

2000

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## Recommended Citation

Newell, Sue and Galliers, Robert D., "More than a Footnote: The Perils of Multidisciplinary Research Collaboration" (2000). *AMCIS 2000 Proceedings*. 304.

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# More than a Footnote: The Perils of Multidisciplinary Research Collaboration

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## Abstract

This paper considers the espoused reasons for the recent emphasis on multidisciplinary research, drawing on some of the literature on multi-functional networking and team-working in industry. We critique the predominately prescriptive and overly simplistic accounts of multidisciplinary working in academia. Finally, we distinguish between interdisciplinary and multidisciplinary research and consider the implications of our analysis in terms of encouraging the former, particularly in the Information Systems domain.

**Key words:** Multidisciplinary research; interdisciplinary research; Information Systems research; team-working; networking; boundary spanning; innovation; research policy.

## Introduction

Individual researchers working alone in their ivory tower are largely a thing of the past. Instead, academics are being encouraged to work in collaborative, often multidisciplinary teams (much like the teams working in the R & D departments of firms). For example, research funding bodies increasingly specify interdisciplinary collaboration as desirable in funding initiatives.<sup>1</sup> This is certainly the case in Management research, but will resonate with Information Systems (IS) researchers as well given, *inter alia*, the nature of the phenomena we study and our varied disciplinary backgrounds. As noted by Knights and Wilmott (1997; 9): “The hype surrounding interdisciplinary research in management has grown dramatically over the last decade. Hardly a research initiative ... appears without making some claim to support or offer an interdisciplinary approach”. This emphasis is to be expected in such academic communities as Management and Information Systems. In IS, for example, we have long accepted our roots in so-called Reference Disciplines such as Computer Science, Management Science and Organization Science, and more latterly, Sociology and Ethnography. Moreover, the fact that those working in the

IS academic community have such varied disciplinary backgrounds (Galliers, *et al.*, 1997) would suggest that multidisciplinary research would be natural.

Despite being increasingly prevalent, university research networks have received relatively little attention in the literature. “Databases are searched in vain for evidence of articles that explicitly present or discuss interdisciplinary management research” (Knights and Wilmott, 1997; 9). There is some literature on business-university networking (e.g. Bonaccorsi & Piccaluga, 1994; Tushman, 1979), but very little empirical work on university research collaboration across disciplines *per se*. There is an extensive literature on industrial collaboration. (e.g. Dodgson & Rothwell, 1994); however, university research networks have unique characteristics and deserve study in their own right. For example, industry ‘recipes’ in higher education are likely to be quite different to those found in other industries (Spender, 1989).

## The Espoused Benefits of Multidisciplinary Research

In IS, research exists to create and develop new ideas and then to diffuse them, typically to both practitioner and academic audiences. Essentially, the argument for encouraging multidisciplinary research is that such collaboration will lead to more creativity and wider diffusion compared to working within single disciplines. This can be considered from a number of different perspectives:

**Boundary spanning:** The argument is that individuals who engage in boundary spanning activities (Tushman & Scanlon, 1981) help to introduce new ideas into a particular community. Without such boundary spanning activity a community (whether an individual organization or an academic discipline) will become insular and will be unlikely to generate creative solutions.

**Innovation:** This literature also highlights the importance of multidisciplinary and cross-functional collaboration. Thus, innovation can be defined as ‘*the development and implementation of new ideas by people who over time engage in transactions with others in an institutional context*’ (Van de Ven, 1986). This definition encompasses the central processes of innovation (development, diffusion and implementation) and is consistent with a social

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<sup>1</sup> For example, the recent ‘Future of Work’ or ‘Priority Network’ programs announced by the Economic and Social Research Council in the UK.

constructionist perspective, i.e. that innovation is inextricably located in complex patterns of social activity which are embedded within particular institutional contexts and communities of practice (Weick & Roberts, 1993; Brown & Duguid, 1991). This suggests that innovation needs to be seen as an *interactive* process - one which involves a diverse range of actors with different backgrounds, cutting across organizational boundaries, combining skills, artefacts, knowledge and experiences in new ways. This interaction is achieved through creating and maintaining networking relationships (Rothwell, 1994).

**Knowledge Management:** The distinction is made in the knowledge management literature between exploitation and exploration (Nonaka, 1994). *Exploitation* of knowledge may prevent reinventing solutions that already exist. This is only possible in similar situations such that explicit knowledge can be transferred between two communities who can understand and make use of it. This requires at least some common beliefs and values and is thus likely to be limited to knowledge sharing within functional or disciplinary boundaries. *Exploration* of knowledge is more likely where individuals from different backgrounds share knowledge, both tacit and explicit, so that new understandings are developed which provide the basis for creativity (Nonaka, 1994). Thus, the important role of social networks and social 'communities' has been stressed (Aldrich & Glinow, 1992; Freeman & Barley, 1990), with emphasis on cross-functional or multidisciplinary collaboration within such communities.

**Mode 1 versus Mode 2:** Similarly, Gibbons (1995) differentiates between Mode 1 and Mode 2 knowledge production. He argues that the key to successful knowledge production is encouraging transdisciplinary learning and problem-solving ('Mode 2'), rather than single discipline ('Mode 1') learning.<sup>2</sup>

## Cracks in the Multidisciplinary Mien

### **Multidisciplinary Collaboration and Team-working:**

The assumption, then, is that multidisciplinary collaboration can lead to positive sum gains. In other words, that the partners can obtain mutual benefits not achievable by working within their respective disciplines. While the difficulties of achieving this collaboration are often acknowledged, they are typically identified almost as a footnote, with the suggestion that putting in place integration mechanisms is sufficient (e.g. Grandori & Soda, 1995). Recently, however, there has been acknowledgement that the difficulties of collaboration have

been under-emphasised. Dodgson (1994), for example, argues that the negative implications of inter-organizational collaboration are often discounted. Similarly, Granstrand and Sjolander (1994) point to the difficulties of conducting multi-disciplinary R & D, caused for example by conflicts between professional sub-cultures and the 'Not Invented Here' syndrome. Chesbrough and Teece, (1996; 64) conclude that: "After many years of studying the relationships between organization and innovation, we believe the virtues of being virtual have been oversold".<sup>3</sup> Such negative implications of collaboration should not surprise us, since the literature on team-working has long demonstrated the negative as well as the positive effects of such arrangements. Despite these difficulties, however, cross-functional team-working within organizations is often portrayed as key to creativity and success for firms in this day and age (Bolwijn & Kumpe, 1990). Such arguments build on the long tradition in psychological research which demonstrates how team-working *can* create, through synergy, ideas which go beyond what any single individual could have produced alone (Hall, 1971).

The literature on team-working, however, also emphasises problems of developing and sustaining collaborative working - problems which are frequently overlooked in prescriptive accounts of the benefits of cross functional/disciplinary working. This literature dates back to early work by Ringelmann (1913) who found that for some tasks there was a reduction in individual effort as the number of people engaged in a collaborative task increased. This is sometimes referred to as 'social loafing' and has been found to be more common where individual contribution to the team effort can be less easily identified (Latene, *et al.*, 1979). Other team-working problems include conformity and obedience (Milgram, 1963), groupthink (Janis, 1982), and risky shift or group polarization (Kogan & Wallace, 1967). Thus, while working in teams can potentially create synergies, it can also produce outputs which are worse than could have been produced by competent individual team members (Hoffman & Maier, 1961; Hackman, 1990).

**An Empirical Example: Competency Trust:** The above literature alerts us to the fact that there may be potential problems, as well as advantages, in carrying out effective multidisciplinary academic research. An empirical example tends to confirm the point. Newell and Swan (1998) observed a publically funded multidisciplinary research team over its three year duration. They were interested in how trust developed during the project and considered how effective the research team was in creating and diffusing new ideas. The research team comprised eight academics from different backgrounds working in three

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<sup>2</sup> There is also, within the systems literature, the related idea that holistic thinking is more productive and robust than thinking from a unitary perspective (e.g. Checkland, 1981).

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<sup>3</sup> Here, virtual refers to working in multi-functional teams using inter-organizational networking relationships.

different institutions, geographically separated by 300 miles. More importantly, they had very different epistemological orientations, some taking a highly positivist approach while others adopted a phenomenological perspective. Newell and Swan argue that the result of having such very different philosophical positions was that the individuals could not develop trust in each others' competence. This is neatly summarised in a quote from one of those involved: "I find it vastly frustrating that ... research approaches which appear to me to be naïve and unworkable are vigorously promoted".

Deteriorating competency trust could occur because it may have been initially inferred on the basis of reputation, rather than direct knowledge (Sako, 1992). In this case, the research team put together a proposal with little direct knowledge of each others' work. Once the joint research actually started, however, this inferred competency trust was 'put to the test'. To understand and appreciate someone else's abilities and orientations when they are very different to one's own takes considerable time and effort. The problem appeared to be that, given the different backgrounds and perspectives, those involved spent insufficient time in the early phases of negotiations (Ring & Van de Ven, 1994). Their original intention had been to hold regular (monthly) face-to-face meetings. However, busy work schedules meant that this proved difficult and meetings became less frequent than originally anticipated. Instead, the team quickly came to rely on email for communication. While this medium is convenient and easy to use, it does not allow the rich communication necessary for achieving the level of integration needed where joint knowledge production is the objective (Grandori & Soda, 1995; Jarvenpaa & Leidner, 2000). In particular, given the multidisciplinary nature of the research team, there was a need, especially early on, to share knowledge in order to achieve some common understanding of each others' perspectives. Nonaka (1994) refers to the need for 'redundancy' in knowledge creation. Redundancy implies that some knowledge must be possessed by individuals within a knowledge creation network even if they do not regularly need it because it allows them to make sense of the knowledge of others (Weick, 1990). Where individuals from a single discipline are working together, such redundancy is more likely to pre-exist. Where a research project brings together individuals from different disciplines, this redundancy will have to be established through media-rich communication, especially face-to-face meetings.

In this particular case, the research was essentially divided up into three relatively independent components rather than being conducted as a single, unified team: a federated rather than a unified approach was adopted. This meant that those from different disciplines could work independently without having to negotiate with those with whom they could not agree about such fundamentals as

analytical approaches. Conflict was effectively avoided (not resolved) in this way. In retrospect, those involved suggested that, were they to collaborate with other academics in the future, they would first make sure that they fully understood the others' perspectives: "One lesson I have learnt from this experience is that, before engaging again in a collaborative project, I would read at least three papers written by the intended partner." As a result, the knowledge created by the research team was actually a compromise, being less creative than could have been achieved had those involved been able to work with others who had a similar orientation (Newell & Swan, 1998). This outcome mirrors the conclusion formed by Burgoyne, *et al.* (1997): because of 'the varied epistemological preferences of the members of the research team ... tension was good-naturedly resolved with a 'bit of each' ... However, the cost of this compromise may have been a degree of fragmentation and fudging in the collective conceptual approach" (*ibid.*; 48).

**Interdisciplinary versus Multidisciplinary Research:** Knights and Wilmott (1997; 21), based on a consideration of the problems of integration within multidisciplinary research teams, concluded that: "we are less than optimistic about the prospects of interdisciplinary research and teaching in management". They argue that the most common response to the various pressures of pursuing interdisciplinary research is one they refer to as 'mechanistic pooling'. Mechanistic pooling involves: "each member of the pool taking a different 'slice' of ... the project and the work then proceeds with the minimum of communication between its members". They argue that this is the most common response because: "By activating this mode of reciprocal manipulation, no time is 'wasted' in confronting differences in theoretical perspective. In research 'teams', each member is able to maximize publication output in journals that cater for their particular specialism. Everyone is happy, including the funding body that can count the multiplicity of publications generated by such 'innovative' interdisciplinary projects" (*ibid.*; 19). This was certainly very apparent in the federated approach adopted by the research team observed by Newell and Swan (1998).

This mechanistic pooling response may be described as multidisciplinary research rather than interdisciplinary research (Burgoyne, 1994). While *multidisciplinary* research involves a group of individuals from different subject specialisms, there is no actual integration across these disciplines. The individuals can be described as the pieces of a *jigsaw puzzle*, where the pieces fit together but are not changed by being part of the puzzle. Conversely, *interdisciplinary* research depends on joint knowledge production, rather than separate subject-based knowledge production. It is meant to lead to new knowledge, combining the different disciplines – a *kaleidoscope*, where the different pieces interact to create new patterns, which

cannot be pre-determined by knowing what the individual pieces look like. There is thus an emergent and highly iterative quality to interdisciplinary work.

## Conclusions

Identifying potential problems that are likely to emerge with multidisciplinary research does not suggest that such research cannot be highly productive. Indeed, this paper is the result of what hopefully is considered to be a productive and creative collaboration. Rather, the analysis suggests that such research teams have unique requirements in terms of their management, in particular in relation to the role of funding bodies in terms of directing and monitoring research process. For example, in the UK, research is increasingly funded within the boundaries of predefined, managed programs. Funded research has to define and achieve specific user-relevant objectives and precise deliverables, and is controlled by tight reviews. While this may encourage research that is more focused on the needs and concerns of business, there may also be unintended consequences. A problem is that the approach used by many funding bodies is based on a rational scientific model of the research process, with increasing emphasis on tight control. However, a social constructivist analysis highlights the emergent and recursive nature of knowledge production, suggesting that much knowledge emerges through social action and interaction during the research process itself (Weick, 1990). This emergent quality of knowledge production is likely to be especially important in interdisciplinary research. Indeed, as we have seen, interdisciplinary research is encouraged precisely because of its supposed capacity to create new knowledge through combining existing knowledge in new and unanticipated ways. This means that to define tightly prescribed deliverables in advance may restrict the level of creativity that could otherwise emerge.

The forgoing analysis of problems associated with multidisciplinary research suggests a number of recommendations, both in terms of practice and policy:

### ***Practical recommendations for interdisciplinary research teams:***

- There is a need for those involved in collaborative research projects to understand the perspective and previous research of the others with whom they intend to work. Reliance on institutional or reputational inference is not sufficient. Rather, there is a need to read at least some of each others' published output so that competence trust is established and maintained.
- There is a need to recognize that conflict is likely when individuals from different backgrounds work together. Such conflict needs to be effectively managed. Essentially this means that conflict needs to be acknowledged and confronted, not ignored by adopting a federated approach.

- Informal, social integration mechanisms need to be recognized as essential, especially during the early negotiation phases of an interdisciplinary project in order to build up the required redundancy. Time needs to be found for regular face-to-face communication. While IT obviously has a role in facilitating communication across virtual teams, there is a need to recognize that these can impede the development of trust in an emerging research network.

### ***Policy Implications for Research Funding Bodies:***

- Given the emergent and highly iterative nature of interdisciplinary research, funding bodies need to actively encourage such research teams to deviate from pre-specified objectives and deliverables. This will allow for creative joint knowledge production, rather than mere mechanistic pooling.
- There is a need for a developmental review mechanism for interdisciplinary research, in place of the more traditional judgmental process. In particular, in the early phases of an interdisciplinary project, the review process should encourage the team to admit and discuss the emerging conflicts and identify how these are being resolved.
- More broadly, there is a need to find new mechanisms for rewarding interdisciplinary work within the academic community. For example, in the UK Research Assessment Exercise (RAE), where the research output of individuals and university departments is formally evaluated every 4-5 years, the RAE panels are currently divided by subject specialism. This means that interdisciplinary output tends to 'fall between' the various subject experts and is less highly valued as a consequence. A recommendation would be that RAE panels adopt a less functional approach. Rather, they should be encouraged to include members whose domain is naturally boundary spanning. IS academics may fill this role particularly well, given the multidisciplinary nature of the field, but are in fact totally absent from the Business and Management Studies Panel for all the preceding and forthcoming RAEs.

In conclusion, this paper suggests that interdisciplinary research has the potential to be highly creative and innovative, but only if certain barriers are overcome. Indeed, such research may easily deteriorate and result in less rather than more productive knowledge, with each individual working within the bounds of their own discipline and pooling knowledge mechanistically rather than creatively.

## Implications for the field of Information Systems

The lessons from this analysis need to be taken on board by members of the IS community in particular since even *within* the domain itself the problems of joint knowledge production may be problematic, given the 'broad church'

which IS represents. Thus, IS is itself a highly divergent field encompassing individuals with very divergent positions. This means that even *within* IS, collaboration may be difficult. For example, an academic with a computer science/software engineering perspective may find it extremely difficult to work with someone with broader organizational and societal interests, and *vice versa*, given their differing philosophical and epistemological stances. We should also take note of the differences in approach and underlying values in, for example, European as compared to North American IS journals. The paradox of parochialism in IS research as against the global nature of the phenomena we study has already been noted (Galliers, 1999). Understanding and taking action to overcome such problems is therefore imperative for the IS community, both working together and working with colleagues from other disciplines, if interdisciplinarity in IS is to succeed.

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