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A Model Management Approach to Business Process Reengineering

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Business Process Reengineering is the popular term for reoptimization of organizational processes and structures following the introduction of new information technologies into an organization. There is considerable anecdotal evidence that even small changes in the use of information technology (IT) in an organization may require major restructuring of the organization to take full advantage of the efficiencies created by the technology [3, 11, 12, 13]. Conversely, there is also considerable evidence that without major restructuring, the introduction of IT may not produce savings needed even to justify the investment [33, 36]. Although the evidence for organizational restructuring to accompany technological change is strong, there is much less agreement on exactly what organizational changes are needed to take full advantage of the technology. The controversy includes both the macro and micro level changes. At the macro level, the most salient issue is the change in the degree of centralization of decision making, with related questions about the depth and shape of organizational hierarchies. At the micro level, the most salient issue is the job definition and content, with related questions about communication patterns, job satisfaction of employees, and skill requirements. There is a remarkable degree of disagreement on the impact of IT on organizations in all of these areas. IT may be expected to increase centralization because it increases the information processing capacity of managers, hence, allowing them to centralize more decisions [35, 42, 43]. IT may also be expected to decrease centralization because it reduces the cost of communication and coordination, and allows decisions to be delegated [6, 20, 31, 42]. IT may be expected to decrease the depth of organizational hierarchies since it automates some of the middle management functions, facilitating the movement of information through the organizational hierarchy [7, 42]. IT may also increase the depth of hierarchies by reducing the delays and distortions introduced by the movement of information through the hierarchy [5, 35]. IT may be expected to reduce job satisfaction and diminish skill requirements by routinizing work, by subdividing work into small, highly specialized and repetitive tasks, and by subjecting humans to machine control [6, 42, 43]. IT may also be expected to increase job satisfaction, enrich jobs, and replace low level clerical jobs with high-skill professional jobs by automating the most mundane tasks [2, 23, 43].

One explanation for the inconsistency of the empirical evidence is that the impact of IT on organizations is nondeterministic. IT creates options for the organization, and the organizational choice among those options creates the variation in observed outcomes [10, 28, 43]. This explanation is valuable in establishing the complexity of the

interactions, but not very useful in prediction or prescription, and gives no guidance to the implementor of IT or Business Process Reengineering. A second explanation for the inconsistency of the empirical evidence is in the treatment of IT as one specific factor. In fact, IT contains many diverse technologies that can be used to automate a variety of organizational processes. What gets automated determines what would be the optimum structure for the remaining processes! Clearly, automating clerical tasks would have a different impact on the organization than building Executive Support Systems for the top management [24, 37]. This explanation is valuable in narrowing the research question, and providing a general framework for prediction and prescription. However, general macro level prescriptions about organizational structures are not always easy to translate into specific micro level changes in organizational processes even when those prescriptions are available [21], and further refinement of the prescriptions is often necessary.

This article takes a prescriptive and analytical approach to Business Process processes, and to provide guidance and analytical tools for the reengineering efforts. In the process, a number of organizational issues are explained and quantified, including the concentrate power on top, and may create employee alienation at the bottom, the need for business process reengineering after the introduction of IT, the exact conditions under which IT may and should lead to more or less centralized structures, and the exact location and nature of those structural changes. An information processing-decision making paradigm of organizations is adopted [14, 17, 38, 40]. Organizational processes are viewed as collections of decision models within the general framework of organizational information processing. Each decision model is identified by a type of decision which is its output, and contains a sequence of information processing tasks [26]. The information processing tasks are the smallest identifiable units of analysis, and their optimum arrangement is the critical design variable determining the efficiency of the resulting structures. The structures will be evaluated in terms of the cost of information processing, and the cost of communication among tasks [21]. Both criteria are heavily influenced by the arrangement of tasks, since those arrangements determine what tasks need to communicate with each other, the direction and the content of communication, and the possible sharing of tasks among models.

1. Alexander C. Notes on the Synthesis of Form. Harvard University Press, 1967.

2. Attewell P., Rule J. Computing and Organizations: What We Know and What We Don't Know. Communications of ACM 27, 2184-2192, 1984.

3. Barley S. Technology as an Occasion for Structuring. Administrative Science Quarterly 31, 1-24, 1986.

4. Blanning R. Model Management Systems: An Overview. Decision Support Systems 9, 1, 9-18, 1993.

5. Blau P.M., Falbe C.M., McKinley W., Tracy P.K. Technology and Organization in Manufacturing. Administrative Science Quarterly 21, 20-81, 1976.

6. Burton R.M., Obel B. Designing Efficient Organizations: Modeling and Experimentation. Elsevier 1984.

7. Crowston K., Malone T.W., Lin F. Cognitive Science and Organization Design: A Case Study in Computer Conferencing. Human Computer Interaction 3, 59-85, 1987.

8. Curtis B., Kellner M.I., Over J. Process Modeling. Communications of ACM 35, 9, 75-90, 1992.

9. Drenick R.F. A Mathematical Organization Theory. North Holland 1986.

10. Gurbaxani V., Whang S. The Impact of Information Systems on Organizations and Markets. Communications of ACM 34, 1, 1991.

11. Hackman J.R., Oldham G.R. Work Redesign. Addison Wesley 1980.

12. Hammer M. Reengineering Work: Don't Automate, Obliterate. Harvard Business Review 104-112, 1990.

13. Hammer M., Champy J. Reengineering the Corporation: A Manifesto for Business Revolution. Harper Collins 1993.

14. Huber G.P. McDaniel R.R. The Decision Making Paradigm of Organization Design. Management Science 32, 5, 576-589, 1986.

15. Huber G.P. The Nature of Organizational Decision Making and the Design of Decision Support Systems. MIS Quarterly 5, 2, 1-10, 1981.

16. Jones D.S. Elementary Information Theory. Oxford University Press.

17. Knight K.E. Organizations: An Information System Perspective. Wadsworth, 1979.

18. Kocher M., Deutsch K.W. Decentralization by Function and Location. Management Science 19, 841-856, 1973.

19. Lawler E.L. The Traveling Salesman Problem: A Guided Tour of Combinatorial Optimization. Prentice Hall 1986.

20. Malone T.W. Modeling Coordination in Organizations and Markets. Management Science 33, 10, 1317-1332, 1987.

21. Malone T.W., Smith S.A. Modeling the Performance of Organizational Structures. Operations Research 36, 3, 421-436, 1988.

22. Malone T.W., Crowstor K., Lee J., Pentland B.T. Tools for Inventing Organizations: Towards a Handbook of Organizational Processes. Proceedings of IEEE Workshop on Enabling Technologies Infrastructure for Collaborative Enterprises, 1993.

23. Mann F.C., Williams L.K. Observations on the Dynamics of a change to EDP Equipment. Administrative Science Quarterly. 5, 217-256, 1960.

24. Marcus M.L., Robey D. Information Technology and Organizational Change: Causal Structure in Theory and Research. Management Science. 1988.

25. Mintzberg H. Structure in Fives: Designing Effective Organizations. Prentice Hall 1983.

26. Moore T.C., Whinston A.B. A Model of Decision Making with Sequential Information Acquisition. Decision Support Systems 2, 4, 289-308, 1986.

27. Morgan G. Images of Organization Sage 1986.

28. Orlikowsky W.J. The Duality of Technology: Rethinking the Concept of Technology in Organizations. Organization Science 3, 398-427, 1992.

29. Orman L. Information Intensive Modeling. MIS Quarterly 11, 1, 73-84, 1987.

30. Orman L. Information Cost as a Determinant of System Architecture. Information and Software Technology 36,3, 165-172, 1994.

31. Osterman P. The impact of Computers on the Employment of Clerks and Managers. Industrial and Labor Relations Review 39, 175-186, 1986.

32. Ozan T. Applied Mathematical Programming. Wiley 1985.

33. Panko R. Is Office Productivity Stagnant? MIS Quarterly 15, 2, 1991.

34. Paulson D., Wand Y. An Automated Approach to Information System Decomposition. Transactions on Software Engineering 18, 3, 174-189, 1992.

35. Pfeffer J., Leblebici H. Information Technology and Organization Structure. Pacific Sociological Review 20, 241-261, 1977.

36. Roach S.S. Services Under Seize: The Restructuring Imperative. Harvard Business Review. September 1991.

37. Robey D. Computer Information Systems and Organization Structure. Communications of ACM 24, 10, 679-687, 1981.

38. Simon H. Rationality as a Process and Product of Thought. American Economic Review 68, 2, 1-16, 1973.

39. Turban E. Decision Support and Expert Systems. MacMillan 1990.

40. Tushman M.L., Nadler D.A. Information Processing as an Integrating Concept in Organization Design. Academy of Management Review 3, 3, 613-624, 1978.

41. Wand Y., Weber R. On Ontological Models of an Information System. Transactions on Software Engineering 16, 11, 12-82-1292, 1990.

42. Whisler T.L. Information Technology and Organizational Charge. Wadsworth 1970.

43. Zuboff S. New Worlds Of Computer Mediated Work. Harvard Business Review 61, 142-152, 1983.

44. Zviran M. Relationship Between Organizational and Information System Objectives: Some Empirical Evidence. Journal of MIS 7, 1, 65-84, 1990.