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Research in Information Systems: A Study of Diversity and Inter-Disciplinary Discourse in the AIS Basket Journals between 1995 and 2011

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Abstract

The paper investigates how Information Systems (IS) has emerged as the product of inter-disciplinary discourses. The research aim in this study is to better understand diversity in IS research, and the extent to which the diversity of discourse expanded and contracted from 1995 to 2011. Methodologically, we apply a combined citations/co-citations analysis based on the eight Association for Information Systems (AIS) basket journals and the 22 subject-field classification framework provided by the Association of Business Schools (ABS). Our findings suggest that IS is in a state of continuous interaction and competition with other disciplines. General Management was reduced from a dominant position as a reference discipline in IS at the expense of a growing variety of other discourses including Business Strategy, Marketing, and Ethics and Governance among others. Over time, IS as a field moved from the periphery to a central position during its discursive formation. This supports the notion of IS as a fluid discipline dynamically embracing a diverse range of adjacent reference disciplines, whilst keeping a degree of continuing interaction with them. Understanding where IS is currently at allows us to better understand and propose fruitful avenues for its development in both academia and practice.

Keywords

Information Systems Journals; Disciplines; Citation Analysis; Co-citation Analysis; Information Systems Research; Reference Discipline; Abbott; Foucault

1. INTRODUCTION

Information Systems (IS) is a relatively young field that has developed into a major body of knowledge and spread in many different ways over recent decades. The prime focus of IS is to understand and improve how socio-technical systems comprising technical and human components or sub-systems gather, process and present data, information and knowledge to users, particularly in the context of an organisational workplace. According to Hassan and Will (2006), the IS community seems consensual in accepting that there are key problems the field addresses which are distinct from any other discipline. A number of studies have defined and mapped different elements of IS knowledge that academics and practitioners use in their work (Baskerville & Myers, 2002; Benbasat & Barki, 2007; Benbasat & Zmud, 2003; Chen & Hirschheim, 2004; Dwivedi & Kuljis, 2008; Klein & Hirschheim, 2008). These proposals reflect an interest of many to seek a firm disciplinary definition of IS in terms of core and boundary knowledge elements (Baskerville, Lyytinen, Sambamurthy, & Straub, 2010; Somers, 2010). To other community members there is an inherent risk in this attempt as any definition can be exclusive and potentially detrimental to the diversity of the contributing groups that form the IS community and to the fluidity of the discipline (Bryant, 2008; Introna, 2003; Oesterle et al., 2010; Paul, 2008). In the multi-disciplinary IS field borrowing of knowledge is a common method, as solutions to problems are created by drawing on theories and treatments that may have not originated in IS (Daft & Lewin, 2008). However, in this constant migration of ideas across fields, the IS field may lack some degree of originality (Wade, Biehl, & Kim, 2006), and IS may not serve as a strong reference discipline for other fields (Hansen, Lyytinen, & Markus, 2006). Consequently, some question if IS is on the right path to develop into a mature and lasting inter-disciplinary field (Hassan & Will, 2006).

Not helping the development of IS are recent debates in journals like the European Journal of Information Systems (EJIS) about the inclusion (or exclusion) of design science oriented articles (Baskerville, et al., 2010; Oesterle, et al., 2010). This debate reflects an internal competition and self-justification in IS, which the well known sociologist Baumann (1992) sees as a symptom of disciplines with a flawed discourse. Building on Baumann, Bryant (2008) extends this view and states that we need another perspective of IS, which accepts a fluid and contingent notion of a discipline where well defined boundaries are neither helpful nor desirable.

The two positions above do little to recognise how IS has been both stable and fluent at different times. It is necessary to crystallise this development in order to draw lessons from where IS has been and where it could go next. To this aim, we use Abbott's ideas on disciplines (1988, 2001) to analyse the dynamics of IS article citations and co-citations in the eight AIS basket journals (Saunders et al., 2007) from 1995 to 2011. The AIS basket are the top IS journals and influence the work of many academics and practitioners worldwide. We explore the expansion and contraction of discourse within these IS journals, and seek to highlight the role of IS in an attempt to clarify the discursive formations originally raised by Foucault (1972). By doing so, we move away from highlighting discourse in the knowledge objects themselves and, thus, do not attempt a content analysis. We abstract IS's sources into subject fields and investigate their sizes and inter-connected structure which may in turn lead to the rules of discursive formations that help and are also needed to better understand IS within the dynamic context of social science disciplines (Abbott, 2001). This understanding could allow us to define avenues for future development in both academia and practice.

Our findings suggest that IS is indeed in continuous interaction and competition with other disciplines, with General Management slowly losing its dominant position as the reference discipline at the expense of a growing variety of others such as Business Strategy, Marketing, Social Sciences, and Ethics and Governance. This view would enable IS academics and practitioners to formulate strategies to keep ownership over certain domains of problems whilst continuing to expand and make their knowledge relevant to other disciplines. By considering how the disciplines position themselves within the co-citation networks, we see how IS moves from the periphery in the early period into the centre of the network in the late period. This now places IS in an ideal position, where members of IS from the centre interact to embrace a diverse range of problems, concepts, and theories, which are

pulled from and pushed back to a variety of adjacent reference disciplines. Currently there seems no danger to IS from Wiegand's central metaphor stating that any discipline can be trapped in its own discursive formation (Wiegand, 1999). However, as we perceive a highly dynamic inter-disciplinary discourse within IS, academics and practitioners need to be wary when groups seek to define unity in IS with specific or "obvious" and well-defined objects and configurations. This may obscure the importance of IS in a wider and dynamic system of disciplines, and thus limit inter-disciplinary visibility of IS in research and practice, as well as stifling the exploration of new themes and areas of work.

The article is structured as follows. First we revisit current views on the status and nature of IS as a discipline, and develop our research aim further with three research questions. We also briefly present Abbott's and Foucault's ideas and how they inform this study. This is followed by our methodology section and findings. Lastly we discuss the results regarding the IS discipline and its dynamic inter-disciplinary discourse, and conclude by drawing a number of implications, which we see as relevant for the characterisation of IS and its next steps.

2. THEORETICAL BACKGROUND

2.1. The Nature of Information Systems

Many internal advocates claim that within IS there is already a sufficient set of 'core' and 'real' knowledge elements (i.e. topics, concepts and phenomena) that can be considered unique and as such IS has become mature enough to become a reference discipline for others (Baskerville & Myers, 2002; Benbasat & Zmud, 2003). Related work attempts to code the body of IS knowledge by distilling published work (Hirschheim, Iivari, & Klein, 2004). By doing so, different distinct areas of IS competence, such as IS application or IS development knowledge among others, have been characterized. Calls are being made to structure the knowledge elements into reference frameworks with coherent sets of ideals and themes, which can be offered to several audiences inside or outside IS practitioners, students or academics. It is argued that these attempts, including the discussion of boundaries, can make the work of IS people more valuable and relevant (Hassan, 2006).

A contrasting perspective acknowledges the variety of other disciplines which extensively engage with IS, leading to profound difficulties in defining unique discourse with a clear set of unique knowledge elements (Bryant, 2008; Somers, 2010). Within this diversity IS can draw on a range of epistemological views and access means to acquire and understand IS related phenomena (Chen & Hirschheim, 2004; Orlikowski & Baroudi, 1991; Vessey, Ramesh, & Glass, 2002). Advocates of this perspective consider that key to a healthy development of IS is the degree of permeability (fluidity, flexibility and variety) allowing IS to take or give knowledge to other disciplines (Bryant, 2008). The taking refers to borrowing concepts from other disciplines while recognizing the underlying constraints and debates in their fields. These concepts can then be adapted to unique IS matters and may then be returned or pushed back to the fields.

An intermediate position between stability and fluidity is currently emerging in the IS discourse in which the focus is shifted from the end goal (achieving a recognised discipline) to the *processes* that underlie its development. Within this position proposals have been made to emphasise the visibility of IS obtained by focusing on salient results as a way of legitimising IS activity within a wider and dynamic market of ideas (Lyytinen & King, 2004); the continuous formation of communities of practice to enable better communication and sharing of knowledge between IS groups (Klein & Hirschheim, 2008); and the acknowledgement that IS can be both stable and dynamic at different periods of time (Córdoba, Pilkington, & Bernroider, 2012). This intermediate position requires an in-depth study of how IS knowledge is the by product of discipline interaction, and how such interaction influences our understanding of what IS is/should be about. This will also offer insights as to what can be done in the future in IS research and practice.

2.2. Discipline Development

To understand how disciplines develop and can be organised, we now turn our attention to the ideas of Foucault regarding discursive formations (Foucault, 1972) and the work of Abbott on knowledge disciplines (Abbott, 1988, 2001). Both sociologists provide insightful perspectives on how scientific knowledge evolves and how disciplines are established around it. Foucault provides a background against which scientific knowledge is organised and 'ordered' into different discourses in Western societies (Foucault, 1972). The act of disciplining involves the development of both knowledge elements together with the practices, norms, power relations and ethical narratives that make them valid and acceptable. To Foucault, the study of knowledge is the study of how its subjects (individual and collective) have become what they are today (Foucault, 1982). Foucault's view emphasizes "discursive formation" to distinguish one field of study from another (Foucault, 1972) by characterizing the discursive practice itself instead of specific forms, objects and their distributions or distances to each other. His research project is also an invitation to decipher how subjects can become 'otherwise' from their historically contingent formations that affect how they think and what they can do (Foucault, 1984).

Following Foucault, it can be said that while scholars of a discipline need not agree on the specific manifestations related to scope of content and methodologies, they need to have a common disciplinary subject matter. Hence, discursive formation can be seen as a meta-theoretical dimension of a field that cannot be pluralistic, without for example, necessarily prohibiting methodological pluralism one level below. In this regard, Hasan and Will (2006) have shown that IS has built a single system of formation and thereby meets Foucault's first threshold of positivity, which a discipline in development needs to pass to be externally accepted. This essentially means that IS can stand on its own and is distinguishable from other disciplines. It remains to be answered whether IS has also passed the second threshold of epistemologization, when 1) IS builds on interaction with other disciplines in order to generate new and 'proprietary' IS knowledge and 2) IS exercises a dominant function over knowledge and is able to validate its norms through verification and coherence.

From a slightly different but equally compelling perspective, the sociologist Abbott is interested in exploring the dynamic of knowledge disciplines in both academic and practical settings. His work involves two studies, one in professions (1988) and one in social science disciplines (2001). Both disciplines and professions are bodies of knowledge which co-exist dynamically in wider cultural and social systems. A discipline according to Abbott is an abstract set of knowledge distinctions which is used by both academics and practitioners to formulate and address specific problems in society. Disciplines contribute to the formation of an abstract societal knowledge system and in doing so they fulfill a dual role: They educate and certify future discipline professionals, and contribute to improve the knowledge system by providing more relevant and adequate knowledge distinctions in the form of diagnoses, treatments and inferences (Abbott, 1988). The fulfillment of this role also ensures that disciplines gain and maintain legitimacy through time.

The development of knowledge within a discipline is dynamic and interactional. Disciplines have some axis of cohesion (or central principles) which result in the laying of claims to a particular set of problems and the translation of other disciplines' own claims to be contested and refuted. By laying and maintaining claims, disciplines aim to protect the territory of problems they work on as well as gaining new ground. The knowledge development process is characterized by continuous differentiations, competitions and absorptions between knowledge distinctions - for instance between sociology and economics, between information systems and computer science, or between qualitative and quantitative approaches to research within a particular discipline (Abbott, 2001). In his later study and referring specifically to academic disciplines Abbott (2001) calls this process 'settlement' and describes it as a type of 'amoebas with pseudo pods' activity which involves alliances, mergers and splits between groups. These activities are continuously fuelled by the existing schemes, rituals, norms and strategies of career progression within a discipline that also include making knowledge portable as well as producing more 'pure' (discipline based) knowledge. For Abbott, both the portability of knowledge as well as its purity can help a discipline exert power over others and hence

maintain or expand its territories. However excessive portability or regression can also lead a discipline to lose territory at the expense of other disciplines. The overall system of disciplines in society has relevant knowledge being re-organised and rediscovered under the continuous illusion of 'scientific progress' within and between disciplines (Abbott, 2001).

Whilst Foucault is more interested in the process of internal 'disciplining' and hence in studying how discursive formations generate the 'truth' about subjects in a particular aspect of their lives, Abbott is interested in how disciplines unfold both internally and in interaction with others, so that we as practitioners of knowledge acknowledge our role and potential consequences of our work. In this regard, both of these theoretical perspectives aim to unveil how people can see themselves. In this study, within a background of IS being in the process of forming its own discourse, we aim to investigate how IS has unfolded dynamically and in particular how it has interacted with other disciplines. This will enable a better understanding of how and why IS has become what it is today and provide some orientations and reflections about the future of stability and fluidity in the field.

2.3. Research Questions

With the ideas above, we can now investigate discursive formation of the IS field not purely linearly, but as continuous and multifarious stages of expansion, stabilisation and/or contraction based on both internal consolidation as well as inter-field linkages. Abbott (1988, 2001) argues that a discipline consolidates knowledge about its problems, treatments and inferences by making them simple to grasp and use, portable, and therefore accessible to others. In this sense we anticipate a constant exchange where IS borrows from other disciplines, but such borrowing results in the creation and further development of knowledge that IS can claim as its own (Hassan & Will, 2006). However, this is not a stable state of affairs because by doing so a discipline can lose jurisdiction over areas it previously occupied (Abbott, 1988, 2001), leading to the re-arrangement of knowledge formations. Based on an emerging perspective of IS that incorporates dynamic interchanges with reference disciplines, we set out to explore the following:

1) What are the reference disciplines that together dynamically represent the IS research body of knowledge ?

2) What are the most active inter-disciplinary links, and how does inter-action affect or is affected by IS?

3) What can we learn about stability and fluidity in consideration of where IS has been and where it could go next?

To answer these questions we intentionally move away from seeking unity of discourse in the knowledge objects themselves. We do not seek to define a set of themes or concepts that belong to IS in an attempt to justify its existence. Instead we investigate a process of continuous interaction with other disciplines and how these constitute IS.

3. RESEARCH METHODOLOGY

3.1. Approach

Following the ideas from Foucault and Abbott, we interpret co-citations as connections between knowledge fields through time periods, representing the formation of the IS discourse as a whole. These connections are formed by individuals using the knowledge from different disciplines (both academics and practitioners) in order to address relevant problems. These connections change through time. In our study we describe IS as composed of three different time periods. We conceive of the connections as graph-like structures (networks) that can be made social network analysis methods (e.g. Freeman, 1977; Hanneman & Riddle, 2005).

We applied three different measures of centrality of field within a network. First, we use "degree centrality" (DC) which specifies the number of direct connections a field has in relation to all possible

connections. A field with a high level of DC effectively functions as *hub* and is a strong inter-disciplinary connector. Second, we use betweenness centrality (BC), which is calculated as the fraction of shortest paths between field pairs that pass through the field of interest. It is a measure of a field's influence over the spread of knowledge through the network, and, thus, captures the field's general importance as a knowledge *broker*. Third, we consider closeness centrality (CC) as an inverse distance measure of a field based on shortest paths to all other fields. It is calculated by its inverse sum of its distances to all other fields. Hence, a high CC reflects how fast knowledge can spread from the field of interest to all other fields. Fields with a high CC are *monitors* as they also have the best visibility of what is happening in the overall network.

These measures can be combined with theoretical interpretations to see how the IS space has lost or gained jurisdiction (Abbott, 2001):

- *Initial settlement for jurisdiction*. We interpret this as a position where IS has established a firm standing and a stable set of connections but some other fields compete with IS for jurisdiction over certain elements. This should be seen by having strong reference fields in central positions which connect other fields, and control knowledge flow. These can be shown by the centrality measures (DC, BC, CC). The result of differentiation within IS and to other disciplines might be the gaining of some degree of ownership of a particular set of problems. However, this differentiation needs further refinement as disciplines might be getting a foothold on a domain of problems, but need 'complete' ownership by filling the gaps in knowledge taxonomies (problem diagnoses, treatments or inferences) (Abbott, 1988).
- *Gaining jurisdiction* is interpreted as an increase of connection (number of links) and centrality (DC, BC, CC) occupied by a field compared to a previous period. The gain of jurisdiction can be seen as an absorption of knowledge from other disciplines which are 'losing out'. Our thesis is that an increased centrality of IS and a strengthening of its connections means that its knowledge gains internal relevance and exposure, which enables it to dispute other disciplines' ownership (jurisdiction) over particular problems.
- On the other hand, a shrinking of the space occupied by a field in terms of connections (number of links), together with growing degrees of internal connection indicates a potential *loss of jurisdiction*. In this case a field becomes either too internally differentiated or too absorbed in itself. Whilst such an observation could mean that IS is in the process of consolidating some key internal knowledge, it can also be seen as a potential sign that such knowledge becomes less relevant for pressing problems, allowing substitute disciplines to take over the vacated space. Possible reasons for this could be that there is a technological disruption of which IS has little knowledge; or other disciplines have better formulation of existing problems, diagnoses and treatments ; or it fails to align with the demands of IS authors career progression(Abbott, 1988, 2001) .

To consider these views we investigate inter-linked and dynamic knowledge formations to understand how they relate to each other to give a holistic view of IS. This requires a hybrid approach combining citation/co-citation analysis and a classification study.

3.2. Citation and Co-Citation Analysis

To identify knowledge distinctions and their connections we use a combination of bibliographic citation and co-citation analyses of eight major IS journals deemed as excellent outlets by publishers of the Association of Information Systems (AIS) (Saunders, et al., 2007). By using citation and co-citation analyses, we aim to re-interpret the knowledge published by these top IS outlets, and intentionally include all the work they publish to see how knowledge distinctions and connections

unfold into the formations and structures of IS research. Citation analysis relies on the idea that a heavily cited article will have exerted a greater influence on a subject than those less frequently referenced (Culnan, 1986; Sharplin & Mabry, 1985). On a critical note, citations may also signal political biases, alliances and omissions, and, especially, seminal studies may function as "concept labels" used to motivate a single statement or research question (Hansen, et al., 2006). Authors' citations can also be interpreted as a reflection of the different power relations that surround a field, giving an indication to what becomes 'real' in the discourses of a field (Foucault, 1980). According to White and Griffith (1990), citation analysis represents "the field's view of itself", which fits our research aim to focus on the fields and their relations that have unfolded through time. We are thus not concerned about, for example, particular power-relations between authors as representatives of 'true' discourses, and examine field properties (growth, usefulness) rather than its published content. A concern about citations is how to weight the different elements identified (Garfield, 1979). In our study, we have weighted the citations to allow each journal and period to have equal impact. We deemed this necessary to account for the fact that articles in later periods achiever lower citation impact ratings and because IS journals seem to have certain preferences. For example, MIS Quarterly (MISQ) is seen as U.S. and wider North American centred, and the European Journal of Information Systems (EJIS) is widely used as a publication outlet by European based (together with Australasia) authors (Dwivedi & Kuljis, 2008).

Citation analysis alone does not show the structure of ideas in a field as such (Leong, 1989); neither does it show how knowledge distinctions are interconnected, or if there are gaps in knowledge that could be addressed. However, *co-citation analysis* helps us to map connections between the articles identified in a citation analysis. Specifically, a co-citation is the frequency of two publications being cited together (Small, 1973). These connections also represent relationships in the knowledge structure of a discipline and as such is well suited to investigate at the 'macro-level' how intellectual structure evolves (White, 1990). Once publications and their co-citations are measured, and in our case aggregated into subject fields, tools can be used to graphically plot co-field relationships, see how different fields relate, the strength of the relationships, and how central a a position a particular field occupies, so giving an idea of the network of fields (IS included). In reporting the relationships represented within co-citations, many approaches can be used to identify implicit dimensions. For example, factor analysis was used by Pilkington and Meredith (2009) to identify that the most cited articles in operations management could be fitted to twelve groups and so the field repeatedly covers these topics. Alternatively, multi-dimensional scaling (MDS) has been used and examples include Ramos-Rodriguez and Ruiz-Navarro (2004) and Hoffman and Holbrook (1993) who use this approach to represent the structural knowledge of the strategic management and consumer research disciplines. Another approach is to utilize network analysis tools to represent the information and also develop measures that allow comparisons between different networks (in different disciplines or from alternative sources) and the roles of the nodes (authors or articles) themselves. These techniques have been employed to examine the development of a range of disciplines, including service operations and technology management (Pilkington & Chai, 2008; Pilkington & Teichert, 2006).

Time periods.

To identify the dynamics of interactions between disciplines, we divided our analysis into three periods: EARLY (1995-2000); MIDDLE (2001-2006); and LATE (2007-2011). This gives sufficient data to present meaningful results, and is driven by the data availability constraints of journal. We were wary of producing too large segregations which would hide changes by amalgamating over too long a period. We found little guidance in the literature on how to divide citation data to track changes, with ranges from 1 to 10 years being common (Biehl, Kim, & Wade, 2006; Kim, Savage, Howey, & Van Hoof, 2009; Leydesdorff & Zhou, 2005; Pieters, Baumgartner, Vermunt, & Bijmolt, 1999; Pilkington & Teichert, 2006; Shibata, Kajikawa, Takeda, Sakata, & Matsushima, 2011). These periods allow us to identify and contrast IS discourse formation differences and see how interactions

with other disciplines have expanded, contracted or changed. This illustrates the context in which IS has established itself as a genuine field as well as its influences.

To consolidate the citations into their source fields we labeled all the references from the source journals (see Section 3.4.). We were then able to map their co-citations into subject fields. Following Pilkington and Meredith (2009) we then displayed the results graphically using the techniques developed for social network analysis (Scott, 1994; Wasserman & Faust, 1994), which allow us to show connections between fields and their strength. The resulting diagrams were produced using NETDRAW part of the UCINET SNA package (Borgatti, Everett, & Freeman, 2002), a standard tool for graph mapping. The figures show the links in the co-citation matrix and are produced by first reducing all the co-citation values to binary zeros and ones, with the strength of the links added later in the form of line thicknesses. Node positions on the diagrams result from a spring-based algorithm developed by Kamada and Kawai (1989), which iteratively reduces the stress in the graph from co-locating unconnected nodes together, by trying alternative node positions. This way fields that are often co-cited with each other appear close together and have thicker lines joining them.

3.3. Data Source

Our data, and the norm for citation and co-citation studies, were drawn from the ISI social science citations index (SSCI) which contains source article information and the reference lists. Specifically, we captured the basket of eight IS journals deemed as “excellent” by the Association of Information Systems (AIS) (Saunders, et al., 2007). To analyse IS, the journals need to be closely associated with the IS community, and not part of management, computer science or any other discipline. The list is internationally oriented and an attempt at establishing a top journal set for the IS field, evening the score with other business disciplines. As such we believe the work published in the IS basket journals can be seen as reflecting the core body of knowledge within the IS field, and is thus a defined data source for investigating how the IS field developed as a whole.

Table 1 shows statistical information about the eight AIS listed journals studied. The oldest is MIS Quarterly, while the the youngest was JAIS established in 2000 with nine issues in a year and is the only journal not featuring in our early analysis period (1995 and 2000). All eight journals for the other periods: middle (between 2001 and 2006) and late (2007-2011). The data contained 4,077 source papers making 198,703 citations to 185,624 different publications.

Table 1. Statistical Information on the AIS Journal Basket

Journal	Year Initiated	Avg. No. Issues/Yr	Avg. No. Article /Issue	Avg. No. Refs/Article
Journal of Information Technology (JIT)	1986	4.0	8.1	37.3
European Journal of Information Systems (EJIS)	1992	4.7	8.2	46.0
Information Systems Journal (ISJ)	1991	4.5	5.0	45.7
Information Systems Research (ISR)	1990	4.0	7.3	49.6
Journal of AIS (JAIS)	2000	9.0	3.0	67.9
Journal of MIS (JMIS)	1984	4.0	10.9	53.3
MIS Quarterly (MISQ)	1977	4.0	8.2	39.2
Journal of Strategic Information Systems (JSIS)	1992	4.0	5.5	43.7

Some care is required to standardize inconsistencies in ISI data, including converting to a consistent format and checking different spellings and abbreviations of names, journal and book titles, as well as book editions. To try and reduce these inconsistencies as much as possible we adopted a process of manually checking and re-checking ranked frequency tables of separate and combined data fields, and using complex search and replace routines to generate standardized records. For example,

MIS Quarterly (MISQ) has several entries including "MIS Q" and "MIS QUART". The result is that our data contains the source article information - authors, titles, and keywords - cross-linked to standardized references. The level of information contained in the standardized references was: first author (with one initial), publication (journal or book title), and publication year. Due care was taken to double check that information was not amalgamated when removing an author's second initials and issue information. Standardization of different book editions into one single reference was accomplished using a similar frequency check approach.

3.4. Classification Approach

We needed a classification system that allows us to capture the field diversity in IS research and explore how this has evolved. This demands an inclusive and international system, as found in the current version 4 of the Association of Business School (ABS) Academic Journal Quality Guide (Harvey, Kelly, Morris, & Rowlinson, 2010). One main objective of the guide was to cover the wide range of fields and sub-fields that constitute business and management research, and clearly identifies information management and other fields. The ABS structure in Table A1 in the Appendix is therefore suitable as reference framework for our field impact analyses. We used this 22 field structure and the associated underlying 825 journals in version 4 (ABS 2010) to tag the references cited by the eight AIS basket journals with subject fields.

4. RESULTS

4.1. Citation Analysis

The work with the highest relevance for IS (according to citations) is shown in Table 2 which lists the top 25 most frequently cited publications among the eight AIS journals over the all years studied. Table 2 is ranked using values which give each journal and period an equal weight, and shows the way IS research is not exclusively IS focused and does indeed borrow ideas and compete with other disciplines. For example, note the readily transferable methodological means, such as case study research methods (Yin, 1984), principles of innovation diffusion (Rogers, 1995), or ideas to structure organizations (Hammer, 1990).

Figure 1 reports the distribution of the subject fields of the weighted citations according to the ABS classification. This diagram quantifies the degree of interaction with other disciplines. While IS (INFO MAN) dominates, we see notable contributions from other fields, most prominently General Management (GEN MAN). The figure shows the influence of General Management decreasing slightly over time, and it is exactly this shift in relationship our later work examines in more detail as we study changes in the co-citation networks and other statistics.

Table 2. Top 25 cited publications over all periods

Title	Citation	Citation Rate/ 10000 citations
Case study Research: Design and Methods	(Yin, 1994)	65.4
Diffusion of Innovation	(Rogers, 1995)	52.4
Perceived Usefulness, Perceived Ease of Use, and User Acceptance of IT	(Davis, 1989)	46.9
Building Theories from Case Study Research	(Eisenhardt, 1989)	44.4
Information Technology and the Structuring of Organizations	(Orlikowski & Robey, 1991)	44.3
Psychometric Theory	(Nunnally, 1978)	42.7
Information Systems Success: The Quest for the Dependent Variable	(DeLone & McLean, 1992)	38.2
Valuating Structural Equation Models with Unobservable Variables and Measurement Error.	(Fornell & Larcker, 1981)	37.1
Qualitative Data Analysis	(Miles & Huberman, 1994)	35.0
Competition in Global Industries	(Porter, 1986)	31.8
User Acceptance of Comp. Technology. A Comparison of Two Theoretical Models	(Davis & Bagozzi, 1989)	31.8
Multivariate Data Analysis	(Hair, Anderson, Tatham, & Black, 1998)	30.8
Reengineering the Corporation: A Manifesto for Business Revolution	(Hammer & Champy, 1993)	30.6
The Case Research Strategy in Studies of Information Systems	(Benbasat, Goldstein, & Mead, 1987)	29.8
Interpreting Information Systems in Organizations	(Walsham, 1993)	29.5
A Set of Principles for Conducting and Evaluating Interpretive Field Studies in IS	(Klein & Myers, 1999)	28.3
Electronic Markets and Electronic Hierarchies	(Malone, Yates, & Benjamin, 1987)	28.1
The Discovery of Grounded Theory: Strategies for Qualitative Research	(Glaser & Strauss, 1967)	26.9
Systems Thinking, Systems Practice	(Checkland, 1981)	26.2
Management Strategies for Information Technology	(Earl, 1989)	25.7
An Instrument to Measure the Perceptions of Adopting an IT Innovation	(Moore & Benbasat, 1991)	25.0
Process Innovation: Reengineering Work through IT	(Davenport, 1993)	25.0
The Constitution of Society	(Giddens, 1984)	24.7
Power, Politics, and MIS Implementation	(Marcus, 1983)	24.2
Competitive Strategy	(Porter, 1980)	24.2

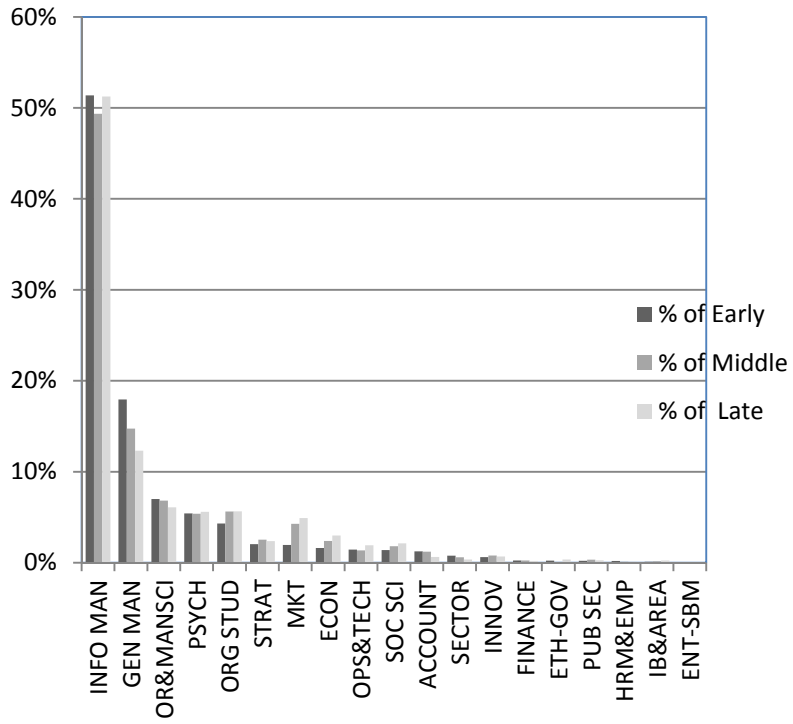

Figure 1. Contribution of Journals from each ABS Field over the Periods

Table 3 shows how the citations are distributed across the fields and periods. About 50% of all cited work was published in IS journals (INFO MAN), with General Management (GEN MAN) in second place with almost 15%. This is followed by eight subject fields with between 1% and 7% of the citations.

Table 3. Distribution of all Citations over Fields

Subject Fields	% of Citations	Rank	Mean Age of Cit.	Mean Age of Source	% of Total in Early	% of Total in Middle	% of Total in Late
INFO MAN	50.64%	1	7.7	6.5	51.0%	48.8%	51.8%
GEN MAN	14.57%	2	12.0	7.6	18.2%	15.3%	12.2%
OR&MANSCI	7.10%	3	11.2	7.4	7.4%	7.4%	6.3%
PSYCH	6.30%	4	15.8	6.8	6.4%	5.8%	6.4%
ORG STUD	5.47%	5	11.8	6.3	4.6%	6.0%	5.6%
MKT	4.38%	6	13.2	4.8	2.2%	4.7%	5.4%
ECON	2.61%	7	18.4	5.0	1.6%	2.8%	3.1%
STRAT	2.24%	8	10.0	6.0	2.0%	2.6%	2.2%
SOC SCI	1.86%	9	19.2	5.7	1.4%	1.8%	2.1%
OPS&TECH	1.57%	10	6.8	5.3	1.4%	1.4%	1.9%
ACCOUNT	0.95%	11	11.2	8.2	1.3%	1.1%	0.6%
INNOV	0.69%	12	14.8	6.4	0.6%	0.8%	0.7%
SECTOR	0.56%	13	7.6	9.2	0.8%	0.6%	0.3%
PUB SEC	0.24%	14	14.9	6.0	0.2%	0.3%	0.3%
ETH-GOV	0.24%	15	7.8	4.3	0.2%	0.1%	0.4%
FINANCE	0.23%	16	19.4	5.9	0.2%	0.3%	0.2%
IB&AREA	0.17%	17	10.3	4.4	0.1%	0.1%	0.2%
HRM&EMP	0.12%	18	14.5	6.7	0.2%	0.1%	0.1%
ENT-SBM	0.05%	19	9.0	8.7	0.1%	0.1%	0.0%
Total	100%			6.6	100%	100%	100%

Figure 2 is a Z-chart of change in subject field importance measured by number of citations. While the importance of some fields remained essentially unchanged through the periods, it is interesting to see the dynamic fluctuations in other fields. IS (INFO MAN) showed a marked decrease from the early to middle period, but regained the ground in the late period as the discipline claims more jurisdiction. The space occupied by the main external reference discipline General Management (GEN MAN) declined over the two periods. This suggests that General Management ideas are either acquired or become less important to IS. Other notable changes that maybe connected with new jurisdictions are seen in the inflow of knowledge from Marketing (MKT), where field-specific problems and information driven solutions, for example in social media marketing, have been readily combined. It is interesting to see that both the soft focused Social Science (SOC SCI) and the harder Economics (ECON) fields gained in both periods, suggesting a move on two fronts. The growth for Organizations Studies (ORG STUD) from early to middle is not maintained in the second period, possibly as a consequence of jurisdiction establishment by IS. This can also be seen in Strategy (STRAT). The decline in Operations Research and Management Science (OR&MANSCI) is probably not significant as it is offset by an increase in Operations and Technology Management (OPS&TECH) as this field itself has become more established. Of note is the way new ideas for inter-disciplinary

discourses have recently emerged, e.g., manifested by incorporating more knowledge from Ethics and Governance (ETH-GOV) , and International Business and Area Studies (IB&AREA) in IS research (Mingers & Walsham, 2010).

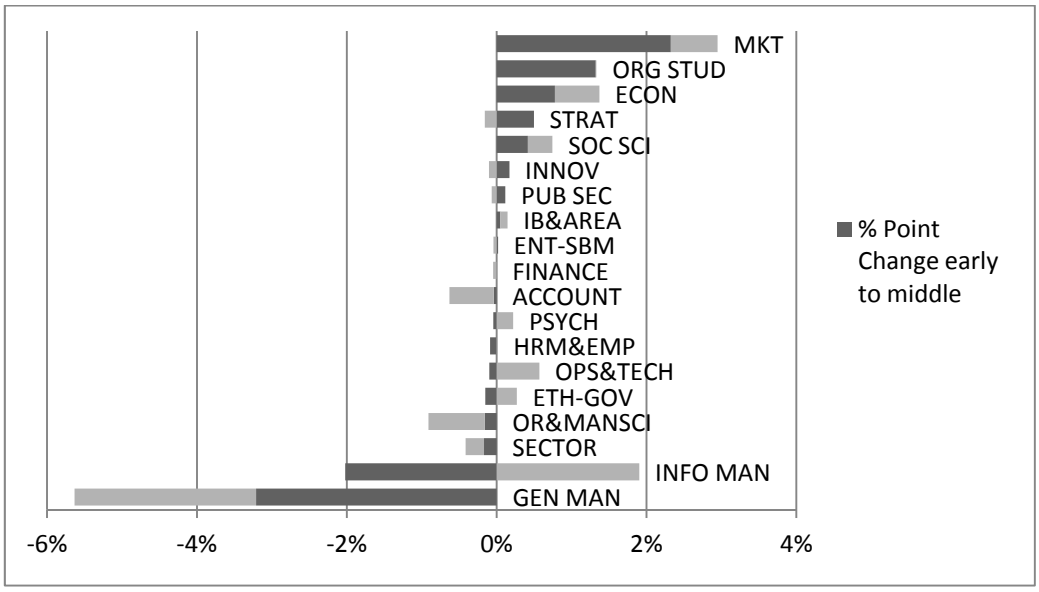

Figure 2. Percentage Point Change in Citations by Field over the Periods

4.2. Co-citations Analysis: All periods

With a general idea about subject field relevance to IS above, we now examine the knowledge structures in the networks of co-citations. Table 4 gives an overview of subject field importance based on co-citations across all time periods and ranked by the total number of links per ABS subject field, as shown in column 2. It is not surprising that the IS field (INFO MAN) ranks first with almost 6 million co-citation links. However, IS references account for only 52.5% of the total number of links published in the AIS basket journals. The number of fields column tells how many fields a field is connected to. A co-citation link indicates a connection within a common set of problems, treatments, claims or points of foci and can be inter as well as intra discipline. Most active fields with at least 1% of total links exhibit such relations with almost all fields in the list. This is confirmed by the centrality measures in the final three columns of Table 4, which are consistently high for those fields. We will discuss the underlying dynamics in more detail as we examine each period seperately.

Table 4. Co-Citation Statistical Information of IS on ABS Subject Fields for all Periods

Subject Fields	Total No. of Links	% Total No. of Links	No. of Fields Connected with	Degree Centrality (DC)	Betweenness Centrality (BC)	Closeness Centrality (CC)
INFO MAN	5,967,453	52.5%	17	100.00	1.35	100.00
GEN MAN	1,708,382	15.0%	17	100.00	1.35	100.00
OR&MANSCI	912,429	8.0%	17	100.00	1.35	100.00
ORG STUD	816,390	7.2%	17	100.00	1.35	100.00
PSYCH	448,077	3.9%	17	100.00	1.35	100.00
MKT	401,336	3.5%	17	100.00	1.35	100.00
STRAT	386,556	3.4%	16	94.44	0.90	94.44
SOC SCI	230,749	2.0%	17	100.00	1.35	100.00
ECON	158,332	1.4%	16	94.44	0.90	94.44
INNOV	129,541	1.1%	16	94.44	0.77	94.44
OPS&TECH	112,285	1.0%	16	94.44	0.90	94.44
ACCOUNT	49,488	0.4%	16	94.44	0.77	94.44
PUB SEC	16,846	0.1%	12	72.22	0.00	77.27
FINANCE	8,363	0.1%	12	72.22	0.00	80.95
SECTOR	8,338	0.1%	12	72.22	0.00	77.27
IB&AREA	5,964	0.1%	12	72.22	0.00	77.27
ETH-GOV	5,433	0.0%	11	66.67	0.00	73.91
		100.00%				

4.3. Co-citation analysis: The EARLY period 1995 to 2000

The IS early period of 1995-2000 seen in Figure 3 and Table 5 shows its *initial* settlement of *jurisdiction* where the field has differentiated itself from associate disciplines. There is a close relationship between IS (INFO MAN) and General Management (GEN MAN) and to a lesser degree with Operations Research and Management Science (OR&MANSCI). We see that IS presents just under 50% of the space in terms of linkages in its own body of knowledge compared to well over 30% taken by the next two . The top three fields in the network also achieve the highest centrality scores and equally function as knowledge hubs, brokers and monitors.

However, gaining this initial jurisdiction was fragile given the peripheral position of IS in the network, as IS is shielded from many other fields which were well connected to the competitors General Management, and Operations Research and Management Science. So these two fields not only score almost a third of linkages in the early body of knowledge cited in IS journals, but also have a relatively strong influence over what connections are or are not established to the IS field. Less important fields in the early period, marked as peripheral players in the network, are Ethics and Governance (ETH-GOV), Finance, and Public Sector Policy, Management and Administration (PUB SEC). These three fields only connect to a sub-set of possible fields (between 5 and 10) and show no role as information brokers. There is some variety in the mid-range, with relatively low interaction levels but good centrality especially in terms of their roles as hubs (high DC) and monitors (high CC). These positions are ideal for gaining more importance in IS in future periods by providing new problems, treatments or inferences. For example, Business Strategy (STRAT) includes the exploration of whether and to what extent IT/IS contributes to the strategic objectives of an organisation (McFarlan, 1984; Porter & Millar, 1985). Similarly, linking into Marketing (MKT), IS research made use of their model for assessing service quality (Parasuraman, Zeithaml, & Berry, 1985). Although existing topics from other disciplines are sometimes revisited in this period, IS research seems to add new views, generating the need to look into human and technology relations in more detail.

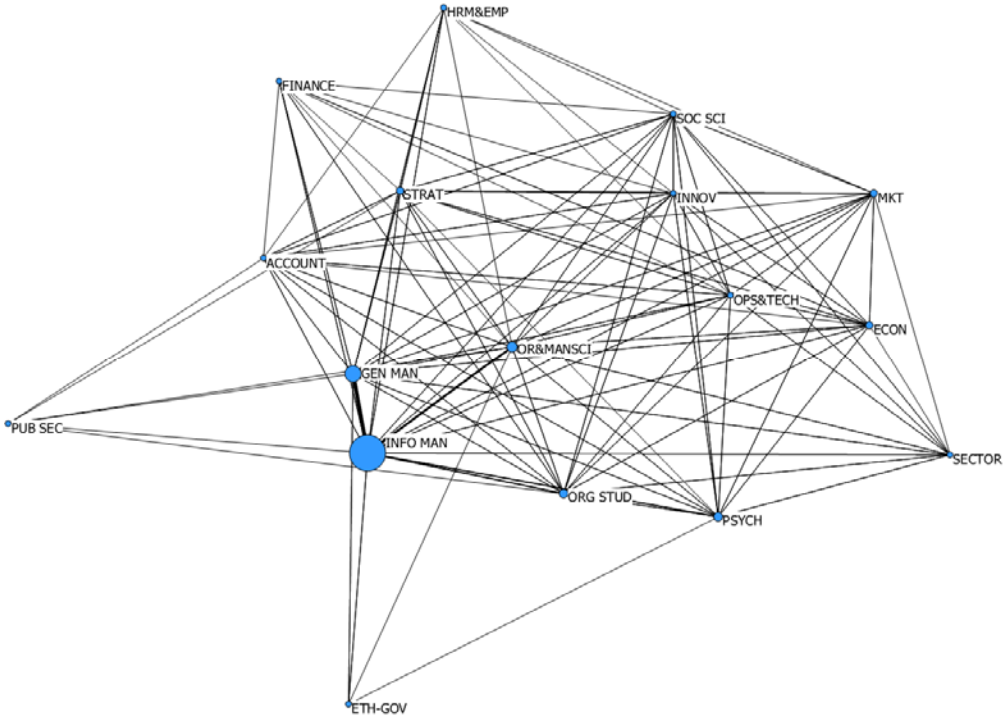

Figure 3. Co-Citation Graph of Subject Fields (EARLY: 95-00)

Table 5. Co-Citation Statistical Information on ABS Subject Fields (EARLY: 95-00)

Subject Fields	Total No. of Links	% Total No. of Links	No. of Fields	Degree Centrality (DC)	Betweenness Centrality (BC)	Closeness Centrality (CC)
INFO MAN	526,770	49.53%	17	100.00	3.99	100.00
GEN MAN	233,783	21.98%	17	100.00	3.99	100.00
OR&MANSCI	100,002	9.40%	17	100.00	3.99	100.00
ORG STUD	57,398	5.40%	15	88.24	1.51	89.47
PSYCH	38,850	3.65%	14	82.35	1.46	85.00
MKT	22,825	2.15%	14	82.35	0.45	85.00
OPS&TECH	19,461	1.83%	15	88.24	0.74	89.47
STRAT	16,654	1.57%	15	88.24	1.56	89.47
SOC SCI	13,992	1.32%	15	88.24	0.74	89.47
ACCOUNT	10,005	0.94%	15	88.24	1.56	89.47
INNOV	9,436	0.89%	15	88.24	0.74	89.47
ECON	6,795	0.64%	14	82.35	0.35	85.00
SECTOR	3,573	0.34%	11	64.71	0.00	73.91
IB&AREA	1,527	0.14%	10	58.82	0.00	70.83
PUB SEC	1,178	0.11%	5	35.29	0.00	60.71
FINANCE	944	0.09%	10	64.71	0.00	73.91
ETH-GOV	267	0.03%	5	29.41	0.00	58.62
		100%				

4.4. Co-citation analysis: The MIDDLE period 2001 to 2006

Within the second period we see new idea sources brought into IS from more diverse fields than before (see Figure 4 and Table 6). The body of knowledge has become less integrated and more inter-disciplinary, with a relatively lower level of space occupied by the most important pair: IS (INFO MAN) and General Management (GEN MAN). Previously less present fields, such as Organization Studies (ORG STUD) Innovation (INNOV) and Business Strategy (STRAT), have now become greater contributors. Consequently, we see a relative *loss of jurisdiction* of IS in comparison to the previous time period. New competitors from a wider list of subjects have appeared claiming jurisdiction (territory) over problems and solutions related to IS. The network statistics show that a strong middle ground has emerged with many fields working as inter-disciplinary connectors and knowledge hubs (high levels of DC). Most notably, Social Sciences (SOC SCI) and Organization Studies (ORG STUD) score high centrality on all three measures (DC, BC, CC).

This situation can be a sign of a greater level of internal differentiation and competition within IS (Córdoba, et al., 2012) in which competing knowledge distinctions appear to contest the ground gained by similar ones (for example interpretive and critical research IS in relation to positivist IS research). The IS field is still located towards the outer edge of the figure, meaning that IS is still relatively isolated from relevant problems. It could be that IS and its influential authors became too absorbed into generating or disputing about 'pure' IS knowledge production, which left the discipline open to attack by others. This struggle is, however, natural to the development of disciplines, and also includes communication and learning through internal competition as IS evolved.

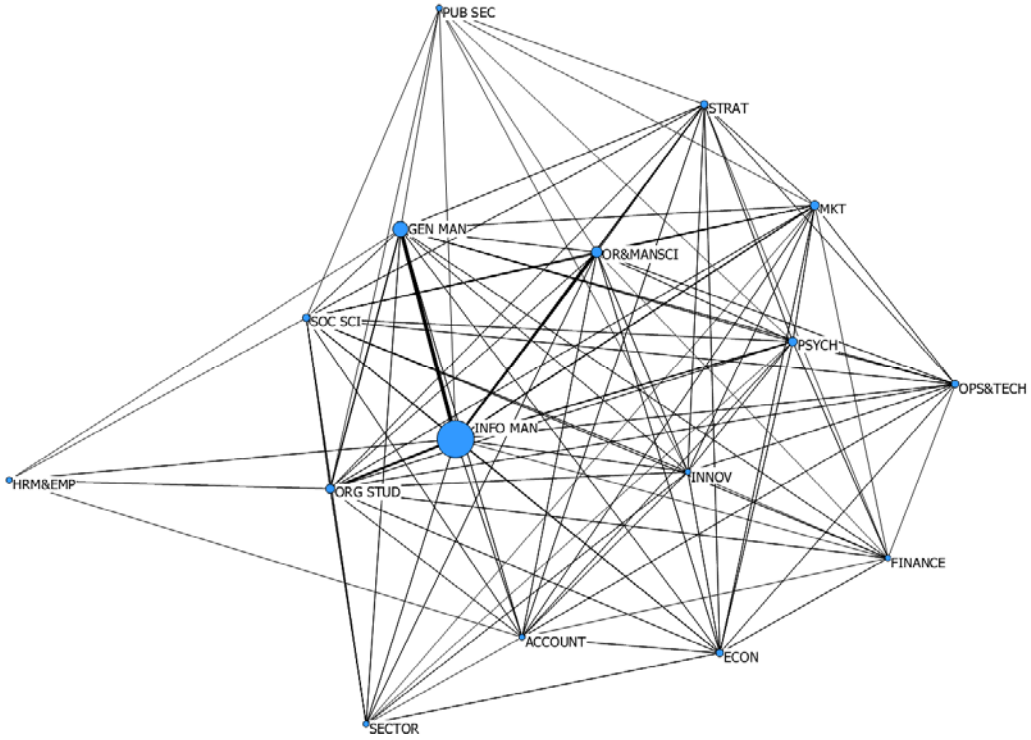

Figure 4. Co-Citation Graph of Subject Fields (MIDDLE: 01-06)

Table 6. Co-Citation Statistical Information on ABS Subject Fields (MIDDLE: 01-06)

Subject Fields	Total No. of Links	% Total No. of Links	No. of Fields	Degree Centrality (DC)	Betweenness Centrality (BC)	Closeness Centrality (CC)
INFO MAN	466,929	46.29%	17	100.00	2.23	100.00
GEN MAN	179,445	17.79%	16	94.44	2.23	94.44
OR&MANSCI	92,859	9.21%	15	88.89	0.58	89.47
ORG STUD	82,777	8.21%	17	100.00	2.23	100.00
STRAT	41,902	4.15%	14	83.33	0.29	85.00
PSYCH	37,272	3.70%	15	88.89	0.58	89.47
MKT	35,890	3.56%	15	88.89	0.58	89.47
SOC SCI	19,191	1.90%	16	94.44	2.23	94.44
ECON	15,629	1.55%	14	83.33	0.20	85.00
INNOV	14,166	1.40%	15	88.89	0.58	89.47
OPS&TECH	10,111	1.00%	13	77.78	0.00	80.95
ACCOUNT	8,271	0.82%	15	88.89	1.67	89.47
SECTOR	2,670	0.26%	11	66.67	0.00	73.91
FINANCE	1,071	0.11%	13	77.78	0.00	80.95
PUB SEC	278	0.03%	10	61.11	0.00	70.83
IB&AREA	130	0.01%	5	33.33	0.00	58.62
ETH-GOV	72	0.01%	2	16.67	0.00	53.13
		100%				

4.5. Co-citation analysis: The LATE period 2007 to 2011

The co-citation structure for the late period shown in Figure 5 shows that IS is now dominant in the centre of the network whilst also occupying more space by attracting an increased share of links (see Table 7). This is both a gain of, and an opportunity to gain, jurisdiction. The influence of General Management (GEN MAN) is clearly reduced and almost half the level observed in the early period. There is a healthy level of competition with a group of highly inter-connected fields forming a ring around the IS field. A strong and integrated core is formed with General Management (GEN MAN), Operations Research and Management Science (OR&MANSCI), Organization Studies (ORG STUD), and Social Sciences (SOC SCI), which now function as brokers through which many ideas move from other subject fields into IS. These fields all have the maximum centrality scores in this period. Similarly, most other disciplines have moved closer to the centre (higher CC). Thus, as monitors they effectively "view" what is happening in IS and knowledge can spread fast through the resulting short channels, from which diverse collaborations with IS are most likely to spring. For example, pulled from Innovation and Technology Change Management (INNOV), IS uses the diffusion of innovations (Rogers, 1995; Rogers, 1962) theory to inform IS success (DeLone & McLean, 1992, 2003), and thus synthesises and absorbing previous frameworks.

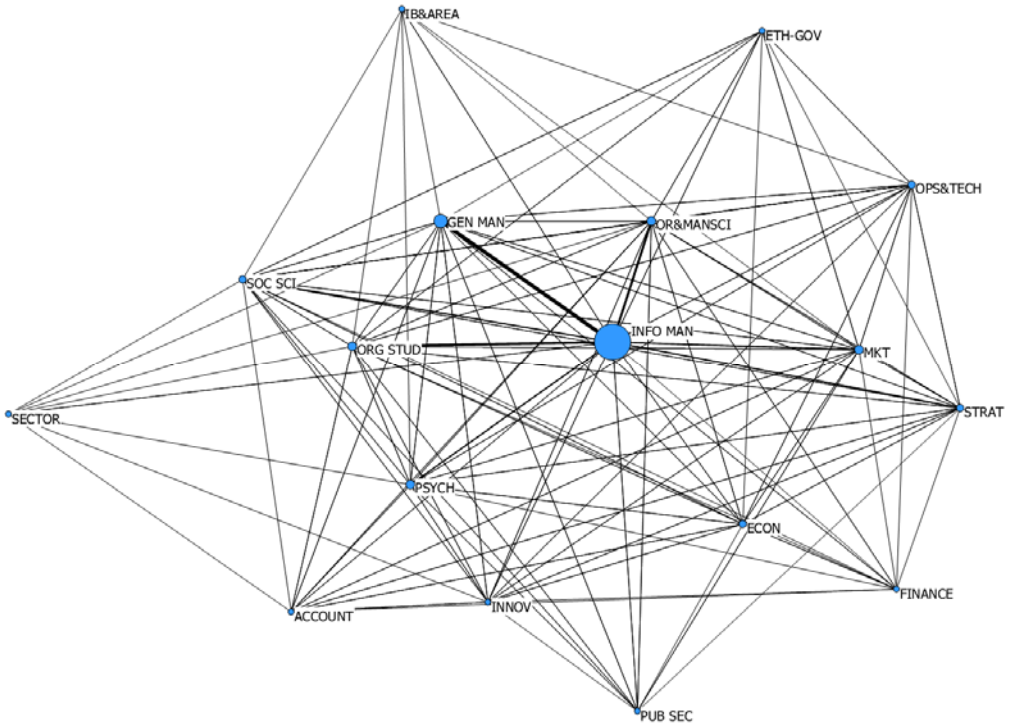

Figure 5. Co-Citation Graph of Subject Fields (LATE: 07-11)

Table 7. Co-Citation Statistical Information on ABS Subject Fields (LATE: 07-11)

Subject Fields	Total No. of Links	% Total No. of Links	No. of Fields	Degree Centrality (DC)	Betweenness Centrality (BC)	Closeness Centrality (CC)
INFO MAN	4,973,772	53.52%	17	100.00	1.99	100.00
GEN MAN	1,295,154	13.94%	17	100.00	1.99	100.00
OR&MANSCI	719,569	7.74%	17	100.00	1.99	100.00
ORG STUD	676,224	7.28%	17	100.00	1.99	100.00
PSYCH	371,956	4.00%	16	94.12	1.39	94.44
MKT	342,621	3.69%	16	94.12	1.25	94.44
STRAT	328,000	3.53%	15	88.24	0.65	89.47
SOC SCI	197,567	2.13%	17	100.00	1.99	100.00
ECON	135,909	1.46%	15	88.24	0.65	89.47
INNOV	105,939	1.14%	15	88.24	0.77	89.47
OPS&TECH	82,712	0.89%	14	82.35	0.64	85.00
ACCOUNT	31,212	0.34%	13	76.47	0.33	80.95
PUB SEC	15,394	0.17%	11	64.71	0.00	73.91
FINANCE	6,347	0.07%	12	76.47	0.06	80.95
ETH-GOV	5,166	0.06%	9	58.82	0.00	70.83
IB&AREA	4,307	0.05%	8	52.94	0.00	68.00
SECTOR	2,095	0.02%	8	52.94	0.00	68.00
		100%				

5. DISCUSSION

As a result of IS focusing on the introduction and use of socio-technical systems from various perspectives, it has a multi-disciplinary tradition and nature. In relation to the perspectives about IS presented earlier in the paper, the following discussion aims to further our understanding about the continuous and multifarious expansions and contractions of reference disciplines within the IS body of knowledge. We say that there is no doubt IS has moved closer to Foucault's second threshold of epistemologization by gaining and maintaining a dominant function over knowledge while building on interaction with other disciplines. Its future, however, would depend on how (senior) IS researchers allow constant exchanges to evolve in the next decades.

Regarding what we present as inter-disciplinary, our findings clearly show strong inter-disciplinary interaction levels in IS which, according to Abbott (2001), is a manifestation of competition for settlement. The space occupied within the IS body of knowledge, as measured by published work in top IS journals (the AIS basket of eight), is indeed shared equally between IS and the other collaborating disciplines. While the 50% share of IS references does not significantly change over time, there is a considerable amount of dynamic exchange observable through linkages with and between other subject fields. By focusing on the exchanges between subject fields and not on what constitutes legitimate methods and research directions, we move away from the flawed discursive formation often reported in IS (Bryant, 2008). As such there are a number of implications for research and practice that we can draw:

A. The most active and largest reference discipline (with declining importance) is General Management, which clearly outranks Operations Research and Management Science; Organization Studies, and Psychology. Co-citation data shows the less dominant position of General Management over time was substituted by a wider list of smaller contributors with growing in importance. Marketing and Business Strategy now belong to those collaborators, as well as Social Science, which now occupies an optimum position to control the spread of knowledge in the network aside from IS.
B. Despite general tendencies of disciplinary advocacy, the overall levels of inter-discipline connectivity and interaction within the AIS basked journals increased over time. After a relatively fragile IS state and jurisdiction in the EARLY period, we perceived a loss of jurisdiction in the MIDDLE stage followed by a gaining of jurisdiction in the LATE stage. In the late period, the field of IS has established itself in the centre of a well integrated collaboration network, which is the ideal position to build upon terms and models from various inter-disciplinary discourses. Most reference disciplines can now attach themselves directly to the IS field, proposing new problems and theories that IS may return with added richness. Again following Abbott (2001), these high levels of interaction and knowledge portability may support IS to maintain or expand its territories. IS knowledge may also have become more portable so that newcomers can use IS terms and models more safely (Benbasat & Barki, 2007). To understand the specific role of the IS field in the disciplinary discourse formation of other bodies of knowledge, such as General Management, would however, require further work.
C. We perceive IS research as being clearly the result of inter-disciplinary work. The purpose of IS to investigate the adoption and usage of socio-technical systems on different levels of analysis (from the individual, the organization, and the society and economy as a whole) can best be tackled through joint efforts where participants from two or more already established disciplines interact or compete to solve associated research problems. As a multi-disciplinary field, IS needs to maintain its ability to collaborate and synthesize all the discourses of reference disciplines (Hassan & Will, 2006). Any attempts by IS scholars to permanently draw lines or boundaries between disciplines could prove counter-productive towards strengthening IS, and may even endanger the unique formation that IS, according to Foucault (1972), needs to establish to grow to a firm (inter-)discipline that can continue to develop.

However, this is not to say that fluidity is to be privileged. According to Abbott (2001), inter-disciplinary work is and always will be present, but its excessive orientation to problem solving is not conducive to create enduring or self-producing communities, unless there is a strong clientele (practical audience) that continuously requires it. IS should think carefully about what it is learning about inter-disciplinarity as a cyclical activity; to continuously review the main principles of the discipline in the light of these interactions, and to promote interactions that enable the field to maintain its strong connections whilst developing new ones. In the light of the ideas of Abbott and Foucault, this should signal the importance of educating future IS practitioners as members of a field in continuous development, in which stability gives us opportunities to pause, map where we are and decide individually where to go next, whilst fluidity enables us the opportunity to engage with other disciplines and become the people we want to become.

The possibilities above can also be seen in the context of IS as a diverse and fluid discipline which is continuously re-aligning. We draw our conclusions on the basis of over 4 thousand papers, almost 200 thousand citations and 6 million co-citations from journals seen as the key IS outlets by the IS community itself. These journals have adopted similar rules and mechanisms, formats and guidelines. By looking, however, at the diversity of the citations and co-citations, the IS field shows a level of discourse among disciplines that may not be found in many other places. While there is some level of consolidation and absorption within IS, e.g. in technology acceptance and fit related areas (Córdoba, et al., 2012), this also means that fluidity, flexibility and variety within IS will remain essential virtues for its future development.

6. CONCLUDING REMARKS

In this study of IS as a discipline we aimed to understand the dynamics of interdisciplinary knowledge exchange. Using the work of Abbott on disciplines and how they unfold plus the background of Foucault's (1972) discursive formations, we have employed a citation and co-citation analysis of eight key IS journals (the extended AIS basket) to distinguish certain IS knowledge features . From this analysis, it can be said that overall the multi-disciplinary and hybrid nature of the developing IS discipline remains visible over time as it equally shares its discourses with inputs from non-IS disciplines, and as a discipline has established different levels of jurisdiction over time. Some of the collaborating disciplines, in particular the most important reference discipline General Management, have vacated space for others to occupy, emerge and expand. Others (e.g. Social Sciences, Marketing and Economics) increased their importance as reference disciplines whilst some have (re)emerged (e.g. Ethics and Governance). This show us that IS continues to explore how to ameliorate its key purposes, which to many is the effective and efficient introduction of information technologies into the organizational workplace.

In more detail, our insights indicate that inter-disciplinary discourse in IS has gone through stages of expansion and contraction in its quest for jurisdiction and legitimacy. This paper does not serve those who are interested in seeing IS as a discipline with core elements and properties. We sought to highlight that IS is in constant exchange with other disciplines, and this should be preserved as a ‘core’ market of ideas, as other authors have suggested. Despite good intentions, any normative or prescriptive formalization to control IS diversity by senior researchers in IS, e.g. the recent memorandum on design science (Oesterle, et al., 2010) may hinder the next stage of fluid development in IS and damage its level of permeability (Bryant, 2008). At the same time, excessive interaction for the sake of fluidity without reflection might leave IS in a fragile state of needing to continually prove its worth to other disciplines.

From our findings, we suggest some strategies to nurture diversity in IS. In order to maintain as well as extend IS jurisdiction on organizational issues related to the adoption of systems and technologies in organizations, connections between research disciplines should be maintained and further developed. Dialogue should be nurtured and maintained in areas that have been explored, as well as in areas that remain unexplored. Our study confirms that as a body of knowledge, IS is in need of continuous consolidation as well as differentiation. The door is open to continue developing IS and

to continue studying problems, from various viewpoints, of IS adoption in organizations and elsewhere. We hope our paper makes a valuable contribution to show where IS has been and where it may go next.

6.1. Limitations

Four main limitations of our study are acknowledged. First, our study is based on analysing citations and the strength of co-citations from a selected list of top IS journals (provided by the AIS basket) only, and so may fail to fully reflect both the content and activities of the whole IS community. By using this approach we may have missed other connections between articles, and hence between subject fields, which some IS researchers might find relevant to consider in mapping the dynamic disciplinary discourse with IS. Also, by focusing on the IS research body, we did not explore the dynamics of the other disciplines (e.g. General Management) and their associated sub disciplines. Consequently, we cannot show the role of the IS field in the discourse within their bodies of knowledge. The changes in connections between IS and these could also be attributed to the unfolding of their own research bodies and cycles of differentiation, competition and absorption. A point identified by Abbott (2001).

Second, we attempted a field impact study based on an existing classification (the ABS journal list) and did not conduct a full content study. Despite the comprehensive nature and internationally coverage of the ABS list, many publications could not be classified because of the journal only focus. However, ABS is widely accepted, particularly in the UK, as a guide for authors and assessors as to range and related subject areas of recognised journals within business and management. Whilst we appreciate there are many texts and a few journals in our data which we were not able to classify using the ABS list, we are happy that it does enable an exploration of the fields and their interplay over time in the IS discipline. We are not concerned here with a content analysis of the data, but wish to study the antecedents and fluid changes in influence on IS, and so the adoption of a journal based list is sufficient.

Third, our interpretation of expansion and extraction has required us to assume that some groups in the IS body of knowledge have prevailed over others. It might well be that there were other reasons for this: groups could have become less prominent through time due to activity not reflected in IS journals, or by retiring from active research. Also, current environmental changes, like the spread of internet based technologies or current legal concerns, could have created a short term spike in new collaborations.

And finally, our choice of periods may well have affected the positioning and structure of the diagrams we present. These issues are faced by any study trying to represent such a large and rich set of data, and there is no set pattern or justification beyond using that which makes the data accessible (Biehl, et al., 2006; Leydesdorff & Zhou, 2005; Pilkington & Teichert, 2006).

7. APPENDIX

Table A1. Subject Fields from the ABS Journal Quality Guide 2010 (Harvey, et al., 2010)

Subject Fields	Subjects Covered
ACCOUNT	Accounting (incl. Auditing and Taxation)
BUS HIST	Business History (incl. specialist views on management, firms, industries and employees)
ECON	Economics (incl. various sub-divisions)
ENT-SMBUS	Entrepreneurship and Small Business
ETH-GOV	Ethics and Governance
FINANCE	Finance (incl. insurance and actuarial journals)
GEN MAN	General Management (considered as „heartland“ of business and management studies)
HRM&EMP	Human Resource Management and Employment Studies
IB&AREA	International Business and Area Studies.
INNOV	Innovation and technology change management
INFO MAN	Information Management and Systems (covering studies in IS, IT, and information processes)
MGT&ED	Management and Education (incl. career, employee and management development)
MKT	Marketing (incl. advertising and related sub-fields)
ORG STUD	Organization Studies
PSYCH	Psychology (not comprehensive because related to business and management)
OR&MANSCI	Operations Research and Management Science
OPS&TECH	Operations and Technology Management
PUB SEC	Public sector policy, management and administration
SECTOR	Sector Studies (covers health, education, arts, not-for-profit, engineering and other fields of management practice, also related to both services and manufacturing sectors)
SOC SCI	Social Sciences (not comprehensive because related to business and management)
STRAT	Business Strategy
TOUR-HOSP	Tourism and Hospitality Management

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