The emergence of design research in information systems in North America

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Abstract: Information Systems (IS) is a relatively new field of study that investigates information and communications technology (ICT) in organisational settings. Originally a branch of management science, IS became an independent field in the late 1960s. Only recently in North America has IS design research (ISDR) become a distinct line of inquiry within the field. This paper details the emergence of ISDR within North American IS research and outlines its current state. ISDR, as currently conceived in North America, is narrower in scope than design research in fields where it has a longer history. With reference to the literature, we expose directions of research highly germane to ISDR that are precluded by the current common understanding, which requires an artefact as the output of all design research efforts. We propose suggestions for relaxing this constraint on research output while still retaining a focus on research relevance and ICT artefacts.

Keywords: artefact research; design research in information systems; design research methods; design research philosophy; design science; information and communications technology; management information systems; research models; sciences of the artificial.


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1 The origin of IS and the emergence of IS design research

The introduction of computers into large corporations beginning in the late 1950s had a profound effect on the business environment. Unprecedented quantities of information were available, potentially at least, to guide management decision making and the human–computer systems used to capture and distribute this information became known as management information systems. Within organisations and within the academic Management Science community the area of study of the design, implementation and organisational effects of these systems took the same name as the object of their study, Management Information Systems (MIS). Although design has always implicitly been a critical component of MIS, neither corporate practitioners nor academic MIS researchers initially considered design per se to be a pertinent topic of study for the new field. In the remainder of this section we describe the growth of MIS and the emergence of design as a topic in its own right within MIS.

By the late 1960s MIS had become significant enough in organisations that, along with notable successes, a number of poorly performing yet very expensive system implementations had become widely publicised. An influential *Management Science* paper published during that time entitled ‘Management misinformation systems’ (Ackoff, 1967) criticised the increasing number of dysfunctional information systems. Significantly, Ackoff’s primary criticism was of the design and design criteria for these systems. However, probably due to the strong operations research background of many MIS academics, design continued to be considered one of many factors in a complex MIS optimisation function rather than a separable, core topic of MIS studies. Despite cautionary articles such as Ackoff’s, the growth of information systems in corporations continued unabated and by the late 1960s a number of more progressive and influential schools of business, such as Minnesota’s Carson school and MIT’s Sloan school, had introduced MIS programmes. MS and PhD degrees began to be conferred in the subject and MIS began to exert a strong influence on the undergraduate business curriculum.

The emergence of a new field, replete with its own jargon, acronyms and research streams from the older discipline of Management Science (MS), was noted by some with
apprehension. ‘MIS is a Mirage’ declared John Dearden in an influential 1972 Harvard Business Review paper. While the critique was aimed for the most part at the ill-conceived concept of an omniscient all-purpose MIS that was being promoted by IS academics of the day, Dearden was also highly critical of the field itself. MIS specialists trained by the new MIS programmes, he opined, would have “little impact on most of the information supplied to management, particularly at upper levels” (Dearden, 1972, p.91). MIS academics, still struggling for acceptance at their universities, felt the criticism especially strongly and interpreted it as a threat to the new field that could only be dealt with by closing ranks around the rigorous, traditional, statistically based empirical research paradigms of the parent MS field (Benbasat and Weber, 1996). Design did not figure in any way in MS research paradigms and the topic lay fallow for many years.

When design ultimately emerged as a research direction in MIS it was via a historical accident. Although MIS departments in universities faced some early threats, the influx of information systems into global organisations was unstoppable and the accelerating pace of the computerisation of commerce carried the academic field with it. By the early 1980s, MIS departments were found in almost all schools of business and the shortage of professors had reached desperate proportions. ‘Boot camps’ for MIS academics were formed at some of the larger universities to induct interested scholars from other fields, such as computer science and engineering, into the area. After as little as six weeks indoctrination in MIS rudiments, these inductees were readily placed in business schools across the US and internationally. Notably, many of the inductees had been originally trained in fields with a strong design tradition, and some of them brought that tradition to bear on the research of their adopted discipline.

As a result of the varied backgrounds of its practitioners, its newness and its diverse subject matter, MIS was and remains very self-conscious of its lack of a cumulative, paradigmatic research tradition. The late 1980s were a time of reflection for the field throughout the world. Two of the first explicit mentions of design as a legitimate object of study came from outside the USA where IS (Information Systems) has historically been more closely aligned with computer science.3 Iivari’s (1986) long range programme for information systems design (italics ours), while grounded in the scientific, engineering approach to IS design, outlined a reflective approach where design methods themselves were necessary and legitimate objects of research. Weber, from the University of Queensland, in 1987 issued a call for the establishment of a paradigmatic base for IS research in the study of “discrete artefacts that have longevity” (Weber, 1987, p.4). Weber then defines ‘purposeful design research’ as that which ‘would focus on those hypotheses that are equivocal. The design would instantiate the controversial hypothesis as a basis for testing it empirically.’ We note that in addition to its early mention of design research, Weber’s paper shows the trend in evidence by the mid 1980s of dropping the ‘M’ from MIS. This is not coincidental; with the explicit emergence of design into the field, study of information systems as interesting artefacts in their own right, not merely their impact on or benefit to management, was beginning to be legitimised. Weber was also one of the first IS publications to cite Simon’s The Sciences of the Artificial (1981; third edition, 1996) as justification of the need for and legitimacy of design research; Simon’s monograph has since achieved almost canonical status in the IS design research field.4

Research on artefacts and their design grew slowly, however, and was still viewed with suspicion by the management-oriented majority of IS researchers who adhered to a strict Popperian vision of theory and its empirical testing (Popper, 1983). An influential
paper from the technology oriented IS department of the University of Arizona (Nunamaker et al., 1991) arguably marks a turning point after which research into artefacts and their design, while still a stepchild in the field, was openly pursued by a small minority of IS researchers. Not surprisingly, all of the authors on this paper had computer science or similar design-oriented training. The paper and the rigorous development in it of a framework for IS research that included design and design research as an integral component of the collective study of information systems in general is still widely cited.

In addition to legitimising artefact-based research, Nunamaker et al. formalised a design research method they termed ‘the engineering approach’ which hypothesises an improvement to a system or correction to a system flaw, implementation of the system, and its evaluation. This approach to design research became so widely adopted by design researchers in IS that it dominates the field and is the only design research method acknowledged by many IS design researchers. While known through the years by many names, including ‘improvement’ and ‘constructivist’ research, the method has for the last decade been widely termed ‘design science research’, a name that serves to heighten the impression among many that it completely encompasses IS design research. Much less well known is the fact that along with ‘the engineering approach’, Nunamaker et al. showed the need for a much broader scope for design research in order to develop the knowledge base to support the constructivist methodology.

While Nunamaker et al. (1991) provided definition and a measure of legitimacy to the research approach, many highly respected IS researchers remained unconvinced of the value of design and other artefact-based research. One facet of that resistance was the virtual impossibility of publishing such research in the premier IS journal, MIS Quarterly, during this period. While a number of IS academic journals such as the Journal of Management Information Systems (JMIS) and related field journals such as Decision Sciences did selectively publish artefact-based research, the perceived need for a premier journal focused on artefact-based research led to the introduction of Information Systems Research (ISR) as a top-tier outlet for design, design methodology, and constructivist research papers.

Not coincidentally, one of the seminal papers on design in IS (Walls et al., 1992) was published in ISR shortly after its inception. The work sets out a notion of an information systems design theory (ISDT) that closely resembles DR (Design Research) models from engineering fields (Evbuonwan et al., 1996) and strongly carries forward the ‘engineering approach’ originally set out by Nunamaker et al. An ISDT for Walls et al. (1992, 2004) is a prescriptive statement of how to develop a specific class of artefacts which rigorously derives its design rationale from more fundamental research in the natural and social sciences that is referred to by the collective term ‘kernel theories’. For example, ‘psychological theories of mental and symbolic problem representation’ are set out by Walls et al. (2004) as the kernel theories for Kasper’s (1996) ISDT for decision support systems. With respect to kernel theories it is notable that IS has, since its inception, considered itself an applied field and has tended to seek its grounding outside the discipline (Keen, 1980).

Artefact-based research in IS, including DR, gained momentum and matured through the 1990s. The first academic conference focusing on IS artefacts, the Workshop on Information Technology and Systems (WITS) began in 1991 as a pre-event to the IS academic community’s largest and longest established conference, the International Conference on Information Systems (ICIS). The motivation for WITS was identical to that
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which led to the creation of ISR – ICIS at the time was steadfastly concerned with management-oriented behavioral research and the maturing design community found it necessary to create its own venue for the discussion of artefact-oriented research. While not solely focused on design research, WITS has provided a sympathetic outlet for IS design research.

Following Walls et al. (1992) the number of papers published by IS academics on artefacts, their construction and design increased steadily. Perhaps more importantly, during that time research about design, built on the conceptual basis set forth in Nunamaker et al. (1991), Walls et al. (1992), and others, continued to formalise the distinctions between design research and empirical research as practiced in the natural and management sciences (March and Smith, 1995). Following Nunamaker et al. (1991), the DR theory papers were ecumenical, suggesting that IS research in total was a multi-methodological endeavour and proposing an important place for design research alongside traditional empirical studies.

Most design science theoretical papers were also insistent on the need for relevance in IS research. This was not so much a direct criticism of empirical research as a positioning of design research as a methodology inherently likely to generate results of interest to IS practitioners. Other papers however, including some from outside the design research camp have been openly critical of the lack of relevance of much traditional empirical IS research (Benbasat and Weber, 1996; Orlikowski and Iacono, 2001). While not intended to champion design research over empirical research, the criticism of empirical studies have made the potential contribution of design research to the IS field more widely salient. The potential of design research for relevance was brought out to the entire IS establishment during the ‘IS core debates’, an extended series of publications in academic journals concerning the putative focus of IS programmes and research. In a special issue of the Communications of the AIS devoted to the IS core discussion, Iivari (2002) proposed IS as an ‘applied science of meta-artefacts’. Within this vision, IS research is relevant, theoretically grounded and incorporates reflective (meta) design research as an integral component.

Recently four seasoned IS design researchers published a mature and rigorous consolidation of over 20 years of design research theorising in IS (Hevner et al., 2004). The paper expresses the view of the nature and place of IS design research that we believe is currently held by a majority of those practicing in the field; this view is self-consciously pre-paradigmatic and so Hevner et al. have chosen to present its core concepts as guidelines that circumscribe the domain without fully explicating it. The paper is also notable in having been published in MIS Quarterly; arguably, publication in this journal indicated design research was approaching a parity of status with managerially focused empirical IS research.

Drawing from Hevner et al. and other contemporary work, the next section of the paper presents the current conception of design science research in information systems.

2 The current state of IS design research

Adequately describing something as complex as a group consensus on research is difficult. However, we attempt to do so by:
presenting the ISDR worldview in terms of the attitudes of practicing IS design researchers on important attributes of research

describing the epistemology and axiology implied by those attitudes

showing how the ISDR worldview becomes concrete by interpreting the list of ISDR artefact attributes from Hevner et al. (2004).

As we have noted, many of the earliest advocates for and most widely published proponents of design in IS research have backgrounds in computer science and engineering. It is no surprise then that the current majority view of IS design research closely adheres to the engineering model (Eekels and Roozenburg, 1991). The origin of academic IS in colleges of business is also clearly visible in the emphasis on practical, usable research results. The essential points of the IS design research worldview are:

- The raison d’être of information systems is to improve the efficiency and effectiveness of organisations. The raison d’être for information systems research is to improve the ability of information systems to achieve their goal (Hevner et al., 2004, p.78).

- IS research occurs at the confluence of people, organisations and technology; therefore two distinct and complementary paradigms are necessary to acquire the information required to improve information systems: behavioral (natural) science and design research (op cit, p.79).

- Design addresses research through the building and evaluation of artefacts designed to meet the business needs identified in the course of behavioural (natural science) research (op cit, p.80). The design-build-evaluate cycle is at the core of any IS design research methodology. It is inherently a problem solving process (op cit, p.82).

- Design research is distinguished from design by its address of important unsolved problems in unique or innovative ways or in the development of more effective and efficient solutions to previously solved problems. Routine design applies existing knowledge to organisational problems. Design research addresses wicked problems, that is, problems characterised by ill-defined requirements (Brooks, 1987).

- Design may proceed atheoretically in that intuitively or empirically guided designs for artefacts may validly further organisational goals; explication of the theoretical basis for the effectiveness of the designs may lag their implementation.

The epistemology inherent in the design worldview is obviously pragmatist. ‘... truth and utility are inseparable’ declare Hevner et al. (2004). Likewise the implicit axiology is utilitarian and pragmatic – ‘[design] methodologies do not describe any external reality... their scientific merit should be evaluated on the basis of their practical value’ (Iivari, 1986). These bases give rise to Hevner et al.’s set of seven guidelines for design research in IS that are strongly bound to commonsense notions of business utility and forcefully promote the strongly felt need of the entire IS academic cohort for legitimacy through relevance. The guidelines are presented below with an interpretation and references to supporting concepts in foundational papers.
Design research in IS (ISDR) produces artefacts.
The result of an ISDR project is a ‘purposeful IT artefact’ addressing ‘an important organisational problem’ (Hevner et al., 2004, p.82.). An artefact is broadly defined as ‘those bundles of cultural properties packaged in some socially recognisable form such as hardware and software’ (Orlikowski and Iacono, 2001). The notion of artefact is further qualified as more likely to be an idea, practice or partial product than a ready-for-business-use information system (Hevner et al., 2004, p.83).

ISDR must be relevant.
The artefact resulting from an ISDSR must be relevant to a technology solution to a ‘hitherto unsolved and important business problem’ (op cit, p.86). cf. guideline 5.

The design of the ISDR artefact must be rigorously evaluated (op cit, p.87).
A formal evaluation of ISDSR results, in addition to defining the research contribution, sets ISDSR apart from the practice of IS design.

ISDR must provide a novel contribution.
Novelty is probably the key distinguishing feature between design research and design practice. The contribution is usually in the form of a designed system (or component) artefact but may also take the form of foundational knowledge for the design knowledge base or methodologies. Methodologies are explicitly defined in this guideline as evaluation methods or evaluation metrics which seemingly excludes design or implementation methodologies. However, system development methodologies are considered artefacts based on guideline 1.

ISDR must balance rigour and relevance.
The assumption here is that much prior IS research has abstracted away the relevant, real world aspects of an area of investigation in pursuit of rigour, i.e. it investigates only what it has the tools to rigorously describe.

An ISDR contribution must be functional.
A demonstration of the effective functioning of an artefact and the repeatable processes to duplicate the functionality (how) take precedence over theoretical development (why). See the discussion of the atheoretical nature of ISDR above.

Design research results must be communicated to both technical and management oriented audiences.
Implicit here is the notion that the research results will be of interest to both technical and practitioner audiences.

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However, ISDR is still decidedly pre-paradigmatic. The lack of a common understanding of the definition and scope of design research in IS was patently evident at the most recent IS design research conference (DESRIST, 2007). From formal panels to lunchroom conversations, a subject of ongoing discussion was whether ISDR was research with design as a topic of investigation or research with design as a method of investigation. Research with its topic as design is broader and could explore almost any design related subject – the psychological attributes of good designers or design education, for example. Research with design as method is more narrowly scoped to the use of IS design techniques to construct an improved IS artefact. A number of experienced IS design researchers seem almost exclusively focused on the latter.

As defined by the seven guidelines given above, the ‘constructivist’ design research methodology consists of building and evaluating artefacts. While this methodology is undoubtedly a valid and highly worthwhile contribution to design research in IS, some members of the IS community (including the authors of this paper) are concerned that the pressure for (short-term) relevance and the understandable desire for ‘definitional closure’ for the area are prematurely narrowing the perception of ISDR; focusing it exclusively on the constructivist methodology and on ‘prescriptive design theories (models) for low level artefacts’ (IT mechanisms) rather than allowing it to have the breadth it has achieved in other design fields. Since ISDR is in a transitional state, we devote the remainder of this paper to an exhortation in favour of a broader scope for ISDR and suggestions for removing obstacles to that end.

We begin by briefly developing the nature of information systems and comparing and contrasting it to other design fields; we show the high level of commonality between IS and other design disciplines even though the artefacts produced by the different fields vary considerably. Then, using a survey of design research literature from multiple fields and an analysis of government sponsored design research initiatives, we develop a preliminary list of recurring design research topics. We show how ISDR would be precluded from evolving to embrace these topics by the injunction in its current definition that all ISDR output be some form of artefact (see item 1, page 7). Finally we make suggestions for removing the output constraint while still allowing a focus for the field on relevant IT artefacts.

3 Case for broadening the scope of information systems design research

3.1 The nature of information systems

Within industry practice, information systems (IS) is a broad discipline that takes responsibility for the effective implementation and management of information and communications technology (ICT) in organisations. The implementation aspect of IS may include in-house development of ICT systems or the elicitation of requirements and supervision of implementation with the actual system development being outsourced. In either case, design plays a prominent role with respect to both IT artefacts per se and the altered business processes supported by the artefacts.

The management aspect of IS includes both responsibility for day-to-day operations and for sustaining a vision of high-level IT infrastructure and function-specific systems that support strategic advantage; within this aspect also there is a strong design component
as the use of the term ‘architectures’ – commonly applied to systems for operations and strategic support – implies (Hamilton, 1999).

The practice of IS, like most design disciplines, requires extensive interaction with clients to produce artefacts that satisfy a perceived user need. Since information systems are deployed in organisational settings the design process is strongly influenced by and in some cases dominated by organisational rather than technical constraints. Many important design decisions are made based on socially constructed notions of cost, effectiveness, need, organisational culture, etc. and so the ‘designerly’ (non-scientific in the sense of being difficult to derive logically and rigorously from first principles) aspect in IS is more influential than in computer science and many engineering disciplines. In a sense design within IS is quite similar to architecture. In IS there are objective methods for constructing software and designing databases and the limits of current technology need to be observed, just as in architecture there are quantitative, objective structural calculations and limitations due to materials; but in both cases the objective methods are performed after or iteratively and in parallel with ‘softer’ more subjective design decisions based on socio-cultural norms and expectations. IS also is concerned, as are all other design disciplines, with teaching design practice and promoting the best practices, with identifying timeless design principles, and with modifying older design practices to be effective with new technology and socio-economic changes such as outsourcing and globally distributed development.

Many if not most IS practitioners, design researchers, and even IS managers and clients, especially in the USA, share the view that IS design is (or should be) rigorously objective, formal, and somewhat detached. This is demonstrated in part by the very slow acceptance in the USA of Soft Systems Methodology (Checkland, 1989) and related techniques for dealing with the subjective aspects of multi-stakeholder projects. Largely due to historical factors – the origin of North American IS within business schools and its base in management science – ISDR has evolved insulated from the decades long discussion of the science–design distinction found in other design literatures (Kuechler and Vaishnavi, 2007). The design–science conversation acknowledges and explicitly treats facets of design such as creativity and elegance that are usually considered outside the province of science. While within the ISDR community there has been some discussion of the distinction between IS and ‘natural science’ research (March and Smith, 1995) the discussion has been limited to methodological differences, and there has been little input to ISDR from the ‘designerly way of knowing’ schools (Cross, 2006) which stress the abductive, ‘satisficing’ nature of all design practices. The view of ISDR as a ‘hard’ engineering practice is being mitigated in the USA by the increasing influence of European concepts of IS and design in IS; these have traditionally incorporated a greater emphasis on the business environment of the IT artefact and client interactions in IS design (Van Aken, 2007).

Although brief, this overview of IS confirms the consensus of researchers in all other design fields that we have surveyed – that all design practices share a large common grounding – what the IS field would typically call a meta-level (Wallace, 1981). In many areas, from client–designer interaction to the cognition of design, there is much IS can learn from other design fields. However the stress on different topics as well as the details of the material aspects of the designed artefacts per se is different for every field, requiring analogous studies in each field. Further, each field has unique elements that while of substantial importance to the field, are unlikely to be investigated in any manner by other
design fields (Mackie, 1981). In IS, for example, two prominent unique aspects are the relative invisibility of the effects of its artefacts until after deployment and the mutability of the organisational environments in which its artefacts are deployed.

3.2 The trajectory of IS design research: open issues and informed prognostication

We believe ISDR as it matures will ultimately come to embrace the majority of research topics that other design disciplines find beneficial to further their practice; that it will embrace research with design as both topic and as method. That fundamental design issues within IS – what an information system design is and how best to effect one, and to understand, represent and teach the design process – are a topic of current interest is well brought out in Bajaj et al. (2005), ‘Systems analysis and design: should we be researching what we teach?’ However, we see an impediment to the evolution of ISDR that merits extended discussion within our field: the requirement in the currently widespread notion of ISDR that all research outputs be IT artefacts that are designed, built, and evaluated (Hevner et al., 2004).

The current stress on IT artefacts in ISDR is constructive. As recounted in the historical portion of this paper the emergence of artefact-based research into the IS research mainstream has over 20 years of momentum behind it and resonates strongly with the current IS-wide perceived need for increased relevance in IS research (Benbasat and Zmud, 1999; Orlikowski and Iacono, 2001). Further, we understand both the desire and the need to strongly distinguish ISDR from IS behavioural (organisational) research. Still, we do not believe it is constructive or that it logically follows that a stress on artefacts implies that the only valid research in pursuit of that stress is artefact-producing research.

To illustrate that point we have performed a survey of design research across design research journals and government sponsored design initiatives from multiple fields. We surveyed papers from the last five years in four different design research journals: two that target a general design research audience: Design Studies and The Journal of Design Research and two design area specific journals: The Journal of Engineering Design and Research in Engineering Design. We also surveyed databases containing the majority of computer science and human computer interface (HCI) journals for the same period, limiting our search to papers addressing design research. Finally, we reviewed the objectives and sponsored projects for two National Science Foundation sponsored initiatives on design research: the Engineering Design Research Center (Siewiorek et al., 1997) at Carnegie Mellon University and the NSF Science of Design initiative (SoD, 2004) which is targeted specifically at design for software intensive systems – unquestionably a core focus for ISDR. The results of the survey are shown in Table 1.

Table 1 is not meant to be exhaustive, but rather representative. The topic areas shown in the first column are of great significance to the furtherance of design in any field including IS; indeed, research in these areas has been conducted in IS or closely related areas such as CS or HCI over the last 25 years. Published examples of each topic area and/or the government research initiatives calling for research on the topic are given in the third column.
The information in support of a definition of ISDR expanded beyond a single constructivist methodology is found in the Output column of Table 1. For every topic area we were quickly able to find widely cited research that did not have an artefact as an output, even under the very broad definition of artefact assumed in ISDR discussions (see item 1, page 7). We have extracted the non-artefact research outputs of the studies from column 2 of Table 1; they are: principles, study and research results, case studies, frameworks and taxonomies. All of these outputs are a form of information or knowledge standing alone rather than embedded in an artefactual form.

In retrospect, we understand how design research in IS came to be widely identified with only the artefact producing design research methodology. The current stress on the constructivist method is an exuberant over reaction to the denigration of artefact-related research in IS over a period of 40 years. This exuberance has been amplified by the call for a ‘return to the IT artefact’ by researchers on the organisational side of IS in order to
increase the relevance to practice of IS research and to distinguish the IS academic field from other forms of organisational studies (Orlikowski and Iacono, 2001).

However, although design research as an accepted academic area is new to North American IS, we propose it is best viewed as part of the larger, more mature trans-discipline design research tradition. It is not a completely new form of research calling for a rejection of traditional research outputs. In fact, it is nearly impossible to envision a research area that precludes relevant-to-the-field information-as-information from viable research results.

Summarising our position:

- ISDR is a new design research tradition that has grown up, through historical accidents, largely isolated from other design communities. Thus, ISDR’s defining discussions have not been able to benefit from the 50-plus years of design discipline reflection from other communities.

- ISDR is a reaction against the behavioural side of the parent IS discipline. This fact, combined with its isolation from older design traditions have possibly led to ISDR’s conception of itself as a more radical departure from prior research traditions than would be revealed by consideration of a broader historical context.

- In the process of evolving toward a unique identity, ISDR has come to be identified strongly with a single methodology that limits the results of its research efforts to artefacts.

- We have demonstrated by example that the restriction of research outputs to artefacts greatly limits the scope of research, precluding it from exploration of topics that are of obvious benefit to IS design practice. These include design environments, design education, cognitive processes of design as relevant to the support of the design process and the multitude of other topics found in journals such as the Journal of Design Research and Design Studies.

3.3 A proposal

Frequently, when we propose to IS constructivist researchers that design research in IS should be broadened in scope and methods, we encounter resistance. The resistance derives primarily from a fear that all the progress made toward relevance in IS research will be lost should the constructivist method’s stress on the artefact be abandoned. However, we believe that the intent served by restricting research outputs to artefacts – to give the design side of IS a unique and relevant identity and direct ISDR toward practice-relevant explorations – can be preserved while eliminating the restricted scope for ISDR. This can be accomplished simply by redefining ISDR outputs as ‘IS design practice relevant artefacts or knowledge directly useful in the construction of IS design practice relevant artefacts’. This position is similar to but expands on Iivari’s proposals for IS research as the exploration of ‘meta-artefacts’ (Iivari, 2002, 2007).

The expanded definition of ISDR outputs will allow the richness of design research topics found in other areas while retaining a focus on relevance and IT artefacts. It may be slightly more ambiguous than the present definition – said definition being ambiguous largely because of the very broad definitions of artefact deliberately introduced to give
more scope to the field – but all research including ISDR generates studies at the frontiers of accepted work. Whinston and Geng (2004), addressing the IS community specifically, make a strong argument that it is better to err on the side of inclusivity than to reject well executed research that might well presage the next advance in the field.

4 Concluding remarks

Design research has largely achieved acceptance as an alternate research paradigm within the field of information systems in North America. The publication of Hevner et al. (2004) has given ISDR a solid definitional base point from which to evolve. However, ISDR in the preliminary, narrow definition that seems to be solidifying around it lacks any notion of a grounding meta-level. Within this definition the concept of ‘design’ is received knowledge and is taken as a given; somehow ISDR practitioners come to know what a design is (design as noun), understand how to design (design as verb and process) and this knowledge is complete and timeless. This is obviously not so.

ISDR, however, is still a work in progress, and we wish to see it expand in scope to be able to provide the IS field with the full range of benefits that DR has provided for other, older design-based fields. These include not only the generation of design models for classes of artefacts (ISDT’s as defined earlier) but a deeper understanding of the process of design especially in ways that are unique to IS. We suggest ISDR can mature more quickly by assimilating the relevant research and philosophical discussions of older design fields, especially with relation to theory in design fields (Gregor and Jones, 2007) and the relevance of ‘scientific’ methodologies, ontologies and epistemologies to design (Cross, 2006; Cross et al., 1981). If the core of information systems is the artefact then surely its heart is increasing understanding of every aspect of the design process by which these artefacts are brought into being.

References


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Notes

1. Even though the focus of this section (and subsequent sections) is North America, all countries share much of the early history of IS as we relate it in this section.

2. While it is not a purpose of this paper to detail the diffusion of computer technology into global culture, we will allude frequently to the phenomenal growth of information systems over the past 45 years and a brief explanation is in order: information technology (IT) has grown to become the largest capital investment made annually for most firms because it has always had enormous perceived value to corporate management. IT success stories span 40 years – from American Airlines’ early reservation system coup to WalMart’s current dominance of US retail – and the perception of IT strategic value combined with an exponentially decreasing cost curve for information and communications (ICT) technology have given IS enormous penetration and influence.

3. As of this writing, most IS researchers outside the USA are resident in schools of Informatics: frequently an amalgamation of what in the USA are the separate disciplines of IS, Computer Science, and Information Science. Recently a number of US universities have adopted a similar concept of creating a school focusing on Information, which is notably not a part of the business school.

4. The quotation: “The professional schools will reassume their professional responsibilities just to the degree that they can discover a science of design, a body of intellectual tough, partly formalizable, partly empirical, teachable doctrine about the design process” has been a rallying cry for IS design researchers for over 20 years.

5. March and Smith (1995) were among the first IS authors to use the designation design science for this type of research; many believe the term originated in the works of Buckminster Fuller (http://en.wikipedia.org/wiki/Buckminster_Fuller). Following the practice of most other design-based disciplines, we drop ‘science’ from the name, referring to the field as IS design research (ISDR).

6. Design is defined, per Simon (1996), as ‘the purposeful organization of resources to reach a goal’ (Hevner et al., 2004).

7. We intend ‘other design fields’ to refer broadly to the many areas that create artefacts for use by people through disciplined, empirical methods. We share the belief that many common cognitive, social and empirical processes underlie design in general (Jacques, 1980). Thus closely related fields such as computer science and engineering are included along with more topically distant fields such as architecture and industrial design.

8. One of the field’s self-criticisms is that the field is too broad and ill-defined. IS academics frequently have difficulty explaining to College of Business Deans and university presidents exactly what it is they teach and study. Chief Information Officers in industry have similar difficulties explaining the breadth of their activities to CEO’s (Benbasat and Zmud, 1999).

9. In prior work we surveyed over 40 papers from relatively recent IS ‘core’ and ‘relevance’ discussions as well as ISDR foundational papers. We found no references to design research outside IS.

10. For confirmation perform searches on keywords from the Topic Area column of Table 1 in either the ACM Computing Library or IEEE Xplore.