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CHANGE MANAGEMENT: A CLASSIFICATION

ABSTRACT. Higher education systems, like others, experience a proliferation of management approaches including tools designed to induce and manage change: strategic planning and reporting, planning and budgeting systems, peer review and self-evaluation, total quality management, reengineering, the art and practice of learning organisations, *etc*. While these approaches may differ in their specific focus and the type of professionals they address, they also have much in common and can complement each other. The present paper addresses the spectrum of change processes and proposes taxonomies to guide their use.

INTRODUCTION

The past half century has seen unprecedented change. Concurrently with this, professions evolved designed to bring about change (Morse 1986; Fenske 1970). The change in the fabric of modern, Western societies has been an ongoing process. The transformation during the past decades was fueled by the growth of the service sector and by a gradual move from labour intensive towards capital intensive industrial production (Rifkin 1995; Thurow 1992). The impact of this process has been dramatic, not only for the service industries but for all sectors of the economy and – by implication – for higher education: higher education moved from an élite to a mass system (Trow 1970); diversity played a more prominent role (Clark 1983; Kells 1997; Trow 1997); new academic programmes were formed and new professions introduced; existing curricula adapted or expanded; professional societies were founded; communication technologies spread; the gradual move away from labour intensive knowledge-transfer fostered distance learning; and the general discussion on management issues intensified.

In the context of this transformation change theories proliferated. During the early years of the post WWII era, developmental issues prevailed and quantitative approaches, both of a descriptive or evaluative nature, gained prominence. Change was predicated on the basis of a strong belief in rational, planned courses of action and autocratic, top-down and expert-based approaches were the rule. In the mid 60s the

climate began to change in the US and Europe, particularly in the public sphere and in the wake of new social movements emphasising bottom-up approaches, broader participation and advocacy (Alinsky 1971). At the same time, environmental issues became prominent (Forrester 1961, 1971; Meadows 1972, 1992). In Japan, the quality movement was well underway, giving rise to a exemplary economic development which was subsequently emulated within our hemisphere (Crosby 1996; Dertouzos 1989; Thurow 1992). Finally, the spread of the developed economies to previously uncharted areas in the 80s and 90s and the implicit impact of the globalisation phenomenon gave rise to a new round of management approaches stressing flexibility, radical changes and institutional learning (Hammer 1992; Senge 1990).

The proliferation of change theories which evolved during past decades parallels an overproportional growth in a range of professions, particularly those related to engineering (including information sciences), business and management (Snyder 1994). With the growth of these professions, individual change theories evolved with particular foci. These change theories span by now a wide range of approaches: the languages in which these are cast differ from field to field, differing disciplinary traditions play a role, their life span is limited, and concepts are used with non-standard connotations. It appears clear that on the bases of such a development communication across disciplinary fields or across schools of thought appears fraught with problems of communication (Herbst 1998; Sokal 1998).

In the field of higher education, many of the more popular change approaches originally designed for other purposes were – as 'borrowed systems' – adapted to and integrated into the management of individual institutions or higher education systems (Chaffee 1985). With the expansion of higher education, the gradual move from élite to mass systems, the expanded roles of higher education and the new funding bases, self-regulation and *laissez-faire* at the departmental levels was gradually giving way to more active forms of leadership and governance (Massy 1990). Consequently, change approaches or change techniques which proved beneficial in the field of business or public administration were found to be of value and were integrated into the practice of higher education management. In addition, approaches specifically designed for this environment, like assessment procedures in the context of accreditation and self-assessment exercises and peer review, gained prominence (Kells 1992).

The present paper presents two classification schemes of these diverse approaches to better assess their relative merit. The aim of this is not a final

taxonomy or a definite assessment of the history of management; rather, the reflection on classification schemes shall be encouraged in the hope that this will lead to more appropriate selections of change mechanism which fit particular contexts.

THE PROLIFERATION OF CHANGE THEORIES AND THEIR CAUSES

Under change processes I would like to subsume goal oriented activities of a conscious, premediated nature. Goal orientation indicates that activities are chosen in response to – or in anticipation of – a perceived situation. We call this reactive or proactive behaviour. The requirement that the behaviour be premediated sets the focus on those classes of activities which are guided by reflective thought and some preparatory organisation. Although individual activities are not excluded, the focus in this paper is clearly on social activities with their associated problems of shared perceptions, communication, and common responses.

Activities such as these have various histories, particularly if we look at the terms chosen to designate these. Some, like planning, date back a few hundred years if we take the term as such; but there can be no doubt that plan making in the various fields is far older than that and must have paralleled human development. Others, like quality management, are a few decades old, dating perhaps from the early 50s; but here, too, it was discovered that quality has not been an exclusive recent concern (Juran 1995). One decade ago the term of the learning organisation was popularised (Senge 1990) and recently a government report was published in Britain under the title of 'Higher Education in the Learning Society' (Dearing 1997), suggesting, perhaps, that organisational or societal learning is a new phenomenon. But nothing could be further from the truth. Looking at the development of mankind (Levin 1993), we observe that learning since the upper Paleolithic period is basically a cultural phenomenon. While direct, individual learning is closely tied to individual brain functions, societal – or social – learning is not: all of the cultural achievements of mankind – its religious constructs and ethical standards, its languages, its arts and sciences – are primarily based on social learning mechanisms.

If we look at the by now vast literature on change processes, both in the wider world and the world of higher education, we observe a constant exchange of keywords to designate these processes. We are not talking merely of planning or management, we use compound nouns or adjectives to specify our focus – and we change our foci. Some of these will designate particular fields of applications, this is clear: health plan-

ning, transportation planning, hospital management, *etc*. But others will designate particular – and changing – emphases regarding the underlying process: strategic planning, contextual planning, quality management.

> No matter how such a system [or change process] comes into use ... it will ... tend to follow a set pattern. First, the system will be widely acclaimed in the higher education literature; institutions will eagerly ask how best to implement it. Next, the publication of a number of case studies will appear, coupled with testimonials to the system's effectiveness. Finally, both the term and the system will gradually disappear from view (Chaffee 1985, p. 133).

We once talked of planning-programming-budgeting systems (PPBS), zero-based-budgeting (ZBB), management by objectives (MBO), *etc*. What happened to these – by now forgotten – management approaches?

The argument here is that change processes have a limited life expectancy and that they are frequently cast in ideological terms. The two aspects appear somehow related. Change processes are normally portrayed as a unitary entity, with a descriptive title and a certain focus, not as a system of elements chosen by managers or planners. As a consequence, if certain elements of a change process appear outdated or ineffectual, the whole process is likely to be replaced by a new process. This leads to a succession of change processes with limited life expectancies and to a proliferation of approaches. Communication problems abound for a number of reasons: the short life expectancy of the processes under discussion is detrimental to the transfer of know-how from teacher to student and from one generation to the next; practitioners lack common concepts and are implicitly asked to follow a particular school of thought; experiences are difficult to calibrate, *etc*. On the other hand, if we were to think of change processes in a more open, less confrontational way, more in the way of systems of elements of change, we should be in a better positions to build and retain a proper practice of management.

CHANGE MANAGEMENT AND PROBLEM STRUCTURE

In the following, the first of two proposed classification scheme of change processes shall be presented. To obtain a clearer view on the spectrum of change processes, we shall attempt to match change processes with problem structures they are designed to address. Change processes are closely related to problem solving. At the outset, we perceive a problem situation we would like to change or solve. In systemic terms, a problem situation can be depicted as a triplet $\langle i, \psi, d \rangle$ of elements composed of an initial state i, a desired state d, and some form of a transformation $\psi : i \rightarrow d$. In the case of reasonably well structured problems, such as

those of recreational mathematics or chess, the problem situation can be illustrated. In a three-move-mate problem of chess, for instance, the initial state is given by the figure configuration on the board plus the instruction which colour will move next; the desired state is a mate in at most three moves; the transformation of the initial state into the desired state is the actual challenge of the chess problem at hand. Problems of recreational mathematics lend themselves to easy structuring and corresponding solution approaches (Bellman 1970; Harel 1992).

In a more realistic, less structured, problem of transportation planning, for instance, we might be confronted with an initial state characterised by a chronic congestion situation we were able to document on the basis of traffic surveys. The desired state is not necessarily clear at the outset: we might want to remove the congestion situation by increasing the capacity of the traffic mode under consideration or by offering alternative – and additional – modes of traffic; alternatively, we may want to reduce transportation demand by various measures. Depending on the desired state chosen, we would then evaluate and eventually implement alternative courses of action over which we exercise some control and which are designed to transform, possibly through a succession of steps, the initial state as we originally perceived it into the desired state chosen. Analogous problems present themselves in higher education if the demand for certain fields of study grossly exceeds available capacities: Should capacities in these fields be enlarged? How would one finance this expansion? Should enrollment be curtailed (*numerus clausus*) to fit available capacities? Should the situation be left unchanged in the hope that an inferior service will reduce the attractiveness of the field? Should the demand be reduced by offering alternative courses of study geared towards the same type of student?

Above, I was alluding to the fact that problems may exhibit varying degrees of structure. We often loosely distinguish between well-structured problems on the one hand and ill-structured problems on the other, knowing, of course, that there exists a whole spectrum (Newell 1969). Well-structured problems are distinguished in that initial and desired states are well defined as well as the way by which we plan to transform one state into the other. Mathematical school exercises are often of a well-structured nature and so are many puzzles and recreational board games. Engineering and design problems are commonly characterised by the fact that both initial and desired states are well-defined and the transformation is of a fairly well-defined nature. I say 'fairly well-defined' because in most cases engineering problems are such as to be well-structured in principle: engineers normally know prior to their designing of a struc-

TABLE I

Classification Scheme of Problem Classes

Problem Class:	States of Problem Sitation			Problem-Solving Approaches:
	i	ψ	d	
I	1	1	1	Algorithms
II	0	1	1	Diagnostic activities, self-evaluation, peer review, benchmarking
III	1	0	1	Total-quality-management, engineering design, R&D
IV	1	1	0	Environmental scanning, technological forecasting, scenarios
V	0	0	1	Diagnosis-treatment approaches
VI	0	1	0	Technology transfer, operations research, SWOT-analyses
VII	1	0	0	Reengineering
VIII	0	0	0	Strategic planning

ture or component whether the design is feasible; in such cases where engineers are confronted with an ill-defined transformation, we normally speak of development or research. Diagnostic activities, to mention another example, address themselves to problem situations whose initial states are ill-defined. There are many problem solving activities which can be characterised not by what they are doing, or how they do it, but by the structure of the problem they address.

Given this systemic sketch of problem situations, we are in a position to propose a classification scheme of problem classes. If we loosely distinguish between well-defined elements of a problem situation (denoted by a '1') and ill-defined elements (denoted by a '0'), we can distinguish 2^3 = 8 problem classes (see Table I). We can now classify problem-solving approaches in function of the problem class they address: approaches which work well in well-structured situations and others specifically geared towards the ill-structured cases. If we look at the lattice which
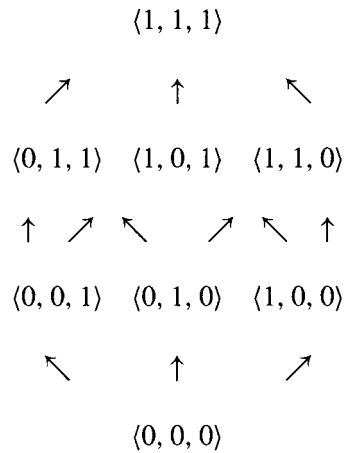
$$\langle 1, 1, 1 \rangle$$

$$\nearrow \qquad \uparrow \qquad \nwarrow$$

$$\langle 0, 1, 1 \rangle \quad \langle 1, 0, 1 \rangle \quad \langle 1, 1, 0 \rangle$$

$$\uparrow \quad \nearrow \quad \nwarrow \qquad \nearrow \quad \nwarrow \quad \uparrow$$

$$\langle 0, 0, 1 \rangle \quad \langle 0, 1, 0 \rangle \quad \langle 1, 0, 0 \rangle$$

$$\nwarrow \qquad \uparrow \qquad \nearrow$$

$$\langle 0, 0, 0 \rangle$$

Figure 1.   Lattice of problem classes.

can be formed by these eight problem classes, we can also see how ill-structured problems can be decomposed into sub-problems of lesser scope and higher structure (see Figure 1). Each node in the lattice represents a problem class – and by implication also a class of problem-solving approaches. Problem-solving will start at a particular node of the lattice (depending on the problem at hand) and will attempt to move to nodes representing problems with more structure.

On the basis of this schematic construction, we can conceptualise problem-solving as a process which moves from the vague and general to the coherent and specific (Emery 1969). At the outset, we are confronted with a less than well-structured problem which we transform, through a succession of problem reformulations, into a set of well-structured sub-problems we can solve. During this process, we structure the original problem until we arrive – iteratively – at a well-structured representation which serves as the operational simile of the original problem (Quade 1968). This chain of problem representations is not unique. In other word, 'adding structure' is not a purely technical matter, quite the contrary. We often observe that people are in reasonable agreement as far as the acceptance of the ill-structured version of the problem is concerned, but may have widely differing opinions when confronted with a well-structured representation of the same problem. Well structured versions of a problem cannot be 'deduced' from ill-structured versions of the problem. The process of well-structuring is value laden and often highly political.

Finally, the schematic construction also indicates how ill-structured problems can be decomposed into sets of better-structured problems of

more limited scope – and how particular problem solving or change processes be combined to address our problems at hand.

FOCUS OF APPROACH

We have stated above that change processes are closely related to problem solving. Problem solving, in turn, relies on models – or on images – of problem situations (Ackoff 1962; Boulding 1961). There is no need to enter into the current debate on deconstructivism or philosophy of science (Sokal 1998; Tierney 1993; Weinberg 1992), but it should be reasonably clear that in the social sciences at least, theories and models reflect as much the perceptions of its authors as the outside world they are supposed to map. This situation holds irrespective of the type of theory or model we construct, in the descriptive domain as well as in the domain of evaluative or normative models or theories.

Theories or models of change processes are of an evaluative – or normative – nature. They will rely on descriptive analyses, but their *raison d'être* is a different one: their purpose is to discriminate between alternative courses of actions or to propose particular action schemes. While in the past a certain emphasis was placed on the construction of mathematical models to prescribe decisions, the newer approaches emphasise people centred – or dialogic – processes of change. The two approaches frequently divide professionals along disciplinary lines, with the more quantitatively inclined opting for the former and the less quantitatively, more verbally inclined in favour of the latter. However, the two approaches do not compete with one another; rather, they are complementary – and should be seen as such.

Schematically, evaluative theories or models distinguish between an endogenous and an exogenous world to analyse or influence (Ackoff 1962). The endogenous world encompasses those aspects of a system under study over which we exert some direct control while the exogenous world refers to factors which lie outside our direct sphere of influence. If we want to classify approaches to change management from this perspective (Peterson 1993), we can generate a 2×2 table in function of whether we would like to primarily analyse or influence a given problem situation (see Table II).

Global analysis, local action

Many of the major theories of how to approach the world will fit this scheme. Perhaps a decade ago a slogan became popular, being carried

TABLE II

Context of Application of Change Approaches

| | | Focus of Analyses | |
		Endogenous	Exogenous
Focus	Endogenous	*Quadrant 1:* Problem analyses and courses of actions pertain primarily to the direct sphere of influence.	*Quadrant 2:* The analysis of the wider context forms the backdrop for the selection of courses of actions pertaining to the direct sphere of influence.
of			
	Exogenous	*Quadrant 3:* Sought after systemic changes are designed to eventually propagate beyond the immediate sphere of influence.	*Quadrant 4:* The larger context forms the backdrop for sought after broad policy changes.
Action			

around on bumper stickers: 'Think globally, act locally'. The basic message behind this slogan was the idea that individual actions have side effects – externalities, as the economists would say – which are not accounted for by market mechanism and that responsible behaviour on the part of the citizenry should voluntarily limit local actions to a subset of actions which are not in conflict with their anticipated aggregated – or global – impact (see Quadrant 2 of Table II). If we talk of sustainable development today, we think along similar lines, although the emphasis is on the building of appropriate supporting structures in the field of technology or law (Schmidheiny 1992).

While neoclassic economic theory pretty much ignores externalities, external effects have been part of economic thought for some time. In neoclassic theory, individual maximising behaviour will lead to global optima. If this were indeed the case, the above slogan would lose its meaning – or would call for a different interpretation. In reality, however, we are confronted with blatant, singular external effects we may attempt to fight. More damaging, however, are the many minor externalities of individual actions which, cumulated, might lead to global effects nobody wants. Many of today's environmental or societal problems – air and water pollution, deforestation and soil erosion, problems of congestion, decay of neighbourhoods or the erosion of public school systems, *etc* – are of

this kind: the systems under consideration drift in undesirable directions. Kahn called the mechanism in support of such drifts 'the tyranny of small decisions' (Kahn 1966). And Senge states, '. . . the primary threats to our survival, both of our organisations and of our societies, come not from sudden events but from slow, gradual processes . . . '. (Senge 1990).

The slogan of 'Think globally, act locally' may, however, also be interpreted from a more adaptive perspective. We want to see the context within which we operate and we want to select our options accordingly. Such a position has a strong systemic bent: it feeds on the early schools of systems analyses and has recently been popularised under the name of 'learning organisations' (Senge 1990). The basic notion of that school is that learning in frequent situations cannot be based on trial and error, because the consequences of our actions might become visible only in the distant future or in a distant part of the world we have no direct access to or knowledge of. Irrespective of this particular connotation and the question of how to support organisational learning, the position has gained prominence, particularly in the field of higher education: '. . . the primary focus of [institutional] planning has been to examine environmental change and to develop institutional strategies for responding or adapting' (Peterson 1997, p. 3).

Local analysis, local action

It is clear that the general strategy we referred to above has a special appeal: many of the professionals who assume functions in the field of planning or higher education management will feel comfortable with it. But that is not to say that other foci are not more prominent. Clearly, the most frequent position adopted, in business and public institutions, is that of a primarily local – endogenous – focus of analysis and action (Quadrant 1 of Table II). This position is convenient in that it minimises the accumulation of costly intelligence and it will limit courses of actions to that subset over which the organisation will exercise sufficient control. But the position is also of an ideal-type: were it not for externalities and could global conditions be readily read locally, the classic assumptions of economic theory would hold and there would be no need to adopt different strategies.

In fact, modern economics is in the process of reviewing its classic assumptions (Arthur 1997). Local actions will not lead to global optima, but the questions will be raised under what conditions a local focus might generate reasonable – or acceptable – results, even from a global point of view. With this focus of inquiry, economics adopts research questions that are well known in the field of organismic biology: we may wonder

how ants are in a position to quickly repair a damaged anthill while the perspective of the individuals, so we must assume, is limited indeed. The chosen focus of inquiry is also an expression of hope and a modern answer to Lindblom's dictum of 'muddling through' (Lindblom 1959). If economics – or the policy sciences for that matter – are in a better position to explain the conditions under which the pursuance of local foci and the general stability of the system at large go hand in hand, we shall have gained a great deal.

Local and global analyses, global action

While change approaches in the fields of business and non-profit organisations fall predominantly into the first and second quadrants of our presently discussed classification scheme, change approaches of many public agencies will have to be classified to belong to the third quadrant. Public agencies, together with their associated set of laws, frequently act as catalysts of change taking place outside the narrower confines of the agency. Significant is not primarily what goes on within an agency, but what kind of an impact the agency has on the society at large. Housing, transportation, land-use or school authorities are not judged primarily on the basis of what goes on within the respective office; they are judged on the basis of the larger effects of their work. Conceptually, these agencies participate in a two-person game (Rapoport 1966) whose rules they shape but over whose outcome they have only limited control.

Lastly, there are change approaches pertaining to fields of public planning – and particularly to large infra-structural projects – or change approaches of a very general nature with an undefined planning horizon (Quadrant 4). In the fields of public planning, we are confronted with situations similar to those of public agencies, but we have a clear different focus: in the case of public agencies management questions are dominant – the running of the particular agency over time – whereas in public planning a future is conceptualised. Again, this future will be brought about by two actors, the public authorities responsible for whatever investments are necessary, and the public at large which will interact with the facilities that were part of the planning effort. Because so much of the planning work pertains to a distant point in time and because the public at large has such a significant impact on the performance of the system under consideration, the foci of analyses and action lie predominantly outside the immediate boundaries of the institutions engaged in planning. Apart from public planning, there are also the fields of the applied social sciences and public policy planning. In the applied social sciences societal aspects are studied with the general aim to further our understanding of these

TABLE III

Classification Scheme of Analyses-Action-Classes (Examples)

| | | Focus of Analyses | |
		Endogenous	Exogenous
Focus	Endogenous	Continuous quality improvement	Benchmarking
		Reengineering	Environmental scanning
		Self assessment	Learning organisations
		Peer review	Scenario-based planning
			Institutional planning
of			
	Exogenous	National performance review	Applied sociology
		New public management	Public planning (various fields)
Action		Impact assessment	Public policy making
		Technological forecasting	
		Technology transfer	

aspects – and perhaps also to prepare the groundwork for future forms of interventions.

Higher education management

With this, we have a second framework to classify major change approaches which became prominent in the field of higher education management. While I do not attempt to present a definitive classification, and while I would like to emphasise that such classifications are character-ised by a degree of subjectiveness, I should think that some examples might be helpful in the understanding of the presented concepts (see Table III). In this second classification framework, change approaches are grouped by the context of application (Table II): depending on how we perceive this context, we will focus on different classes of change processes; and conversely, depending on our interests in particular change processes, we will have to take account of particular contexts of analyses and action.

CONCLUDING REMARKS

In recent decades, management approaches designed to bring about desired change proliferated. In the field of higher education, many – if not most

– of the more popular change approaches which found their ways into literature and practice were adopted by institutional management. This adoption did not occur uniformly, of course, by all involved; nor did an eventual adoption take place without time limits. In fact, management approaches can be linked to schools of thought or basic professional orientation and the life span of particular theories is limited. There is a constant generation of ideas which are introduced, propagated and popularised – only to be replaced by new versions of ideas. The process of this history of ideas will continue, but it appears that a clearer picture will have to emerge regarding the linking of theories and regarding their concurrent use or replacement over time.

The present paper criticises the unreflected use of change processes. Many processes are chosen without a clearer picture of the options at hand and without a deeper understanding of the pros and cons of individual processes under consideration. The choice of change processes seems to be linked to professional orientation: the disciplinary background of the key players of change processes appears to have a strong bearing on the types of the processes chosen. Furthermore, change processes appear to be selected more on the basis of their popularity than on the basis of analysed merit. While our environments, or worlds, indeed do change, change approaches designed to respond to these environments appear to change even faster: frequently, we observe them as fads.

We are thus confronted with a paradox: while we observe that many of our higher education systems in the world have retained a strong traditional orientation with slow changes and reluctant adaptations to changing conditions, we are confronted with ever changing change theories. In fact, most higher education systems seem to lag behind the general economic development (Herbst 1997b), although there appear to exist exceptions (Clark 1998; Trow 1997). We can argue that higher education systems eventually adapt to changing societal conditions and that a certain lag in responsiveness will in fact improve the stability of the system and will keep it better on course: both higher education and research require commitments extending beyond the short range. But we should also be clear on our focus: we want to change and modernise higher education, not necessarily change theories.

References

Ackoff, Russell L., Gupta, Shiv K. & Sayer Minas, J. (1962). *Scientific Methods: Optimizing Applied Research Decisions*. John Wiley & Sons.

Alinsky, Saul D. (1971/1989). *Rules for Radicals: A Primer for Realistic Radicals*. Vintage Books.

Arthur, Brian W., Durlauf, Steven N. & Lane, David A. (eds) (1997). *The Economy as an Evolving Complex System II*. Proceedings Vol. XXVII. Addison-Wesley: Santa Fe Institute.

Bellman, Richard, Cooke, Kenneth L. & Lockett, Jo Ann (1970). *Algorithms, Graphs and Computers*. Academic Press.

Boulding, Kenneth E. (1961). *The Image: Knowledge in Life and Society*. The University of Michigan Press.

Chaffee, Ellen Earle (1985). The Concept of Strategy: From Business to Higher Education. In John C. Smart (ed.), *Higher Education: Handbook of Theory and Research* **I**, 133–172.

Clark, Burton R. (1998). *Creating Entrepreneurial Universities: Organizational Pathways of Transformation*. Pergamon.

Clark, Burton R. (1983). *The Higher Education System: Academic Organizations in Cross-National Perspective*. University of California Press.

Crosby, Philip B. (1996). *Quality is Still Free: Making Quality Certain in Uncertain Times*. McGraw-Hill.

Dearing, Ron (1997). The National Committee of Inquiry into Higher Education, 'Higher Education in the Learning Society': Dearing's Summary, *The Times Higher Education Supplement*, July 25.

Dertouzos, Michael L., Lester, Richard K., Solow, Robert M. & the MIT Commission on Industrial Productivety (1989). *Made in America: Regaining the Productive Edge*. HarperPerennial.

Emery, J. C. (1969). Management Information Systems. In Julius S. Aronowsky (ed.), *Progress in Operations Research: Relationship between Operations Research and the Computer* **III**. John Wiley & Sons, 489–524.

Fenske, Russell W. (1970). *Operations Research: 15 Year Index, Volumes 1–15, 1952–1967*. ORSA 1970.

Forrester, Jay W. (1971). *World Dynamics*. Wright-Allen Press.

Forrester, Jay W. (1961). *Industrial Dynamics*. Wright-Allen Press.

Hammer, Michael & Champy, James (1992). *Reengineering the Corporation: A Manifesto for Business Revolution*. HarperBusiness.

Harel, David (1992). *Algorithmics: The Spirit of Computing*. Addison-Wesley.

Herbst, Marcel (1998). Book Review of the 'Rise and Fall of Strategic Planning' by Henry Mintzberg, *Tertiary Education and Management* **4**(2), 153–157.

Herbst, Marcel, Latzel, Günther & Lutz, Leonard (eds.) (1997a). *Wandel im tertiären Bildungssektor: Zur Position der Schweiz im internationalen Vergleich*, vdf.

Herbst, Marcel (1997b). Die Hochschule zwischen Tradition und Erneuerung. In Marcel Herbst et al. (eds.) (1997a), op. cit., 173–193.

Juran, J.M. (ed.) (1995). *A History of Managing for Quality: The Evolution, Trends, and Future Directions of Managing for Quality*. ASQC Quality Press.

Kahn, A. E. (1966). The Tyranny of Small Decisions, *Kyklos* **20**, 23ff.

Kells, H. R. (1997). The Implication of Increased Institutional Diversity for Higher Education Evaluation. In Marcel Herbst et al. (eds.) (1997a), op. cit., 43–51.

Kells, H. R. (1992). *Self-Regulation in Higher Education: A Multi-National Perspective on Collaborative Systems of Quality Assurance and Control*. Jessica Kingsley.

Levin, Roger (1993). *The Origin of Modern Humans*. Scientific American Library.

Lindblom, C. E. (1959). The Science of Muddling Through, *Public Administration Review* **19**, 79–88.

Massy, William F. (1990). A Paradigm for Research on Higher Education. In John C. Smart (ed.), *Higher Education: Handbook of Theory and Research* **VI**, 1–34.

Meadows, Donella H., Meadows, Dennis L. & Randers, Jørgen (1992). *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. Chelsea Green Publishing.

Meadows, Donella H. et al. (1972). *The Limits to Growth*. Universe Books.

Morse, Philip M. (1986). The Beginnings of Operations Research in the United States, *Operations Research* **34**(1), 10–17.

Newell, A. (1969). Heuristic Programming: Ill-Structured Problems. In Julius S. Aronowsky (ed.), *Progress in Operations Research: Relationship between Operations Research and the Computer* **III**. John Wiley & Sons, 360–414.

Peterson, Marvin, Dill, David D., Mets, Lisa A. & Associates (1997). *Planning and Management for a Changing Environment*. Jossey-Bass Publishers.

Peterson, Marvin & Spencer, Melinda G. (1993). Qualitative and Quantitative Approaches to Academic Culture: Do They Tell Us the Same Thing?. In John C. Smart (ed.), *Higher Education: Handbook of Theory and Research* **IX**, 344–388.

Quade, E. S. & Boucher, W. I. (1968). Systems Analysis and Polic Planning, Rand R-439-PR.

Rapoport, Anatol & Guyer, Melvin (1966). A Taxonomy of 2 × 2 Games, *Peace Research Society (International)*, Papers, Vienna Conference, **VI**, 11–26.

Rifkin, Jeremy (1995). *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-Market Era*. G.P. Putnam's Sons.

Senge, Peter M. (1990). *The Fifth Discipline: The Art and Practice of Learning Organizations*. Doubleday.

Schmidheiny, Stephan (1992). *Changing Course; A Global Business Perspective on Development and the Environment*. MIT Press.

Snyder, Thomas D. & Hoffmann, Charlene M. (1994). *Digest of Educational Statistics*, National Center for Education Statistics, US Department of Education, NDES 94–115.

Sokal, Alan (1998). www.physics.nyu.edu/faculty/sokal.html.

Thurow, Lester (1992). *Head to Head: The Coming Economic Battle Among Japan, Europe, and America*. Warner Books.

Tierney, William G. and Rhoads, Robert A. (1993). Postmodernism and Critical Theory in Higher Education: Implications for Research and Practice. In John C. Smart (ed.), *Higher Education: Handbook of Theory and Research* **IX**, 308–343.

Trow, Martin (1997). Reflections on Diversity in Higher Education. In Marcel Herbst et al. (eds.) (1997a), op. cit., 15–36.

Trow, Martin (1970). Reflections on the Transition from Elite to Mass Higher Education. *Deadalus* **90**, 1–42.

Weinberg, Steven (1992). *Dreams of a Final Theory*. Pantheon Books.

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