A FRAMEWORK FOR ANALYSING THE EVOLUTION OF THE IS FIELD - CAN IS BECOME A STABLE DISCIPLINE?

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Abstract

There is much concern among IS researchers due to the failure to establish adequate conceptual and theoretical foundations, and also the lack of clear definitions of concepts and terminology in the IS field. This paper considers why this is the case, and puts forward a framework which has been developed to analyse the emergence of the IS field, its relationship with associated disciplines, and the problems it currently faces. These problems are of a fundamental nature and include the field's identity crisis and epistemological problems; the failure to erect barriers to entry; the reference discipline problem; and the trend towards increased divergence rather than harmony and convergence in the field. Urgent research is needed to lay the foundation of a model for progress in the IS field which will support the evolution of the field towards control and harmony. This need is now stronger than ever at a time when the status of IS comes under attack in academic circles and the field seems to be under pressure to establish a stronger identity and solve fundamental methodological problems.

1. Introduction

It is widely acknowledged that the information systems (IS) field does not have an adequate and unified conceptual and theoretical base—indeed some have questioned whether it can ever establish such a base [5;6]. This issue has now become especially relevant given the uncertainty regarding the future of the IS field as a number of educational institutions are taking actions to reduce the importance of IS courses at undergraduate and graduate levels, despite the current explosive growth of the IS/IT industry [cf. 24; 71]. There is also the very real risk that, unless the IS field can move towards becoming a stable and distinct discipline with its own intellectual core and accepted research protocols, traditional IS research issues may be 'reclaimed' by other disciplines who regard these areas as more properly their remit [22]. Indeed, there have been examples of the failures of fields to preserve their status in the history of science [43].

This paper considers the evolution of the IS field, and identifies a number of fundamental problems in IS research. Beyond the identification of these problems, the main contribution of this paper resides in the presentation of a framework developed

specifically for the analysis of the evolution of the field (Figures 1 to 4). The problems we have identified are:

- Stable and universally-accepted conceptual foundations do not yet exist in IS, which leads to an identity crisis and certain epistemological problems.

- Barriers to entry do not exist in the IS field which allows open access to researchers from a wide variety of disciplines. This has not helped efforts to achieve stability in the IS field.

- The vast amount of research in all these disciplines requires a huge intellectual investment for IS researchers who struggle to get to grips with research traditions in many loosely-related areas.

- The application of these research protocols in IS often creates a 'reference discipline'[1] problem.

- The outlook for the field appears negative, since the indications are that, rather than moving towards convergence and stability, the field is actually diverging.

These problems appear to be causally inter-related as each problem contributes to the emergence of another.

Some researchers have argued that the diversity and openness of the IS field are two of its strong aspects, given that they stimulate creativity—a particularly important factor in the pre-maturity phase of a discipline [15; 19, 62]. However, it is our contention that some stability is necessary to end the buzzing confusion that characterises the IS field, all the more pertinent given the threat to its very existence. In view of such a wide range of problems, an overall solution for IS may therefore involve more than just establishing an intellectual foundation for the field.

We would like to emphasise that the problems we identify in this paper are ones that have been perceived by the authors, and are the result of reflection on their experience of the practice of research in the IS field today. Thus, it is not claimed that they have been derived from any specific theoretical stance. Also, it is acknowledged that we see the main contribution of the paper as the explicit identification and discussion of a number of fundamental problematic issues in the field. Remedies to these problems are obviously difficult to formulate—if they were not, these problems would no longer exist. However, the first step in solving a problem is to explicitly recognise the nature of the problem and to provide the basis for a constructive debate in the IS field. This paper addresses these needs.

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[1] Reference discipline is used in this paper in the context originally intended by Keen [37], which refers to the need to respect standards of ethics in a field of study when importing findings from other studies or other fields. However, most researchers now tend to use the term to refer to a 'subject area'.

2. The Emergence of the IS Field

The emergence of IS as a discipline has been due in large measure to the inadequacy of computer science in addressing the problems associated with the use of computers in an organisational or business context [cf. 35]. The computer science influence caused a tendency to view information systems in narrow technical terms, whereas a wider focus on the application and the management of technology and on its wider social implications is necessary. Computer personnel have been accused of 'letting the technology drive the application' and to be so engrossed in technical considerations that they failed to pay adequate attention to crucial managerial and social aspects. Their primary focus was on getting technical aspects right without due attention to their relevance to the business situation [2, 27].

A number of disciplines have been primary contributors to the emergence of the IS field, including computer science, management science and organisational science [17]. There have also been a host of supporting disciplines, including psychology, sociology, statistics, political science, behavioural science, economics, philosophy, mathematics [7,12, 42,52]. Indeed, Keen [38] has remarked that the IS field has nothing unique in terms of either topics, theory or methodology, since these have been borrowed from other fields (see Figure 1).

However, the IS field is not alone in having an eclectic and pluralistic foundation. It is quite natural in many emergent fields to borrow a foundation of usable knowledge and concepts from more mature disciplines—the emergence of psychology from psychophysical philosophy being a well-documented example of a discipline which emerged and compartmentalised in a stable fashion, albeit after about one hundred years [cf. e.g. 13, 28]. Having a wide breadth of contributing disciplines can bestow advantages in a field insofar as research can be illuminated in many ways with many differing conceptual schemes.

Researchers in the philosophy of science have described how fields can achieve progress on what may appear to be intractable research issues, through the use of findings from other very diverse fields, and the young IS field benefited from many contributions from other fields in its early days. For example, Kendall and Kriebel [40] discuss the contributions made from management science/operations research in the areas of modelling and decision making. These contributed greatly to the emergence and coalescence of the Decision Support Systems (DSS) area. However, the symbiotic benefits which could arise from the multi-disciplinary conceptual foundations of IS have not brought about long-term dividends and the DSS story itself does not have a happy ending, as DSS is acknowledged as having been trivialised by an abundance of poor academic research [38]. Rather, the multi-disciplinary nature of the IS field has led to a number of significant problems. These are discussed in the following sections.

Adam, F. and Fitzgerald, B. (1996) A Framework for Analysing the Evolution of the IS Field: Can IS become a Stable Discipline?, in Coelho, J. et al. (Eds) *Proceedings of the 4th European Conference on Information Systems*, Lisbon, pp. 17-32

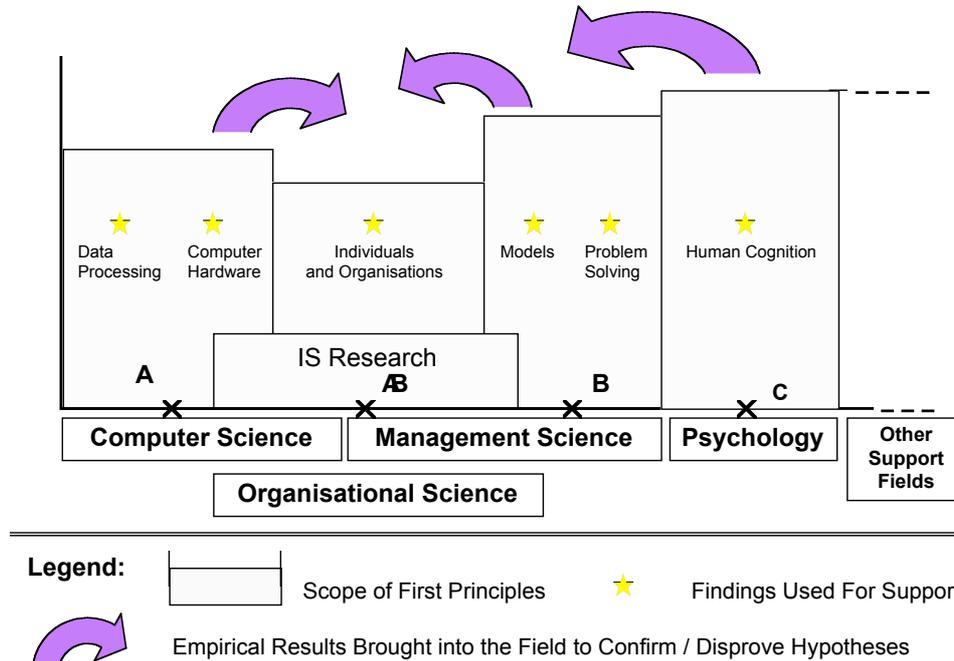**Fig.1. IS - The Emergence of a Multi-Disciplinary Field**

Figure 1 Commentary

Figure 1 depicts the emergence of IS as described in this paper. In our diagram, we represent the three main disciplines, computer science, management science and organisational science [17], and one of the support disciplines, psychology, as it had a significant influence on the IS field. The breadth of the three areas of knowledge along the horizontal axis symbolises the relative importance they had in the emergence of IS. The large arrows represent the movements of the results and the transfer of knowledge from established disciplines into the new area of knowledge, IS. The point ÆB symbolises the new focal point which emerged from the coalescing of the established disciplines into the new one.

In this diagram, IS is represented as a very recent field, reflected in the very low height of its rectangle pattern—i.e. the low impact of the first principles of IS (virtually non-existent to this day) in comparison with the neighbouring fields. At the early stage of a discipline, findings are bound to have greater impact as they open new territories of research, but often fail to be elevated to the rank of first principle. As a result, in the IS field, the level of the first principles remains similar through Figure 1, Figure 2 and Figure 3 even though these figures consider IS as it evolved. This illustrates the failure to confirm and assimilate the findings of other researchers to build upon them for the overall progress of the field.

3. Fundamental Problems in the IS Field

This section discusses some of the major problems of the IS field, namely; the identity crisis and the epistemological problem; the lack of barriers to entry; the breadth of the field; the lack of reference discipline and the IS research direction tending

towards divergence rather than convergence. These problems are also analysed in Figures 2, 3 and 4 using the framework outlined in Figure 1.

3.1 The Identity Crisis in IS

The IS field may be characterised as a definitional quagmire rather than a multi-disciplinary field. When one considers even the central concept of *information*, problems become apparent. Many researchers seem content with a definition which views information as processed data with attributes such as relevance and timeliness, whereas researchers such as Stamper [61,63] have long argued that such a definition is in itself inadequate. This quagmire is again evident when one considers the variety of definitions which have been proposed for the central term, *information system* [e.g. 3, 18, 30, 35, 39, 41, 53, 59 etc.]. An analysis of a sample of these definitions reveals an unnecessary abundance, with some definitions taking a broad focus to include managerial and social issues, while others take a narrower computer technology focus, viewing the computer as a necessary *and* sufficient component of information systems [35].

Another symptom of the failure of IS to establish its own identity is evident in the current difficulties of many IS researchers in academe. At this stage, IS has achieved the status of independent department in very few institutions and can be found in many diverse departments, including Accounting, Statistics, Economics, Computer Science etc. This does not help the discipline establish a solid and uniform identity.

3.2 The Epistemological Problem

The IS field has been characterised by Banville and Landry [6] as one of "fragmented adhocracy". There are some islands of cohesive thought, but no overarching conceptual roof. At a very fundamental level, the failure to abstract foundational theories and concepts from the contributing disciplines means that the IS field suffers from an epistemological problem: the lack of a unifying paradigm for the orderly and cumulative acquisition of knowledge.

The importance of such a cumulative tradition has been emphasised, most notably by Keen [37], as being a critical requirement for IS. Not surprisingly, the absence of such a cumulative tradition has resulted in problems. For example, very few research papers arise (or are acknowledged as arising!) from the call for further research which is routinely advocated in the conclusion section of many academic papers. Teng and Galletta, in their 1991 survey of IS researchers' perception of the field, report that the majority of respondents were of the opinion that IS research has failed to build a cumulative research tradition. This was corroborated by the finding that IS researchers virtually never rely on existing frameworks developed by other researchers. This is a matter of worry for IS research, given Naumann's [50] persuasive argument that, in new fields of research struggling to develop theories, "pre-theory frameworks" should be used to guide research activities.

Research papers are thus published which 'pass each other like ships in the night', without intersection, and with little reconciliation of research results. There are many examples of studies which investigated the same research topic, but whose findings are completely at variance with each other [cf. 34, 31]. Hiltz and Johnson [31], in their study of user-satisfaction with information systems, reviewed the findings of twelve previous studies which sought to identify reliable variables that could predict user acceptance of information systems. Among the thirty variables investigated, twelve showed *no* agreement across the different studies. Research on such a trivial attribute as "speed of typing" produced very different findings, ranging from *strongly predicting* user acceptance (one study), *predicting* user acceptance (three studies) and having *no correlation* with user acceptance (three studies). Similarly, "size of group", an important variable for the groupware research, was found to be *strongly positively* correlated with user acceptance, *positively* correlated, *negatively* correlated and *strongly negatively* correlated by four different studies! Such a variability of findings for such well-defined attributes leaves no doubt that there is an epistemological problem in IS.

3.3 No Barriers to Entry

The contributions from related disciplines were necessary and very useful during the emergence of IS in order to import some foundational concepts and some contributors may be characterised as 'guests'. Examples of such researchers are numerous, especially in the early days of IS research - eg: Anthony's [4] study of planning and control systems, and Mintzberg's [49] study of executives. More recently, the new groupware area has become "an umbrella collecting researchers from a variety of specialisations" [26] who are concerned with establishing foundational concepts in the area.

However, by drawing concepts from these other disciplines, a bridge was created which researchers from these disciplines have readily crossed to work in IS (see Figure 2). Interestingly, these bridges seem to operate unidirectionally as few IS researchers have attempted to work in other disciplines [cf. 38, 68], suggesting that barriers to entry may exist in other disciplines. The legal requirements which many bodies of expertise (accountants, lawyers, doctors...) have established to regulate the practice of their speciality are such barriers.

We contend that some of the researchers from other disciplines contributing to IS may now be characterised more as 'invaders' than 'guests', as research which might not make as much impact in its original subject area is relocated in IS where the results can appear more significant. These 'invaders' further hinder efforts in the IS field to establish first principles, as they blur the picture even more, multiplying the number of pseudo-findings and incrementing, without sufficient justification, the arsenal of methods and research protocols which must be used in IS research.

An example of such a scenario is the introduction of techniques for recording eye movements in the DSS area. Very difficult experiments covering limited decision

situations (mainly binary choice by one individual) are put forward as a valid form of inquiry for DSS even though they shed very little light on the type of decision making that takes place in organisations [60, 1]. Such research actually contributes to the detriment of the field, as it causes a tendency to believe that research in DSS actually requires such experiments.

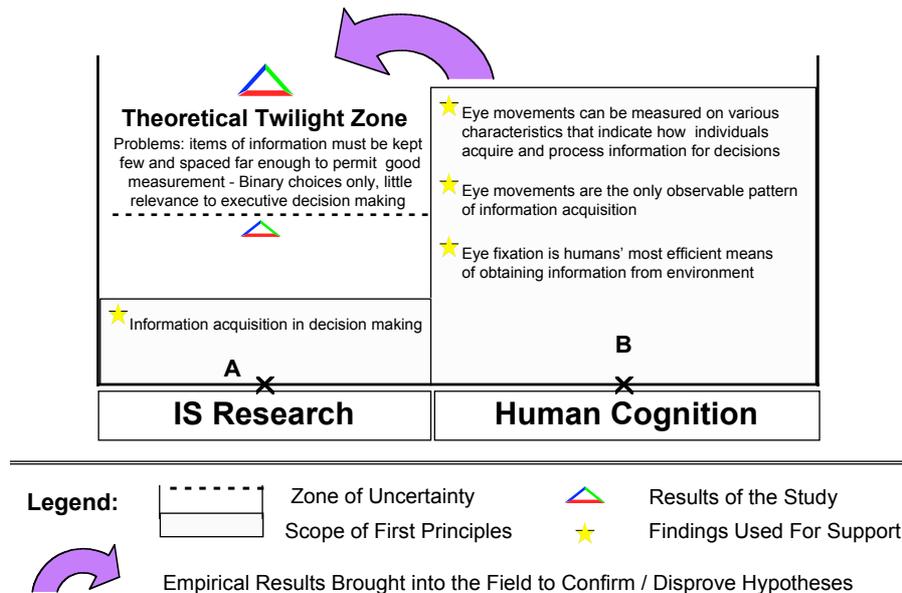**Fig.2. No Barriers to Entry in IS**

Figure 2 Commentary

Figure 2 represents a pattern of linkage between IS and other fields of knowledge which can be identified in the IS literature. Here, we illustrate an example where a researcher from the cognitive psychology field uses important findings in terms of human cognition, obtained with research methods and knowledge belonging to that field, to make an impact in IS. In this case, the support area often gets more attention than IS itself (as symbolised by the breadth of the fields along the horizontal axis) and the study is not always well grounded in existing IS literature (illustrated by the origin of the findings used for support). Similarly, the results are more significant in the field of origin than in IS, even though they may extend the IS field's first principles or uncertainty zone (lower triangle). We contend that researchers in this position will often compromise on the results which they claim because of their relative ignorance of the IS field. The significance of findings which it would seem could have been claimed by the study (upper triangle), is merely contemplated in the conclusion/further research section of the paper and a theoretical 'twilight zone' remains. Indeed, some methodological difficulties may arise if more ambitious results are claimed or else, the real significance of such findings for IS may be unclear as they do not address identifiable IS issues. Nevertheless, confirming these 'unclaimed' findings often becomes a 'holy grail' quest for IS researchers.

The establishment of barriers to entry in a given field can occur through raising the first principles to a critical level. This is represented in our diagram by the height of the rectangle for a given field. This height represents the intellectual investment required of researchers before they can feel comfortable writing in a discipline. The different levels of first principles in neighbouring fields give an indication of the relative ease (or difficulty)

with which a researcher can "come down" into a field (or "climb up" into a field). In the case of IS and its neighbouring fields, IS researchers always have to "climb up" from IS, while other researchers can "climb down" into IS as they please.

Henderson [29] suggested that both theory *and* practice are necessary to develop a competent understanding in a field. He uses an analogy with a physician to put forward three prerequisites:

(a) An intimate, intuitive familiarity with things;

(b)A systematic knowledge of things;

(c) An effective way of thinking about things.

Henderson concluded that researchers are often exposed when they move outside their field to another discipline. However, that does not seem to occur with researchers writing under the IS banner. It is regrettably the case that (b) and (c) only apply in some research.

There now is a clear need in IS for research to be informed by characteristic (a) above, that is research which is practically relevant and useful [24, 51].

3.4 The Breadth of the Area

There is an essential tension between the sclerosis of an introspective field talking mainly to itself about itself, and the confusing dispersion of a field where all views, not all of which are helpful, contribute to the debate. In IS, the 'invasion' by researchers from a host of other disciplines has had certain negative consequences. In particular, the enlarged scope of the area has caused the intellectual investment of IS researchers to be very large, since familiarity is required with a multitude of potentially-relevant areas when researching any particular topic. Influential researchers in the field have recommended that IS researchers should enlarge the scope of their reading to other support disciplines—the rationale being that this would improve their own research and also help avoid re-inventing the wheel by gaining access to accumulated knowledge in other sources [19]. The logic of this strategy is certainly sound, but as it has been enacted in practice, it has raised more problems than it has solved.

Bjorn-Andersen [9] estimated that there were more than 150 journals within the field of IS, and he lamented the breadth of reading thus required. With the proliferation of relevant journals, recently estimated to be 1,366 [33], the situation is currently even more extreme. The old adage that "if one wants to learn anything, one shouldn't try to learn everything" reflects the essential problem this poses for researchers. The intellectual investment required in becoming familiar with the potentially-relevant research in these related fields may thus be constraining productive research, as all exposed flanks have to be guarded—a problem which does not seem to arise to the same extent in other disciplines. A particularly rich IS research area, that of

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Checkland's [14] soft systems methodology (SSM), has been criticised on the grounds that it is flawed from both a philosophical and a sociological point of view [8]. This illustrates how IS research areas, even influential and fruitful ones such as SSM, may leave certain flanks exposed which are then vulnerable to excessive scrutiny.

3.5 The Reference Discipline Problem

The term "reference discipline" was originally coined by Keen [37] to refer to the need for intellectual honesty in respecting the standards of the field from which concepts are drawn with a view to ensuring the soundness of research results. The problem has long been recognised in other disciplines; a well-documented example being that of sociology [11, 16]. The authors would argue that some of the research in the IS field has trivialised or misused the results of other fields (see Figure 3). Certainly, researchers have noted the phenomenon whereby articles have been published which have looked right and sounded right, but have been fundamentally flawed [38]. Indeed, Olaisen [54, p.247] cites the "recipe" for getting papers accepted for publication:

> Define your problem properly, cite the "correct" researchers, have a representative sample, use the Statistical Package for the Social Sciences (SPSS) to "prove" your results and end up with a proposal for another framework.

Additionally, there is much by way of spurious accuracy as frequency counts of isolated units of behaviour in psychological laboratories are taken to be relevant to real organisational situations. McGrath [47], one of the foremost researchers on group behaviour, has expressed concerns with the limitations inherent in the findings of much of the group research which has been conducted. His primary concern is that most of the studies undertaken so far have focused on a limited range of types of artificial groups under controlled experimental conditions and, as a result, he questioned whether such studies can accurately reflect the structures and processes of naturally-occurring groups as they exist in reality.

A further example of the reference discipline problem can be traced to a well-known IS paper where findings from a psychological study by Mehrabian [48] were used to argue for the importance of non-verbal signals as a reason why face-to-face contacts should be the preferred mode of communication among senior managers. In the study in question, the authors concluded that the study of non-verbal communication should be given more importance in IS. In particular, they quoted one quantitative result from the Mehrabian study as follows:

> In one study of face-to-face communication, only 7 percent of the content was transmitted by verbal language. The remaining 93 percent of information received was contained in the tone of voice and facial expression [48]. A sarcastic versus enthusiastic tone of voice conveys as much meaning as the specific statement processed between managers.

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In the light of such a finding, subsequent studies of information exchange between managers are led to acknowledge that face-to-face situations are richer than any other. Furthermore, Computer-Mediated Communication Systems cannot be expected to achieve the same importance as face-to-face communication because they are so weak for the transfer of non-verbal cues.

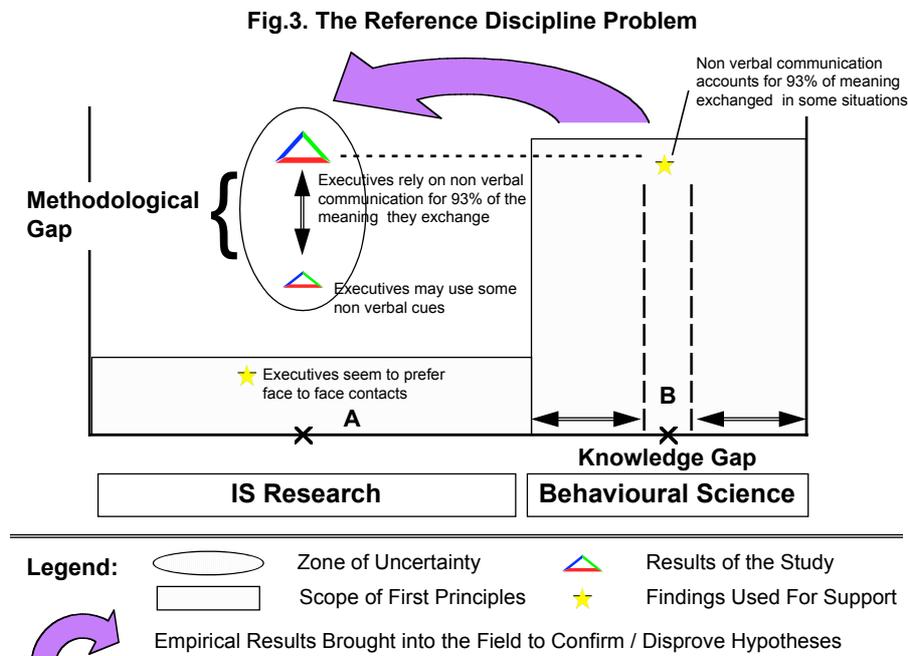**Fig.3. The Reference Discipline Problem**

Figure 3 Commentary

Figure 3 represents another pattern of linkage between IS and another field of knowledge. In this case, an IS researcher—perhaps as a consequence of reading some research originating from another discipline (as in Figure 2)—attempts to use isolated findings from the behavioural science field to establish ambitious findings for IS research. However, he/she does not devote adequate attention to understanding the behavioural science field before using these findings. This is identified in our diagram as a **knowledge gap**, illustrated by the discrepancy existing between the narrow extent of the knowledge and findings grasped and used by the IS researcher, and the much broader boundaries of the field of behavioural science. This kind of reference discipline problem often results in unreliable findings and unwarranted conclusions.

Alternatively, the IS researcher might attempt to replicate in the IS field experiments from another discipline without appropriate knowledge of the conditions and context in which they should be carried out, and this may bias the results or trivialise the findings. This is identified as a **methodological gap** in our diagram. As a result, the conclusions regarding the IS field claimed by the study (upper triangle) are not valid, since the methodological limitations of the study would normally allow the researcher to claim only less ambitious results (lower triangle). Needless to say, this contributes further to the phenomenon of poor IS research.

The reality is that the original study by Mehrabian does not warrant such conclusions. Quite the contrary, in the conclusion of his study, Mehrabian [48] himself explains:

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> Anyone who has played charades knows that language is by far the most effective medium for expressing complex and abstract ideas. The ideas contained in this book cannot be communicated with actions. This would only be possible if we were to develop a special code...and this would amount to learning a new language (...) One important difference between actions and speech, then, is that actions only permit the expression of a limited set of things, primary feelings and attitudes.

This highlights the true nature of Mehrabian's conclusions and shows that it is probably unhelpful for IS research to focus on studying non-verbal communication to improve the design of information systems. Studying organisational communi-cation in itself is difficult without having to worry about non-verbal aspects given their little relevance to organisational communication.

There is an additional danger in carefree borrowing from other disciplines, insofar as the discipline in question may change but the ramifications of such changes may not ripple through to all the other disciplines in which the results have been used. The mental models case which has been widely cited in the executive information systems area is an example of this. Most researchers cite a reference from 1983 [36] in support of this phenomenon. However, research in the psychology field has since questioned the use of the concept in other areas [70]; yet, IS researchers continue to refer to it, seemingly unaware that the field has evolved in the interim. Our argument is that the IS field should not bind itself too tightly with other evolving disciplines; rather, to use a programming term, it needs to be loosely coupled to avoid problems due to changes in related fields.
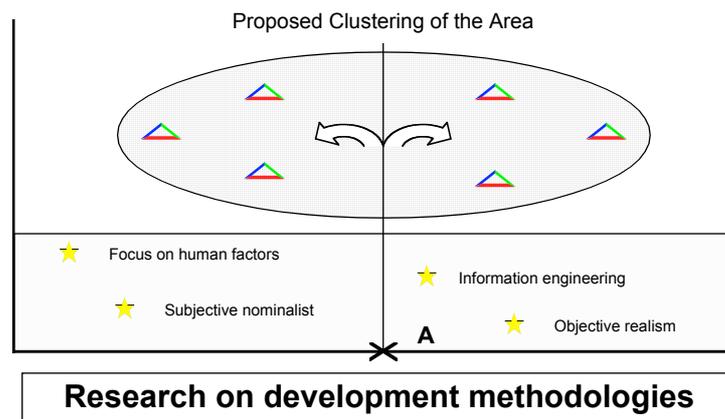
3.6 IS Direction: Divergence rather than Convergence

Given that other disciplines have taken many decades to achieve solid conceptual foundations, the obvious argument is that IS simply requires more time to stabilise. Teng and Galletta [64], in their survey of IS researchers' opinions, found that the average IS researcher thought that the greatest problems in IS were maturity and direction and that both would come with time. However, the same survey collected a large number of opinions of researchers who were concerned that the IS field was going in the wrong direction.

There has been a consistent failure among researchers to reach agreement on the fundamental nature of particular research areas, thus establishing divergent streams of research into essentially the same phenomenon, and thereby inhibiting the establishment of a cumulative tradition (see Figure 4). Researchers with different backgrounds argue for the primacy of their own recommended starting point. The evolving divergence of the IFIP WG8.1 CRIS conferences on systems development provides an example of this [55, 56, 57, 58, 67]. In 1982, the first conference (CRIS 1) attempted to identify available methodologies. It considered thirteen different development methodologies considered fairly representative of both academic and commercial practice [66]. In order to facilitate comparison, it was decided that the methodologies should be applied to a standard case. The case selected (that of supporting an IFIP Working Group conference) attempted to be neither trivial, nor

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excessively complex. However, the reactions to it provide evidence of the wide gap in assumptions between different researchers. Some considered the problem statement to be so well-defined that it represented a complete requirements definition, while others considered it to be too ill-structured to form a basis for the first design step. The disparity in the assumptions of the researchers is also evident in the disparity of the output designs from each methodology included in the CRIS 1 review, even though these addressed the same problem case [66].

Fig.4. How the IS Field Diverges Rather than Converges

Proposed Clustering of the Area

Focus on human factors

Information engineering

Subjective nominalist

Objective realism

A

Research on development methodologies

Legend:
Zone of Uncertainty   Results of the Studies
Scope of First Principles   Findings/Approaches Used for Support
DIverging conclusions reached by researchers investigating similar phenomena

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Figure 4 Commentary

Figure 4 illustrates the manner in which different studies of essentially the same phenomenon diverge from each other. In the specific case of research on systems development approaches which has a specific focal point A, researchers have categorised various approaches along a 'hard' v. 'soft' continuum [e.g. 20, 32]. At the hard end of the continuum, an ontological position of realism is adopted. An engineering approach to accomplishing tasks is taken, and people are seen in mechanistic terms as processing devices who undertake tasks that could be done by machine. Typical 'hard' development approaches are the traditional SDLC approach, the various structured approaches and Information Engineering [32].

At the soft end of the continuum, the ontological dimension is the subjective nominalist one. People are central and the emphasis is on achieving empathy and understanding. The soft approaches to systems development have primarily been associated with Scandinavia, culturally very different from the US [cf. 10, 23]. For example, ISAC [46] differs from hard approaches in that it begins much earlier in the development process, is very much people-oriented and based on the assumption that "information systems have value only if they contribute to improve the situation for people in the organisation" [46, p.174]. In fact, ISAC does not mandate computer system development unless totally necessary, in marked contrast to 'hard' perspectives where "any software development effort begins with a problem thought to be solvable by a computer system" [72].

Thus, researchers from the different ends of the continuum place different emphasis on different issues and produce a wide range of contradictory results. We argue that, in situations where researchers cannot agree on the definition of the problems they attempt to address, there would be benefit in a clustering of the area into distinct camps where researchers can meaningfully exchange their research results. This clustering can remain until the accumulation of knowledge within each cluster is sufficient to raise first principles and enable constructive dialogue.

In 1994 (five conferences later), the search is no longer for convergence, but rather opts for the more pragmatic goal of seeking some kind of harmonisation among the vast number of currently-available development methods.

The above is not a criticism of the CRIS conference series—far from it. The various CRIS conference proceedings are widely cited by researchers in the development methods field, and the conference series itself is extremely well-regarded among the IFIP Working Group community. However, in the case of the CRIS series, the acid test is that a system does not appear to have yet been developed which could actually support an IFIP Working Conference.

This movement towards divergence in the IS field has also been reported in two separate studies [15, 17] which involved a comprehensive analysis of the IS literature. We would argue that the fact that the field is not moving towards convergence does not augur well for the establishment of a cumulative tradition in the field.

4. What Future for the IS Field?

Given the danger of possible usurpation of the research issues in the IS field by more established disciplines, it is imperative that a research agenda which would help IS progress towards maturity becomes a reality. The first step in this process, that of recognising the problems in IS is addressed by research which discusses the problems facing IS, which was one aim of this paper. But mere acknowledgement of these problems or exhortation to researchers to do better research is not sufficient

Further research, perhaps of a more conceptual nature, must determine a desirable future for IS and how to achieve it. Some researchers have seen the solution in terms of deriving a specific paradigm for IS [21, 65, 69]. However, Banville and Landry [6] present powerful arguments to question whether such a paradigm is feasible, or, even, desirable. It is therefore unclear whether the volatile character of the boundaries of IS has positive or negative effects on IS research. As mentioned earlier, many researchers view the pluralistic flexibility of the IS field as a significant advantage [15, 19], while Culnan and Swanson [17] have pointed out the advantages, such as economies of communication among researchers, which would arise from the establishment of a stable IS discipline.

These internal contradictions regarding the future of IS suggest that looking at the history of other sciences could be helpful. Previous research which has focused on the emergence and evolution of disciplines has stressed the importance of establishing

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an intellectual core around which progressive institutionalisation and professionalisation take place [cf. 25, 45]. The argument that the IS field will eventually achieve such a stable and credible identity if given enough time could be proposed. However, not all fields have taken several decades to achieve a distinct identity, and IS could use these as models. Loft [45] discusses the evolution of cost accounting, from establishing a clear intellectual core, rapidly creating its own identity through the establishment of professional associations to eventual institutionalisation, all in the space of a few years. Lee [44] proposes the study of architecture as potential model of non-positivist domain for IS.

Based on these examples, we argue that the overall solution for the future of the IS field involves more than the existence of a specific paradigm. The analysis of examples of other fields where the formal establishment of 'proven facts' is problematic must provide us with a model of progress for IS. In palaeontology for example, there is only so much that can be proven in a scientific (i.e. Popperian) sense. Like in IS, researchers must rely on their ability to interpret their findings as much as on their ability to collect data so as to make prehistoric bones speak for themselves - a task akin to making managers 'say' more than they know. This results in the volatility of the field as scientists take a very personal view of 'their' data. But, researchers in these 'non-exact' fields found other ways to achieve irreversible progress. They formed strong, permanent alliances, either across clusters or across disciplines with other groups of scientists who helped them establish crucial first principles (e.g. chemical content of soils, absolute dating of fossils, genetic classification of species, biostratigraphy of species). Scientists within these alliances benefited in their turn by gaining increased status and a wider recognition for their own clusters. Symbiotic alliances were thus created without any of the fields involved losing control over their methods or their research agenda, as each cluster preserved ownership of its conclusions. Taking this as a model of progress in 'non-exact' sciences, researchers in IS must work at establishing more solid foundations for the field and a consistent agenda for research.

However, the biggest problem for IS may arise through the inertia of some researchers who, content or complacent with the current situation, would adopt an Augustinian outlook on this issue, that is, maturity, but not yet.

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