

come of his research. Organizational learning need not be positive. In fact, an organization's learning may indeed be highly detrimental to its effectiveness. The author regards 'increased employee loyalty and reduced staff turnover, and an enhanced *esprit de corps*' (p. 183) as positive signs of learning. Such assumptions are likely to be partly contested by most organizational learning scholars. Loyal members are certainly beneficial to focused learning, but may be severe obstacles to any major changes. Seen from the perspective of a consultant that insight may not be a pleasant one. As the author himself concludes: 'Those belonging to the consultancy school almost invariably have a very positive view of the potential benefits of organizational learning' (p. 41). The book would clearly have benefited, both in terms of rigour and credibility, from a discussion of the amplification and reduction structure of learning. This would have required more attention than has been the case. Still, John Denton's book fulfils an important mission: that of inspiring a further discussion of how organizational learning is to be analyzed, both in terms of short-term and long-term effectiveness. In addition, the book is a good example of how organizational learning can be approached, which may trigger the interest of both scholars and practitioners, amplifying their joint understanding. This is not an achievement accomplished by many.

Bryn Jones: Forcing the Factory of the Future. Cybernation and Societal Institutions

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Speculations and research efforts aimed at discovering future organizational forms attract a lot of attention, both in practice and among organization and strategy scholars. Descriptions of new organizational forms are numerous. However, so far, the analysis of their expected properties and their contribution to competitive advantage have received less attention. Usually, these descriptions are derived from idiosyncratic cases. In the literature of the past fifteen years, various examples of new organizational forms have been described, such as the internal network form (Miles and Snow 1986), the spherical form (Miles and Snow 1994), the N-form (Hedlund 1994), the hypertext organization (Nonaka 1994, Nonaka and Takeuchi 1995), the platform organization (Ciborra 1996) and the flexible form (Volberda 1998). In analyzing the emergence of organizational forms, these contributions asked for theories addressing questions such as: How and why do new strategic forms of organizing emerge and evolve from ancestral forms? Unfortunately, such theories are still in their infancy (Lewin and Volberda 1999). As Van de Ven and Grazman (1999: 186) have recently pointed out: 'There is no one comprehensive theory of organizational change able to explain how and why organizations grow and develop as they do'. Among the promising candidates for such comprehensive theories are co-evolutionary theories. In analyzing the emergence of organizational forms, these

theories incorporate both environmental selection processes and organization adaptation processes (Lewin and Volberda 1999). After reviewing Jones (1997), in which the question is raised as to whether the organizational form of the factory of the future will be forced towards a universal model or will be fragmented due to national particularities, we will discuss how the research questions and methodology as used by Jones (1997) can be further explored by taking an explicitly co-evolutionary perspective into account.

This paper is structured as follows. First, we will discuss Jones' (1997) contribution: *Forcing the Factory of the Future*. In this 'discussion', we will limit ourselves to considering this publication as an example of an interesting research effort aimed at gaining an understanding of how, over time, forces external to the firm may influence the organizational form in use in a particular industry and the extent to which the national institutional context matters. In doing so, we will focus on Jones' (1997) research methods and findings and point out key strengths and weaknesses of this approach. Next, we will briefly sketch a co-evolutionary perspective on the emergence of new organizational forms and use this perspective to reflect on Jones' (1997) research questions. In doing so, we will illustrate that using such an approach may contribute to answering more generic questions.

Although in the recent literature on knowledge-intensive organizations and the new knowledge economy (Hodgson 1999) manufacturing organizations get less attention, the future form of factory organization and the understanding of its determinants are obviously important. In the context of manufacturing organizations, examples of relevant questions are the following: Will the future form be a completely reprogrammable and computer-integrated factory without involvement of human skills? Or will human skills be necessary in the future form in mediating between the technological and social worlds? To what extent, and why, will the long-term trend of replacing human action by machine operations — a trend towards 'the workerless factory' — take place? Will the future form of factory organization be completely different from the past and present version, and will a universal form emerge across countries and industries? These questions are raised by Jones (1997) who investigated the impact of computerized production in the metalworking batch production industry. We will discuss Jones' (1997) research questions, methods and findings and will point at strengths and weaknesses of the approach chosen.

Jones (1997: 3) investigated to what extent information and computer technology replace human skills in a factory organization 'by an all-encompassing, integrated machine system'. Information and computer technology aimed at the automation of the automation of the factory is coined as 'cybernation'. The investigation is guided by three research questions (Jones 1997: 244):

Q1: 'Will computer technologies finally establish true factory principles through the cybernation of the "workshop" sphere of batch production?'

flexible manufacturing systems, Numerical Control (NC) technology and the Computer Integrated Manufacturing (CIM) technology. Furthermore, the national institutional contexts are described. The third part assesses the impact of Flexible Manufacturing Systems in four countries, and summarizes the findings. Following the research questions, above, the empirical research showed that the answer to the first question is negative. Human skills appeared to be necessary as a mediating factor between the technological and social worlds. The second question, on continuity versus discontinuity, is not answered as clearly as the first one. Jones (1997) pointed out that there is a permanent potentiality for both continuity and transformation. Regarding the third question, addressing a universal model versus national particularities, the answer is clear: national institutional environments do matter! Cybernation did not eliminate national contextual differences nor did it reduce these differences to insignificance. The main contextual differences are between Europe (Britain and Italy) and the United States on the one hand, and Japan on the other.

The book has several strengths, the most important of which is its historical and strongly empirical focus that is normally lacking in publications on new or future forms of organizing. The historical perspective covers about two hundred years — from the first metalworking machine production at the end of the 18th century till 1990. This analysis shows, for example, how the size and predictability of the market also plays a role in the nature of production control. The strong empirical focus is attractive for its richness of important details and for focusing on a relatively under-researched industry. For example, Jones (1997: 94) carefully describes how the introduction of the NC technology is linked with workers' skills as 'the medium by which self-regulating, but contextually insensitive, machine technology is adapted to the contingencies and priorities of the factory floor'. A major weakness, however, is the use, in the research questions, of empirically difficult-to-assess variables and the use of an implicit analytical framework. For example, the first and leading research question is rather imprecise. What are true factory principles and what criteria have to be satisfied to assess whether these principles are established? What is meant by the workshop sphere? Because Jones (1997) distinguishes not only a factory organization and a workshop organization but also a 'workshop factory' form, this issue is particularly important. How can the question of whether the emerging organization (see Q2) is qualitatively different from earlier ones be assessed? The use of an implicit analytical framework, however, is a major weakness and does not easily facilitate either the generalization of the findings or their connection with the wider literature.

However, Jones (1997) provides several insights to make his implicit framework more explicit. Some examples are: the warning against using either technological or socio-economic determinism (p. 77); the effort to avoid crude Darwinian conceptions of evolution (p. 89); the emphasis on mutual reinforcement between the socio-economic environment and the technological properties (p. 90); and the observation of the embeddedness of

human skills in social institutions and how this appears to be 'the ultimate arbiter' of technological selection and economic viability of technologies of control, such as NC, compared with rival technologies (p. 100). Building on these insights, we believe valuable research efforts like Jones (1997) may further explore their analysis by taking a co-evolutionary perspective into account.

The number of publications in the organization and strategy literature dealing with various aspects of co-evolution is growing rapidly (Baum and Singh 1994; Barnett and Burgelman 1996; Levinthal 1997; Aldrich 1999; Lewin and Volberda 1999). In the context of organization theory and strategy research, Lewin and Volberda (1999) define co-evolution as the joint outcome of managerial intentionality, the environment and institutional effects, and distinguish five properties of co-evolution. These are: multi-levelness of co-evolution, the occurrence of multidirectional causalities, nonlinear interactions, positive feedback mechanisms and path dependency. A recent example of multilevel co-evolution is provided by Van de Ven and Grazman (1999). They investigate how and why evolutionary processes at one level facilitate or constrain evolution at other levels of a 'nested ecological hierarchy'. In their research, this nested hierarchy consists of three levels: management within organizations, within a community or an industry. Another interesting feature of their research is the methodology to distinguish whether new forms of organizing indeed arise, described as 'branching' (the emergence of new forms, i.e. variations) or can be considered as an extension of an ancestral form, described as 'persistence' (i.e. retention). Such an approach, however, requires a longitudinal analysis of the focal organization (Lewin and Volberda 1999).

By using a rather schematic representation (and extension) of Jones' (1997) research questions, we can illustrate how a co-evolutionary perspective might be helpful in further exploring the questions addressed by Jones (1997). The first research question focuses, in fact, on one, albeit interesting, direction of causality between a change in an external force, in this case technology, and its impact on factory organization, i.e. organizational form. From a co-evolutionary perspective, however, managerial intentionality (or the strategic choice perspective) is missing. Although Jones (1997: 255) pays attention to it by observing that 'management in different countries does share a core common perception in the production paradigms, ... [but] important national and local variations ... have been clearly evident'. In future research, managerial intentionality might deserve more attention. In particular, Jones' (1997: 258) conclusion that 'the cybernation crusade is still significant for revealing the managerial preferences that guide work organization choices' stresses this point. In this connection, Dijksterhuis et al. (1999) identify management logic and the contextual variation of this logic at national, industry and firm level, as a source of co-evolution of new organizational forms. In this connection, Jones (1997) provides interesting insights regarding the contextual variation of Fordism and Taylorism over time. Another interesting aspect of managerial intentionality is the deliberate increase of a firm's absorptive capacity, i.e. the

capacity to recognize, evaluate and commercially utilize new external knowledge (Cohen and Levinthal 1990). From a co-evolutionary perspective, such an increase in absorptive capacity may take place by adapting organizational form to the changing requirements of the knowledge environments (Van den Bosch et al. 1999). An interesting question in the context of the emerging information economy is, how the factory of the future will cope with uncertainty. Will cybernation result in reduction or will new ways of organizing bring about absorption (Boisot 1998)? The second research question can be explored further, empirically, by using Van de Ven and Grazman's (1999) analysis of genealogical lineage of the various forms of factory organization described by Jones (1997). Furthermore, Tushman and Romanelli's (1990) punctuated equilibrium model of organizational evolution might be helpful to reconcile the incremental and transformational approaches to organizational change. Regarding Jones' (1997) third research question, from the notion of co-evolution, organizational adaptations are likely to vary across national institutional contexts (Whittington et al. 1999). In such an approach, it may appear that various interacting factors and actors (such as managers) at multiple levels of analysis over time mutually force the organizational forms of the factory of the future. As Aldrich (1999: 40) points out: 'indeterminacy is a key feature of evolutionary analysis, and human agency is very much a part of the explorations...'. Therefore, it is likely that these future forms will arise in a non-deterministic way. In conclusion, Jones (1997) provides important insights regarding the development of the factory organization over time. Future research may extend and generalize these insights by using a co-evolutionary approach.

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Book Notes

Nordal Åkerman: *The Necessity of Friction*

1998, Colorado: Westview Press. 320 pages.

Friction is what keeps us from realizing our goals. It is what compromises all our plans, sometimes making them unrecognizable. It defies our wish for perfection and constantly surprises us with new elements or resistance. It constitutes the divide between dream and reality. However, friction is also what gets us moving, a necessary incentive to achieve progress. Nothing can start if it cannot push off something else. By blocking or delaying the easy solution, friction makes for a richer, more varied world. If it stops schemes from being completely fulfilled, it also stops them from going totally awry. To the modernist project, with its one-sided rationalist pretensions, friction is unambiguously bad — and so it is being disposed of at an increasing speed. The currency markets are one example, cyberspace another. This means that there is less and less time to pause and rethink, while the vulnerability of societies is aggravated. In *The Necessity of Friction*, scholars tackle this concept of friction. A number of scientific fields are engaged: physics, philosophy, economics, architecture, organizational theory, artificial intelligence, and others. Together, these contributions form an attempt at analyzing the intriguing, yet elusive, subject of friction as a metaphor.

