22-11-2005

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Abstract

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Keywords

Change, Processual, Manufacturing, Organizations

Disciplines

Business | Social and Behavioral Sciences

Publication Details

Dawson, P. (2005). Changing manufacturing practices: an appraisal of the processual approach. Human Factors and Ergonomics in Manufacturing, 15 (4), 385-402.

CHANGING MANUFACTURING PRACTICES: AN APPRAISAL OF THE PROCESSUAL APPROACH

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ABSTRACT

There has been a longstanding interest in human factors and the processes of change in manufacturing organizations. This paper focuses attention on the establishment and contribution of a processual perspective to understanding change. A history of the processual approach is outlined and some of the main defining elements and ongoing developments are appraised. Field data drawn from a study of cellular work arrangements at a mirror manufacturing plant is used to highlight the interlocking and overlapping dynamics between substance, context, and politics. In advocating the benefits of a processual perspective, it is argued that during the uptake of cellular manufacturing there is a mutual shaping between the 'technical' and the 'social' and in support of this claim, case study data are used to illustrate the complex and ongoing interaction between socio-political processes and the substance of change (in this case, the technical reconfiguration into cellular form). It is argued that attempts to distil, separate, identify and examine discrete elements (such as, technology) are misplaced and likely to produce misleading results that undervalue the importance of the contextual and socio-political processes that also play a key part as mutual shapers of change.

1. INTRODUCTION

The main aim of this paper is to outline and appraise the contribution of the processual approach to understanding change in manufacturing organizations. An historical overview of

studies that have examined processes of change is provided and the contribution of the landmark work of Pettigrew (1985) is briefly reviewed. The central elements of the author's own proposed framework are then described and explained. For illustrative purposes, the paper uses data drawn from a study of cellular work arrangements at a mirror manufacturing plant that services the automotive industry. The interlocking influence of context and political process is highlighted and the labels and defining characteristics of the change are discussed. The case illustrates how our interpretations of technology and new forms of work organization influence the way we view and respond to change and how these social processes have a powerful influence on the way change is shaped and reshaped.

In adopting a processual perspective, it is argued that there is a mutual shaping between the 'technical' and 'social' during the process of organizational change, and that political human action may reinforce and redefine certain structural features to service preferred design options. As such, political processes may overlap and interlock with the substance of change and thereby reify, obfuscate or recompose the structural arena in which decisions are made. In this sense, the shaping and reshaping of technology and workplace arrangements is as much a social process as it is a technical issue. The case study is used to demonstrate both the importance of substance to understanding processes of organizational change, and to illustrate how the technical elements cannot simply be separated, identified and examined as discrete elements of change. It is argued that the mutual shaping of technology and organisation is an essential part of a political process within which new cellular teamwork arrangements are negotiated and agreed.

2. AN OVERVIEW OF THE PROCESSUAL PERSPECTIVE

A longitudinal research design is integral to processual research that seeks to study processes of change over time. Some commentators have attached the 'emergent' label to studies that examine change 'as-it-happens' (see, for example, Burnes, 2000). This is perhaps not surprising given that an important argument of this approach has been that radical large-scale

change does not simply occur over night (it is not an event) but takes time. As Pettigrew and Whipp (1991: 108) state: 'the management of strategic and operational change for competitive success is an uncertain and emergent process.' Essentially, Burnes (2000) argues that the planned Organizational Development (OD) approach that derives from Kurt Lewin's ice cube model of change (unfreezing, changing and refreezing), dominated thinking from the late 1940s to the early 1980s. He claims that since the 1980s there has been increasing criticism of this approach, especially in the more contextual and processually oriented studies in the UK (see for example, Dawson 1994, Pettigrew, 1985), and by writers such as as Kanter (1983) and her colleagues in the US – as they state: 'organizations are never frozen, much less refrozen, but are fluid entities with many "personalities"..to the extent that there are stages, they overlap and interpenetrate one another in important ways' (Kanter, Stein and Jick, 1992: 10).

According to Burnes (2000: 283), there are two common beliefs underlying what he terms as this new 'emergent' approach. First, change is viewed as an ongoing 'emergent' process with no finite end point. Second, change emerges from the actions and decisions of people in organizations; for example, as the outcome of conflicts between different vested interest groups, (in attempts to adjust the organization to changes in the external environment, or through attempts to construct and implement a new social reality on the organization). As such, change is viewed as a continuous process and consequently, attempts to impose a linear sequence of planned actions on what are untidy processes 'which unfold in an iterative fashion with much backtracking and omission' (Buchanan and Storey, 1997: 127) are heavily criticised (Dawson, 1994).

2.1. Emergent Approach Versus Processual Perspective

Burns (2000: 299-300) characterisation of the emergent approach differs in a number of important ways to the processual perspective. The two main tenets that align are: first, that an understanding of power and politics is central to an understanding of the processes of

organizational change; and secondly, that small-scale incremental changes can over time lead to a major re-configuration of an organization. However, the claim that this approach equates with a contingency perspective (Burnes, 2000: 285) in advocating that planned change is inappropriate in an uncertain environment, misrepresents this perspective. The processual approach does not view the non-linear dynamics of change as only being in evidence in turbulent environments, nor does it reject the notion of planning. The approach recognises that there are often critical junctures that necessitate radical change – as illustrated by the Enron debacle – and that ongoing processes of change occur within organizations operating in relatively stable environments as well as those operating in dynamic business contexts (see, Dawson, 2003a and 2003b). Over the last decade, the increasing number and rate of organizational change initiatives (both proactive and reactive) has drawn attention to the inadequacy of a one best way approach (such as, the rational participative approach of many OD consultants) and the need for a broader understanding of the complex untidy and messy nature of change. But in so doing, the processual approach is not making a statement against the importance of planning for change, rather, it is pointing out that change is unpredictable and therefore that there will be a need to accommodate and adapt to the unexpected, the unforeseen twists and turns, the omissions and revisions that are all part of managing the process of change over time. Furthermore, in seeking to make sense of the way change unfolds; the processual approach also provides insight into processes of continuity as well as the temporal reshaping of change.

2.2. A Brief History of Processual Studies

Interest in the socio-political processes of change and human behaviour is nothing new (see, Gouldner, 1965). Roy's (1967) study from November 1944 to August 1945 on the process of quota restriction and goldbricking in a machine shop is a good example. His study illustrates the process by which operators met their quota for 'gravy jobs' then 'knocked off' and how over time they restricted output on jobs they considered 'stinkers' and deliberately produced

at lower rates. The workers sought to manage their earnings (determined by variations in hourly production piecework rates) and to ensure that the rates for 'gravy jobs' were not lost whilst engaging in work behaviours that would encourage the reconsideration of rates for 'stinkers'. As a fellow worker advised (Roy, 1967: 316): 'Don't let it go over $1.25 an hour, or the time-study man will be right down here!' As Elger (1975: 114) indicates, many of these early empirical studies can be broadly placed within a processual school.

In drawing on the work of Woodward (1980) and Burns and Stalker (1961), Elger outlines how these studies have often been too quickly ignored and misunderstood. He demonstrates how the case studies of Woodward draw attention to an ongoing process in which management ideology, established rhetorics and political manoeuvring all serve to influence change outcomes. Similarly, in detailing the work of Burns and Stalker (1961), Elger (1975: 109) argues that whilst a systems typology is their starting point "they develop, in relation to a rich array of empirical materials, a processual analysis which treats actors' allegiances, perspectives and strategies as problematic features of organizational action". His discussion highlights how major detailed empirical studies of innovation and change have historically drawn attention to *process* in the study of organizations. At this time, Childs (1972: 2) critique of systems orthodoxy also drew attention to the process by which power-holders make strategic choices. He highlights the role of agency and choice in the way that individuals and groups can influence the environment rather than simply being constrained by operational contingencies.

The early work of Burns and Stalker (1961) and the perspective of Elger (1975) and Child (1972) contributed to the political process perspective which forms part of the processual approach developed in this paper. In addition, Child's (1972) concept of *strategic choice* focuses attention on the dynamics of change and continuity. He is critical of the tendency within organizational analysis to polarize between forms of determinism or voluntarism, and suggests that attention should be given to what he terms as 'the paradoxes of simultaneous choice and constraints, change and continuity' (Child: 1997: 70). This aspect of

continuity and change is also picked up and developed by Pettigrew (1985) in: *The Awakening Giant. Continuity and Change in ICI*. This book powerfully demonstrates the limitations of theories that view change either as a single event or as a discrete series of episodes that can be decontextualised. In a comparative analysis of five cases of strategic change, the study illustrates how change as a continuous incremental process (evolutionary) can be interspersed with radical periods of change (revolutionary). These major change initiatives are associated with major changes in business market conditions (such as, world economic recessions) in which managers develop active strategies which build on these circumstances in order to legitimate and justify the need for change. For Pettigrew 'change and continuity, process and structure, are inextricably linked' (1985: 1) and he argues that the intention is not simply to substitute a rational approach with a political process perspective, but 'to explore some of the conditions in which mixtures of these occur' (1985: 24). He also notes how empirical findings and theoretical developments are generally 'method-bound' and how studies on organizational change have tended to adopt the planned stage model approach of Organizational Development (OD).

2.3. The Early Work of Pettigrew

Pettigrew is highly critical of the OD approach to change that is seen to ignore the importance of *changing*. For example, in drawing on longitudinal contextual data (between 1975 to 1983 134 people were interviewed), Pettigrew examines the interplay between internal contextual variables of culture, history and political process with external business conditions as factors that maintain continuity or bring about change. In providing what he terms as a 'holistic, contextualist analysis', the approach provides both multilevel (or vertical) analysis, such as, external socio-economic influences on internal group behaviour; and processual (or horizontal) analysis, for example, in studying organizations 'in flight' with a past, present and future. In multilevel theory construction, attention is given to the way contextual variables in the vertical analysis link to those examined in horizontal analysis, and how 'processes are

both constrained by structures and shape structures…both in catching reality in flight and in embeddedness' (Pettigrew, 1985: 37).

Pettigrew clarifies how this work builds on his PhD work (under the supervision of Enid Mumford) on the politics of organizational change (see, Pettigrew, 1973). He views political process as evolving from individual and group levels, in which interest groups may form for a range of reasons developing different rationalities which direct action and response (whilst a particular rationality may predominate at any one time this is seen to be open to change). For Pettigrew (1985), change creates tension over the existing distribution of resources through threatening the position of some whilst opening up opportunities for others. As such, change stimulates power plays and heightened political activity. He notes how it is normally the case when the decision to change is being made that the greatest political energy is released rather than during implementation when constraints have already been set (Pettigrew, 1985: 43). He also suggests that the political and cultural elements of change are likely to overlap in the management of meaning, especially in situations where individuals or groups seek to legitimise their own position and to delegitimise others.

In his study of ICI, Pettigrew (1985: 438-76) demonstrates how strategic change is a continuous process with no clear beginning or end point, and how it often emerges with deep-seated cultural and political roots that support the establishment of a dominant ideology. As such, he usefully illustrates how these strategic change processes are best understood in context and over time, as continuity is often 'a good deal easier to see than change' (Pettigrew, 1985: 439). For example, insufficient commercial pressure, satisfaction with the status quo, lack of vision and the absence of leadership, are all identified as contextual factors constraining change. Drawing on the work of Kanter (1983) he supports the view that integrative structures and cultures are broadly facilitative of 'the processes of vision-building, problem-identifying and acknowledging, information-sharing, attention-directing, problem-solving, and commitment-building which seem to be necessary to create change' (Pettigrew, 1985: 456). Whereas segmentalist structures and cultures with clearly defined levels and

functions are viewed as inhibitative of change. This dichotomy by Kanter (1983: 396) is a modification of the distinction of organic and mechanistic organizations made by Burns and Stalker (1961). They argued that a mechanistic system is most appropriate for an organization that uses an unchanging technology and operates in relatively stable markets. It is characterized by clear hierarchical lines of authority, precise definitions of job tasks and control responsibilities, a tendency for vertical interaction, an insistence on loyalty to the concern, and an emphasis on task skills and local knowledge rather than general knowledge and experience (Burns and Stalker, 1961: 119-20). Conversely, an organic form was deemed most appropriate to changing conditions, which gives rise to innovation, and the continual willingness to tackle fresh problems and unforeseen requirements. It is characterized by a network structure of control, authority and communication, a reliance on expert knowledge for decision-making, the continual redefinition of individual tasks through interaction with others, and the spread of commitment to the firm beyond any formal contractual obligation (Burns and Stalker, 1961: 121-2). Pettigrew's findings supports this early work by Burns and Stalker (1961) and the later work by Kanter (1983) in concluding that critical to all five ICI cases was leadership in initiating strategic change and facilitating a movement from segmentalist to integrative structures and cultures (Pettigrew, 1985: 457).

This foundational work of Pettigew has been widely referenced and discussed in the organizational change literature (see, Burnes, 2000). For example, in a critique of the work of Pettigrew, Buchanan and Boddy (1992) also argue that the richness and complexity of a multi-level analysis does little to simplify or clarify processes of change and thereby renders the research as largely impenetrable for the organizational practitioner. In other words, whilst the research findings adequately convey the complexity of organizational change, they have also tended to mask, mystify and create barriers of interpretation to a non-academic audience who may seek practical tools for action.

Although they point out that it was not Pettigrew's intention to offer practical advice, they remain critical of this approach, both as a method for analysing data on change and as a

perspective which serves to disable attempts to develop practical managerial advice (Buchanan and Boddy, 1992). Although to be fair to Pettigrew, the work has been used successfully in executive teaching and consultancy. Also in 2002, in recognition of his standing in the field, Pettigrew was asked by the Office of Public Sector Reform to summarise the main message of his research on change since 1985 (Pettigrew, 2002).

2.4. The Issue of Practical Advice

Although the author's own processual research has been used to openly identify a number of practical guidelines (Dawson, 1994) these have been criticised for appearing 'almost as an afterthought' (Burnes, 2000: 295). Although there is some justification in the claim that these earlier guidelines were too restricted in their focus on managing change (Dawson, 1994), it is argued here that there is value in using this approach to identify practical dimensions to change. As shown elsewhere (Dawson, 2003a), this practical advice should not be limited to a consideration of how managers can 'better' manage change; rather, it should have a broader agenda that extends beyond management and include advice to non-managers and others (such as, ergonomists, systems designers, unions, business development agencies) who seek a greater understanding of organizational change.

Accessibility and the practical dimension to understanding change are two further elements that have informed the processual approach developed and advocated by the author. Although the work of Pettigrew provides a useful counterbalance to rational textbook models, by combining some elements of Pettigrew's approach (the emphasis on context and process) with a more critical conceptualisation of political process the approach can be used to openly search for and uncover the different views and experiences of individuals and groups at all levels within organizations. Unlike the ICI study, the intention here is to provide a framework for exploring the contemporary experience of workplace change for a range of different employees (Dawson, 2003a), rather than with a focus on the role of senior managers in managing strategic change (Pettigrew, 1985: xv). Essentially, the processual perspective is

concerned with understanding processes of organizational change through using a compendium of data collection techniques including observational work and in-depth interviewing of for example, trade unionists, senior managers, line managers and supervisors, change consultants, shop floor workers and branch office personnel (see, Dawson, 1994 and 2003b).

3. IN PERSPECTIVE: STUDYING PROCESSES OVER TIME

In developing a processual perspective and analysing change over time, it is advocated that the timeframe of before, during and after change can be used as a means of breaking down the complex change process for analytical purposes. This framework mirrors the work of Beckhard and Harris (1987) who characterise organizational transition as a movement from a present state of organization to some future state (the process of getting from position A to position B). The three general categories advocated here comprise: the initial conception of a need to change; the process of organizational change; and the operation of new work practices and procedures.

3.1. The Initial Conception of a Need to Change

The initial awareness of a need to change may either be in response to external or internal pressures for change (reactive), or through a belief in the need for change to meet future competitive demands (proactive). The increased complexity and uncertainty of international business markets has led some organizations to base change on imitation (which organizations are successful and what changes have they introduced), rather than on any conception of a need to adopt untried technologies or techniques (DiMaggio and Powell, 1983). This conception of a need to change can be influenced by factors residing within the organization, such as operational inefficiencies or employee disputes, or by factors which emanate from outside of an organization - for example, through business press and media

reports on the success of other organizations and the direct or indirect promotion of various management fads and fashions (Jackson, 2001).

3.2. The Process of Organizational Change

Once a need for change has been identified, then the complex non-linear and 'black box' process of changing commences. This period will comprise a number of different tasks, activities and decisions for individuals and groups both within and outside of the organization. In order to clarify this statement let us take the example of a firm where senior management have identified a need to change to meet competitive pressures and a fall in profitability. Once a decision to change has been made, management then have to decide on the type of change they wish to introduce. This may be through a change in human resources, products or services (task), technology, or administration. In the case of new technology, a number of strategic objectives have been identified as influencing management's decision to embark on a programme of change. For example, a change in technology may offer several possibilities for increasing an organization's ability to adapt to changing market conditions. The flexibility of advanced capital equipment may permit the modification and redesign of production without necessitating any major structural alterations to the operating system. Alternatively, the new technology may enable a more effective utilization of existing resources and increase operating efficiency whilst reducing overall operating costs, and thereby improve an organization's business market position. Such an objective is achievable in cases where modern technology is introduced for the purpose of providing rapid access to accurate, up-to-date information on the disposition of material resources.

Apart from improving a firm's market position and reducing operating costs through the more efficient utilization of resources, savings could also be made by reducing the total number of jobs required in the production of a given good or service. Technology could be used to eliminate management's dependence on 'in-house' labour by transferring the use of labour from an employment to a contracting-out basis, or improving quality and operational

control through providing the rapid access of information and integrating previously diverse areas of operation.

The strategic decision to adopt new technology, to introduce new products or services, or to change administrative structures, are generally taken at senior management level. However, the formulation of strategic objectives is not always as clearly defined as our example of a change in technology may suggest. For example, the research of James Quinn (1980) demonstrates how strategic decisions are often not highly formalized and may take the form of what he terms 'logical incrementalism'. This involves the blending of behavioural techniques, power politics and formal analysis, in a logical incremental movement towards ends that are broadly conceived and revised in the light of new information during the process of strategic change. Quinn's findings illustrate how strategies can often be implemented prior to their final formulation (that is, during the conceptualization phase). This lends support to the need for a processual model that is able to accommodate the non-linear nature of complex processes of change within modern organizations (Quinn, 1989:20-36).

When a decision has been made on the general theme or content of change, then the task of search and assessment may follow, where members of an organization set out to find the best option for achieving a particular change objective. In our example, the search task would involve identifying the type of technology required and the assessment task would involve an analysis of available products. In practice, many of these decisions may have been made during the conception stage, and may undergo revision as more information is collected on what is available in the market place, what costs are involved, and what the pay-back on investment is likely to be. The timeframe involved with this task may be relatively short involving a quick analysis of options, or it may instigate a major evaluation exercise requiring a team to visit other organizations and/or suppliers operating in different states and countries. In assessing possible options, a decision will generally be made on the choice and design of the system to be implemented. In the case of technology, whilst the choice of a piece of

equipment may be made by senior management, the actual design of the system will often reflect the values and assumptions of design engineers (Luff, Hindmarsh and Heath, 2000).

The task of implementing change has been well documented within the literature (see, for example, Preece, 1995), and has been identified as a period that requires considerable political skill on the part of the change agent (Buchanan and Badham, 1999). It is during the implementation of change programmes that occupational and employee concerns normally begin to influence the transition process, these concerns may manifest themselves as a complex political struggle between various occupational groups (managerial, supervisory and operative) with differing vested interests (see also, Clausen, Dawson and Nielsen, 2000).

3.3. Operation of New Work Practices and Procedures

The final general timeframe is taken to refer to the period when, following the implementation of change, new organizational arrangements and systems of operation begin to emerge. During this period, a number of novel developments or contingencies may arise which may compromise the change outcomes. For example, unanticipated technical or social problems may undermine the usefulness of the system in its replacement of traditional methods. As a result, this may cause conflict and confusion among staff and management, and threaten the establishment of new working relationships. Thus, the early stages of operating under new systems may be characterised by uncertainty, conflict and misunderstanding among employees, who may variously adapt, modify, reassert and/or redefine their positions under new operating procedures and working relationships set-up during the implementation of change. This is also the period in which a relatively stabilized system of operation may emerge comprising new patterns of relationships and new forms of working practices. It is during this timeframe, therefore, that the outcomes of change can be examined and contrasted with the operating system prior to change. Although in reality it is often unrealistic to talk of an 'endpoint' of change (as the process continues *ad infinitum*) it does make sense to talk of the 'effects' of a particular type of change. In the case of large-

scale or radical change initiatives, it is possible to identify a period after implementation when the daily work routines of employees become part of the operating system (which is no longer regarded as 'new'). Whilst the ongoing process of change will continue, this is the period that can be used to identify the outcomes of change on organizational structures and traditional operating practices.

4. A FRAMEWORK FOR ANALYSIS: THE POLITICS, CONTEXT AND SUSTANCE OF CHANGE

Although every major change programme will have an organizationally defined beginning, middle, and end, in practice it is not only difficult to identify the start and completion of change programmes (for example, there is often more than one organizational history of change and these may be reconstructed over time) but also, to explain the complex pathways and routes to establishing new operational processes. Therefore, in examining the process of technological change there are considerable returns to be gained from developing a framework for data analysis. It is argued here that a useful way of tackling the problem of analysing complex change data is to construct data categories either around themes or around the various activities and tasks associated with change. For example, data categories for the activities associated with the establishment of new organizational arrangements may comprise: system selection, identification of type of change, implementation, preparation and planning, and search and assessment. These tasks are unlikely to occur in a tidy linear fashion throughout the process of change, but will normally overlap, occur simultaneously, stop and start, and be part of the initial and later phases of major change programmes. Nevertheless, they are useful for locating and sorting data on change that might otherwise be too complex to deal with systematically. Although at a more general level there can be no definitive list of appropriate data categories, as these should be modified or revised to fit particular case examples and/or the characteristics of different change programmes, task-

oriented or thematic categories can provide a useful starting point for locating and analysing change data.

In accommodating the temporal aspects of change the processual perspective aims to examine change as-it-happens and is concerned with three groups of determinants that shape this process, namely: the politics, substance and context of change.

4.1. The Politics of Change

The politics of change is taken to refer to the political activity of consultation, negotiation, conflict and resistance, which occurs at various levels within and outside an organization during the process of managing change. Examples of political activity outside of an organization would be governmental pressure, competitor alliances or the influence of overseas divisions of large corporations. Internal political activity can be in the form of shop floor negotiations between trade union representatives and management, between consultants (working within the organization) and various organizational groups, and between and within managerial, supervisory and operative personnel. These individuals or groups can influence decision-making and the setting of agendas at critical junctures during the process of organizational change.

4.2. The Context of Change

The second major concern of a processual approach is with the context in which change takes place. External contextual factors are taken to include: changes in competitors' strategies; level of international competition; government legislation; changing social expectations; technological innovations; and changes in the level of business activity. Whereas, internal contextual factors are taken to include Leavitt's (1964) fourfold classification of human resources, administrative structures, technology, and product or service, as well as an additional category labelled the history and culture of an organization. This latter category is used to incorporate both an historical perspective that can take account of multiple histories of

the context in which change is taking place, and an understanding of organizational culture. By so doing, the framework is able to accommodate the existence of a number of competing change histories (these organizational histories may be further refined, replaced and developed over time) and recognises that the dominant or 'official version' of change may often reflect the political positioning of certain key individuals or groups within an organization, rather than serving as a true representation of the actual process of change (these change stories may in turn shape, constrain and promote the direction and content of future change programmes).

4.3. The Substance of Change

The third and final area of concern relates to the substance of change. This comprises four main elements: first, the *scale and scope of change*, which may range along a continuum from small-scale discrete change to a more 'radical' large-scale transformation. A distinction can also be made between change at the level of the unit, plant/branch, division and corporation. Second, the *defining characteristics of the change programme*: which refers both to the labels attached to change projects and the actual content of the change in question. In other words, content is never assumed on the basis of the label attached to a particular change programme. Third, the *timeframe of change*: at it simplest this refers to the period over which change occurs from the conception of the need to change through to routine operation. It is also concerned with the starting and stopping of change, and the way certain tasks and decision-making activities may overlap and interlock. It is also concerned with the way some programmes evolve incrementally over a number of years only to be followed by a fairly rapid and specified period of implementation; whilst others, may be triggered by a sudden shift in business market activity. Fourth, the *perceived centrality of the change*: that is whether or not change is seen to be critical to the survival of the organization. For example, if change is viewed as central to the competitive position of the company, then it can have major implications for the timescale, resource support and overall employee commitment to

change. Finally, it should be noted that the substance of change is not static but is itself open to change. In other words, the substance of change both influences and is influenced by contextual and political elements. For example, it is not uncommon for definitional confusion to surround the introduction of new management techniques and for the content of change to be redefined during the process of implementation. Moreover, knowledge of the substance of change and clarification of what the change means for a particular organization can in itself become a political process, influenced by external contextual views and the setting of internal agendas around the management of change. In this sense, there is a continual interplay between these three groups of determinants during the process of change in manufacturing organizations.

5. WORKPLACE CHANGE: THE EXAMPLE OF CELLULAR MANUFACTURING AT BRITAX RAINSFORDS IN SOUTH AUSTRALIA

Britax Rainsfords is located in Lonsdale, South Australia and is part of the Britax Automotive Components Division, a global manufacturing operation (with locations in America, UK, France and India) that manufactures (among other things) fuel filler caps, lighting equipment, electrical components and rear vision systems for the automotive market. They produce over 13 million exterior mirrors annually and service a range of customers (including, Ford, General Motors, Toyota, Mitsubishi, Renault and Volkswagen) capturing approximately 13 per cent of the world market. Manufacturing operations build on the principles of lean production (tailored from the Toyota Production System) and through introducing the concept of 'lean thinking' (imagining the perfect process and then setting about achieving change in this direction) there is a commitment to continuous improvement throughout their worldwide operations.

Britax Rainsfords designs and tests rear view mirrors and approved products are then manufactured and supplied to customers. They are the single supplier in the Australian automotive market (100% of the market which accounts for over 300,000 domestic exterior

vehicle sets per annum). In addition, they export over 850,000 exterior mirror sets per annum and in 1998 supplied 2,429,000 passenger mirrors to the world market. The manufacturing plant covers an area of 13,800m^2 and in 1998, employed nearly 600 people (331direct personnel and 264 indirect personnel). The plant comprises: injection moulding equipment (there are 44 injection moulding machines); a fully automated robotic paint facility with a computerised inspection and recording system; a motor mechanism section with a potential capacity of 1 million mechanisms per month; and mirror assembly. Motor mechanism operates 3 transfer assembly lines and 4 work cells, while mirror assembly operate 4 transfer assembly lines and 4 work cells.

5.1. The Change from Line to Cell Manufacture

In the development of the manufacturing facility, a number of products were taken on in servicing the automotive market. By the mid-1980s, the commercial feasibility of manufacturing such a diverse range of products (which included car seat-belts and lights) was questioned and a decision was made to focus on a central core business. As one interviewee explained: "At that stage mirrors were chosen because it was a growing market at that time. We didn't have a hundred percent control of that market in Australia and so we decided to concentrate on the mirror side of the business. At that time, the type of manufacturing facilities that we had for mirrors was the old traditional conveyor built down the centre with mirrors traveling along it at various states of assembly. And people working both sides, pulling the mirrors off, doing their little bit, putting it back on, and so forth and so on. So you had a progressive, typical conveyor system."

Once the company (Britax Rainsfords) had started to concentrate on mirrors, they began to enlarge their share of the market, eventually becoming the main manufacturer of automotive mirrors in Australia. In order to continue this aggressive and focused push, they started to investigate options for expansion into the export market. As it turned out, in the late 1980s they managed to capture a US contract (for the Ford Escort Tracer). However, at the

outset of this study their output (at this stage around 50-60,000 vehicle sets per line) was not sufficient to service a requirement of 450-500,000 vehicle sets and hence, they needed to enlarge their operations and in the process of doing this, they set about considering one of a number of options. Their engineering team travelled the world to identify the best technology they could get for assembly processes and they came up with, what they term locally, as the Bosch line (that is, the machines are manufactured by Bosch). The Bosch arrangement was also a conveyor system but rather than being a straight conveyor it was in the form of a loop with nested operations. Under this system, the value-added for the mirrors occurred in the nests. In other words, the mirrors were travelling around the line and the jigs and fixtures and all of the value-added was done in the nests on the line, this saved a lot of picking-up and putting-down time and hence improved the efficiency of the manufacturing process.

The plant started off with one Bosch line and this proved successful in enabling the manufacture of up to 300 mirrors an hour. The benefits of this system promoted the decision to purchase additional Bosch lines to service the expanding Australian market and further possible export growth. Management decided that all new mirror contracts would be manufactured under the new Bosch manufacturing systems and this in turn, signalled the gradual death of the traditional conveyor-belt system. Although this new system was viewed as being very flexible, in practice, if more than one product was manufactured on the line, a fairly lengthy changeover was required. The Bosch system was well suited to high volume production but proved limited when a shift in demand for a broader product range occurred in the 1990s. In response to changing customer demands for more complex products (in the range of glass and type of glass, colour spectrum, and the need to service left-hand and right-hand drive vehicles) existing arrangements suitable for the manufacture of a single high volume product were no longer deemed appropriate. Although the company sought to keep this type of system operating within the manufacturing facility to meet high volume customer contracts, alternative arrangements and options also became a central concern. Moreover, as cellular work arrangements had been shown to be commercially viable by their sister

company in the UK, it was decided that local management should examine the possibility of adopting the cell concept to their Australian operations. Over a nine-month period during 1996, engineers were sent over to the UK and an initial experiment in the setting up of a new manufacturing cell was introduced into the plant in South Australia. The change was viewed as successful from the outset. From the viewpoint of the plant manager, the main benefits were savings on people, it became more efficient as a process (more value-added per person), they were able to cut-down on stock and yet, they were still getting the same volume of output. One major advantage was that the cell could be run with only 4 people whereas the line required between 6 and 8. Furthermore, if volume increased it was possible to add one or two extra employees to the cell and by so doing, raise output to meet increasing customer demands. The new cell form of work organisation proved to be a far more flexible system for meeting the changing requirements of the automotive market. As described by one manager: "The UK had been doing it for a while. We could see the benefits, the way they could do fairly rapid changeovers, minimal stock. In fact, what they were building today went into their warehouse and was effectively gone that same day. It was shipped to Toyota effectively the same day. So you are really making today what Toyota are using tomorrow. It was that close. It was so very tight that you had no stock within the system and the benefits cost wise were obvious. So we sent a couple of engineers over to work with the UK group. There was a specialist in the UK who had developed this system with the Toyota people and had become their plant expert. So we sent engineers over to work with him for a couple of weeks to understand the principles of what you did, why you did it, how you did it. Then we brought that back and decided that we would try the process on a line that was already running."

In identifying staff to go into the new cell, local management picked those who they saw as being their 'best multi-skilled' employees (those cross-trained in all operations) who were also willing to be flexible in moving between cell tasks as required. During the early period of change, they did have some problems with a supervisor, but this person was simply replaced with someone who was seen to be more open and not tied to any traditional

operating culture. Local managers were aware of the political significance of ensuring that the system was 'successful'. It had worked in the UK and there was a perceived need to show that the system could operate efficiently in the Australian context, and that it could be modified and adapted in a way that improves the system as a whole. In particular, the project manager knew that it was important for his own career agenda to succeed in this change initiative and to be able to demonstrate and report this achievement to the manufacturing director and the managing director of the company.

In progressing with the use of multi-skilled teams within cellular work arrangements, the company shifted from a more traditional form of work organisation with a fairly simple product to a more complex operating situation (see, Buchanan, 1994; Proctor and Mueller, 2000). The new manufacturing cell was seen to offer flexibility in being able to accommodate frequent rapid changeovers, not only from product to product but also, in being able to deal with a number of variations associated with each product. In 1997, a lot of time and effort was put into developing the equipment and planning for the final cell layout. The cell equipment was designed and developed in-house and then either manufactured internally or contracted out to other firms. All the programming was done internally so that there was no dependence on external expertise (it was viewed as essential to have access to this knowledge within the company in case of problems or breakdowns). The new cell arrangements were implemented in 1998 and the change programme has been ongoing for a number of years.

In the search for improvements in cell design, the Australian team have reduced the size of cells and they are looking at the possibility of having two U shaped cells facing each other with one line-leader in overall charge of cell operations. Between the line-leaders and the local manager there are a number of roving supervisors, who wander throughout the facility dealing with unforeseen events (whether of a technical or human nature) and checking that the system is operating efficiently. Their main role is as problem-solvers and system checkers in ensuring the smooth running of the manufacturing facility. In reflecting on the

change in supervision, it was argued that there is now a need for a broader understanding of the operating system. Today, there are fewer supervisors with a wider area of control responsibility. Prior to this change, leading hands were very focused on their particular area of responsibility, whereas today, line-leaders have a broader range of skills and understanding which goes beyond the cells and includes an understanding of how their tasks and responsibilities link with the broader operational system. They are also aware of how the company and corporation is doing and show a greater interest in commercial aspects outside of their own domain. Under the old production arrangements, there was a line-leader within each unit. Currently, there are two line-leaders who are in charge of more than one cell. The intention is to get the U-shaped cells facing each other so that there is one line-leader per two cells. Essentially, line-leaders are direct operators responsible for allocating work within the cells, working out the runs for the day, recording production data and keeping track of how the cells are operating (such as, efficiency levels, scrap and absenteeism). Although performance information is available in the cells, local management also run weekly communication sessions where they informs employees how things are going.

5.2. Behavioural Change: A Key Element to the New System of Operation

In support of the findings on change reported elsewhere (see Dawson, 1994, 2003a and 2003b), there are a number of outstanding and emerging human resource issues which remain central to this change process. For example, it has been found that some individuals are not well suited to team working and are finding the new work arrangements difficult to accept. Linked to this has been the 'challenge' of getting employees to accept the concept of cells. This has been particularly noticeable in situations where the quantity of output is less under cellular work arrangements then under previous forms of work organisation. However, with a movement towards a greater number of products the concern shifts from mass output of a few products to the ability to reconfigure production to accommodate an increasingly wide variety of products for the automotive industry. For employees who have worked in the industry for

many years, there is a certain degree of scepticism over the rate and direction of change that seeks to make production more complex rather than minimising product range and maximising product output.

Another behavioural change required by the cell system is the need for employees to take greater responsibility over the pace and pattern of work. Under the line-conveyor system, the machinery of production dictated the progress of work, but under cellular work arrangements, individuals are part of a team in securing performance targets within broader time frames. Teams are aware of the work that should be done and they also know that their performance will be monitored and evaluated in terms of the group rather than the individual. Under these conditions, the pressures to perform come from within the group and are not pre-determined by the technology of the line.

The general view from those interviewed, is that there is a lot more peer pressure under cellular work arrangements. Moreover, working within a team was not found to be a good environment for all employees. It was claimed that just as some people are more interested in team sports and others in individual sports, so it is with the new teamwork arrangements. Under these changed circumstances there are therefore critics, generally employees who find the new working conditions uncomfortable and difficult, as well as supporters of change. As such, replacing one set of working arrangements with another will generate 'casualties' and cause a higher level of stress and anxiety for some employees (see, Baldry, Bain and Taylor, 1998). Thus, not only is behavioural change a key element to the new system of operation, but it will also be evaluated in a range of different ways by employees. In this case, there were a set of remaining tasks that were less team-based, for example, those associated with supporting the production of older products to service continuing, yet declining, demand in this area.

As Britax Rainsfords operates with between 20 to 25 per cent contract labour, permanent jobs are viewed locally as premium employment and hence, employees in these jobs are reluctant to admit to difficulties which they perceive may threaten their position

within the company. Economic fluctuations in the level of activity within the automotive industry does create a less stable environment in which contract staff are keen to show commitment and over time, they would expect such loyalty to be rewarded with the offer of a more permanent position. In terms of trade unions, there have been no major industrial disputes at the company for a number of years. The trade unions have been kept informed about change, the reason for change and the expected outcomes. From the perspective of management, the way ahead is clear, there is no choice and employees must adapt or else jobs will be lost. Their aim is to develop the cells further and to use pre-production builds to get employees involved in the design of work operations. The suggestions made by employees are tried and tested (often through the use of cardboard engineering), these temporary changes are then implemented and any further problems identified and the system refined. The quick response to employee suggestions is seen as critical to gaining employee commitment to the change initiative and taking ownership over the new forms of work organisation.

5.3. The Process of Manufacturing Change at Britax

The process of change at Britax was shaped by the *context* (traditional line arrangements and changing business demands), *substance* (availability and proven benefits of cellular manufacturing) and *politics* of change (senior management support and career agenda of local management). Change in the business market for the type and range of products and the growing uptake of team-based cellular arrangements by manufacturing organizations (Venugopal, Suresh and Slomp, 2001), presented not only a commercial need for change but, also, a potential and well defined route for accommodating this shift in customer demand. Moreover, previous experience and knowledge with cellular manufacturing in their UK operations set the context within which senior management support was guaranteed. In this sense, the *context* – company and senior management having a positive experience of the benefits of cellular manufacturing in their operations elsewhere in the world; the *substance* - cellular manufacturing design and layout configurations; and the *politics* – support of senior

management and commitment of local management; are not separable in practice but overlap and interlock. In the case of Britax (Australia), the local implementation team used their knowledge gained from their study of cellular work arrangements in Britax (UK), to further refine and develop their own plans for manufacturing change. Their design was then implemented and reconfigured in response to a number of human and technical contingencies that arose under Australian operations. Local management engaged in detailed discussion with key staff at their Lonsdale site and experimented with a number of modified designs. The intention was not simply to improve on the technical efficiency of operations but to raise the profile of the plant and gain senior management recognition. Again illustrating the way the substance and polities of change often interpenetrate over time and are rarely distinct in practice.

From the outset, the programme of change was promoted as a technical solution to the increased demand for more customised and complex products that would also further the strategic competitive position of the company in the manufacture and supply of automotive mirrors. Engineers were sent overseas to gain the necessary knowledge to implement cell-based production and on setting up cellular work arrangements, employees were handpicked by management. Any employees who did not fit in were replaced (there was no consideration of their concerns or views), as 'success' was viewed by the project manager as critical to his own future career within the company. Interestingly, employees and unions generally supported these changes as they believed that they would ensure the commercial viability of the plant; in fact, even those employees sceptical of change, maintained a fairly low profile due to employment and contractual concerns. In addition, individual forms of work organization were not accommodated into the new arrangements. Although there is still some individual-based work in spare parts production, many employees who shifted into these positions felt sidelined and marginalized. Essentially, management adopted an 'automate or liquidate' approach (see, McLoughlin and Clark, 1988: 2) arguing that in order for the Lonsdale operation to remain commercially successful technical reconfiguration of

production was critical. In this case, the local management team conveyed a fairly rigid and predetermined position on the need for change in order to influence employee views through limiting their interpretations of possible choices and options. Ironically, this projected rigidity was legitimated through the need for greater production flexibility to meet changing customer demands for more sophisticated and customised products. Consequently, this case also demonstrates how the substance of change was purposefully managed through a political process that sought certain preferred outcomes over others.

6. CONCLUSION: THE PROCESS OF MANUFACTURING CHANGE

The central aim of this paper has been to summarise the key elements of a processual framework and to illustrate the benefits of adopting a processual perspective for making sense of manufacturing change. The Britax case was necessarily succinct (given space limitations) but has hopefully provided a useful demonstration of how the shaping and reshaping of change involves interaction between conceptions of technology, the structural features of an organization, and political processes, as part of an ongoing social dynamic. While human action is enabled and constrained by structures these rules and resources are the consequence of previous actions. Action is situated (in this case in our automotive components company) and employees who experience change are able to reflect on what they are doing while they are doing it, to articulate their experiences to others, and to make sense of changes in work through discussion and debate of their shared experiences. However, there can also be unintended consequences of action and problems in articulating the more unconscious elements involved. Some aspects of the process while not articulated (for example, tacit knowledge) might nevertheless through action create and sustain practices that eventually become institutionalised and in so doing, become part of the structural properties of organizations. There is a duality of mutual interaction between agency and structure that is ongoing, and although at times structural elements may appear solid and unyielding, this

appearance is a consequence of this reciprocal interaction that ultimately highlights the social nature of technical processes.

In our case study, the 'rigidity' of interpretation was not technically determined but, rather, a process managed by management to ensure acceptance by employees of the new workplace arrangements. This position was further supported by a stance that stressed the commercial necessity of change in order to sustain competitive advantage. In this sense, there was an attempt to raise the perceived centrality of the change by stressing the criticality of the new work arrangements to the future survival of the company. In practice, employees did not endorse this view and were sceptical about such claims given the companies dominance with the Australian market place. The project manager was nevertheless highly motivated to ensure that the change programme was 'successful' and he was aware of the consequences of 'failure' for his own future career opportunities. Consequently, employees who resisted change or questioned the new cellular work arrangements found that they were sidelined and/or displaced. Interestingly, the case study provides a good example of how competing and alternative interpretations of technology can be constrained as part of a political process in which certain vested interests seek to shape the views of others (the power and politics of change). Furthermore, management provided only limited and well defined opportunities for employees to participate in discussions over the redesign of work arrangements. They defined the change as a technical and engineering programme that was not open to debate and focussed feedback on the need to reconfigure to best meet the needs of local operating circumstances. In these, as in other case examples (see Dawson, 2003a), even when the substance of change may appear fixed and determined, this lack of interpretative flexibility is not structurally determined but part of the political process of change. A processual perspective allows us to examine these processes in our analyses of human factors in manufacturing and yet, there remains a limited body of research in this area. There is therefore, a need for more process-oriented studies that treat the complex non-linear dynamics

of change seriously and enables us to gain greater insight into the theory and practice of managing change in manufacturing operations.

In studying change, the processual perspective draws our attention to the temporal character of change (the before, during and after of change) and the need to examine the way this process is shaped over time. The elements of context, substance and politics are advocated as providing a useful analytical framework from which to study manufacturing change. Although it is recognised that in practice, these elements often overlap and interlock, they ensure that we do not take a technological determinist stance in recognising the importance of choice and human experience within the political context of organizational life. As such, the call is for more critically reflective processual studies that take substance (in the case cellular manufacturing), politics (people and change), and context (the culture and history of operations and the business market environment) into account when examining the choice, design, implementation and operation of manufacturing practices over time.

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