Future work design research and practice: Towards an elaborated model of work design

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Developments in work design theory have not kept pace with the changes occurring in the organizational landscape. We propose a theoretical framework that specifies five categories of work design variables that span individual, group and organizational levels of analysis. Specifically, we propose an elaborated model of work design that includes: systematic consideration of *antecedents* of work characteristics; expansion of the traditional range of *work characteristics* to include aspects salient to the modern context; extension of the range of *outcome variables* beyond the existing narrow focus on affective reactions; analysis of the *mechanisms*, or processes, that explain why work characteristics lead to particular outcomes; and consideration of *contingencies* that moderate the effects of work characteristics. We argue that the particular choice of work design variables should be guided by theory and an analysis of the organizational context.

Most of us are now well versed in the changes occurring within the organizational landscape. These include greater global competition, new forms of work enabled by information and communications technology, increased service sector work, growth in contingent work, more individualized career paths and the changing composition of the workforce—to name but a few. What does this change mean for the theory and practice of work design? Does it render this well-established topic unimportant?

We argue the reverse. Traditional concerns about job simplification remain clearly on the agenda while new issues arise and assume considerable importance. Flexible forms of work design, such as empowerment, are increasingly appropriate in organizations seeking to compete in turbulent markets. A 'war for talent' in many industries places much more attention on creating work that is attractive to the

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right candidates. In other words, several factors converge to render the topic of work design one of continued and even greater importance.

Our aim in this paper is to identify key issues for work design research and practice, particularly in relation to contemporary and future jobs. To provide the context for the account that follows, we first take a backward glance at work design, and highlight some historical themes and developments (fuller accounts are widely available, e.g. Davis & Taylor, 1972; Parker & Wall, 1998; Rose 1975). We then briefly describe the modern context and some of the key changes occurring in the workplace. Following this, we describe an elaborated model of work design that, we suggest, will enable a better understanding of the consequences of change occurring in contemporary organizations, as well as helping to identify the types of work design likely to be most appropriate within emerging settings. Finally, we point to some implications for practitioners and researchers.

A backward glance

The thinking underpinning contemporary approaches to work design can be traced back to views that emerged in the United Kingdom around the time of the Industrial Revolution. Adam Smith (1776) promoted the division of labour, or the breaking down of complex jobs into simpler jobs, as a way of enhancing performance. Charles Babbage (1835) expanded on these ideas, pointing out added advantages of such job simplification through its requirement of less skilled, and hence cheaper, labour. At the turn of the 20th century, the notion of job simplification was given momentum through the contributions of Frederick Taylor and Henry Ford. Taylors' ideas on 'Scientific Management' (1911) focused on determining the most efficient way to execute tasks, which resulted in responsibility for how to execute the job moving from the individual employee to engineers and managers. From that point, it was but a short step to control employees' work further through the use of a moving assembly line, as first introduced by Henry Ford in his car factory in Michigan in 1914.

From the beginning, job simplification became profoundly embedded within the industrial world, spreading from manufacturing to other domains (e.g. Davis, Canter, & Hoffman, 1955). As we shall see later, the contemporary importance of job simplification has scarcely diminished. At the time, however, the dominance of job simplification set the agenda for early empirical research, which focused on the psychological consequences of repetitive jobs. Early research in the UK (e.g. Fraser, 1947) and the US (e.g. Walker & Guest, 1952) confirmed the intuitively evident view that simplified jobs were boring, tiring and dissatisfying as well as potentially damaging to mental health. Practical suggestions for ameliorating such problems included those of job rotation (moving people between simplified jobs) and horizontal job enlargement (including a wider range of tasks within jobs).

This early and largely atheoretical work focused on the lack of variety in task requirements, rather than the loss of discretion also brought about by job simplification. These limitations were addressed in the period from 1950 to 1980, which saw the emergence of the three most influential theoretical developments to

date, and their associated proposals for job enrichment and autonomous work groups. With respect to the design of individual jobs, the first major theory was that of Herzberg and colleagues (Herzberg, Mausner, & Snyderman, 1959). Their Two-factor theory distinguished between two types of factor, namely 'motivators', intrinsic to the work itself (e.g. the level of interest in the tasks), and 'hygiene factors', extrinsic to the work (e.g. work conditions). The proposition was that motivators affected satisfaction, but had little impact on dissatisfaction; whereas hygiene factors were proposed to have the opposite effect, causing dissatisfaction but having little impact on satisfaction. Although highly influential for a decade, the Two-factor theory lost support as empirical evidence failed to confirm its basic premise (e.g. King, 1970). The theory however, spurred the idea of job enrichment, which was succinctly defined by Paul and Robertson (1970) as 'building into people's jobs, quite specifically, greater scope for personal achievement and recognition, more challenging and responsible work, and more opportunity for advancement and growth' (p. 17). This central idea of job enrichment remains current.

The Two-factor Theory was superseded by Hackman and Oldham's (1976) Job Characteristic Model (JCM). This identifies five 'core job characteristics', namely: skill variety, task identity, task significance, autonomy, and feedback. The core job characteristics are specified as determinants of three 'critical psychological states': skill variety, task identity and task significance together contributing to 'experienced meaningfulness'; autonomy to 'experienced responsibility'; and feedback to 'knowledge of results'. In turn, the critical psychological states are cast collectively as promoting work satisfaction, internal work motivation, performance and reduced absence and labour turnover. The model assumes that autonomy and feedback are more important than the other work characteristics, and that individuals with higher 'growth need strength' (i.e. desire for challenge and personal development) will respond more positively to enriched jobs than others.

More than two decades of empirical research inspired by the JCM allow two main conclusions. First, the collective effects of the core job characteristics on affective responses (satisfaction and motivation) have been largely supported, but those for behaviour (i.e. work performance, turnover and absence) less consistently so (Parker & Wall, 1998). Second, the more particular features of the model remain unproven. For example, the specified links between the job characteristics and the critical psychological states have not been confirmed (e.g. Johns, Xie, & Fang, 1992), and the job characteristics have not always been found to be separable aspects of jobs (e.g. Cordery & Sevastos, 1993).

The final major theoretical perspective derives from sociotechnical systems (STS) thinking, which originated at the Tavistock Institute in London in the 1950s (Rice, 1958; Trist & Bamforth, 1951). This approach takes a wider perspective based on a set of normative sociotechnical principles, such as: 'methods of working should be minimally specified' and 'variances in the work processes (e.g. breakdowns) should be handled at source' (Cherns, 1976). Application of STS theory focused on group rather than individual work design, and gave rise to the idea of autonomous work groups (known also by various other terms such as self-managing or self-directing teams). The features for such groups parallel those of the Job

Characteristics Model, including, for example, recommendations that the work should provide for variety and involve areas of decision-making members can call their own.

There is no doubt that the STS approach to group work design has had considerable impact, and autonomous work groups are increasingly popular (e.g. Lawler, Mohrman, & Ledford, 1992). Nonetheless, the underlying lack of specificity about the nature and expected effects of such initiatives makes a coherent assessment of research on their outcomes difficult. In more recent times, we have seen the growth of team effectiveness models, which make more precise specifications about how aspects of group work design, and indeed other group factors (e.g. group processes), affect outcomes (e.g. Campion, Medsker, & Higgs, 1993). As was the case with individual work design, the well-being and motivational effects of autonomous work groups have largely been supported by empirical findings, although the evidence for the performance outcomes is somewhat more mixed (Parker & Wall, 1998).

The JCM and STS thinking remain the most common approaches to work design research today. Of course, there have been extensions and challenges to both[1]. A development within the tradition of the job characteristics approach is Karasek's (1979) demand–control model, which posits that psychological strain results from the joint effect of high demands (work load) coupled with low control (autonomy). A challenge to the job characteristics approach came in the form of the social information-processing perspective (Salancik & Pfeffer, 1978). Noting that employees' perceptions of their work would be the most direct determinants of their attitudes and behaviour, this approach suggested that perceptions arise as much from social factors as from objective work characteristics, making how people see their work the focus rather than the design of work itself. Research has supported the idea that social influences affect perceptions of jobs, but suggests that these effects are weaker than those of objective job features (Taber & Taylor, 1990). Another development has been Campion and colleagues' (e.g. Campion & Berger, 1990) interdisciplinary perspective pointing to a biological approach and a perceptional–motor approach as additional ways of conceptualizing work design. Their proposition that the different approaches to work design are associated with different outcomes has largely been supported (e.g. Edwards, Scully, & Brtek, 2000). Looking outside the US and the UK, German Action Theory has been important in shaping work design thinking and practice in that country and is increasingly influencing developments elsewhere (Frese & Zapf, 1994; see later section on mechanisms).

One theoretical development that is currently popular is the concept of psychological empowerment (Conger & Kanungo, 1988; Spreitzer, 1995; Thomas & Velthouse, 1990). This approach does not focus on the objective features of the job but focuses on whether an individual perceives themself as empowered. The state of psychological empowerment is defined as a motivational state involving an assessment of meaning, impact, competence, and choice (or self-determination). These cognitive-motivational assessments overlap considerably with the critical

[1]See, for example, Holman, Clegg, and Waterson (1998) for a non-positivist approach to work design research.

psychological states in the Job Characteristics Model. Thus, meaning is similar to meaningfulness; impact is similar to knowledge of results; and self-determination/choice is similar to experienced responsibility. Indeed, evidence suggests that work characteristics result in psychological empowerment, which in turn results in affective outcomes such as work satisfaction (Liden, Wayne, & Sparrowe, 2000). However, where the psychological empowerment approach is distinct from the JCM is that it recognizes that the psychological states of empowerment can arise from influences over and above work characteristics, such as peer helping and supportive customer relationships (Corsun & Enz, 1999). In this respect, it has some parallels with the earlier social information-processing perspective.

For the purposes of this paper, the key issues arising from the history and established theory in work design are two-fold. First, this heritage serves to identify the prime focus of interest. This is squarely on the nature and content of the work (with autonomy being a key element), and how that content affects outcomes such as employee well-being (e.g. satisfaction, mental health) and behavior (e.g. performance, absence). The second issue is that there are many important missing components to an adequate general theory. To be more specific, existing approaches do little to explicate the antecedents of work content; nor do they recognize additional work characteristics or outcomes that are of potentially increasing importance. Likewise, there has been insufficient attention to the mechanisms or processes that underpin the link between work characteristics and outcomes, as well as limited consideration of the contingencies likely to moderate those links. Quite simply, existing theory is under-specified and relatively context-insensitive.

We do not seek to describe the evidence for the above analysis, as this has been well documented elsewhere (see Parker & Wall, 1998; 2001). Rather, in keeping with the future-oriented nature of this special issue celebrating the BPS centenary, we focus on the way forward. To this end, we introduce extensions to work design theory to overcome existing limitations. First however, we look in more detail at the context to which work design theory must be responsive.

The current work context

Established work-design theories developed principally from studies conducted in the mid-20th century of male shopfloor workers working in large-scale manufacturing plants in the US and UK. The work context and the composition of the workforce have changed dramatically since that time. One important change is the decline in manufacturing jobs and the rise in service work (Osterman, 1997). For example, in the UK, the figure of 49.4% of employees working in services in 1975 had risen to 65.7% by 1999 (European Commission, 2000). In particular, 'front-line work', involving direct contact with customers, has grown considerably. This is exemplified by the emergence of call centres (sometimes called 'contact' or 'customer service' centres), a new type of organization dedicated to service or sales in which employees interact with customers to service or sell a product, with the interaction mediated by telephone or computer (Batt, 1999). A further rapidly

growing segment of the workforce is that of the 'knowledge worker', a high-level employee who applies theoretical and analytical knowledge, acquired through formal education, to developing new products and services (Janz, Colquitt, & Noe, 1997). Knowledge workers include, for example, those working in the areas of product development, consultancy, and information systems.

Organizations themselves, whether service, manufacturing or other, also differ from the rather static and inflexible enterprises of earlier times. Greater flexibility is required to enable the rapid delivery of low-cost, high-quality and customized products, and to provide increasingly powerful and demanding customers with seamless service (Davis, 1995). Use of team working and other flexible forms of working continues to grow (e.g. Devine, Clayton, Philips, Dunford, & Melner, 1999; Osterman, 2000). Traditional distinctions between departments are disappearing as organizations become more integrated. Boundaries between organizations are also blurring, as shown by a growth in network organizations in which independent firms work together through joint ventures, strategic partnerships and the like. Many organizations are also becoming leaner through downsizing and the growth of a large contingent workforce (Morris, Cascio, & Young, 1999).

Developments in information technology are also having major implications for the way in which work is conducted (Van der Spiegel, 1995). The low cost and portability of computers, together with the ubiquitous availability of the internet, enable employees to work away from a designated 'office' (geographic virtuality) and to work a 'waking' week rather than a 'working' week (temporal virtuality). Telecommuters can now work from home (teleworking), and employees in different locations and on different schedules can work together as 'virtual teams' (Duarte & Tennant-Snyder, 2000). Teams located in different countries even exploit time zone differences to provide 24-hr working so that, in the case of product design teams, for example, the time taken from concept to final product can be reduced dramatically (Cascio, 2000).

The composition of the workforce itself is also very different to the era when work design first became of psychological interest. Key trends in workplaces within Western countries include an increased proportion of women, greater ethnic diversity, more educated employees, and an ageing workforce (e.g. Howard, 1995). The relationships that employees have with their organizations also often differ (Lawler & Finegold, 2000). Whereas once it was considered normal for employees to spend their entire working career with one or two companies, forces such as downsizing, as well as changed notions of careers, mean that employees now expect to move between organizations much more often. Increasingly, careers are located less within an organization as across several organizations.

This brief (and necessarily incomplete) account shows that the work context is very different today than that from which the major work design theories developed. This does not mean that there are not points of continuity. There certainly are, as we shall highlight later. Nevertheless, there is also a need for some re-orientation. As a simple example, service jobs typically require some degree of 'emotional labour', in which employees have to adhere to rules regarding the expression of emotions (Hochschild, 1983). Such emotional demands have been given little attention in work design research to date (Schaubroeck & Jones, 2000).

The more general message is that the restricted range of work characteristics and outcomes addressed by traditional theory is insufficient to capture the salient aspects of modern work. Thus, next, we describe an elaborated model of work design that attempts to reflect these changes in context whilst addressing the other limitations identified earlier, which we believe will help us better to understand and indeed shape developments in emerging forms of work.

Towards an elaborated model of work design

The elaborated model of work design, shown in Fig. 1, distinguishes between five categories of variable, namely antecedents, work characteristics, outcomes, mechanisms and contingencies. We consider each of these in turn.

Antecedents

Work design theory has often been criticized for failing to take account of factors that influence and constrain the choice of work design (Clegg, 1984). Such factors can be *internal* to the organization, such as the style of management, technology, nature of the tasks, information systems, human resource practices, strategy, history, and culture. For example, a directive style of management, an assembly-line technology or intensive performance monitoring can each act to constrain employee autonomy (Cordery, 1999). Of course, these organizational factors are in turn influenced by aspects *external* to the organization, such as the uncertainty of the environment, customer demands, the available technology, social and cultural norms, economic circumstances, the nature of the labour market, and political and labour institutions. Illustrating the last factor, Garen (1999) described how national trade-union agreements can affect work design by opposing payment schemes that are important for more autonomous and flexible jobs.

An important practical contribution of expanding work design theory to include contextual antecedents is that this makes salient the many ways over and above directly manipulating job characteristics that work design might be altered, such as by removing demarcation barriers, running management development programs, or promoting cultural change. Moreover, taking account of contextual antecedents also enables us to better predict the types of work designs that will be found in various settings and to understand how wider changes taking place in modern organizations might impinge on work design.

As an example, consider the position of one of the UK's major gas suppliers, which aims to be a comprehensive home service provider by extending into markets such as electricity, home security systems, plumbing and insurance. Through mergers and acquisitions, it has the capacity to deliver all these services. The interface with the customer, however, is through its call centre, which is structured so that customers are directed to agents who specialize in only one category of service. If the customer wishes to pay a gas bill, inquire about insurance *and* request a plumber, it will take them three calls or transfers. The imperative for the organization, yet to be achieved, is to move to a 'one-stop shop'. This requires
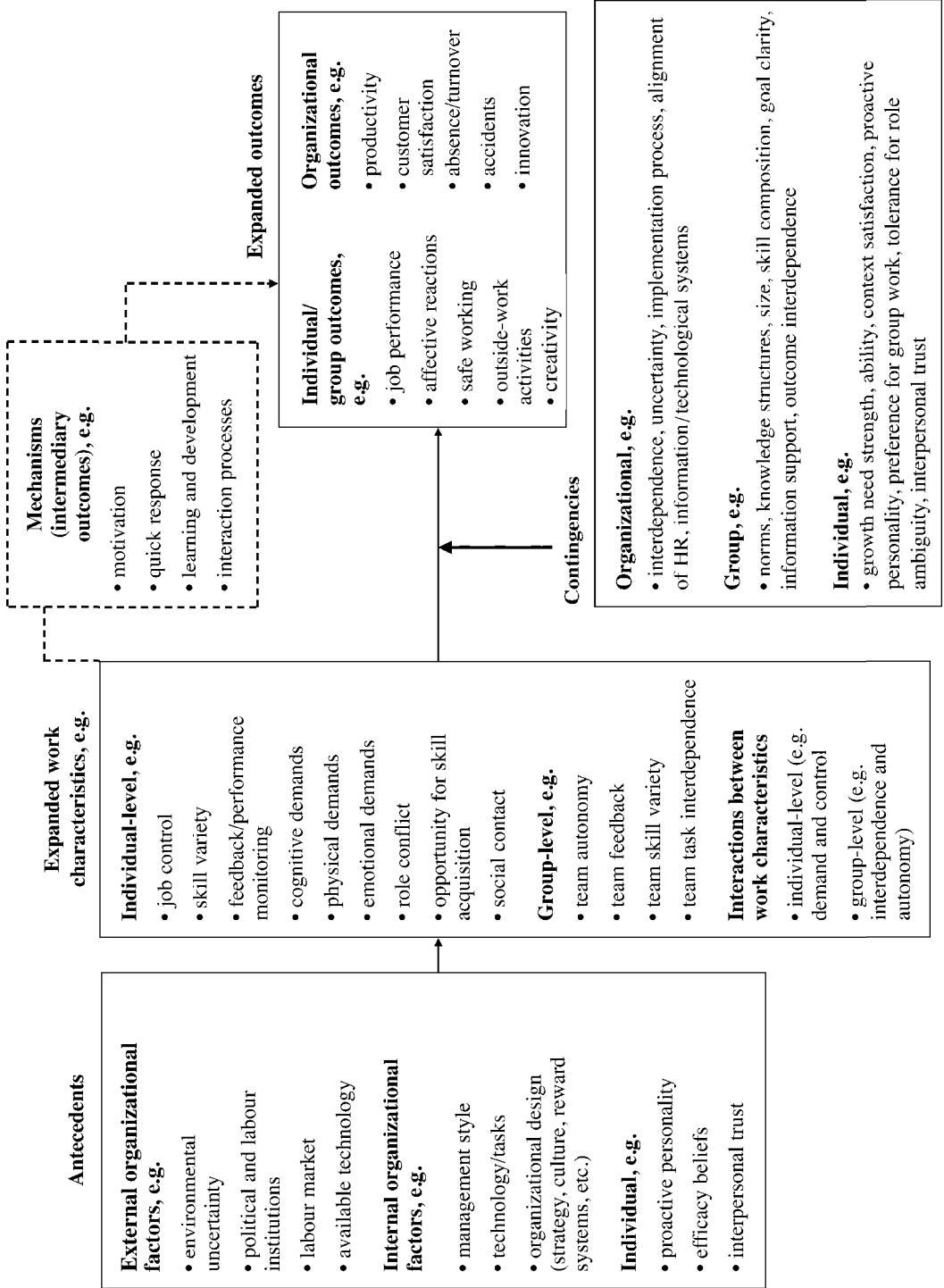
Figure 1. Elaborated model of work design.

generalist call-centre agents capable of dealing with the full range of services, which in turn has to be supported by an integrated computer-based system. Thus, strategy, technology and work design need to come together to deliver the service.

This example demonstrates how external factors (e.g. customer need, competition) and internal factors (e.g. organizational strategy) impinge on work design. It also illustrates a trend in the modern workplace, which is that many organizations face greater uncertainty and complexity than they have in the past. For example, the availability of more flexible technology allows organizations to meet more differentiated market demand through greater product or service customization, therefore requiring more frequent changes in design and procedures. This rise in uncertainty and complexity accounts for the growth in self-managing terms and other such empowered work designs. As we describe later (see 'contingencies'), evidence suggests that enriched forms of work design are most appropriate where uncertainty is high.

A further important contribution of considering antecedents is that work design can be considered as a link between various organizational initiatives or practices and outcomes such as well-being and performance. From this perspective, the effects of a particular organizational practice will depend, at least to some degree, on how the practice impinges on work design. At the same time, our assumption is that a particular initiative rarely determines work design completely. In other words, the effect of an antecedent on employee autonomy can be mitigated or enhanced by making different work design choices. For example, in a study of downsizing Parker, Wall, and Jackson (1997) failed to find the expected negative effects of this practice on employee well-being, despite increased job demands. They were able to explain this in terms of the counteracting effect of job enrichment and increased role clarity that occurred as a result of a simultaneous empowerment intervention. Similar intermediate roles of work design have been reported in the context of understanding the effects of lean production (Jackson & Mularkey, 2000), just in time (Jackson & Martin, 1996), performance monitoring (Carayon, 1994), teleworking (Feldman & Gainey, 1997), team working (Kirkman & Rosen, 1999; Sprigg, Jackson, & Parker, 2000) and temporary employment status (Parker, Griffin, Wall, & Sprigg, in press).

A final point about antecedents is that consideration should also be given to *individual factors*. In less well-defined circumstances, it is reasonable to assume that individuals might mould their work characteristics to fit their individual abilities or personalities. Discussions of role-making (Graen, 1976), for example, are consistent with the idea that more proactive individuals shape and expand their job content. Self-efficacy (Burr & Cordery, 2001; Parker, 1998), dispositional trust (Kiffen-Petersen & Cordery, in press) and cultural values (Kirkman & Shapiro, 1997) might also affect an employee's willingness or ability to give effect to key work design variables, such as autonomy. Work design research has rarely accommodated this more dynamic perspective, tending instead to focus on how individual differences moderate the impact of work design on outcomes, or, more recently, how work characteristics might influence personal factors such as proactivity (e.g. Parker, 1998) and preference for group working (e.g. Wageman, 1995).

The key point from a theoretical perspective is that much greater attention needs to be given to the antecedents of work design. We have suggested factors of this type to be considered (e.g. environmental uncertainty, management style) but shy away from providing a particular list as that would deny the very different environments in which organizations operate. The need is to be aware of antecedents and to identify the specific variables relevant to a given context.

Work characteristics

Many of the work characteristics traditionally investigated by work design researchers remain highly relevant within the modern context. Let us return to the case of call centres. Although there are exceptions (see 'contingencies'), many call centres are structured along Taylorist lines, as reflected in their description by journalists as the 'dark satanic mills' of the late 20th century (Wylie, 1997). Call centre representatives are typically required to respond to customer inquiries on the basis of tightly scripted protocols over which they have little control (Fernie & Metcalf, 1988). The work is often highly repetitive, with work timing paced by electronic performance-monitoring systems rather than by assembly lines (e.g. Bain & Taylor, 2000). In this context, traditional work characteristics such as *job autonomy* and *task variety* are likely to be key factors. Similarly, autonomy has been identified as a particularly salient aspect of work for knowledge workers (Janz *et al.*, 1997).

Feedback is also likely to be salient within modern settings, especially given the prevalence of electronic performance monitoring (EPM). Nevertheless, the effects of EPM are likely to be quite different from traditional forms of feedback. Whilst some researchers have suggested that employees will benefit from EPM, because it provides accurate, fair and timely feedback that can help them cope with work demands (Stanton, 2000), others have suggested serious downsides, such as reduced privacy and increased work loads (Carayon, 1994). The few empirical studies that exist do suggest a link between EPM and employee stress (e.g. Aiello & Kolb, 1995), but there are many potential aspects of such performance monitoring that could influence its effects (e.g. frequency, source, target, intensity and purpose) that have yet to be investigated systematically (Stanton, 2000). For example, Frenkel, Korczynski, Shire, and Tam (1999) found that EPM can be perceived positively by employees if there is a high trust and supportive culture. In the same way, the links and interactions between performance monitoring and other work characteristics (e.g. job autonomy) have received scant research attention (Carayon, 1994 is an exception).

Thus, the incorporation of traditional work characteristics is required within any theoretical development, albeit that these may need to be adapted for the modern context. Yet this is not sufficient (Oldham, 1996; Wall & Martin, 1987). Consideration of modern forms of work and employment indicates the need to encompass a wider range of work characteristics (see Fig. 1). For example, the *opportunity for skill acquisition*, especially for those skills that are transferable, is likely to become more important, given the requirement for many employees to move jobs frequently (Lawler & Fingold, 2000). Similarly, *role conflict* has been identified as a particular concern for front-line workers, many of whom are increasingly

expected to play multiple roles, such as to provide information to customers, generate revenue through selling, and perform an intelligence-gathering role (Frenkel *et al.*, 1999). *Home–work conflict* is also an important dimension given an increase in the number of women in the workplace and the increased opportunity for such conflict that could be engendered by working at home (e.g., interruptions from children).

Other important work characteristics emerge when considering the growth in service and knowledge work. Jobs in these contexts (and indeed in manufacturing) are becoming more knowledge-oriented, highlighting the importance of *cognitive characteristics of work*. For example, in contexts such as research and development, information technology often absorbs what is referred to as 'routine knowledge work' (such as processing accounts) and emphasizes more complex problem-solving, or 'non-routine knowledge work' (Mohrman *et al.*, 1995). Two types of cognitive demands have been identified in manufacturing settings: attentional demands, which occur as a result of increased vigilance requirements (e.g. Van Cott, 1985), and problem-solving demand because of the need for fault prevention and active diagnosis of errors (e.g. Dean & Snell, 1991). Both types of demands can apply in the context of service work, where it has been predicted that problem-solving demands in particular will increase due to a greater product variety, the requirement for employees to carry out multiple roles, and more frequent policy and procedural changes (Frankel *et al.*, 1999).

Another element of work that is brought to the fore by the growth in service work concerns the *emotional demands* of work. The concept of 'emotional labour' refers to a requirement for individuals to manage their emotional expression in return for a wage, such as being required to be friendly towards customers using a service (Hochschild, 1983). There can clearly be positive benefits of such emotional displays for organizations (e.g. customer retention), and even for individuals (e.g. one qualitative study suggested that service staff use positive emotional displays to maintain control in their exchanges with customers; Mars & Nicod, 1984). Nevertheless, there is evidence that high levels of emotional management can be associated with burnout and anxiety (Carver, Lawrence & Scheir, 1995).

The link between emotional demands and other work characteristics also deserves attention. One could speculate, for example, that providing greater autonomy might limit the negative effects of such demands. Autonomy would enable the individual to control their exposure to emotional demands, by passing a difficult customer on to a colleague when already over-burdened, or deferring that interaction to a more convenient time. Such work designs may thus create virtuous circles in which the work design leads to more satisfied and supportive customers, which in turn reduces emotional demands. In this vein, Corsun and Enz (1999) found that customer displays of support enhance employees' perceived control over the situation.

A further development necessary in work design research, especially given the growth in team work, is to consider *group-level work characteristics* more systematically. This means not only covering the work design dimensions of traditional concern at the group level (e.g. team autonomy), but also focusing on aspects that are a function of groups or teams per se, such as the degree of cohesion among

members (Xie & Johns, 2000), team composition (Neuman & Wright, 1999), group norms (Barker, 1999), interdependence (Wageman, 1995), and shared knowledge structures (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). This line of development will gain from considering models of group effectiveness (e.g. Campion *et al.*, 1993; Cohen & Bailey, 1997; Sundstrom, DeMeuse, & Futrell, 1990) that focus attention on a broader range of predictors than just the nature of the tasks, such as the organizational context (e.g. leadership, information support, rewards, training) and group diversity.

Furthermore, some traditional work characteristics have been relatively ignored at the team level (e.g. feedback and autonomy). These factors are likely to interact with, and be affected by, other work characteristics. Janz, Colquitt, and Noe (1997) found that the positive main effect of team autonomy over planning and work processes on levels of team motivation was actually reduced for knowledge workers as levels of task interdependence increased. However, autonomy over people aspects (e.g. staffing decisions) was positively associated with job motivation, regardless of interdependence. So, whilst moderate levels of interdependence may provide the raison d'être for team-based work designs, high levels of interdependence can also serve to restrict some choices for teams and their members. In a similar vein, Uhl-Bien and Graen (1998) found that the effect of team composition (cross-functional versus functional) on team effectiveness differed depending on levels of individual autonomy within the team. Autonomy was negatively associated with work-unit effectiveness in cross-functional teams but positively associated where teams were composed of functionally similar roles.

The above suggestions for expanding work characteristics in the light of the changing work context are by no means exhaustive. Neither do we suggest that those factors that we have mentioned are necessarily the most important. It is premature, and perhaps ultimately inappropriate, to specify which characteristics are most critical. Rather, it is likely that different work characteristics will be more or less salient in different contexts and jobs. For example, for some types of teleworkers working from home, such as management consultants, autonomy might be relatively high (Feldman & Gainey, 1997), in which case, it would not be the main focus for a redesign. However, other types of teleworkers, such as telephone operators, might have their work tightly controlled and monitored and therefore could benefit from enhanced autonomy. In addition, a key work characteristic for most teleworkers might be *social contact,* or perhaps reducing the interruptions that arise from *home–work conflict.* The approach we advocate, therefore, is one in which we have a broader set of work characteristics to draw from and one that recognizes that the relative salience of particular work characteristics will depend on the context. In practical terms, this calls for an approach that focuses on a thorough diagnosis of the situation prior to any work redesign. It is an indicative, not a prescriptive, approach.

Outcomes

In the same way that the range of work characteristics usually considered in work design research has been criticized as being too limited, so too has the range of

outcomes. Traditional outcomes such as job satisfaction, motivation, attendance and performance will certainly remain central to the agenda. However, even within these, research has been somewhat restricted. With respect to performance, for example, work-design research often focuses on such outcomes as the number of products made or sales achieved, and sometimes on quality, but less often systematically assesses dimensions such as *contextual performance* (e.g. helping) or *proactive performance* (e.g. use of initiative) (Parker & Turner, in press). The latter types of outcomes have been given serious attention in the more general performance literature only in the last decade or so (e.g. Borman & Motowidlo, 1993), and these wider developments are yet to be incorporated into work design research. Dunphy and Bryant (1996), for instance, argued that autonomous work groups add value in ways that are not typically assessed, such as by making incremental improvements to work processes. *Customer satisfaction* is also likely to assume greater importance in today's context of increasingly demanding and powerful customers.

Safety has been virtually ignored as an outcome. The possible link between work design and safety is clearly important. Following a major incident in a UK petrochemical refinery, for example, the official inquiry specifically raised the question of whether or not the existence of autonomous group working was a contributory factor. One of the few studies to address this issue directly is that by Pearson (1992). Pearson found that the introduction of semi-autonomous work groups was associated with no deterioration in accident rates against a worsening record for other groups. Pearson attributed this result to the greater ownership of safety that autonomous work groups engendered in their members (e.g. they discussed safety in their meetings). This contrasted with the reliance on external guidance from safety representatives or the safety officers to detect unsafe practices exhibited by those not in autonomous work groups. Suggesting another way in which work enrichment might enhance safety, Parker, Axtell, and Turner (2001) found that job autonomy was associated with greater organizational commitment, which, in turn, was linked to safer working. There are many other plausible reasons why work structures might affect safety, which are yet to be investigated (see Turner & Parker, in press). These include both positive processes (e.g. autonomy over the design of procedures might promote greater compliance) as well as potential detrimental processes (e.g. autonomous work groups might lead to diffused responsibility for safety).

Outcomes related to the use, creation, and transfer of knowledge also assume a greater importance in today's innovation era (Miles, Snow, & Miles, 2000). We elaborate on this when we consider employee learning and development in the section on mechanisms. However, it is important to consider how work redesign might facilitate or inhibit *knowledge sharing, lateral integration, collaborative decision-making, perspective-taking* and other outcomes related to *knowledge transfer*. For example, in contexts where professionals from different disciplines need to share their expertise across different 'thought worlds' (Dougherty, 1992), the key indicator of a successful work design might be the extent to which it facilitates perspective-taking amongst the different experts. Some early evidence that work design can affect such an outcome was shown by Parker and Axtell (in press). For

a group of front-line employees, job autonomy was associated with them developing a wider understanding of the department ('integrated understanding') as well as more flexible role orientations, which were in turn both associated with employees being more able to take the perspective, or see the view point, of their internal suppliers. Those employees who took the perspective of their suppliers were then more likely to help, and cooperate with, their suppliers. At the group level, recent research linking shared mental models and group performance suggests the need to investigate work characteristics as potential antecedents of shared knowledge structures in teams (Cannon-Bowers, Salas, Blickensderfer, & Bowers, 1998; Mathieu *et al.*, 2000). These studies are consistent with the conclusion of Miles *et al.* (2000, p. 305), who suggested that self-management is the 'first design principle' for an innovative and collaborative organization.

As was the case for work characteristics, the above suggestions for additional outcomes are by no means exhaustive. Individual and group work characteristics are also likely to affect *career-related outcomes* (e.g. Campion, Cheraskin, & Stevens, 1994), *mood* (e.g. Saavedra & Kwun, 2000), *industrial relations attitudes, grievances, outside-work relationships*, and *leisure activities*. If we are to understand more fully the value of work design, as well as its limitations, we should consider a wider range of dependent variables in future research. The decision on which to include depends on theory, purpose, and analysis of relevance to the context.

Mechanisms linking work characteristics to outcomes

How do work characteristics influence outcomes? This is a question of mechanisms, that is, of the mediating pathways that underpin the core relationships. Of course, it is likely that work characteristics affect outcomes via multiple mechanisms. By and large, however, work to date has assumed these to be motivational. The Job Characteristics Model, for example, proposed motivational processes in the form of the critical psychological states, although these have not fared well in empirical studies (Fried & Ferris, 1987). The intrinsic motivation mechanisms proposed by psychological empowerment theory have thus far fared better, at least in terms of accounting for attitudinal outcomes, at both individual and group levels (e.g. Kirkman & Rosen, 1999; Liden *et al.*, 2000). Kelly (1992) suggested several other pathways by which work design might enhance performance, such as improved goal-setting and labour intensification.

Work design, however, can affect outcomes in many other ways. One mechanism, implicit in the sociotechnical principle that variances should be controlled at source, is that of a *quick response* (Wall & Martin, 1987). Thus, giving employees responsibility for tasks otherwise completed by support staff means that employees can deal with disruptive events as and when they arise, which enhances performance outcomes such as machine up-time. It also often means that constructive use is being made of employees' time when otherwise they would be idle. Similarly, allowing the control of variances at the source can enable employees to *use their tacit and local knowledge* to solve the problems, which can be more effective than relying on those further removed from the job (Cummings, 1978; Miller & Monge, 1986).

Another idea that has recently gained much ground is the notion that work design does not simply allow employees to apply knowledge they possess, but it also promotes *knowledge creation*, or *employee learning and development*. Evidence is accumulating for this more developmental perspective. Thus, studies have shown a link between enhanced autonomy and: cognitive development (Kohn & Schooler, 1978); the acquisition of new task knowledge (such as learning how to prevent faults; see Wall, Jackson, & Davids, 1992); the acquisition of broader knowledge about the organization, or 'integrated understanding' (Parker & Axtell, in press); the greater use of personal initiative (Frese, Kring, Soose, & Zempel, 1996); the development of more proactive role orientations (Parker, Wall, & Jackson, 1997); and increased self-efficacy (Burr & Cordery, 2001; Parker, 1998; Speier & Frese, 1997).

A learning and development perspective is consistent with German Action Theory (e.g. Hacker, Skell, & Straub, 1968); the basic tenet of which is that work is action-oriented. In brief (see Frese & Zapf, 1994, for a review of this theory and its implications in English), core features of actions include that they are motivated by goals and regulated by cognition. Important implications derive from this emphasis on cognitive processes. The theory proposes increasing job control, not only for motivational purposes, but to promote employees' deeper understanding of the task. More broadly, Action Theory is underpinned by the premise that: 'the human is seen as an active rather that a passive being who changes the world through work actions and thereby changes him- or herself' (Frese & Zapf, 1994; p. 86). It is proposed that an individual develops and changes through action, and hence that work has some influence on the development of personality.

Similar learning and development mechanisms have been proposed for group work design. For example, it has been suggested that autonomous work group members learn from each other (Pearce & Ravlin, 1987) and, because they assume more responsibility for external coordination with those in other departments, they also gain more understanding of the broader work process (Batt, 1999). It is assumed that this learning promotes better performance. It is also argued that creativity and innovation may be enhanced in work groups which provide enhanced autonomy and the opportunity to engage in a range of tasks (e.g. Paulus, 2000).

Other mechanisms linking work design and outcomes are suggested by theories about team effectiveness. Implicit in many such theories is the assumption that team inputs (e.g. work characteristics) affect outcomes (e.g. performance, member satisfaction) via *intra-team processes*. Consistent with this, increased task interdependence has been found to be reflected in increased cooperation within teams of service technicians (Wageman, 1995); and Tesluk and Mathieu (1999) found that self-management in road crews was significantly associated with the use of constructive problem-management strategies, in turn linked to improved performance. In general, however, we know little about how work characteristics affect team interaction processes. For example, it is conceivable that enhanced autonomy allied to heightened task interdependence could give rise to increased conflict within groups. Barker's (1993) study of self-managing work teams demonstrated the

potential for dysfunctional forms of normative control to develop as team members assumed responsibility for regulating the behaviour of other team members.

In the same way that we can ask how individual or group work design influences performance, we can ask how work design affects outcomes such as job strain and affective well-being. Thus, autonomy might prevent job strain by enabling employees to directly reduce stressful work aspects (e.g. having the autonomy to return a customer's money for returned goods) or to reduce the negative impact of stressful work aspects (for example, having the freedom to take rest breaks when required) (Frese, 1989). Strain might also be reduced via a learning mechanism. For example, Karasek and Theorell (1990) proposed that well-designed jobs promote mastery, which in turn helps people learn to cope with the stresses of the job. Similarly, Jackson (1989) suggested that people who feel 'in control' are more likely to use proactive problem-solving strategies to cope in uncertain situations.

In summary, we can be fairly clear *that* work design can affect behavior and attitudes at work, but we have much less systematic evidence about *why* (Mitchell, 1997). That is an area where development is urgently needed, because if we can identify why a given work characteristic or form of work design affects outcomes, it will be easier to ascertain the circumstances under which it will and will not be effective. The significance of this last point is advanced in the next section.

Contingencies affecting the link between work characteristics and outcomes

It has been recognized that work enrichment might be more beneficial for individuals with a high *growth need strength* (Hackman & Oldman, 1976). Apart from this contingency, established work design theories have been largely universalistic in their prescriptions. However, it is plausible to assume that there are contingencies that affect the appropriateness and effectiveness of particular work designs. The failure to take account of such contingencies might explain the apparently inconsistent performance effects of work design recorded to date. Incorporating such moderators into our model of work design will also increase the precision of recommendations for work redesign within particular contexts. Next, we describe potential organizational, team and then individual-level contingency factors.

Cummings and Blumberg (1987) suggested three variables affecting the appropriate choice of work design. The first was *technical interdependence*. When there is a high technical interdependence, that is, employees need to interact to get the job done (as in a sports team), work should be designed at the group level to facilitate the coordination of inter-related tasks. If technical interdependence is low, as might be the case for an estate agent, individual job redesign is likely to be more appropriate. In support of this recommendation, Sprigg, Jackson, and Parker (2000) found that the introduction of team working in a situation where the technology (wire-drawing) prevented employees from co-operating together resulted in employee dissatisfaction and few performance benefits. In the same company, but in a different area where the technology permitted employee collaboration (rope-making), team working enhanced employee well-being and performance.

Our ignorance about the veracity of such propositions, however, is shown by Batt (1999), who found performance benefits (increased sales and self-reported

quality of service) of autonomous work groups in customer service centres in which there was relatively low technical interdependence (e.g. customer representatives answered customer queries individually). Further analysis suggested that the benefits occurred because group members established group sales goals and then helped each other to develop sales strategies, handle problem customers, and to keep up with changes in procedures. In Batt's words (1999, p. 558): 'Effective sales as well as service quality depend on continuous learning, processing of information, and tacit knowledge that group collaboration appears to foster'. This suggests that, in situations where group members can help each other to learn, group working might enhance performance even though the requirement for technical cooperation among team members to carry out their particular job is quite low.

The second and third contingencies identified by Cummings and Blumberg were technical uncertainty and environmental uncertainty, respectively. These have been considered together for production work design purposes as *operational uncertainty* (Wall & Jackson, 1995). Basically, the argument is that the greater the operational uncertainty in a job (i.e. lack of clarity about how best to do the work because of changes in product specification, variability in materials and unreliability in technology), the greater the need to devolve decision-making to employees (i.e. job enrichment or autonomous work groups). This premise is consistent with more general organizational theory, which proposes that 'mechanistic' structures with routinized tasks and centralized decision-making are appropriate for stable conditions, and that 'organic' structures with decentralized decision-making are best for more uncertain environments (e.g. Burns & Stalker, 1961).

A study of job enrichment for operators of complex technology by Wall, Corbett, Martin, Clegg, and Jackson (1990) has provided some support for this proposition. Where operators worked on uncertain machines that had more frequent operational problems, the increase in operator autonomy resulted in substantial performance gains. However, for more reliable machines, there were no performance benefits of work redesign. At a more macro level, but still supporting the same idea, Niepce and Molleman (1998) observed that low discretion work such as lean production is most likely to be successful if tasks are stable, repetitive and uncomplicated; whereas sociotechnical work designs, such as autonomous work groups, will be more appropriate if there is a high uncertainty because these contexts require 'knowledge about the product and the process as a whole, and larger analytical capability and problem-solving capacities' (p. 277).

This latter quote highlights a potential connection between operational uncertainty as a contingency and the earlier discussion of learning-based mechanisms. Uncertainty effectively means a lack of knowledge about when problems will arise and/or how best to deal with them (Jackson, 1989). When operational uncertainty is low, events are predictable and the means of dealing with them known. It is therefore possible to determine and enforce the 'one best way' of doing the job. In contrast, where there is high operational uncertainty, the occurrence of problems and the means of solving them are less predictable, which means that structuring work so as to promote learning will be both

possible and important. Wall and Jackson (1995: 163) described it thus: 'production uncertainty is important as a contingency because it defines the conditions under which knowledge development and application can occur and affect performance'.

The importance of uncertainty and related variables in determining the choice of work design (such as the degree of empowerment) has also been made in relation to service and knowledge-work settings (Bowen & Lawler, 1992). For example, Batt (1999) argued that where organizations have a strategy to build long-term relationships with customers by providing quality service, with service being a 'bridge to sales', they need to design service work so that employees have the autonomy and skill to meet a wide range of demands at any one time (referred to as 'universal service' or 'one-stop shopping'). Consistent with this, although many call centres appear to be designed along Taylorist lines, there are reports of job enrichment and other high-commitment work practices being introduced in some call centres, especially those where highly interactive and quality relationships with customers are required—as in relationship marketing (Frenkel *et al.*, 1999; Hutchinson, Purcell, & Kinnie, 2000).

In a study of 223 customer service employees in a telecommunications company, Batt (1999) found that work organized into self-managed teams led to better service and sales performance (an increase in 9.3% per employee) than traditional work designs, and that the interactive effect of self-managed teams and new technology raised sales by an additional 17.4%. There were no effects of a TQM programme in which employees were involved in 'off-line' problem-solving groups. It is interesting to note that these positive effects of self-managing teams occurred despite relatively low levels of self-management (e.g. there was still extensive process standardization and limited opportunities for self-regulation), low interdependence, no group-based pay, and low job security. As described earlier, Batt (1999) attributed the benefits of self-managing teams to promoting learning in a context where requirements were frequently changing and group members could help each other learn effective sales strategies. This argument accords with the conclusions of Wall and Jackson (1995) that autonomous work groups are particularly important in uncertain and complex contexts because of the learning opportunities they provide.

Many commentators agree that organizations face greater uncertainty and complexity than they have in the past. In this sense, operational uncertainty can be seen as an antecedent factor that is leading to the wider introduction of autonomous forms of work design (see 'antecedents' above). Nevertheless, uncertainty also remains a contingency factor because, even if there is a trend towards greater uncertainty, there will be many organizations, and areas within organizations, that are characterized by relatively stable and certain operating conditions. Indeed, developments in technology and various management practices often lead to reduced uncertainty. For example, in call centres, developments in technology that enable customers to route their calls according to their nature reduce the range of problems encountered by any one operator. Similarly, engineers strive to build ever more reliable machines, and quality management programmes aim to reduce errors (Graham, 1988). Thus, whereas some forces are leading to a

greater uncertainty, others are pushing in the opposite direction. Even today, therefore, organizations and departments will vary in their level of uncertainty and should adapt their work design strategies accordingly. Evidence suggests that organizations often do not make appropriate choices. For example, studies show that the frequent failure of new flexible technologies is often due, not to the technologies themselves, but to the failure to simultaneously adopt appropriate work design (e.g. Waterson *et al.*, 1999). We can thus expect work designs to be introduced that are not in tune with circumstances, which means that considering uncertainty as a contingency variable will continue to be an important issue for the foreseeable future.

There are, of course, other organizational factors that are likely to affect whether work redesign leads to the predicted outcomes. These include the *process of implementing work redesign, the organisation's 'readiness' for work redesign* (e.g. the management style and culture), *the degree to which human resource and other systems align with the work design* (e.g. payment, training, information systems), *the history of change in the organization* (e.g. repeated unsuccessful attempts at change might enhance employee cynicism), and *the level of job security of employees*. For example, Bailey (1998) reported that self-directed work teams in a wafer-manufacturing company were associated with a lower productivity relative to the implementation of improvement teams, despite the much higher autonomy and training present in the self-directed work teams. Bailey identified several reasons for the teams' relatively low performance, including: the failure to adequately install an information infrastructure necessary for team decision-making; lack of support from management for the teams; failure to involve engineers in the implementation process (causing a lack of understanding from engineers, who were critical to the process); and the choice of traditional quantity-based measures of productivity (e.g. wafers processed per hour) rather than quality-based metrics. Pearson (1992) similarly identified several factors that affected the success of semi-autonomous work teams, such as the lack of transformational leadership shown by managers, a lack of active union support, and the presence of bureaucratic administrative practices. These studies converge with much of the more general organizational change literature which points, for example, to the importance of top management support, employee involvement in the change, and the alignment of organizational subsystems (e.g. Mohrman & Mohrman, 1997).

Team-level contingencies are also likely to be important. For instance, the way that the team works together, or the *team dynamics*, is likely to impinge on the effectiveness of autonomous work groups, thus acting as a moderator in addition to the potential mediating role identified earlier. Banker, Field, Schroeder, and Sinha (1996), in a longitudinal study of high-performance work teams, reported that quality and labour productivity improvements associated with group working mostly occurred within a team that was cohesive. The researchers observed that the group with the least performance benefits was one that had persistent conflict among its members. Team dynamics, in turn, are likely to be strongly related to *team composition* variables, such as the personality and ability mix (Barrick, Stewart, Neubert, & Mount, 1998; Neuman & Wright, 1999; Stevens & Campion, 1999). The need for supportive processes and structures at the team and

organizational levels is a consistent theme in the literature on team effectiveness (Guzzo & Dickson, 1996). For example, Wageman (1997) suggested that effective self-managing work teams require a clear and engaging direction, performance goals, demographic and skill diversity, an optimum size, stable membership, group rewards, as well as a coaching style of leadership and easy access to informational material and training resources. Again, whilst we generally accept the significance of these contingency variables, the body of empirical research into their impact on team effectiveness is relatively sparse. Shared attitudes at the team level, such as interpersonal trust and workforce cynicism (Dean, Brandes, & Dharwadkar, 1998), and collective efficacy beliefs (Little & Madigan, 1997), are further examples of likely moderators of the work characteristics–outcomes relationship that require investigation.

To date, we have considered organizational- and team-level contingencies. However, contingencies might operate at both broader and more individualistic levels. Considering the former, work-design theory is largely derived from studies of industrialized Western jobs, and therefore, theory and practice are likely to need adapting for other *cultures* (e.g. Kirkman & Shapiro, 1997). As an example, Robert, Probst, Martocchio, Drasgow, and Lawler (2000) found that empowerment was associated with a lower job satisfaction in India, which, they argued, resulted from the conflict of this form of work with cultural deference to hierarchy and status. However, it would be premature to conclude that autonomy is less valued in Indian culture. In the early studies of autonomous work groups in Indian textile companies, Rice (1958) described how autonomous work groups emerged relatively spontaneously, on the basis of workers' 'intuitive recognition' (p. 81) that this was a more satisfying method of work organization than the traditional methods. Thus, whether members of different cultures vary in their responses to enriched work design remains to be established. The more general point is that national culture is a contingency variable whose significance is growing along with the globalization of firms, especially when it comes to designing work for international teams.

Finally, as described already, there are likely to be *individual-level factors* that influence the consequences of work design. Growth need strength, or an individual's desire for learning and development, is the factor that has been studied most often. Other individual-level moderator variables have been investigated (e.g. the need for achievement), although these studies have produced less consistent results (Wall & Martin, 1987). There is a need to carefully choose individual difference variables that theoretically would be expected to moderate the impact of work design. For example, Parker and Sprigg (1998) found that *proactive personality* moderated the interactive effect of job autonomy and demands on employee strain. Their results were consistent with the premise that proactive employees take advantage of high job control to manage more effectively the demands they face, whereas passive employees do not take advantage of greater autonomy to this end. The choice of the individual-level moderator (proactive personality) was thus linked to a potential mechanism through which work design might affect strain (job autonomy allows an emloyee to reduce, or cope with, stressful job demands).

Conclusions

Anyone contemplating work redesign in a call centre, a high-technology plant, among hairdressers, for teleworkers, for knowledge workers, for virtual teams, or in a multitude of other contexts, and armed only with existing work design theory, cannot feel other than inadequately prepared. Those theories, though providing a window, do not speak to the reality and complexity of the situation. Reducing work design theory to a handful of universalistic prescriptions in respect of work characteristics and outcomes might be convenient, but it is not realistic.

The best way forward, however, is unlikely to be either the abandoning of theory altogether or the development of a new mandatory and universal list of variables. As should be clear from the paper so far, that list would be long and unmanageable, and we have only touched the surface. Instead, our argument is that it should be possible to identify an overall guiding theoretical framework, in terms of categories of variables to be considered; and, using this framework, to identify potential variables of relevance within a particular context. In some contexts, some variables will vary little, so the explanatory power will lie in other variables. For example, social interaction might not vary much in most jobs but might assume especial significance for certain forms of work such as teleworking. Generally, the choice of variables will be guided by the overall theory as well as an understanding and analysis of the context. Rather like the premise of traditional work-design theory, researchers and practitioners need to be afforded autonomy and minimal critical specification if the full potential of their contribution is to be realized! Such a premise concurs with Rousseau and Fried's (2001) argument for a much greater attention to context in organizational research more generally.

Thus, we propose that work design theory should develop in two directions simultaneously. On the one hand, a general theory is required that specifies the type of relevant factors, namely antecedents, work characteristics, outcomes, mechanisms and contingencies, and which recognizes these span individual, group and organizational levels of analysis. That is what we have attempted in this paper. On the other hand, we need to encourage a diversity of empirical studies that presents not only the results, but also the rationale for focusing on certain variables of each type, given the general theory *and* the particular context. The accumulation of such evidence linking context and outcomes will lead to the development of more specific models for identifiable types of work that are embedded within the general framework. In short, the vision is of an overall framework linking together a family of more specific empirically-derived models for specified domains of application.

That picture also enables work design research and practice to draw on other lines of theory and research, which again might differ according to the category of variable and context under inquiry. For example, if the focus were on processes underlying the link between work design and motivational outcomes, then social cognitive theory (Bandura, 1982) is likely to be highly relevant. The same argument applies to many other theories (e.g. affective events theory; learned helplessness theory; theory of planned behavior, etc.). Contextualizing work design as we recommend would also enable a greater integration with cognate areas of research,

such as the current interest in the link between human resource management (HRM) or 'high involvement management' practices and organizational performance (e.g. Staw & Epstein, 2000). These fields of inquiry have many components in common, but are currently separated by their traditional differences in favoured levels of analysis. Yet, it is clear that to develop a fuller understanding of high involvement management, we need to uncover the more detailed means through which HRM practices affect performance. Work design is part of the package, and to fully appreciate its effects, we need to consider work content in relation to the wider HRM provision and culture (Wood & Wall, 2001).

Some comment on method is also in order. The traditional methodological challenges that have been identified in work design research (Wall & Martin, 1987) remain. Thus, there continues to be a preponderance of cross-sectional studies with an over-reliance on solely self-report measures of both independent and dependent variables. The need is for longitudinal intervention studies with comparison groups, using both quantitative and qualitative methods. Detailed case studies are also called for, particularly with the newest forms of work where less is known about the choice of key variables.

The opportunities for such research is enhanced by the current popularity (at least in rhetoric) of empowerment and other such work design-related initiatives, as well as the growth in technology that allows more systematic collection of outcome data (e.g. more sophisticated human resource information and performance monitoring systems). However, the greater scope of change means that it is frequently difficult to isolate work-design change from the other co-occurring changes (e.g. downsizing). In such contexts, effective research design is both more difficult and more important. Innovation in theory needs to be matched by innovation in method. We also recommend that work design researchers exploit the opportunities afforded by new technologies to obtain dynamic longitudinal data, such as using hand-held computers to assess individual's daily work experiences (e.g. Totterdell, 2000). Analytically, developments in multi-level modelling statistical techniques (e.g. Hofmann, Griffin, & Gavin, 2000) hold out the prospect of being able to disentangle change processes that typically occur at both individual and group levels.

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