RECONSIDERING IMPACTS OF TECHNOLOGY TO WORK DESIGN: AN INTEGRATIONIST PERSPECTIVE (2014)

Prof. Michael V. Barbas

Professor of Marketing and Strategic Planning,

Sharda University, School of Business Studies, India

1. Introduction

Thomas Teal, senior editor at Harvard Business Review has published the following interesting story in *Fortune*: 'Malden Mills owner Aaron Feuerstein was both ridiculed and canonized when he kept his 1000 employees on the payroll after a fire burned down his factory. The experts said Feuerstein was nuts to rebuild his textile factory in high-wage Massachusetts. One business school Professor has suggested pointedly that not everyone should look to him as a model. However, the two hours I spent with him, convinced me that he is as rough-minded as he is righteous, a man entirely up to the job of running a factory for profit. "The trick", he told me, "is to keep growing fast enough to give new jobs to the people technology displaces, to weed out unnecessary jobs without crashing the spirit of the work force". If all you're after is cutting costs", if you "just have a scheme to cut people - that sort of thing is resented by labour, and you're never forgiven"....Feuerstein has a union shop, has long invested heavily in technology that eliminates jobs, and has never had a strike - not exactly the hallmarks of a fool'.[1]

Feuerstein's business is perhaps an ideal one. But this is seemingly not true for all companies. Apparently a few businessmen act in the way Feuerstein acted. What mostly happens is that 'advances in technology afford managers progressive opportunities to reduce skill and discretion in work and tighten management control'. [2] This study examines the impact of technology into work design by emphasizing the relationship of managers and employees. It has been argued' that 'even though changes in technology are changing people's jobs', it is not technology by itself, but 'managers who shape work by means of technology' [3]. Because of such practises in the work environment the relation of workers and managers have long run into conflict. Here we aim to clear this

equivocation by analysing the "input" of technology into people's jobs. The Malden Mills example above is a possible exit from this quarrel and we will return to it later. At present it is interesting to see how managers in a different company, Vauxhall, UK, used to greet new employees to the job: "You know the sort of thing. 'This is Fred, he'll show you what to do'. "Hello", says Fred, "you stick this in here and that in there - 'I'm not paid for this y' know", You either do it or you don't. If you don't you're unsuitable and you get your cards'. [4] What a sharp contrast with Malden Mills' CEO above!

1. The Technology impact

It is important to appreciate that technology has to be studied as something that changes. It is also useful to keep in mind that technology is pervasive. The ambiguity regarding technology and work design starts with the argument that 'technology generates its own imperatives for work and skills'. [5] This implies that as technology changes, old jobs are eliminated and employees are expected to fit with the new jobs technology creates. If not, employees are in danger to lose their job. According to the technological determinism argument 'every industrial job contains technologically determined task attributes which would influence the worker's response. By "task attributes" we mean such characteristics of the job as the amount of variety, autonomy, responsibility and interaction with others built into the design'. [6] In this respect technology is said to determine the 'kinds of jobs that have to be done, job designs, or the horizontal division of labour, the hierarchy through which work is planned and co-ordinated, or the vertical division of labour, or organisation structure., the knowledge and skills required to carry out the work and the values and attributes and behaviour of workers' [3]. The

assertion is established here that technology determines skills and other facets of organisational life.

The above argument is further developed by explaining the organisation as an engineering system. It is argued that 'rather than just being pieces of hardware and software, technologies are also conceptualised as systems based on certain engineering principles and composed of elements which are functionally arranged (configured) in certain specific ways. The engineering system has in each case changed the work and skills of those involved independent of the managerial choices or the organisational setting'. [5] In practise in this

model work is mechanised and the machine controls the work. The process of mechanisation occurs as follows: 'there are seventeen levels of mechanisation related to power and control sources. Apparatus in levels 1 to 4 are human operated and controlled. From levels 5 to 8, the machine movements follow a fixed pattern. In levels 9 to 17 the machine is controlled by information coming from outside the apparatus. The key element is therefore the way in which the relationship between the machine and the user changes. This relationship depends on developments in the machine's capability to determine and control its own cycle of operations'. [7] Table 1.A below presents the different stages of mechanisation.

TABLE 1.A   *The stages of mechanisation*

Initiating Control Source	Type of Machine Response	Power Source	Level number	LEVEL OF MECHANIZATION
	Modifies own action		17	Anticipates action required and adjusts to provide it.
	over a wide range of		16	Corrects performance while operating.
	variation		15	Corrects performance after operating
			14	Identifies and selects appropriate set of actions.
	Selects from a limited range		13	Segregates or rejects according to measurement.
	of possible prefixed actions		12	Changes speed, position, direction according to measurement signal.
From a			11	Records performance.
variable in the environment	Responds with signal	Mechanical-Nonmanual	10	Signals preselected values of measurement. (includes error detection)
			9	Measures characteristics of work.
From a control			8	Actuated by introduction of work piece of material.
mechanism that directs	Fixed within the		7	Power tool system, Remote Controlled.
a predetermined pattern	machine		6	Power tool, Program control (Sequence of fixed functions)
of action			5	Power tool, Fixed cycle (single function).
			4	Power tool, Hand control.
From man	Variable		3	Powered Hand tool.
		Manual	2	Hand tool.
			1	Hand

Source: James R. Bright, *Automation and Management,* p.45

Still, there seems to be a major defect in technological determinism. It has been argued that model 'has the tendency to ignore the influence of human actions on the development and use of a technology' [8]. Another problem seems to be that 'the model has a view of change as involving a linear progression' [9]. Alvin Toffler in *Future Shock* has argued that important factors such as organisational culture and human potential are ignored in the model. [10] Subsequent research shows that the model assumes that 'machines do more than suggest or compel changes in other machines - they suggest novel solutions to social, philosophical, even personal problems' [11].

Here the important question is: can machines alter man's intellectual environment? The model supports that they can although there is serious dispute and disagreements on this matter. Below we discuss the conflict of organisational choice and technological determinism. Here we would like to stress people's resistance to technological change. The astonishing prediction that 'computers will lift jobless total to 2.5 million' was established some years ago in the *Financial Times*. [12] Of course one wants to know, will technology finally destroy our workplaces and lives? In fact these fears are not without reason as unemployment numbers worldwide are disappointing. Eurostat estimates that only in the European Union countries 26.231 million men and women in the EU-28, of who 19.175 million were in the euro area (EA-18), were unemployed in January 2014. [13] Employees are anxious that the introduction of advanced technology will dramatically increase this number. Another fear is that high technological jobs may create more discrimination towards older employees, women, unskilled workers, and poor people. These categories of workers have always had lesser opportunities to work than men, younger and skilled workers and well-off people.

Nevertheless, it is perhaps surprising to learn at the moment that we have listened to so many complaints and fears, that these reactions are not justified. There is evidence that 'there are job enrichment imperatives behind technological innovations'. [5] Moreover, research in the area has

shown that 'new technology is creating jobs rather than creating redundancy, and is improving quality of working life instead of diskilling'. [14]

It seems to be the case that technology by itself is not a threat. Figure 1.A below shows that-

FIGURE 1.A
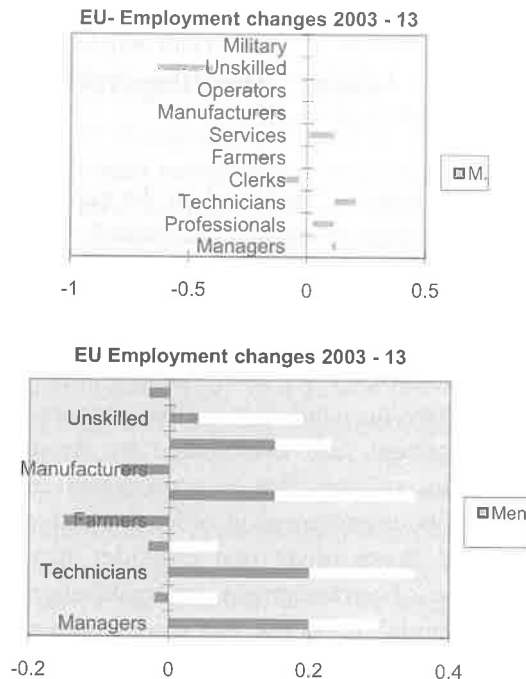
SOURCE: Kathimerini Newspaper 23/1/2014 (Figure compares the changes in employment in European Union countries except of France, Finland, and Sweden)

1. Strategic choice

First, let me ask you this question: what shapes the relationship of technology to change if not our belief that technology changes? In fact 'because we associate important new technologies with dramatic historical changes it is understandable that there is a popular tendency to attribute causal importance to the technology, in other words to say that technology is so revolutionary that we will have to change basic aspects of our social behaviour and patterns of organization to make best use of it'. [15] This answers in part the prediction made by *Financial Times* previously. The other half is answered by the implication derived above that

technology by itself does not shape work design but we are those who use technology to shape work. Tavistock Institute of Human Relations was the first to suggest that 'the way work is organised did not necessarily follows from using a particular technology but that there is degree of organisational choice open to management. To make that choice effective, management must be aware that the firm is a 'socio-technical system' [16] But let's remain for awhile to this idea as, it seems, it can help us explain the complex relation regarding technology, companies, and employees.

The systems approach is based on the assumption that work organisations can be treated as open systems. Peter Checkland in *Soft Systems Methodology in Action* defines a system as something that functions by virtue of the interdependence of its composing parts, as a "Holon" where 'the whole is more than the sum of its parts, a concept first established by Aristotle. [17][18] This suggests that an open system has to trade with its environment in order to survive. To understand these ideas just consider how an organisation is born and grows. An organisation 'has to import capital, materials, equipment, labour and information. When this is completed, it has to transform these inputs somehow into goods and services. Finally it exports waste materials, finished products or services, or satisfied customers to get money to begin the cycle again'. [3] An organisation's activities can therefore be described in terms of its import, transformation, and export processes. This relationship is shown in Figure 2.A below:

FIGURE 2.A : *An open system*
SOURCE: Huczynski & Buchanan, p.315

Open System Processes:

Imports ———→   transformation process   ———→ Exports
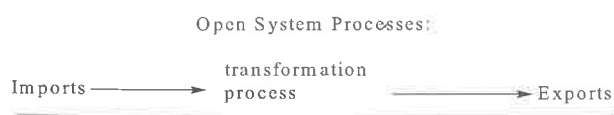
Now consider the issue that 'any production system requires both a material technology and a social organisation of the people who operate the apparatus'. [19] An enterprise can be considered as an open socio-technical system. 'The socio-technical system design setback is to find the "best

fit" between the social and technical components. These components should be designed in such a way that the needs of each aspect are met' [19]. This clearly suggests that work design depends on human choices not on technological imperatives.

Now that we have understood the importance of the organisation as being an open socio-technical system it is easier to define organisational choice. The strategic choice alternative to technological determinism has been developed by sociologists adopting an 'action perspective. "Action" is the term given to purposive, meaningful behaviour, and action theorists have argued that links between technology and organisation reflect choices based on management perceptions. It is argued that 'there is no inescapable technological or bureaucratic logic. Applications and the implications of technology and technical change are firmly within our control'. [20]

To understand how the workers react to this issue it is useful to look at the idea of culture within and across organisations. It is argued that 'if an organisation's culture demands the perpetuation of a style of working then that is what tends to happen - regardless of the technology' [21]. In an interview of 250 UK based companies they found that 'the principal culture was to undermine the stated objectives for using this technology' [21]. Let's see how this would apply to a real life situation. Managers often complain when they consider the role of organisational culture. 'The main problem', they say, 'as far as management is concerned is making sure that people are adequately trained for the job to which they have been allocated and that we provide appropriate re-training to cope with change, which is always happening in this operation....by the way - new product specifications, and new equipment'. [4] Yet, there is no clear ground for complaints. On the contrary such complaints reveal that technology is mostly subordinate to culture. This issue is explained fully below in our discussion of the social impact.

1.   The Social impact

Workers and unions react violently to strategic

choice as they see technological change not as an abstract process but as taking place in the context of capitalist society and thus representing the deliberate policy by management to concentrate control over the labour process and thus intensify the production of surplus value. [2] The argument here is that the organisation of work around a given technology can be used to control labour costs, to control decision making, to control the relative status Huczynski and Buchanan show that 'Managers can be able to manipulate employees in these ways by appealing to the technological deterministic argument'. [3]

Ironically, evidence shows that the reaction of the workers against these management practises can justify more organisational choice. 'The adverse reaction to specialised, repetitive work can simply confirm management's view that tight control is necessary to produce goods and services efficiently. In this way management becomes a self-justifying approach. The whole thing results to a vicious circle of control' as was the case with scientific management, a theory that implies that the tasks of planning a job should be given to management and the task of doing it should be left to the workers [3] The theory seems to have certain limitations as it assumes that the employee motivation was to secure the maximum earnings for the effort neglecting achievement, job satisfaction and recognition, as well as the personal and interactive aspects of performance, and resulted to violent reactions by the workforce in the previous years. [3] [23] Scientific management's latest renaissance has come with the development of the flexible firm. 'As international competition increases, companies have had to respond more quickly to market demands. They are therefore seeking to increase their ability to redeploy employees between different tasks (functional flexibility); to increase and decrease the number of their employees to match peaks and troughs of work (numerical flexibility); and to have the freedom to pay rates which reflect market conditions and not be constrained by pay differentials (financial flexibility)'. [3]

At this point we have to take an important decision. Either we resolve the conflict of technological determinism with culture and the social impact or we eternalise the strife. In the end we will probably end up with a handful of golden boys earning billions by manipulating work through technological change and billions of workers losing their jobs because they simply do not fit with change. However, we expect the integrationist model below seems to present a solution to this problem.

2. The Integrationist model

Nowadays 'management concern is primarily associated with being able to deal with changing markets, how to make best use of sophisticated levels of technology application, and how to meet the rising expectations of customers as they relate to quality, reliability, and delivery. This means that issues related to the people element of firms become more important'. [16] This means that in the 21st century everybody is going to compete for people. A compromise is needed to remove the conflict between technology and the human element and to limit determinism. 'A partnership between machine and man and less control exercised by managers' seems to be the solution. [14] The intergrationist model takes account of both these factors as follows: 'the model portrays an "impact" not as a linear outcome (that is inherent in technological determinism) but as a complex, interactive, and ongoing process. The principal mechanism for this is the interaction of groups and individuals free to act within the constraints of their current milieu. The term "impact" is used here as convenient shorthand for outcome at any particular time, as unlike the previous models, there is no real concept of an "impact" at all. The outcome at any one time both shapes future outcomes and is shaped itself by what has gone before'. [23]

Modern computer technology can support in practise this argument. Provided that computing technology is 'autogenerative - innovations derive from the users of computer systems as well as from their original designers' it is one instance of technology that is out of management's control and organisational structure. [24] People need IT and IT needs people in order for both to develop. Given the proper conditions, motivation, incentives, and work

environment, technology, may act as a trigger of change moving people away from traditional forms of work organisation to looser hierarchy. Company A here shows a traditional bureaucratic area structure that industries have followed for long. Now take a look at Company B. Although communication here contains many more lines of communication the situation has improved.

Company A

Company B
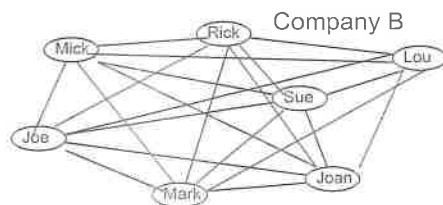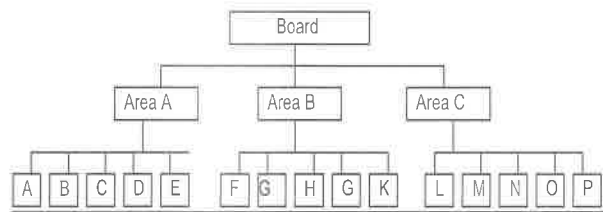
Employees seem are able to communicate directly with management and among them. Technology seems to have allowed them to shape the work themselves but also it has shaped work organization. We consider in such an environment both workers and company will heartily enjoy technology profits. What is also important, it seems that in the second diagram IT seems to have dramatically improved organizational communication meaning and processes. Baldry argues that IT copies our mental activities, uses and potentials for simultaneous introductions of IT are vast, it is interactive and its operations transcend the limitations of physical location. [23]

It is also argued that the integrationist model emerges as the most useful 'for advancing study of the applications of computer based Information Systems on manager's works' [24][25][26] By looking at several companies, research has shown that the integrationsit model seems to reconcile the old tension so long experienced in the industry. 'Over a period of time the features of the new system and the existing company culture interacted to shape a new outcome where certain features of the Company One (as they call the company culture) began to reassert themselves. This new outcome was shaped both by features of the technology and by features of the corporate culture but was mediated through the actions of individuals and groups with a common interest evolving over time'. [26] Walsham has provides a 'synthesis of these different approaches into a broad analytical framework designed to advance our understanding of organisational change linked to computer-based systems'. [27] [28] Indeed the traditional hierarchies are beginning to break down with the application of computer technology in services and manufacturing. 'Technology now requires a more participative style'. [29] IT allows any member of the organisation to have access to the whole system rather than just a fragmented part of it'. [30] I maintain advanced technology can resolve conflicts between determinism and the workforce. However, 'the quality of people is going to make a bigger difference than the quality of products and services as the new structure creates the need for better Human Resource Management'. [31] 'Such developments in HRM would be reflected in a commitment to multi-skilling and a flexible mode of operations'. [32] That's why Aaron Feuerstein in the *Fortune* story above keeps his 1000 employees after his factory is burned. Feuerstein is an example of CEO who has aimed to invest in people and technology and has left each other to shape the "impact" over time. One should bear in mind that directors need to be trained as well as same with the rest of the workforce that also have to refresh operational skills or competencies quite apart from the qualities (e.g. creativity, synthesis, abstract reasoning, personal development) associated with management development' [32][33] In Malden Mills Feuerstein has met these requirements as the company both trains workers to high tech and hires skilled workers create value to customers.

As indicated in Figure 6.B below alienation tends to increase initially with the degree of automation until the point is reached as in process industry where control over the process is restored by the operator'. [4] Complaints that new technology brings 'health and work hazards' have some basis but should not be

generalised. [34] Research has shown that alienation decreases in High Technology jobs. [35][36][37]

FIGURE 6.B *Employee reactions to variations in technology*
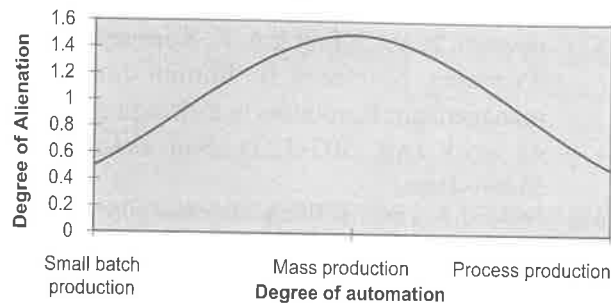
SOURCE: Bailey, p.18

1. Conclusion

This paper has examined the impact of technological determinism to work design. Research supports the argument that technology by itself does not change the organisation of work. On the contrary it is management that has often taken advantage of technology developments to shape the work. Scientific Management was one instance of this in the past. At present the interest in technological determinism has revived. Workers, unions and social theorists have reacted violently to these practises. However the integretionist model removes the conflict by taking a holistic view of the situation. In this model time and change are working to eliminate the strife. Nevertheless, technological determinism is there in most organisations as we presented in this study. But technological change is very likely to change this situation. Evidence shows that as advanced technology enters our lives more and more managerial control over work design eventually declines.

2. References

[1] Teal, T., "Not a Fool, Not a Saint", *Fortune*, Nov.11, 1996, 111-13.

[2] Braverman, H., "Labor and Monopoly Capital: the Degradation of work in the Twentieth Century", *Monthly Review Press*, 1998.

[3] Huczynski, A., and Buchanan, D., (2014) *Organizational Behaviour,* (7th Ed), New York: Prentice Hall, 263-363.

[4] Bailey, J., (1979) *Job Design and Work Organizations*, 1-65

[5] McLoughlin, I., and Clark, J., (1988), *Technological Change at Work*, Milton Keynes: Open University Press.

[6] Pierce, J. L., Jussila, I., & Cummings, A. (2009). Psychological ownership within the job design context: Revision of the job characteristics model. *Journal of Organizational Behavior,* 30(4), 477-496.

[7] Bright, J.R., (1958), *Automation and Management,* Division of Research, Boston: Harvard Business School.

[8] Child, J., (1972) "Organisational structure, environment and performance: the role of Strategic Choice, *Sociology*, vol.6., no.1, 1-22.

[9] Flerk, J., Webster, J., and Williams, T., "Dynamics of Information Technology Implementation", *Futures*, July/August, 1990, 618-40.

[10] Tofler, A., (1970), *Future Shock*, London: Pan Books.

[11] Slovic, P., Finucane, M., Peters, E., MacGregor, D. (2002.) When Predictions Fail: The Dilemma of Unrealistic Optimism. In *Heuristics and Biases* (pp. 335-347), T. Gilovich, D. Griffin, D. Kahneman (Eds.). Cambridge, U.K: Cambridge University Press.

[12] *Financial Times*, 11, January, 1985, p.4, col.2.

[13] *Eurostat*, Report, 201

[14] Forester, T., (Ed) (1989), *Computers in the Human Context: Information Technology, Productivity and People*, Oxford: Basil Blackwell.

[15] Kelley, M.R., New Process Technology, Job Design, and Work Organization: A Contingency Model, American Sociological Review Vol. 55, No. 2 (Apr., 1990), 191-208.

[16] Sitter, L. U., Hertog, J. F. & Dankbaar, B., "From complex organizations with simple jobs to simple organizations with complex jobs", in: *Human Relations*, 50(5), 497-536, 1997. p. 498

[17] Checkland, P., "Soft Systems Methodology in Action", in J. Rosenhead, (ed), *Rational*

Analysis in a Problematic World, London: Wiley.

[18] Falcon, A., (2005), Aristotle and the Science of Nature: Unity Without Uniformity, London: Cambridge University Press.

[19] Trist, E.L., and Bamforth, K.W., (1951), "Some Social and Psychological consequences of the longwall method of coal-getting", *Human Relations*, Vol.4, no.1, pp.3-38.

[20] Vergne, J., Toward a New Measure of "Organizational Legitimacy: Method, Validation, and Illustration", *Organizational Research Methods*, July 1, 2011 14: 484-502

[21] Campbell, A., and Warner, M., (1987), "New Technology, Innovation and Training, *Behaviour and Information Technology*, Vol.2, no.1, 86-99.

[22] Clegg, S., and Dunkerley, D., (1980) *Organization, Class and Control*, London: Routledge and Kegan Paul.

[23] Baldry, C., (1988) *Computer Jobs and Skills: the Industrial Relations of Technological Change*, New York: Plenam Press.

[24] Griffin, R., and Moorhead, G., (2013) Organizational Behaviour: Managing People and Organizations, (11th Ed.), New York: South-Western College Publishing.

[25] Church, A. H.,Walker, A. G.,&Brockner, J. (2002). Multisource feedback for organization development and change. In J.Waclawski & A. H. Church (Eds.), Organization development: A data-driven approach to organizational change (pp. 2754). San Francisco: Jossey-Bass.

[26] Coovert, M. D. (1995). Technological changes in office jobs: What we know and what we can expect. In A.Howard (Ed.), The changing nature of work (pp. 175-208). San Francisco: Jossey-Bass.

[27] Walsham, G., and Ham, C.K., "Stracturation Theory and Information Systems Research", *Journal of Applied Systems Analysis*, 1991, Vol.17, pp.77-85.

[28] Walsham, G., (1993), *Interpreting Information Systems in Organizations*, Chichester: Wiley.

[29] Burke, W. W.,& Litwin, G. H. (1992).Acausal model of organizational performance and change. Journal of Management, 18, 523-545.

[30] Kraut, A. I.,&Saari, L. M. (1999). Organizational surveys: Coming of age for a new era. In A. I. Kraut & A. K. Korman (Eds.), Evolving practices in human resource management: Responses to a changing world of work (pp. 302-327), San Francisco: Jossey-Bass.

[31] Howard, A. (Ed.). (1995). *The changing nature of work*. San Francisco: Jossey-Bass.

[32] McKenna, E., and Beech, N., (1995) *The Essence of Human Resource Management*, London: Prentice Hall.

[33] Reily, A.H., 'The Role of Human Resource Development Competencies in Facilitating Effective Crisis Communication', in *Advances in Developing Human Resources*, June 2008 vol. 10 no. 3 331-351.

[34] Watanabe, T., "New Office Technology and the labour process in contemporary Japanese Banking", *New Technology, Work and Employment* Vol. 5, no.1, spring, p.64.

[35] Katz, D., & Kahn, R. L. (1978). The social psychology of organizations (2nd ed.). New York: John Wiley.

[36] Beckhard, R., & Harris, R. T. (1987). Organizational transitions: Managing complex change (2nd ed.). Reading, MA: Addison-Wesley.

[37] Friedman A., and Cornford D., (1989) *Computer Systems Development: History, Organization, and People,* Oxford: Basil Blackwell.

[38] Mankin, D., Cohen, S.G., and Bicson, T.K., (1996) *Teams and Technology: Fullfilling the promise of the New Organization*, Boston: Harvard Business School Press.

****