HRM PRACTICES IN INFORMATION TECHNOLOGY MANAGEMENT

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ABSTRACT

This paper concerns the specific problem of the critical levels of staff turnover in the information technology (IT) area in Hong Kong. The aim is to give advice to improve the management of IT personnel. IT management practices are compared with theories from human resource management. As the theories are mostly developed in a Western context, a grounded approach has been taken. An in-depth study of programmers and analyst programmers in Hong Kong was carried out at the time of a crisis in labour turnover. The level of crisis enabled this study to find underlying factors that may normally be more hidden. A low level of attachment to the organisation was found, with stronger ties towards the profession and professional development. There was also an apparent difference in the attitudes and practices of group work.

RESEARCH CONTEXT

Technological upgrading, in particular through information technology, is a cornerstone of the development of Hong Kong in the 1990's.

> Hong Kong's future ability to create wealth will ... depend on its flexible response to changing markets and technologies. Speed to market with the most appropriate technology will be vital for success. All this will depend on both an advanced informatics infrastructure and its connection to global networks of markets, banks, production centres and laboratories. (Liang and Denny, 1991)

The apparent high rates of job turnover and emigration among computer professionals and computer-aware end-users are militating against this development. Individual organisations are faced with difficulties in trying to isolate the factors under their control that will improve the situation. We seek to examine those factors in the work environment that contribute to high turnover among this restricted group of employees. The research will seek to isolate those information technology management strategies that reduce turnover.

Hong Kong is in a unique setting. Contrary to the world movement away from communism towards greater democracy and wider individual freedom, in 1997 Hong Kong is moving towards communism - at least to the extent of "embracing the motherland." Many Hong Kong residents are now taking the opportunity to vote with their feet They are leaving Hong Kong in very large numbers. Estimates vary but would indicate that at least 50,000 people are leaving each year. A disproportionate number are well-qualified professionals and paraprofessionals. Health, information and accounting professions are significantly affected. The most popular destinations are Canada, Australia and the US, although special programs from other countries are also attracting many applicants.

Hong Kong is thus increasingly facing an employment crisis. The organisations that the emigrants are leaving are finding themselves in a difficult situation in terms of filling the vacancies and also in terms of maintaining continuity of work and work processes. Any organisation that can find ways of retaining staff for a longer period of time, has a potential strategic advantage when compared with its competitors. One area that has been particularly hard hit and, from available survey data, appears likely to suffer more is that of computing personnel. Experienced staff in MIS departments are readily employed in the popular destinations. Their skills and experience are usually immediately transferable to the new environment, where their diligence and drive are highly regarded

A HUMAN RESOURCE MANAGEMENT AGENDA

We are here concerned with three major tasks:

- The comparison of IT management practices

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with HRM theories. This is because the IT specialist area has traditionally been managed from within – by managers whose skills lie in technology rather than human resources.

- A consideration of the appropriateness of Western-based HRM theories in a non-Western context. It is dangerous to assume that Western-developed theories can be applied in culturally divergent situations.
- The specific problem that is addressed, namely the critical levels of staff turnover in the IT area in Hong Kong

The first objective of the authors was to compare IT management with human resource management theories to advise good management practices. A fundamental question to the authors is whether the inherently technical nature of IT work, such as system performance estimation, structured design and software engineering, drives the management of IT personnel. Moreover, does this happen at the expense of those social and psychological needs that are generally held by motivation theorists as being central to "good management practices?" There is a concern that such a technical focus in IT personnel management could lead, among other things, to being overly "task" directed and controlled (in the sense of Taylor, 1911). There is a substantial Western-based human resource management literature which details the pervasiveness and, later, the dysfunctionality (Mayo, 1923) of such an approach.

From the days of Taylor's scientific management principles (1911) up to the present-day HRM/organisation behaviour texts (such as Torrington et al., 1989), the emphasis has been on both the manager and the employee as individual people. Being or becoming cooperative team members in the sense of having a 'composite identity' may not come naturally to western individuals. They may need to change considerably and adapt their natural predispositions to become cooperative team or group members. Assumptions in the HRM theories are based on the cultural requirements of individualistic, independent and competitive societies (Bond, 1986). HRM and management development theories and techniques draw upon the propensity for individualism. That the assumptions behind these theories are not appropriate to the south east Asian cultures which are more group-centred, cooperative and interdependent is well known (Bond, 1986). It is hoped that signals from the data will indicate whether the group-centredness, which is natural to Chinese people, is nearer to 'groupthink' than composite team roles.

Arguably, HRM theories are seldom applied in the IT area. If they were, they would have to be modified for use in a non-Western setting. There is an HRM problem in the IT area in Hong Kong, manifested by the high labour turnover rates of programmers. A careful examination of this problem from first principles will shed light on those HRM theories that are applicable and give indications of how they might be modified to suit Hong Kong.

This paper represents part of a research programme that is intended to follow a three stage process. The first stage of the process is to make IT managers aware of human resource issues in their specialist domain. The second is to generate sufficient substantive data to inform them of which areas need to be given urgent attention. The third stage in the process is to set IT HRM managers' agendas for solutions, methodologies and training programmes that will facilitate changes in current practices.

INFORMATION SYSTEMS / INFORMATION TECHNOLOGY MANAGEMENT

We examine the management literature that is directed at the IT manager. The nature of the human resource information included – 'people' or 'tasks' – will signal the managerial preference for a social or technical managerial style.

In its formative stages, management as a discipline grew up in a scientifically ordered environment. Around the turn of the nineteenth century, the Industrial Revolution developed on a philosophical and practical base of mechanisation, precision, scientific "proofs" and technical considerations. F.W. Taylor (1911) embraced the idea of the human worker as a flexible and malleable extension to the tool. In terms of engineering, tools could be designed to harmonise with human movement and effort to optimise productivity.

The literature on the human (as opposed to the administrative) side of management has generated specific crucial areas in which the manager needs to perform well - motivation, leadership, communication and conflict. Knowledge of how employees behave in work is a vital 'tool' in the manager's toolbag. Some working knowledge of sociology and psychology, and behavioural aspects of management is essential Also, managers need perceptive and sensitive catalyst skills (Pedler et al., 1986). Faced with change, employees may not be knowledgeable, perhaps not even interested in the strategic necessities underlying unwelcome change If the management/worker relations are not continuously maintained, then change can bring with it a sense of lost trust and commitment (Robbins, 1988).

Additionally, the Asian manager needs to be aware of the cross cultural nature of work in their countries to help determine the degree of goodness-of-fit of the predominantly Western management literature. For example, there are differences in fundamental beliefs and values which colour the way in which workers see their working lives. Literature suggests that such differences may also direct, overtly or covertly, the ways in which workers decide to follow policies, procedures or instructions. Such characteristics are not superficial differences in the preferred methods of management in different countries. They represent the intricate strands of the social fabric of a heritage. These strands can present themselves in the guise of inviolable, yet often unspoken rules, which workers may feel must override less

compatible directives from management.

Standard texts available to the information systems professional, such as Senn (1989), view information systems development as predominantly a technical discipline - focussing on technical, procedural matters. Major areas of concern are structured methods, analysis tools and detailed aspects of system design. More general books on management information systems, such as Davis and Olson (1984) and Parker (1989), have small references to human aspects of systems, but they are generally referring to the *users* of the systems, not the *developers*. Textbooks dealing with management issues are concerned with the issues that are seen as very important by practitioners, namely project management, budgets, deadlines, technical specification and system performance; while for the staff, technical expertise is paramount:

> The job of a programmer may be enriched by a programmer workbench - a set of tools for writing code, documentation and testing. Online programming provides a more motivating environment because of reduction in test time and improved feedback on program errors etc. The job of an analyst may be enhanced by various tools for automating some of the more mundane tasks. (Davis and Olson, 1984, p. 649)

All this is in spite of the considerable work of Peter Checkland, in his "soft systems" (1980), and the work of Mumford and others (see, for example, Wood-Harper, Antill and Avison, 1985), who have developed methods for approaching the information systems development process in a more human-oriented way. These methods were developed, and have mainly been applied, in the United Kingdom, and as such have not been widely-known outside Europe. It must be noted that these "soft" methods relate to the analysis and design process in particular, or to the methods of determining the needs for systems and the specification of requirements. The management of programmers and analysts, as portrayed in management texts, is usually concerned with ensuring that skills are appropriate (and here technical skills are intended). There is a preoccupation with specialisation, a Taylorist trait. This is evidenced in the concern with how to decompose large projects into schedules of tasks and, in one of the problems of greatest interest to the data processing literature, how to estimate the time taken to complete a project.

Significant work has been done on the motivation of programmers (see, for example, Couger and Zawacki, 1980), however this work itself is motivated, reported and disseminated on the basis that, through motivation, productivity will be increased. One wonders whether there is only a veneer of being concerned with the programmer as a person, when in effect there are discernible traces of interest in machine-like productivity and predictable performance:

> Developing reliable schedules does not guarantee project success. The project must still be managed. Personnel must be assigned and properly used. At the same time, the development must meet specifications and follow guidelines for quality assurance.... In large projects, communication between users and development teams is time-consuming and occasionally even confusing, particularly if a specific user is working with several team members at the same time. (Senn, 1989, p.804)

> Like any other functional business area, MIS involves a management process that is subject to planning, control and appraisal. The outputs of MIS are the data and information resources (many of which are intangible) provided to them by the organisation. These outputs are a function of budgetary allowances and the beginning mix of MIS resources (the inputs) as well as of managerial performance (the processing of those inputs into outputs). (Parker, 1989, p.736)

The gap between the philosophy of management expressed in the above quotations from sample texts and current organisational behaviour theories is great. No particular attention is being brought to these texts as similar quotations could be found in many other books.

RESEARCH METHOD

The choice of research method posed a problem for the researchers. An implication in the research problem is that IT human resource management is a special case and cannot justifiably be studied using mainstream HRM instruments. The work on motivation by Couger was available and, as already stated, this work may not have reflected the human-relations position of the researchers. It was decided, therefore, to adopt the Grounded Theory methodology (Glaser and Strauss, 1967) in developing a research instrument that would be strictly applicable to human resource questions in information technology in Hong Kong. This has been described in detail in an earlier paper (Jordan and Whiteley, 1992).

A content analysis of focus group interviews revealed major dimensions corresponding to the Hackman and Oldham (1973) "Job Satisfaction Model." These are:

task identity,
task significance,
autonomy,
skill variety and
feedback.

After allowing for these dimensions in the analysis of the interviews, it was found that a significant amount of

material remained, which was not explained nor synthesised by the Job Satisfaction Model. This material dealt in part with human relationships. A close correspondence was found with the motivation theory of Herzberg et al. (1987). Dimensions here are:

supervision, working conditions,
feedback (again), social aspects,
communication, company and management,
opportunity for advancement,
security, and wages and benefits.

Thus the dimensions derived from the 'first principles' application of grounded theory had much in common with those used in the Western literature. The dimensions were then used to create a detailed questionnaire that contained both open and closed questions.

Nearly seventy organisations, employing over 1800 programmers, agreed to take part in the survey. For all the larger employers, and a significant fraction of the remainder, the survey forms were delivered personally by the survey team. The others were sent as a single package by mail. The distribution of the questionnaires to the programmers was done by their employers. The programmers then returned the document directly to the research team, ensuring confidentiality. For each organisation that participated, an additional survey form was produced that collected organisational statistics and a number of employment and environmental characteristics. Satisfactorily completed questionnaires were received from employees in sixty organisations, the greatest number of rejected questionnaires being through omission of a job category, or an invalid one, such as "data processing manager."

FIELDWORK RESULTS AND DISCUSSION

There were 636 valid questionnaires, giving a response rate of over 30%, with 183 females (28.8%) and 452 males (71.2%). As the questionnaire was long and complex, with many open-ended questions, there is the suggestion that the reasonably high response rate demonstrates that the issues are central to the concerns of the respondents. Twenty five percent of the respondents hold a higher diploma (US: associate degree) or equivalent, while 60.8% have a bachelor's degree or higher. Job titles of analyst programmer (39%), systems analyst (22.8%) and programmer (22.2%) predominated, with the remainder (16%) occupying a variety of positions including systems programmer, data base analyst and systems support; management staff were not part of the survey. The ages, years with the present employer and years of experience are given in Table 1.

	Mean	Std. deviation	Max-imum
Age (years)	27.6	3.7	45
Years with company	2.3	3.0	24
Years total experience	4.5	3.3	24

Table 1 Age and experience characteristics (N=636)

Years service with the present employer is the variable that expresses the stability of the employees. In a period without growth (or decline) it is a direct measure of the turnover rate. When there is growth, either within a company or in the total market, the turnover and the growth will be confounded. Companies participating in the survey supplied data on their employment growth and total market growth is available from other sources. The frequency distribution of years experience with the present company is shown in Table 2. This shows that almost 70% of the respondents have two years or less experience with their present employer, clearly reflecting a critical situation as an employee is normally only regarded as fully contributing after this period of time. The data follows an exponential-like distribution with an obvious discrepancy in the "less than one year" category. This is attributed to two factors: the rounding up to one year by employees nearing that level, and recent recruits being excluded from the survey by their employers while they are still under probation.

Years with co.	Freq.	Percent	Cum.Pct
0	134	21.1	21.1
1	195	30.7	51.7
2	115	18.1	69.8
3	71	11.2	81.0
4	35	5.5	86.5
5	29	4.6	91.0
6	13	2.0	93.1
7	8	1.3	94.3
8	10	1.6	95.9
9	6	.9	96.9
10+	20	3.2	100.0
TOTAL	636	100.0	100.0

Table 2 Frequency distribution of years with present company

Some light can be thrown upon the situation by looking at two of the central dimensions that in the authors' judgement would secure loyalty and commitment from an employee to a company. These dimensions were captured by two questions concerning "security of employment with my company" and "feeling valued by my firm". Each issue were investigated in terms of its strength and its importance to the employee. Five point scales with poles

of "strongly agree" and "strongly disagree" were used and the percentages of "agree" and "strongly agree" were combined. Studying these results, presented in Table 3 below, reveals some striking findings, perhaps a crisis.

	Strength (percentage agree or strongly agree)	**Importance** (percentage agree or strongly agree)
My security of employment with my present company	**68.8**	**91.4**
My feeling of being valued by my employer	**40.3**	**95.9**

Table 3 Strength and importance of security and being valued

We are concerned with the employees' motivation to stay in a company. It is well-accepted in motivation theory that security is a basic psychological need. If this need is not fulfilled it may be that employees will not attempt to achieve the sense of relatedness and the sense of personal growth that are the higher-order needs (Alderfer, 1972). It is at the higher-order levels that employees are extending their learning and sense of self-actualisation. Arguably, the employee will contribute more valuable creativity and problem-solving if he or she is at the higher-order level. But, is security of employment high on the list of importance to Hong Kong IT employees? Clearly, and overwhelmingly, the answer shown in the above table is "yes". Then, is there a corresponding feeling that security is provided? One would hope for around the same level of support. Such is not the case. This is a clear signal for employers. In the authors' views it is within the capacity of every employer, large or small, to engender a feeling of being secure in all employees, including IT staff. As this is a psychological benefit it does not cost real dollars to do. What it does cost is a determination on the part of employers to be constantly vigilant to be finding out the perceptions of employees, not employers' perceptions of what employees feel.

If evidence of employees not feeling secure is a hazard, evidence of them not feeling valued is positively dangerous. The finding in Table 3, that while 95.9% feel that being valued is important, only 40.1% report feeling valued by their company, calls into question the fundamental role of the manager in the IT environment. If company culture is the heartbeat of an organisation and if values are the core concept in it, then the managers' prime function is to make sure that each employee feels valued, (Whiteley, 1991). We would ask every IT manager to consider how the employees in his or her care would gain a feeling of being valued by their management.

While the above are two very distinctive and cogent findings of employees' perceptions it is also of interest to look at some of the extremes in terms of job characteristics as perceived by IT employees. Some 27 questions asked about the degree of importance of a job characteristic. As these characteristics were those identified in the focus group interviews, there is an instrinsic disposition for them to be found to be important, that is, they have a "motherhood" component to the target population. While many of them are going to be described as "important", the top ranked and bottom ranked items, based on the mean score from Likert scale responses, will show contrasts meaningful to the population. It is worth noting employees' perceptions are 'real' in their consequences in the work situation and the manager's responsibility is to penetrate the reality of the employees rather than impose his/her own. Table 4 demonstrates the kind of findings that a manager would set out to achieve from action research in the workplace. The authors would suggest that this is a simple starting point for IT managers' investigations of their employees' perceptions about the job and the company.

Top five important job characteristics (N=636)	Mean	St.dev
The development of new skills and talents	1.43	.55
Effective communication between management and employees	1.46	.54
Supervisor being a good team builder	1.55	.64
Good hardware	1.59	.62
Good software	1.59	.61

Bottom five important job characteristics (N=636)	Mean	St.dev
Being able to work independently	2.07	.73
To have competent colleagues	2.07	.70
Being liked by colleagues	2.19	.76
Having colleagues appreciate one's work	2.21	.77
Being able to work alone	2.75	.85

Table 4 Ranking of job characteristics

It is important to stress that the "bottom five" characteristics were not found to be "unimportant", simply that they were less important than the other characteristics. A score of 2 represents "important" on the 5-point scale. The respondents have effectively closed up the five point scale, showing their acceptance of the dimensions of the instrument and partially demonstrating its construct validity.

A further 31 questions looked for agreement or disagreement with a statement. The content of these questions was in many cases very similar to the questions asking for importance to be rated. They must therefore be analysed and interpreted together. Responses were on a Likert scale and the mean response for each question enabled ranking to be carried out:

Top five - strongest agreement (N=636)	Mean	St.dev.
Professional advancement is important	1.35	.52
I prefer an employer that is caring	1.61	.60
Company training programs are important	1.65	.71
Feeling valued is important	1..67	.61
It is important that senior management is friendly	1.74	.65

Bottom five - strongest disagreement (N=636)	Mean	St.dev.
I feel valued by the firm	2.72	.81
I get adequate privacy	2.73	1.06
I am satisfied with my present salary	3.08	.98
Commuting to work is a nuisance	3.17	1.16
I prefer to work alone	3.24	.90

Table 5 Levels of agreement with statements

What do these findings tell us? The authors would like to develop three human resource points of view:

1 Taking the top important job characteristic of the "development of new skills and talents" and the top strongest agreement that "professional development is important", here we see a means and ends situation. From the employees' point of view the company's willingness to help him or her develop new skills and talents will contribute to professional advancement, very much a desired end in terms of these findings.

2 Effective communication between management and employees is the second top employment characteristic. Elsewhere in the data, employees strongly agree that effective communication includes feeling valued and that the senior manager is friendly. The HR manager would use this as a starting point to explore what employees perceive to be the most effective communication, and perhaps, what they perceive to be ineffective communication. Communication strategies are to people management what financial strategies are to budget management. It is a great risk to the company if either is neglected.

3 The supervisor as a good team builder is an important job characteristic and this presents some problems for the researchers. It is evident that IT employees in this survey do not prefer to work alone, as evidenced by the bottom important job characteristic and the strong disagreement on "being able to work alone". Effective teams show interdependence in terms of competencies and social relationships (Gilmour and Lansbury, 1984). The question is "Do IT staff have an idea of what comprises an effective team?" We ask this because employees do not signal having competent colleagues, being liked by colleagues, and having colleagues appreciate one's work as essential job characteristics. One would expect that participants in good team-building situations would be able to recognise the importance of these job characteristics. Whilst the idea of project teams is well-installed in the vocabulary of IT managers, perhaps the concept of teams and teambuilding is an area for further development.

SUMMARY AND CONCLUSIONS

The employment crisis in information technology personnel in Hong Kong enables underlying characteristics of their work environment to be investigated. There are strong indications that personal, professional development is the most important issue to the programmer / analyst. For this development there is a tendency to look outside the organisation rather than inside. For the people surveyed, it is important to be able to belong to an organisation, to fit in and to feel secure - feelings that are generally not satisfied. These findings are different to those found using instruments developed in Western environments. Another significant departure from Western observations is found in the respondents attitudes to group work and group membership. It appears that membership of a group is particularly sought – there is litttle enthusiasm for individual distinction and responsibility – however there are only very low expectations of the group's performance.

REFERENCES

Alderfer, Clayton P. (1972) *Existence, Relatedness and Growth Human Needs in Organizational Settings*, Free Press, New York

Bond, M.H. (ed.) (1986) *The Psychology of the Chinese People*, Oxford University Press, Hong Kong

Carmody, D.L. and Carmody, J.T. (1983), *Eastern Ways to the Centre: an Introduction to Asian Religions*, Wadsworth, Belmont, California; cited in Redding (1990).

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

Couger, J.D. and Zawacki, R.A. (1980) *Motivating and Managing Computer Personnel*, John Wiley, New York.

Davis, Gordon B. and Olson, Margrethe H. (1984) *Management Information Systems: Conceptual Foundations, Structure and Development, 2nd ed.*, McGraw Hill, New York

Gilbreth, F.B. (1911) *Motion Study*, Van Nostrand, New York.

Gilbreth, F.B. and Gilbreth, L.M. (1916) *Fatigue Study*, Sturgis & Walton Co., New York.

Gilmour, P. and Lansbury, R.D. (1984) *Marginal Managers: The Changing Role of Supervisors in Australia*, Queensland University Press, St. Lucia, Queensland

Glaser B. and Strauss, A.L., (1967) *The Discovery of Grounded Theory*, Aldine, New York

Gouldner, A. (1959) 'Theoretical requirements of Applied Social Sciences', *American Sociological Review*, February 1959, p. 22

Hackman, J.R. (1977) Work Design, in Hackman, J.R and Suttle, J.L. (eds.) *Improving Life at Work*, Scott Foresman, Glenview, Ill.

Hackman, J.R and Oldham, G.R. (1973) Development of the Job Diagnostic Survey, *Journal of Applied Psychology*, Vol. 60, No. 2, 159-170.

Harris, C.L. (1985) Information Power: How Companies are Using New Technologies to Gain Competitive Edge, *Business Week*, Oct. 14 1985, Hightstown, N.J., pp 48-57.

Hartog, C. and Herbert, M. (1986) 1985 Opinion Survey of MIS Managers: Key Issues, *MIS Quarterly*, Dec. 1986, pp 351-361.

Herzberg, F., Mausner, B., Peterson, R.O. and Capwell, D.F., (1987) *Job Attitudes: Review of Research and Opinion*, Garland Publishing Inc., New York.

Liang W.W. and Denny W.M. (1991) 'The Upgrading of Hong Kong's Technology Base', *Proc. Emerging Technological Trajectory of the Pacific Rim Conf.*, Tufts University, October 1991, Centre for Technology and International Affairs, Medford, MA

Likert, R. (1961) *New Patterns of Management*, McGraw Hill, New York.

Mayo, E. (1923) *The Human Problems of an Industrial Civilisation*, Macmillan, New York.

Parker, C.S. (1989) *Management Information Systems: strategy and action*, McGraw-Hill, New York.

Parsons, T.(ed.) (1947) *The Theory of Social and Economic Organisations*, Free Press, New York.

Pedler, M., Burgoyne, J. and Boydell, T. (1986) *A Manager's Guide to Self-Development (2nd ed.)*, McGraw Hill, London

Redding, G.S. (1990), *The Spirit of Chinese Capitalism*, Walter de Gruyter, Berlin.

Robbins, S. (1988) *Management: Concepts and Applications (2nd ed.)*, Prentice Hall, Englewood Cliffs, NJ

Senn, J.A. (1978) A Management View of Systems Analysts: Failures and Shortcomings, *MIS Quarterly* **2** No.3, pp 25-32.

Senn, J.A. (1989) *Analysis & Design of Information Systems*, 2nd ed., McGraw-Hill, New York.

Smith, A. (1776) *The Wealth of Nations* in Robbins, S.P. (1988) *Management Concepts and Applications (2nd ed.)*, Prentice Hall, Englewood Cliffs, NJ

Taylor, F.W. (1911) *Principles of Scientific Management*, Harper and Brothers, New York.

Torrington, D., Weightman, J. and Johns, K. (1989) *Effective Management: People and Organizations*, Prentice Hall, Englewood Cliffs, NJ

Whiteley, A.M (1991) 'Empowering the People Who Manage Technology', *Proc. EDP Auditors Association Annual Conference*, April 1991, Perth, Western Australia

Whiteley, A.M. and Jordan, E. (1990), 'Behavioural Aspects of Introducing Change in Information Systems', *Australian Computer Journal*, **22**, No. 2, pp. 59-68.

Wood-Harper, A.T., Antill, A. and Avison, D.E. (1985), *Information Systems Definition: The Multiview Approach*, Blackwell, Oxford, UK.