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OPENNESS UNDERPINS EVIDENCE BASED PRACTICE IN INFORMATION SYSTEMS

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Abstract

This paper summarises research in progress on developing an evidence based approach in information systems (EBIS). EBIS offers a solution to information systems failures. Openness lies at the heart of EBIS, with open-access publishing and a culture of openness to new ways of working between IS academics and practitioners in the production of the evidence base. The authors have published an EBIS agenda and are developing a roadmap to implement this agenda. Their research activities are aimed at contributing to this roadmap and comprise: (i) setting up the open-access, peer-reviewed 'Evidence Based Information Systems Journal' which provides a vehicle to explore open access publishing and a research impact case study; (ii) creating an EBP culture, through establishing research networks; (iii) investigating IS practitioners' use of resources; (iv) developing a model-driven approach for the analysis and synthesis of qualitative research within systematic literature reviews (SLRs) and using this to conduct an SLR on telehealthcare innovations. The 'Evidence Based Information Systems journal' lies at the heart of this research, providing the evidence repository with clear findings to take away and use, a forum to discuss and reflect on the evidence, and thus contributing to creating the paradigm shift to EBIS.

Keywords: Information Systems, Evidence Based Information Systems, Open Access Publishing, Evidence Based Practice, Systematic Literature Review, Peer Review

1. Introduction

There are numerous failed information systems (IS) implementations. Public sector examples get the most publicity but there is no doubt that major private sector failures are equally prevalent. These failures not only have direct financial costs, but also opportunity costs. A conclusion is that one of the reasons for such failures is ignorance of, or ignoring, the evidence base about IS failures and, conversely, what constitutes good practice in IS implementation. The authors of this paper propose that an evidence based approach (EBP) in information systems (IS) offers a solution to these problems. One key aspect of EBP is the need for evidence to be made open, transparent and understandable so that all stakeholders have access to the evidence base, and can contribute to it. EBP requires a culture of openness in the way that evidence is produced and used, with academics and practitioners working in collaboration.

1.1 An Example of the Need for Evidence Based Information Systems

The scale of the direct financial costs of failed information systems implementations can be huge, emphasising the need to compile evidence and develop methods to prevent IS failures. One example that clearly demonstrates this need is the National Programme for IT (NPfIT) in the English National Health service (NHS) which was initiated in 2002. The aim of NPfIT was to use IT to improve the delivery of services in the NHS and thus to improve the quality of patient care. Because of problems and delays the UK government dismantled NPfIT in 2011 and split it into individual components. The National Audit Office (2013) has reviewed the Department of Health's final benefit statement for NPfIT. Actual costs versus benefits to March 2012 were £7.3bn to £3.7bn. Forecast end of life costs to benefits were £9.8bn to £10.7bn. However, the National Audit Office (2013, p.4) notes that there is "very considerable uncertainty around whether the forecast benefits will be realised, not least because the end-of-life dates for the various systems extend many years into the future". In addition it warns that there are "considerable potential risks to the realisation of future benefits" (National Audit Office, 2013, p.17). It is worth noting that "It is not possible to compare the total forecast benefits set out in the benefits statement with what was expected at the outset of the National Programme because the Department did not establish a comprehensive baseline" (National Audit Office, 2013, p.5). The history of NPfIT is a complex one (Campion-Awwad et al, 2014) but the conclusion is straightforward and widely applicable as NPfIT demonstrates many of the "well-worn themes" of failure (Campion-Awwad et al, 2014, p. 36).

King and Crewe (2014) cover NPfIT and provide other examples of UK government blunders. Many of these examples include an IT system component. These authors, although focusing on the UK government, state that the general lessons they draw are applicable to the private sector and to other countries. They asked 'why' the initiative failed, looking at the causes with the aim of reducing the number of failures in the future.

1.2 An Evidence Based Information Systems Agenda

The authors of this paper believe that an evidence based approach to information systems is urgently needed: this may be viewed as a paradigm change (Oates, Wainwright and Edwards, 2013). The existing evidence base for the design, development, adoption, implementation and use of information systems needs to be used, and existing and new evidence from academics and practitioners needs to be made openly available to all. In addition, students, practitioners and researchers need educating about EBP. IS educators need to include research methods, systematic literature reviews (SLRs) and EBP in the curricula studied by our future managers, systems developers and policy-makers (Oates and Capper, 2009). This will provide them with the EBP philosophy and skills to incorporate empirical evidence into their decision-making, inculcate reflexivity, and to routinely collect data about their own IS projects which can be added to the discipline's knowledge-base.

Drawing on definitions from the health field (Muir Gray, 1997; Sackett et al, 1996) we define evidence based information systems (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'. We have drawn up an agenda for EBIS (Edwards, Childs, Oates and Wainwright, 2014; Oates, Wainwright and Edwards; 2013), comprising the following aspects:

1. To conduct empirical research into the design and adoption of IS strategies, tools, methods, processes or systems.
2. To conduct SLRs that discover all relevant empirical studies via a transparent and repeatable process.
3. To develop a web-based knowledge-base of SLRs.
4. To transmit the knowledge of the evidence to IS practitioners and other stakeholders.
5. To include EBP in the IS curriculum studied by our future managers, developers and policy-makers.
6. To establish evangelists for EBIS.
7. To conduct research into EBP and EBIS itself.
8. To build the EBIS community

1.3 A Roadmap to Evidence Based Information Systems

We are developing a roadmap to implement this agenda (Oates et al, 2014) which includes activities such as establishing an EBIS community leading to an international research network and developing methods of producing SLRs within the IS domain. A major component of our roadmap is the setting up of a peer-reviewed open access journal, the 'Evidence Based Information Systems Journal'. Through an action research approach (e.g. Baskerville and Myers, (2004), which contributes to both practice and theory, we are establishing and developing this open access journal and exploring how the insights we gain can contribute to a greater understanding of EBIS and open-access publishing.

2. Open Access Publishing

Open access journals provide free online access to scholarly journal articles so that research is available to all. Though scientists made their research work freely available electronically prior to the Web, the open access movement started to take off in the early 1990s and shared a similar philosophical belief of openness to that of the Web and open source software. In 1991 E-print repositories were established in order to communicate the results of ongoing scholarly research prior to peer-review and journal publication. The earliest of these was xxx, later arXiv http://arxiv.org/ [pronounced 'archive' - the X represents the Greek letter chi] which began with high energy physics, but now covers Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance and Statistics literature.

2.1 A definition

Early after the new millennium, there was a flurry of declarations on open access as groups of academics and representatives of academic institutions and research funders met to start campaigns for 'open access'. A key definition was given by the 'Budapest Open Access Initiative' http://www.budapestopenaccessinitiative.org/ in 2002 – they also coined the term 'open access':

> *"An old tradition and a new technology have converged to make possible an unprecedented public good. The old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the internet. The public good they make possible is the world-wide electronic distribution of the peer-reviewed journal literature and completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds. Removing access barriers to this literature will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge."*

The 'Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities' http://openaccess.mpg.de/Berlin-Declaration gave a similar definition, but also linked it to the need to make the software tools freely available as well as the content:

Since these early days, open access has become mainstream and is now promulgated by governments. In the UK for example, Research Councils UK has an open access policy for publicly funded research http://www.rcuk.ac.uk/research/openaccess/, the government has endorsed the Finch Report (Finch, 2012) which established a policy for expanding access to published research findings, and Hefce (Higher Education Funding Council) has a requirement that to be eligible for submission to the post-2014 Research Excellence Framework (which judges the quality of research in universities) research outputs must be published as open access (Hefce, 2014). Open access to research outputs (publications) has been extended to open research data (OECD, 2007).

The Bethesda Statement on Open Access Publishing http://dash.harvard.edu/bitstream/handle/1/4725199/suber_bethesda.htm?sequence=1#definition defines an open access publication as one meeting the following two conditions:

> *"1. The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use.*
>
> *2. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving."*

There are two routes to open access: the Green route where authors self-archive their work in repositories, and the Gold route where journals provide open access to their articles often by charging authors or their institutions to publish their work.

2.2 The Evidence Based Open Access Journal

The 'Evidence Based Information Systems Journal' http://www.ebisjournal.co.uk is an open-access, peer-reviewed journal devoted to the evidence base for the design, development, adoption, implementation and use of information systems. The journal covers the whole diversity of information and communication technologies and systems, and the wide diversity of contexts in which they are used, e.g. organisations, services, personal. Certain disciplines are particularly associated with this area, e.g. information systems, library, information and communication management, archives and records management. However, submissions from other disciplines and from system users are also included. The nature of the articles included in the journal is the reporting of evidence from new research or from re-analysis/synthesis of existing evidence from the literature or previous research. The journal aims to:

- act as a conduit for practitioners seeking evidence to support decision-making in ICT adoption / implementation scenarios
- provide a forum for information systems researchers to publish and discover research that adds to the contextual understanding of ICT in use
- create a paradigm shift in the information systems field towards creating and using a robust evidence-base

- support the research impact agenda

The journal will publish a wide range of types of evidence: research paper; data paper; case study; case example; systematic literature review; evidence summary; conceptual/theoretical paper on EBP in IS; student paper; publication review. It will provide:

- A journal plus evidence repository for both research outputs and research data
- For writers: access to a rigorous publication venue for empirical studies and syntheses of empirical data
- For readers: access to high quality resources, with clear findings to take away
- For academics and students: the opportunity to integrate EBP into information systems education
- For researchers and thinkers: the opportunity to discuss and reflect on the evidence

Open refereeing is encouraged. The review (anonymous or attributed at the choice of the reviewer) plus the authors' responses will be published with the article. After publication, additional comments can be made by readers of the article, and such post-publication discussion as well as social tagging is encouraged.

The journal is run as a not-for-profit, unincorporated association of information systems/information sciences academics and practitioners. The journal receives support from the University of Sunderland, Northumbria University, Teesside University and the UK Academy for Information Systems (UKAIS). Initially, an article submission fee of £100 is payable, with reductions for staff/members of supporting organisations and for students.

3. EBIS Research in Progress

3.1. Developing an Open Access Journal

As well as helping to grow EBP in IS, the journal is also acting as a vehicle to allow us to explore open access publishing, e.g. the barriers and enablers encountered by individual academics/practitioners when setting up an open access journal. Within an action research framework, we will use a range of data sources, including:

- Journal website traffic statistics
- Papers, reviews and post-publication comments
- Individual reflective journals kept by the managing editor, editors-in-chief and technical support colleagues

The intended outcomes of this research will comprise peer-reviewed articles and a research impact case study, detailing the impact on practitioners and on the implementation and use of information systems in practice.

Reflections to date on the process of setting up and running the journal have highlighted the following issues:

- problems obtaining seedcorn funding and workload allocation to the project from universities with an approach to research focussed on research projects obtaining research council funding and publication of research outputs in 'top-quartile' academic journals. The lever to attract university support is the research impact agenda, which is becoming increasingly important to governments and funding bodies.

- legal (and political) aspects of setting up a journal as a group of individuals independent from a single organisation, but with a sustainable structure. We have therefore established the journal as a not-for-profit, unincorporated association of information systems/information sciences academics and practitioners.

- the challenge of using the Open Journal Systems (OJS) open-source software https://pkp.sfu.ca/ojs/. We have had technical support in setting up the software. However, the workflow from article submission to publication is complex and not sufficiently flexible/tailorable, and setting up of the software and using the interface, although relatively simple once you know how, is not intuitive. The reason OJS is so complex is because it has been designed to cater for all types of journal (big, small, multiple journals on a single installation, etc.). It would be a good idea for the developers/development community to release a 'lite' version of OJS.

- the pros and cons of setting up the journal as a collaborative activity between a number of academics from different organisations working to different timescales and demands, and geographically dispersed (although located in the same region). The desire to reach a consensus produces a solid foundation, at the cost of a timely response

- the 'chicken and egg' problem of obtaining the first submissions to the journal, as to have credibility with potential authors the journal first needs to contain published articles. Linked to this is the challenge of distinguishing our journal from the large number of predatory open access journals that now exist. Quality markers for newly set-up open-access journals (http://www.openaccess.manchester.ac.uk/checkjournal/predatoryjournals/) include entry in the Directory of Open Access Journals (DOAJ), membership of the Open Access Scholarly Publishers Association (OASPA), named editors who are experts in the field, full journal contact details. Although we are fully transparent about who we are, and have enlisted experts on the Editorial Board, the other markers also suffer from the 'chicken and egg' problem. Obtaining an ISSN, being listed in DOA, and joining OASPA requires the journal to demonstrate a history of successful article publications (e.g. publication of one volume of the journal).

- the need to promote the social networking aspect of the journal which will distinguish it from the conventional journal model. This is not provided by the OJS software, so we are currently developing a blog front to the journal.

3.2 Creating an EBP Culture

We are in the early stages of conducting research into the creation of an EBIS culture. We are currently seeking funding to set up an international research network. The aim of this network will be to:

- build the community
- establish evangelists for EBP.
- conduct research into EBP itself

Evidence based practice has become firmly established in the healthcare field (Smith and Rennie, 2014). We are analysing the reasons for this success to see if there is guidance for establishing a similar movement in IS. An EBP culture will require more focused action from the IS community to target research on major organisational and societal challenges with a more overt aim of building cumulative studies (depth) and reducing wasteful duplication (breadth).

3.3 Investigating IS practitioners' use of resources

Examination of the IS literature has failed to unearth any significant investigations into how decision-makers and ICT professionals make their decisions and what resources they use to inform the process. Similar investigations in other professional fields seems to suggest that professionals depend upon colleagues, grey (especially on-line) literature, online resources such as blogs, material distilled in training seminars, short reports and, occasionally, books. This is true whether the field is global software engineering (Beecham et al, 2014), management (Francis-Smythe, Robinson and Ross, 2013), marketing (Bennett, 2007) or

training (Carliner et al, 2009). We could surmise that the same situation would be found in the IS field. Disappointing though it may be to academics that research outputs do not feature highly, this should not be a surprise when an overriding theme is the convenience of access. The majority of research papers are still available only by subscription (closed access). We currently do not know what knowledge-based resources IS managers and practitioners would find useful and informative, and how they should be provided by the research community. We have therefore established a project to gather this empirical data. We plan to use the findings from this project to develop the journal as a hub for active involvement of practitioners.

3.4 Model-driven SLRs

We are also undertaking research into appropriate methods for SLRs, a key component of EBP. The majority of studies and SLRs in EBP in the health field focus on randomised controlled trials and their synthesis via statistical meta-analysis (e.g. Wilson and Lipsey 2001). However, such an approach is less suited to much IS research, which often explores multiple facets of the use of an IS method, tool or system via qualitative, idiographic studies. (Oates 2011). Where medical practitioners need to know if a particular clinical treatment 'works', IS researchers and practitioners need to understand and synthesise the evidence which can apparently show that an IS-related change is perceived as successful in one organisation, unsuccessful in another and 'a bit of both' in a third (Oates, 2011; Pawson, 2006).

So far we have focussed on a 'model-driven method' for SLRs (MD-SLR), one approach which can analyse and synthesise qualitative research studies (Oates, 2011; Pawson, 2006). We used this method to examine the evidence on the use of BPMN (Business Process Modelling Notation) in organisations. The outcome was a model which shows the factors that can influence the effective use of BPMN, based on the (limited) available evidence (Oates, Edwards and Wainwright, 2012). This model can inform practitioner decision-making and support EBP, and should also stimulate further empirical research on the topic. We are now undertaking a further model-driven SLR on the long-term success of telehealthcare innovations. This will enable us to further explore the suitability of the MD-SLR approach. The SLR will be published in the 'Evidence Based Information Systems Journal', thereby contributing to the IS evidence base.

4. Conclusions

This paper outlines our research in progress on developing EBIS, viz: (i) establishing an EBIS agenda and an implementation roadmap; (ii) developing the open-access, peer-reviewed 'Evidence Based Information Systems Journal'; (iii) creating an EBP culture; (iv) Investigating IS practitioners' use of resources; and (v) developing a 'model-driven method' for SLRs. Openness underpins EBP in numerous ways: open-access publishing of research outputs and data; a culture of openness to new ways of working, with IS academics targeting empirical research on real world problems, practitioners including research evidence in their decision making, and organisations conducting research into their use of information systems and then openly publishing the findings; collaborative working between academics and practitioners on the production and dissemination of the evidence base. At the heart of these activities is the open-access, peer-reviewed 'Evidence Based Information Systems Journal'.

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