



The Distributed Workplace

Edited by
Andrew Harrison
Paul Wheeler and
Carolyn Whitehead



Spon Press

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The rise of a global knowledge economy—to a large extent enabled by increasingly integrated communications and computer technologies—has changed many aspects of organizational life almost beyond recognition and in the process has cruelly exposed the inadequacy of traditional models of workplace management.

Based on extensive EU-funded research into the creation of sustainable, collaborative workplaces across virtual and physical spaces, this unique book makes the case for a distributed workplace model that takes full account of the pressures acting on the modern organization. It proposes a radical reappraisal of both demand and supply sides of workplace procurement, provides a comprehensive framework for understanding the significance of changing work patterns and offers detailed guidance on workplace design for all professionals concerned with the procurement, design and provision of today's workplace.

The Distributed Workplace will be an invaluable point of reference for everyone responsible for developing workplace strategies in end-user organizations, and for suppliers of office buildings, information and communications technologies and building operation services. The book is of special relevance to public sector bodies and other organizations concerned with sustainable development and sustainable workplaces.

The Distributed Workplace

Sustainable work environments

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LONDON AND NEW YORK

First published 2004
by Spon Press
11 New Fetter Lane, London EC4P 4EE

Simultaneously published in the USA and Canada
by Spon Press
29 West 35th Street, New York, NY 10001

Spon Press is an imprint of the Taylor & Francis Group

This edition published in the Taylor & Francis e-Library, 2005.

“To purchase your own copy of this or any of Taylor & Francis or Routledge’s collection of thousands of eBooks please go to www.eBookstore.tandf.co.uk.”

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

The distributed workplace: sustainable work environments/edited
by Andrew Harrison, Paul Wheeler and Carolyn Whitehead.
p. cm.

Includes bibliographical references.

ISBN 0-415-31890-4 (pbk. : alk. paper) — ISBN 0-203-61657-X
(ebook)

1. Commercial buildings—Designs and plans. 2. Sustainable
architecture. 3. Work environment. I. Harrison, Andres.

II. Wheeler, Paul. III. Whitehead, Carolyn.

NA6210.D58 2003

725'.2047—dc21

2003012471

ISBN 0-203-61657-X Master e-book ISBN

ISBN 0-203-34488-X (Adobe eReader Format)

ISBN 0-415-31890-4 (Print Edition)

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Foreword

Our workplaces must inevitably reflect what we do and the tools we use. When these change, so must our workplaces.

Europe has set itself the objective of becoming a dynamic and competitive knowledge-based economy by 2010. We are already well on the way: most people provide knowledge-based services, and over 50 per cent of those in work now use a desktop PC connected to the internet for at least part of their day. We still, however, commute to work in offices designed decades ago, and whose continued use is both inefficient and unsustainable.

The next 5–10 years will see a major transformation in work. Wireless communications will allow us to work anywhere and voice recognition will liberate us from the keyboard. Information and communications technologies will become more pervasive, yet social contacts will become more important and more diverse.

This research opens the wider debate about the workplaces we will need in the future. It begins to build the bridge between the European ambitions for wide participation and creativity in work, and of sustainable development. In supporting this research, the European Commission has appreciated the open spirit of enquiry and collaboration between the architecture and technology communities in Europe. We look forward to further fruitful collaborations in the future.

Peter Johnston
Head of Unit, Evaluation and Monitoring
European Commission
Directorate General Information Society

Preface

SANE—sustainable accommodation for the new economy—was a two-year, multi-disciplinary research project supported by the European Commission. It was set up to consider the combined impact of the new economy on place, people and process, and its objective was to enable space designers, technology developers and other professionals concerned with the workplace to move from a location-centric to a location-independent approach.

Europe-wide teams of experts provided the European Commission with detailed reports of their investigations into their area of expertise. Space environment modelling focused on the architectural aspects of the human environment in organizational settings. Human environment modelling examined communications and interaction in physical and virtual environments. Processes and tools provided a physical base for these packages in terms of understanding current and likely future technology tools and processes.

The key operational goal of the project was to develop a unified framework for the creation of sustainable, collaborative workplaces for knowledge workers across Europe, encompassing both virtual and physical spaces.

The work of the team charged with creating the space environment model forms the basis of the present book.

Acknowledgements

SANE (Sustainable Accommodation for the New Economy) was a two-year, multi-disciplinary, European-wide research project partially funded by the European Commission under the Fifth Framework Information Society Technologies programme.

We would like to acknowledge the diverse contributions of all the SANE partners to the production of the space environment model described in this book. The earlier internal project deliverables, the outputs from consortium partners and other contributors, the meetings and communications throughout the project have all contributed greatly to the development of concepts outlined in this book.

Members of the SANE research consortium have included:

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In addition we would like to acknowledge the work of Lorna Walker and her team at Arup Environmental, and the contribution of Connel Bottom (Bernard Williams Associates) to the development of costing strategies based on the space environment model.

Introduction

The relationship between sustainability and the built environment has always been a tortuous one: close but not warm. They're an uneasy pair. Sustainability with its sometimes conflicting imperatives: ethical, practical, physical, economic. The built environment—a work of will masquerading as a force of nature. Perhaps a clash of fact and value. But at least, in certain key aspects, fixed.

No longer. Sustainability, once a simple matter of better resource use—difficult but achievable—now claims its rightful place at the shifting centre of all the issues raised by globalization. And the built environment—particularly the work environment—loses its monolithic status to stand revealed as a mercurial participant in the new economy.

It is evident that the workplace is evolving in a distributed form to deal with these changed circumstances. It is equally evident that the fluidity of the distributed workplace will set society some urgent problems—not least in the field of sustainability.

SUSTAINABILITY

Definitions of sustainability all agree on one key point: that however we use our world and its resources, we should preserve the ability of future generations to do the same. This concept first found broad expression in Western culture in the words of Thomas Jefferson: “Then I say the earth belongs to each...generation during its course, fully and in its own right, no generation can contract debts greater than may be paid during the course of its own existence” (Jefferson 1789).

This principle is picked up in the definition set out in the 1987 Brundtland Commission¹ Report, “Our CommonFuture”, in which sustainability is defined in terms of development: “Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.”² This definition established the benchmark on which all subsequent definitions have been based.

The Brundtland Report emphasizes the need for economic development to take place in a manner that meets the basic needs of the world's poor, and

approaches economics with a view to the impact of human activity on the surrounding environment. Subsequent definitions have varied considerably in their desiderata: maintaining inter-generational welfare; maintaining the existence of the human species; sustaining the productivity of economic systems; maintaining biodiversity; and maintaining evolutionary potential (Kane 1999). Most, however, have retained the Brundtland Report emphasis on the economy and economic development as central to achieving sustainability—overturning the previous wisdom that economic development can only take place at the expense of the environment.

Sustainability is the [emerging] doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense—by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it...It follows that environmental protection and economic development are complementary rather than antagonistic processes.

(Ruckelshaus 1989)

Earlier notions of sustainability referred simply to the natural, physical environment, and environmental sustainability undoubtedly remains the driving force behind all approaches to the subject. This was true of the 1970s, with the first widespread realization that worldwide development and economic growth were finite, and could not be sustained indefinitely. It was equally true of the 1990s, with a growing awareness of environmental problems, ranging from the release of carbon dioxide and other “greenhouse gas” emissions into the atmosphere and the consequent climate problems, to deforestation, desertification, interruptions of fresh water supply, soil degradation, marine resources depletion and food production challenges. But the understanding of the concept had grown: the 1992 Rio Conference³ recognized that sustainability includes aspects of socio-economic and cultural development as well as resource utilization.

A healthy economy is a prerequisite to financing and supporting sustainability in all senses. Sound (balanced) budgets are necessary to prevent passing on today’s costs to future generations, as well as enabling the extension of economic benefit to people the world over. The Rio Conference acknowledged the right of all people to a reasonable standard of living, but also accepted that the present lifestyle of the developed world cannot be extended to all within the limits of existing technology.

The immediate constraint to global economic development is environmental, associated with material use and transfers. Economic and social sustainability are closely connected, although economic growth by no means guarantees increased equity or a reduction in social deprivation. Global patterns of economic production and distribution need to correspond to worldwide social and cultural requirements, as well as to ecological needs. Social sustainability has various

sub-sets, one of which is community sustainability, which requires investment in education, infrastructure, accommodation and services in areas where (industrial) jobs have disappeared. Cultural sustainability, though sometimes referred to in isolation, is also effectively a subset of social sustainability. It seems plausible that cultural diversity is as important to human society as biodiversity is to all living species and the ecosystem as a whole. Cultural pluralism is a source of human progress, and an essential basis for development (Information Society Forum 1997).

Sustainable development requires the pursuit of lasting economic benefit, in terms of investment, employment, incomes and wealth, enhancing the capacity of areas to maintain a continuing and stable level of economic activity. From a perspective informed by ideas about sustainability, such an economic pursuit can only be successful in the longer term if it is undertaken within an approach that recognizes that there are limitations to the exploitation and use of current resources, and that exceeding this carrying capacity threatens long-term sustainability.

This implies an acceptance that the social, economic and environmental aspects of sustainability are interrelated, and a willingness to use consultation, empowerment and partnership processes as the means of mobilizing, informing and encouraging changes in attitudes and behaviour. Respect for diversity, and the corresponding commitment to equity at local, national and international levels (both in terms of current inequalities and the needs and aspirations of future generations) are the route to the realization of the strengths that can be built from the co-existence of difference and variety (DETR 2002).

Sustainability needs to be seen as a dynamic process, not a fixed and attainable state. It is rather like the mathematical concept of a limit—an end point that does not exist as such, and cannot be reached, but represents the hypothetical end point of a tendency. There are four key areas for innovation and change towards achieving the “limit” of sustainability: economic systems and value; technology; individual behaviour; and social systems. Any one of these taken in isolation is likely to be at best ineffective, at worst detrimental. All need to be taken together, under a holistic approach, if progress towards sustainability is to be achieved.

There is a general agreement among economists working within the sustainability agenda that worldwide economic systems need some kind of modification. In particular there should be a new emphasis on qualitative economic growth rather than quantitative economic growth, with an associated de-coupling of economic growth and the consumption of non-renewable resources. There is, however, considerable debate over the extent of change required.

This debate principally centres on the concept of value—the problem of attaching value to resources and measuring that value. Our current systems of value are measured according to the global market system, governed by a framework established by the World Trade Organization and the financial markets. The framework, characterized by the principles of free trade and

deregulation, is insufficient to value resource consumption and its social and environmental costs.

Value is, after all, a relative term. There are differential meanings—market value; value to humanity; and overall value to ecosystems. The market is ill-equipped to value resources effectively—potentially an extremely dangerous short-coming.

The very narrow and ephemeral framework of marketbased valuation can hardly begin to take into account the total value of biodiversity to the human species. As long as we remain in the one-dimensional, timeless and spaceless hierarchy of market exchange, even the destruction of resources essential to the long-term survival of our species can be justified.

(Gowdy 1999)

The debate over how far the framework needs to change is split between two camps, termed roughly the “environmental economists” and the “ecological economists” (Köhn 1999). The first camp views the natural environment as simply a source of inputs to be allocated for economic production. The second views the economy as the subsystem of a larger human society and its institutions, and of the still larger biophysical world.

The first view implies progressing towards policy solutions that aim to ensure resources are used in the most economically efficient way possible. This might require, for example, extending property rights to environmental resources—to ensure that prices of goods and services reflect their environmental costs and benefits—and educating the public about these environmental costs and benefits (through, for example, carbon trading). There is a benefit involved in changing the price of goods to take into account ecological cost, but it does not alter the economic fundamental of expansion that governs markets as they exist today—that more consumption is better than less. Environmental pricing therefore does not challenge the key driver of unsustainable resource use—the continued consumption of materials (Schütz 1999).

The second view states that if these resources are deemed irreplaceable and essential requirements for human existence, assigning property rights with taxes and subsidies will be insufficient: some factors simply cannot be assigned a meaningful price. This implies a different, more complex, agenda.

The belief here is that the economist’s concept of value must be broadened beyond one that holds that biodiversity is a substitutable market good like any other—it must include both market prices and those unquantifiable human cultural and environmental features (Köhn 1999).

The existing market system favours the individual, and the present or short term. Sustainability is only capable of being conceptualized, let alone achieved, in terms of the collective, the system, and the long term. Through the market, the individual is able to act unchecked, limited only by the extent of personal financial resources. The greater the individual success in the market, the more

the goals of the system are likely to be undermined, to the extent that at a certain point the system is no longer able to adjust to change sufficiently to ensure its survival. Individual actions are not necessarily themselves the problem, provided they are subservient to the purposes of the system as a whole (Schütz 1999).

Various sources see increasing technological progress, particularly in information and communications, as the route towards a sustainable and inclusive world. Information and communications technologies (ICT), so the wisdom goes, allow the possibility of economic growth and increased prosperity with reduced impact on the physical environment and less consumption of non-renewable resources. This is achieved largely through the process of de-materialization, whereby the amount of material extracted, synthesized and dispersed in any process or product is reduced. De-materialization is realizable in a number of ways: via process improvement, product improvement, substitution of a service for a product, and structural change.

Although ICT potentially reduces the environmental effects of products and processes via de-materialization, it is also a major driver of globalization, which in itself is causing increasing social and environmental burden. Moreover, although new technology enables production to occur with reduced resource consumption per unit, the subsequent increased availability of products and services stimulates demand, thus increasing resource use overall. These factors are known as the rebound effect. For example, production of the silicon chip has massively increased computing power per unit of output compared with computers based on ferrite core memory, but the dematerialization that this engenders is insignificant in the context of the massive increase in the number of personal computers that this has encouraged.

Linked with the volume of materials consumed in the production of these machines are several other factors causing environmental degradation, including: the toxicity involved in the production of the silicon chip; the enormous amount of power consumed by the increased number of computers; and the massive increase in paper consumed as computer users are able to print countless drafts.

A further example of the rebound effect is given by the use of mobile technology, which has increased rather than decreased personal mobility as we use these systems to set up more meetings with more people. Telework, which enables people to work anywhere, anytime, while remaining linked to information networks, also allows them to travel and work at the same time. This represents a considerable increase in the overall potential for travel (Radermacher 1997).

The driving processes behind technological change are still predicated on increased consumption and exploitation of resources. As long as they remain so, information and communications technologies will be powerless to bring about increased sustainability.

The great dilemma faced by most advocates of sustainability is that global concern for social equity apparently requires economic growth to raise the quality of life of the poor nations relative to that of the rich. The production and

consumption factors of such growth, however, seem likely to have global environmental consequences, which will themselves impose serious limitations to future growth. The key question is whether economic growth and resource use can be de-coupled?

Some definitions of sustainable development have described it as a process of “improving the quality of life while living within the carrying capacity of supporting ecosystems” (Chambers *et al.* 2000). Conventional measures of the quality of life usually assess rates of consumption. Above a certain threshold, however, further consumption adds little to human quality of life.

Because the cumulative environmental impact of the processes of production is a direct function of consumption levels, increased consumption can in fact become detrimental to our quality of life. Where consumption is greater than nature’s carrying capacity, it becomes by definition unsustainable (Chambers *et al.* 2000).⁴ Keynesian economics supposed that consumption would be the driving force of the economy. Current theory, however, suggests that ideas—new ways of thought leading to technological advances and inventions—will be the economic driving force of the future. Economic growth will therefore be dependent on doing more with less, or doing without (Hansen 1999).

One of the driving factors behind the emerging interest in sustainability is the principle of scarcity, requiring conservation and management. Conventional market economics attaches value to what is scarce: “Market economics values what is scarce—not the real work of society, which is caring ... we have to find a way of rewarding contributions to it” (New Economics Forum).⁵ From a wider perspective, however, human resources are not at all scarce, and yet are valuable in terms of talent, skill and knowledge. The conventional approach to valuing, rewarding and exploiting these resources—that is, the market and money—fails to do any of these effectively.

Monetary reward buys consumables, which by definition are unsustainable, but does nothing for social cohesion, community value and so on: in fact it detracts from these. Social capital, which involves the investment of people’s time, is the principal factor in creating sustainable social structures, and is therefore a prerequisite to effecting economic and environmental sustainability.

If achieving social sustainability is the prerequisite for physical (environmental) sustainability, the implication is that global societal frameworks will have to be modified.⁶ Moreover, responsibility is a key factor, requiring the formation of a globalized body politic and global community. According to the Information Society Forum, the “European Way” (defined as liberty, equality, fraternity, solidarity and sustainability) offers the best model for a sustainable global framework. The relative primacy of politics over economics has brought about European integration and will facilitate the development of a global civil society (Information Society Forum 1997).

Conventional approaches to sustainability focus on environmental versus economic issues, neglecting deeper explanations, which find that the problem of sustainability is not just environmental, nor economic, but also, and

fundamentally, social. The global problems of sustainability (or lack of it) have their origin in local action. At the same time, the global environment has significant local impacts.

Cities are open social systems integrated into the broader systems of the global economy and environment. They are also globally connected to one another in a complex web of links: in production systems; finance; resource usage; and in the environmental problems caused and suffered by them. The conventional argument states that cities are the antithesis of sustainable development, as massive consumers and producers of waste. Cities are also closely associated with crime and vandalism, deprivation, unemployment, deteriorating infrastructure, decay, socio-economic problems and neighbourhood collapse—that is, they are seen as socially unsustainable. However, although the created urban environment may exhibit some of the most serious symptoms of unsustainable development, it provides at the same time the greatest opportunities for its remedy through the concentration of population and activity (Chen-chong Wu 1998).

As well as providing the theatre for the re-invention of societal structure, the form of the city itself represents the greatest potential for achieving a sustainable future. It is the ability to adapt that is the major characteristic of sustainable urban form, achievable through built in overlap and redundancy, and robustness (Scoffham and MaratMendes 2000).

The various themes and processes of sustainability need to be considered together. Acting in only one arena will simply tip the balance of pressure elsewhere, without moving towards a real solution. The holistic approach therefore required has its roots in systems theory, and sees society and the earth as a single system.

In the view of Joachim Schütz and others (Schütz 1999), the world we inhabit is composed of a series of interconnected systems. It is not simply an assemblage of objects, but made up of multiple mutual relations between elements. Systemic co-operation takes precedence over individual competition. The broad focus of the sustainability debate is towards determining the limits of resource use and species survival. However there also needs to be a shift to consider the potential for the added benefit of cocreation that will be attained through fostering relationships and systems rather than by examining the objects between which those relationships exist.⁷

This is the key to the creation of a holistic outlook linked to the recognition of individual and collective responsibility: systemic competence, co-operative structures and biodiversity are interrelated. Systemic competence is dependent on three interdependent sources: positive practical experience of diverse systems and co-operative behaviour; the rationale of systems thinking; and identification with other elements of the biosphere.

Our current economic system of private goods in competitive markets asks for significantly less systemic competence than club goods, public goods,

commons or even global commons do...there is no way to achieve a high level of system efficiency under conditions of low biodiversity, non co-operative behaviour, and a low standard of systemic competence, as it is proposed by current economic reasoning.

(Schütz 1999)

Melinda Kane furthers the argument in a discussion of the ways in which complex layers of human society—social, economic, ethical, technological and biological—function in conjunction with the biosphere and its various components operating at different scales of geographic scope and time. Each human layer is associated with a different dimension of time and spatial impact on the biosphere; decisions made with respect to one layer may have unpredictable consequences for others (Kane 1999).

The environmental problems experienced today are, she maintains, the result of economic decisions based on only one or two layers. For sustainability to be achieved, all layers must be included in individual and collective decision-making processes. Sustainability within a layer is often confused with sustainability of the whole system.

Other writers have taken the argument to its logical conclusion, arguing against the subdivision of sustainability into social, economic and environmental categories, since they consider that the concept refers simply to the resilience of a system to absorb change. “Sustainability in a systemic and evolutionary perspective is the ability to absorb disturbance and reorganize, self-regulate and evolve” (Köhn 1999).

Sustainability is simply a unifying and guiding principle of social and social-environmental interaction, which, if it is to be achieved, requires the emergence of a “political economy of sustainability” (Köhn 1999). All the various themes and processes described above, although emphasizing different areas of the sustainability debate, share a common goal that involves worldwide acceptance of responsibility for sustainable development.

THE NEW ECONOMY AND NEW WAYS OF WORKING

In the wake of the dot.com boom and bust it may seem paradoxical to place the new economy at the centre of an argument on the future of the workplace, particularly an argument that attempts to embrace issues of sustainability. If we are to argue that the new economy is to play a critical role in shaping how and where we will work in the future we are obliged to offer some definition, distinguishing it from the dot.com economy.

By the new economy we mean the structural change in the forces shaping our society. First there was the agricultural revolution, then the industrial revolutions. Now, there is the digital revolution—the radical reshaping and restructuring of society caused by digital technology. This digital revolution—

the result of a convergence between communications and computing technologies—allows individuals and organizations to connect in ways, and on scales, that were previously inconceivable. The digital revolution is premised on the increasing importance of digitizable knowledge products in the economy, and the shift to knowledge as the fundamental source of value. This digital revolution is creating the new economy.

If we accept the proposition that the digital revolution is transforming the economy we may, though we cannot predict what the impacts on our society will be, be able to understand something of the direction in which we are being driven.

The world we live in today was shaped by the explosion of productive power and economic potential released by the industrial revolution. The dynamic of the industrial revolution has governed how we experience time, space and human society. Time became more sharply segmented into work and life as discrete realms. The centralization of production, driven by the need to bring people together to exploit the potential for economies of scale generated by early industrial machinery, has shaped our cities, driving a wedge between workplaces and living places, now evident as business districts and suburbs.

Less visibly, the role of work in relation to our experience of society has also undergone a major shift. As new forms of social structure emerged in response to the changing economic base—structures such as corporations, mass political movements and trade unions—other structures have declined and withered. In contemporary developed societies, for a large proportion of the population the organization in which they work provides the only organized social group of any scale in which they participate. Work overwhelmingly provides the context within which we negotiate and understand our identities and our place in society.

The new economy is characterized by an increasing virtualization of products, processes, organizations and relationships. New economy production no longer requires people to work together in the same physical space to access the tools and resources they need to produce their work. Production can be spatially decentralized and reintegrated back into other aspects of life. Once work and life are no longer rigidly separated in space, the temporal boundaries between them can be refashioned according to different imperatives. If the demarcation between work and leisure is no longer a lengthy period of commuting, a much finer granularity of interplay between work and leisure becomes possible. These changes are contingent on changes in organizational behaviour. Those with responsibility in organizations will have to learn to move from management-by-observation to management-by-results.

This shift in management approach is just one aspect of a wider shift that is realigning organizational structures with the imperatives of the new economy. The industrial economy was characterized by vertical institutions, bureaucracies and large-scale factories. The new economy of ideas, intelligence and knowledge demands a horizontal economy characterized by non-hierarchical, horizontal institutions.

The discussion above may suggest to some that the impact of the new economy is restricted to a small number of businesses in particular sectors of highly-developed countries—that even in the most economically-developed countries, the old economy accounts for the majority of GDP. To accept this argument would be mistaken. The new economy is in the driving seat and it is the new economy’s dynamics that are shaping our future. Approximately 60 per cent of the GDP of North America is attributed to knowledge work. Even in the car industry, the major proportion of value created is attributed to knowledge work.

A “knowledge worker” has been defined as:

anyone who creates, develops, manipulates (including selecting and organizing), disseminates or uses knowledge to provide a competitive advantage or some other benefit contributing towards the goals of the organization. Thus, the product of a knowledge worker’s work is intangible: knowledge is the addition of meaning, context and relationships to data or information (this is sometimes referred to as “mature content”). Knowledge workers typically work in a team (whether local or virtual), and make extensive use of IT.

(SANE 2001a)

The rise of knowledge work has been accompanied by a shift from valuations based on tangible assets to intangibles. Emphasis on intangible assets such as “brand” and “customer ownership” has increased with competitive pressure. Both “brand” and “customer ownership” are heavily leveraged to preserve margins and market share in the new economic climate. While the principle of scarcity may no longer apply to the production of certain goods, it holds with increasing force with regard to “attention” in a society suffering from information overload.

This transformation has been clearly expressed by Jeremy Rifkin: “ownership of physical property -formerly the bulwark of capitalism—has become a liability” (Rifkin 2001). The accelerated business cycle accompanying this transformation has further stressed the relationships between organizations and their physical assets. Fixed physical assets cannot be reconfigured to meet changing business needs as quickly as organizational processes and structures may be modified. They may act more as a brake than a springboard for change. Patterns of work and structures of organizations are evolving faster than the built environment can be transformed to meet their needs.

Competitive economic pressures should encourage more intensive space use. This does not necessarily have to be detrimental to the quality of the environment and can even improve it. Use of space does not conform to the same pattern of consumption as applies to most other natural resources. Oil reserves once consumed cannot be replenished. The act of consumption destroys the

resource. Physical space, while finite in its extent, is, however, infinitely recyclable overtime.

This cycle is most obvious over the long term as land use changes; for example, historically, use may have shifted from rural to urban and possibly back to rural. The potential recyclability of space over the shorter term provides the potential for increasing the intensity of space use. The high-value business centres of most developed cities are empty and unused overnight and at weekends. From a financial perspective, no airline would think of leaving an expensive capital asset such as a 747 un-utilized for over 50 per cent of the time. The environmental impact of under-use of urban space is the expansion of the city, as “night time” activities take place in other locations —dormitory suburbs or entertainment zones. The social impact is the creation of “dead” neighbourhoods. The more intensive use of space over time in our cities, facilitated and supported by the digital revolution, would relieve them of many of their most pressing problems.

Intensifying the use of space must be considered in conjunction with the experience or values attached to the consumption of space. Different cultures attach different values to space and this affects their rate of consumption and maximum capacity that any space can absorb. Pressure for more intensive space use, combined with the potential of emerging technologies, will allow organizations to re-evaluate their property portfolios. As noted above, companies can reconfigure processes and organizational structures far faster than physical assets. Flexibility of physical space will, therefore, be at a premium. Flexibility may be afforded through the construction and design of highly re-configurable buildings, but could more easily be created through a flexible approach to property ownership.

Rather than viewing physical property simply as a liability, the challenge of the new economy may be that it allows us to change how property adds value for organizations. This change has already started, notably in the retail industry. The potential to move from retailing based on physical real estate to virtual shopping has already produced a new trend, as retailers review the role that physical property can play in their business. Environments such as NikeTown use physical space as built advertising, with the strengthening of the brand image taking precedence over maximizing sales per square metre. Early entrants into e-retailing have taken physical space in high-throughput locations to act as display cases, allowing consumers to see, feel and, in some cases, try on the products while still handling sales through a virtual channel. Dickson CyberExpress at Kowloon Station, Hong Kong, was an early adopter of this strategy.

We are in a period of transition from the old rules and systems of organization to those associated with the new economy. This period will be lengthy and uneven. The capacity for technological and perhaps organizational change will outstrip the capacity of the built environment to transform itself. For example, in the UK, commercial off ice premises are replaced at about 1 per cent of the total stock each year. Many of the environmental ills observed today are legacies of

the physical transformation that accompanied the industrial revolution. The environmental consequences of attempting to accelerate the transformation of the building stock to match a new economy imperative would be severe.

The digital revolution and the technologies associated with it fortunately provide us with a new realm of space, capable of virtually infinite extension without the excessive resource consumption that accompanied the industrial revolution. The early internet enthusiasts and the dot.com entrepreneurs could be seen as the first two waves of pioneers colonizing these new spaces.

This transition period may involve a change to the frame of reference (such as group norms, communication, work environments) within which people and organizations are used to operating. Where work processes have been virtualized in the form of a series of abstract information spaces, performance has frequently suffered as participants in these processes no longer have access to the implicit social clues that previously guided their behaviour, even in what were understood to be highly formal processes. Attempts to recreate “naturalistic” interaction through the construction of virtual representations of physical environments have, however, met with some limited success, though rarely in the world of work. At any one time, a popular virtual environment such as Habbo Hotel may have thousands of users (www.habbohotel.com).

Re-creating the physical world online in this direct, representational way may prove to be a temporary, transitional and perhaps necessary step in order to provide people and organizations with familiar landmarks and iconography in an otherwise unfamiliar environment.

Precedents taken from the physical world can be understood to be useful in this transition but should not necessarily be simply applied to a non-physical-virtual—organization. New systems and norms need to be developed: “the nature of work and operating patterns of organizations that stem from the Age of the Machine, no longer make sense in the revolutionary Age of the Network” (Zuboff 1988).

Once people have adapted to the new environment, it should be possible to create new iconography and environments that will not simply copy or replicate traditional and accepted forms from the physical world. Behaviour is conditioned by environment. Virtual environments afford opportunities for the development of new forms of co-operation and collaboration. These developments must, however, be grounded in the understanding that the physical world remains an integral part of the environment we experience. The major challenge facing those concerned with both the design and management of working environments is to harness the strengths of both the physical and virtual environments—creating a hybrid space that matches the needs of individuals and organizations.

Far from reducing the importance paid to physical space, the focus on knowledge work and increasing productivity in the new economy should lead to increased emphasis on creating the “right” working spaces. Although technologies have the potential to enable people to work anywhere, people will still always choose to work somewhere. If their choice is no longer conditioned

by the need to be in a specific place in order to have access to information or to communicate with colleagues, other factors will come into play.

The social importance of the workplace is likely to be increasingly emphasized. Human beings are social animals: we need contact with others to give us a sense of purpose and worth (and it's worth remembering that at the beginning of the twentieth century, alienation for workers was commonly associated with production line manufacturing) (Chinoy 1955).

The assumption that social contact with others occurs primarily through face-to-face interaction is based on our empirical observations of people working in contemporary organizations with current technologies. While this may characterize social interaction today, we cannot conclude that this is immutable. Generational differences in the use of technologies such as mobile phones suggest that forms of social interaction in this sense are quite plastic. The growth of virtual communities online also suggests that for some, satisfying and in some sense real social interaction is taking place.

New and emerging technologies will increase the range of possibilities, allowing people and organizations, over time, to make different choices about how they use hybrid environments to satisfy professional and social needs. In the near term, the increased social role of the workplace is likely to continue to blur the division between work and leisure. Some organizations are already acknowledging this blurring, and are looking at a "homing from work" rather than a "working from home" strategy (Culliford 2001). This can involve breaking down traditional components of work and office space to introduce domestic and social elements. It also suggests giving work a centrality in people's lives that many find uncomfortable.

Movement in this direction will face considerable resistance. While few people today would endorse the Marxist thesis of an irreconcilable contradiction between the interests of labour and capital, real conflicts of interest exist between businesses determined to extract productivity from their workers and individuals attempting to lead balanced, fulfilling lives. The emergence of 24/7 business cultures places people under pressure to lead 24/7 business lives. A significant minority may already find the once distinct spheres of work, life and play woven into a seamless satisfying whole. For the majority, however, this transformation has not occurred.

Within this new work/life culture, the balance of interest between employer and employee will need to be renegotiated. Through the last half of the twentieth century, a consensus emerged on aspects of employment such as the length of the normal working week, with working time outside these limits considered overtime. Expressions such as 9-to-5 reflect the widespread acceptance of this consensus. The idea of "24/7" potentially threatens this consensus.

Some groups affected by these changes are able to negotiate their terms and conditions of employment on an equal footing with their employer, but this is not the case for many groups. In the realm of work, existing social legislation may act as a brake, preventing transition to more productive and sustainable

ways of working. In many countries, for example, legislation sets a maximum for the number of hours that can be worked in a week. This is intended both to protect workers from unscrupulous exploitation and to broaden participation in the workforce.

While neither of these goals should be abandoned, the mechanisms used to achieve them will have to be radically rethought in the context of the new economy. Limiting the number of hours spent in the office, as the legislation currently does, serves to advance neither the protection of workers from exploitation, nor to broaden participation in the work force. Inertia inherent in social and physical structures must be overcome if the potential of the new economy is to be realized: if society as a whole is to reap in full the potential benefits of the new economy a new consensus reflecting the interests of all must be constructed.

Even if we remain optimistic about the capacity for technologies to change the ways in which we work and the work we do, we shouldn't presume such a transformation inevitably to be for the better.

ALTERNATIVE WORKPLACES

1980 was the year in which IBM introduced the personal computer (PC) and the world of office work and office design was changed forever. The computer began its escape from the confines of the computer room and started to proliferate on office desks. The consequences are continuing to drive innovation in office use and design.

Between 1983 and 1985, DEGW and others carried out the Orbit studies into buildings and information technology. These multinational client-sponsored research programmes that established the new parameters for office buildings able to cope with IT and the changing nature of the corporate organization in Europe and the US (Duffy and Chandor 1983; Becker *et al.* 1985).

The first study identified the impact of cabling requirements, heating and cooling, and pressures on space for the office building. It also investigated the indirect effects of changing organizational structures, staff profiles and patterns of work affected by the new technologies. The trend whereby the interior design of offices had become disassociated from the characteristics of the base building shell was overturned by the impact of IT. IT demanded a radical re-thinking of the use, servicing and base building design for the office.

One of the central tenets of the second study, Orbit 2, was that not only are organizations different from one another, but each organization has different needs at different stages as it changes under external or internal pressures. The position of an organization can be plotted against two dimensions: the degree of change and the nature of work. For example, building features suited to a high change, non-routine organization (or part of an organization) may not be suitable for a low-change, more routine organization. Change may be caused by internal reorganization, and measured by the frequency of relocation within the building;

or it may be caused by change in staff size, measured by differences in headcount.

The nature of work is defined by the extent to which most organizations are routine and predictable or varied and unpredictable. The more non-routine the work, the more likely it is to involve the integration of different forms of expertise, increased networking, and more personal meetings. On the other hand, companies with more routine work tend to use conventional hierarchies to maintain control, and are more likely to rely on a central mainframe and a knowledgeable management information systems group than on dispersed computing intelligence.

Today's corporate back offices and high tech organizations, now so different in nature and work technique, will tend to move closer to each other in the future as the former becomes less routine and the latter more so. Similarly, small start-up companies characterized by high change, non-routine work tend, over time, to become more hierarchical, more differentiated, with more routine work and less change. Very stable, mature companies typically find that they also have to innovate to remain competitive. Change occurs in all kinds of organizations.

The recession of the late 1980s and early 1990s, the associated collapse of the office real estate boom in Europe and North America, and the need for corporate organizations to re-invent what they were doing in order to survive, threw the world of office work, office design and office development into a tailspin. All of the old certainties disappeared.

The Anglo-American standardized model of the speculative office building—the central core skyscraper or the groundscraper-plus-atrium—was no longer valid. Nor could the high cost and expense of the tailor-made, owner-occupied, northern European office building be sustained. Only the very richest organizations could afford to cater to the unique preferences of their particular culture in the design of their own buildings.

The northern European organizations were being forced to re-think their needs for expensive custom designed buildings for their exclusive use; the Anglo-American developers were being forced to link up more closely with end users through joint ventures or pre-lets.

A double shift has, therefore, occurred in the expectations of what buildings should offer end users: on the one hand, the developers are being forced to pay more respect to the complex, varied and changing needs of end users; on the other hand, the end users are demanding buildings and office environments that can add value to the ways they want to work, but in ways that minimize their overall costs.

In other words, the tyranny of supply-driven development that dominated the UK and US throughout the 1980s has been broken. In its place a new world of office organizations, of ways of working both in and out of offices, has placed entirely new demands on the ingenuity of designers at all levels of the provision of the workplace environment.

The Responsible Workplace, a major multi-client research project in the early 1990s, captured this shift in perspective (Duffy *et al.* 1993). The aim of this project was to link the evolution of the organizational structure and technology-enabled work process to the types of office environment that best support the corporate objectives of structure/culture and business direction.

The project analysed the dimensions of interaction and autonomy to establish an organization's current position and its plans for the future—interaction being the degree of face-to-face contact necessary to undertake the work process, and autonomy being the degree of choice available as to when, where and how the work process may be undertaken.

The traditional “office factory” of the nineteenth century and early twentieth century involved little face-to-face interaction or autonomy. It was an environment in which individuals were co-located and clearly directed to undertake specific prescribed tasks. Contemporary management thinking departs substantially from the rigours of prescribed tasks and hierarchically driven work processes. The office of the future relies heavily on highly-motivated individuals who are enabled by technology to have a high degree of autonomy and who use face-to-face interaction to increase the richness of their business transactions.

Throughout the 1970s and 1980s, the drivers for building design were based on reducing costs and the design solutions relied on tightly prescribed, centrally controlled standards of design and specification that corporations rolled out globally. In contrast, today's multinationals must balance reducing costs with the value of increasing productivity.

Work process tasks such as brainstorming and the importance of horizontal interaction across organizational divisions generally enhance the nature and quality of the business undertaken. The corporate management objectives should therefore be to find ways that buildings can support the new methods of working. This approach can thus generate the link between the new management theories and design in ways that enhance efficiency and effectiveness.

Alternative models for offices are therefore required as a result of:

- the changing nature of business organizations requiring greater flexibility in the use of space and time; allowing rapid responses to operational needs; and responding to higher expectations of employees for quality
- the location of office work being far less constrained as a result of information technologies enabling work to take place in a wide variety of locations both within and outside the conventional office building
- the ubiquitous provision of information technology, which means that although workstation design will remain important, other shared working settings, meeting rooms, and other intelligent environments will become more significant.

The demand to add value to organizational performance means that the office is not merely a place of information and control but a place for stimulating intellect

and creativity. The office has to provide high quality and attractive features for demanding office workers. But this has to be achieved alongside the pressure to drive down occupancy costs in ways that use space more efficiently. Moreover, offices also have to respond to the demands for healthy and environmentally responsible buildings.

During the last quarter of the twentieth century, awareness of the principles of sustainability became a global phenomenon. The field of the built environment does, however, offer huge potential for abuse of the key principles involved in sustainability and this, coupled with an accelerated rate of change in the ways in which we work, imposes an urgent imperative for a clear and well-informed course of action.

Current best practice in office design has begun to embrace a variety of architectural and construction solutions to the problem of creating more energy efficient and environmentally comfortable office buildings. However, there is little attempt to question the prevailing workplace accommodation paradigm. In this paradigm—a descendant of the planning principles formulated under the *Congrès International d'Architecture Moderne* (CIAM) and espoused by planners and architects ever since—office workers are employed in dedicated office buildings, often remote from other urban and social functions.

Within this paradigm, there have been significant advances in terms of creating individual buildings that are more “environmentally sustainable”, in the sense that they consume less energy and produce less waste per measure of office space created. There are two main aspects to this: the first involves the construction process; the second involves the building itself.

The construction process has been the focus of attempts to reduce the amount of material and energy consumed in building erection, through, for example: increased pre-fabrication to reduce construction time and material waste; reduction in water consumption; reduction in transport distances and costs; use of self-finished materials; and recycling of construction waste. In short, those responsible for building delivery should be driven by what Taylor and Twinn have simply termed “good neighbourliness” (Taylor and Twinn 2001).

In response to the need for an objective building construction assessment method, Rab Bennett for the Movement for Innovation is currently devising six environmental sustainability indicators (Bennett 2001). These measures include:

- operational energy consumed during the construction process
- embodied energy of building materials
- transport energy consumed in bringing materials to and from site
- waste produced in the construction process
- water consumed
- the maintenance of biodiversity on the site.

Construction energy costs are increasingly important as building life cycles shorten. The requirements for flexibility in use may require greater turn-over in

building stock, thus increasing the significance of construction energy against energy in use. For a building of a 60-year life span, the embodied construction energy represents some 10 per cent of the energy cost of the building, with the remaining 90 per cent being energy in use. If the building life span is reduced to 30 years, the embodied energy makes up some 20 per cent of the energy cost.

In terms of the building itself, key ideas that have contributed to its environmental sustainability include the following: thermal mass; increased passive ventilation or simple mechanical ventilation; passive cooling; reduction of internal heat gains; solar control, glare control and orientation; ease of operation; increased user interface; and the introduction of monitoring programmes.

Environmental sustainability, as expressed in these aspects, focuses on the interdependence of building structure, environmental services and building fabric. This approach should result in higher quality workplaces, and therefore in increased productivity, if one accepts that environmentally benign buildings are usually better liked by their users.

In this way, to some extent, the environmentally sustainable office building becomes part of the wider agenda embracing social and economic sustainability, if measured in terms of user satisfaction and productivity. Social sustainability, however, requires that the building works both for its users inside, and is responsible to others into whose broader community it fits—that is, what does the building give back to the city?

What is needed is a redefinition of the term “workplace”. It needs to be broadened from the narrow focus on the office building, to incorporate the various work environments embraced by the new economy and new ways of working. This, of course, represents both a challenge and an opportunity. According to a report published by Information Society Technologies, the sustainable workplace will have positive net business benefits; positive net societal impacts (both internally in terms of human resources and externally on wider society); and low net environmental impact (especially through material and energy consumption).

Rather than referring to the workplace, we should perhaps begin to talk about “work systems” or “work environments”. Any realistic attempt to create sustainable office accommodation must take a broader view than the design of individual buildings. It should be asking some of the following questions:

- What is a more sustainable way of work, of operating an economy?
- What is the nature of the sustainable working environment?
- How should we house office workers—in dedicated buildings or elsewhere?
- Where should these working environments be located?
- How should people move and communicate between working environments, and between these and other environments?

- What elements should be incorporated into the sustainable working environment, both to increase productivity and efficiency, and to reduce consumption?

It is these questions that this book addresses. While it does not provide all the answers—indeed, the idea of fixed answers is probably misguided—it raises some of the relevant issues, implications and concerns.

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