

Challenging the hierarchical perspective on information systems: implications from external information analysis

PAT FINNEGAN AND CIARAN MURPHY

Executive Systems Research Centre, University College Cork, Ireland

JOHN O'RIORDAN

Alps Electronics, London, UK

The strategic choices of organizations have traditionally been influenced by their environmental interactions. Consequently, the field of information systems has become increasingly concerned with providing managers with external information. However, such systems are largely based on research that was conducted prior to the important organizational and environmental changes of the late 1980s and 1990s. Much of this research focuses on hierarchical differentiation when providing information (especially external information) to managers. This paper presents the findings of a study that investigated the sourcing, dissemination and use of external information in organizations. The results show that managerial demand for such information is unrelated to managerial level, but is influenced by functional affiliation. The study also contradicts many of the previously held beliefs about managerial preferences for information channels and media. These findings have important implications for the field of information systems, especially personnel involved in systems design.

Introduction

Organizations in the 1990s are rapidly changing from stable hierarchical structures with well defined boundaries to more dispersed and flexible configurations. Arguments for flatter structures (Leavitt and Whisler, 1958; Snow *et al.*, 1992; Handy, 1992), flexible forms (Drucker, 1988; Starkey *et al.*, 1991; Bahrami, 1992), and global orientation (Bartlett and Ghoshal, 1989; Earl and Feeney, 1992) have increased in recent years. Such changes are evident within firms as activities are conducted by task groups, and functional boundaries become more obscured (Drucker, 1988). The nature of an organization's interaction with its environment also changes as interorganizational dependencies are formalized through virtual organizations (Davidow and Malone, 1992) as well as electronic hierarchies and markets (Malone *et al.*, 1987). It is claimed that an increasingly turbulent environment as well as competitive pressures will lead to further such developments in the future (Peters, 1992). These expected developments have substantial implications for the information systems field as they change the nature of organizational activity and information processing. However, many systems' development efforts are based upon preconceptions of managerial activity and organizational need

that are becoming extremely dated (e.g. Gorry and Scott Morton, 1971; Mintzberg, 1973). Consequently, there is a need to better understand the role that information plays in management.

Many information systems have been developed on the premise that the information needs of managers differ according their level in the organizational hierarchy (Rockart and DeLong, 1988; Paller and Lasky, 1990; Watson *et al.*, 1991; Bergeron and Raymond, 1992). In particular the decisions that are made at senior management level are believed to differ from those that are made at the operational level (Gorry and Scott Morton, 1971). Consequently, it is assumed that information is differentiated better on a north south axis (hierarchical axis) rather than an east west axis (functional axis).

This paper examines the sourcing, dissemination and use of external information by managers in organizations. It is based on a study that identifies the methods that managers in organizations use to capture external information, and how this is subsequently dispersed throughout the organization. The study shows that managerial demand for external information is independent of managerial level, but is influenced by functional responsibility. The results show that the functional areas of finance and marketing are important

sources of external information. Significantly, the study reveals that information systems are a poor provider of external information, even though they are used for the provision of internal information. This is partly due to the fact that managers regard internal and external information differently. The authors conclude that information systems are not currently being used to their full advantage for the provision of external information. However, computer based systems, even incorporating technologies such as voice recognition and teleconferencing, are not a suitable replacement for other conduits of external information.

Managerial activity and environmental interaction

The recognition of the organization as an organism (Morgan, 1986), emphasizes the relationship between the organization and its environment, and suggests that organizations must have in place the means and methods to continually observe their environment. This perspective implies that external factors rather than internal organizational, technological or managerial variables are the keys to explaining organizational success (Joynt, 1991). 'For strategy we need organized information about the environment. Strategy has to be based on information about markets, customers, and noncustomers; about technology in one's own industry and others; about world-wide finance; and about the changing world economy. For that is where the results are. Inside an organization, there are only cost centres. The only profit centre is a customer whose cheque has not bounced' (Drucker, 1995). In keeping with conventional thinking on organizational activity, such environmental information has typically been provided to upper level managers. Their preference for such information was justified as being due to the unstructured task environment in which they operate and their strategic planning activities. This dependency on external information was seen to decrease as one moved down the managerial hierarchy (Gorry and Scott Morton, 1971) This philosophy has been incorporated into computer based information systems designed to support managers at various organizational levels.

It has been argued that managers' perception of their environment will affect the amount of external information that they demand (Aguilar, 1967; Wilensky, 1967). If the cause and effect relationships within the environment are clear, managers then become more focused on the information that they require. Highly competitive or rapidly changing conditions, such as those produced by the turbulent economic and competitive strategies of the information economy

(Zwass, 1992), should therefore lead to an increase in the demand for external information. According to Kefalis and Schoderbeek (1973), these conditions should lead the chief executive officer to engage directly in environmental scanning. However, Jones and McLeod (1986) discovered that such managers relied on subordinates who are one or two levels further down the organizational hierarchy to provide them with information relating to the firm's internal and external environment. This is consistent with more traditional views of middle managers as information filters. In this process they have come to be regarded as information gatekeepers from both a functional and a hierarchical perspective. March and Simon (1993) have found that 'the person who summarizes and assesses his own direct perceptions and transmits them to the rest of the organization becomes an important source of informational premises for organizational action. The "facts" he communicates can be disbelieved but they can only rarely be checked'.

Interestingly, Jones *et al.* (1989) reported that, while there was a large demand for external information at all levels of the organization, managers at lower levels used more external information than senior level managers. Since these unconventional findings were based on a case study of a single organization, they can only be regarded as tentative since it is difficult to generalize such findings without further empirical confirmation. Such findings, when viewed in conjunction with changing managerial perceptions have important implications for the information systems field, and thus require further investigation.

Rethinking the hierarchical perspective

Hierarchy is a two dimensional space (March, 1994). The first dimension is the vertical one, the level in the organization that fixes an individual's place relative to the top of the organization. The second dimension is the horizontal or functional one that defines where in the divisional structure of the organization the individual is located. As March puts it 'the horizontal cleavages tend to obscure the cleavages associated with the vertical dimension of the organization. The sense of similarity and common destiny shared by vice presidents in different departments is undermined by their allegiances to their departments and the competition among them'. Indeed March suggests that this differentiation of identities results in intragroup cohesiveness and unity being sustained by accentuating intergroup differences and conflict. These arguments would point to the possibility at least, that the information needs of managers are likely to be differentiated more on a functional than a vertical basis.

The assumption of conventional IS that external information is of greater concern to top management is simply a more modern manifestation of Taylorism. It ignores the changes that have taken place in the business environment in recent years. It also ignores the reality of many organizations where most of the value-added is achieved through knowledge-based service activities including market research, customer information functions, R & D and distributions. Furthermore, as organizations and enterprises develop strategic links with other enterprises to form virtual companies or virtual networks (Davidow and Malone, 1992), the focus switches from one of internal control to one of network coordinations. Thus it is no longer reasonable to assume that external information should mainly be the property of senior management.

Two powerful examples of recent trends in the functioning of organizations have been suggested by Quinn (1992) and Tapscott (1996). Quinn has put forward the concept of the inverted organization. This places the emphasis on the point of contact between the customer and the employee in the company who deals with that customer. This person personifies what the company is to the customer. For some companies these contact persons are so important that the organization is inverted making all executives, systems and support staff in the company work for the front-line people. (See Figure 1.)

Tapscott (1996) proposes the concept of molecularization. The modern enterprise has a molecular structure based on the individual. Motivated, self-learning, entrepreneurial workers empowered by and collaborating through new tools apply their knowledge and creativity to create value. Conditions may warrant a solid structure that tightly binds molecules together more likely, conditions will require more dynamic relationships among molecules causing them to cluster in teams.

The image that emerges from these works is a need by all managers to monitor their total business environments, both within and outside of the organization

and to use the information that they gather in a direct way to add value to the company.

Such fundamental changes in the operation of organizations are leading towards the dismantling of the traditional hierarchy. This has important performance implications for the information systems infrastructure within organizations which has been based on the hierarchical model in terms of meeting managerial needs. Consequently there is an urgent need to re-examine managerial work practices from an information processing perspective. As part of a re-examination of such practices, this paper presents the findings of a study which examined the organizational use of external information. The appropriateness of studying external information was justified in relation to the important changes taking place in relation to the number of personnel who were directly interacting with the external environment. Specifically our study sought to examine

- (1) the extent of managerial use of external information from a functional and hierarchical perspective,
- (2) the types of external information used by managers as well as the orientation of this information, and
- (3) the sourcing and patterns for the transfer of such external information.

The research approach

It is recognized that the IS field is fragmented and pluralistic by nature in that it incorporates many disciplines (Galliers, 1991). Choosing one research method is therefore difficult as different approaches have previously been used to investigate these disciplines (Antill, 1985). It is therefore argued that IS research is best understood when pluralistic models are used (Banville and Landry, 1989) as either positivistic or interpretivistic methods alone will not provide the richness that the IS field needs to advance further (Kaplan and Duchon, 1988). However, such methodological pluralism is contingent on the problem being studied and the kind of knowledge being sought (Hirschheim, 1985), and therefore should be directly related to the research objective and previous research in the area.

The researchers considered that pluralistic research methods were important in addressing the three research issues. This was because in-depth research was required to investigate the relationship between managerial decision making and the precise use of external information, while the need for generalizable results called for more survey-based research. In order to investigate the sourcing, dissemination and use of external information in organizations, a double faceted research framework was developed.

Sixteen structured interviews were conducted with managers from organizations in the financial services,

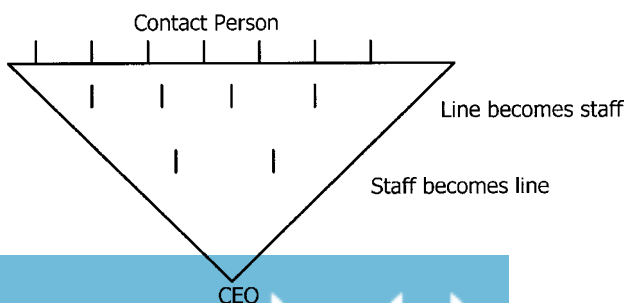


Figure 1 The inverted organization (from Quinn, 1992)

manufacturing and agricultural/food sectors, which are generally considered to be leader in these sectors. Seven interviewees were from senior management, five were from middle management, and four were from lower level management. Of these, three were in the production function, six in finance, three in marketing and four were from other functions e.g. research and development. The interviews lasted between one and three hours, with the average duration being one and a half hours. The interviews were generally conducted in single sessions, with two interviews going into a second session. A copy of the questionnaire was given to the interviewee during each session, and a copy of the notes taken by the interviewer was sent to each participant within a week of the interview. This allowed the researchers to confirm the accuracy of the results reported. Interviews were not taped at the request of participants.

In order to ascertain whether the findings from these interviews are generalizable to a larger and more representative sample of organizations, postal questionnaires were sent to managers in 100 of the top 800 Irish organizations. Twenty-six per cent of these organizations returned a total of 97 questionnaires. Twenty-nine participants in this part of the study were from senior management, 43 from middle management and 25 from lower level management. Seventeen were from the production function, 29 from finance, 25 from marketing and six from other functions. All companies in the sample had a turnover in excess of IR£150m and employed over 500 people. Significantly the answers given to the postal questionnaires, with one nonsignificant exception, confirmed the answers given in the interviews. Hence for the purposes of presentation both groups are treated as one. The questionnaire used for the study is shown in the appendix.

The fact that this study was conducted in Irish organizations may raise issues for the relevance of the study elsewhere. However, due to the openness of the Irish economy and the high proportion of multinational organizations operating there, these organizations were rich sites for the study of the use of external information. Also all organizations are faced with an increasingly global economy and turbulent environmental conditions and as such are probably similar to their Irish based counterparts in this area.

For the purpose of this study external information was defined as information that originated outside of the organization and hence excluded such information as 'number of items sold to customer etc.'. For the purpose of analysis, the use of external information was examined from the traditional managerial perspectives of managerial level and organizational function.

Use of external information by managerial level

Most managers (75%) stated that external information accounted for less than 40% of the information that they used, but over 80% of respondents used external information to help them make decisions. This finding is consistent with the studies of Hickson *et al.* (1982) who found that 40% of the information sources utilized by management in decision making were external. An important finding here was that the results showed no significant difference across managerial level in relation to the amount of external information used by managers. This finding contradicts the findings of many previous researchers who stated that the demand for external information increased as one moved up the managerial hierarchy (Gorry and Scott Morton, 1971; Gessford, 1980; Austin, 1986). However, the findings of this study are consistent with the findings of Jones *et al.* (1989) who found that managers at higher levels made no greater use of external information.

The researchers concluded that the results of the current study are, in part, due to the proportion of environmental scanning that is delegated by managers at the top level to the middle and lower levels. Thus the lower levels of management are, in some instances, transmitters of external information rather than 'sinks' for such information. Another explanation of these findings is that the nature of the work of organizations may have changed since the classical studies of Gorry and Scott Morton and others. As the complexity of an organization's environment increases, then all of the participants in the organization at managerial level need to become much more aware of the external environment in which it is operating (Wilensky, 1967; Kefalis and Schoderbeek, 1973; Mintzberg, 1975; Pfeffer and Salancik, 1978; March and Sevon, 1982; Sauter and Schofer, 1988).

Eighty-one per cent of respondents believed that their demand for external information would increase in the future, while 19% stated that their expected requirements for external information would remain constant. None of the respondents expected their requirements to decrease. A chi square test showed that these responses were independent of managerial level.

The study examined managerial interest in different types of external information. An analysis of this managerial interest by organizational level is shown in Table 1. This shows that there is no significant difference in managerial interest in different types of external information by managerial level except in five instances. This can be explained by the smaller degrees of interest by lower level managers in (i) the appraisal of competitors using like products/services, (ii) channels

Table 1 Interest in different types of external information: an analysis by managerial level

External information class	Top <i>n</i> = 29 (%)	Middle <i>n</i> = 43 (%)	Lower <i>n</i> = 25 (%)	Chi Sq.
Appraisal of competitors producing like products/services	83	72	36	14.36*
Channels of distribution	38	44	8	9.82*
Cost characteristics of industry	55	51	20	8.19*
Appraisal of competitors producing substitute products/services	52	67	32	8.04*
Demand for products/services	80	70	48	6.21*
Technological	62	55	56	0.56
Customer behaviour	62	60	36	4.74
Human behaviour	38	53	28	4.53
Design/composition of product	55	51	32	3.33
Processing of product	38	37	32	0.25
Pricing of product	41	42	48	0.31
Wages (government restrictions)	31	28	28	0.10
Accounting practices	28	33	40	0.94
Reporting to shareholders	17	9	12	1.01
Distribution/labelling of product	41	40	20	3.39
Advertising of product	34	37	28	0.60
Issue of stock	3	14	4	3.33
Capital acquisition	10	12	8	0.23
Demographic information	52	40	32	2.49
Economic indicators	62	65	48	4.51
Availability of capital, raw materials and supplies	34	33	24	0.79
Technological state of industry	62	65	36	5.94
Marketing, advertising and pricing practices	43	37	28	2.47
Wages (industry structure)	31	23	16	1.60
Others	17	7	6	4.91

* Denotes a statistically significant Chi Square value

of distribution, (iii) cost characteristics of industry, (iv) the appraisal of competitors producing not only like but substitute products/services, and (v) the demand for products/services. The results are hardly surprising as the types of information showing significant differences in the degree of interest across the three managerial levels are more associated with the goal setting, priority setting, performance evaluation, personnel planning and control functions associated with the upper and middle managerial levels.

In order to determine a profile of the external information that managers value, the participants were asked to categorize the external information that they used under four 'binary' headings. These were the degree to which the external information that they used was (1) current or forecast based, (2) judgemental or factual, (3) confidential or public, and (4) proactive or reactive. The results as shown in Table 2, indicated that much of the external information that managers receive is current, factual, public and proactive in nature. No significant variation in the opinions of managers occurred across managerial level.

Each manager was presented with a list of commonly used sources of external information, derived from the work of Jones *et al.* (1989). An analysis of the results reveal that reports and journals are the most utilized sources of external information as shown in Table 3. These preferences are independent of managerial level and contradict the findings of Daft and Lengal (1986) and Mintzberg (1975), who had concluded that top managers would prefer richer 'verbal, interactive media'. These sources are consistent with the above findings on the characteristics of external information i.e. these sources could be capable of providing current, factual, public and proactive information. These results have significant implications for the development of executive information systems as they indicate that external information for upper level management may be more amenable to computer capture than originally thought.

The capture of information within an organization is a complex task with many actors involved. These actors can play important roles within the organization as its information gatekeepers (Pettigrew and Mumford, 1975).

Table 2 Orientation of external information used by managers

Information characteristics	< 40%	41%–60%	>60%	Significance (level)	Significance (function)
Current	16%	30%	54%	No	No
Factual	9%	15%	76%	No	No
Public	18%	16%	66%	No	Yes
Reactive	48%	33%	18%	No	No

The study sought to determine which organizational functions were highly regarded as sources of valuable information, and how these information gatekeepers differed for external and internal information. The results indicated that the finance and marketing (including sales) departments were considered to be the most valuable sources of information in the organization with 63% of the respondents indicating one of these departments. An analysis of the responses by organizational level revealed only one significant result. This was that higher level managers held the production department in higher regard than their lower level counterparts when it came to providing valuable information.

A breakdown of the results revealing the valuable organizational sources of internal and external information is shown in Table 4. This shows that marketing is the preferred source of external and internal information. This result is significant as it shows that managers use intelligence collected by the marketing and sales personnel to keep the companies informed about the general business environment. It is noteworthy that while marketing is ranked as the most valuable source of both internal and external information, its ranking on external information is so strong that all other organizational sources pale in comparison. It is notable that although MIS groups are seen as valuable providers of internal information they do not rank as providers of external information.

Table 3 Preferred sources of external information

Information source	Response (%)
Reports	49
Journals	45
External consultants	34
Employees	34
Personal experience	33
Colleagues	32
Industrial conferences	26
Professional meetings	24
Books	22
Suppliers	20
Friends	19
Board meetings	18
Operational tours	16
Intraorganizational communications	10
Others	3

An analysis of responses by managerial level showed that there was no significant differences in relation to which functions were regarded as valuable sources of external information. However, upper level managers showed a higher than average interest in the marketing department as their greatest source of internal information while middle level respondents showed a greater preference for internal information resident in the production department. No significant variations in the response across the three managerial levels was noted in relation to the remaining response classifications.

An analysis of the most frequently used media for the transfer of external information is presented in Table 5. This indicates a preference for the verbal channels followed by written forms and finally computer channels for the distribution of external information. These results are consistent with external information being transferred as part of the informal organizational network. An analysis by managerial level revealed only one significant value. This relates to the percentage of upper, middle and lower level managers who choose the computer screen as one of their most utilized media for the transfer of external information. Forty per cent of lower level managers as compared to only 17% and 28% of top and middle level managers respectively indicated a preference for this medium for the transfer of external information. This is an important finding as it suggests that these two levels of managers are not direct users of computers. Therefore despite the suitability of external information for computer capture, managerial prefer-

Table 4 Internal and external sources of valuable information

Area	Internal information %	External information %
Marketing	23	45
Finance	21	9
Colleagues	Not rated	8
General management	3	4
CEO	1	4
MIS	13	2
Production	11	Not rated
Others	28	28

Table 5 Patterns for the transfer of external information used by managers

Transfer medium	Response (%)
Reports	47
Formal meetings	46
Informal meetings	40
Books/journals etc.	38
Computer printout	35
Telephone conversations	31
Mail	30
Computer screen	28
Others	2

ences for other information channels mitigates against using computer-based information systems for transferring this information. This finding is consistent with the research of Adam and Murphy (1995) who suggest that the issue of information transfer and communication among executives is difficult for managers themselves, and may be out of reach for the designers of information systems for executives.

Use of external information by organizational function

The study revealed that there were no significant differences across organizational function in relation to the amount of external information used at present or in relation to expected future demand for external information. However, a far greater degree of significance was noted when the degree of interest associated with the 25 classes of external information was related to organizational function rather than managerial level. The percentage of managers who indicated a preference for each of the categories of external information varied significantly over 21 of the 25 classes of external information as shown in Table 6.

Higher degrees of interest for external information relating to technology, design/composition of product, processing of product and the technological state of the industry were associated with the production function within the organization. Finance managers showed a higher degree of interest in external information relating to legal and governmental restrictions in reporting to shareholders and accounting practices, while marketing managers showed a higher preference for a large number of categories of external information including customer behaviour, human behaviour, product pricing, advertising, demographic information, economic

indicators, appraisal of competitors producing like products or services, marketing, advertising and pricing practices, channels of distribution, and appraisal of competitors producing not only like but substitute products/services. Managers in the 'other' category who consisted mainly of the engineering, R&D and personnel functions showed a greater interest in wage related information along with a higher preference for information relating to the labelling and distribution of products. These results reflect the differing needs for the 25 classes of external information as determined by both the areas of responsibility and major decision areas associated with the different functional areas. It also demonstrates the different levels of environmental interaction associated with the different functional areas. These results suggest very strongly that the external information sought by managers differs sharply according to the functional position of managers in the organization.

In relation to the orientation of external information used within the various organizational functions, some significant results were obtained. External information was generally found to be current, factual and proactive in nature, as shown in Table 2. The study indicated a greater preference for public external information within the production, finance, and 'other' functional areas, while marketing personnel indicated a preference for confidential external information.

The different sources of external information utilized by managers, as shown in Table 3, were found to be independent of organizational function. However, some significant results were discovered when perceptions of the most valuable organizational sources of information were examined by managerial function. A majority of managers in the finance and marketing departments stated that they found their own department to be the most valuable source of information in the organization.

Interestingly, 28% of marketing managers considered the MIS function to be their best source of internal information. This compared to 0%, 3% and 19% from the production, finance and 'other' classifications respectively who saw MIS in this way. In relation to external information, 28% of managers in the finance area indicated that they saw their own department as their greatest source of external information. This compared to 0%, 0% and 4% of respondents from the production, marketing and 'other' functional classifications respectively who stated that they saw the finance department as their greatest source of external information. No other significant results were recorded in this regard.

Finally, the media used to transfer external information as shown in Table 5 and the amount of external information received using a computer-based information systems was found to be independent of managerial function.

Table 6 Interest in different types of external information: an analysis by organizational level

External information class	Prod (%)	Fin. (%)	Mkt (%)	Other (%)	Chi Sq
Appraisal of competitors producing like products/services	65	34	92	77	15.06*
Channels of distribution	18	17	64	31	16.00*
Cost characteristics of industry	47	31	52	50	3.06*
Appraisal of competitors producing substitute products/services	53	24	88	54	22.02*
Demand for products/services	76	38	100	62	24.44*
Technological	88	34	64	73	15.66*
Customer behaviour	41	28	92	57	23.98*
Human behaviour	47	21	64	42	10.53*
Design/composition of product	71	14	60	58	19.50*
Processing of product	76	7	32	46	24.06*
Pricing of product	18	31	76	42	17.23*
Wages (government restrictions)	29	31	8	46	9.15*
Accounting practices	6	76	24	12	36.09*
Reporting to shareholders	12	28	0	8	10.25*
Distribution/labelling of product	47	3	48	50	18.19*
Advertising of product	6	17	76	30	29.38*
Issue of stock	12	17	0	4	6.29
Capital acquisition	12	17	4	8	2.81
Demographic information	6	17	92	42	42.25*
Economic indicators	41	52	92	50	15.06*
Availability of capital, raw materials and supplies	71	10	16	42	22.45*
Technological state of industry	82	27	60	69	16.34*
Marketing, advertising and pricing practices	18	17	64	31	25.81*
Wages (industry structure)	35	24	0	38	12.16*
Others	0	21	8	15	4.91

* Denotes a statistically significant Chi Square value

Conclusions

This study has highlighted the failure of the IS field to meet the external information needs of organizational managers by neglecting two levels of managers and providing inadequate support to the third level. The recognition of this fact by organizational managers is evident by their lack of respect for the IS function as a valuable provider of external information. Such managers recognize that IS professionals fail to understand the changing nature of managerial work and are operating on antiquated preconceptions of need. The importance of functional affiliation as demonstrated by the study is vital for a new understanding of managerial information requirements, and has a number of interesting implications for the IS field.

The failure of executive information systems is partially explained by the over-reliance on a vertical hierarchical perspective to the provision of external information. External information is required by all managerial levels, but functional affiliation is an important indicator of the demand for certain types of this information. Consequently it is necessary to examine the existing systems infrastructure to determine whether appropriate attention has been given to the provision of external information to nonexecutives. This examination must consider, for example, the key position of sales and marketing as an organizational interface with the external environment, and how this interface may be best exploited to maximum organizational benefit. The energy which, in recent years, has been invested in the development of executive

information systems should now be more productively used to establish sales and marketing information systems as pivotal instruments in the systems infrastructure. In effect, such systems infrastructure will be a mirror of Quinn's (1992) inverted organization with the provision of external information being driven by information systems in sales and marketing.

The MIS function rates poorly as a valuable provider of external information despite being perceived as the second most valuable source of internal information. This result is significant, as the nature of the external information used makes it suitable for capture by computer systems and the MIS function already has the channels in place for distributing internal information. This raises questions for the developers of information systems as to why internal and external information are kept separately. As well as investigating the media for transmission of such data, the poor perception of the MIS function as a provider of external information must also be investigated.

Beyond the provision of information, is the information centred redesign of business processes by obliterating functional boundaries and replacing them with customer oriented processes. While business process re-engineering (BPR) was beyond the scope of this study, the findings have some interesting implications for such transformation efforts. The concept of an organizational function is central to meeting managerial requirements for external information. The increasing market or customer driven nature of organizational activity will re-enforce the need to meet such demands. The obscuring of functional boundaries may therefore indirectly have an adverse effect on organizational performance as individuals or molecules (Tapscott, 1996) are left to source their own external information without the support of functional structures. If molecularization and process driven organizations are to truly emerge as a viable alternative to existing structures, much consideration will have to be given to the resulting implications for the systems infrastructure. In addition, such information issues may hinder the process transformation or result in reduced benefits from it.

An important development in organizational interaction in recent years has been the rise of interorganizational systems. These systems have mainly been used for transactions, and as such were excluded from the scope of this study under the operational definition of external information used. However, the results indicate that such systems may be underutilized from an organizational perspective. These systems are prime organizational interfaces located in functional areas, and can consequently be incorporated into the information infrastructure to source and capture external information. These systems tend to be functionally based and many already feed into the systems infrastructure to record

transactions. Further research is required, but it is hypothesized here that these systems can be used beyond transaction processing to source and capture external information. The dissemination of external information may remain a classical management activity, but the IS field can improve the information infrastructure by re-examining its traditional preconceptions.

References

- Adam, F. and Murphy, C. (1995) Information flows amongst executives: their implications for systems development. *Journal of Strategic Information Systems* 4(4), 341–55.
- Antill, L. (1985) Selection of a research method in *Research Methods in Information Systems*, Mumford, E., Hirschheim, R., Fitzgerald, G. and Wood-Harper, A. (eds) (Elsevier Science Publishers, North Holland) pp. 203–15.
- Aquilar, F.J. (1967) *Scanning the Business Environment* (Macmillan, New York).
- Austin, N. (1986) A management support environment. *ICL Technical Journal*, November, 17–24.
- Bahrami, H. (1992) The emerging flexible organisation: Perspectives from Silicon Valley, *California Management Review*, 34(4), 33–52.
- Banville, C. and Landry, M. (1989) Can the field of MIS be disciplined? *Communications of the ACM*, 31(1), 48–60.
- Barlett, C.A. and Ghoshal, S. (1989) *Managing Across Borders: The Transnational Solution* (Hutchinson, London).
- Bergeron, F. and Raymond, L. (1992) Evaluation of EIS from a managerial perspective. *Journal of Information Systems*, 1(2), 45–60.
- Daft, R.L. and Lengal, R.H. (1986) Organisational information requirements, media richness and structural design. *Management Sciences*, 32(5), 554–71.
- Davidow, W.H. and Malone, M.S. (1992) *The Virtual Corporation* (HarperCollins Publishers, New York).
- Drucker, P.F. (1988) The coming of the new organisation. *Harvard Business Review*, 66(1), 45–54.
- Drucker, P.F. (1995) The information executives truly need. *Harvard Business Review*, 73(1), 54–63.
- Earl, M.J. and Feeney, D. (1992) Information systems in global business: evidence from European multinationals. *Oxford Institute of Information Management Research and Discussion Paper 92/6*.
- Galliers, R.D. (1991) Choosing information systems research approaches in *Information Systems Research: Contemporary Approaches and Emergent Traditions*, Nissen, H.E., Klein, H.K. and Hirschheim, R. (eds) Proceedings of the IFIP TC8/WG 8.2 Working Conference, Copenhagen, Denmark, 14–16 December, pp. 327–46.
- Gessford, J.E. (1980) *Modern Information Systems Designed for Decision Support* (Addison-Wesley, New York).
- Gorry, G.A. and Scott Morton, M.S. (1971) A framework for management information systems. *Sloan Management Review*, 13(1), 55–70.

- Handy, C. (1992) Balancing corporate power: a new federalist paper. *Harvard Business Review*, 70(6), 59–72.
- Hickson, D.J. (1982) Comparing 150 decision processes in *The Bradford Studies*, Pennings, J. M. (ed.) (Jossey Bass) pp. 114–42.
- Hirschheim, R. (1985) Information systems epistemology: an historical perspective in *Research Methods in Information Systems*, Mumford, E., Hirschheim, R., Fitzgerald, G., and Wood-Harper, A. (eds) (Elsevier Science Publications, North Holland) pp. 13–36.
- Jones, J.W. and McLeod, R. (1986) The structure of executive information systems: An exploratory analysis. *Decision Sciences*, 17(2), 220–49.
- Jones, J.W., Saunders, C. and McLeod, R. (1989) Information media and source patterns across management levels: a pilot study. *Journal of Management Information Systems*, 5(3), 71–84.
- Joynt, P. (1991) International dimensions of managing technology. *Journal of General Management*, 16(3), 73–84.
- Kaplan, B. and Duchon, D. (1988) Combining qualitative and quantitative methods in information systems research: a case study. *MIS Quarterly*, 12(4), 571–86.
- Kefalis, A. and Schoderbek, P. (1973) Scanning the business environment: some empirical results. *Decision Sciences*, 4(4), 268–78.
- Leavitt, H.J. and Whisler, T.L. (1958) Management in the 1980's. *Harvard Business Review*, 36(6), 81–97.
- Malone, T. W., Yates, J. and Benjamin, R. I. (1987) Electronic markets and electronic hierarchies. *Communications of the ACM*, 30(6), 484–97.
- March, J. and Simon, H. (1993) *Organisations* (Blackwell Publishers, Massachusetts).
- March, J. G. (1994) *A Primer on Decision Making* (Free Press, New York).
- March, J.G. and Sevon, G. (1982) Gossip, information and decision making in *Advances in Information Processing in Organisations*, Sproull, L. and Larkey, P. (eds) (Jay Press, Connecticut) pp. 80–94.
- Mintzberg, H. (1973) *The Nature of Managerial Work* (Hampden Row, New York).
- Mintzberg, H. (1975) Manager's job: folklore and fact. *Harvard Business Review*, 53(4), 49–61.
- Morgan, G. (1986) *Images of Organisations* (Sage Publications, London).
- Paller, A. and Lasky, R. (1990) *The EIS Book – Information Systems for Top Managers* (Business One Irwin, Homewood, IL).
- Peters, T. (1992) *Liberation Management* (Macmillan, London).
- Pettigrew, A. and Mumford, E. (1975) *Implementing Strategic Decisions* (Longman, London).
- Pfeffer, J. and Salancik, G. R. (1978) *The External Control of Organisations: A Resource Dependent Perspective* (Harper and Row, New York).
- Quinn, J.B. (1992) *Intelligent Enterprise* (Free Press, New York).
- Rockart, J.F. and DeLong, D.W. (1988) *Executive Support Systems: The Emergence of Top Management Computer Use* (McGraw-Hill, New York).
- Sauter, V.L. and Schofer, J.L. (1988) Evolutionary development of decision support systems: Important issues for the early phases of design. *Journal of Management Information Systems*, 4(4), 77–92.
- Snow, C.C., Miles, R.E. and Coleman, H.J. (1992) Managing 21st century network organisations. *Organisational Dynamics*, 21(4), 5–20.
- Starkey, K., Wright, M. and Thompson, S. (1991) Flexibility, hierarchy, markets. *British Journal of Management*, 2(3), 165–76.
- Tapscott, D. (1996) *The Digital Economy* (McGraw-Hill, New York).
- Watson, H.J., Kelly, R., Rainer, J. and Chang, E.K. (1991) Executive information systems: a framework for development and a survey of current practices. *MIS Quarterly*, 15(1), 13–50.
- Wilensky, H.L. (1967) *Organisational Intelligence* (Basic Books, New York).
- Zwass, V. (1992) *Management Information Systems* (Wm. C. Brown Publishers, Dubuque, IA).

Biographical notes

Pat Finnegan is a lecturer in information systems at University College Cork, Ireland, and a senior researcher with the Executive Systems Research Centre (ESRC). He holds a BComm and an MBS from University College Galway and a PhD from Warwick Business School. His research interests include IS strategy and electronic commerce.

Ciaran Murphy is the Bank of Ireland Professor of management information systems at University College Cork, Ireland. He is also the Director of the Executive Systems Research Centre (ESRC), and a member of the Higher Education Authority (HEA) in Ireland. His research interests include Decision Support Systems and Executive Information Systems.

John O'Riordan is a senior systems analyst with Merrill Lynch in Japan. He hold a BComm and an MBS from University College Cork, Ireland. His research interests include information infrastructures in organizations.

Address for correspondence: Dr P. Finnegan, Executive Systems Research Centre, University College, Cork, Ireland.

Appendix: Outline of questionnaire used in study**Section 1: Company information**

1. Please indicate the primary end product or service of your organisation.
- | | |
|---|--|
| <input type="checkbox"/> Agriculture, Forestry or Fishing | <input type="checkbox"/> Mining |
| <input type="checkbox"/> Construction | <input type="checkbox"/> Manufacturing |
| <input type="checkbox"/> Transportation, Communications | <input type="checkbox"/> Electrics/Gas |
| <input type="checkbox"/> Wholesale Trade | <input type="checkbox"/> Retail Trade |
| <input type="checkbox"/> Finance/Insurance/Real Estate | <input type="checkbox"/> Services |
| <input type="checkbox"/> Government Agency | <input type="checkbox"/> Other _____ |
2. Is your corporate headquarters at this location? Yes No
3. Please indicate the number of employees within your organisation.
- | | At all locations | At this location |
|---------------------|--------------------------|--------------------------|
| Less than 100 | <input type="checkbox"/> | <input type="checkbox"/> |
| 100 to 500 | <input type="checkbox"/> | <input type="checkbox"/> |
| 501 to 1000 | <input type="checkbox"/> | <input type="checkbox"/> |
| 1001 to 5000 | <input type="checkbox"/> | <input type="checkbox"/> |
| 5001 to 10 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| 10 001 to 20 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| Greater than 20 000 | <input type="checkbox"/> | <input type="checkbox"/> |
| Unsure | <input type="checkbox"/> | <input type="checkbox"/> |

Section 2: Managerial Role Description

1. What is your position in the organisation?
-
2. Would you consider yourself as occupying a functional/line or staff position?
- Functional position Staff position
3. With respect to the above question, please indicate your area of responsibility.
- | | |
|---|--|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> General Management |
| <input type="checkbox"/> Finance | <input type="checkbox"/> Business Analysis |
| <input type="checkbox"/> Marketing | <input type="checkbox"/> Information Systems |
| <input type="checkbox"/> Production | <input type="checkbox"/> Human Resources |
| <input type="checkbox"/> Research & Development | <input type="checkbox"/> Engineering |
| <input type="checkbox"/> Other _____ | |
4. To whom do you report in the organisation. Please give organisational position.
-
5. Please indicate the types of decisions that you are normally involved with within the organisation.
- | | |
|--|---|
| <input type="checkbox"/> Budget Preparation | <input type="checkbox"/> Budget and cost analysis |
| <input type="checkbox"/> Distribution/Routing | <input type="checkbox"/> Engineering Cost Determination |
| <input type="checkbox"/> Fleet Mix | <input type="checkbox"/> Mergers and Acquisitions |
| <input type="checkbox"/> Motivation of Personnel | <input type="checkbox"/> Plant/Warehouse Locations |
| <input type="checkbox"/> Promotion/Advertising | <input type="checkbox"/> Production Planning & Control |
| <input type="checkbox"/> Sales & Forecasting | <input type="checkbox"/> Short Term Forecasting |
| <input type="checkbox"/> Variance analysis | <input type="checkbox"/> Strategic Decision Making |
| <input type="checkbox"/> Other _____ | |

Section 3: External Information Usage

Definition: External information can be regarded as that information which is relevant to the decision making processes within the organisation, but which is not generated by those activities that occur within the boundaries of the organisation, or by the organisational system (either computerised or not) which monitor and control these activities.

1. Please indicate the major decisions for which you have full or partial responsibility. (Major is defined as where significant resources are required and/or significant effort had to be made, and where such decisions were part of the development or implementation of overall company strategy, and where the decision was critical to the success/survival of the company). Please label these decisions with the numbers 1 to n and use these numbers to indicate the level of your involvement in each of these decisions.

2. Please indicate whether your involvement in these decisions was high, medium or low.

3. Please indicate the classes of external information that you find useful in making decisions within your organisation:

Technological

Socio-Cultural

Customer behaviour

Human behaviour

Legal/Governmental Restrictions

Design/composition of product

Processing of product

Pricing of product

Wages

Accounting practices

Reporting to shareholders

Distribution/labelling of product

Advertising of product

Issue of stock

Capital acquisition

Customer-related Information

Demand for product/services

Demographic information

Economic indicators

Industry Structure

- Appraisal of competitors producing like products / services
- Availability of raw material, supplies and capital
- Cost characteristics of industry
- Technological state of industry
- Marketing, advertising and pricing practices
- Channels of distribution
- Appraisal of competitors producing substitute products
- Industry wages
- Other _____

4. Are there any further types of external information that you could use, but which at present are not available to you?

5. To what extent do the following statements apply to the external information used for the types of decisions you make within your organisation. (-2 = strongly disagree, -1 = mildly disagree, 0 = neither agree or disagree, 1 = mildly agree, 2 = strongly agree).

External information supports decisions that are of a routine nature	-2	-1	0	1	2
External information is used within this organisation to serve a wide variety of decision types.....	-2	-1	0	1	2
External information helps solving decision problems which are:					
Imprecisely defined	-2	-1	0	1	2
Recurring	-2	-1	0	1	2
Unanticipated.....	-2	-1	0	1	2
In this organisation external information is used for:					
Decision formulation.....	-2	-1	0	1	2
Search for alternatives	-2	-1	0	1	2
Evaluation of alternatives	-2	-1	0	1	2
Choice of alternatives.....	-2	-1	0	1	2
Evaluation of outcome	-2	-1	0	1	2
The computer-based information systems that I use provide me with the majority of my external information requirements	-2	-1	0	1	2

6. How is the external information that you use oriented? Please give an indication of the percentage of the external information that you receive as classified under the following headings.

_____ % current information	as compared to	_____ % forecast information
_____ % judgemental information	as compared to	_____ % factual information
_____ % confidential information	as compared to	_____ % public information
_____ % proactive information	as compared to	_____ % reactive information

7. With respect to the information you receive within your organisation, how much of this information can be considered as:

Internal information |-----|-----|-----|-----|
 0 25% 50% 75% 100%

External information |-----|-----|-----|-----|
 0 25% 50% 75% 100%

8. Who, in your opinion, are the people with the most valuable information in the organisation?

9. What are the current sources of external information you receive within your organisation. (with respect to the information presented below and using a scale of 1 to 3, please rate 3 information sources most frequently used / preferred by you for gathering external information)

- | | | |
|---|--|-------------------------------------|
| <input type="checkbox"/> Personal experiences | <input type="checkbox"/> Journals | <input type="checkbox"/> Books |
| <input type="checkbox"/> Reports | <input type="checkbox"/> Professional meetings | <input type="checkbox"/> Friends |
| <input type="checkbox"/> Operational tours | <input type="checkbox"/> Industrial conferences | <input type="checkbox"/> Colleagues |
| <input type="checkbox"/> Employees | <input type="checkbox"/> Board members | <input type="checkbox"/> Suppliers |
| <input type="checkbox"/> External consultants | <input type="checkbox"/> Intra-organisational communications | |
| <input type="checkbox"/> Others _____ | | |

10. What individual or group within the organisation would you consider as your greatest source of INTERNAL information.

11. What individual or group within the organisation would you consider as your greatest source of EXTERNAL information

12. Please indicate the media used by you to present information. (With respect to the information presented below and using a scale of 1 to 3, please rate the 3 information media most frequently used by you for the presentation/transfer of information).

Paper:

- Reports Mail Books/Journals etc.

Verbally

- Formal meetings Informal meetings Telephone conversations

Computers

- Screen Printout

- Others: Please specify _____

13. In your opinion, what percentage of the external information that you currently require is presented to you by the computer-based information systems within your organisation?

Computer based |-----|-----|-----|-----|
 External info. 0 25% 50% 75% 100%

14. In your opinion, to what extent do you successfully integrate external and internal information in your decision making responsibilities?

Rarely |-----|-----|-----|-----| Often

15. Do you expect your future demands for external information to:

Increase Decrease Remain constant

16. What proportion of the information you receive for decision making purposes draws on common integrated databases which have a wide variety of users within the organisation?

|-----|-----|-----|-----|
 0 25% 50% 75% 100%

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.