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# The relationship between information technology and corporate financial reporting

IT and corporate  
financial  
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A number of large-scale empirical studies have been undertaken to investigate the impact of information technology (IT) on accounting (e.g. Carr, 1985). These studies are useful in bringing IT-related issues into perspective and raising awareness of opportunities and threats. Their recommendations have influenced also the actions of accountants. However, it has been observed that most of these studies focus too much on accountants (Kaye, 1986), and consequently neglect users of accounting information, the organizational environment, and corporate financial reporting (CFR), especially external reporting (Xiao, 1995).

Many have speculated about the impact of IT on CFR: there was the expectation, expressed by the AAA (1966) and by Bedford (1973), of multiple measure reporting; database reporting envisaged by Beaver and Rappaport (1984) and Ijiri and Kelly (1980); and online reporting forecasted by the Information Technology Group (ITG, 1989).

Information asymmetry between corporate managers and external stakeholders, and among groups of external stakeholders, has long been a major concern in economics and accounting as it leads to such problems as moral hazard and adverse selection. The use of IT may have complicated this issue. It is important for accounting regulators to know whether IT use has enlarged or reduced the asymmetry, for they have to consider the social benefits of financial reporting and whether or not to regulate IT use to achieve such benefits.

There is a strong case for more empirical research into the social and organizational implications of IT in relation to CFR. This paper does so through an investigation of whether contingent factors can explain the degree and pattern of IT impact on CFR. Specifically, it examines the relationships between

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IT use and CFR under different levels or aspects of contingent factors: user type, size, listing status, gearing ratio, and management compensation plan. The first section presents the contingency perspective; the second develops a number of hypotheses; the third section deals with the questionnaire survey; and the fourth is devoted to testing the hypotheses. A summary and conclusions then follow.

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### **I. The contingency perspective**

The contingency perspective proposed here assumes that the impact of IT on different aspects of CFR varies, and that the degree and pattern of the impact in different organizations is conditional on factors such as the characteristics of the environment, the organization and management.

This perspective is analogous to the contingency theory of organization. Although not without its critics (see e.g. Schoonhoven, 1981), this theory has been seen as a unifying and general framework, and has occupied an important position among modern organization theories (Ford *et al.*, 1988). Its general principles include:

- there is no one best way to organize;
- different ways to organize are not equally effective; and
- the best way to organize depends on the nature of the environment to which the organization relates (Galbraith 1973; Lawrence and Lorsch, 1967; Scott, 1987).

#### *The relationship between IT use and CFR*

For the purpose of this study, the impact of IT on CFR is described as "IT-related changes". This terminology is adopted as the relationship between use of IT and corporate reporting is likely to be reciprocal. While it may be true that more IT use leads to more change in CFR, it may also be the case that change in CFR results in more IT use. In the former IT acts as a cause of the change, whereas in the latter IT is a facilitator of the change. However, both roles of IT are important. Taking a dynamic view, the link may be better seen as the results of some successive and cumulative interactions between IT use and change in CFR.

IT-related changes can be observed in several ways: by directly questioning what changes have been caused by IT use; by asking about the importance of IT use in any changes that have occurred; and by statistically examining relationships between IT use and any changes identified. The first approach requires the isolation of the impact of IT if a change is caused by multiple factors. The second requires knowledge of all the factors and of their relative importance in a change. Both these requirements are difficult to meet in practice, hence the third approach was adopted in this study.

#### *Contingent relationships*

A relationship between IT use and a change in CFR may be conditional on one or more contingent factors. The association between IT use and a change in

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CFR may be strong at one level of the contingent factor(s), but weak at another; or it may be positive at one level, but negative at another. Thus, a contingent factor may specify, clarify or modify the original relationship. Identification of relevant contingent factors should enable the pattern and degree of IT impact on CFR to be made clearer. This study sought to identify contingent factors and to determine the factors on which the relationship between IT use and a change in CFR is conditional.

Adoption of this three-dimensional design involves three interrelated procedures:

- (1) collecting data on IT use, change in CFR and contingent factors;
- (2) examining the association between IT use and change in CFR; and
- (3) specifying the relationship between IT use and change in CFR by reference to one or more contingent factors.

*Components of the contingency perspective*

This contingency perspective can be seen as having three components: information technology, CFR and contingent factors.

- (1) *Information technology.* Defining information technology as “computer-based information processing and communication technologies”, it can be considered as comprising three dimensions: IT availability; forecasted IT developments; and IT use. This study focuses on the sophistication of *IT use* in accounting.
- (2) *Corporate financial reporting.* CFR can be examined from several aspects, including:
  - *components* of CFR – accountants, accounting devices and machines, accounting methods, procedures and rules, accounting policies and CFR strategies;
  - *outputs* of CFR, i.e. financial information, measured in terms of quantity and quality;
  - *performance* of CFR – in terms of efficiency, effectiveness, and strategic significance; and
  - *procedural* and *decisional* system levels.

This study focuses on CFR *outputs*, and makes a distinction between *internally* reported information and *externally* reported information.

- (3) *Contingent factors.* The contingent factors may be characteristic of the business environment, the organization, the management or of IT development. They can be political, social and economic, as well as technological. The factors found to influence financial disclosure and accounting choice in studies of CFR under agency theory and positive accounting theory may affect also the impact of IT on CFR. If this is the case, findings under these theories can be used as a starting-point in

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selecting contingent factors for the present study. The two theories may be used also as reasoning bases when examining the contingent relationships.

## II. Development of hypotheses

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One aspect of the contingency perspective is that it restricts the form of the hypotheses. Since it sees the impact of IT on CFR as being conditional, it generally prohibits the prediction of the impact of IT unless a condition or contingency is specified. When a condition is specified, a hypothesis may take one of two forms: it can be presented as the relationship between variable A and variable B, conditional on factor C; or it further specifies the strength or direction of the relationship between A and B in relation to factor C (e.g. "the relationship between A and B is stronger at one level of C than at another level of C"; or "the relationship between A and B is positive at one level but negative at another level of C"). Both forms are used in this study, the choice in each case being dependent on the strength of the underlying arguments.

### *Hypothesis 1: IT use is associated more with IRC than with ERC*

Information asymmetry between corporate managers and external users such as shareholders has long been a concern in information economic and agency theory (Walker, 1988). In general terms, the asymmetry means that managers have superior access to financial information compared with external users. In a narrower sense, it means that shareholders and other stakeholders are not always able to observe managers' behaviour and level of effort. The problem of information asymmetry is complicated by the use of IT in accounting: has IT use reduced or increased the asymmetry?

The use of IT has been seen as having automated basic accounting systems in most organizations (Carr, 1987; Clark and Cooper, 1985). The use of general accounting packages, spreadsheets, financial modelling, database, decision support and expert system software have offered support to accountants in their analytical and decision-oriented tasks and allowed them to move from the accumulation, analysis and preparation of financial information towards interpretation, evaluation, control and involvement in decision making (Carr, 1987; Clark and Cooper, 1985; Collier, 1984). As a result, information quality has been improved in terms of comprehensiveness, accuracy, timeliness, and frequency (Clark and Cooper, 1985; King *et al.*, 1991; Mantle, 1983), and relevance (Banyard, 1982). Legitimately, management can have full access to this improved information. However, this is not the case for external users. While the central issue in internal reporting is how to meet managers' information requirements, the major problem in external reporting seems to be whether or not to disclose certain information.

In the long run, IT use may benefit external users. A study (ITG, 1989) by the Information Technology Group of the Institute of Chartered Accountants in England and Wales has predicted that cumulative use of IT will lead to more sophisticated computerized networks, and thus allow more frequent and online

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reporting to external users. Moreover, IT availability and IT use will increase the expectations of external users and regulators regarding CFR. These expectations may result in increased minimum legal requirements. Evidence is emerging already. For example, the Securities and Exchange Commission (SEC) in the USA has implemented the EDGAR (electronic data gathering, analysis and retrieval) system (Coffey, 1994), which requires listed companies to file financial reports in electronic format. When fully operational, the system will be able to disseminate information to users on a more timely online basis through the Internet.

However, several barriers may prevent external users from enjoying as many benefits as do corporate managers. Managers have to protect proprietary information. Also, they have incentives to suppress some non-proprietary information, especially of “bad news” for their own or their company’s interest (Dye, 1985). Moreover, while financial reporting is costly, the true value is not easy to establish since there is no accepted and practicable unit of measurement for pricing information, thus making it difficult for the provider to identify any benefits of a disclosure (Boulding, 1966). Therefore, unless there are foreseen benefits, such as in the situation where the managers believe that their company may be undervalued (Verrecchia 1983), managers are reluctant to disclose any information beyond minimum requirements.

Consequently, the increased amount of information generated for *internal* financial reporting through greater use of IT is not likely to be incorporated on the same scale as it would be for *external* financial reporting. As a result, it is likely that the asymmetry not only exists, but has been enlarged by increased IT use.

*Hypothesis 2: the relationship between IT use and internal reporting change is stronger in smaller companies*

The larger the organization, the greater its complexity, the greater the control and co-ordination needed, and the greater the volume of information that needs to be handled. Hence, information systems are likely to increase in complexity with company size. As a result, larger companies will tend to find it more difficult than smaller ones to instigate any changes to their existing systems. Although large companies have more resources, in terms of finance and expertise to be invested in IT applications, this advantage may not be as significant as might be thought.

Smaller companies may not be able to use a mainframe or even a minicomputer, but they can afford personal computers. They may not need or may be unable to implement a wide area network (WAN), but a local area network (LAN) may be appropriate and sufficient for their needs. They may not be able to develop in-house software, but their needs can be met by external services, or by a variety of generic software. Therefore, these smaller companies may no longer feel constrained by limited resources, and thus a greater relative improvement in internal reporting may be obtained by them from more use of IT.

Finally, empirical evidence suggests that large companies are quite sceptical about the benefits of IT use (Carr, 1987). Consequently, it is expected that the relationship between IT use and IRC becomes stronger as size decreases.

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*Hypothesis 3: the relationship between IT use and external reporting change is stronger in listed companies than in unlisted ones*

It was found that *listing status* is associated with the extent and quality of financial disclosure to external users (Chow and Wong-Boren, 1987; Cooke 1991). Two reasons for this are suggested:

- (1) listed firms are aware of financial benefits accruing from adequate disclosure, thus they have a greater incentive to use IT to improve external reporting than do unlisted firms; and
- (2) listed companies have to comply with certain stock exchange regulations, which means that the minimum reporting requirements are more stringent than for non-listed companies.

From the perspective of agency theory, stock exchange listing is an externally institutionalized monitoring/bonding device (Hill and Jones, 1992). To comply with listing rules and additional reporting requirements, listed companies may incur certain monitoring/bonding costs, but these should be outweighed by greater capital liquidity and a lower financing cost arising from more extensive reporting. Moreover, given limited financial resources and market capacity, listed companies have to compete with each other for greater capital liquidity and lower capital cost. This gives them an incentive to improve their external financial reporting. The incentive is further maintained because of adverse selection. Companies with high-quality securities have to signal their performance to the market, otherwise the market may undervalue them.

Moreover, market regulators may promote IT use for external reporting either by requiring listed companies to implement a specific form of IT or by directly implementing IT-based reporting systems and requiring companies to use them. This is evidenced by the SEC's development of the EDGAR system. For these reasons, it is predicted that the relationship between IT use and ERC is stronger in listed companies than in unlisted ones.

*Hypothesis 4: the relationship between IT use and external reporting change is conditional on management compensation plans*

A central issue in both agency theory and stakeholder theory is the moral hazard problem. One suggested solution is the use of *management compensation plans* which aims at inducing management to act in the interests of stakeholders. Without such plans, managers (the agents) of a company would adopt short-term horizons and would, when their own interests are at stake, be risk-averse in decision making.

There are two contrasting types of management compensation plans – short-term and long-term schemes (see Smith and Watts, 1982). Bonus plans are predominantly *short-term* incentive plans. They are usually based on annual earnings. In addition to the short-term-horizon problem, bonus plans are potentially subject to managers' manipulation since they are based on accounting numbers.

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Share options, on the other hand, are a major type of *long-term* compensation plan. Here, the wealth of managers and their personal interests are tied to share price which determines the value of the firm or the wealth of the stakeholders. As a share-option scheme is not directly associated with accounting numbers, the incentives for manipulation are reduced. However, just as in the case of bonus plans, the schemes need to be adjusted continuously as the firm's market value changes. This process is costly. Moreover, because the options are non-negotiable and are subject to forfeiture, managers' investment portfolios are exposed to risk, leading to demands for extra compensation.

There are two links between management compensation plans and the relationship between IT use and CFR.

- (1) The adoption of different incentive plans may influence management's decisions on IT use, especially when an IT implementation requires a great deal of resources. When an IT project is large, it may have negative cash flows in early years, but a positive overall net present value. Given that managers are naturally risk-averse, they may not be keen on such an investment if a *bonus plan* is in use; however, they may be more inclined to adopt a long-term horizon and accept such a project if a *long-term compensation plan* is adopted (Larcker, 1983).
- (2) The adoption of different plans may influence management decisions on financial reporting. Jensen and Meckling (1976) predicted that the optimum level of monitoring by stakeholders increases as the ratio of managers' share of equity to outside equity falls. Following this, Watts (1977) hypothesized that the smaller the managers' relative share of the corporation's equity, the greater the likelihood that the corporation presented financial statements in an unregulated economy in the nineteenth century. This can be logically extended to voluntary disclosure in a regulated economy at the present time. If this view holds, as it increases the managers' relative share of the equity, the adoption of a share-option plan would have a negative effect on voluntary disclosure.

However, other studies indicate that full disclosure will reduce the dispersion between market price and the intrinsic value of a security (Friend and Herman, 1964). In particular, when the firm is believed by the managers to be undervalued by the market, managers have incentives to disclose more information (Verrecchia, 1983). For this reason, managers who have a larger stake in their company will disclose more in order to maximize the value of the firm and to realize their own benefits. Following this, the presence of a share-option plan should give management an incentive to disclose more and better information.

Consequently, it is expected that the relationship between IT use and external reporting change (ERC) is affected by the adoption of management compensation plans. However, due to the lack of theoretical clarity, the direction of this specification has to be estimated from the data.

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### III. Survey design and implementation

To test the hypotheses, a postal questionnaire survey was undertaken, followed by face-to-face interviews with some of the respondents.

#### *The sample*

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A sample of 1,515 companies was selected at random from the 5,320 public companies included in the May 1993 release of the CD-ROM database *FAME* (*Financial Analysis Made Easy*), a database of over 130,000 UK companies. In the determination of the sample size, the emphasis was placed on analysable data in sub-samples (set at 50, following Hoinville, Jowell and Associates, 1989) in contingent analyses.

#### *The questionnaire*

The questionnaire consisted of an IT use index, an internal reporting change (IRC) index, an ERC index and the set of contingent factors discussed in the hypotheses.

*IT use index.* There is no agreement in the literature as to how to measure IT use. However, it is commonly held that IT use is multi-dimensional and cannot be captured by a single indicator or item. Thus, in a study of the impact of IT on small-business performance, Cragg (1990) adopted several measures derived from the literature, including: number of sophisticated applications; number of functional areas involved; number of managerial applications; uses by managers; and single or shared use.

Drawing on previous studies of IT use in accounting (as described in the previous section), IT forecasts (IIARF, 1991; Straub and Wetherbe, 1989), and IT implementation (Bailey and Pearson, 1983; Ives and Olson, 1984), six items were selected for inclusion in a multiple-item IT use index:

- extent of accounting computerization;
- years of IT use in accounting;
- types of IT-based accounting system in use;
- workstation-accounting staff ratio;
- types of IT applied in accounting; and
- level of integration of IT applications;

To facilitate further aggregation and analysis, all items were coded as ordinal variables with a four-point scale. These items may be seen as individual variables that capture different aspects of the use of IT in accounting. They can be seen also as multiple items of a conceptual variable that measures the sophistication of IT use in accounting.

*IRC and ERC indices.* In designing these indices, an information characteristic-oriented approach was taken to portray a change in financial reporting. Information characteristics are well-documented (ASSC, 1975; FASB, 1980) and have been used widely in previous research (see e.g. Gorry and Scott Morton,

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1971; Stamp, 1982). The approach allows the survey subjects to state the degree of change in each item.

In order that a comparison could be made between IRC and ERC, the two indices contained the same items, all measured on a five-point scale – much less, less, no change, more, and much more – respondents being asked to specify the degree of a change since the early 1980s (on the grounds that it covered the period during which personal computers, database technology and LANs have become increasingly popular in business). The items included in the IRC and ERC indices were:

- forecast information;
- external information;
- comparative information;
- non-financial information;
- segmental information;
- strategy-specific information;
- user-tailored information;
- frequency of reporting;
- timeliness of reporting;
- auditability;
- accessibility;
- availability;
- understandability;
- presentation; and
- cost.

The items in the IRC and ERC indices were derived largely from existing accounting conceptual frameworks. Similar indices can be found in the literature. For example, Chenhall and Morris (1986) developed a ten-item index comprising information characteristics to measure the perceived usefulness of management accounting information.

*Contingent factors.* Information about *company size* and *listing status* was obtained from *FAME*. Company size was measured in terms of a company's average sales during the last five years[1]. To facilitate an analysis of the contingent relationships between IT use and IRC and between IT use and ERC, company size was classified as:

- *small* (average annual sales of £10 million or less);
- *medium* (£10 million-£100 million); or
- *large* (in excess of £100 million).

Data about the other contingent factors were obtained from the questionnaire.

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*Survey implementation*

Finance directors were chosen as subjects on the grounds that they make major decisions on financial reporting. Moreover, many finance directors are responsible for computer-based accounting information systems (King *et al.*, 1991).

Following two pilot studies, the questionnaire, accompanied by a covering letter and a postage-paid reply envelope, was sent to the finance directors of the 1,515 selected companies. Following Dillman (1978), two waves of follow-up letters were sent to those whose questionnaire had not been returned.

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Three-hundred-and-seventy-six (25 per cent) of the questionnaires were returned, of which 311 (21 per cent overall) were usable – a not untypical response rate compared with the current trend in the UK[2]. Of those returned uncompleted, reasons offered for non-participation included company policy (20), resource constraints (14) and non-applicability (12). The Ferber test (Ferber, 1948-1949) revealed no evidence of non-response bias.

*Face-to-face interviews*

Fourteen of the 32 respondents who agreed to take part were interviewed in semi-structured interviews.

**IV. Hypothesis testing**

For the purposes of testing the hypotheses, the overall scales – the sums of all the individual item scores – of the three indices (ITUSE, IRCAGG and ERCAGG) were used. Cronbach's alpha (Cronbach, 1970) was used to test the reliability or internal consistency of the three indices. The alpha values for the IT use, IRC and ERC indices were 0.59, 0.83 and 0.91, respectively, indicating that they were reliable (Nunally, 1978).

Since the overall scales of the three indices were used to test the hypotheses, and because these aggregated scales are essentially ordinal variables, Spearman's  $\rho$  was used, along with partial correlation analysis in order to control for the interactions among the contingent factors.

As testing of the formulated hypotheses involved a comparison of the strength of the contingent relationships or the sizes of correlation coefficients, it was necessary to investigate whether the differences between these coefficients were statistically significant. However, as methods for testing such differences between correlation coefficients determined from ordinal data are not well-developed, methods for continuous data were used as an approximation. A well-known  $z$ -test (Wetherill, 1981) was used to test the significance of the difference between two correlation coefficients  $r_1$  and  $r_2$ . For testing differences among three or more correlation coefficients, a  $\chi$ -square test was applied (Wetherill, 1981). A  $t$ -test (Williams, 1959) was used to compare two dependent coefficients  $r_{13}$  and  $r_{23}$ , where  $r_{13}$  is the coefficient between the first and third variables, and  $r_{23}$  is that between variables two and three[3].

*H1: IT use is associated more with IRC than with ERC*

While the Spearman correlation coefficients in Table I suggest that IT use is positively associated with both IRC and ERC, the data also shows that IT use is

associated more with IRC than with ERC, the difference being significant at less than 0.01 in the one-sided *t*-test. These results support *H1*.

The implications of these results can be elaborated further in the context of information asymmetry. If the information asymmetry has worsened, these results suggest that IT has played a role, be it as cause or as facilitator. A detailed frequency analysis of the changes in individual items of the IRC and ERC indices suggests that both internal and external reporting have experienced change, mostly for the better. Parallelism exists between IRC and ERC. For example, forecast information, frequency, timeliness and presentation are aspects which were most frequently marked as having undergone great improvement in both internal and external reporting. However, it seems that IRC's improvement is greater than ERC's. To confirm this, a one-sided Wilcoxon matched-pairs signed-ranks test was performed. The test confirmed that IRCAGG is significantly greater than ERCAGG, with the *p*-value being well below 0.01. In 14 of the 15 aspects, IRC is greater than ERC (*p*-values being well below 0.01). The only exception is that the change in the cost of internal reporting was not found to differ significantly from that of external reporting.

	IRCAGG	ERCAGG
IT use	0.294** (280)	0.179** (235)

**Notes:**

\*\* = significant at 0.01. Sample sizes are given in parentheses

**Table I.**  
Spearman correlation coefficients between IT use and IRC and between IT use and ERC

Thus, it seems that IT use has increased the information asymmetry in that improved information for internal users resulting from or facilitated by the increased IT use has not been enjoyed to the same extent by external users.

*H2:* the relationship between IT use and IRC is stronger in smaller companies

Table II shows that the association between IT use and IRC is stronger in small companies than in medium-sized ones, and much stronger than in large ones. Moreover, the relationship is not significant at all in large companies. The

Company size	IT use and IRCAGG
Small	0.400** (83)
Medium	0.210* (117)
Large	-0.17 (56)

**Notes:**

\* = significant at 0.05

\*\* = significant at 0.01

**Table II.**  
Spearman correlation coefficients between IT use and IRC by size

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*chi*-square test shows that the difference among the coefficients of the three groups is significant at 0.05. These results are consistent with *H2*.

*H3*: the relationship between IT use and ERC is stronger in listed than in unlisted companies

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It can be seen from Table III that a positive association obtains only between IT use and ERC in listed companies. However, the difference between listed and unlisted companies was not significant.

Since listing status is an indicator of an externally institutionalized agency monitoring and/or bonding device (financial market regulation), the fact that the relationship between IT use and ERC is not significantly conditional on listing status suggests that market regulators have contributed little to the use of IT for external reporting.

**Table III.**  
Spearman correlation coefficients between IT use and ERC by listing status

Status	UT use and ERCAGG
Listed	0.215* (121)
Unlisted	0.134 (114)

**Note:**  
\* = significant at 0.05

The interview data provided further evidence against this hypothesis. Interviewees in listed companies were asked whether they felt any influence from the stock exchange regulators on the use of IT for external reporting. The answers were unanimously negative. *H3* therefore was unsupported.

This contrasts with the situation in the USA where the SEC has developed the EDGAR system. By implication, although not yet empirically tested, EDGAR can be expected to produce some changes in financial reporting. In the UK, no such development has been initiated.

*H4*: the association between IT use and ERC is conditional on management compensation plans

Table IV displays the Spearman correlation coefficients between IT use and ERC in relation to four management compensation plan options. A *chi*-square test found no significant differences among the four contingent correlations.

**Table IV.**  
Spearman correlation coefficients between IT use and ERC by management compensation plan

Management compensation plan	IT use and ERCAGG
No plan	0.315* (47)
Bonus	0.042 (42)
Share option	-0.003 (31)
Bonus plus share option	0.083 (75)

**Note:**  
\* = significant at 0.05

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The only significant association between IT use and ERC is in companies without any compensation plans. It was hypothesized that the strength of the contingent associations between IT use and ERC vary from one mode of management compensation plan to another. However, this is not supported by the analysis here. It seems that the type of compensation plan has no effect on the relationship between IT use and ERC, and so *H4* was unsupported.

In the light of this result, management compensation plans were discussed with the interviewees. All the companies with no management incentive plan were small family-controlled businesses, which may explain why *they* showed a positive and significant association between IT use and ERC.

Reasons for the lack of association between IT use and ERC in companies with a compensation plan were revealed during the interviews. At the time of the survey, the economy had been in recession for many years. In several companies the operating results had been such that only very small bonuses, if any, could be provided; or share prices were so low that share options were relatively meaningless to the directors. For similar economic reasons, one large company with both a bonus plan and a share-option scheme, failed to implement a major new IT strategy because of a shortage of funds. Other reasons identified include difficulties in measuring management performance, the effect of salary-tied pension schemes on directors, and nominal bonus schemes.

These findings, in effect, break the two links on which *H4* was developed – between compensation plans and IT investment decisions, and between compensation plans and financial reporting decisions. However, caution must be exercised in this interpretation as it is based on a very limited number of interviews.

#### *Other findings*

During the interviews, interviewees were asked to discuss their company's financial reporting strategy. The responses suggested that the relationship between IT use and ERC may be conditional on the existence and level of borrowings, since companies with a loan, and especially a large loan, tend to disclose to creditors much more information in addition to formal reports, and this gives IT a role to play.

It is argued in agency theory that, as the gearing ratio increases, managers have a greater incentive to transfer wealth from creditors to themselves and existing shareholders, given the existence of information asymmetry (Fama and Miller, 1972; Jensen and Meckling, 1976). However, the potential wealth transfer is positively related to residual loss, since creditors would anticipate these opportunistic activities and thus seek compensation by discounting the firm's security. Therefore, if managers and shareholders agree not to exercise opportunistic behaviour, they would benefit from a higher security price and an increase in firm value because such agreements (debt covenants) reduce the probability of suboptimal investments. Although managers and shareholders have to bear the costs of establishing and executing these contracts, these costs are relatively small compared with the residual loss. Financial reporting plays a

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central role in many debt covenants because accounting data are used in them and because extensive disclosure often is required by the creditors. When the gearing ratio is very high, the extent and frequency of financial disclosure reaches a point where IT use becomes essential.

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This gearing effect was tested by a Spearman correlation analysis of the relationship between IT use and ERC by stratifying the sample by the variable gearing. In the sample frame (*FAME*), gearing measures the relationship between shareholders' funds (including preference shares) and creditors' funds, using the formula:

$$\text{Gearing (\%)} = \frac{\text{Bank overdrafts} + \text{long-term liabilities}}{\text{Shareholders' funds}} \times 100$$

The five-year average gearing ratio was extracted from *FAME*, and categorized into four levels as shown in Table V. A chi-square test found that the difference among the four contingent correlation coefficients between IT use and ERC in Table V was significant at 0.10. There is indeed a positive significant association between IT use and ERC when the gearing ratio is over 100 per cent, or between 11 and 50 per cent. However, no association was found in companies with a gearing ratio between 51 and 100 per cent.

Gearing (%)	IT use and ERCAGG
0-10	0.006 (28)
11-50	0.353** (63)
51-100	-0.054 (56)
100 >	0.286* (56)

**Table V.**  
Spearman correlation coefficients between IT use and ERC by gearing

**Notes:**  
\* = significant at 0.05  
\*\* = significant at 0.01

In summary, the results do not provide full support for the agency theory argument, although they do indicate that the relationship between IT use and ERC is conditional on gearing ratio.

#### *Discussion*

*H1* was supported by the contingent analysis, similar tests involving IRC revealing that most contingent correlations for all the relationships measured in *H2-H4* between IT use and IRC were larger than the corresponding ones between IT use and ERC.

The introduction of the contingent factors in the analysis naturally leads to further interpretation or explanation of the relationships. For example, the introduction of company size as a factor provides several potential explanations for the relationship between IT use and IRC. Further, by stratifying the sample

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by the contingent factors, the effect of the relationships between them and the original variables (IT use, IRCAGG and ERCAGG) are controlled, thus contributing to the establishment of non-spurious associations between IT use and CFR changes.

*Company size* was found to be associated with *listing status* and *management compensation plan*, with the Cramer's  $v$  measure of association between company size (size) and these two factors being 0.33 and 0.24 (significant at 0.01). Thus it is desirable to control the size effect in testing the hypotheses ( $H3$  and  $H4$ ) involving these factors using partial correlation analysis[4]. The tests resulted in the sizes of most correlation coefficients changing slightly compared with the earlier Spearman correlation coefficients. However, the directions and the patterns of the contingent associations remained unchanged.

## V. Summary and conclusions

This paper has described the contingency perspective, the hypotheses formulated on the basis of that perspective and the results of the tests of those hypotheses. It segmented the sample into sub-samples according to the specified contingent factors and examined the contingent relationships in sub-samples. By doing so, it avoided the much-criticized linear assumption of the relationship between the contingent factors and the original variables (IT use, IRC and ERC) (Schoonhoven, 1981), often made in the contingency theory of organization to which the contingency perspective adopted in this study is analogous. Further, being aware of the fact that some contingent factors are correlated, partial correlation analysis was performed to control the effect of company size while testing  $H3$  and  $H4$ .

$H1$  – IT use is associated more with IRC than with ERC – was confirmed, implying that more and better information is available, but that external users have not benefited as much as have corporate managers. Given that IRC is greater than ERC, these results together suggest that IT use has played a role in increasing the disparity between internal and external reporting. This finding indicates that IT use in accounting is not merely a technological innovation, but that it also affects the interests of a wide range of people. Thus, the effect of IT use in accounting is not confined to accountants and individual organizations and, therefore, requires monitoring and control at the societal level. To prevent further increase in the information asymmetry between managers and external users, the UK financial reporting regulators should encourage companies to make greater use of IT to improve external reporting. Alternatively, they should take the initiative in using IT for that purpose. The SEC in the USA, by sponsoring the development of EDGAR, has set a good example in this regard. The effects of IT on the information asymmetry has implications also for managers. Arguably, companies and their managers do not benefit from the existence of, and an increase in, the information asymmetry (ICAS, 1988). Thus, managers perhaps should pay more attention to the use of IT in external reporting. The recent developments in IT, such as database and the Internet, provide great potential for both regulators and individual companies to improve external reporting.

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The agency literature shows that information asymmetry, together with uncontrolled opportunistic behaviour, leads to moral hazard and adverse selection. It would be interesting to investigate further how the enlarged information asymmetry has been exploited, and whether it is more likely for companies to experience moral hazard and adverse selection problems.

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It would be equally interesting to see how IT has been, or is being, used to exploit the information asymmetry. The possibility exists that IT is used to “decorate” the data to be disclosed and create good or “better” images to external users, even within the guidelines for best reporting practices. Current standards or regulations, for example, do not take into account the opportunities and consequences of presenting information in non-print media, hypertext or even hypermedia.

Support was obtained also for *H2* – the relationship between IT use and IRC is stronger in small companies than in large ones – suggesting that IT use may be more effective when the organization is less complex and the information system less complicated. It may be also because IT use, especially the use of PCs, LANs and economical software, has removed or made less significant some previous resource constraints in smaller companies. However, further research is required to ascertain how smaller companies have taken advantage of IT in improving their internal reporting.

No evidence was found to support *H3* – the relationship between IT use and ERC is conditional on listing status. This indicates that financial market regulators have played no role in promoting IT use for the purpose of external reporting in the UK.

IT use seems to be positively and significantly correlated with ERC when companies operate no management compensation plan. The interview data suggest that the positive correlation between IT use and ERC may have resulted from the fact that these were small companies. The finding that IT use has no association with ERC in companies operating a management compensation scheme was unexpected. The interview data suggests that factors such as poor operating results, low market prices, and cash shortage may have made incentive plans ineffective, thus breaking the two hypothesized links with financial reporting decision making, and with IT investment decision making. However, since only 14 interviews were conducted, these reasons should be treated as indicative rather than conclusive.

While support for an agency theory perspective was identified in relation to the level of gearing, it was not consistent across all levels of gearing, suggesting that other unidentified factors were affecting the relationship. Further effort is required to examine the causes of this irregularity. An explanation may lie in the construction of the gearing ratio.

Overall, the findings show that the impact of IT on CFR is not unconditional and that the contingency perspective is a useful framework for investigating this impact. However, it should be recognized that this study, apart from suffering from other standard problems of the questionnaire survey approach, is largely a static test of the contingency perspective. Consequently, questions such as how IT and CFR interact remain to be answered. To fully test the

framework, some form of longitudinal or anthropologically anchored approach may be needed, although a robust theory should withstand empirical investigation by either approach (Gordon and Narayanan 1984).

A major feature of the contingency perspective is that it forces the researcher to find contingent factors which can explain the degrees and patterns of the impact of IT. Apart from those investigated in this study, it is possible to identify further contingent factors. This provides additional research opportunities.

### Notes

1. Two other size indicators (five-year average total assets and five-year average number of employees) were considered, and information about them was extracted from FAME. However, they were not used subsequently. This was mainly because the *company size* variable had to be converted into an ordinal variable (large, medium and small) so that stratified data analysis could be undertaken to test the hypotheses. Thus, the differences among the three measures would be more a matter of how to transform them into ordinal variables. Further, five-year average total assets and five-year average number of employees were highly correlated with five-year average turnover (the Pearson correlation coefficients being over 0.90 significant at 0.001 in both cases).
2. Research on survey response in the UK shows that the typical response rate of mail surveys was 37 per cent in 1966, 24 per cent in 1987, and well below 24 per cent with current surveys (Richards, 1993).
3. • To test the equality of two population correlation coefficients,  $H_0 : \rho_1 = \rho_2$  based on sample correlation coefficients  $r_1$  and  $r_2$  determined from independent samples of sizes  $n_1$  and  $n_2$ , we use:

$$Z = (z_1 - z_2) / \sqrt{\frac{1}{(n_1 - 3)} + \frac{1}{(n_2 - 3)}}$$

where

$$z_i = \frac{1}{2} \log_e [(1 + r_i)/(1 - r_i)] \quad (i = 1, 2)$$

which is referred to as Fisher's transformation. Under  $H_0$ ,  $Z$  follows the standard normal distribution (Wetherill, 1981).

- To test the null hypothesis  $H_0 : \rho_1 = \rho_2 = \dots = \rho_k$  based on sample correlation coefficients  $r_1, r_2, \dots, r_k$  determined from independent samples of size  $n_1, n_2, \dots, n_k$ , we use:

$$\chi^2 = \sum_{i=1}^k (n_i - 3)(Z_i - \bar{z})^2$$

where

$$Z_i = \frac{1}{2} \log_e [(1 + r_i)/(1 - r_i)] \quad (i = 1, 2, \dots, k), \quad \text{and} \quad \bar{z} = \frac{\sum (n_i - 3) Z_i}{\sum (n_i - 3)}$$

Under  $H_0$ ,  $\chi^2$  follows the *chi*-square distribution with  $(k-1)$  degrees of freedom (Wetherill, 1981).

- To test the equality of two population correlation coefficients, i.e. correlations involving a common variable, based on sample correlation coefficients  $r_{13}$  and  $r_{23}$  determined from a sample size  $n$ , we use:

$$T = (r_{13} - r_{23}) \sqrt{\frac{(n-1)(1+r_{12})}{2\left(\frac{n-1}{n-3}\right) |R| + \bar{r}(1-r_{12})^3}}$$

where

$$|R| = (1 - r_{13}^2 - r_{23}^2 - r_{12}^2) + 2 r_{13} r_{23} r_{12}, \text{ and } \bar{r} = (r_{13} + r_{23})/2.$$

Under  $H_0: \rho_{13} = \rho_{23}$ ,  $T$  follows Student's  $t$  distribution with  $(n-3)$  degrees of freedom (Williams, 1959).

4. Since it is based on Pearson correlations, partial correlation analysis requires the use of interval or ratio variables. While company size (sale) is a ratio variable, the multiple-indicator indices are essentially ordinal and the results of this test can, therefore, be taken only as an approximate guide.

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