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INFORMATION SYSTEMS AND THE NATURAL SELECTION OF BAD SCIENCE

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Abstract

Recent studies of information systems suggest a coalescing around a limited set of methods and subject areas, particularly led by a dominance of technology adoption studies and research methods that orbit around the technology adoption model (TAM). This is interpreted as evidence of a maturing of a discipline and the development of scientific foundations. I would suggest that far from this being the case, the dominance of particular method and topics is resulting in a disciplinary stagnation and the fueling of an increasing irrelevance of information systems studies to both practice and research innovation. Having illustrated this with reference to two recent information systems trends studies, and briefly critiqued the dominant information systems paradigm, I draw on a recent study of the evolution of behavioural sciences using computer models. I suggest that the development of information systems is an example of bad science, constrained by social and economic forces. I offer some suggestions on how different environmental forces could be applied to reinvigorate information systems. However, I conclude by suggesting that regardless of changing evolutionary forces, there is a deeper underlying philosophical concern which is catalysing the malaise of information systems.

Keywords: Information systems discipline, information systems research trends

1.0 Introduction

Recent studies on trends in information systems should raise serious concerns about the health of the information systems discipline, particularly with reference to disappearing information systems departments and the absorption of information systems into general departments of management. Two recent studies should raise concerns about the evolutionary stagnation of information systems, and the loss of variety, innovation and adaptive ability within the information systems discipline.

Stein et al's recent study of information system trends as represented in the ECIS conferences of the last ten years illustrated all too well the cul-de-sac of much of information system academia has drifted into (Stein et al, 2016). Far from bringing leading-edge ideas, insights and wisdom to academics and practitioners across management and technology disciplines, information systems has become an unhealthy side subject with an obsession with technology adoption. Stein et al (2016) illustrated the predomination of positivist frameworks such as TAM, and the reluctance to pursue new avenues, to branch out, to challenge significant industrial

issues, and I would suggest, to take a systemic view of information systems as enshrined in the discipline's title.

Lui et al's study of information systems themes (Lui et al, 2016) covered by the major information systems journals over 20 years illustrates dramatically the convergence of the field on technology adoption and acceptance. Furthermore, their study shows that adoption/ acceptance, usage and the Technology Acceptance Model (TAM) form the major theme of information systems research across 20 years of information systems research. Lui et al point to the domination of TAM-related research in information systems. TAM has invaded of 16 new application areas in the last decade. Lui at al (2016) identify a cohesion of information research towards adoption technology. This is not a healthy evolution of information systems, rather it is a destructive contraction into safety of side waters, avoiding the rush of the river, avoiding negotiating the rapids of technological and social change, Evolution implies a diversification a creation of new species, and explosion of diversity. We do not see this in information stems. Our discipline seems to be trapped by a thematic myopia and a methodological conservatism. There is a dominance of TAM, an orthodoxy where every information systems phenomena must be interpreted as an issue of technology acceptance and cracked with the hammer of quantitative modelling and statistical analysis.

Lui et al (2016) present a study of the evolution of a field which maps a contraction to a point, rather than a diversification an expansion to match the diversification of information system and practice in the real world. Significantly, when it comes to comparing the progression of information systems with that of other disciplines, Lui at el choose example disciplines, which might be defined as hard scientific, including stem cell research and psychophysiology. In comparing information systems to 'well-established scientific disciplines such as psychology' (Lui et al, 2016 p 21) there is an underpinning assumption that information systems is a science, a study of deterministic, natural phenomena that can be measured and theorised in the same way as environmental ecology or quantum physics.

It looks as if the discipline has retreated to the safely of navel contemplation and a concentration on pure positivist statistical techniques. Case studies, reflection and creative qualitative research have been side lined. In pursuing certainty and safety, we

are reduced to a predominance of statistical studies. PhDs are considered valid if they identify hypotheses, run surveys and process data through a statistical system such as Amos. A concern with techniques such as structural equation modelling results in the discussions of conclusions based on levels of statistical significance which would be questioned by professional statisticians. Frequently the validity of qualitative research is only accepted if the data has been appropriately processed through software to give it a positivist veneer and support the expression of numerical data derived from the field work.

Has the information system community abandoned its responsibility to be thought leaders, to question and reflect on information systems practice, to draw on concepts from a range of disciplines, to establish new understanding and new methodological directions? Has it abandoned engagement and dialogue with practice and with other disciplines in the pursuit of a dogmatic scientific purism which is neither useful to practitioners nor philosophically justifiable?

One of the prime issues is how has information systems arrived at this state? This paper examines the recent development of the information systems discipline as an example of the natural selection of bad science, an idea developed by Smaldino and McElreath (2016). TAM is discussed as being an example of the evolution of the information systems discipline. With reference to the natural selection of bad science, I suggest some forces that may be acting on the information systems discipline. I suggest some ways in which the ecology of the information systems environment could be changed to enable diversification, but conclude that the malaise of information systems runs deeper than mere environment and institutional practice and concerns the nature of the information systems discipline and its positioning as a science.

2.0 Evolution of TAM

TAM offers a case in point which I will address because Davis' paper is the most cited paper in ECIS and I have personal experience of writing a TAM based study (Elbeltagi et al, 2005). The TAM model only explains 40% of variance in use (Legris et al, 2003). Studies tend to ignore the critical role of organisation dynamics, and

other influences and concentrate on the self-reported behaviour of individuals. While the number of TAM articles published has risen exponentially since 2005 (Mortenson and Vidgen, 2016), the origins of TAM have receded into the past. TAM has become a black box, applied to a range of organisations, contexts and cultures far outside its original domain. As an initial study, it was confined to students in a computer laboratory, making a simple decision about what software package to use. The social confines, cultural homogeneity, simple software, straightforward use, and simple in goal and purposes, provided a tight boundary for the study.

The context of our TAM-based study bore little in common with Davis' study. It concerned the use of decision support systems by senior managers in local authorities in Egypt. We dropped TAM into a complex cultural situation, involving the use of a decision support system in a multi-faceted political and social environment including power structures and state influences inside and outside the manager's office. Expectations and purposes generated by an underpinning military-aligned public sector were ignored. The outcome of TAM was to reduce a year of hard field studies, of criss-crossing Egypt in pursuit of difficult to access managers into a superficial expression of obvious factors which had limited theoretical depth and practical value.

In writing up such a study, the practical focus was on the statistical mechanics of the study; a debate about statistical significance and a reliance on software such as Amos. Our discussion with editors became an exercise in statistical analysis rather than managerial insight. Left with a supported statistical model, we were little wiser as to what this meant and whether it had any value. Indeed the value in the paper lay in the interpretive jump made in the discussion from cold statistics to a consideration of interpretive insights concerning power, relationships with vendors, and cultural background based a qualitative narrative.

TAM offers little to the practitioner, however accurate measurements of perceived ease of use and usefulness are: there are no control levers in the IT managers' offices to help adjust these (Ramiiler and Pentland,2009)! TAM fails to engage with the systemic complexities of technology, with the legion of economic and political forces, the fallout between departments, the power structures, the attempts to control and resist control. It offers no tools for analysis, or means of enabling managers to

direct IS practice in the context of the messiness, uncertainty, and complexity of IS deployment.

This is the information systems equivalent of the domination of the mall and the high street by large retail chains and franchises. TAM represents the MacDonaldisation of information systems: TAM in every journal, structural equation modelling in every mall. This is a distinctly unhealthy phenomenon, a breakdown of natural metabolism, an inbreeding of information systems that will lead to disease and metabolic dysfunction. The high centrality and low density map of information systems is not an asset but a burden which may render information systems unable to adapt to the changing information system environment, marooned on an island of introspection, and unable to engage with practical needs, unable to connect with theories and ideas as they develop across a number of disciplines

This focus on TAM and positivist statistical methods leads to poor research design, a reliance on weak statistical results and a spreading irrelevancy as the discipline drifts away from the practitioners and industries it should be serving like a broken iceberg. Despite its inadequacies, TAM has evolved into a dominant method and technology adoption a dominant topic.

3.0 Evolution of information systems discipline

So how have we got to this point? Smaldino and McElreath suggest a model of the evolution of bad science driven by institutional forces that demand high publication rates in high impact journals. They suggest that positive selection leads particularly to flawed research methods as scientists rush to publication and take the route of least resistance. Quantitative studies are not only easier to do, but harder to question statistical ‘facts’ than qualitative interpretation. Smaldino and McElreath (2016) provide empirical and analytical evidence that supports the natural selection of weak, flawed research of low statistical power, a characteristic of much information systems research. They state that ‘.. *in the absence of change*, existing incentives will necessarily lead to a degradation of existing practices.’ And this is what is happening in information systems. The evolutionary forces do not promote variety, but conformity. Driven by the reputation of senior researchers, particular methods,

philosophies have become reified and established as the norm. Alternative approaches are regarded as maverick, pushed to the edge and hard to publish. Senior editors favour particular kinds of research topic and method. This leads to more submissions of the same kind, which when published reinforces a view of what is the right kind of research and the right way to do it.

The end result is, of course, an illusion of stability and focus. Since favoured methods and topics emerge, it is assumed that this is a sign of a maturing discipline; a delusion particularly nurtured in any discipline which struggles for identity. But such settling is not an indication of maturity and stabilisation; it is rather an indication of stagnation and side-lining. Smadino and McElreath (2016) remind us that the first necessity for evolution is variety. If there is no change, no challenge, no anarchy the result is a convergence to a single point in a field, a sinkhole in an academic space. The deeper it is, the harder it is to get out of. The absence of changing environments, of new challenges, of new thinking results in an evolutionary backwater where dinosaurs reside who are ill-equipped to face any environmental catastrophe; that is where information systems resides.

Yet the strange thing is, that while information systems paddles in the backwaters of technology adoption and the opinions of students about the selection of software, of e-commerce, of trusted systems in classrooms, the very practical field information systems is supposed to be studying is changing and progressing both organisationally and technologically. Areas such as digital transformation, the Internet of Things, Big Data, Smart Cities, Genomic computing, Datacentre Management, DevOps, Green IT and Artificial Intelligence receive little or no attention

The top ten issues for 2016 identified by Educause (Grajek2016), for example, include concerns such as information security, leadership in optimising educational change, data standards, integration and governance, changes of processes in the light of the spread of enterprise wide systems, IT organisation and the many and key issues around learning analytics and business intelligence. Such complex and relevant areas are hardly to be found in the information systems literature.

This state of affairs may lead to certain consequences. Firstly, the selection of research topics may be constrained by what is perceived to be a safe topic, to have well characterised research methods, to be uncontroversial and have a greater

certainty of successful completion and publication and to be popular and easy to implement. Pursuing ease of research and certainty may lock a discipline into a narrow field of topics and methods. The pressure to drive a PhD to rapid completion make a TAM application very attractive. Tried and tested method, safe and well-fenced study areas offer a risk-free certainty of completion. And the reduced risk of no-publication is important when as Smaldino and McElreath(2016) illustrate, publication rates are critical in promotion and tenure.

Secondly, it may create an illusion of trust and certainty in the outcomes of the research because they are well-bounded and grounded in statistical methods. Such trust in the outcome of statistical analysis, particularly when driven through statistical tools and packages may blind the researcher to the critical analysis of the disruptive interpretive layers between hypothesis, survey items, actual and reported behaviour and the conclusions drawn.

Thirdly, not only are topics and method limited but the critical faculties of young researchers remain underdeveloped. Risk, exploration, innovation and creativity are replaced by a dogmatic adherence to a sacred text taught by an academic priesthood. Power structures in the discipline, whether real or perceived, encourage a conformity to methods and subjects, and spawn journals such as the Transactions on Replication Research.

The views of senior academics on what constitutes good information systems research provides a strong evolutionary force. But this is unchallenged by doctoral students and applicants who view using TAM as a safe way of gaining a doctorate where the external incentives of increased salary and prestige are highly influential.

Finally, the academic 'science' propounded and executed by information system researchers becomes bad science. Low power studies lead to false discoveries (Smaldino and McElreath, 2016). Effects being investigated are always weak and masked by the social complexity of the organisation and human environment within which information systems reside. Finally, the conclusions of such research may be of little practical relevance. They may be obvious and well-known: successful information systems projects need higher management support; or offer nothing of significance that could be implemented as change: there are no levers for increasing perceived usefulness nor perceived ease of use sitting in the information systems

manager's office. Furthermore, the treatment of information systems as a variables-centred discipline of science distances researchers from organisational actors (Ramiller and Pentland, 2009).

4.0 Conclusions

If institutional and economic forces act on the discipline, mediated by the selective forces of journal article acceptance and PhD recruitment, how can we establish new evolutionary actors which will move the field from volume to variety, from conformity to diversity? Admittedly journals can only work with the material they are offered which may result in more quantitative studies published and less and less incentive to pursue qualitative and risky studies, but journals could alter the constraints and affect the field. The provision of short publications: letters which bring current concepts and new ideas to bear on information systems; the creation of rapid turnaround for short, novel pieces; and the promotion of developmental and consultancy based approaches might act as environmental catalysts.

Additionally, the creation of structures and approaches which bring the transformative and rapidly-changing technical, managerial and organisational environment into collision with any remote information systems department may be evolutionarily valuable. A requirement, or at least an encouragement, of academic consultancy such that the academic and industrial interact might be supported by the provision of a mean of publishing short consultancy reports whether case studies, practical results or new concepts. A change in doctoral education may be suggested which widens research education and seeks to recruit doctoral students who have passed through the industrial furnace as opposed to students who have remained in universities, passing through bachelors, masters and doctoral studies within the safety of academia.

However, while institutional change, educational innovation and changing culture may help in evolving a new information systems discipline, there is a much more fundamental issue to be addressed. This concerns the philosophical perception of the information systems, its positioning as a science and underlying deterministic

assumptions in conducting information systems as a social science. It is this block that needs to be challenged next.

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