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Digital workplaces: Vision and reality

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Abstract

Whilst organizations accept that effective information management (IM) is now crucial to information/knowledge worker productivity and organizational performance, the continued dramatic growth in information volumes has not been accompanied by increased information management capability. This is the case for both data and unstructured information. At the same time the consumerization of technology, growth in social media, and expectations of the work environment are resulting in pressure on IT and IM functions to deliver information and information tools via multiple channels/devices and simple interfaces. This article charts the evolution of views on the digital workplace and the drivers that now render this an essential strategic direction for organizations. The desirable features of the digital workplace can be achieved now through integration of four technologies – mobile; big data; cloud computing and search-based applications – and with a focus on developing for the mobile environment. Providing this environment could transform the way in which work is accomplished both in terms of individual and organizational productivity and competitiveness. Understanding organizations through an ethnological and cultural perspective will be essential to the design and management of this transformation.

Introduction

The last decade has seen some significant changes to the IT landscape. It has been a period where developments in consumer technology have had a major impact on enterprise technology. The most obvious example is mobile technology but in addition many of the hardware innovations used in consumer devices (such as the high-capacity hard drives in the iPod) have been incorporated into lightweight laptop computers. Social media started in the consumer sector and are now an important corporate communications channel. However, the working environment has changed very little over the last decade and companies are now beginning to consider how they can provide better support for the next generation of knowledge workers.

The 2011 Cisco Annual Security Report[1] summarizes the emerging situation as follows:

> Today, your 'millennial' employees – the people you want to hire because of the fresh ideas and energy they can bring to your business – show up to their first day on the job toting their own phones, tablets, and laptops, and expect to integrate them into their work life. They also expect others – namely IT staff and chief information officers – to figure out how they can use their treasured devices, anywhere and anytime they want to, without putting the enterprise at risk. Security, they believe, is not really their responsibility: They want to work hard, from home or the office, using social networks and cloud applications to get the job done, while someone else builds seamless security into their interactions.

The rapid adoption of mobile technologies is starting to force IT managers to consider how they might deliver a digital workplace that provides a seamless user experience from wherever the employee may be working. There is also considerable interest at present amongst intranet managers in developing the corporate intranet into a corporate digital workplace and the extent of this interest is now being tracked in the Digital Workplace Trends Survey conducted by NetStrategy/JMC.[2]

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This article provides an overview of the development of the concept of digital workplaces and sets out user requirements that a digital workplace has to meet.

The information paradox

There have been a number of surveys in recent years which have highlighted what can only be described as an information management paradox. Respondents are united in recognizing that good access to quality information is crucial to the success of their organizations. However, despite the rate of growth of both unstructured and structured information it is very difficult to find and share information assets and to maintain their quality. The financial assets of an organization are set out in the balance sheet, which will also include a figure for the depreciated value of fixed assets. In the body of the annual report there will be information on the number of employees, who are also an asset of the organization. There is no means of accounting for the value of information as an asset because there is no agreed methodology for measuring the value of information.

In 2008 Capgemini published a report[3] which for the first time attempted to put a value on information. The company surveyed 125 executives in FT350 companies and in public sector organizations. Over 80 per cent of respondents acknowledged that information exploitation was a critical driver or determinant of business performance and both a personal and organizational priority for the vast majority. Yet many of them felt they could make better use of their information. In the private sector, executives felt there was the potential to increase business performance by 29 per cent with more effective exploitation; in the public sector this stood at 24 per cent. Overall the research suggested that poor utilization of information assets equates to an annual £46 billion missed opportunity for private sector profits, and £21 billion in administrative costs across the public sector.

A survey carried out by Oracle in North America in 2012[4] indicated that the volume of information has increased by an average of 86 per cent in the last two years; 60 per cent of executives rate their companies unprepared to leverage the data and cite significant gaps in people, process, and tools; and most of the executives believe they are losing revenue at an average rate of 14 per cent annually because of an inability to manage information assets.

The reality is that few companies have any reliable information on the scale of their information assets. McKinsey Global Institute (MGI) published a report in 2011[5] on the impact of 'big data' which included an analysis of the amount of data stored by companies in vertical market sectors in the USA. MGI estimated that by 2009 nearly all sectors in the US economy had at least an average of 200 terabytes of stored data per company with more than 1,000 employees. Many sectors had more than 1 petabyte in mean stored data per company. This analysis was probably the first time that the scale of the data repositories inside companies had been made visible and indicated very strongly that organizations are now reaching the point where immediate action needs to be taken to improve the processes for managing information.

In 2010 the MIT Center for Digital Business published a paper by Aral, Brynjolfsson and Van Alstyne[6] on the results of a major research project funded by some of the world's largest companies into the economic impact of effective information management. One of the main conclusions was that improvements in information worker productivity can also increase the rate of innovation in the economy as a whole. This leads not only to higher levels of productivity but more importantly, to faster increases in the growth rate of productivity, and thus, overall living standards. Information worker productivity has to be a function of the value that information workers are able to add through their expertise and experience to base-line information. This value is the true measure of their productivity rather than measures such as the time taken to complete a procedure.[7] Information workers are also not just based at corporate headquarters. A service engineer working on a faulty hydraulic pump drilling rig in the Gulf of Mexico is also an information worker as they download service reports from colleagues around the world on the solutions they have to the pump failure.

Our working day

The office environment has changed little over the last decade. Screens may have become larger and PCs smaller but a time traveller from 2002 could quickly make themselves at home in a 2012 office. Although the functionality of Microsoft Office has been substantially improved in this period it is still based around Word, Excel and PowerPoint, each of which is in effect a separate application. Documents are assembled by cut and paste between these applications and not by drag and drop. Outlook email also looks little different.

However, in many ways our working day has changed substantially over the last few years. Our day is now full of interruptions. We have largely lost control over our working day as emails, social media and virtual team applications mean that although we are better connected we are also more likely to be interrupted. In an open plan office people can quickly see whether a colleague is in a situation where they can be interrupted, but in a virtual working environment that is not the case. Our daily calendar is open to everyone else in the company worldwide. Research indicates that we may be interrupted every 4–11 minutes and that rarely are we able to work for more than around ten minutes on a specific task without deliberately cutting ourselves off from all channels of communication, and in so doing running the risk of not being seen as a 'team player'.[8,9]

Another difference is that now we each have multiple roles and responsibilities. In 1992 Tom Peters predicted the rise of project-based work and that has certainly come to be a reality.[10] On a minute by minute basis we may move from being a manager to being a managed employee, take on a mentoring role, participate in multiple projects and communities and work through a never-ending supply of emails. This is of course one reason why we have so many interruptions; we are part of multiple networks and communities.

The third change is the arrival of location-independent working. Even on aircraft it is now possible to use a wi-fi connection link to the internet and so for others to link to us. Mobile phone connectivity is close at hand. There is nowhere to hide, especially in a global business.

At the end of a working day it takes a considerable feat of memory to remember how the day went, and to judge dispassionately the extent to which we were actually in command of the events of the day. Work has begun to be very messy indeed, and this is especially true behind the desktop.

Almost no-one outside the corporate IT function understands the scale of the applications that are keeping the company in business and compliant with laws and codes of conduct. In larger multinational businesses there may well be several hundreds of such applications, many of them customized versions of the same application. However, the extent of the customization is such that each needs its own development and support team. The situation is especially acute in companies that have expanded by merger and acquisition. In late 2012 the purchase of several hundred RBS branches by Santander was halted because of the difficulties of integrating the back-office applications. All IT managers realize that reducing this complexity will reduce costs and increase the speed of upgrading the applications, but they often lack a business case for the resources needed in the near term to bring about the development of a fully integrated digital workspace.

The Digital Workplace Forum[11] suggests that this business case should be built around:

- Real estate reductions (ability to reduce costs on office space)
- Productivity improvements (employees are often more efficient when working away from the office)
- Absenteeism declines (staff are less inclined to have a day officially away from the office if they are working flexibly)
- Staff turnover decreases (employees who work flexibly are more engaged, happier and less likely to leave)
- Operations continuity (a good digital workplace infrastructure is key for successful operations continuity and disaster planning)
- Environmental gains (by reducing employee travel there are significant reductions in organizations' carbon footprint).

It is questionable whether a business plan for a digital workplace based on these achievements would be acceptable to the Board of a multinational business struggling to cope with current economic and financial realities. For example, companies already have high-quality business continuity plans and it is difficult to see how a digital workplace that is built on existing systems and networks will confer a higher degree of continuity.

The concept of a digital workplace

The predecessor to the digital workplace was the concept of a paperless office, which dates back to the work of George Pake, a co-founder of the Xerox PARC research institute in the mid-1970s.[12] In parallel at the Computer-based Education Research Laboratory (CERL) at the University of Illinois a group of researchers led by Ray Ozzie developed PLATO Group Notes in 1976[13] which offered the ability to:

- Create private notes files organized by subject
- Create access lists
- Read all notes and responses written since a certain date
- Create anonymous notes
- Create director message flags
- Mark comments in a document
- Link notes files with other PLATO systems.

This development was five years before the launch of the IBM PC but was already setting a framework for a digital office application. Ray Ozzie then moved to Lotus Corporation and headed up the development of Lotus Notes.

Tom Peters' book *Liberation Management*, published in 1992[10] makes extensive use of case studies of Lotus Notes implementations to highlight the benefits of using technology to support work processes. In a chapter entitled 'Unglued Organizations' Peters sets out 27 organizing propositions about the structures that would be requisite for survival in what he saw as the Nanosecond Nineties. It is a remarkable piece of futurology and it says much for the author that thirty years later the propositions still hold true. Yet we have made comparatively little progress towards their implementation and wide-scale adoption. If you sum all 27 propositions you come very close to a vision of a digital workplace that has yet to be implemented even though technically all that Peters proposed is now possible.

The concept of the digital workplace is usually attributed to Jeffrey Bier, who founded Instinctive Technologies in 1996 to provide collaboration applications based on the knowledge that Bier and his co-founders had gained at Lotus Corporation. The company was re-launched in 2000 as eRoom Technologies but was then acquired by Documentum, at which point the eRoom technology was integrated into an enterprise content management application. However this development is predated by the books on virtual workplace and digital

workplace design by Charles Grantham published in 1993[14] and 1996.[15]

A component of the branding of eRoom was the concept of a digital workplace. Bier set out five criteria for a digital workplace which still hold good today:

- It must be **comprehensible** and have minimal learning curve. If people have to learn a new tool, they will not use it, especially those people outside the firewall. The digital workplace needs to be as simple and obvious as email or instant messaging.
- It has to be **contagious**. The digital workplace must have clear benefits to all parties involved, to both distributed workers and the different enterprises interacting in these new workplaces. The workplace also has to be a trusted place, thus secure, both for the individual and the companies involved. People have to want to use it.
- It must be **cross-enterprise**. The digital workplace must span company boundaries and geographic boundaries. It also must operate outside the corporate firewall with an organization's customers, suppliers and other partners, and require very little IT involvement, or it will not gain acceptance.
- The workplace has to be **complete**. All communication, document-sharing, issues-tracking, and decision-making needs to be captured and stored in one place.
- The digital workplace must be **connected**. If not, it will not gain acceptance.

Over the last few years the concept of a digital workplace has slowly come back into circulation. A very well grounded view of digital workplaces has been developed by Jane McConnell at NetStrategy/JMC based on a series of global surveys of intranet trends and latterly digital workplace trends. NetStrategy/JMC uses the term to convey the sense of an eco-system of enterprise platforms and services that enable people to work, collaborate, communicate, develop services and products, and better serve customers. According to the Digital Workplace Trends Report 2012[2] many companies are already working on the integration of a number of corporate applications around an intranet as a precursor to a digital workplace, and are also establishing digital governance teams. Thirteen per cent of respondents had a unified digital landscape in which all tools are delivered through one platform. A greater number, though still only 21 per cent, had a unified entry point with global navigation and consistent design.

InfoCentric Research, in a very comprehensive assessment of the role and implementation of a digital workplace[16] regard it being made of building blocks which address:

- Different and specific areas of work performance
- More generic areas indirectly related to performance and tasks

- Structures, context and services that build the foundation of the digital workplace and that are offered and used in other building blocks.

Oscar Berg[17] sums up the situation:

> In this respect the digital workplace also highlights a paradigm shift in how organizations are using IT to support information work. Previously it was primarily administrative personnel that used IT for information worker tasks, and they performed them at their desks at the office during office hours. Now, virtually all employees need to perform some information worker tasks on a daily basis, and they need to be able to perform them wherever and whenever the job needs to get done. There simply is no time for them to go to the office to get the information work done. Perhaps they don't have an office to go to. They need to do it in the situations where they actually work.

A problem with the term 'digital workplace' is that by definition it focuses on a 'place' even though the vision is to enable information access to be location independent. Perhaps we should be considering the concept and vision of a 'digital work platform' rather than a 'digital workplace'. After all Microsoft SharePoint is positioned as a platform and not as a set of applications. However, for the purposes of this article I have used 'digital workplace' for clarity.

The characteristics of a digital workplace include those set out by Jeffrey Bier of being comprehensible, contagious, cross-enterprise, connected and comprehensive together with five additional characteristics which I suggest also need to be taken into account with a DWP:

- It must be **adaptive**, because companies are constantly restructuring, acquiring new businesses and selling off or closing businesses that no longer fit with corporate strategy. The digital work platform has to be able to be re-configured on an almost overnight basis.
- It has to provide solutions that are **compliant** with applicable laws and regulations.
- It should be **imaginative** and attract employees to use it because it provides a transformational integration of business, information, knowledge and technology.
- The speed of change in business and the multiple roles and responsibilities held by each employee mean that the digital work platform has to be **predictive** so that it is able to anticipate the requirements of the user for data, information and knowledge and anticipate the requirements of the business for links with suppliers and customers.
- The nature of the connected world we live and work in means that the digital work platform has to provide ubiquitous **location-independent** access to services at the point of requirement.

Many definitions of digital workplaces focus on features and functionality, often from a somewhat philosophical

perspective. A digital workplace should be defined in terms of what it does, not what it is. My definition would be:

> A digital workplace enables any employee to complete a task, share information and work as a member of a team with other employees in the organization and in any partner organization on a totally location-independent basis for all the parties concerned.

No organization works in isolation. It has suppliers, customers and other partner organizations. Any technology solution that does not provide seamless links to these partners cannot be a digital workplace. The links to other organizations give rise to very challenging security issues, but unless they can be solved all that will happen is that email will reign supreme as the only way of allowing information to pass through the IT firewalls. Indeed a success criterion of a digital workplace might well be the rate at which email exchanges tend to zero!

Intranets and portals

At one time it seemed likely that the office of the future would be managed through Enterprise Information Portals (EIP), announced with some fervour by Merrill Lynch in a market report in 1998.[18] The authors of the report commented:

> We believe there are three market forces driving this market:
>
> - Corporate realization of the gold mine of data currently stored, and not readily accessible in enterprise systems,
> - The emergence of 'packaged' information applications playing into the buy versus build trend, and
> - The availability of affordable, ubiquitous distribution channels; the Internet, Intranet and Broadcasting.
>
> Enterprise Information Portals are applications that enable companies to unlock internally and externally stored information, and provide users a single gateway to personalized information needed to make informed business decisions.

The market leader was Plumtree Software, and over the period from 1996 to 2002 the company was very successful in providing a desktop application which integrated multiple applications through a set of portlet windows. As the number of applications increased, the back-end systems became extremely complex to manage and Plumtree was struggling to keep up with customer requirements. In 2005 the company was acquired by BEA Systems which itself was acquired by Oracle Corporation in 2008. Portal technology is still an important element of corporate enterprise architecture offerings but with the acquisition of Plumtree the concept of an enterprise information portal came to an end though some vendors do still offer EIP applications.

It is important to consider why enterprise information portals failed to gain any momentum. These included:

- No attention was paid to how work was being performed
- Very limited search capabilities
- A cluttered and complex user interface
- Limited integration between applications and repositories
- High per-seat cost
- Invariably no linkage between IT and business operations.

In 1999, less than a year after the Merrill Lynch EIP report 1998[19] several hundred people attended the first Intranets Conference and Expo in San Francisco. A year later the conference attracted over 70 exhibitors and the intranet business looked to be very bright indeed. The opening keynote was entitled 'Is the intranet still a relevant concept'. Intranets have continued to evolve and in many companies are now recognized as being of considerable value to business operations. Even in these situations, practical support for the intranet can be limited. If the intranet was switched off for a day there would be a significant impact on business performance, but few companies are able to meet the levels of an intranet manager for every 3000 employees. This is now recognized as an indicative benchmark for the staff investment needed in an application used by probably all employees every week. The annual Intranet Innovation Awards[20] highlight how meeting the specific requirements of a small group of users can have a significant impact on operational performance, but often these innovations have been scoped and implemented on almost a spare-time basis.

There is a general recognition that intranets need to support work tasks but there is a substantial challenge in identifying these tasks, especially when they take place outside of the office environment.[21] The intranet may only be providing some of the information needed to undertake the task which may in fact be carried out using an application (such as product data management) that is rarely integrated into the intranet.

Digital transformation

Digital transformation is a comparatively new concept and to some extent has arisen out of the blending of personal and corporate IT environments, often referred to as the consumerization of IT. The MIT Center for Digital Business has carried out a very wide range of research projects into the evolution of digital business and digital transformation. One of these projects was carried out in conjunction with Capgemini.[22]

> Digital technology, which transformed the media industry, is now transforming the rest of the commercial world.

Companies in all industries and regions are experimenting with – and benefiting from – digital transformation. Whether it is in the way individuals work and collaborate, the way business processes are executed within and across organizational boundaries, or in the way the company understands and services customers, digital technology provides a wealth of opportunity to those willing to change their businesses to take advantage of it.

The pressure points for change are increasing from many angles. Globalization is dictating efficient integration of businesses which can only be achieved through digital processes and collaborative tools. Employees and customers are starting to demand new ways of working. As competitors and new entrants make digitally-enabled practices a reality in an industry, other firms will need to follow.

It seems possible, but perhaps not yet probable, that the trend towards digital transformation will be the driving force towards the development of a digital workplace.

Four technologies in particular are rapidly shaping the future of corporate IT and the way that work will be undertaken:

- Mobile
- Big data
- Cloud computing
- Search-based applications.

So far these four technologies have tended to be evaluated and implemented separately, but the business benefit that could be generated from integrating these technologies into a digital workplace could transform the way in which work is accomplished.

The march to mobile

If there is one area where a reasonable link between information and business performance can be made it is the support of field-based employees engaged in customer and supplier-facing operations, in particular customer technical service. Here the ability to fix a problem quickly and permanently through access to the latest information can probably be measured in terms of metrics such as customer retention and lower costs for equipment failure. At present the focus is on how location-identification of mobile devices can be used to provide users with relevant just-in-time information. There has been a lot of attention paid to the use of responsive web design to enable web pages sized for a desktop PC to be adapted on the fly to a tablet or smartphone format. This misses the point. The widescale adoption of mobile will inevitably mean that the design is initially optimized for the mobile device and then expanded for other formats.

However, it is now gradually being recognized that a desktop PC, a tablet and a smartphone not only have to provide a contiguous digital working environment, but that

the information presented on these devices may be different.[23] A search might be carried out on a smartphone and just the titles of documents presented. The search might then be saved and could be viewed later on a tablet in more detail, and the search refined using facets and filters that are almost impossible to display on a smartphone. Having found a relevant document the user could then click on the document and send it to the desktop of their hot-desk office for review later in the day. This requires a substantial amount of back-end management but is certainly not beyond the capabilities of current technology. Indeed it is interesting to note that the new Microsoft Windows 8 operating system has been designed at the outset to work across multiple device formats.

This interlaced mobile environment has to be at the heart of whatever will eventually emerge as a digital workplace. One of the best visions of this location-independent working environment has been developed by Corning Glass in two videos[24] about the future of glass. Corning developed the gorilla glass that is now widely used for smartphones and tablets, and the videos take the interlacing to another level with the use of large flat glass screens, either horizontally for a desk or table, or vertically as a wall. Indeed it could be argued that the best vision yet of a digital workplace is given by the computing infrastructure on display in the US TV series Crime Scene Investigation (CSI). What is notable about the use of technology in this series is not just the large screen displays but the way in which information from multiple applications can be integrated together in a few seconds!

In mid-2012 Unisys undertook a large-scale survey of mobile IT use across nine countries.[25] The survey identified a 'mobile elite' who are changing the way that business is conducted, often using devices that they themselves have paid for. Indeed, many said that they had a better personal IT environment than the one offered by their employer. This elite group is going to expand in size and will start to demand better support from the organization because they have a concern that at present their ability to progress their careers is being hindered.

Big data

Although the term 'big data' has been one of the buzzwords of 2012 many companies have been well aware of the escalation in the amount of data and information that is being acquired and stored, and the potential value of being able to make effective use of this in gaining and maintaining a competitive advantage.[5]

The focus on operational data tends to obscure a similar increase in the growth of unstructured information in the form of sales and customer service reports, product development documentation and market intelligence. This information is crucial in providing a context to assess the significance of trends and outliers derived from data

analytics. A survey by AIIM[26] suggests that 60 per cent of companies regard it as essential that data and information can be integrated, but only 2 per cent are currently able to do so.

Although big data is often defined in terms of volume, velocity, variety and value, these are all relative, and even smaller companies may be running into problems delivering business-critical information. The rapid growth in the use of smartphones and tablets by customer and supplier-facing staff adds to technical complexity.

It is now widely accepted that IT technology will not provide a turn-key solution to big data management. Another big data V is veracity. If data is not of sufficient quality by the time it has been integrated with other data and information, a false correlation could result in the organization making an incorrect analysis of a business opportunity. Many studies are now indicating the importance of data analysts in validating and interpreting data, but people with these skills are in very short supply. The same is true of people with the skills to manage large enterprise search applications which (unlike big data applications) will be used by most, if not all, the employees in a company.

A study published by IBM in conjunction with the Said Business School at Oxford University[27] identified five obstacles to taking full advantage of big data. These were: making the business case for the investment in technology and additional specialist skills; understanding how to use big data analytics; data quality; management support; and recruiting and then training staff with the required skill sets.

Companies are now appreciating for the first time just how important effective information management is to their future success. As the IBM/Said report highlights:

> With the emergence and expanding adoption of big data, organizations worldwide are discovering entirely new ways to compete and win. They are transforming themselves to take advantage of the vast array of information that is available to improve decision-making and performance throughout the enterprise.

This is becoming a substantial problem in the management of 'big data' where there are now many potential IT solutions but a severe shortage of data scientists[28] to analyze the results from content and data analytics applications.

The opportunity of big data is that it will cause chief executives to ask their IT director what the corporate strategy should be for big data, and in turn IT directors will for the first time realize that the data and information assets of the business are worthy of management and investment.

Cloud computing

Another major technology development has been the arrival of cloud services. The National Institute of Standards and Technology sets out five essential characteristics of cloud services.[29] In the context of a digital workplace the most important of these is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources.

Cloud computing services are already moving into the consumer sector. This article is being written in the cloud provided by Microsoft Office 365. In the mobile sector there is already a blurring of the boundary between the enterprise and the individual with enterprise support of Bring-Your-Own-Device applications and this is likely to happen with cloud computing services as well. The value of these services in providing location-independent access to services is also one of the challenges to be met because this is where data privacy legislation bumps up against service provision.

Search-based applications

Rightmove, one of the largest groups of estate agents in the UK, offers users of its website[30] the ability to draw a polygon on a map using mouse clicks that defines with great precision the area in which they are looking for a house or apartment. In the UK, school catchment areas are very important in selecting a house and this feature enables the area to be mapped precisely without needing to know all the appropriate postcodes. Behind the scenes a search application (in this case Exalead) is converting the map into a search of properties within the polygon. This is a very simple search application, in which a powerful search engine is supporting a business process by running in the background.

This is one of many areas where search is undergoing a renaissance and moving away from 'keyword' queries towards 'unified information access' where the search application is indexing both unstructured and structured information and integrating them in a way that best supports the user in making good business decisions.[31]

The future of work

In an article in Business Week in 1975 Pake commented:[12]

> 'If the office of the future is a collection of these electronic terminals linked to each other and to electronic filing cabinets, it will change our daily life ... and this could be kind of scary.' This is what most concerns Pake and a growing number of other researchers and users. 'We have just really discovered the enormity of the problem,' Pake admits. 'How well we succeed,' he says, 'depends on how well we understand the human interface and the human thought process as people go through the daily work process.'

At one time, many decades ago, most large companies had an Organization and Methods department that undertook studies into how work was being undertaken and what

process changes ought to be made, an area of study that then became known as Operational Research. One of the most original thinkers on this subject was Stafford Beer, who developed the concept of the Viable Systems Model.[32] This model was designed to enable an enterprise to meet the demands of surviving in rapidly changing business and economic environments and was the subject of The Brain of the Firm. Perhaps now is the time to review the value of the Viable Systems Model in the context of digital work platforms.

Another important research tool is ethnographical research. Ethnography is the branch of anthropology that involves trying to understand how people live their lives. Unlike traditional market researchers, who ask specific, highly practical questions, anthropological researchers visit consumers in their homes or offices to observe and listen in a non-directed way. The goal is to see people's behaviour on their terms, not ours. While this observational method may appear inefficient, it can be very enlightening about the context in which customers would use a new product and the meaning that product might hold in their lives. This approach has been applied to work practices, with the work carried out at the International Monetary Fund by Richard Harper setting a very high standard for the methodology and its value to an organization.[33]

These techniques are now being applied to digital work, notably by a research group at Xerox led by Jennifer Watts-Englert. The group has been carrying out a multi-year ethnographic study of how knowledge workers integrate new technology into their work practices.[34] The group studied mobile and remote workers who use smartphones, tablets, cloud computing, and social networking to support their work. The outcomes of the work describe the characteristics of mobile work, the coordination of multiple devices and sources of information, how new technology functioned as a social resource and issues that arose when participants used personal mobile devices to support work.

In parallel, a research group at PARC has been developing a cross-channel information management tool which is to a significant extent a prototype for a digital work platform.[35] Studying two communities from a large IT enterprise, they characterized the work practices and information-management needs of a growing class of knowledge workers, categorizing them as requiring:

- Information aggregated across multiple channels, including the combination of content and status updates
- Filters that help to easily find important content
- Organization and sharing functions for individual and collaborative sensemaking.

Although Xerox PARC and IBM are among the leaders in this area of digital work research, another valuable resource is the work of the MIT Center for Digital Business[36] which carries out a substantial programme of research in this area

and publishes a wide range of working papers each year. However, much of the research into digital workplaces is published in peer-reviewed journals or in conference proceedings. The Digital Library of the US Association of Computer Machinery contains over 6000 citations to papers, reports and conferences on various aspects of digital workplaces, but access to this requires membership of the ACM. There is a similar situation with the IEEE Xplore digital library.

Although there are many blogs that comment on digital workplaces, none are grounded in the wealth of research that has already been undertaken into their design and use, and the blogs tend to focus on the philosophy of a digital workplace. There has also been a significant amount of research into Computer-Mediated Communication (CMC) and Computer-Supported Collaborative Work.

The fact that this work is invisible and never cited is probably a result of the algorithms used by Google. If a search is conducted using 'digital workplace' as the search term then the first reference to any peer-reviewed research paper will be found on the 30th page of results, and that reference is to a paper published in 2002. In the bibliography to this paper it will be seen that many of the research papers are available on the web through institutional websites, but these can only be found if either the exact title or the authors are known. Most of the research conducted for this article was carried out using the ACM Digital Library.

Language and culture

Two major challenges to the adoption of a digital workplace are the multiplicity of languages and the impact of organizational and personal cultures. Many multinational companies (and which companies nowadays are not multinational?) claim that the corporate language is English. English may indeed be the default language of communication, but there will be many instances where the corporate language is the national language of the location of the office. In many countries legal documents (such as contracts) that are not in the national language are not valid documents, and that often applies to employment contracts. A significant amount of research has been carried out into the problems around language, including a working paper from Harvard Business School imaginatively entitled *Walking Through Jelly: Language Proficiency, Emotions, and Disrupted Collaboration in Global Work.*[37]

Anyone who has worked for a period of time outside of North America and Europe knows that business cultures and the respect for hierarchy and seniority vary widely across the global business community. The danger with a poorly conceived and implemented digital work platform is that it may well hold up a magnifying glass to these cultural issues. One department where the use of English is especially widespread and where the culture is usually very open and collaborative is the IT department, who may

fail to appreciate the challenges they will face in implementing a global digital work platform that has been specified, developed and tested in North America.

An area that is closely related to a digital workplace is the management of virtual teams. A substantial amount of research has been carried out into the success factors of virtual teams, especially in the use of technology[38] and could usefully be incorporated into the design of digital workplaces.

Conclusions

There is now a very urgent need to resolve the information paradox referred to in the opening section of this article. Companies cannot continue to function without being able to make the maximum possible use of the information assets they have invested in but cannot find, and the expertise of staff they have hired but cannot identify. Digital workplaces will be needed to create macro-economic gains and not micro-economic savings, enabling companies to:

- Enhance market share and competitiveness, especially in the more rapidly developing economies such as Brazil, India and China
- Increase margins on the delivery of services and products to provide investment funding and a better return to investors
- Reduce the time to market of innovations in service and product development
- Respond quickly to business opportunities and challenges.

These digital workplaces will not come through a bottom-up evolution of intranets, though the corporate knowledge of working practices and information requirements will be of great value in designing digital workplaces. The initiatives will come from the Board in response to the challenges and opportunities of digital transformation.

In the view of International Data Corporation, the largest global IT market analysis and forecasting company[39] in announcing its 2013 forecast:

> The information and communications technology (ICT) industry is in the midst of a once every 20–25 years shift to a new technology platform for growth and innovation. IDC calls it the 3rd Platform, built on mobile devices and apps, cloud services, mobile broadband networks, big data analytics and social technologies. By 2020, when worldwide ICT spending reaches $5 trillion ($1.7 trillion larger than it is today) at least 80 per cent of the industry's growth will be driven by these 3rd platform technologies. In the interim, there will be an explosion of new products and solutions built on the 3rd platform, along with rapidly expanding consumption of these products and solutions in emerging markets.

The change management implications are immense and need careful attention. What is also certain is that working practices will change to take advantage of the significant advances in technology over the next few years, and also the way in which teenage future employees will expect to be able to use these technologies for personal development and the achievement of corporate objectives, in that order. There is a substantial amount of research already available on emerging work patterns, and intranet managers and other information professionals need to become familiar with it and begin to support these new work patterns at a proof of concept stage in anticipation of being able to use this knowledge in partnership with IT and business units to develop the first generation of digital work platforms.

Notes

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