*Journal of Information Technology* (1993) **8**, 92–98

# Research issues in information systems*

R.D. GALLIERS
*Warwick Business School, University of Warwick, Coventry, England*

This paper sets out to give some indication of the key issues confronting information systems researchers as we move towards the millenium. The stance taken to the subject of information systems will be unashamedly managerial and organizational (as opposed to technical), and the issues covered relate to (1) the topic of Information Systems; (2) aspects of the topic that have been identified as being of key concern, and (3) the methods that we might usefully employ in undertaking this research.

## Introduction

Prior to raising a number of points for discussion regarding key information systems research issues, both from the perspective of those issues requiring further research and of those methods which seem to be most appropriate in undertaking that research, it is important first to introduce the subject of information systems itself. The stance taken towards the topic in this discussion paper is organizational and managerial, as opposed to technical. This is because of the very nature of information systems themselves, as will be argued below.

Too often, when discussing the topic of information systems, our attention is drawn towards the means of delivery, i.e. IT. While this is, of course, a key component of the topic, it is precisely that: a component only. It is because of this that this paper will concentrate more on what information is and what needs to be collected and made available, as opposed to how this may be achieved through the use of IT. In addition, attention will be focussed on management issues associated with the provision of effective information in organizations. This is achieved by reviewing those studies that have provided evidence as to the views of managers regarding the key issues they face in this context, and also by reviewing some of the research that is actually being undertaken. Through this comparison, a view can be formed as to the respective agendas of information systems managers and researchers.

## On information and information systems

When reflecting on the nature of information systems as a discipline, it is necessary to consider what it is we mean by the terms 'information' and 'systems'. Taking the former first, I define information as:

> *"... that collection of data, which, when presented in a particular manner and at an appropriate time, improves the knowledge [understanding] of the person receiving it in such a way that he/she is better able to undertake a [required] action or make a [required] decision."*
>
> (Galliers, 1987, p. 4)

Accepting this view of information leads us to the conclusion that it is best seen as being both enabling and contextual: enabling in the sense that it allows required decisions and actions to take place in an informed manner, and contextual in that data lose informatory quality if provided in support of different decisions and actions in different circumstances. This contrasts with the context-free nature of data which may be seen as the raw material from which information (meaning) may be attributed. (Galliers, 1987, 1991a, 1992a; Checkland and Scholes, 1990).

Paraphrasing Checkland and Scholes (1990, p. 55): from these considerations two consequences flow. Firstly, the boundary of an information system will always have to include the attribution of meaning and will consist of both data manipulation, which machines do well, and the transformation of data into information, which humans do well. Secondly, designing an information system will require explicit attention to the purposeful action or decision which it serves.

This argument is developed further by Land (1992) who reminds us that IT systems are but one means of supporting informed activity/decision making. An amended version of his model is depicted in Figure 1.

Zuboff (1988) points out that IT has the ability to 'informate' (as opposed simply to automate) business processes. Her view is that of IT being used to add value to business processes, providing them with a kind of emergent property: that of informating or 'generating information [data in my terms] about the underlying

* A previous version of this paper was prepared for a Research in Information Systems workshop at the Seventh Annual Conference of the Operations Management Association (UK), UMIST, Manchester, UK, 23–24 June 1992.

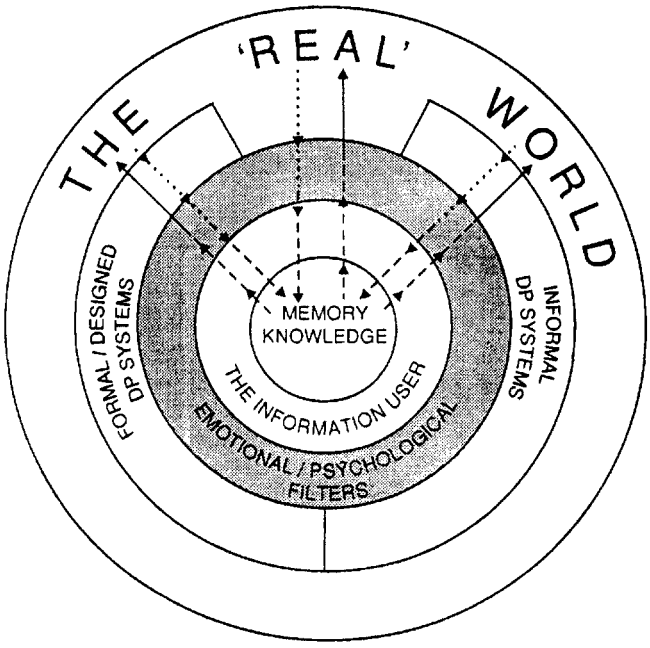


**Figure 1.** An individual's information system (Galliers, 1992a). ····▸ Data; — — —▸ Information; → Action. After Land (1992, p. 8)

productive and administrative processes through which an organization accomplishes its work.' (Zuboff, 1988, p. 9).

The suggestion seems to be that the informating process is somehow automatic when IT is used to support business processes. Given acceptance of my earlier arguments, I suggest that this is a misleading and potentially damaging assumption. Despite early warnings (e.g. Ackoff, 1967), all too often, we have assumed that the mere collection of data as a by-product of business activity will lead to informed decision making. All too often, it leads to what is often called information (*sic.*) overload, and to an over-concentration on formal systems, processing internally produced data.

What this means in terms of information systems research is that we should consider the topic of information systems as more of a social science or a socio-technical subject, not simply a technical one. It is because of this that I am taking an organizational and management stance in discussing key information systems research issues. It is also as a consequence of this that I shall argue, after Checkland (1981), that information systems is a subject best researched using the two pairs of systems thinking principles of emergence and hierarchy, and of communication and control. The argument is that an approach which bears the hallmark of science, based on Descartes' second rule (i.e. deal with complexity by dividing up the problems under study into their separate parts), is inappropriate for the study of information systems. This is argued because it seems almost self evident that such division is likely to distort the phenomenon under study; i.e. the components of the information system depicted in Figure 1 cannot be assumed to be the same when examined singly as they are when playing their part in the whole (Checkland, 1981, p. 59). In other words, formal designed systems must be viewed in the context of the individual who attributes meaning to the data being output from the system with a view to taking some purposive action or decision, and of the informal (as well as formal) sources of data on which they are dependent and of which they choose to take notice.

## Information systems management issues

Given this argument, it is not surprising that when we take a look at those studies that have been undertaken to identify the key issues facing information systems managers over the last decade or so (Ball and Harris, 1982; Dickson *et al.*, 1984; Hartog and Herbert, 1986; Brancheau and Wetherbe, 1987; Parker and Idundun, 1988; Watson, 1989; Niederman *et al.*, 1991; Watson and Brancheau, 1991), we see that it is those that are concerned with integrating information systems considerations with business strategies and the provision of effective information support that are of key concern.

An illustration of the integration of information systems strategy within business strategy is given in Figure 2, while an indication of what have been identified as the key information systems management issues in American studies during the 1980s and as compared to two other English-speaking countries is given in Tables 1 and 2 respectively.

Figure 2 attempts (after Earl, 1989) not only to show

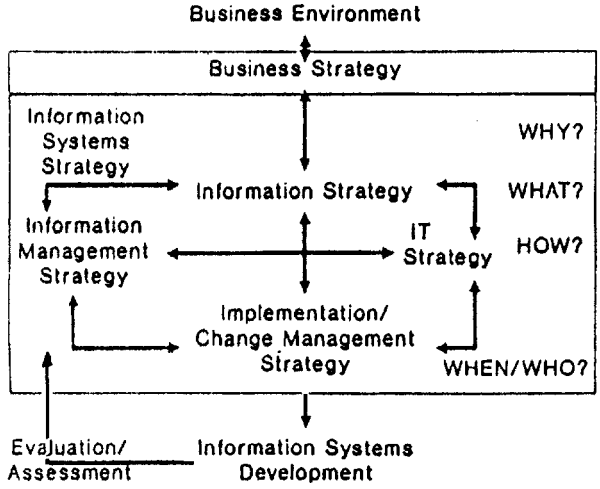


**Figure 2** Information systems strategy as an integral part of business strategy. Source: Atkins and Galliers, 1992, p. 133; Galliers, 1992b, p. 161

**Table 1** Key information systems management issues identified in the United States during the 1980s

| Issue | Rank (criticality) | | | |
|---|---|---|---|---|
| | 1989 | 1986 | 1983 | 1980 |
| Information architecture | 1 | 8 | NR | NR |
| Data resource management | 2 | 7 | 9 | 4 |
| Strategic IS planning | 3 | 1 | 1 | 1 |
| IS human resources | 4 | 12 | 8 | 7 |
| Organizational learning re. IS/IT | 5 | 3 | 6 | 8 |
| Technology infrastructure | 6 | NR | NR | NR |
| IS organizational alignment | 7 | 6 | 7 | 9 |
| Competitive advantage from IT | 8 | 2 | NR | NR |
| Quality of software development | 9 | 13 | 4 | 13 |
| Implementing telecommunications | 10 | 11 | 13 | 3 |

Note: NR means not ranked.
Source: Niederman *et al.*, 1991.

that information systems strategy should be seen as but one aspect of business strategy, but also that it comprises concern for the development of an understanding of key information needs (to take account of changing business conditions and to inform – and, indeed, question – business strategy formulation as well as core business processes); an information management strategy (concerned with setting policies and standards and with the role and organization of information systems services); an IT strategy, and a concern with managing the change associated with the implementation of the strategy (including human resource issues).

Tables 1 and 2 reflect this concern for issues more widely based than the mere management of the technology itself, important though this is. For example, as can be seen from Table 1, just two of the top ten issues in 1989 were associated with IT, and even in these cases, the concerns were respectively to do with planning, managing and implementing an effective technology architecture and a telecommunications system integrated with the organization's other IT systems. In other words, the issues were not concerned with technology *per se*.

Table 2 provides an international perspective as to the key issues identified by senior IT executives. Unfortunately the data from studies in countries other than the US does not provide a means of comparing the relative strength of feeling about different issues throughout the 1990s, nor is there more recent comparable data available than 1987 as regards the UK[1] or 1988 in the case of Australia[2]. Nevertheless, a similar

**Table 2** Key information systems management issues in the late 1980s: an international comparison

| Issue | Rank (criticality) | | |
|---|---|---|---|
| | Australia (1988) | UK (1987) | USA (1986) |
| Strategic IS planning | 1 | 3 | 1 |
| IS human resources | 2 | 6 | 12 |
| Information architecture | 3 | NR | 8 |
| Software development | 4 | 10 | 13 |
| Goal alignment | 5 | 1 | 5 |
| Role and contribution of IS | 6 | 22 | 4 |
| Competitive advantage from IT | 7 | 2 | 2 |
| Managing end-user computing | 8 | 12 | 6 |
| Data resource management | 9 | 9 | 7 |
| Organizational learning | 10 | 4 | 3 |

Note: NR means not ranked.
Source: Brancheau and Wetherbe, 1987; Parker and Idundun, 1988; Watson, 1989.

picture emerges, with the more technical issues being seen as less of a concern than such organizational issues as strategic IS planning (as depicted in Figure 2), IS human resource issues and issues associated with providing quality, flexible information support in line with changing business imperatives.

In addition to these surveys on attitudes regarding key issues, some recent research (Clark Jr, 1992), which relied on structured interviews of selected senior IS executives in the US, identified a number of key trends in thinking regarding the role and function of IS support. These included an identification of the following trends:

- a shift in the primary function of the central IS service, from systems design and development to systems integration, with the role changing from that of developer to one of advice giving (to coincide with an increase in the dispersion of IS resources into business units);
- continued attempts at improving the linkage between IS and business strategy;
- increasing attention to the measurement of effectiveness of the IS support function and of the IS themselves, and to the development of executive support systems;
- increasing reliance on externally produced software and facilities management (with a view to reducing costs and speeding up implementation), but with
- continued reliance on internally developed strategic IS.

Again, it is apparent that attention is being focussed far more on organizational and informational issues than on technological ones.

## Information systems research issues

Having seen what issues have been identified by IS executives as being critical, it is appropriate now to look at the kind of issues in the field of IS that have attracted research attention. A number of studies on this topic have taken place over the years (see, for example, Hamilton and Ives, 1982; Farhoomand, 1987; Galliers, 1992c), the most recent being that of Teng and Gallena (1990).

The latter study is interesting in that it suggests a somewhat different emphasis as to the IS topics being researched in the US compared with those issues that are perceived to be critical by IS executives. For example, as can be seen from Table 3, the most mentioned current areas of IS research relate to decision support systems (ranked only 17th in Niedermam *et al.*, 1991), artificial intelligence (not ranked in the top 25 issues); database management systems (the nearest equivalent topic being data resource management, which is ranked 2nd); systems development (9th), and end-user computing (18th).

**Table 3** Most mentioned areas of current IS research

| Research area | % of researchers |
|---|---|
| DSS | 32 |
| AI | 22 |
| DBMS | 21 |
| MSS development | 19 |
| End-user comp. | 15 |
| Human factors | 10 |

Source: Teng and Gallena, 1990, p. 3.

What is even more enlightening, and perhaps rather worrying (in the light of the key issues listed in the preceding section), is that a net 15 % respondents believed that more research emphasis should be placed on further research on decision support systems (DSS) and similarly 12 % on database management systems (DBMS) and 15 % on artificial intelligence (AI), as indicated by the figures given in Table 4.

No comparative figures are available as regards current IS research effort in the UK. However, it is possible to gauge the level of interest in different topic areas by reviewing the subject matter being addressed by those attending the 1991 and 1992 UK IS Doctoral Consortia[3]. The most common topics are shown in Table 5 and can be compared, in Table 6, with the topics of completed Doctoral dissertations in the USA (Hamilton and Davis, 1992[4]).

On the basis of this (admittedly sketchy) evidence, it would appear that there is a somewhat different emphasis to IS research amongst Doctoral students as compared to their faculty in that there appears to be greater interest in the 'softer' organizational/managerial aspects of the topic amongst student researchers, somewhat more in line with the issues identified in the preceding section. Having said that, there is only slight evidence that the key issues identified by IS executives as being critical as we move towards the millennium provide an agenda for IS research

**Table 4** IS research areas requiring more or less emphasis

| Research area | Emphasis | |
|---|---|---|
| | More % | Less % |
| DSS | 23 | 8 |
| DBMS | 17 | 5 |
| AI | 15 | — |
| IS Evaluation | 13 | — |
| IS Development | 12 | — |

Source: Teng and Gallena, 1990, p. 5.

**Table 5** Research topic areas of information systems doctoral students in the UK

| Research area | % of PhD students | |
|---|---|---|
| | 1991[a] | 1992[b] |
| IS, S/W development | 13.5 | 13.6 |
| IS planning, strategic IS | 0.8 | 18.2 |
| Database design/management | 10.8 | 0.0 |
| Networks, distributed systems | 8.1 | 9.1 |
| Requirements analysis, knowledge elicitation | 8.1 | 0.0 |
| Executive IS, (G) DSS | 5.4 | 0.0 |
| IS in Developing countries | 5.4 | 0.0 |
| HCI | 5.4 | 0.0 |
| IS Evaluation | 0.0 | 9.1 |
| Expert systems, AI, IKBS | 2.7 | 13.6 |
| Object orientation | 2.7 | 9.1 |

Notes: [a] $n = 37$.
[b] $n = 22$.

**Table 6** Information systems PhD dissertations in the US

| Research area | % of PhD dissertations 1990–1991[3] |
|---|---|
| (G) DSS, CSCW, EIS | 16.7 |
| Impact of IS/IT | 10.8 |
| IS, S/W development | 10.0 |
| Expert systems, AI, IKBS | 10.0 |
| IS planning, strategic IS | 5.8 |
| Requirements analysis, knowledge elicitation | 5.0 |
| User acceptance | 5.0 |

Source: Hamilton and Davis, 1992.
Note: $n = 120$.

in practice. This is, perhaps, not so surprising when we come to review the kind of research methods being adopted by scholars and research students in the IS community, as will be seen in the section that follows.

## Information systems research methods

Evidence for the kind of research methods being employed by IS researchers is provided by (e.g. Hamilton and Ives, 1982; Vogel and Wetherbe, 1984; Farhoomand, 1987; Teng and Gallena, 1990). While the evidence is somewhat confusing and contradictory, it would appear that the emphasis is shifting towards the greater use of laboratory experimentation and survey techniques at the expense of case and field studies (Hamilton and Ives, 1982, p. 342; Vogel and Wetherbe, 1984, p. 7; Farhoomand, 1987, p. 52).

This might, for example, explain the emphasis on (G)DSS research in the US: research which relies to a considerable extent on laboratory experimentation, which in turn is the favoured approach of a number of leading IS research institutions in that country (Vogel and Wetherbe, 1984; Hamilton and Davis, 1992).

If one accepts the arguments of (e.g. Galliers and Land, 1987, 1988; Galliers, 1991b, 1992c), however, one might call into question the appropriateness of those research methods which are based on positivist traditions (Hirschheim, 1985) when attempting to research the more organizational/managerial aspects of the subject area identified as being the most critical earlier in this paper.

The point is demonstrated by Figure 3, which attempts to provide an indication of the likely appropriateness of various IS research approaches in the context of the focus of the research effort. As can be seen, it is precisely the newer, post-positivist approaches that appear to have

| | ← Modes for traditional positivist approaches (observations) → | | | | | ← Modes for newer post-positivist approaches (interpretations) → | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Object | Theorem proof | Laboratory experiment | Field experiment | Case study | Survey | Forecasting and Futures Research | Simulation and Game/ role playing | Subjective/ argumentative | Descriptive/ Interpretive (inc. Reviews) | Action research |
| Society | No | No | Possibly | Possibly | Yes | Yes | Possibly | Yes | Yes | Possibly |
| Organization/ group | No | Possibly (small groups) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Individual | No | Yes | Yes | Possibly | Possibly | Possibly | Yes | Yes | Yes | Possibly |
| Technology | Yes | Yes | Yes | No | Possibly | Yes | Yes | Possibly | Possibly | No |
| Methodology | Yes | No | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |

**Figure 3** A taxonomy of information systems research approaches. Source: amended from Galliers and Land, 1987; Galliers, 1991b, 1992c)

most utility in terms of undertaking research with respect to the management and utilization of IT in organizations, and not the positivist approaches which seem to be favoured by many, particularly in the North American context (Vogel and Wetherbe, 1984).

## Concluding remarks

I have attempted in this discussion paper to set out some of the key issues associated with undertaking research in that aspect of the field of IS concerned with its organizational and managerial impacts. The objective has been to provide a context for an informed debate on this important topic. The importance of the 'softer issues' of the topic area has been stressed, particularly the interpretive nature of information, and the need to integrate a consideration of information systems issues when formulating business strategy and assessing organizational performance.

In addition, there has been an attempt made to review those issues which are perceived to be of importance to IS executives in different English-speaking countries, and to give some indication as to how these views have changed during the 1980s. These issues, which are concerned in the main with managing the organization's data resource, building a flexible information architecture to meeting changing corporate information requirements and integrating business and IS strategies, are contrasted with the focus of much of our research efforts in this field of enquiry. In addition, the approaches we are tending to adopt in undertaking this research are also brought into question.

While not arguing that our research agenda should be dictated entirely by the views of the IS Management community, it would appear that a change in focus is called for if our research activity in the field of IS is not to meet with criticism from managements who are endeavouring to obtain greater value from their IT investment. There should be a greater cross-fertilization of ideas between the practitioner and academic communities, and more research – undertaken with a post-positivist philosophy, based on real-world situations – seems to be called for, rather than the current emphasis on experimental elegance albeit in the sanitised environment of the laboratory.

This paper has been unapologetically oriented towards the managerial and organizational issues facing us in utilising IT effectively for business and human advantage. As such the argument has been based on a view of IS as a socio-technical discipline.

This does not mean that I am arguing for the total disappearance of research associated with technological developments: far from it. What I am arguing for is a reorientation of our research efforts to take account of the organizational and managerial issues that have confounded us for far too long. I hope this paper has fulfilled its task and that the debate as to what makes for an appropriate research agenda for IS will have benefitted as a result.

## Notes

[1] Two quite recent surveys have been conducted in the UK (Silk, 1989, 1990), but these used a somewhat different set of issues and those responding were attendees at management courses at a British Business School, thus potentially at least, presenting a somewhat biased set of results. The top five issues identified for the period 1987–1989 were, respectively:

(1) The impact of IT on users; training;
(2) The need for an information strategy;
(3) Security of information; hackers; staff security;
(4) Managing the IS function, and IS development;
(5) Justifying the cost of new systems.

Throughout the period, the top issue was perceived to be the impact of IT on users, but more recently there has been increased concern about assessing the value of IT/IS – a concern expressed as cost containment in even more recent surveys by Price Waterhouse (Grindley, 1992).

[2] However, a more recent survey undertaken in Australia and New Zealand (Broadbent *et al.*, 1992), not used for comparative purposes because of the use of different categories, indicates that their top five issues are:

(1) Aligning business and IS strategies;
(2) Marketing IS services;
(3) Project management;
(4) Management of IS professionals;
(5) Business cases for IS projects.

[3] Held at City University, London in September 1991 and the University of Leeds in September 1992 and attended respectively by 37 and 22 selected Doctoral students from UK universities.

[4] 120 of the 131 dissertations listed have been counted for this purpose (i.e. excluding the 11 listed emanating from UK institutions).

## References

Ackoff, R.L. (1967) Management misinformation systems. *Management Science*, **14(4)**, B147–B156.

Atkins, M.H. and Galliers, R.D. (1992) Human resource development for IS executives. Proceedings of the ACM SIGPCR Conference: *Managing the Information Provider/ Managing the Information User*, Cincinnati, Ohio, 3–7 April, 129–135. Also in *Warwick Business School Research Papers*, No. 36, January.

Ball, L. and Harris, R. (1982) SMIS members: a membership analysis. *MIS Quarterly*, **6(1)**, 19–38.

Brancheau, J.C. and Wetherbe, J.C. (1987) Key issues in information systems management. *MIS Quarterly*, **11(1)**, 23–45.

Broadbent, M., Hansell, A., Lloyd, P. and Dampney, C.N.G. (1992) Managing information systems in Australia and New Zealand: requirements for the 1990s. *Australian Computer Journal*, **34**(1), 1–11.

Checkland, P.B. (1981) *Systems Thinking, Systems Practice* (Wiley, Chichester).

Checkland, P.B. and Scholes, J. (1990) *Soft Systems Methodology in Action* (Wiley, Chichester).

Clark Jr, T.D. (1992) Corporate systems management: an overview and research perspective. *Communications of the ACM*, **35(2)**, 61–75.

Dickson, G.W., Leitheiser, R.I., Wetherbe, J.C. and Nechis, M. (1984) Key information systems issues for the 1980's. *MIS Quarterly*, **8(1)**, 135–148.

Earl, M.J. (1989) *Management Strategies for Information Technology* (Prentice Hall, London).

Farhoomand, A.F. (1987) Scientific progress of management information systems. *Data Base*, **18(3)**, 48–56. Also in *Information Systems Research: Issues, Methods and Practical Guidelines*, Galliers, R.D. (ed.) (Blackwell Scientific, Oxford) pp. 93–111.

Galliers, R.D. (ed.) (1987) *Information Analysis: Selected Readings*. (Addison-Wesley, Sydney).

Galliers, R.D. (1991a) A scenario-based approach to strategic information systems planning, In *Systems Thinking in Europe*, Jackson, M.C., Mansell, G.J., Flood, R.L., Blackham, R.B. and Probert, S.V.E. (eds) (Plenum, New York) pp. 73–87.

Galliers, R.D. (1991b) Choosing appropriate information systems research approaches: a revised taxonomy. In Nissen, H.-E., Klein, H.K. and Hirschheim, R. (eds) *Information Systems Research: Contemporary Approaches & Emergent Traditions*. (North-Holland, Amsterdam) pp. 327–345. Also in *Information Systems Research: Issues, Methods and Practical Guidelines*, Galliers, R.D. (ed.) (Blackwell Scientific, Oxford) pp. 144–162.

Galliers, R.D. (1992a) Information systems research: key players and fundamental problems – a personal view, *Library and Information Service of Western Australia (LISWA) Research Notes*, **2**, Perth, WA, 61–66.

Galliers, R.D. (1992b) Integrating information systems into business: research at Warwick Business School. *International Journal of Information Management*, **12**, 160–163.

Galliers, R.D. (ed.) (1992c) *Information Systems Research: Issues, Methods and Practical Guidelines*, (Blackwell Scientific, Oxford).

Galliers, R.D. and Land, F.F. (1987) Choosing appropriate information systems research methodologies. *Communications of the ACM*, **30(11)**, 900–902.

Galliers, R.D. and Land, F.F. (1988) The importance of laboratory experimentation: a response. *Communications of the ACM*, **31(12)**, 1504–1505.

Grindley, C. (1992) *Information Technology Review 1992/93* (Price Waterhouse, London).

Hamilton, J.S. and Davis, G.B. (1992) MIS Doctoral Dissertations: 1990–1991. *MIS Quarterly*, **17(2)**, 267–272.

Hamilton, J.S. and Ives, B. (1982) MIS research strategies. *Information Management*, **5**, 339–347. Also in *Information Systems Research: Issues, Methods and Practical Guidelines*, Galliers, R.D. (ed.) (Blackwell Scientific, Oxford) pp. 132–143.

Hartog, C. and Herbert, M. (1986) 1985 opinion survey of MIS managers: key issues. *MIS Quarterly*, **10(4)**, 351–361.

Hirschheim, R.A. (1995) Information systems epistemology: an historical perspective. In Mumford, E., Hirschheim, R., Fitzgerald, G. and Wood-Harper, A.T. (eds) *Research Methods in Information Systems* (North Holland, Amsterdam) pp. 13–36.

Land, F.F. (1992) The information systems domain. In *Information Systems Research: Issues, Methods and Practical Guidlines*, Galliers, R.D. (ed.) (Blackwell Scientific, Oxford) pp. 6–13.

Niederman, F., Brancheau, J.C. and Wetherbe, J.C. (1991) Information systems management issues in the 1990s. *MIS Quarterly*, **16(4)**, 474–500.

Parker, T. and Idundun, M. (1988) Managing information systems in 1987: the top issues for IS managers in the UK. *Journal of Information Technology*, **3(1)**, 34–42.

Silk, D.J. (1989) Current issues in information management. *International Journal for Information Management*, **9(2)**, 85–89.

Silk, D.J. (1990) Current issues in information management – update. *International Journal for Information Management*, **10(3)**, 178–181.

Teng, J.T.C. and Gallena, D. (1990) MIS research directions: a survey of researchers' views. *Data Base*, **21(3)**, 1–10.

Vogel, D.R. and Wetherbe, J.C. (1984) MIS research: a profile of leading journals and universities. *Data Base*, **16(3)**, 3–14.

Watson, R.T. (1989) Key issues in information systems management: an Australian perspective. *Australian Computer Journal*, **21(3)**, 118–129.

Watson, R.T. and Brancheau, J.C. (1991) Key issues in information systems management: an international perspective. *Information and Management*, **20**, 213–223. Also in *Information Systems Research: Issues, Methods and Practical Guidelines*, Galliers, R.D. (ed.) (Blackwell Scientific, Oxford) pp. 112–131.

Zuboff, S. (1988) *In the Age of the Smart Machine: The Future of Work and Power* (Heinemann, Oxford).

## Biographical notes

Bob Galliers is Lucas Professor of Business Systems Engineering and Director of the award-winning MSc programme in Business Management Systems at Warwick Business School, where he also heads the Doctoral Programme in Information Systems. He had published widely on the topics of Strategic Information Systems Planning and Information Systems Management, and is Editor-in-Chief of the *Journal of Strategic Information Systems*. He is author of *Information Analysis: Selected Readings*, published by Addison Wesley in 1987, and co-author of *Towards Strategic Information Systems*, published by Abacus Press also in 1987. His most recent book, *Information Systems Research: Issues, Methods and Practical Guidelines*, was published by Blackwell Scientific in 1992.

**Address for correspondence:** Professor R.D. Galliers, Warwick Business School, University of Warwick, Coventry CV4 7AL, UK.