

A NOTE ON THE CLASSIFICATION OF COMPUTER SYSTEMS

J.A. Walsh*

Background

In the auditing and accounting literature, computer systems are normally classified as 'mainframe' 'minicomputer' (mini) and 'microcomputer' (micro) systems for the purpose of highlighting the potential accounting control weaknesses associated with classes of computer systems [e.g., Page and Hooper, 1987, pp. 285-288].

However, there are significant difficulties associated with this approach. The terms mainframe, mini and micro are not well defined. There are no generally accepted definitions or cut-off points and classification is frustrated by the large number of machines with overlapping facilities [e.g., Rossa and Rossa, 1980, pp. 149-150]. Even if agreed definitions were feasible, computers in each class could be employed in fundamentally different ways, giving rise to different accounting control issues.

These differences undermine the utility of the mainframe, mini, micro (MMM) approach, first, at the operational level as an aid to practitioners in control and audit and second, as an effective framework for teaching and research.

Proposal

The purpose of this note is to propose an alternative, multi-dimensional approach to highlighting the potential accounting control weaknesses¹ associated with classes of computer systems. Using the multi-dimensional approach, computer systems are classified by reference to the pattern they

¹ The paper is concerned with highlighting 'potential' accounting control weaknesses. It is impossible to be prescriptive about the 'actual' weaknesses that will be associated with a specific firm's computer where the computer system has given a profile of relevant characteristics. This is mainly because compensating controls can be brought to bear on potential weaknesses, particularly at application controls level. Because this is the case, an additional advantage of the proposed approach is that it will help pinpoint areas where compensating controls are likely to be required.

*The authors is Dean of the Dublin Business School, National Institute for Higher Education.

IBAR — Irish business and Administrative Research, Volume 9, 1988, pp 99-102

display with respect to a number of relevant characteristics (RCs). Four sets of RCs are proposed. RCs were identified by deducing from the literature's accounting control frameworks for computerised systems [e.g., Price Waterhouse, 1981, pp. 1-98] those characteristics of operation and of the environment of operation which make elements of the frameworks difficult to implement.

RC's arise from the nature of a firm (e.g., size, geographic dispersal) and its approach to computer processing (e.g., distributed or remote processing). Though they make elements of the accounting control frameworks difficult to implement, they are not in themselves accounting control weaknesses. But they do give rise to a need to substitute other less cost-effective (compensating) controls which rely to a greater extent on constant human vigilance and intervention (e.g., reliance on closer supervision rather than segregation of duties). Essentially, the proposed approach has its roots in a contingency view of accounting control in computerised systems.

Only RCs which are long-term or structural in nature are considered here. Those which arise from temporary causes within a firm (e.g., inexperience because of the acquisition of a new computer) are outside the scope of this paper.

Relevant Characteristics

RC's are now explored under four headings.

EDP Staffing:

To achieve a reasonable level of segregation of duties as a means of reinforcing the integrity of the computerised information system, a firm must have a relatively large number of EDP staff [for further insight, see for example, Porter and Perry, 1984, pp. 152-160]. Therefore, in those firms with small numbers of EDP staff, there is likely to be a reduction in the standard of accounting control attained at the general controls level [for a discussion of General and Application Controls, see APC, 1984].

Physical Environment and Services

The physical environment of the computer is an important arm of the accounting control framework [Fitzgerald, 1978, pp. 64-71]. Where the computer is located in the same room as EDP or user staff without a protected environment (with respect to access, humidity, temperature or fire control), there is an increased danger of hardware failure and destruction with resultant data loss and it is difficult to enforce segregation of duties at the operational level.

Security and Control Software:

Operating system-based routines help prevent and detect unauthorised access to data and files [see AICPA, 1982, pp. 4-5], allow recovery from data loss [see Price Waterhouse, 1981, p. 69] and check the validity of computer processing [see Chambers, 1981, pp. 70-72]. With those computers whose operating systems incorporate only a restricted range of such routines, there is unlikely to be an adequate framework at the general controls level for the prevention and detection of unauthorised processing, data loss and processing error.

Hardware and Approach to Processing:

Certain computer configurations bring their own issues of accounting control. Important ways in which these issues arise are outlined below.

Teleprocessing Links: Where a firm configuration includes teleprocessing, a means of unauthorised logical access is introduced over which the firm has less control than internal means of access [See Jenkins, 1985 for a discussion of the nature of this problem].

Single Backing Storage Devices: When a firm relies on one high volume backing storage device, copying data and software files is more difficult and so, records may be completely lost if the original files are destroyed.

Distributed Processing: Where a firm's decentralises a major part of its computing and data processing resources into other functional departments rather than concentrating them in a centralised department, in general, within each department, resources are more limited than in a central equivalent which is likely to lead to a microcosm of the problems already discussed under EDP Staffing, Physical Environment and Services and Security and Control Software.

Summary and Conclusion

The MMM approach, which is widely advocated as a means of highlighting the potential accounting control weaknesses associated with classes of computer systems, has, in practice, limited utility in business and educational contexts. There appear to be many advantages in adopting an alternative, multi-dimensional approach whereby computer systems can be classified by reference to the pattern they display with respect to four sets of RC's.

REFERENCES

American Institute of Certified Public Accountants, 1982. *Audit and Control Considerations in an On-Line Environment*. New York.

Auditing Practices Committee, 1984. *Auditing Guideline — Auditing in a Computer Environment*. London: Institute of Chartered Accountants in England and Wales.

Chambers, A., 1981. *Computer Auditing*. London: Gee & Company.

Fitzgerald, J., 1978. *Internal Controls for Computerized Systems*. San Leandro, California: Fitzgerald and Associates.

Jenkins, J., 1985. "Data Communications Security — Exposures and Controls", *Comsar*, September 1985, pp. A1-A6.

Page, J. and Hooper, P., 1987. *Accounting Information Systems*. Englewood Cliffs, New Jersey: Prentice-Hall.

Porter, W.P. and Perry, W.E., 1984. *EDP Controls and Auditing*. Boston, Massachusetts. Kent Publishing Company.

Price Waterhouse, 1981. *Evaluation and Testing of EDP Controls*. New York.

Rossa, N. and Rossa, S., 1980. *Small Computers for the Small Businessman*. Portland, Oregon: Dilithium Press.

BOOKS REVIEWS

Gewerkschaften und Arbeitsbeziehungen in der Republik Irland (Trade Unions and Industrial Relations in the Republic of Ireland) by Wolfgang Weinz, Verlag Peter Lang, Frankfurt/M Bern New York Nancy, pp. 218, price SFr 48.

The Republic of Ireland differs greatly with regard to its industrial relations from German-speaking countries. In the research field, at least in the recent past, a more pronounced discussion of this field has developed in Ireland compared to the Federal Republic of Germany, where there is neither a "College of Industrial Relations" nor a corresponding department in a Commerce Faculty, nor even an equivalent term for this research discipline. The actual structuring of industrial relations in the FRG however is constituted by a multiple network of laws, collective agreements and decisions by the Labour Courts which are legal binding norms. As such, industrial relations in the Federal Republic is much more codified and integrated into the legal system than in English-speaking countries.

Thus Industrial Relations is taught and researched at German-speaking universities principally as part of Labour Law (in the law faculties) and also as part of management theory in Business Administration, and as part of the study of trade unions in politics and sociology departments. With regard to the last mentioned case, numerous papers have been written in the last few years dealing with comparative trade-unionism, especially dealing with comparisons between the West German and British trade unions. As a continuation of this discussion the dissertation by Wolfgang Weinz (Heidelberg) about trade unions and industrial relations in Ireland is a welcome addition to this literature.

An analysis and description of the labour and trade union movement can't leave out of account the historical background, especially when the dissertation is published in a foreign country. Leading from an introductory glance at the available literature, Weinz then discusses in the second chapter the emergence and development of the Irish trade unions in the context of their relationship to political parties, to the political system and to the development of industrial relations and Irish nationalism. In doing this he tries to outline separately the Anglo-Irish traditional line and genuine Irish developments. Finally he analyses the relationship of the trade union movement to the wider Irish labour movement. The weakness of the Irish labour movement is attributed to the conservatism of the Irish trade unions, split into British and Irish units. Under the leadership of William O'Brien who operated without a consistent ideological outlook on the basis of a narrow pragmatism and without a more than marginal representation in the parliamentary sphere, the Irish unions co-operated with the Fianna Fáil party.

In the third and fourth chapters Weinz describes the political and economic background of recent Irish history. Here he describes the factors which hinder the development of a strong trade union movement: a social structure dominated by conservatism, authoritarianism and the catholic church; a corporate structure dominated by a "clan" of big families rather than a modern power elite; and the still underdeveloped economy. The concept of a "small open economy" or, as it is sometimes called, "external dependent industrialisation" would seem to have brought no improvement to the central concern of the trade unions because of the absence of a coordinated overall state strategy in the sphere of industrial politics orientated to the home market and employment.

In the fifth and longest chapter Weinz examines the structure of the unions in more detail. Here he makes the previously-analysed historical and socio-economic factors responsible for the resulting splits and the ensuing short-sightedness of the unions.

According to Weinz Irish trade unions are in principal non-political, pragmatic and co-operative. Even after the reunification into the ICTU, the divergent interests of the individual unions prevented the formation of a strong umbrella unit capable of developing a political strategy. A result of the existence of a large number of smaller unions is however a relatively functional democracy within the unions and a human level to their operation. The latter is certainly an important contrast to the monumental and bureaucratic representational organisation in West Germany, however effective it may be.

On examining of the strike record of the Irish unions Weinz observes an increased tendency to strike since the 60s. This, however, is almost exclusively concentrated in Irish companies in the service sector. He interprets this development as being a consequence of disparities in collective agreements, a socially underdevelopment political system, outdated company structures and employer-employee relations as well as the ignorance of the elites within the big trade unions with regard to their grass-roots members.

In the sixth chapter, the second central one, Weinz examines the system of industrial relations, looking in detail at various institutions. Here he highlights the fact that collective agreements are not legally binding, as opposed to the FRG, but that industrial relations are more legally binding than in the UK. Weinz however doubts that the aforementioned could have a positive influence on the shaping of individual protective rights.

For Weinz the essential reason for the failure of major negotiations over the National Wage Agreements, and the lack of improvement in industrial relations after the establishment of central mediatory institutions (Labour Court, Employment Appeals Tribunal etc.) is the poor extension of the collective agreement/negotiating system to the middle and lower level, i.e. to the level of the various industrial sectors and individual companies. National agreements can never be binding for all. They can only lay down minimal conditions, by which unions in prospering industries cannot allow themselves to be bound. Weinz therefore demands the development of negotiations in each industrial sector, which simultaneously would draw in all unions in a democratic and participatory way, overcome their competitions, and thus make the realization of the agreements more effective.

A look at the discussion about industrial democracy in the seventh chapter, and the investigation and survey of shop stewards in the eighth chapter, makes clear that the foundations for such a reconstruction of industrial relations are weak. Analysing the questionnaire Weinz shows that the majority of the relatively young shop stewards involved in trade unions demand a greater strengthening of their role, and therefore are not against more strongly legalized, centralized and institutionalized forms of negotiations.

The actual importance of the shop stewards however, is much less than in the UK. Discussions about industrial democracy and the further development of industrial relations are both limited to central level, denying the shop stewards any role.

A stronger institutionalized inclusion of the shop stewards into the system of industrial relations, according to Weinz, is regarded with scepticism by the unions and is rejected by the employers. The scepticism of the unions is explicable in terms of their fear of future bureaucratization and legalization of industrial relations, whose positive effects are seen to be questionable.

Weinz thinks that management feels that union's power to partake in the decision making process is already too strong at present. This, along with their traditionalist standpoint, makes them uninterested in a discussion about the development of bodies to represent the interests of workers on a company level — be that by means of the strengthening of shop stewards or by means of a system of works councils.

In the ninth and final chapter he sums up by stressing once again that an improvement of industrial relations without the inclusion in collective bargaining of individual firms and sectors is not possible precisely because of the multiplicity of the Irish unions.

It is sadly all too often the fate of dissertations that they are basically written for university libraries and are only of interest for a small circle of experts. Foreign studies of one's own country can indeed be of great interest, especially when one is looking for inspiration and provocative criticism and not only endorsement. Because of the different observational background the odd detail may not be comprehensible but if the work is accompanied by a sympathetic search for the specifics of the society foreign to the observer, as it is the case for Wolfgang Weinz dissertation, it can open up new dimensions for the native reader. This is particular the case for Ireland, where foreign developments are given scant attention, and then mostly through the often inadequate perspective of the USA. For the continental European coming to Ireland, points of discussion and possible solutions being developed in industrial relations in the economically successful and socially stable smaller countries of continental Europe come immediately to mind, but are here hardly taken into consideration. In this sense the present dissertation, were it translated and revised, would surely be of interest to the Irish reader.

In relation to the German-speaking reader, the judgement must be less positive. Despite the unquestionable quality of its content, the dissertation has many shortcomings especially in relation to the presentation and treatment of the facts and statistics. These are poorly structured and quite difficult to read, even for the reader familiar with the area and the economic situation in Ireland. The dissertation gets lost in detail in its major parts; many tables and dates are inadequately treated and hence remain incomprehensive; the presentation of the history jumps back and forth so much that the reader easily loses the thread.

The description of different authorities for the regulations of industrial conflicts is carried out purely in terms of institutional frameworks and remains dry and lifeless. A case study examination and description of typical cases would have better illustrated many of the important findings of the dissertation. Thus Weinz could easily have backed up his important analysis of the lack of procedures for factory level conflict regulations with cases of dismissals (surprising for the West German reader) which arose out of petty issues and drew solidarity strikes in their wake, and which might have been prevented by effective shop stewards entrusted with the necessary powers.

The inhibiting influence of the one-sided conservative structure of the Irish society on overall political and economic discussion could have been illustrated with an example which could show how fruitful approaches and socio-political targets being developed in the trade union and labour movements of other countries could be for the solution of Irish problems, even if they only spurred the dominant conservative trend of thought to greater efforts.

Unfortunately the dissertation neglects to compare explicitly the Republic of Ireland with the Federal Republic of Germany (it naturally does this implicitly). This not only makes the critical analysis of the stance of the dissertation more difficult but also limits greatly the possible circle of readers. The reader always compares the situation in a foreign country with that in his own, to make it more comprehensible. The present dissertation compares the Irish situation only with the British and assumes a knowledge of the comparative research on German-British trade unionism. As an example, it is mentioned in one sentence that the position under the law of shop stewards in Ireland is analogous to the position in the English system, without explaining to the German Reader what this means and if it means anything.

For the German-speaking businessman, interested in Ireland, a reading of this thesis would be a laborious means of acquiring relevant informations. So this thesis, rich in content, may appeal only to a small circle of experts and adorn the library shelf. It would be desirable, therefore, to see it issued in a more accessible form in a revised edition.

Richard Ullmer
University College Dublin

Process Consultation, Volume II: Lessons for Managers and Consultants by Edgar H. Schein. Addison-Wesley, 1987. 208 pages

Schein's *Process Consultation* (Addison-Wesley) was published in 1969. Its aim was to articulate a model of organisational consultancy that paralleled the client-centred approach in counselling and contrasted with consultancy models that were centred on expertise. The process consultation approach is an approach by which the consultant works with the manager in a collaborative way to help the manager "perceive, understand and act upon process events" in the organisation. The emphasis is on the joint endeavours of the consultant and manager, whereby the manager would learn the skills of diagnosis and intervention through interaction with the consultant. This little book quickly became a standard text and a classic in the organisational process area. The term "process consultation" became a technical term in organisational behaviour for the concept and practice of helping managers learn to help themselves through a consultation process. It is not simply a series of techniques. It is a philosophy of a helping relationship.

Eighteen years later, Schein has produced a second volume. In the intervening period he found that the process consultation approach applied, not only to consultants, but to managers themselves. His aim in this second volume is "to reaffirm the concept of process consultation as a viable model of how to work with human systems, to clarify the concept where needed and to introduce some modifications and new ideas that elaborate on the original ideas". (1987: vii). The earlier volume focused on human process issues like, leadership, functional roles, communication, norms, group problem-solving and decision-making, and intergroup processes. In this volume he has added areas related to consultation, the management of change, intrapsychic processes and culture. There are key chapters on: the manager as consultant, models of human processes, intervention strategy and tactics, and of course, on the nature and development of process consultation. Each chapter is clearly written and is very well supported by concrete examples from Schein's own consulting experience. In the chapter on process a significant framework for diagnosing and intervening on content, process and structure under the headings of task and interpersonal issues is developed. With the exception of the introductory chapters there is no overlap of material between the two books.

In an age where expertise is more narrowly defined the function of the manager is increasingly becoming one of enabling experts to do their own jobs well. A subordinate is likely to have more expertise than the boss. It is in this context that process consultation is discussed as a relevant management approach and tool. The general manager consistently is required to facilitate good decision-making. He/she is frequently in a situation where he/she may wish to influence situations without doing so in terms of power and authority. Schein maintains that the higher one sits in the managerial hierarchy the more relevant a process consultation approach becomes. It is in these positions that a skill in facilitating good process is imperative.

Process Consultation, Volume II is a lively, stimulating book. It makes easy reading. Like its predecessor it is destined to become essential reading for consultants, managers, teachers and students of organisational behaviour. The original *Process Consultation* quickly became a best-seller and a classic. *Process Consultation, Volume II* will do so too.

David Coghlan

The National College of Industrial Relations

Addison-Wesley 1987 OD Series

In 1969 the publishers, Addison-Wesley, began a series of books on Organisation Development. This series, initially six small and inexpensive paperbacks, explained and opened up to a wider readership the growing concept of Organisation Development (OD). These books, by such leaders in the field as Beckhard, Bennis, Schein, Lawrence & Lorsch, Blake & Mouton, and Walton, provided an explanation of the growing science of organisational change through behavioural science methods. Through the 1970s this series grew to 26 volumes. The initial series marked an innovation in providing an explanation of OD for managers, academics and practitioners of organisational change. Several of these books have become classics and standard texts in the fields of organisational behaviour, organisational change and consultation.

Now in 1987, after a lapse of several years the series is revived. Under the general editorship of Schein and Beckhard, some new works have been produced and some of the earlier books revised. There are seven books in the new series with more promised. Each book is a small paperback with on average 160 pages and costs £12.95 str. As in the original series the covers are distinctive and easily identify the series.

Organizational Transitions: Managing Complex Change, Richard Beckhard & Reuben Harris. This is a revised edition of the 1977 original. It deals with the process of moving from the present to a desired future with an emphasis on managing the transition state. I found this book much clearer than its predecessor. Ideas are linked more clearly. The flow of the book is helped enormously by a series of diagrams which build on each other and unify the concepts. For the diagrams alone the book is worthwhile. This little book is a must for managers, consultants, students and practitioners of organisational change.

Organization Development: A Normative View, W. Warner Burke. This is a new book in the series, though much of the material is a repeat of an earlier textbook by the same author. Burke presents an overview of the current state of OD, treating of the history and conceptual foundations of OD, models of organisational diagnosis, models of change, use of consultants, and a review of OD's effectiveness. This is a gem of a book. It is an ideal overview of OD for students and no doubt will become a university text. There are good brief introductions to the major OD theorists and practitioners and excellent references to standard works. It is an invaluable reference book and an excellent introduction to and overview of the field.

Team Building: Issues and Alternatives, William G. Dwyer. This is a revised edition of the 1977 original. This is the teambuilding bible with a comprehensive treatment of team issues — what teambuilding is and what it isn't, how to do it, how a consultant can be used, how to evaluate a team, designing team building activities, developing a new team, handling conflict, and an interestingly fresh topic — handling complacency. I found this edition much tighter and clearer than its predecessor. It is really an excellent revision. Like its predecessor it will be the classic work on teambuilding. It is essential for every manager, consultant and trainer.

The Technology Connection, Marc S. Gerstein. This is a new book on what is one of the most significant issues in contemporary organisational life. Gerstein looks at information technology in terms of strategy, change and management. He describes the role of technology in manufacturing and office settings and discusses the implications for management in terms of organisation development. While it is a book about technology it is not technological. It is comparatively easy to read and provides a valuable framework by which to locate issues of information technology in organisational structure, business strategy and human resource management. It is very practical in its recommendations. This is a field that needs good books and this book is a valuable contribution and should be read by top management, as well as consultants.

Stream Analysis: A Powerful Way to Diagnose and Manage Organizational Change, Jerry I.

Porras. This is a new book. Stream Analysis, a creation of the author, is a graphics based technique for diagnosing an organisation's problems and planning the actions and interventions needed to deal with those problems. The work setting has four dimensions — "streams" as Porras calls them. These are organisational arrangements, social factors, technology and physical setting. Stream Analysis comprises a process of listing organisational problems on a stream chart under the four headings and connecting them as appropriate. Focusing on the key inter-connections between problems helps uncover core problems and distinguish them from symptoms. The book requires detailed reading, particularly in following the complex streams presented in the diagrams. The utility of this model remains to be demonstrated, which is a separate issue to a review of the book.

Managing Conflict: Interpersonal Dialogue and Third-Party Roles, Richard E. Walton. This is a revised edition of the 1969 original. Walton presents a model of interpersonal conflict, distinguishing substantive and emotional issues, triggering events and consequences, how conflict proliferates, how dialogue can be promoted and managed and the role and skills needed in third party intervention. The concepts are illustrated by numerous cases. This is a value book on the dynamics of interpersonal conflict and a useful resource for managers and people in organisations in understanding and dealing with the inevitable conflicts in everyday life. It does not deal with industrial relations as such but does provide a support resource for those who are called upon to mediate and intervene in conflict situations.

Process Consultation, Volume II: Lessons for Managers and Consultants, Edgar H. Schein. This is reviewed separately. It is good that Addison-Wesley has revived the series. Overall these seven books are a significant contribution to the continuing development of reflection and understanding of how organisations change. The revised books, Beckhard & Harris, Dyer, Schein and Walton, in particular are essential reading for managers, academics, consultants and students of organisation development.

David Coghlan

The National College of Industrial Relations