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Should 'Virtual' Mean 'Vague'? A Plea For More Conceptual Clarity in Researching Virtual Organisations

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Should 'virtual' mean 'vague'? A plea for more conceptual clarity in researching virtual organisations

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Abstract

Around fifteen years ago the concept 'virtual organisation' (VO) was coined to describe changes in organisational structures of value creation as a reaction to developments in modern market environments. Since then, the VO as a concept has been used to describe different things in different contexts, so that today we find a rather unsatisfying mix of VO notions in the literature. Moreover, in many articles the VO remains underspecified and vague; sometimes even a mismatch exists between VO definitions provided and examples discussed. Motivated by these observations we carried out a literature analysis to explore differing notions of virtual organisation. The contribution of our study is twofold. First, we identify and describe in conceptual detail three distinct types of VO as the basis for future research endeavours. Second, we point to a need for conceptual clarity in researching VOs in practice, in light of the rather different management challenges of the three identified types.

Keywords: Virtual Organisation (VO), Literature analysis, Typology

1 Introduction

Market changes and emerging new information and communication technologies (ICT) have a profound and lasting impact on the organisational structures in which value creation is organised. Companies increasingly seek to cooperate in order to gain market or resource access or to share risks in joint initiatives. Moreover, firms change the ways in which they are internally organised to achieve flexibility and responsiveness to changing market requirements. Against this backdrop, scholars have argued in favour of new ways of value creation in virtual organisations (VO).

The term virtual organisation (VO) was coined 15 years ago (Byrne, Brandt & Port 1993; Bleecker 1994). Since then the concept has been used in a range of contexts, which led to rather unsatisfying picture in terms of its conceptual clarity in the literature. Today, different interpretations can be found, which in sum leads to a rather confusing and underspecified notion of what counts as a virtual organisation. In fact, a range of differing organizational forms and their corresponding management issues and research topics are discussed under the VO label. We argue that this situation is problematic in

that in order for the concept to gain credibility and develop into a distinct concept, which can be used in research to describe and explain real world phenomena, we need to clarify what we mean precisely when applying the VO label. Today, rather different organisational entities are subsumed under the one term, which is problematic given the differences in structure, properties and most importantly management challenges. Against this backdrop, we argue in favour of more conceptual clarity in order to know what one is dealing with in a particular research endeavour and for being able to identify distinct management and research issues alike.

To this end, we have carried out an extensive literature review classifying nearly 60 articles according to their VO definitions and the characteristics used for describing the VO concept in these papers. Not surprisingly, we discover that different organisational concepts are discussed under the umbrella term VO. This leads us to the identification of three distinct types of VO. Our analysis not only reveals the two frequently used notions of VO, as an intra-organisational and an inter-organisational concept, but we discovered a third type, which quite often remains somewhat hidden behind the second one. Interestingly, in a number of papers we found a mismatch of definitions provided and cases discussed later in the papers. Again, this can lead to problems with regard to reliability and transferability of the research results provided in these papers. Based on our results and these observations we advocate a more precise approach in defining and dealing with the VO as a concept.

We begin by spelling out our research method for identifying and classifying VO definitions in section 2. In section 3 we present the three identified types of VOs, their constituent characteristics, as well as typical examples and management challenges. In section 4 we discuss our results. In doing so, we point out typical examples of lack of conceptual clarity and discuss implications thereof. We then advocate a more distinct and outspoken understanding of the VO when dealing with the concept in research and practice. Only by applying some conceptual clarity can the virtual organization gain credibility as a concept and can this stream of research make a viable contribution to the literature in the fields of information systems and organisation.

2 Study overview

2.1 Method

Our study is based on in-depth literature research for which we had to identify papers that describe the VO concept. For doing so, we used typical databases such as Ebsco and Proquest to identify a core set of papers. This was followed by a snowball approach for expanding our list with papers using the reference lists of the core papers identified from the databases. Language-wise we were able to include papers from an English and German background.

Only papers that explicitly provide definitions and VO characterisations were included; all other papers were eliminated from the list, e.g. those in which Vos were only mentioned or where a case was discussed without actually defining VO. The final list after classification and consolidation consists of 58 references comprising academic papers as well as some practice-oriented papers and books.

2.1.1 Classification and identification of VO types

The classification process was an iterative process comprising the three stages 1) identification of VO characteristics, 2) classification of papers according to these

characteristics, and 3) consolidation and grouping/re-grouping of the criteria (see figure 1). As such, it resembles a typical qualitative research process (Berg 1995), in which "only the circular interlinking (…) does justice to the character of discovery in qualitative research." (Flick 1998, 44) The interlinked tasks of identifying characteristics, classifying VO definitions and consolidating criteria resemble a typical grounded theory approach, which draws on content analysis as the data analysis technique (Bryman & Bell 2003).
For identifying the VO characteristics all papers were read one by one. Whenever a seemingly new characteristic was found, it was compared with the existing list and added once we decided that the authors indeed describe a new aspect. In order to manage the list of characteristics we frequently compared similar characteristics and joined them when they turned out to describe the same aspect.

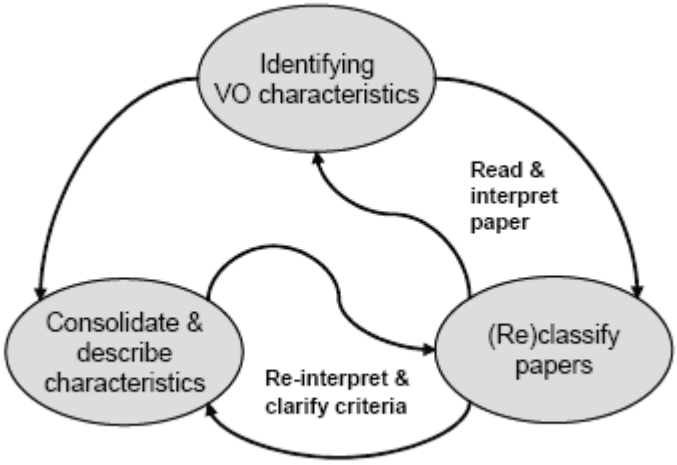

Figure 1: Iterative research process for classifying VO papers

Concurrent to identifying characteristics, papers were classified using the resulting criteria list (see appendix 1); the main result of this process is a classification table that shows for all papers whether a characteristic was mentioned (marked 'X') or not (see appendix 2). Please note that in this table some papers are mentioned twice – this is the case when a paper explicitly distinguishes and describes different types of VOs. We treat these types as distinct definitions that were classified separately since it was our goal to identify and characterise VO types and not papers.
Using these tables as displays, according to Miles and Huberman (1994), we then grouped and re-grouped the definitions in order to identify patterns/clusters and types of VOs, as well as their typical characteristics. We also counted the number of papers that showed certain characteristics and used this to identify both a set of constituent characteristics and a set of characteristics that further describe the three identified types of VO (see appendix 3). As constituent characteristics we count those that are mentioned by at least two thirds of the authors; the second group is made up of criteria that were mentioned by at least one third of the authors. A few papers could not be grouped into one of the clusters since they showed characteristics of more than one type or where very unclear or unspecific in terms of their VO definitions. In appendix 2 these papers are grouped into a fourth group; we will come back to this issue later in the paper.

2.1.2 Analysis of VO case examples

In a second step, we identified all papers in which, in addition to a definition or description of the VO concept, the authors also presented and discussed cases or real-life

examples. We analysed the characteristics of these examples and characterised them in terms of the three types of VOs identified earlier. In doing so, it turned out that a surprising number of papers show a deviation between what is defined as a VO early in the paper and the cases that are presented later. We discuss implications of this finding in section 4.3. Before we describe the three VO types in more detail, we first present briefly the list of classification criteria and give a more detailed overview of the classification results.

2.2 Criteria for characterising VOs

In total 22 characteristics have been used to classify the VO definitions; these criteria are grouped in six clusters each describing a different set of aspects of VOs; the complete list can be found in appendix 1.

The most important group of criteria for characterising virtual organisations comprises the characterisation of different types of *VO network structures*. The VO is generally considered to be a network organisation (Bekkers 2003; Travica 2005), even though different forms are described in the literature. The second group of criteria are concerned with *VO projects*, since the VO is associated with a strong project-oriented organisation (Kasper-Fuehrer & Ashkanasy 2004; Tuma 1998; Saabeel et al. 2002). Geographical, organisational and temporal *distribution of value creation* (and generally work processes) is the next main group for characterising VOs (Bultje & van Wijk 1998); this is closely linked to the idea of ICT being the core enabler of virtual organising (Riemer, Klein & Selz 2001; Saabeel et al. 2002). The criteria in the fourth group characterise VOs in terms of specific *management aspects*. Since VOs are most often discussed in terms of unique ways of *organising value creation* in networks, another group of criteria describe this aspect. The final set of characteristics comprises a range of *aims or goals* intended to be achieved by forming a VO.

2.3 Overview of classification results

Using the 22 characteristics listed in appendix 1 a total of 61 VO definitions were classified and then tabled and sorted in groups (see appendix 2). Three main types of virtual organisations could be identified by using the network structure as the main differentiating criterion: an internally virtualised company, a virtual network organisation and a centralised, value-chain oriented type of VO. Before we describe the three types in more detail in section 3, we first give some more background on the classification results.

Firstly, it becomes obvious that the papers are by no means equally distributed between the three types. The second type is by far the most prominent of the three; it accounts for 42 of the 62 definitions. The first type comprises 11 papers, the third type a mere 4, while 5 papers could not be classified due to a general lack in conceptual clarity or because they intermingle characteristics of two of the three types (see appendix 2).

Secondly, we analysed the fit between definitions provided in the papers and cases discussed. 38 of the papers present one or more VO cases. Of these 16 showed a misfit between the cases and the definitions provided earlier in the papers (see appendix 4). In these papers, most often a type 2 definition is followed by a type 3 case example (in 10 papers). Hence, while type 3 only accounts for a very small fraction of the papers in terms of the definitions provided, it is actually much more prevalent. Authors often intend to discuss a type 3 VO case example, but provide, rather uncritically, definitions and characteristics that describe a type 2 VO. It is this lack of conceptual clarity in

dealing with the VO that we intend to point out with our study, because, as we will also show, the three types exhibit rather different management challenges.

3 Three types of virtual organisations

In the following three sub section we describe the three VO types in terms of their characteristics as identified from the analysis; in doing so, we draw on typical quotes taken from the respective papers. Moreover, we briefly present typical examples and we also point out typical management challenges for the three types, which in the end leads us to suggest that, even though on a structural level the three types might show certain similarities, the resulting challenges are actually quite different. This in turn calls for distinct research endeavours investigating these issues.

3.1 Type 1: The virtualised corporation

We name the type 1 VO a 'virtualised corporation', referring to one company that relies on virtual teams using ICT in order to bridge gaps of geographical (and temporal) distribution; it thus relies on remote and mobile work practices.

3.1.1 Discussion of (constituent) characteristics

The constituent characteristics for defining the virtualised corporation are:

- The VO resembles a collaborative network of people residing inside one organisation (virtual team structures).
- It is characterised by geographical (and temporal) distribution of value creation (de-centralisation),
- and the linking of partners via ICT; ICT thus is the main means for communication and information sharing.
- Consequently, tele and mobile work is quite common, with people being linked via ICT to the company information systems.

In contrast to the other two types of VO, virtualisation in this type happens (more or less) internally, i.e. within the borders of one organisation. As such, a "virtual organisation is a geographically dispersed organisation, in which travel for the purpose of exchanging information is minimised" (Moller 1997, 39); "the emergence of virtual organisation is inconceivable without the capabilities of modern day networked ICTs" (Breu & Hemingway 2004, 194). Authors have coined the term 'virtual office' (e.g. Scholz 1996) to describe the resulting work settings; virtualisation in this sense is about "replacing offices with technology: portable computers, cellular phones, and fax machines all enable remote or mobile work." (Davenport & Pearlson 1998, 51) As a result of the geographical distribution of people trust becomes more important since control is not always possible (Handy 1995, 44).

3.1.2 Typical examples

Most authors mention as typical examples of the virtualised corporation large multi-national corporations (e.g. Scholz 1996; Berger 1996; Breu & Hemingway 2004; Davenport & Pearlson 1998). Berger for example explains that "major cor-porations such as IBM, AT&T, VeriFone, and McDonald's have all introduced or are in the process of exploring variations of the virtual office." (1996, 1) Davenport and Pearlson (1998) also discuss a range of large corporation that have changed heavily the way they operate internally by replacing traditional with virtual work arrangements. Among them are

technology firms such as AT&T, Pacific Bell, Hewlett-Packard or Xerox. They also mention the consultancy business as typical for this type of VO.

3.1.3 Management challenges

A range of management challenges are associated with virtualising organisation structures. Through virtualisation the complexity of the organisation can increase drastically, because of new barriers and inter-group interfaces (Breu & Hemingway 2004). Particularly challenging is the management of the resulting multi-project organisation where people work in more than one (virtually organised) project at the same time (Handy 1995). At the group level, new problems of information exchange and knowledge sharing arise due to the emergence of new spatial and social barriers in distributed environments (Breu & Hemingway 2004). Cramton found that "a central problem of dispersed collaboration is maintaining mutual knowledge [… so that] failure to establish and maintain mutual knowledge can have serious consequences for the viability of the collaboration" (2001, 363). In distributed work arrangements people are often left out of important decision processes (remoteness) which can cause unnecessary conflicts at the team level (Grinter, Herbsleb & Perry 1999).

These problems are further aggravated by the challenges of computer-mediated communication (CMC). While "ICT allows organisations to bridge time and distance barriers with once undreamed of ease" (Kasper-Fuehrer & Ashkanasy 2001, 240), it also creates new boundaries at the level of the work unit (Breu & Hemingway 2004). Scholars have shown that CMC can lead to severe problems of interpreting transmitted information (e.g. Andres 2002; Putnam 2001; Scholz 1996). The resulting communication problems and inefficiencies can increase the informational and knowledge-sharing problems of spatial distribution.

Moreover, in the virtualised organisation people have to show social competencies and to learn to act as boundary spanners to ensure knowledge sharing (Breu & Hemingway 2004). From a human resource perspective further problems are posed by the control and incentive aspects of the new work settings: controlling people and their work processes becomes much more challenging once traditional co-located settings are given up.

To sum up, the challenges of the first type of VO can be subsumed in three groups: 1) project and work management challenges, 2) information systems-related (CMC) challenges and 3) human resources challenges.

3.2 Type 2: The virtual network organisation

We term this type of VO a 'virtual network organisation', because the VO essentially is a network of (often small and medium-sized) companies that, by bringing in their core competencies, join forces in order to swiftly exploit arising market opportunities carried out in short-term projects.

3.2.1 Discussion of (constituent) characteristics

The constituent characteristics for defining the virtual network organisation are:

- The VO is a flexible, collaborative inter-organisational network of independent (small and medium-sized) firms (or individuals).
- Partners bring in their core competencies to the network, where they are synergistically combined to create a best-of-breed organisation.
- Partners join forces to jointly exploit market opportunities.
- Work is undertaken in short-term projects,

- and is characterised by geographical (and temporal) distribution
- and the linking of partners via ICT.
- Trust is the key enabler of collaboration, which points to the importance of social relationships in the network.

Consequently, the virtual network organisation can be described as a "network of companies that come together quickly to exploit fast-changing market opportunities." (Coyle & Schnarr 1995, 41) In contrast to the intra-organizational view, in the type 2 VO "business units of different organizations collaborate" (Kasper-Fuehrer & Ashkanasy 2004, 36). In order to bridge geographic distances "the members in a virtual organization are dependent upon information technology (IT) for the coordination of their activities." (Lin & Lu 2005, 185)

Most authors point to the short-term project nature of the VO as "a temporary network or loose coalition of manufacturing and administrative services that comes together for a specific business purpose and then disassembles when the purpose has been met." (Christie & Levary 1998, 7) However, some authors also point to the need for a long-term element (a pool or source network) so that basic collaborative structures have time to emerge (Saabeel et al. 2002; Franke 2001). In addition, "the relationship between the partnering companies has to be flexible and grounded in mutual trust in order to enable rapid market response" (Franke 2001, 50). For further characteristics please refer to the table in appendix 3.

3.2.2 Typical examples

A typical type 2 VO is a network of small independent firms that team up to jointly achieve virtual size and offer a joint service; a good example is the Australian TCG, a network of 24 small computer service firms that have teamed up to become the largest national computer service provider (see Jurk 2003). From the pool of 24 partners projects are swiftly created to fulfil a specific customer project. In doing so, the partners take on varying roles in the cooperation; a hierarchical organisation does not exist. Another well-known example is the Virtuelle Fabrik Bodensee, a VO in the lake Constance region that has been described by Jurk (2003), Hannus et al. (2004) and more extensively by Göransson and Schuh (1997). The Virtual Factory currently comprises 16 SMEs in engineering, development, and production and aims at designing, developing, and building industrial products to the specifications of customers in changing project configurations. Besides these networks of firms, networks of independent people (that otherwise show the same characteristics) have also been described; Camarinha-Matos and Afsarmanesh (2006) mention freelance networks, while Gallivan (2001) researches Opensource software development groups from a VO perspective.

3.2.3 Management challenges

Management challenges of the virtual network organisation can be identified on two levels of analysis – 1) the organisational level, which comprises typical network management issues, and 2) the group level, which refers to the people issues of collaborating in a virtual network organisation.

Network management challenges refer to the initiation and configuration of the network and the management of network operations (Riemer & Klein 2006). During the initiation of the virtual network organisation the first challenge is the identification of partners for inclusion in the VO pool (Albers et al. 2003; Camarinha-

Matos & Afsarmanesh 2006). Moreover, finding the right people to manage the VO network is another challenge. According to Hannus et al. (2004) VO managers need a range of competencies such as the ability to identify market opportunities, manage across organisational boundaries, and manage complex projects. The next challenge is concerned with finding the right coordination and control mechanisms that allow for effective management without hampering network flexibility (e.g. Albers et al. 2003; Wirtz 2000; Weibler & Deeg 1998; Klein 1994). Furthermore, the distribution of network rents, costs and risks also has to be managed (Scholz 1996); this is especially important in order to avoid conflicts and to uphold a common perception of network fairness.

While the initiation and configuration of the VO network is a challenging task, the main challenges happen to be on the group level, since virtual organisation structures create environments that challenge effective inter-personal collaboration due to both cultural diversity and temporal fluidity. The idea behind the virtual network organisation is the creation of a best of breed collaboration that brings together specialized experts from different organisations. Yet at the same time, diversity and cultural barriers are obstacles for collaboration. While achieving effective group work is challenging within companies, it becomes even more challenging in an inter-firm arrangement, where people come from different organisational backgrounds, which raises questions of diversity and conflict (Riemer & Klein 2008). With increasing group diversity the development of social relationships and a shared group-level understanding becomes more difficult and time consuming (Anand, Clark & Zellmer-Bruhn 2003), which can lead to serious conflicts and 'us and them' thinking (Hughes et al. 2001).

The second management challenge on the group level results from the swift configuration of short-term projects. The limited duration of projects and the switching of partners create a volatile work environment that provides little incentives for people to invest in social group structures or to engage in time consuming social alignments. In fact, people brought together in such an environment face the paradox that they are expected to form teams quickly in order to collaborate, but that in-depth collaboration normally only develops in medium or long-term relationships (Larsen & McInerney 2002).

3.3 Type 3: The virtual value chain network

We term the type 3 VO a 'virtual value chain network', because the VO essentially refers to the network of suppliers (or customers) of one core company that is in charge of strategy and coordination of this network. The VO results from outsourcing of business activities by the focal company thus leading to the distribution of activities to a network of partners coordinated through the application of ICT.

3.3.1 Discussion of (constituent) characteristics

The constituent characteristics for defining the virtual network organisation are:

- The VO refers to the focal network of one company with its suppliers (or customers)
- In which contracts are awarded flexibly to one or more of the partners for often a short- to mid-term duration
- Large parts of the value creation happen organisationally (and geographically) distributed within the external network driven by outsourcing
- And is governed by the application of sophisticated ICTs, such as eBusiness technologies

- Core competence concentration is a main characteristic describing the behaviour of the focal company (via outsourcing) as well as the specialised partners that are sourced to bring in their expertise.

The virtual value chain network is thus defined from the point of view of the core player who governs and controls the network, which is a main difference to the more federated type 2 network VO. The VO is created by one company that outsources a range of its activities to an external network of suppliers (Alt, Legner & Österle 2005; Werther 1999; Lawton & Michaels 2001). In doing so "the core power player determines strategy" (Lawton & Michaels 2001, 110), while contracts play a vital role in governing the network (Werther 1999). The outsourcing results in a geographical and temporal separation of value creation (Alt, Legner & Österle 2005); by applying modern supply chain and eBusiness technologies the focal company then aims to "enhance logistics management with its suppliers" (Lawton & Michaels 2001, 109).

3.3.2 Typical examples

Typical examples of type 3 VOs are companies that are well-known for core competence concentration and the management of a network of supply-side partners, such as Dell, Cisco Systems, Benetton, Nike, Puma, Airbus and the OEMs in the automotive industry. Dell for example is well-known for the management of its just-in-time sourcing network of assembly partners (Lawton & Michaels 2001; Saabeel et al. 2002). Cisco Systems nowadays concentrates on the development and sales of products and owns only two of its 34 production sites, while partners provide nearly every aspect of production and assembly (Rahman & Bhattachryya 2002). Similarly, Benetton, Nike, and Puma have outsourced their production to networks of firms around the globe (mainly in Asia) to fulfil everything but design and market development (Rahman & Bhattachryya 2002).

3.3.3 Management challenges

The core management challenges of this type of VO stem from the outsourcing of business activities to external partners. Firstly, challenges in regards to the make or buy decisions and the determination of the optimal degree of integration and virtualisation have to be mentioned here (Lawton & Michaels 2001). Secondly, selecting the right suppliers is another critical challenge from the point of view of the focal company. Thirdly, the outsourcing relationships have to be managed effectively (Kern & Willcocks 2002); here, negotiation and contracting play a vital role (Werther 1999). Fourthly, hand in hand with effective management of outsourcing relationships goes the application of modern ICTs in terms of IT-enabled supply chain management through eBusiness technologies, in order to co-ordinate and control the virtual value chain via computer systems (Lawton & Michaels 2001). Finally, outsourcing and the management of external partner relationships puts pressure on the internal organisation of the focal company as well. Authors see flexible internal structures as a key success factor for this type of VO (Lawton & Michaels 2001).

4 Discussion and implications

Having introduced and characterised the three types of VO, we will now first of all discuss our results against the backdrop of other VO typologies that we found in the literature, before we will point out the core implications of our research – the need for more conceptual clarity in dealing with the VO as an organisational concept.

4.1 Comparing our classification with existing typologies

Only very few of the papers we examined provide typologies of virtual organisations and to our knowledge none of them grounds their understanding in the body of existing literature like our study does. Most studies that discuss more than one type of VO only distinguish between two types – most often type 1 and type 2; three of these papers provided detailed definitions and were included twice in our classification table (Klein 1994; Tianfield & Unland 2002; Scholz 1996). Only two papers provided typologies with more than two, i.e. a total of four different types (Bultje & van Wijk 1998; Tjaden 2003). Bultje and van Wijk (1998) distinguish an internal VO (type 1), a dynamic VO (type 2), a stable VO (type 3) and as a further type a so-called web-company, while Tjaden presents an intra-organisational (type 1), an inter-organisational (type 2), an extra-organisational (type 3) and a customer-oriented VO.

It becomes obvious that both papers generally correspond well with our typology in that three of the types are similar to our classification. However, the fourth type presented in both typologies refers to virtualisation as being characterised by the use of the Internet. Following this logic, a company is virtual when it uses the Internet to provide services to its customers – Amazon.com is mentioned as a typical example. This notion of virtualisation however is rather different from the one used to define the other three types of VO – virtualisation in our sense refers to changes in organisational structures. As such, the main characteristic of (all three types of) VO is their unique organisational structures, which sets them apart from the traditional functional, hierarchical and vertically integrated organisational form. This fourth notion on the other hand means something different, in that 'virtual' only refers to using a different (ICT-based) marketing channel for providing customer services. Consequently, we argue that this type of web-enabled firm should not be confused with the concept of virtual organising. However, typical web companies are frequently mentioned in the literature as VO examples, even when a different definition of VO is provided, which is one example for lack of conceptual clarity.

4.2 Evidence of lack of conceptual clarity

We found two types of evidence of a lack of conceptual clarity in dealing with the VO. Firstly, a few papers provide, in a rather uncritical fashion, a mix of VO characteristics taken from other papers that do not describe one distinct VO type, but rather mix-up different often conflicting characteristics. Four papers fall in this category, all mixing type 1 and type 2 characteristics by not clearly stating whether virtualisation is an internal or external phenomenon. Hence, these papers mix the notion of a VO "that has several headquarters in different countries" (Shin 2004, 727) with a VO that is a network of "different organizations involved at different times" (Shin 2004, 730). We argue that such a vague and imprecise understanding of the VO does not help in researching its particularities and in drawing sensible conclusions as to their management challenges.

The second and more prevalent example of lack of conceptual clarity is the mismatch between definitions and case examples discussed in the same paper. Ten of the papers we researched provide type 2 definitions but discuss (at least some) examples that do not fit these definitions. Most commonly type 3 examples are provided that obviously do not fit the characteristics provided with the VO definitions, we briefly discuss three examples. Firstly, Lin and Lu (2005) provide a typical, albeit quite abstract, type 2 definition but discuss as a VO case a Taiwanese semiconductor manufacturing company that draws heavily on outsourcing and web-based tools in order to coordinate information flows in

its external supply network. Secondly, Saabel et al. (2002) provide almost an ideal type definition for a virtual network organisation showing all the characteristics of a type 2 VO discussed above. Irritatingly though, the examples the authors provide are Dell, Airbus and also Amazon.com, which again presents a clear mismatch. Finally, Grabowski and Roberts (1999) after introducing type 2 characteristics discuss as VO examples companies such as Nike and Sun. While the authors mention briefly that the type 2 characteristics "are at odds with the dominant player models" of the examples, the question remains as to why the authors do not deal with this apparent mismatch in a more coherent manner.

4.3 Need for conceptual clarity

Drawing from the descriptions of the three types of VOs in section 3 it becomes apparent that in the literature three rather different organisational concepts are discussed under the one umbrella term 'virtual organisation'. While from a very top level (structural) perspective the three types share some common properties (e.g. distribution of value creation, ICT usage, the network character), they show very different management needs once we shift the focus to a meso or micro level of analysis, where virtual teams, VO projects or value creation processes have to be managed. Figure 2 provides a summary of the typical management challenges of the three types, which makes clear that one needs to be specific about the type of VO that is being studied, such as in case studies dealing with real-life VOs. By mingling characteristics of different VO types, research results are likely to remain rather arbitrary. In order to gain credibility and to make a useful contribution to both organisation and information systems research, we need to be more specific about the characteristics of what we are researching and to appreciate the different challenges of the three types of VOs.

For example, the types 2 and 3 are both networks of organisations and as such are treated by some authors as very similar albeit with a slight structural difference, i.e. the existence of a central coordinating entity (e.g. Mertens, Griese & Ehrenberg 1998). However, the differences are much more profound once we shift our attention to a lower level of analysis. While type 3 VOs show some similar characteristics as type 2 VOs, such as geographical dispersion and ICT use, core competence concentration, and to a certain degree the flexibilities of switching partners, they also show significant differences. Firstly, type 3 networks are hierarchically organised by the dominant brand owners, often in a rather tight fashion. As such they resemble hierarchical supply networks. Secondly, virtualisation often concentrates on capacity aspects with well-specified production contracts handed out to the partners. Hence, inter-personal collaboration requirements are significantly lower since in outsourcing agreements task interdependencies are less prevalent than in joint engineering or development projects, which leads to very different management challenges. On the other hand, some unique challenges exist in the type 3 VO such as negotiating outsourcing agreements, managing a complex supply network and the striving for operational efficiency by applying supply chain ICT systems.

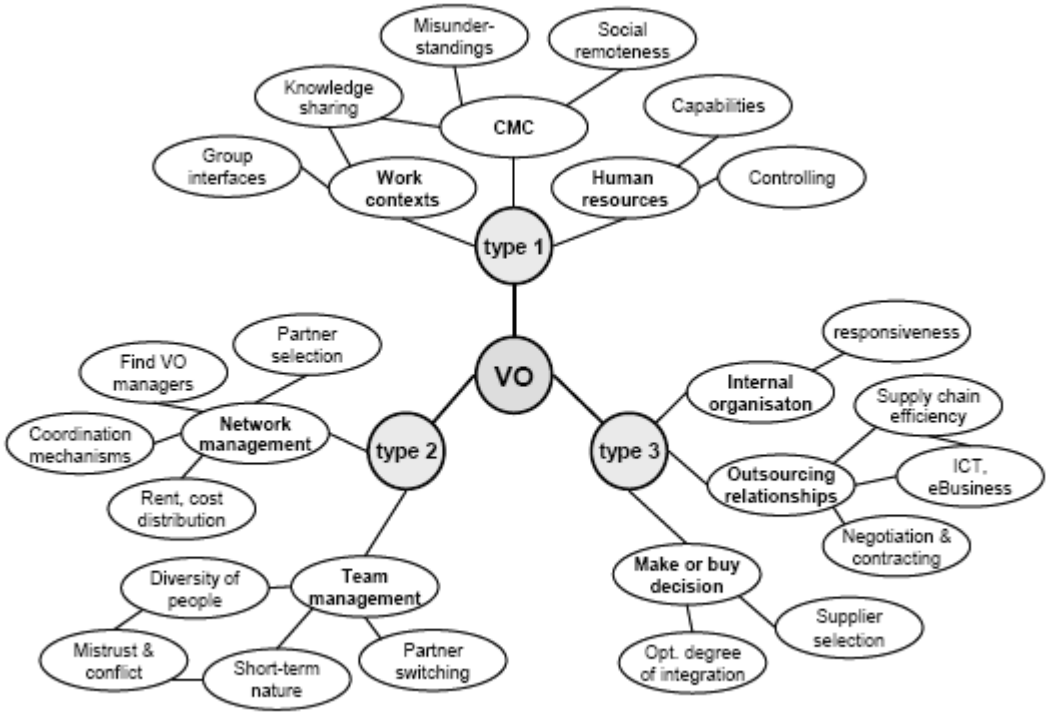

Figure 2: Landscape of management challenges of the three VO types

5 Conclusion

Based on the observation that virtual organisations are described and defined quite differently across the literature and that in many studies the notion of VO remains rather vague, our study aimed at bringing to the fore a more conceptually clear understanding of the VO as an organisational concept. Our literature analysis and classification of VO definitions led us to the identification of three (ideal) types of virtual organisation that exhibit not only different structural properties, but also show different management challenges. Hence, one contribution of our work lies in the structured presentation of thee three types of VO and their properties.

More importantly, we advocate a more succinct approach to defining the VO in future research studies. Authors should spell out in detail what they regard as a VO in the context of their particular research endeavour. In more general terms, we propose to divide efforts and establish three more or less separate, albeit related, streams of research. Given the rather different management challenges of the three types, we argue that different research issues should guide inquiries into real-life cases of any of the three types of VO and that authors should be clear about what they are dealing with conceptually.

However, since it is not uncommon for real-life VO cases to show characteristics of more than one VO type, we argue that authors should aim at characterising the cases in enough detail by spelling out the unique features of each particular case. In doing so, the criteria provided in our study might be a useful starting point. Consequently, besides positioning future research efforts in either of the three areas, the best way to clarify one's understanding of the VO is to bring to the fore the specific characteristics of the particular virtual organisation one is dealing with. In particular, researchers should provide rich case descriptions and then take into account the implications these characteristics might have for management, IS application and one's own research. By

doing so, we believe that VO research can gain credibility and built out distinct and lasting streams of research.

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Appendix 1: Classification criteria

The following table provides a list of all criteria used in classifying VO definitions taken from the papers examined.

Network	
Intra-organisational	Collaborative network of people residing inside one organisation (virtual team structures)
Inter-organisational	Flexible, collaborative inter-organisational network of independent firms (or individuals, e.g. freelancer)
Hierarchical network	Focal network of one company with its suppliers (or customers)
Projects	
Short-term nature	Short-term nature of VO, existence of specific projects
Existencs of pool	Existence of a pool (network) as the long-term element from which projects are formed
Distribution aspects	
De-centralisation	Geographical (and temporal) distribution of value creation (de-centralisation)
ICT as enabler	Linking of partners via ICT; ICT as means for communication and information sharing
Joint marketing	Joint market presentation of the partners - VO as a discrete entity
Tele work	Remote (tele) work and mobile work with ICT-linkage to company systems
Management	
No hierarchy	Lack of institutionalised management mechanisms and hierarchical structures --> flat, flexible organisation
Coordinator	Existence of a coordinator or dedicated coordination mechanisms
Control	Use of control mechanisms
Trust	Trust as enabler (importance of social relationships)
Value creation	
Core competencies	Core competence concentration (synergetic combination of partner competencies)
Joint resources	Resources are jointly built up and shared between partners
E-Commerce	Offering of electronic services for end customers (via Internet / eCommerce)
Reasons / goals	
Virtual size	Achieve virtual size (collaboration of SMEs)
Market opportunities	Jointly exploit market opportunities
Customization	Individual customized products for customers
Costs	Sharing costs / Cost efficiencies
Risks	Sharing of risks
Knowledge	Sharing of knowledge, joint learning

Appendix 2: Final classification table

The following table is the result of the main analysis step, the classification of VO definitions and the clustering in the three VO types. Marked in yellow are the constituent characteristics (mentioned in at least two thirds of the papers).

	Network			Project		Distribution				Management				Value			Reasons / goals					
Type 1: Virtualised corporation:	Intra-organisational	Inter-organisational	Hierarchical network	Short-term nature	Existence of pool	De-centralisation	ICT as enabler	Joint marketing	Tele work	No hierarchy	Coordinator	Control	Trust	Core competencies	Joint resources	E-Commerce	Virtual size	Market opportunities	Customization	Costs	Risks	Knowledge
Berger (1996)	x					x	x		x			x	x			x				x		
Bleecker (1994)	x			x		x	x		x						x				x			
Breu, Hemingway (2004)	x			x	x	x	x		x	x			x	x	x					x		x
Cohen (1997)	x					x	x		x				x									x
Davenport, Peralson (1998)	x					x	x		x			x								x		
Handy (1995)	x			x		x	x		x				x									
Klein (1994) [functional]	x					x	x		x													
Kock (2000)	x			x		x	x		x											x		x
Moller (1997)	x					x	x															
Scholz (1996) [virtual office]	x					x	x		x	x			x						x	x		
Tianfield, Unland (2002) [de-localization]	x					x	x		x						x							
Type 2: Virtual network organisation:																						
Albers et al. (2003)		x		x	x		x	x		x	x		x	x	x		x		x	x	x	x
Alt, Legner, Österle (2005) [institutional]		x		x			x	x		x				x								
Bremer et al. (2000)		x		x	x	x	x				x		x	x	x		x	x	x	x	x	x
Brütsch, Frigo-Mosca (1996)		x		x	x						x		x	x	x		x	x	x	x	x	
Bullinger, Thaler (1994)		x		x			x			x				x				x		x		
Bultje, van Wijk (1998)		x				x	x	x					x	x				x	x			
Byrne, Brandt, Port (1993)		x		x		x	x			x			x	x				x		x		
Camarinha-Matos, Afsarmanesh (2006)		x		x	x		x				x		x					x				
Christie, Levary (1998)		x		x		x	x			x			x	x	x			x	x	x	x	x
Coyle, Schnarr (1995)		x		x		x	x						x	x	x			x				
Eversheim et al. (1998)		x		x	x	x	x				x			x	x			x	x	x		
Franke (2001)		x		x	x	x	x				x		x	x	x		x	x	x	x		x
Gallivan (2001)		x		x		x				x		x		x	x		x					
Goransson, Schuh (1997)		x		x	x		x	x			x		x	x	x		x	x	x	x		x
Grabowski, Roberts (1999)		x		x	x	x	x						x					x			x	
Hannus et al. (2004)		x		x	x		x	x		x	x		x	x			x	x	x		x	x
Hansmann, Ringle (2005)		x		x	x	x	x	x		x	x		x	x	x			x	x	x		
Jones, Bowie (1998)		x		x	x	x	x			x			x	x	x			x		x		
Jurk (2003)		x		x	x	x	x	x		x	x		x	x	x			x		x	x	x
Kasper-Fuehrer, Ashkanasy (2004)		x		x		x	x	x		x	x		x	x	x		x	x	x			x
Kemmner, Gillessen (2000)		x		x	x	x	x	x		x	x		x	x	x					x	x	x
Klein (1994) [institutional]		x		x		x	x	x		x	x		x	x	x		x	x		x		x
Larsen, McInerey (2002)		x		x		x	x						x	x				x	x			
Leimeister, Weigle, Kremar (2001)		x		x		x	x	x		x				x				x	x			
Lin, Lu (2005)		x				x	x	x		x			x	x	x			x	x			
Mertens (1994)		x				x	x															
Mertens, Faisst (1996)		x		x		x	x	x					x	x			x	x	x	x	x	x
Mertens, Griese, Ehrenberg (1998)		x		x	x	x	x	x			x		x	x								
Pihkala, Varamäki, Vesalainen (1999)		x		x	x	x	x			x	x		x	x	x		x	x		x		x
Rahman (2002)		x		x		x	x			x			x	x	x		x	x	x	x		x
Riemer, Klein, Seiz (2001)		x		x	x		x			x	x		x	x			x	x	x			
Saabel et al. (2002)		x		x	x	x	x						x	x	x		x	x	x	x		
Scholz (1996) [Virtual company]		x		x			x	x		x			x	x				x	x			
Tianfield, Unland (2002) [co-localization]		x				x	x	x							x		x					
Tjaden (2003)		x		x	x			x		x	x				x			x	x	x	x	x
Travica (2005)		x		x	x	x	x	x										x	x			
Upton, McAfee (1996)		x				x	x	x			x			x								x
Voss (1996)		x		x		x	x						x	x			x		x			x
Weibler, Deeg (1998) [institutional]		x		x		x	x	x		x	x		x	x	x				x	x		x
Weisenfeld et al. (2001)		x		x	x	x	x			x	x		x	x	x			x		x	x	x
Wirtz (2000)		x		x		x	x			x	x		x	x	x			x		x	x	x
Zwicker (1996)		x		x	x		x	x		x	x		x	x				x	x			
Type 3: Virtual value chain network:																						
Alt, Legner, Österle (2005) [functional]			x	x	x	x	x	x			x		x	x	x		x		x			x
Cooper, Muench (2000)			x	x		x	x			x		x		x	x			x				
Lawton, Michaels (2001)			x			x	x				x	x		x		x			x	x		x
Werther (1999)			x	x			x			x				x		x		x				
mixed / not clustered:																						
DeSanctis, Monge (1999)	(x)	x		x		x	x	x		x			x				x	x	x			
Elliot (2006)		x					x	x						x	x	x				x	x	
Shin (2004)	x	x		x		x	x			x			x	x								x
Tuma (1998)		x	(x)	x		x	x			x	x			x					x	x		
Vakola, Wilson (2004)	(x)	x		x		x	x			x			x									x

Appendix 3: Distribution of criteria across VO types

The following table provides an overview of criteria distribution across the papers. It is the basis for identifying constituent and further characteristics of the three types of VOs. Marked in green (yellow) are all criteria per group that were mentioned in at least 66% (33%) of all definitions.

	Type 1		Type 2		Type 3	
no of papers	11		42		4	
	x	%	x	%	x	%
Network						
Intra-organisational	11	100%	0	0%	0	0%
Inter-organisational	0	0%	42	100%	0	0%
Hierarchical network	0	0%	0	0%	4	100%
Projects						
Short-term nature	4	36%	37	88%	3	75%
Existencs of pool	1	9%	21	50%	1	25%
Distribution aspects						
De-centralisation	11	100%	31	74%	3	75%
ICT as enabler	11	100%	39	93%	4	100%
Joint marketing	0	0%	21	50%	1	25%
Tele work	10	91%	0	0%	0	0%
Management						
No hierarchy	2	18%	23	55%	2	50%
Coordinator	0	0%	22	52%	2	50%
Control	2	18%	1	2%	2	50%
Trust	5	45%	32	76%	1	25%
Value creation						
Core competencies	1	9%	36	86%	4	100%
Joint resources	3	27%	24	57%	2	50%
E-Commerce	0	0%	0	0%	2	50%
Reasons / goals						
Virtual size	0	0%	16	38%	1	25%
Market opportunities	0	0%	32	76%	2	50%
Customization	2	18%	24	57%	2	50%
Costs	5	45%	22	52%	1	25%
Risks	0	0%	12	29%	0	0%
Knowledge	3	27%	19	45%	2	50%

Appendix 4: Deviations between definitions and case examples

The following table shows all papers in which VO cases or examples were discussed. Marked with grey colour are those papers in which the definitions provided did not match with the characteristics of the examples discussed.

Paper	Definition	Case examples
Albers et al. (2003)	Type 2	Type 2
Alt, Legner, Österle (2005)	Type 2 and 3	Type 2 and 3
Berger (1996)	Type 1	Type 1
Bleecker (1994)	Type 1	Type 1 and 3
Bremer u.a. (2000)	Type 2	Type 2
Breu, Hemingway (2004)	Type 1	Type 1
Brütsch, Frigo-Mosca (1996)	Type 2	Type 3
Bultje, van Wijk (1998)	several	several (matching)
Camarinha-Matos, Afsarmanesh (2006)	Type 2	Type 2
Christie, Levary (1998)	Type 2	Type 3
Cooper, Muench (2000)	Type 3	Type 3
Davenport, Peralson (1998)	Type 1	Type 1
Franke (2001)	Type 2	Type 2
Gallivan (2001)	Type 2	Type 2
Göransson, Schuh (1997)	Type 2	Type 2
Grabowski, Roberts (1999)	Type 2	Type 3
Handy (1995)	Type 1	Type 2 (and 4)
Hannus et al. (2004)	Type 2	Type 2
Jones, Bowie (1998)	Type 2	(strategic alliance)
Jurk (2003)	Type 2	Type 2
Kasper-Fuehrer, Ashkanasy (2004)	Type 2	Type 2
Kemmner, Gillessen	Type 2	Type 2
Klein (1994)	Type 2	Type 2
Kock (2000)	Type 1	Type 1
Lawton, Michaels (2001)	Type 3	Type 3
Lin, Lu (2005)	Type 2	Type 3
Mertens (1994)	Type 2	Type 2
Mertens, Faisst (1996)	Type 2	Type 3
Moller (1997)	Type 1	Type 1
Rahman (2002)	Type 2	Type 2 and 3
Saabel et al. (2002)	Type 2	Type 3 (and 4)
Scholz (1996)	Type 1	Type 1
Tjaden (2003)	Type 2	Type 2
Travica (2005)	Type 2	Type 3
Upton, McAfee (1996)	Type 2	Type 2
Voss (1996)	Type 2	Type 1, 2 and 3
Weisenfeld et al. (2001)	Type 2	Type 2
Werther (1999)	Type 3	Type 3 (and 4)