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Urban histories within a global epos: how digital and physical modes of communication can enable promising network narratives.

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Abstract

This paper concerns the use of a digital work style among urban employees, a way of working in which people are enabled to work independently, wherever and whenever, and to cooperate virtually, using digital tools in their work processes. Such a work style could lead to a diminishing level of face-to-face contact, which, in turn, may result in a dispersion of organisational sites outside urban areas. The debate in the literature about the conditions for this development, is known as the 'death of distance'. In line with this debate we study the work style of a Dutch subsidiary of an internationally operating software company in Amsterdam, one of the most urbanized places of the Netherlands. Therefore, we empirically explore the presence of personas in different business model. Personas are fictive user profiles that can describe the level of receptiveness to new technologies. Business models are the common way to pinpoint the ways how organisations add value. Specific business models theoretically represent the death of distance, meaning that organisational structures support the work of people without being physically together. On the one hand we have found three personas, who have different working behaviours in relation with Information and Communication Technologies (ICT). On the other hand, the factor analysis results show that the theoretical business methods are yet not sufficiently refined to describe the way of work of the company. These findings are discussed in light of the company's intentions to relocate the subsidiary's office building.

Keywords: business models, personas, urban locations, space, ICT.

Introduction

This paper seeks to identify specific strategies and structures that enable the administrative coordination of group decision making amongst urban stakeholders with varying backgrounds. It seeks to investigate which of available methods might offer them an appropriate mechanism to lever “smart” work, i.e., the capability to mobilize and connect systems, including various worlds of virtual, physical and social to individual cognitive needs and capacities, in real time and in parallel (Go and Fenema, 2006). The former would be coordinated by information communication technologies (ICTs) for collaborative advantage, resulting in a so-called digital work style. Accordingly, the paper focuses on two questions:

1. What business models support encounter-based services of the digital work style? We explore this question by relating business models to fictive user profiles (so-called personas) designed to enact the expectations of future potential usage of ICTs, as a means to raise the productivity, job satisfaction and flexibility performance of stakeholders. As work increasingly comprises both co-located and (remote) mobile ‘production’ components, the following issue arises, namely:
2. How should organizations adapt their organizational structures, both physical (within an urban context) and virtual ones, in order to respond to the expectations of selected personas, based on the empirical findings that delineate their specific behavioural beliefs and work patterns along the dimensions that are characteristic of the digital work style?

The logic of our paper is based on two premises. First, we apply the rationale of the theatre metaphor to illustrate that, in essence, complex activities such as effective new product development comes about via network encounters between actor(s) and audience. However, such encounters increasingly tend to be at arms-length or virtual in nature and increasingly involve globally-distributed teams in co-production, resembling the way that special events productions are coordinated. Second, we posit that success is increasingly determined by one’s capability to connect activities on the level of the ‘world stage’, i.e. global systems to the local scene, or the other way around. By extension, the former implies the subsequent need for agents to create trust between global and local systems (Ganzarolli, 2002) in order to gain, through trustworthy connections, access to ‘fine-grained’ knowledge to make sense (Weick, 1995) of ‘global’ space.

The aforementioned premises result in an issue, i.e., the need to understand how to create trust in the overlap between global and local systems. The development of global institutions and technologies, such as virtual communities of practice, affords an opportunity ‘to replace the value of local relationships of trust based on mutual knowledge and to standardize the way trust is established and created between people and firms’ (Ganzarolli, 2002). The network-centric organization format (Ford et al, 2003) enables the interaction, that affords corporations, in turn, first, to incorporate same in their business models; second, to support personas to leverage the information advantage to dramatically increase their capacity through self-synchronization and, third, connect to institutional urban support and related network-centric operations (Gartska, 2000) to develop products more successfully, that is to say in a fashion, which is popularly perceived as smarter, faster, cheaper and cleaner (e.g. in terms of reducing CO2 emissions).

Theoretical Framework

Digital work style and productivity

One decade ago, Drucker (1991) studied the opportunities to raise labour productivity. He specifically aimed at productivity gains of knowledge workers in the service industry by means of “smart” work. Since that time, the uptake of information and communication technologies (ICTs) in business and society, have increased opportunities for collaborative work, increasingly on a globally distributed scale. Aral et al. (2006) argue for the role of appropriate network structures and multi-task working

methods in order to exploit the productivity promises of ICT. Our study explores the potential further evolution of business models wherein ICTs and networks support business-to-business relationships via smart ways of working (Ford et al., 2003).

Recently, Langlois (2003) has argued that improved ICT and developments in transport caused considerable changes in business processes and result in a renaissance of research focusing on a firm's intra- and inter-organizational processes by means of the standardization of work in modular units. His research emphasises notions of market coordination following in essence Smith's 'invisible hand'. In line with this argument, authors have declared the 'death of distance' meaning that work could be performed anywhere in a standardized way (Cairncross, 1997). The accompanying style of working is popularly referred to as 'digital work style'.

The digital work style encapsulates a new way of working enabled by information technology. It is often associated with increases in flexibility, also, described in European Union reports as eWork, that is, new ways of working in the dynamic, digital, knowledge-based economy. It entails a new phase, including development of 'tele-work', with its benefits in time and place, and anticipates a revolution in work for most people as information technologies change office equipment and design, and as the nature of work itself changes (Johnston and Noland, 2002). The following description, as stated by Bill Gates, former chairman of Microsoft, gives a broad understanding of the digital work style:

[A digital work style is a] work style, where workers have and make use of the nearly on-site (office) levels of service and capabilities regardless of location and time. Integration between data, desktops, and collaboration between users and departments are widespread. Collaboration through Video, Instant Messaging, Document Sharing and other capabilities, which already exist today.

These devices enable workers in finding and sharing information, working together, creating information, developing insights, taking action, driving business processes, by utilizing extensive digital tools in our day to day work. The workforce that adopted a digital work style is always on and always connected -- using these new tools to work more efficiently and effectively and help people organize and prioritise their work and personal lives.

Examples of these tools are: "online video training; collaborative screen sharing (for reducing trips); business information on mobile phones (e-mail); online training (human resource matters) and live sales information.

The (ir)relevance of distance

Does this digital work style make distance irrelevant? It may be too soon to tell whether it's irrelevant or not. The case of the software industry in India illustrates this claim. It is especially the need for geographic proximity aimed at new product development (Ganesan et al., 2005) that appears to have generated centres of gravity, that is to say, clusters of skills. This Indian case shows that, although global forces standardize many aspects of our work styles, they, paradoxically, create national, regional and local differences in personal - and career opportunities at the same time. Consequently, 'localized', transnational, and hybrid cultures and identities have evolved that represent social networks, which influence decision-making and work patterns. Complex work tends to cluster in urban areas, because it requires tacit knowledge (Nonaka, 1991), creativity (Florida, 2002), face-to-face communication, specialized resources, market and strategic capabilities (Zaheer and Manrakhan, 2001).

Physical proximity is important in the course of carrying out complex work. However, performance measures push companies towards geographical distribution of project management. And, in turn, trigger the need to establish relational ties (by a mixture of digital and physical means), which allows for trust building and tacit knowledge sharing.

But Ganesan et al. (2005) advocate that, because of the lack of unnecessary distractions, a digital work style may be more effective for complex work than its face-to-face variant, which may be more appropriate for specific problem-solving situations.

In summary, we observe several positions in the literature on the issues of distance. The extremes are that 'physical proximity of workers is essential for understanding that (complex) work (distance is important)' versus a perspective that 'work can be performed everywhere (distance is unimportant – death of distance)'. Hence, this paper may be seen as a search to explain which catalyst appears to trigger the pendulum movement, described above by studying a different aspect of work style. The earlier noted definition of digital work style is our starting point in the description of ICT-based professional work. We approach this concept from two angles: first, the characteristics of professional workers and, second, possible 'ways to conduct work'. We describe the former through the use of the so-called personas technique; the latter by means of relevant business models.

Personas: worker archetypes

Personas are fictional worker profiles. Agarwal and Prasad (1999) suggest that the construction of profiles of individuals serves a dual purpose. First, to control for individual differences; and second, to lever such insight to identify those personas, who appear more receptive to new technologies or the digital work style than others. In the present study, we, in turn, use personas to connote dissimilarities among them, including differences in psychographic beliefs, such as perceptions and behaviours. It is assumed, that the fictive representations of such user profiles can be translated, in real work practice, into personifications of specific target groups who display different behavioural characteristics compared to others. The personas technique demonstrates some parallel characteristics with those observed in ethnography. The latter refers to studying and learning about a person or group of people in their own, natural environment" (Grudin, 2006). Whereas "traditional ethnography relies on information obtained from a few people, over a longer time, to reach an understanding, persona design draws on information obtained from many people, over a shorter time, to reach an understanding, which is then communicated to others through examples – personas—that show the norms and ranges of behavior. (Grudin, 2006)".

The use of "personas", i.e., fictional people, first gained popularity in the software industry as a user representation tool. Particularly, in product design it is presently widely heralded for creating "easy to communicate" personas (Cooper, 1999).

Whereas personas give an idea about the working behaviour of persons, so-called business models describe labour processes.

Business models

The term 'business model' emerged at the dawn of the digital age (Magretta, 2002). Its potential to combine the architecture of professional activities with ICT standard designs has turned the idea of business model into one of the most discussed concepts today. The reasons for their popularity are that business models make sense because they offer suggestions to make work more efficient, flexible and smarter (Malone et al., 2006). Outsourcing, partnerships, alliances are only a few of the often used terms to denote business models.

In essence, a business model is the unit of analysis that depicts the sources for the firm's value creation and explains the underlying logic how such value is delivered to customers (Amit and Zott, 2001; Magretta, 2002). The models create a narrative of the business system that the company applies, which is a set of processes by which the company carries out its business. These processes have a goal (strategy), are being performed by the use of people and equipment (technology with certain dependencies creating information needs) and need to be coordinated (structure as information

processing device, answering the information needs) (Davenport and Short, 1990). Malone et al. (2006), for instance, lists sixteen models, such as entrepreneurship, manufacturer, retailer, broker and so on. These models are based on the dimensions ‘right being sold’, ‘the amount of transformation to the asset’ and the ‘type of asset involved’.

In our study, we identify those dimensions that seem to be present in work style studies, particularly the level of codification and the level of diffusions of knowledge, which result in the focus of efficient work and the willingness to exchange, respectively (Boisot and Child, 1996; Ducatel et al, 2001). This observation leads us to the business systems who describe how, in various cultures, different routes result in four distinct ways of work.

The first dimension (the level of diffusion) discusses ‘information dispersion’ or ‘diffusion’, which ranges from centrally-controlled (e.g. hierarchies) to unlimited diffusion (e.g. market companies). However, such unlimited diffusion is not always possible, especially in cases that concern complex issues. Here, we touch upon the second dimension that refers to the handling the level of certainty; it is coined ‘structured information’ or ‘codification’.

The combination of dimensions creates a typology of business systems that defines codified and rule-driven ‘bureaucracies’, free ‘market systems’, isolated ‘fiefs’ (cultures wherein information is controlled) and flexible ‘clans’ (see Figure 1). In our study the clan is represented by a model wherein group members intend to share information with other clans.

STRUCTURED INFORMATION	<p>2. BUREAUCRACIES</p> <ul style="list-style-type: none"> • Information diffusion limited and under central control • Relationships impersonal and hierarchical • Submission to superordinate goals • Hierarchical coordination • No necessity to share values and beliefs 	<p>3. MARKETS</p> <ul style="list-style-type: none"> • Information widely diffused, no control • Relationships impersonal and competitive • No superordinate goals - each one for himself • Horizontal coordination through self-regulation • No necessity to share values and beliefs
UNSTRUCTURED INFORMATION	<p>1. FIEFS</p> <ul style="list-style-type: none"> • Information diffusion limited by lack of codification to face-to-face relationship • Relationships personal and hierarchical (feudal/charismatic) • Submission to superordinate goals • Hierarchical coordination • Necessity to share values and beliefs 	<p>4. CLANS</p> <ul style="list-style-type: none"> • Information is diffused but still limited by lack of codification to face-to-face relationships • Relationships personal but nonhierarchical • Goals are shared through a process of negotiation • Horizontal coordination through negotiation • Necessity to share values and beliefs
	UNDIFFUSED INFORMATION	DIFFUSED INFORMATION

Figure 1 Business systems (Boisot and Child, 1996)

This model does not, however, pay explicit attention to new options of ICT. Contemporary and future methods of communication, e.g., email and instant messaging, allow for more efficient means of information exchange and at much lower costs than older methods, e.g., face to face meetings, memos, etc. (Malone 2004). Recently, a study commissioned by the European Union has scrutinized the subject of ICTs for Ambient Intelligence (AmI). AmI puts the emphasis on user-friendliness, efficient and distributed services support, user empowerment, and support for human interactions. This vision assumes a shift away from PCs to a variety of devices which are unobtrusively embedded in our environment and which are accessed via intelligent interfaces (Ducatel et al, 2001). The report

generated four scenarios based on two axes. Firstly, there is the attribute ‘attention for efficiency’, which is seen to align with the level of codification. This attribute ranges from efficiency to ‘sociable and humanistic’ - a value that represents attention for dealing effectively with complex and ‘soft’ issues. Secondly, they depict the attribute ‘individual’, representing the opportunity for individuals and members of clans to spread ideas; this attribute is seen to align with the level of diffusion (closed communities often hinder this diffusion).

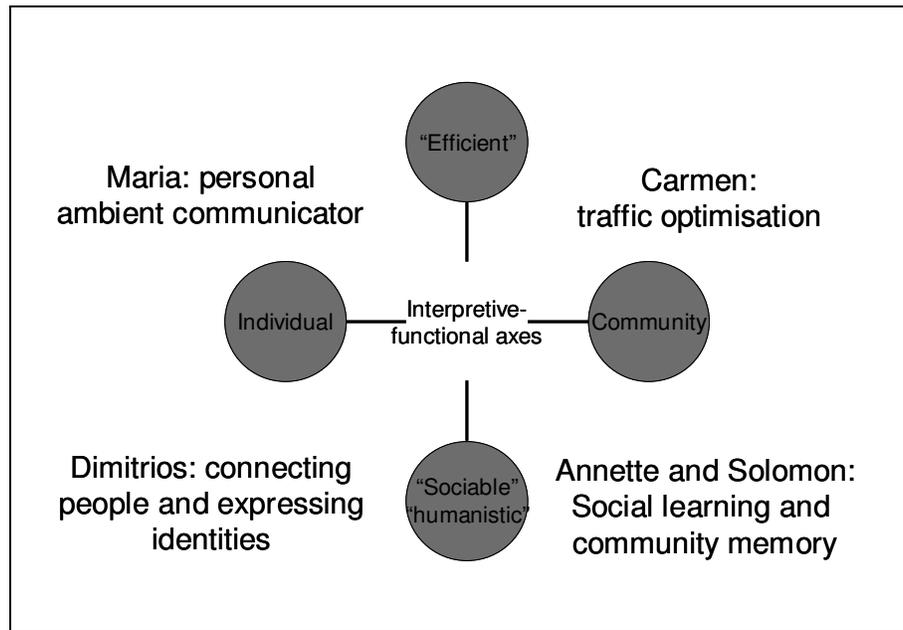


Figure 2 Ambient ICT scenarios (Ducatel et al., 2001)

Each scenario refers to a specific business model, which supports the personas in their work by specific organizational and technological features. We will discuss them below.

- The Market is represented by personal ambient communicators. Here we see the stand-alone business model (dimension values: efficient/codified and individual/diffusion) that realizes work by personal devices with embedded intelligence that support human performance in dynamic situations. ICT is a strategic asset that serves as a competitive tool. It helps the salesman that works out-of-office, the general practitioner that helps homebound patients from his office but buyers and sellers at auctions where they, nor the merchandise, have to be at one physical location.
- Bureaucracies are represented by traffic optimisation. This is the service-demand business model (dimension values: efficient/codified and community/undiffused) that enables work of bordered systems. ICT is foremost a processing tool that computes many simple data within a bound context. Examples are traffic services, stock exchange systems, internet finance systems in which protection and verification are very important.
- A Fief is represented by social learning and community memory. The self-provision business model links end users who are also in close contact with each other (dimension values: effective/uncodified and community/undiffused). ICT consists of group decision making software and knowledge-based facilities as leverage in the community of end users, but also between them as a group and other institutions. We think of strategic decisions makers, intramural medical practitioners, Indian farmers who apply micro credits and participants of self-help groups

- Clans are represented by connecting people and representing identities. Here we have a mass business model in order to efficiently support a large number of people in a half-open setting (dimension values: effective/codified and individual/diffused). ICT is the supportive tool for actors to enable business. Examples are the support of teaching with decentralized systems but also back-office systems to process a multitude of complex issues.

Business models and the death of distance

The discussion on business models resulted in two dimensions, which may illustrate how personas adopt the (digital) work-style concept. By doing so, we hope that illustration results in clues for the need to cooperate in close nearness (meaning the relevance of distance). The comparison of business models and the discussion about ‘distance’ leads to the following positions.

A first position is that ICTs enable people to cooperate wherever and however. Modern technologies provide organizations the capability to create knowledge/experience databases where workers can look for information to help them in their projects or connect them to people who might be able to offer advice and guidance. These technologies include blogs, groupware, recommender systems, and various other knowledge management systems ([Malone, 2004](#)). This position refers to the death of distance.

A second position takes into account the different types of work. Indeed, when the issues are clear and data are reliable, groups work easily based on analytical, linear frameworks, with process efficiency as key. But when many elements have to be combined into creative solutions, and the degree of complexity ascends, non-linear behaviour is of essence and corporeal travel across geographical boundaries often mandatory so as to get acquainted with the other’s capabilities, both the strengths and weaknesses and establish trust among group members, perhaps the key ingredient for close cooperation needed to solve complex problems (Mintzberg, 2001). Then, face-to-face contacts are necessary. [Aral et al. \(2006\)](#) search for the impact of ICT on multitasking and asynchronous work and find that ICT makes multitasking and asynchronous work possible (and so create more productivity) but also see that still meetings are essential to plan, divide tasks and ensure that members are on the same game. And with increasing multitasking (in complex project environments) the more face-to-face communication is needed, ICT can be applied to support but not replace the former.

Therefore we presume that the ‘death of distance’ observation may hold true in those cases, wherein ‘codified/efficient’ or ‘diffused/individual’ values represent the dominant business model. However, as each business case is unique the decision makers must be aware of and understand two matters of substance. These are, first, the specific opportunities and limitations that a firm’s business model affords one to enhance corporate performance. Second, that each of the personas within a typology (that may be portrayed as a mobility continuum) represents particular strengths and weaknesses. Accordingly, the real challenge is to find ways and means to match the latter with opportunities afforded by the business model so as to achieve optimal performance.

Case Study Method

Introduction

Our study attempts to refine [Ganesan et al.’s \(2005\)](#) point of view with the previous discussion in mind; we will explore (urban) situations in order to find personas that work in the non-codified and cooperative setting of the business model, which represents work situations in which closeness is important. The other three positions in the business model (codified or individual) represent the death of distance.

After the introduction of the case context and sampling procedure, we start with verifying the appropriate business models of our case company within the Dutch business. Furthermore, our empirical case study determines the personas (Cooper, 1999). As mentioned earlier, these are, first, based on observed group dynamics (including cultural elements and willingness to change), subsequently, applied to provide an organization with fictive user-profiles, which finally, can be linked to various ICT- roles (see for instance the ISTAG scenarios). Finally, we explore insights on how Dutch urban institutions host the virtual and physical networks of the aforementioned scenarios.

The Context: Softinternational Holland

The personas analysis outlined above is conducted at Softinternational Holland (a fictitious name of the Dutch subsidiary of a multinational software house), based on the implementation of an internal organizational change program. The study is conducted among individuals who were about to be introduced to an organizational work setting change in their workplace. The internal organizational change at Softinternational Holland has as its main objective to create and harness knowledge aimed at increasing knowledge worker productivity. The latter underscores Softinternational's believe that the key to helping businesses is to become more agile and productive in the global economy by means of the empowerment individual workers, i.e., giving them tools that are seen to enable them to improve efficiency and focus on high-value work.

The quantitative research design is chosen to examine the proposed relationships among the various constructs in the research model. The next section describes the sampling method, construct measures, and analysis methods employed.

Sample Description and Procedure

The case company is chosen based upon the following criteria: (1) it expressed interest in participating in a study of internally reorganizing the organization to enable their people with the right technology to work whenever, wherever. (2) it expressed desire to transform the business. In total, the questionnaire was sent to a sample of 350 individuals working at Softinternational Holland from diverse work units.

Workers at Softinternational Holland were invited to complete the questionnaire; enabling them to express their potential concern about the proposed changes. Subsequently, the completed questionnaires from 223 respondents were returned, overall yielding a response rate of 64%, which means 223 respondents of the 350 who had seen the first page of the questionnaire actually completed it.

An online tool served to distribute the survey (through an e-mail notification) to the entire population of the organization under study. Through this approach, the current study was designed to ensure a random sampling of the knowledge workers in the case organization. To achieve acceptable levels of measurement reliability and validity, a pilot study and a pre-test was carried out, following the guidelines suggested by Dillman (1978). A pre-tested questionnaire containing eighteen items of existing constructs from other studies was administered at the Dutch subsidiary of the Softinternational, resulting in 223 responses in three weeks (calendar week 28-30, 2007).

Step 1: factor analysis to determine the dimensions of work style

The survey in the current study contained eighteen items addressing work behavior patterns. These items characterize the new way of working in the organization, which were found to be representative parameters of the digital work style. They concern elements of autonomy, collaborative technology use, workplace mobility, interdependence and collective values. Although many of the variables are

adapted for use in a different context, the questions are essentially those used in previous studies (Miller, 1990; [Ryssel et al, 2004](#)). The scales were all based on a seven-point scale (see: appendix).

Our first step was the selection of variables to subsequently "carve" the knowledge worker population into subgroups. In order to do so, we grouped the items based on the underlying constructs that intent to measure and assess the reliability of the scales. We included the total set of 18 variables in one single confirmatory factory analysis to assess the underlying factor structure, and consider how well the hypothesized factor structure defined in our model fits the observed data. For this analysis, significance was based on a power level of 80%, at a 0.05 significant level, with standard errors assumed to be twice those of conventional correlation coefficient. Accordingly, with our sample size of 223, a factor loading of 0.40 or higher should be considered as a cut-off value. Through the confirmatory factor analysis, discriminant and convergent validity of the dimensions were assessed.

Step 2: cluster analysis to identify personas

We seek to provide scientific evidence in the Softinternational Holland case through the validation of qualitatively derived archetypes by empirical data so that we are able to gain those insights necessary to either support or reject the personas technique.

In the current study we injected measures based on the result of the factor analysis. The expected result was a number of clusters, specific to the problem at hand, representing a behavioural pattern depending on a particular archetype considered. These behavioural patterns typically correspond to work style choices made by respondents in our study.

In order to create homogeneous groups of respondents (personas) we conducted cluster analysis ([Gray, 1997](#)). A clustering technique was used to develop typologies of knowledge workers based on shared behavioural patterns. Consequently, we used Ward's method and squared-Euclidian distances, a hierarchical cluster technique, to assess the number of clusters appropriate and to be used for further analysis. For determining the number of clusters we assessed the percentage change in agglomeration coefficients, which suggested that the appropriate number of clusters was three.

Hereafter, we used K-means method of non-hierarchical clustering to divide and refine our sample in clusters. This two-stage approach was suggested because of the robustness of the K-means approach to the presence of outliers (Punj and Steward, 1983), which resulted in our final cluster solution.

Step 3: positioning the results in an ICT-based, urban context

In our study we intend to focus on those clusters of behavioural patterns that seem to bear a relationship and be applicable to the context of a digital work style. In that sense the clusters, or personas, may be interpreted to encapsulate a behavioural pattern along the dimensions that are characteristic of the digital work style. Following that, we position this result in arising developments in the Dutch urban context.

Results

Step 1: factor analysis to determine the dimensions of work style

Table 1 demonstrates the results of the factor analysis of work behaviours. The 18 work behaviour items were grouped into a total of four factors and given names according to the type of behaviour that was included under the given construct. The factor analysis used principal components in order to extract the maximum variance from the items.

	Component			
	1	2	3	4
Autonomy how	0,73			
Autonomy where	0,83			
Autonomy freedom	0,77			
Collaborative face		0,65		
Mobile when home	0,73			
Mobile while traveling	0,65			
Mobile within company	0,50			
Interdependent check		0,81		
Interdependent cooperate		0,87		
Interdependent closely		0,82		
Posit yourself	0,58			
Information management			0,80	
Communication			0,80	
Decision support			0,80	
Collective work together		0,67		
Collaborative e-conference				0,78
Collaborative chat				0,76
Collaborative portals				0,66

Rotation converged in 5 iterations

Table 1 - Factor analysis of work behavior

To minimize the number of items that have high loadings on any given factor, a varimax rotation was utilized. Using the Kaiser Eigenvalues greater than unity criterion and the scree plot indicated four to five factors. The two solutions were analysed, and the four-factor solution was used (table 2).

The extracted four factors collectively explained 59% of the variance in all items. For our analysis we followed the guidelines of [Hair et al. \(1998\)](#) for identifying significant factor loadings based on sample size. Factor one was called “Autonomy” and included measures of being able to do work wherever, whenever, and how you want. Factor two was called “Physical cooperation”, its underlying variables included measures of face-to-face to virtual collaboration. Factor three was called “IT-usage”, this construct measured the use of information technology to manage information, communicate, and make decisions in one’s job. The last construct, defined as “Virtual cooperation”, measured the individual’s efforts of communicating with others through internet-based applications, or virtually.

Total Variance Explained			
Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	4,50048	25,00267	25,00267
2	2,95127	16,39594	41,39861
3	1,857949	10,32194	51,72055
4	1,338264	7,434798	59,15535
5	0,99242	5,513442	64,66879

Table 2 - Eigenvalues

Step 2: cluster analysis to identify personas

We appointed single items as representative of each factor under our study and based our clustering process on these as suggested by Gray (1997). Relatively large changes to the agglomeration coefficient between the third and second to last clustering stage indicated that the three cluster solution is the optimal number of clusters to be considered for further analysis. Since the number of cases per cluster diminishes with an increasing number of clusters considered, we only take three clusters into account. For these three clusters we demonstrated ‘heterogeneity’ along the above mentioned dimensions, in the multidimensional space.

After having established a suitable number of clusters, we executed non-hierarchical cluster analysis in SPSS, for subsequently refining the clusters. This generated the final cluster-solution for the present study.

The mean scores per cluster of the four variables are depicted in the ANOVA, which is typically used with K-means clustering to test that significant differences exist among the cluster centers.

Given that the clusters generated by the approach we use in this study are proven valid, Scheffé test is used to compare differences in the four factors among the clusters considered in the study.

In the previous section we tentatively labelled the clusters as “cluster 1” to “cluster 3”, respectively. The latter series is based on the significant differences across the behavioural measures and are applied to interpret profiles, accordingly. In this section we interpret the clusters generated by the statistical analysis through examination of the differences in the clustering variables across clusters. We base our interpretation and validation of the clusters on the one-way analysis of variances.

The following three representations of knowledge workers, in turn, represent the entire population under study. The narratives encapsulated with the personas studied embody in everyday life Softinternational Holland workers with different job descriptions, as long as they all share similar behaviour patterns related to their work styles. Consequently, we label the clusters Donny-digital, Ivan-independent and Tania-together.

Cluster Groups	Manager's Behavioural Patterns	Variable Means 1Hi-7 Lo	Groups that Differ*
Group 1	Behaviour		
50%	My job allows me to make my own decisions about where to work	6,116071	3
	I often have to cooperate directly with other people in the department in order to do my job	5,946429	2,3
	Information management (Searching, Storing, Refining, Distributing Information)	6,651786	3
	I frequently collaborate with other people through collaboration technologies. (such as: portals, sharepoints)	6,232143	2,3
Group 2	Behaviour		
22%	My job allows me to make my own decisions about where to work	5,86	N/S
	I often have to cooperate directly with other people in the department in order to do my job	2,76	1,3
	Information management (Searching, Storing, Refining, Distributing Information)	6,46	3
	I frequently collaborate with other people through collaboration technologies. (such as: portals, sharepoints)	5,8	1,3
Group 3	Behaviour		
28%	My job allows me to make my own decisions about where to work	5,52459	1
	I often have to cooperate directly with other people in the department in order to do my job	5,311475	1,2
	Information management (Searching, Storing, Refining, Distributing Information)	5,114754	1,2
	I frequently collaborate with other people through collaboration technologies. (such as: portals, sharepoints)	5,180328	1,2

*based on Scheffe tests at .05 significance level

Table 3 - Three clusters representing personas

Donny - digital (50% of the total sample). This largest group of knowledge workers differs from the other clusters by demonstrating a higher need to cooperate directly with other people in the department, thus showing higher need for interdependence. To facilitate this need, the group of workers collaborates in a more virtual manner than the other groups of knowledge workers. Their job allow them to make their own decisions about how, when, and where to work. Furthermore this group demonstrates high usage of information technology to manage information, support their decisions and communicate with their colleagues.

Ivan - independent (22% of the total sample). These knowledge workers demonstrate only little physical cooperation in their jobs. They were found to have high levels of information technology usage compared to group three, and a moderate to high usage of virtual collaboration or through internet-based utilities.

Tania - together (28% of the total sample). This group of knowledge workers demonstrates a significantly lower level of autonomy in their job behaviour compared to group one. With regard to the needed interdependence it demonstrates moderate levels of interdependence in their jobs. Furthermore they appear to less likely to use information technology in their job in order to communicate, make decisions, and manage information. Compared to the two other groups they have fairly low levels of virtual collaboration.

Step 3: positioning the results in an ICT-based, urban context

Where we expected that the dimension cooperation would range from virtual cooperation towards physical cooperation (indicating the level of intensity of cooperation), it broke up in two independent axes, representing virtual cooperation and physical cooperation. Obviously, virtual cooperation is not generally seen as an exchange for physical cooperation. This means that business models do not opt between facilitating individual versus cooperative behaviour, but that a combination may be offered depending on the situation. Also the work style-mobility axis fell apart, namely in autonomy and in the attitude to use ICT to enable mobility.

In the discussion, we give a preliminary explanation of how the clusters can be understood in terms of the four factors, and so if we see a death of distance. Before that discussion, what light might these results shed on computer supported collaborative working (CSCW) and, consequently, to what extent urban environments may be of any help to answer this organizational question?

In order to be able to respond to the above query, we frame CSCW practice in the present section within a constellation of four multifaceted 'life worlds', namely a material world, a virtual world, a mental world, and a world of social interaction ([Go and Fenema, 2006](#)). It should follow that each of these worlds are embedded within a different culture, e.g., a 'technological culture', relying greatly on the concept of 'codification' and 'positivist reductionism', as opposed to corporate or ethnic cultures that give rise to more dialectical, relational and integrative approaches within organizations. Also, each of these life worlds is governed by a temporal dimension that set themselves apart from one another. For example, the degree of velocity of processes is many times greater in virtual interactions than would be the case in face-to-face processes of intra- and inter-organizational communication, increasingly within networks ([Ford et al, 2003](#)), both local- and global spanning.

Against the backdrop of a network context, the success of a corporation depends increasingly, on its effective relationships with its prime stakeholders, employees, clients and suppliers. As the rules are changing, people are reverting back to rely on their individual talent/skills – this model is on the rise in the Western world and likely to reform the capitals of emerging economies. By extension, it implies that the traditional 'knowledge workplace' is under threat. In that knowledge workers display varying backgrounds, interests and competences, corporations that aim to make a competitive difference must be committed to goal congruence, particularly regarding the building of new capabilities ([Prahalad and Ramaswamy, 2004](#)).

An ICT-based process of enactment, interaction and retention ([Weick, 1995](#)) drives the evolution of new organizational forms. On the web content precedes virtual social interaction and the latter precedes physical social relationships. However, as our study indicates both virtual and physical interactions are important for the organization of “smart” work, i.e., the capability to mobilize and connect systems, including various worlds of virtual, physical and social to individual cognitive needs and capacities, in real time and in parallel ([Go and Fenema, 2006](#)).

It is important to note that people organize themselves around issues. As we head towards decentralized forms of organization, the relationship between knowledge worker and corporation is subject to re-definition.

The move to the new Softinternational office building is in this context relevant in that it affords not only an opportunity to set new policy, but also reflect on the role and the social implications of the office as ‘physical environment’. Our study underscores the importance for a ‘co-evolution’ of the virtual – and physical life worlds, which implies that the new Softinternational building needs to fulfill the role of ‘attractor’ in many-to-many’ networks ([Gummeson, 2006](#)). Put in other words, the new office building should be represented in tandem with knowledge workers as a ‘third place’, i.e., a gathering spot where people like ‘to hang out’, share stories and convey to guests through language, visual images and bodily intensities Softinternational’s philosophy and perceived collaborative advantage of a digital works style.

There are indications that astute organizations are responding to the urgent need to co-evolve towards combining virtual and social systems in support of “smart” work, i.e., the capability to mobilize global systems and connect them to local needs, in real time and in parallel, all coordinated by ICTs and architecture, which dovetails with particular workstyle scenarios, that we analyzed in the present paper. For example, [Myerson and Ross \(2006\)](#) signal in ‘Space to Work’ the rise of four realms of knowledge work: the corporate realm (‘Academy’ or the learning campus e.g. Philips and Infosys Bangalore); the professional realm (‘Guild’ a professional cluster); the public realm (‘Agora’ the public workplace); and the domestic or private realm (‘Lodge’ or the life-work setting).

The dynamics of the above mentioned factors implies that the relationship between corporation and knowledge worker is subject to continuing transformation designed to accomplish high- performance individuals through better team play. By extension, the ascendance of mobile knowledge workers implies that the centre of gravity of business dynamics shifts from ‘workplace’ to ‘workspace’. The mobile knowledge workers and new Softinternational building represent an emerging work or rather life world that invites analytical reflections amongst policy makers with regard to the urban government and enterprise relationship. The latter is subject to continuing transformation towards a ICT-based mediation of the everyday experience and the role of air transport to facilitate corporeal travel. Together the forms of both computing and air travel seem to amount to a phenomenology of air travel and a metaphor for post modern life.

In that sense, the new Softinternational head office at Schiphol becomes intertwined with the psychological aspects of flight, the structures and logistics of terminals, within a complex system of changing experiences of time, space, work, travel, the environment and globalisation ([Lash and Urry, 1994](#)). In particular, the global distribution of work practice as a consequence of outsourcing is reason for policy makers to use the present study to consider how its findings are likely to shape new forms of representation and participation, in the aftermath of the Dutch consensus mechanism referred to domestically as ‘the Polder model’. The relationship between the corporation and government is subject to redefinition, inviting us to visit the thought leadership of [Pralhad and Ramaswamy \(2004\)](#) who advocate the ‘building a new theory of governance’. Alternate forms of governance are needed to address the impact of changing ‘flows’ on urban and regional planning and architectural perspectives on the built environment. Furthermore, it implies that city and regional government must begin to comprehend in tandem with companies the governance of combined systems of technologies, and physical resources to generate network-centric solutions, enabling actors to respond more rapidly to critical infrastructure and insufficient organizational resources. However, that is an issue to be addressed in future research.

Discussions and conclusion

These results are, partly, a confirmation of the theory, but, more importantly, make it impossible to divide the personas over the four quadrants and verify exactly how they relate with the death of distance. As stated before, we have found three personas but cannot frame them in terms of the business model dimensions efficiency and diffusion because the factor analysis has generated four factors. This is not to say that these factors cannot be interpreted in terms of efficiency and diffusions, and so contribute on the discussion of the 'death of distance'. A first attempt to position the results on the theoretical frameworks is as follows.

The personas Donny and Ivan are clearly autonomous and apply ICT to support this behaviour. Besides, both personas have adopted virtual cooperation. This behaviour refers to the death of distance, although physical cooperation is important for Donny. Tania shows the need to cooperate (physical even more than virtual) and has a relative low score on the autonomy and ICT levels. Here distance seems an important issue. The main issue is, however, the question of virtual and physical cooperation. Where physical cooperation clearly relates with community, virtual cooperation is harder to typify. Is it a sign of extra community collaboration (leading to undiffused knowledge: distance is important) or a token that represents individual freedom (leading to diffusion: death of distance)? We need further study in order to grasp this issue.

The value of our research may be summarized as follows. Firstly, from a theoretical perspective our study offers a preliminary academic understanding how digital and physical modes of communication can, firstly, contribute to establish a business model picture, which would guide the formation of a coherent narrative chronicling the extent, content and characteristics of the network in which the actors operate (Ford et al, 2003).

Secondly, to help manage the process of interactive networking, involving simultaneous cooperative and competitive behaviours, and deal with the complex flow of information in the group decision making process within existing relationships, through consistency (a standard stakeholders agreed on); which, in turn, help stakeholders, individually and collectively, to focus on the network outcomes, along three dimensions, namely: stakeholders, activities and resources. Negative outcomes typically lead a stakeholder to change his networking activities and or network picture, whereas positive outcomes are likely to encourage a stakeholder to increase interactive behaviour (Ford et al, 2003:176) so as to leverage and sustain collaborative advantage.

Thirdly, of a practical nature, in that it may help practitioners to identify the opportunities of city-based virtual networks that may contribute to reducing urban problems.

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Appendix: items for cluster analysis and factor analysis

1. My job allows me to make my own decisions about how to schedule my work	Autonomy (All items score 1 =strongly disagree, 7 = strongly agree unless stated otherwise)
2. My job allows me to make my own decisions about where to work	Autonomy
3. My job gives me considerable opportunity for independence and freedom in how I do the work	Autonomy
4. Throughout my daily activities, I often need to collaborate with other people in face-to-face	Collaborative Technology usage
5. I frequently work with people via internet-based conferencing applications	Collaborative Technology usage
6. I frequently participate in real-time online discussions, such as chat or instant messaging	Collaborative Technology usage
7. I frequently collaborate with other people through collaboration technologies (such as: portals, sharepoints)	Collaborative Technology usage
8. I frequently work at home during normal business days	Workplace mobility
9. I frequently work while traveling, for example, at airports or hotels	Workplace Mobility
10. I frequently work at different company sites	Workplace Mobility
11. I often have to meet or check with other people in the department in order to do my job.	Needed interdependence
12. I often have to cooperate directly with other people in the department in order to do my job	Needed interdependence
13. My job requires me to work closely with others employed here.	Needed interdependence
14. I prefer to work with others in my group rather than to work alone	Collective value
15. To which degree do you use INTERNAL Information Technology for the information management tasks (search, storage, refining and distribution of information)?	(1 = not used at all; 7 = strongly used)
16. To which degree do you use INTERNAL Information Technology for communication (coordination of cooperation, general communication between employees, calendaring and scheduling, support of meetings)	(1 = not used at all; 7 = strongly used)
17. To which degree do you use INTERNAL Information Technology for decision support (problem solving, improvement of flexibility, strategic support, quality improvement)	(1 = not used at all; 7 = strongly used)
18. If we make a distinction in types of work styles, where 1 represents a very desk-bound work style, 3 represents a work style where mobility is restricted mainly to meetings in the buildings, and 7 represents an always on the run, or highly mobile work style. Where would you posit yourself?	Score is 1 to 7 (see question)