into undergraduate, graduate, and postgraduate research students.

The reasons why these different stakeholders would be interested in interacting with one another should be self-evident. Researchers see the importance of their work having an impact on practice, and also wish to learn from practice. Practitioners benefit from using research findings and knowledge to influence their decisions, which should inform researchers of their needs and contextual understanding. Additionally, researchers should conduct research on systems implementation and use within their own organizations and publish their personal experiences, case examples, and analytical case reviews (Rousseau, 2006). Students comprise the researchers and practitioners of the future, and therefore benefit from "standing on the shoulders of giants" but also benefit from having the opportunity to develop the skills needed to use an evidence-based approach in their own studies and as reflective practitioners in their working lives. Table 1 provides an overview of the main communication mechanisms for these groups (although many more exist).

Table 1. Examples of Inter-Stakeholder Communications

From \ To	Researchers	Practitioners/Users	Students
Researchers provide:	• Rigorous research articles • Debate/discussion	• Focused materials for practical use	• Research resources • Skills to develop EBP
Practitioners/Users provide:	• Contextualized cases. • Information needs.	• Contextualized cases. • Lessons learned.	• Contextualized cases. • Lessons learned.
Students provide:	• Student research papers	• Internships • Project outcomes	• Peer support • Lessons learned

Currently there is a "shotgun" approach to disseminating evidence-based information among these stakeholders. Knowledge about contextualized successful (or failed) IS interventions exists in many places: research papers, government committee reports, newspaper articles, blogs, public seminars, and more (see Appendix A). This mitigates against an EBP strategy, as those seeking to acquire information must forage extensively. In contrast, the medical and health professions have established repositories to host and disseminate findings to the stakeholders in their communities (see above), e.g., via the Cochrane Collaboration (www.cochrane.org). These online repositories are supported through social media and act as hubs for knowledge dissemination. In a similar way, therefore, the authors have started to pilot the *Evidence Based Information Systems* journal www.ebisjournal.org and its associated blog. The journal provides an open-access repository for a range of resources, including case study papers, SLRs, data papers, industrial experience reports, and student empirical studies. The blog allows findings to be highlighted and discussions to develop. Since the journal and blog are still in early development, it will take some time to determine whether they effectively support our EBIS agenda and provide a useful and accessible knowledge base.

7.4 Transfer Knowledge to Practitioners and Other Stakeholders

For evidence-based information systems to have substance and sustainability they must be treated as a cyclical knowledge transfer process. A useful model for conceptualizing this is that of Liyanage, Elhag, Ballal, and Li. (2009). In their model (see Figure 1), knowledge is transferred between a source (with knowledge and a willingness to share) and a receiver (with an absorptive capacity and a willingness to acquire): the loop is closed by the receiver, who then processes the knowledge, adding to it and feeding back to the source. This model builds upon Deutsch's (1952) theory of communication and Holden and von Kortzfleisch's (2004) theory of translation, both cited in Liyanage et al. (2009).

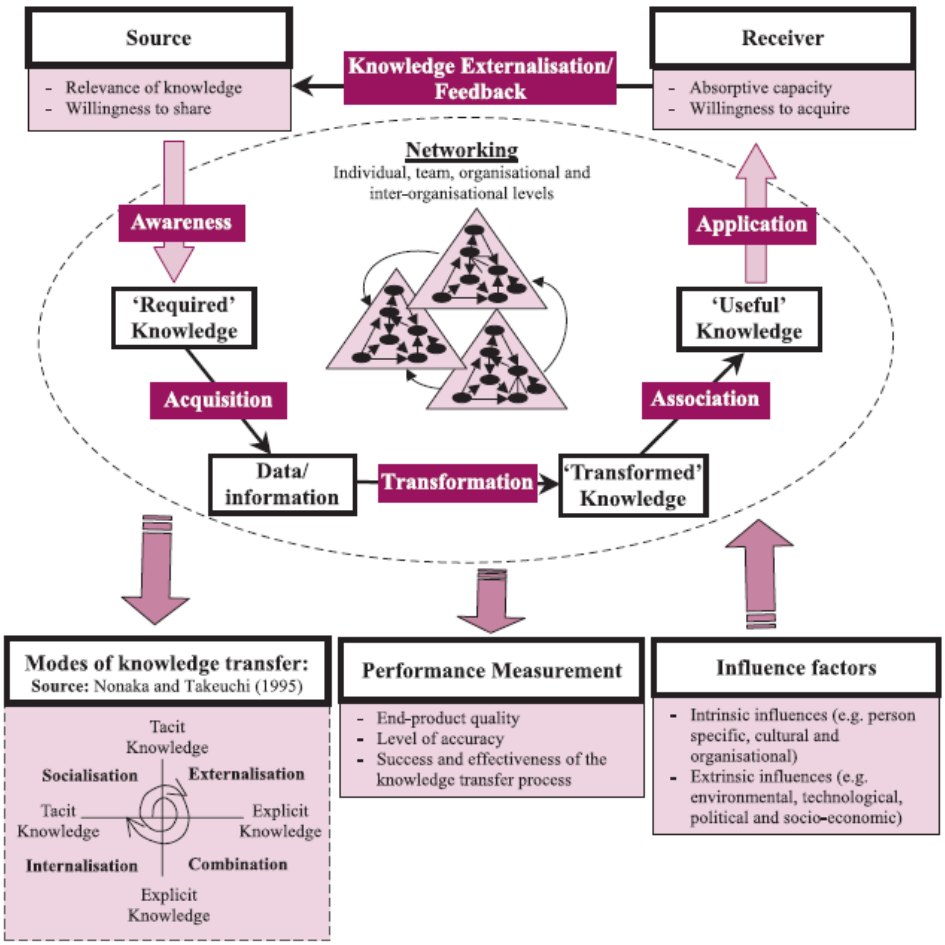

Figure 1. Knowledge-Transfer Process Model from (Liyange et al., 2009)

Considering the steps of this model it could be posited that too often academic research only feeds into the *knowledge awareness and acquisition* steps through research activity, resulting in traditional journal papers. However, to develop evidence-based practice, it is clear the *knowledge transformation and association* steps are both fundamental and key. It is these steps that take the original information and translate it into a useable form, which enables a receiver to associate it with his or her needs and apply it (*knowledge application*) to professional practice. An EBIS example would be to take a set of papers about the security implications of m-commerce in SMEs (knowledge awareness and acquisition) and translate them via a systematic literature review into a set of contextualized highlights (knowledge transformation and association). These could then feed into the decision-making process of an SME considering a move to m-commerce (knowledge application). Similarly, the *knowledge externalization* step enables the development of an evidence-based community of practice through feedback evidence from practice to inform the researcher community. An EBIS example would be an SME working through an m-commerce roll-out and using a case example to feed back to the community the security implications and strategies adopted by them. Such a case example would be of direct benefit, as it stands, to others in practice but also to researchers as additional evidence feeding into the corpus of knowledge (for instance for inclusion in an updated SLR). The *Evidence Based Information Systems* (*EBIS*) open-access journal and blog which is being piloted could provide a repository for housing all such materials: research papers, SLRs, and case examples, among others.

7.5 Develop a Practitioner Research Culture

Research needs to be undertaken by practitioners themselves. They are aware of the problems that need to be researched and their knowledge of the practice context is crucial in informing analysis and interpretation of research findings. There are number of stages in the development of a practitioner research culture. A first step is that of the reflective practitioner, who thinks carefully and analytically about their practice in a continuous process, with the

aim of learning and improving. A further step is a practitioner being a research collaborator in a participatory research project, which may then be followed by becoming more fully involved as a co-researcher. In participatory research (ICPHR, 2013) the aim is to hand power from the researcher to the research participant, giving control of the research question and the research process to the research participant, and analyzing and reflecting on the research findings. Finally, a fully fledged practitioner researcher initiates and carries out their own research, with the aim of solving problems, enhancing practice, and informing other practitioners. Practitioner research requires reflective practice, thus closing the circle.

7.6 Incorporate EBP in the IS Curriculum

Students, practitioners and researchers need to be educated about EBP. IS educators must include research methods, SLRs, and EBP in the curricula studied by our future managers, systems developers, and policy-makers, so that they can incorporate empirical evidence in their decision-making, and so that they can routinely collect data about their own IS projects and systems, which can then be added to the discipline's knowledge base. Teaching students how to carry out a systematic, traceable, and repeatable literature search, a key component of SLRs, also offers teachers the added benefit of increased insight into their students' current literature searching skills (Oates & Capper, 2009). Additionally, the teaching approach of problem solving and critical appraisal used in the medical field, or more recently in management postgraduate and MBA education (Rousseau, 2006), could be adopted and adapted for the IS disciplines.

Practitioners need access to an SLR repository complete with an appreciation of its benefits and training in how to combine guidelines from SLRs with experience and circumstance to act effectively. As noted earlier, practitioners will also need to be educated about how to critically appraise a research paper. IS Researchers require greater training in meta-analysis and thematic synthesis—including methods for synthesizing qualitative, interpretive research studies—so that the findings from high-quality individual research projects can be combined into useful models and guidance for practice. Currently research methods are not included in the "IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in IS" (Topi et al., 2010) other than in the discussion of the elective course "Introduction to Human-Computer Interaction," which includes evaluation methods. EBP is not mentioned in these guidelines at all. Similarly, the "MSIS 2006: Curriculum Guidelines for Graduate Information Systems Programs" (Gorgone, Gray, Stohr, Valacich, & Wigand, 2006) mention research methods only in one terms of one course, "Emerging Technologies" (where designing and implementing a research study is one suggested pedagogical approach), and EBP is not mentioned at all. Education curricula and industry standards should also reflect the evidence from SLRs, and address how to apply SLR guidance in practice.

7.7 Establish Evangelists for EBP

There needs to be a community of IS researchers who share similar ideals for the development of an evidence-based culture and want to explore and promote the possibility of EBP in IS.

There have been previous calls for EBP in IS. Atkins and Louw (2000) identify the need to develop a EBP framework and a publicly accessible, Cochrane-type database infrastructure, alongside an EBP culture, in order to provide EBP studies and SLRs. Baskerville & Myers (2009) argue for a reevaluation of evidence-based practice in management and for better practitioner education, in order to interpret theoretically and empirically rich IS research. Moody (2000; 2003) focuses on the internet as a medium for knowledge management, transfer, and dissemination where researchers and practitioners can interact to jointly develop evidence-based practice in IS. Oates et al. (2012) review the state and status of EBP in IS and develop and illustrate a pragmatic model-based approach for SLRs for qualitative research, based both on empirical research to develop an initial model and then the published literature used to refine it. Finally, Wastell (2011) strongly argues for the development of more informed evidence-based approaches to IS strategy, adoption, and implementation in government and the public sector, illustrating his case with pertinent examples of a significant IS failure and its lost potential to protect vulnerable children in society.

More empirical studies are needed to build up a Cochrane-style database, and more commentary articles are needed to further our understanding and knowledge of how to adopt, adapt, and develop evidence-based approaches to IS research and practice. Alongside these we need strong leadership and evangelists who will promote and proselytize EBP ideals and its development within the IS movement.

7.8 Conduct Research into EBP

Research is needed in all of the areas outlined above—e.g., methods for synthesizing previous research in IS, which has a plurality of research methods and philosophical paradigms; effective dissemination approaches to help translate research findings into practice; and critical evaluations into the use of EBP in IS to understand the process, benefits,

and limitations, and to counter any unfounded claims of EBP promoters and evangelists. Additionally, the issue of diagnostic evidence, i.e., identifying what the problem facing the practitioner really is, needs more emphasis and exploration.

In addition, the practice aspect of EBIS needs to be considered more explicitly. It is tempting, as academics, to keep the lens focused on what researchers study and publish, but for EBP, *practice* is key. There is a requirement to engage with and work with practitioners to learn from practice, and to synthesize findings from practice. It is noticeable that the discussion of systematic reviews and EBP in our sister discipline, software engineering (SE), seems to keep the lens firmly focused on research and researchers (Zhang & Babar, 2013; Kitchenham & Brereton, 2013), with the implication that practitioners will somehow find and benefit from their work (e.g., Zhang & Babar, 2013). Where is the research that evaluates the impact that the (synthesized) findings of SE research have had in practice, and identifies how this knowledge translation has been effected and effective? Without explicit investigations into these aspects of EBP the transfer of knowledge discussed in section 7.4 is unlikely to become a reality.

Research into the broader concern of effective bidirectional knowledge translation in information systems is essentially virgin territory. This contrasts with other disciplines, such as health, where large-scale initiatives have been created to support this, including the Centre for Translational Research in Public Health (http://www.fuse.ac.uk/) in northeast England which aims to:

> *explore what translational activities work under what conditions; develop methods to explore these issues; inform theory; and work with policy and practice partner . . . to facilitate evidence-informed practice and policy, and practice and policy informed research agendas.*

Our own multiuniversity research group for EBP currently has the following agenda: (1) setting up the open-access, peer-reviewed *EBIS* journal which publishes EBP-oriented articles and also provides a vehicle to research open access publishing and will constitute a research impact case study; (2) creating an EBP culture, through establishing research networks; (3) investigating the resources currently used by IS practitioners to inform their decision-making; (4) developing a model-driven approach for the analysis and synthesis of qualitative research within SLRs and using this to conduct a range of SLRs.

7.9 Build an EBP Community

As discussed in earlier sections, researchers and professional bodies in health/medicine, public policy, crime, justice and social welfare, and software engineering have developed different models for developing communities of evidence-based practice; with the most mature and successful by far being the Cochrane Collaboration in medicine. The growing academic debate over evidence-based management and, by close association, evidence-based information systems, necessitates the requirement to initiate a corresponding community of practice in IS. This needs to be an equal endeavor between IS academic researchers and IS/IT practitioners and policy-makers. Our paper proselytizes the development of a movement towards EBP in IS but recognizes that these are early days, and there are still many concerns, doubts, and criticisms over the efficacy of such an approach. It is difficult to change the status quo when the IS academic research community thrives on the existing system in terms of both short- and long-term career development, reinforced by university and national assessments that place emphasis on citation numbers and impact ratings/factors for individual publication outputs. The last U.K. Research Excellence Framework (REF) conducted in 2014 (REF2014; www.ref.ac.uk) and the planned REF2021 exercise are prime examples of this.

Formal organizations such as the Association of Information Systems (www.aisnet.org) and its national chapters, and in the U.K. the Academy for Information Systems (www.ukais.org.uk), could help with the promotion and dissemination of EBP. Since 2012, the Academy for Information Systems has started to promote EBP, firstly with panel sessions at its annual conferences, and closely followed with support for the *EBIS* journal. Leading conferences in information systems (ICIS, ECIS), computing (ACM, IEEE), and management (AOM, EURAM) can be used to disseminate and promote good practice and innovative methods for developing EBP in the IS discipline. For example, EBP was included in the call for papers for the "Research Methods and Philosophical Foundations of IS" track at International Conference for Information Systems in 2015. Similarly, professional associations such as the ACM, IEEE, and the British Computer Society can also promote access to EBP-oriented research contributions and support EBP in the larger practitioner communities.

The key issue is to make the evidence easily available, open access if possible and, most importantly, to make the main messages understandable, relevant, and intelligible to practitioners on the front line as well as policy-makers up to government level. This may require a paradigmatic shift away from increasing the philosophical "weight" of research papers aimed

inwardly and self-referentially at the burgeoning international academic research "industry" towards research communities that are able to demonstrate impact and relevance for the economy and society. This will entail moving back towards the original intended purpose of the IS discipline and towards a much greater emphasis on the coproduction of knowledge and evidence between researchers and practitioners.

8 EBP Challenges Facing the IS Community

The road map we have provided is not without its challenges. As with any journey, a map is useful but the reality depends upon the terrain being traversed. In this section we focus on some of the greatest challenges in the IS environment for EBIS.

8.1 The Gap Between IS Research and IS Practitioners/Users

Over the last decade, the rigor versus relevance debate for IS research has always been a contentious and often controversial subject. Initiatives such as introducing additional assessment criteria for research impact (both economic and societal) have been adopted for the U.K. 2014 and 2021 national research assessment exercises. It is well recognized, therefore, that a problem exists over a potentially ever-widening gap between IS researchers and IS practitioners/users. This is where academic researchers have a focus on developing more sophisticated research approaches, methods and the development of novel concepts and theories, which contrasts with IS practitioners/users who are more interested in bottom-line results, quick wins and simple/structured solutions to complex problems. Also, the pressures of academic publication, with associated incentives and reward structures, often encourage researchers to focus more on "starred" publication rather than become involved in enterprise and consultancy work and regular engagement with practice.

8.2 Learning From Others in Establishing the Road Map

A useful analogy can be made with other applied subject disciplines and institutions such as medicine and medical schools. In medicine, a practitioner and professional culture, underpinned by research, is more the dominant focus. Research and education therefore directly supports professional practice and does not become an end in itself. The characteristics of the medical profession also demonstrate a predisposition to adopting an evidence-based approach—though, even here, EBM took a long while to be established, and is still not implemented fully by all clinicians and managers. This provides an exemplar from which many lessons applicable to IS researchers and practitioners can therefore be learned by looking at the evolution of medical teaching and education, the embeddedness of applied research, and the development of a professional culture.

8.2.1 Education

Doctors require a high educational attainment, undergo a long training, and legally require regular continuing professional development (CPD). Medicine is predominately a science-based discipline: a lot of scientific topics are covered in basic medical education and there is still a strong scientific/quantitative bias in medical research. However, increasingly, qualitative and mixed studies are valued, as medical practice does not take place in a clinical vacuum. CPD is equally applicable to EBIS, where researchers could update and validate knowledge and skills related to current IS practice. Knowledge, skills, and techniques related to designing business intelligence and analytics solutions would be an example.

8.2.2 Practice-Research Partnerships

There are strong, long-existing partnerships between universities and hospitals, particularly teaching-based hospitals and medical schools, with joint appointments of staff between universities/hospitals. There is a strong public-body interest and commercial interest in research, with a push from patients/patient groups dealing with serious/rare diseases to trigger research, and to increase knowledge/understanding of these conditions in both health practitioners and the public. All these groups have an interest in the results of research being published and placed in the public domain. The secondment of IS academic staff to industry, or public sector organizations, should be more strongly encouraged, especially where the demonstration of research impact is becoming more important.

8.2.3 Publications and Their Use

Medical literature focuses on peer-reviewed journal articles, with a long tradition of high quality journals and well-resourced, high-quality databases. Doctors have access to well-resourced libraries provided by hospitals and their professional bodies, as well as universities. There are numerous professional bodies/learned societies in the medical field with high academic standings, and doctors are strongly encouraged to belong to one or more. Many journals published by these bodies/societies are of high academic standing, e.g., the *BMJ* (*British Medical Journal*) and the *Lancet*. IS practitioners could be made more aware of open-access, free-to-download journal publications, especially those that may be relevant to their practice. An evidence-based resource

might help develop the same culture for knowledge acquisition as currently exists in the medical field.

8.2.4 Accountability

Culturally, as doctors are dealing with potentially life-and-death situations, and always with people's health and well-being, there is a risk-adverse approach and a strong desire to do the right and not the wrong thing. Professionally, ethically, and legally, doctors are accountable for their actions and the outcomes of those actions. As we move into the era of artificial intelligence and machine learning, where IT systems are more mission critical, similar rules for accountability and governance will apply. The evidence base will then become increasingly important.

8.3 The Complexity of IS in Practice

Information systems in practice fits the definition of a "wicked problem." Rittel and Webber (1973) first articulated this and identified its 10 characteristics as:

- lack of a definitive formulation of the problem
- no criteria for knowing when the/a solution has been found
- solutions that are not true or false, but rather good or bad
- no immediate or ultimate test of a solution
- every solution counts, and has significant consequences
- no criteria for proving that all solutions have been identified and considered
- an essentially unique problem
- a symptom of another problem
- no criteria for determining the "correct" explanation of the problem
- leaders/managers have no right to be wrong.

McLeod and Childs (2013) discuss this issue in the context of electronic records management (ERM), a specific domain within information systems. To deal with this ERM challenge, McLeod and Childs (2013) suggested the use of the Cynefin framework (Snowden, 2010), which is a "sensemaking" framework to analyze business problems and situations and to identify the appropriate course of action, i.e., diagnose the problem (Kurtz & Snowden, 2003). Cynefin comprises five domains which cover the types of situations that organizations encounter and ways of managing them. Figure 2 summarizes this.

		Domain			
		Simple	**Complicated**	**Complex**	**Chaos**
Characteristics	Order	stable, repeatable	stable, discoverable	fluid, unpredictable	Un-ordered, turbulent
	Cause/Effect	Evident to everyone	Not evident to everyone	Only seen in retrospect	Not seen
	Answer	Only one right	More than one right	May exist but unknown	No right answer
	Domain	Efficiency	Experts	Emergent patterns: perceived, not predicted	Rapid response
Decision model	Elements	Known knowns	Known unknowns	Unknown knowns	Unknown unknowns
	Approach	Sense ➔ Categorise ➔ Respond	Sense ➔ Analyse ➔ Respond	Probe ➔ Sense ➔ Respond	Act ➔ Sense ➔ Respond
Resultant actions		Best practice	Good practice	Emergent practice	Novel practice
Techniques		Standard operating procedures, Process re-engineering	Scenario planning, Business intelligence, Systems thinking	Complex adaptive systems thinking	Crisis management
Management style		Hierarchical - directive	Oligarchic - consensual	Information - consensus	Decisive - directive
Work pattern		Co-ordination	Co-operation	Collaboration	Compliance
Connections / networks in the organization	Managers and workers	Strong	Strong	Weak	Weak/none
	Among workers	Weak	Strong	Strong	Weak/none

Note: The fifth domain is disorder, where it is unclear which of the four other domains apply. The disorder domain is managed by breaking down and examining the individual parts of the problem. If this is possible, and helps to reduce the complexity, the component parts may then be allocated to another appropriate domain.

Figure 2. Summary explanation of the four Cynefin domains: simple, complicated, complex, chaos. McLeod & Childs (2013) with permission of the authors.

Though ERM as a whole constitutes a wicked problem, some aspects are simple or complicated, while others are complex or chaotic; it is crucial when dealing with a problem to know which domain it falls under. Childs & McLeod (2013) looked at the ERM challenge dealing with and diagnosing a problem via Cynefin using data from the AC^{+}erm project. This data comprised ERM issues and solutions (to try and to avoid). These were obtained from an SLR and from empirical research (through Delphi studies and colloquia) with practitioners and other experts. An ERM framework was developed using the Cynefin model with the aim that it could be used in practice in different organizational contexts to identify the domain of the problem to be dealt with, and provide

examples of possible solutions. It is an approach that should have merit more widely for EBIS.

The importance of diagnosing the correct research problem is also illustrated by a second brief example investigating the sociopolitical problems associated with the design and implementation of role-based access control (RBAC) systems in hospitals. If these systems are perceived solely as technical artifacts with research that focuses mainly on their engineering, technical, and informational capabilities (cynefin simple domain), many more complex issues concerning the role of organizational issues, professional cultural biases, hierarchical politics, and power may be underestimated or missed (cynefin complicated leading to complex domains). The use of a "soft operations research (OR)" multimethodology including problem structuring and diagnostic methods (Mingers & Brocklesby, 1997), illustrates the importance of using problem-driven clinical inquiry (Schein, 1995) to incorporate the views of practitioners in complex technology adoption cases. Small & Wainwright (2018) use a tailored (OR) multimethodology that combines both hard technology management methods alongside soft problem diagnostic methods to illustrate the importance of problem definition and effective diagnosis through a case study based on the acquisition and adoption of a role-based access control system (RBAC) system in 3 U.K.-based large acute hospital trusts. The original RBAC project (considered essential for the development, deployment, management, and use of hospital electronic health record systems) was originally misdiagnosed purely in terms of technical issues and the appropriation of an effectively engineered solution, managed by a classic project management method (Prince2). A research based consultancy intervention was requested by hospital senior management, and through the use of a problem focused multimethodology, tailored using soft systems methodology, and process modeling, the important sociopolitical problems and organizational issues were identified as being the core issue to be addressed, necessitating a project pause and rethink in terms of the final RBAC solution adopted. The rescoped project then focused on issues associated with departmental ownership of systems, information governance, security and privacy issues—and how this would impact on the appropriate choice of user-based authentication technologies.

Therefore, in terms of evidence-based practice, careful consideration must first be paid to diagnosing, classifying, and structuring the correct information systems adoption problem. Only once this is more clearly defined and understood, can an evidence base be compiled providing the correct foundation for future cumulative research.

8.4 The Creation and Use of Contextually Relevant Empirical Data

For EBP in IS there is a significant challenge in ensuring that high-quality trustworthy data are created and used both by practitioners and researchers. Figure 3 summarizes the required relationship showing not only that it is vital to consider how robust IS research informs and feeds forward into practice, but, equally, that IS practice must feedback into research to inform and refine the research process. Primary studies are required that demonstrate robust methodologies; reliable, verifiable, evidence; and effectual data analysis (including recorded limitations). This is not a radical idea, but examination of standard IS literature reveals many published articles that lack at least one of these aspects. This renders such studies problematic when seeking to abstract impactful findings either for stand-alone purposes or as inputs into systematic reviews. Systematic reviews are only as effective as their input data allows them to be, however well-conducted they are methodologically. However, even an SLR that provides little in terms of practical findings can be useful in identifying the need for better primary studies. The practice community can benefit from well-conducted studies; moreover, they can also identify situations that are worth investigation, and evidence that can be fed into primary research (whether by practitioner-researchers or by conventional researchers). There is a need for IS academics to focus more on real-world IS development, management, and usage problems (clinical inquiries determined by practitioners/client's needs as opposed to being purely data- and theoretically driven), and hence the need for more engaged scholarship and clinical research that includes diagnosing problems as well as identifying cures (Schein, 1995).

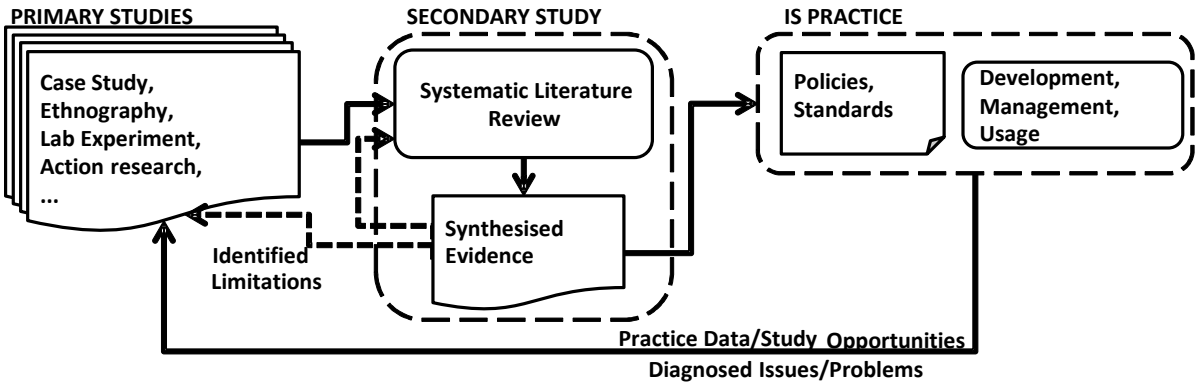

Figure 3. The Relationship Between Evidence for Research and Practice in IS EBP

8.5 Extending the Publication Model

In EBM all stakeholders have an interest in the results of research being published and placed in the public domain. As a result, medical and health fields have a vast resource of accessible and synthesized findings, as well as standard research publications: the varied publication types are equally valued and expected to be provided by researchers in the field. This is not the case in the IS field. In the U.K. the REF assessment constrains publication, due to implied emphasis on established journal rankings, impact ratings, and citation factors. Journal rankings, such as those provided by the U.K. Association of Business Schools journal ranking list, can be a hegemonic force in terms of shaping both researcher and academic management behaviors—heavily impacting recruitment, promotion, and research allowance decisions. The low impact status given to open-access online journals only adds to this culture, wherein established publishers now assess significant charges for what is termed "gold open access." This "gold open access" is seen as a mechanism for maintaining standards (separating the wheat from the chaff) in a world where open access to publications is becoming a requirement in certain areas: such as for consideration of work in the U.K.'s REF 2021 assessment. However, in reality this route is a discriminatory practice, as such payments are only affordable to the richest few in the academic world. Therefore, there is a fundamental challenge ahead of us in changing editorial agendas and persuading the IS community of the value of creating and using a wide range of outputs and providing them as a free resource to the user. To support this, end guidelines are needed on what to publish where and how (which we have attempted in the *Evidence Based Information Systems* journal). Despite the challenges, we are fortunate that we can work towards this by learning from others, such as: the Cochrane Collaboration (www.cochrane.org), The Campbell Collaboration (www.campbellcollaboration.org), and the Alliance for Useful Evidence (www.alliance4usefulevidence.org). Moreover, we have the opportunity to harness internet resources effectively in a manner that was not available to the early pioneers of EBP.

9 Conclusion

A robust economy and a more fair, balanced and equal society is now inextricably linked with the effective use of information technology in all its guises. We cannot afford to waste the accumulated evidence of 50+ years of information systems research, nor to be accused of complicity in the proliferation of failed ICT implementations. We contend that EBP in IS offers the prospect of decision-making, which takes account of previous lessons and experiences, rather than simply repeating the mistakes, biases, and assumptions of the past. We hope our explanation of EBP and survey of the terrain and road map for action will enable the IS research and practitioner communities to engage with each other in the quest to develop higher standards of professional practice based on cumulative knowledge, facts, and evidence.

It is worth revisiting one explanation of EBP from the mature field of evidence-based practice in medicine, which defines it as an approach to decision-making where the practitioner uses the best evidence available, in consultation with the client (patient), to decide upon the best option. The key message to note is that the practitioner consults with, is aware of, and is able to translate the available research evidence into everyday practice for the benefit of the recipient(s). This is not yet the case in IS research or practice. Much work needs to be undertaken to convince practitioners of the efficacy of adopting IS management and development methods, techniques, models, strategies, and sociotechnical practices. Similarly, much work also needs to be undertaken by the IS research community to engage practitioners in the coproduction of this evidence base and to ensure that their research work, which includes theories,

findings, and data, is openly accessible, shareable, accountable, and intelligible to practitioner audiences.

As the number of systematic reviews, and in particular SLRs, increases, practitioners could increasingly base their decisions on the available evidence, combined with their knowledge of their own particular context. Reports by researchers for researchers should also be mediated via readable summaries of systematic reviews into an accessible format for practitioners, which will bring research and practice much closer together. Ultimately, the distinction between IS academic researchers and practitioners may become less relevant, as the IS discipline moves towards an applied professional practice model, such as can be seen in medicine, especially where medical research centers are colocated and intrinsically linked with medical schools and hospitals.

We believe that the arguments summarized in this paper are strong, and the ICT problems and opportunities for our economies and societies, especially from 2017 which has been popularly labelled the "post-truth era," are significant. IS practice needs to improve and enable us to harness the full benefits of revolutionary technological developments. IS research therefore needs to change as well, to support and develop new practice, and this can only be achieved by firstly appreciating the need for change within the IS discipline itself. This represents a significant challenge, but the potential alternative is greater irrelevance and eventually an even greater schism between research and practice. IS academics must ask themselves who they serve: their own career self-interest? the academic publishing industry? university league tables? or the development of a less wasteful economy and a better society? We argue that the EBP paradigm in IS will enhance the future of the discipline, and perhaps represent the biggest challenge, but the most rewarding, in its brief history.

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Appendix A

Table A1. An Illustration of Some Key Findings from the U.K. NHS NPfIT Electronic Patient (Health) Record (EPR and EHR) Project: Comparison of IS-related Academic Research, Medical Research Practitioner Publications and Official Government NHS Reports

Key Findings: IS related Academic Publications	Key Findings: Medical Practitioner Targeted Reports	Key Findings: Government Reports (NHS)
Journal of Information Technology (Currie, 2012a) and **Health Policy and Technology** (Currie, 2012b) • Clinicians attempt to regain professional dominance in climate of continuous restructuring of health services policy and political initiatives to adopt EHRs. • Resistance to change by key stakeholders. • Use of institutional theory/logics (isomorphic conditions related to coercive, mimetic, and normative forces) to explain power and structural change/resistance. • Professional dominance shifting towards management practice (balanced scorecard, lean, knowledge management). • Need to focus on healthcare field and adopt EBP as opposed to concentration on single health organizations. • Patients socialized to be passive actors and not consulted in changes. **University College London**: Independent academic report of Summary Care Record, (Greenhalgh et al., 2010) • The achievement of stated anticipated benefits comprising: better, safer, more efficient, and, more equitable care with reductions in accident and emergency admissions has yet to be directly evidenced. • No evidence of increased patient empowerment. • Low uptake of electronic health records, with concerns over privacy, security, and data sharing. • Lack of clarity and vision from major stakeholders. • Competing policy directives. • Low maturity levels of technology and business processes. • Unanticipated administrative workload increases • Rapid progress for adoption and	**British Computer Society** (Eason et al., 2012) • Sharing information between stakeholders and agencies is problematic. • Success comes through full stakeholder involvement and sociotechnical systems development. • There can be no one "single" system. National systems are too inflexible. • EHRs need tailoring to care pathways, professional role,s and levels. • There needs to be more collaboration between informatics and front line clinical staff. • More attention should be paid to micro, meso- and macrolevels of systems design. • A "middle out" systems-development approach is needed with emphasis on organizational change. **BMJ** (Adams et al., 2004) • Many issues centered on coding issues (inconsistency), data quality, and availability of analytical skills. • Issues need addressing nationally and locally. • Live clinical systems are dynamic—causing problems for software development, upgrades, staff training. • More investment in clinical leadership required. • Different levels of access for stakeholders is a problem. **BMJ Open** (Job et al., 2013) • Evidence for reduction in costs is sparse • Main obstacles to implementation are: security, privacy of patient data, lack of training, costs, and time lost for implementation. **BMJ Open** (Robertson et al., 2010)	**UK National Audit Office** (May 2011) • £11.4 billion program for the way the NHS in England uses information launched in 2002, with £6.4 billion actual expenditure by 2011. • £2 billion expenditure on Broadband infrastructure and X-Ray systems seen as successful. • Fully integrated electronic care records systems (EPR/EHR) are central to the program but have not met with same success. • Targets for fully integrated records systems not met. • Delayed/cancelled due to technical software development and major contractual issues. • Fewer systems now to be delivered. • New problems over interoperability due to shift from national to localization strategies resulting in fragmentation. • Little transparency over costs from suppliers, trusts and the Department of Health. • Confusion over expected levels and definitions of functionality of systems. • Obscure and confused metrics for assessment of benefits and successful delivery of sytems. • Concludes expenditure to date does not represent value for money and remaining planned expenditure will not be any different in terms of outcomes. **U.K. House of Commons Library** (Parkin, 2016) • New targets now set due to collapse of the NPfIT program. U.K. Government committed to making all patient and care records digital, real-time, and interoperable by 2020. • All patients to have access to their own records by 2016. • 2020—an NHS that is "paper-free

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implementation is associated with sociotechnical approaches and good practice. • The EHR/EPR landscape is a complex and dynamic sociotechnical network spanning the different worlds: political, clinical, technical, commercial, and academic with different institutional logics. **Journal of Information Technology**, Randall (2007). • An academic computer scientists view of the NPfIT program including the HER/EPR projects – as part of an entire special issue for JIT. • Large scale centralization is problematic as it increases the risks for large scale delivery and operational failure. • Threats to security and privacy of data not given enough consideration. • Smaller scale (localized not national) program for EPR implementation would increase success. • There should be more emphasis on evolutionary design and development methods and approaches in such complex and dynamic systems. • Control should be given to local stakeholders and not large-scale bureaucracies (government departments). • More attention needs to be paid to academic research and, in particular, the adoption of sociotechnical principles for design, development and implementation.	• Slow implementation, less functionality than planned. • Over ambitious expectations, underestimate of development time and volume of training for end users. • Rapidly changing NHS policy and priorities. • Different stages of systems maturity. • Complex multilayered organizational communication, silos and lack of teamwork. • Complex commercial contractual structures were extremely problematic to navigate. • No full economic analysis undertaken. • Limited discernible benefits for clinicians or patients. • Usability problems and loss of professional identities. • Move from top down strategy to localized planning. • No common vision or purpose varying between data, business and policy centric. **Computer Weekly** (Maughan, 2010) • Six reasons why the NPfIT program failed: motives (top down politically driven); lack of buy-in from stakeholders; rushed and naive procurement of large scale systems; poor contract management; multisourced contracts and commercial sensitivities; lack of accountability.	at the point of care" • 2016—55 million people have a summary care record created for them. • "Datacentric" view for a complete "care data" service to create large national database for patient health care and demographic information for strategic planning and commissioning of services. **UK Houses of Parliament Parliamentary Office of Science and Technology** (2016) • Benefits for real-time and interoperable care records are predicted to include improved: patient care, patient involvement in their own health, improved use of data for research and planning, wide access for all healthcare professionals when needed. • Estimated costs of EHR systems are now £1.3 billion with estimated savings of over £6.3 billion over 10 years. • Implementation challenges are seen as: interoperability of localized IT systems, system installation and user/staff training, patient digital literacy to access their own electronic records, data security and privacy issues, and negative consequences for the clinician-patient relationship.

IS-Related Academic Research Publications:

Greenhalgh T., Stramer K., Bratan T., et al. (2010

Currie, W. L. (2012a)

Currie, W.L. (2012b)

Randell, B. (2007)

Medical Practitioner Publications:

Eason, K., Dent, M., Waterson, P., Tutt, D., & Thornett, A. (2012)

Adams, T. et al. (2004)

Job, O.; Bachmann, L., M., Schmid, M. K, Thiel, M. A; Ivic, S. (2013

Robertson, A., Cresswell, K., Takian, A., Petrakaki, D., Crowe, S., . . . , Sheikh, A. (2010)

Maughan, A. (2010)

Government Reports (NHS):

National Audit Office (2011c)

Parkin, E. (2016)

Houses of Parliament Parliamentary Office of Science and Technology (2016)

About the Authors

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Sue Childs Sue Childs is a retired senior research fellow who worked in the Department of Library and Information Studies/iSchool at Northumbria University, U.K. from 2000 to 2016. She conducted externally funded research projects in a range of subject areas within the domain of information and communication studies. Her particular research interests are records management, health information, electronic provision of information and use of new technologies, and evidence-based practice. Her recent projects include the following: DATUM—Research data management, funded by Joint Information Systems Committee (JISC), 2010–2012; AC+erm, Accelerating positive Change in e-Records Management, funded by the Arts & Humanities Research Council (AHRC), 2007–2010; and an investigation into the use of Microsoft SharePoint in higher education institutions (HEIs), funded by Eduserv, 2009.