

Organisational effects of virtual meetings

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Abstract

Virtual meeting (VM) technologies are applications of ICT that could potentially be used to decrease the environmental impact of business activities. There are, however, uncertainties and disagreements about the organisational effects of increased use of these technologies.

This article explores the potential effects that VM may have on an organisation. It does so by examining the presence and strength of these effects in a number of organisations, both public and private. Information has primarily been collected through a literature review and a number of in-depth interviews. The results are analysed with a special focus on seeking explanations for diverging opinions among the respondents and in the literature.

The findings and analysis indicate that organisational effects of VM depend on the following factors: organisational perception of the virtual toolbox, behaviour and rebound effects, and the organisation's virtual maturity. The latter refers to the penetration and diversity of the collaborative tools used in the organisation and is divided into three stages: substitution, diffusion and integration. As the use of VM grows in the organisation, different effects will emerge and eventually subside.

Keywords: virtual meeting, unified communications and collaboration, green ICT, substitution, rebound effects, meeting efficiency.

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Introduction

The use of information and communication technologies (ICTs) has become vital for many private and public organisations and essential for their business processes to operate as intended. One specific ICT-related area to which significant attention has been paid in recent years is in virtual meeting technologies that enable employees and partners to meet, communicate and collaborate virtually. A virtual meeting (VM) can be defined as "synchronous communication mediated by ICT, making it possible for two or more geographically remote people to interact" (Arnfolk, 2002, p. 7), and employs audio- or videoconferencing technologies¹, or computer-mediated web conferencing². Through the implementation and integration of these solutions into the organisation's processes, public and private companies alike aim to achieve a number of positive effects: cost efficiency, increased collaboration between peers and partners, business mobility, improved flexibility for the employees and increased productivity to name a few.

Furthermore, there are also examples of domains where the potential environmental aspect of extended use of VMs has been recognised. For instance, the Swedish government has laid out a strategy called "ICT for a greener administration - ICT agenda for the environment 2010-2015" (Näringsdepartementet, 2010). This agenda identifies and outlines a number of action areas, one of which is to reduce environmental impact by the use of VMs. The idea is that VMs will contribute to a reduction of GHG emissions by substituting business travelling. The Swedish State employs more than 230 000 people, through its more than 400 public agencies. Thus, there is a significant potential for the state to find the ways to green government activities, and reduce the environmental impact of its own work.

Gradual implementation of VM technologies allow organisations to retire aged, expensive and obsolete circuit-switched technology, such as private branch exchanges (classic telephone switches). The cost-savings from these activities is immediate and often suffices to make rapid return on investments. However, the understanding of the non-economic and long-term effects of VM on organisations is deficient. It is also necessary to improve our knowledge about how these effects can be related to the organisation's objectives to improve their performance in terms of efficiency, productivity and sustainability.

Considering the growing importance and use of computer-mediated communication tools, managing, measuring and monitoring the effects of VMs will be increasingly determinative for the organisation's ability to achieve its goals. Better understanding on what constitutes actual organisational effects of VMs, and explaining the underlying reasons for potential disagreements about these impacts will help map the prerequisites necessary to maximise positive and minimise negative effects from VM use. This information will be also vital when developing organisational strategies for the implementation of VM

¹ On circuit- or packet based networks.

² On packet based networks only.

technologies. By better understanding the effects that the use of VM can have on an organisation and its employees, and by identifying factors that may influence the outcome, organisations have a better chance to reap the potential gains of this technology and avoid its pitfalls.

The objectives of this article are therefore to explore:

- potential organisational effects from increased VM use;
- factors influencing the presence and magnitude of these effects; and
- extent to which opinions about organisational effects converge or diverge.

Methodology

The findings presented in this article are based on a deductive approach to research, where primary and secondary data have been analysed with the help of a conceptual framework (Figure 1).

Primary data was collected mainly through 23 in-depth interviews, whereof 18 over telephone and five personal. Employees from six Swedish national authorities, one public authority on supranational level, and one industry trade group have been interviewed. In addition, representatives from five different private companies and private persons were interviewed. The interviewees typically have roles such as project, environmental, sales, ICT or travel managers.

The interviews typically lasted for 45-60 minutes, and aimed to:

- investigate the level of VM use in the interviewee's organisation,
- discuss potential and actual effects of VMs,
- collect reflections on implications not mentioned by the interviewee, and
- understand the interviewee's view on factors that may influence the effects discussed.

In many cases the discussion about VM effects has been adapted to the role of the interviewee. As an example, a project manager has potentially better insights in the effects related to work processes than a staff manager, who in turn might have better knowledge about the effects on employees.

Immediate notes during all interviews have been taken and later transcribed. The data collected was then organised into categories using a procedure based on the inductive coding process, as described by Thomas (2006). However, unlike the inductive coding process where categories or themes are developed as the work progresses, the categories used in this process have been retrieved from the selected conceptual framework. The coding process was based on three assumptions:

1. The validity of a statement or opinion increases by its frequency of appearance,

2. The validity of a statement or opinion depends on the level of competence of the interviewee. For example, a project manager is assumed to have more valid opinions on the effects on work methods than a travel manager,
3. The validity of a statement or opinion increases, if the interviewee has worked in an organisation with more advanced use of VM.

Primary data has also been collected through a review of information in a digital form provided by the organisations interviewed and through official statistics and documents, e.g. annual reports and appropriations. Moreover, data has been retrieved from Resvaneundersökningen³, a Swedish national travel survey questionnaire.

Secondary data has been collected through a literature review of books, research papers, articles and public reports. This material originates from research institutions, public authorities and private industrial organisations. Main sources for secondary data have been the online databases, such as *LUBSearch*, *EBSCOhost* and *SciVerse*. For printed material, the online catalogue *Lovisa* has been used. Searches have been also performed using external search engines (e.g. *Google Scholar* and *Ixquick*).

Potential Organisational Effects of Virtual Meetings

In order to explore the organisational effects of VMs, the authors have selected a conceptual framework developed to describe the potential effects of VMs (Arnfolk, 2012). From an organisational perspective the potential effects described in this framework are divided into four groups: *organisational structure*, *efficiency*, *staff* and the *sustainability requirements*. All these groups of effects in turn influence the organisation's possibilities of achieving its goals. The organisational part of the framework (Figure 1), has been used to develop a number of indicators and identify information collection methods that could be used to measure the effects listed.⁴

³ The National Travel Survey is carried out by Trafikanalys, an agency charged with providing decision-makers in the area of transport policy with knowledge and advice

⁴ The model in its original presentation covers also potential effects on individual and societal levels. Research in these two areas is done in parallel within the same research project and will be presented in related articles

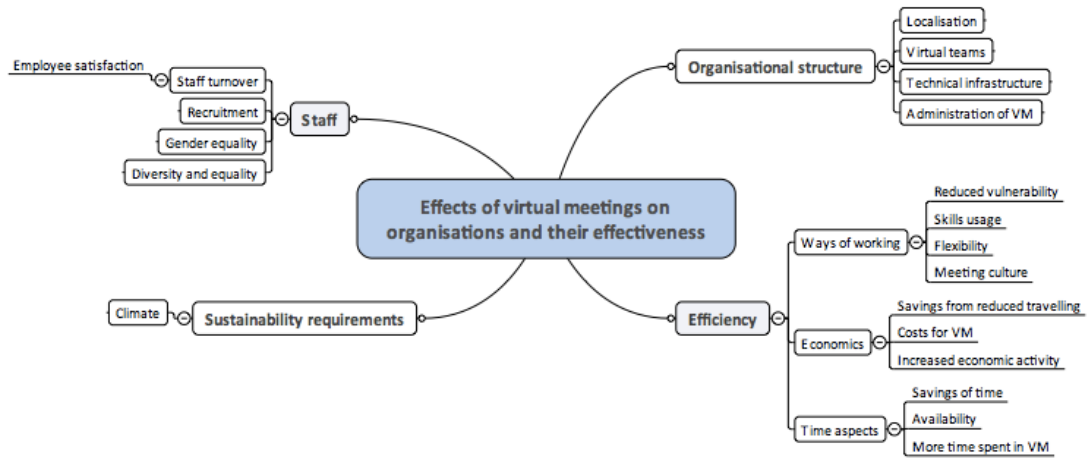


Figure -1 Conceptual framework of organisational effects of virtual meetings (based on Arnfalk, 2012)

Organisational structure

According to the framework, VMs use may influence the organisation's geographical and logical structure. It potentially affects the physical localisation of offices and staff and how the work is organised. It might also have effects on the technical infrastructure and organisational sections administering the technical solutions.

Efficiency

The efficiency category covers all potential effects that fall under working methods, economic and time aspects. VM&VC are expected to have effects on organisational vulnerability, in the sense of business continuity or capacity to keep activities up and running; on the use of internal and external skills and competencies; on flexibility, i.e. the organisation's capacity to adjust to changes in work settings; and on the meeting culture.

Economic factors that are assumed to be affected include costs for travelling, running costs for technical solutions, and the scale of economic activity. According to the framework, the organisation will also discover effects on the time spent in meetings and for business travelling as well as on availability. In this context, availability implies both the availability for the organisation of its employees and their competence, and the availability of the organisation's information and data for the employee.

Staff

According to the conceptual framework, the use of VMs might also have organisational effects on the staff. As opposed to individual effects, these are more on an aggregated level and include staff turnover and employee satisfaction levels, capacity to recruit, gender equality and social equity, and diversity.

Sustainability requirements

Finally, VMs use is expected to influence sustainability requirements to which the organisation is exposed, or is imposing on itself, specifically in terms of climate impact.

The point of departure for the Swedish government's greening-by-ICT strategy is based on the assumption that environmental impact can be changed by a reduction in travelling, which can be enabled by the increased use of VMs (Regeringskansliet, 2010). Indeed, many organisations claim that increased use of VM&VC has contributed or will contribute to a decrease in business travelling. These, for example, include Procter & Gamble (Cooke, 2010), Capgemini (Doherty, 2008), Cisco (Cisco Systems, 2008a), TeliaSonera (TeliaSonera AB, 2010), the association of municipalities in Västernorrland (Northern Sweden) (Risberg, 2012) and the United Nations (UNEP, 2009).

Despite this evidence from the corporate environment, where the correlation between VMs and reduction in business travelling is a common theme, there is

surprisingly little evidence on this in existing academic research (Mokhtarian, 2002). Instead, it has been suggested that VMs might not automatically influence travelling levels (Arnfolk, Kogg, 2003), or even that VMs could increase travelling (Arnfolk, 2002, p. 72). The use of VMs may as well extend the geographical distance at which business relations are practical and economically feasible, which might lead to an increase in travelling to physical meetings at longer distances (Plepys, 2002). Societies with a high rate of ICT use are also the ones that are physically mobile, and therefore an elevated use of, for instance, telecommunication can actually work as a trigger for more travelling rather than a substitute for it (Adams, 1999).

In this context it is important to distinguish between *substituted* meetings, where VMs work as a replacement for F2FMs, and *stimulated* meetings, where VM technologies actually spur the need for more meetings (Lee, Shanahan, 2010). A third distinction includes *complementary* meetings, which are stimulated from virtual communication, but that would not have taken place unless there were possibilities to meet virtually (Mokhtarian, 2002).

Examples listed in the previous section argue that decreased levels of travelling are also likely to lead to decreased levels of emissions. Further examples to support this assumption appear in a WWF report where the use of ICT solutions (e.g. videoconferencing) is estimated to reduce GHG emissions by 3 GtCO₂e annually (Pamlin, Pahlman, 2009). Another example comes from Carbon Disclosure Project, which has estimated that global deployment of telepresence solutions in US and UK firms could save an accumulated 5.5 kt CO₂e between 2010 and 2019 (Lee, Shanahan, 2010).

It should be noted that all evidence presented above is based on the assumption that VMs help decrease business travelling. If this assumption is not plausible, the case for VMs' emission decreasing effect fails. There is not much research evidence that supports a direct correlation between increased VM use and changes in emission levels.

Presuming the substituting effect of VMs (and not taking stimulating or complementing effects into consideration), the cost saving effect of VMs can easily be demonstrated. One example comes from TDC, a Danish ICT company, that saved ca. 16 000 work hours, thereby adding 6.5 MSEK⁵ to profit, from substituting travelling with videoconferencing in 2011 (TDC Sverige, 2012). Another example is Cisco, who has calculated on a total travel cost avoidance of USD 90 million during the implementation of 238 telepresence units for internal use. On top of this, they have also estimated an additional benefit of USD 40 million in increased employee productivity (Cisco Systems, 2008b). Since the company in question has vested interests in this matter these figures should be treated carefully.

In a study on telepresence by Carbon Disclosure Project, the biggest driver for investments in telepresence technology is to reduce air travel costs (Lee,

⁵ At an exchange rate of 7 SEK per 1 USD this equals 930 000 USD

Shanahan, 2010). Another area for potential economic savings includes reduction in the cost of premises, which decrease due to increased mobility (Cooke, 2010). A typical return on investment (ROI) calculation for an investment in any VM technology includes investment costs, operating costs, total travel costs saved and increase in productivity⁶(Lee, Shanahan 2010). Ideally, the organisational costs that should be taken into consideration include not only travel expenses and connection costs⁷, but also cost of time not used for effective work during travelling (Arnfolk, Kogg, 2003). In order to get a full picture of costs and benefits, stimulating and complementary effects, i.e. instances when the use of VMs can increase the use of other forms of meetings, need to be considered. VMs can enhance the use of other meeting forms, leading to increases in total meeting costs. They can also lead to increased efficiency of other meeting forms (Mokhtarian, 2002). However, no evidence in the literature has been found that would show ROI or cost-benefit analyses where total meeting costs have been estimated.

Another interesting aspect is the changing perception about meetings in general and how VM technologies affect our ways of working. Organisations are moving from a tradition where meetings were small isolated agenda elements/components and time restricted to a situation where meetings are continuous, asynchronous, and in which participants upload and share their work from everywhere and at any time (Wallström, 2010). With the introduction of VM technologies and other collaboration tools, earlier applicable geographical and time boundaries are no longer valid, which is leading to a trend when people organise into *virtual teams*, “a group of people who work interdependently with a shared purpose across space, time and organisation boundaries using technology” (Lipnack, Stamps, 2000, p. 18). Virtual teams have been found to increase agility and speed of work, make more efficient use of existing human resources and enhance use of existing skills in an organisation (Duarte, Snyder, 2001, p. 9).

Business cases for investments in various technologies sometimes make a reference to the increased productivity, mostly resulting from time saving. As an example, Carbon Disclosure Project states that two of the main drivers for investments in telepresence include improving executives’ and employees’ productivity (Lee, Shanahan, 2010). Another example comes from Procter & Gamble, where an employee questionnaire shows that 95% of respondents think it is easier to get in contact with a colleague by the help of VM&VC, and every user saves 20 minutes of work per day (Cooke, 2010). This indicates that productivity can be increased, although the company admits that this effect is hard to measure.

⁶ In this article we have chosen to work with the definition of efficiency as *output in relation to resource input*. Maximising efficiency is about getting as much output as possible out of labour, money, time or other resources, i.e. doing things the right way. Productivity is related to efficiency, but adds to the equation also the concept of value, the *value of the output in relation to resource input*. Productivity is about getting utility out of activities, i.e. doing the right things. An organisation can be very efficient, making use of its resources with little waste, but if the value of the output is low, such organisation has low productivity

⁷ Costs involved in setting up, running and closing a virtual meeting

The framework presented above provides a point of departure for the identification of potential VM&VC effects, but as the literature analysis shows it does not sufficiently explain the complexity of impacts of VM&VC use in organisation. There are important disagreements about even the most fundamental effects of VM&VC. One striking example is the actual effect on business travelling, which is decisive for a number of other effects, such as GHG emissions and travel cost savings. There is a need to fill the knowledge and research gap on the reasons for disagreements and uncertainties about organisational effects of VMs as well as scientifically ground actual VM effects on the organisation. Very often studies in the field focus on the description of specific VM effects while miss to present a holistic perspective or systematic analysis. Therefore to fill this knowledge gap empirical evidence is needed to support or reject speculative thinking around VM effects on the organisation, which is addressed in the following sections of this article.

Findings and analysis

Findings from the literature and empirical research are presented below and structured within the categories of the conceptual framework introduced in the previous section and visualised in Fig. 1.

Organisational structure

VM technologies and collaborative tools suggest completely new ways of organising work, both geographically and logically. VM&VC remove geographical boundaries enabling organisations to involve co-workers or external resources, with specific competencies in projects or teams, regardless of their physical location. This allows for a new geographical distribution of the organisation, and also for virtual teams to emerge. For example, Swedish Tax Agency now partly works in permanent, distributed teams of experts that belong to the same department in the organisational chart, but are physically dispersed. The same tendency can be seen in Swedish Customs.

Virtual collaboration tools also remove time boundaries by enabling people in different time zones to collaborate more flexibly. As an example, one of the private organisations in this study organises some of its project work in virtual teams that are physically located partly in Sweden and partly in India, which prolongs the work day of the project, but also requires more careful management. These changes in paradigms are reflected in organisational structures and become drivers for changes in organisational processes.

The ability to work and meet virtually enables increased frequency in communication between colleagues, team members, partners and other stakeholders. Over time this change of preconditions in work settings can also lead to a change in work methods. If the organisation can keep up constant dialogues with customers, suppliers and colleagues, the way of working becomes more adaptive and agile. This also enables work to be done in shorter cycles or iterations.

Efficiency

There is a high level of coherence in opinions regarding the following efficiency effects in the conceptual framework:

- **Skills usage:** Meeting and working virtually is expected to enhance our possibilities to make more efficient use of the skills and competencies available inside and outside the organisation.
- **Reduced vulnerability:** Improved conditions for business continuity in case of disasters or force majeure events. VM&VC also make the organisation less vulnerable to unexpected events or catastrophes, thereby securing business continuity.
- **Increased availability,** both between co-workers and of corporate information needed by the employees to perform their work.
- **Increased flexibility:** As mentioned above, virtual tools make it possible to organise work and teams more flexibly in space and time, and also increases flexibility for the employees to work from home or on the run. The two last effects together are expected to foster changes in work processes towards shorter cycles of deliverables.

Meeting culture

There is a consensus among the interviewees that VMs and collaboration have an effect on the meeting culture. Adding new forms of meetings also requires clearer rules on how and when meetings should be held and who should be invited. VMs require more preparations, a clearer agenda and a more structured way of working. There is less room for fuzziness and informal communication in VMs, and therefore some people think that VMs are more efficient than F2FMs.

On the other hand, there are also interviewees who view VMs not as efficient as physical meetings due to increased risks of misunderstandings, unfairness, cultural aspects and technical hassle. There is a risk that all participants do not get fully involved in a VM. One example is that they might be doing other things in between. Furthermore, there is a potential risk of “over-invitation”, inviting more participants than needed. Inviting just one more person to a VM may seem to come with almost no marginal cost, which means that some participants might be added “just in case”. If these people accept the invitations, meeting efficiency has a risk to decrease.

VM efficiency largely depends on the purpose of the meeting. In general, complicated and complex issues that require dialogues in larger or smaller groups are less efficiently handled in VMs. The more complex and interactive the agenda is, the more sophisticated virtual technology is needed, and still some meetings might require face-to-face communication.

Economic effects

The majority of the interviewees agree with the initial time and cost saving effects of VM&VC. As one example, Swedish Customs have been collecting data regarding occupancy in their video-conferencing facilities since 2004, when video-conferencing was introduced. Based on the assumption that travel costs for three people for every third meeting is avoided, they have been able to estimate the annual savings resulting from the use of video-conferencing. In 2004 the savings were roughly USD 230 000. Since then, this figure has been growing every year and in 2011 the savings were estimated at 14.2 MSEK⁸. The annual gross time savings spent in meetings have gone from almost 500 hours in 2004 to almost 3800 hours in 2011.

At this point it should be noted that cost savings in the example above are based on the assumption that travelling will be substituted, which is a common perception. There are other examples of organisations in this study that have been able to demonstrate a real decrease in travelling, and its associated costs, due to VM&VC. Also on the aggregate level, as in the Swedish example, business travelling is reported to be decreasing (SIKA, 2000; SIKA, 2007; Trafikanalys 2012). One of the private companies interviewed have reported that their number of business related air travels had decreased from 25 000 in 2007 to ca. 16 500 in 2012, with a stable amount of employees over the period. There are other similar examples in both private and public sector.

However, some of the respondents state that VM&VC do not actually have the commonly expected effects on their organisations' travelling levels, neither in terms of costs nor in the number of business trips. Two of them even claim that travelling has increased, despite the introduction and increased use of VM&VC technologies. This view is supported by research showing that VMs use will not automatically lead to a decrease in travelling (Arnfolk, 2002; Adams, 1999, ref 91, p 120).

Few organisations have accurately measured the total cost for meetings, including travelling, equipment, support, operations, and total time spent in the meetings. Thus, there is a great uncertainty regarding the true cost effects. However, as some interviewees point out, it is important to look at these issues from a holistic perspective. It is crucial to focus on broader perspectives and look at such aspects as a total productivity. In fact, when confronted with the question, most interviewees are inclined to agree that their economic activities and productivity increases with increased use of VM&VC. In order to show increased cost efficiency the total meeting costs need to be related to the value of the output of these activities.

Staff

The use of VM&VC is shown to have implications for the employee satisfaction levels. Many organisations have systems in place for measuring employee satisfaction at regular intervals with individual surveys. Employee satisfaction index levels based on these surveys are often used as a basis for work improvements and sometimes as specified goals or are written into balanced

⁸ At an exchange rate of 7 SEK per 1 USD this equals a bit more than USD 2 million.

scorecards.⁹ There are some examples of interviewees from organisations in the private sector who claim that the effects of virtual work could be clearly seen in their employee satisfaction surveys. Mostly, the effects on employee satisfaction mentioned are individual: stress levels and work-life balance in particular, and based on the assumption that individual employees will experience a decrease in their travelling and also more control over their own time. (Refer to Yuliya?) On the other hand, few employee satisfaction surveys have questions that can be directly related to the use of VM&VC, so the empirical support for any relationship between employee satisfaction levels and staff turnover on the one side, and VM&VC on the other is weak.

The possibility to work virtually affects recruitment in several different ways. First, it saves time in the recruitment process and more people in geographically dispersed locations can be interviewed, which gives a broader range of selection. Second, organisations may have better opportunities to recruit employees who live in places further away from where the offices are located. Third, by being clear in an early stage of the recruitment process about the expectations on travelling and the possibilities to work and meet virtually, an organisation can attract new types of applicants, for instance, people that normally would not apply for a job position due to geographical boundaries. If the use of VMs and collaboration contributes to more satisfied employees, this might also work as an advantage for the employer branding¹⁰ of the organisation. In turn, this might help the organisation recruit and retain the competencies it needs.

With few exceptions, the interviewees themselves do not bring up any effects with regards to social equity, diversity and gender equality. When asked, most people agree that the travel substituting effect of VM&VC will logically have implications for gender equality but that this relationship is uncertain.

Sustainability requirements

The predominant opinion among the interviewees in this study is that VM&VC will lead to a decrease in the organisation's climate impact. The natural and logic reasoning behind this is that decreased travelling leads to decreased emissions, and this view is widespread in other sources (REF) confirmed by the Swedish government's strategy for greening its activities with the help of ICTs. Some interviewees are more cautious about environmental impact, pointing out that VM&VC should affect climate but that data or evidence of such impacts is missing or insufficient. Others again see no relation between an increased use of VM&VC and decreases in emissions.

Analysis

⁹ A commonly used measuring framework, which is used for strategic management of activities in many organisations

¹⁰ The organisation's reputation as an employer, or the "image" of the organisation as an employer

When analysing the data collected it can be concluded that the existence of some of the effects described in the selected conceptual framework can be confirmed, whereas the presence, magnitude and direction of others is more ambiguous.

In some areas there is a higher extent of convergence in existing data. For instance, there is no doubt that VM&VC has similar effects on organisational structures. The tendency is to go towards organisations that are less bound to geographical locations and more prone to organise their work in virtual, dispersed teams. The conceptual framework also points out that the administration and organisation around the VM technologies should be taken into consideration. However, very few interviewees bring this up as an issue, which probably is linked to the fact that it has marginal effects on the existing organisational structure, most often being the ICT department.

More convergence in empirical data is to be found in the efficiency area, where people tend to agree that VM&VC increases flexibility, reduces vulnerability and enables more effective use of skill related resources. These areas, together with the effects on the organisational structure, seem to be the first and initially most prominent effects of increased use of VM&VC.

In other areas, the opinions and evidence presented in the findings above clearly diverge when it comes to the presence and direction of organisational effects. One example is meeting culture, which is relevant because the efficiency of meetings constitutes an important determinant for other effects. Increased efficiency is a major contributor to cost- and time savings, and also influences the performance of virtual teams. In addition, it can have a psychological effect on the general opinions and feelings about using VMs.

More important is the divergence in opinions about the effects that are in one way or another related to travelling levels. The substitution of physical meetings with virtual ones frees up time that can be used for additional meetings, which in turn can generate more work and also more travelling, a potential rebound effect of improved technical solutions in ICT(cf. Plepys 2002). Another travel-related aspect is the complementary effect (Mokhtarian, 2002). Eventually VM&VC provide new additional ways of meeting and working. New media for communication can further extend professional networks and thereby the need to also meet physically with colleagues in such networks. In short, the relationship between the use of VM&VC and travelling is not clear, which is confirmed by the differences in the views expressed by the respondents in this study.

From the disaccord in these positions it can be concluded that the assumption that VM&VC will automatically lead to cost savings due to reduced travelling costs is uncertain, at best. Moreover, there is a general problem with measuring travelling and its associated costs. As VM&VC increasingly grow into an organisation's working methods or the organisation changes itself, the validity of existing baselines for measuring is eroded. Meetings carry a variety of costs, whereof travelling is one and time is another. A change in the ratio between, for instance, physical and virtual meetings may only result in a transfer of costs

between cost units, departments or organisations, and not to a decrease in total travelling costs or even aggregated costs. This adds to the challenge to adequately measure cost effects of VM&VC.

The relation between environmental and climate impact and VM&VC is complex. Literature often focuses on the potential savings in emissions based on the underlying assumption that business travelling, and especially air travelling, will decrease due to the substituting effect of increased use of VM&VC. In other words, this supports the assumption that if there is no decrease in travel, there is no decrease in emissions either. But in reality the increased VM&VC use might not decrease travelling but instead change the composition of it, including the travel modal split into an activity with a smaller / higher total negative environmental impact. In other words we might end up with more travelling, yet less emissions or vice versa.

Typically, organisations that have been successful in managing issues discussed above have acknowledged the importance of combined travel- and meeting policies. There are several examples in this study of organisations who have successfully implemented such policies. The organisation also needs to measure outcomes and make adjustments in policies or in their implementation, in training or in follow-up. Indicators for measuring GHG emissions are often quite accessible. This information can then be used in a combination with statistics on the use of VM&VC technologies.

In the long run, however, the question about productivity is the key one. The effects related to reduced travelling will subside as the work processes adapt to the evolving ways of collaborating virtually. Thereby, the measurements of reduction in environmental impact gradually lose a valid baseline for comparison. However, if it can be shown that VM&VC contributes to an increased productivity, one could claim that more service output is delivered per kilogramme of GHGs emitted from travelling and virtual technology operations. Therefore from an environmental perspective in the long run it will pay off to focus less on measuring business travelling levels, and instead focus rather on the relationship and measurements of total meeting costs and productivity.

Discussion

To MRM: Här vill jag diskutera och försöka förklara varför åsikterna går isär.

The analysis of the data presented in the findings shows that there is a great extent of disaccord in opinions regarding the effects of VM&VC. In order to understand the effects that can be expected in a given organisational context, it is deemed important to understand the underlying reasons for such disagreements. In this section the authors discuss possible explanations for the observed phenomena.

Rebound effects and change in behaviour

As we have seen above, many of the potential effects of VM&VC are based on the assumption that their use leads to a decrease in business travelling. However,

this is not the case, if the resources released from decreased travelling are used for more travelling or complementary meetings. This rebound effect could partly explain some of the divergences in opinions about the outcomes of increased use of VM&VC. Moreover, the discussions often stagnate when comparing different solutions and their impacts. But the effects of virtual work methods are not caused by the implementation of specific techniques. They are rather enabled by the changes in behaviour of the members in an organisation. Successful implementation of any VM&VC technology should be supported by a clear strategy on how the organisation prefers its employees and partners to use the tools, thereby reducing the risk of rebound effects. For instance, the Swedish Transport Administration's existing manual for implementation of VMs, a so called "10-step model", includes a number of important actions that are related to behavioural changes (Arnfalk et al. 2010).

A clear strategy for VM&VC requires a well-defined ownership of the "meeting" within the organisation. Responsibility for developing and implementing meeting policies and guidelines should be appointed in the institutional context. It is not uncommon, especially in organisations that are less mature in their use of various technologies, that there is no ownership at all and that the question ends up at the desks of the ICT department. In order to maximise the benefits offered by VM&VC and minimise associated costs, the organisation needs global guidelines for meetings and meeting types, which should be connected to travelling and travel policies since the separation of these two issues is not possible (Grankvist, 2007; Gustafson 2012).

This also means that it is important to involve top management in leading the process, depending on what an organisation aims to achieve. Is it looking for cost and time-savings or decreased emissions, or is it also interested in longer-term effects? Is the organisation's main purpose in improving public image in environmental issues, increasing productivity or both? The strategy is vital as input to the needed policies and guidelines. It will also affect the carrot-and-stick range of incentives that are important to be put in place in order to achieve a needed change in employees' behaviour.

The virtual context

In broad terms, the technologies used for VMs can be categorised into audio-conferencing, videoconferencing, and various types of computer-mediated communication (CMC) (Davis, Wainfan, 2004). More recently, the development in videoconferencing (VC) technology has led to the distinction between VC and *telepresence*, where the latter combines rich audio and high-definition video to provide a remarkably more life-like experience (Lee, Shanahan, 2010; Cisco Systems, 2007). There are two types of underlying network infrastructure: circuit switched, used by traditional telephone communication and also in the original videoconferencing technology, and packet switched, which is the technology used for CMC.

It is within CMC that development has been considerable in the last years, and this is also where VMs have merged with other types of virtual collaborative solutions into what is increasingly commonly referred to as unified communications and collaboration (UCC)(Ref 109). The UCC concept encompasses the integration of voice-over-IP (VoIP); instant messaging; web-conferencing, including audio, video, desktop/dashboard sharing; and electronic messaging.

Virtual collaboration technologies further broaden the perspective. Virtual collaboration technologies enable asynchronous co-operation in virtual teams: file and document sharing solutions, shared project platforms and noded project management.

Depending on the implemented solutions of their organisations, it is sometimes hard for the respondents in this study to separate and discuss effects from VMs only from those of other types of collaborative tools.

The view on the organisational effects from VM&VC is strongly dependent on the perception of which tools and solutions are included in the concepts of “virtual meetings” or “virtual collaboration”. In some organisations the entire perspective is limited to VMs only, and associated with audio- and video-conferencing, and the effects are discussed from this angle. In other organisations VM technologies are seen as a part of a more complete set of collaborative tools, which opens up for other effects to emerge. To illustrate this, the authors have developed a virtual context model (Lindeblad, 2012) (Fig. 2). The purpose of the model is to give the reader an idea of how infrastructure, enabling technologies, implemented applications, objectives and goals can be connected in the organisation applying ICTs in its work routines. An organisation with a limited selection of technologies and applications will experience effects that are also limited in nature and magnitude. As the virtual scope broadens, for instance by implementing new solutions, the same organisation will see new effects emerge.

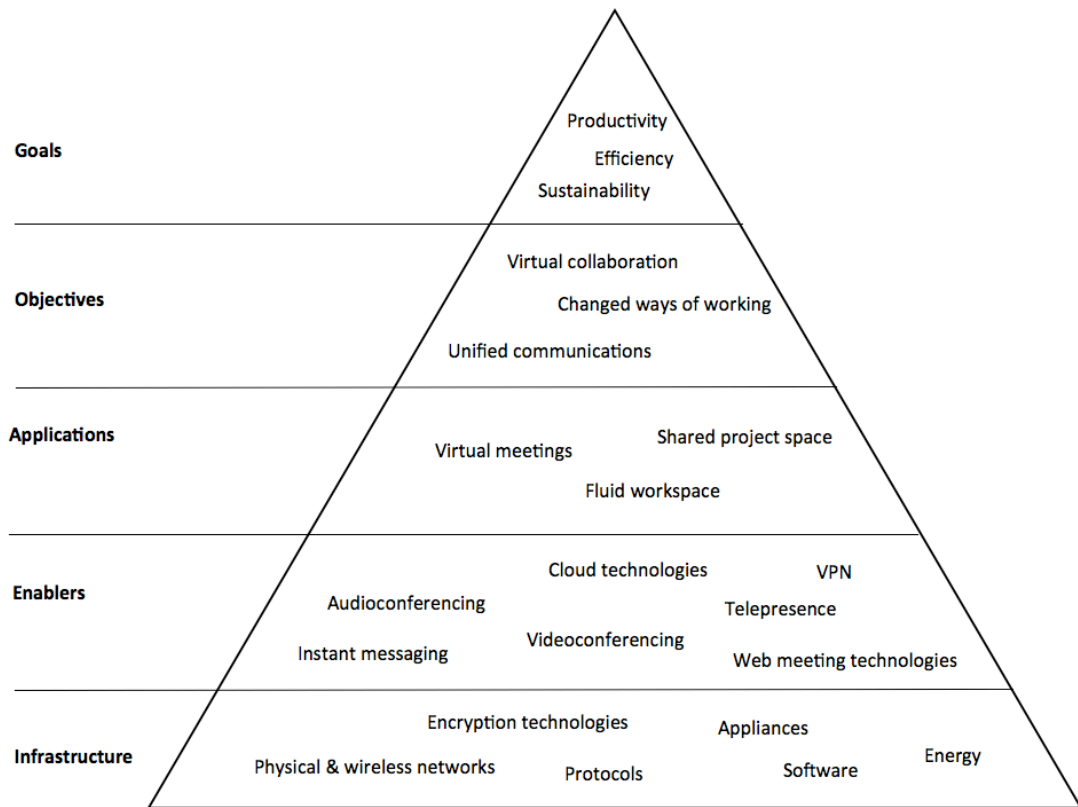


Figure-2 The context of "virtual"

The applications in the model together or in isolation will work as drivers for the changed ways of working. Old work processes will become obsolete and new processes will emerge. Increased frequency of communication and increased availability of employees, managers, suppliers, customers and other stakeholders will lead to shorter work cycles. The integration of technologies, standards and platforms, enabling seamless unified communications is driven by ambitions for more collaboration, not only within an organisation but also between different organisations.

The key message of the model is in the need to account for VM&VC effects in an integrated manner, and isolating these effects limits the discussion of the full potential of all applications. The latter is a common pitfall when discussing the organisational effects, which helps to also explain some of the divergences in the empirical data collected for this study.

Organisational virtual maturity

As organisations widen the virtual context and promote desired change of behaviour among its members, the noticeable effects of VM&VC change over time. The substitution effect - virtual meetings replacing travelling - and its side effects are among most prevalent in the beginning of the implementation of VM technologies. As virtual collaboration integrates into the organisation's working processes, the baseline loses validity and savings in emissions, cost and travelling become irrelevant and incomparable. This development is running in

stages and the effects that can be seen in the first phase, like cost savings, and decreased travelling and emissions will sooner or later wear off and stabilise at a new level. In the coming stages, new effects will take their place. The authors have chosen to divide this virtual maturity development into three phases: substitution, diffusion and integration, and the hypothetical scenarios described below will work as illustrations for such development.

Scenario 1: Substitution stage

You are a project manager and your task is to successfully achieve your project goals in terms of quality, time and cost. It is now 2013 and your project, A, is running. The organisation introduces a new video-conferencing tool for virtual meetings that makes it possible for you to involve resources with unique competencies in remote locations. It also makes it possible for you to decrease your costs, in time and money, for travelling. In fact, the time saved can be used to increase project delivery with the same budget and still stick to the deadlines given. On top of this, your project is not the biggest culprit for your company's emissions.

In the substitution stage, business is run as usual but an early introduction of VM&VC technology makes it possible to replace some physical meetings with VMs, primarily for practical reasons. The implementation and use of VM&VC tools may not be a controlled process and even if the management approves of the development, they are not necessarily steering it. As physical meetings are replaced with VMs, some benefits appear rather quickly in the areas where VMs are being used. Reduction in travelling decreases costs, releases work time and contributes to reduced emissions.

Some of the staff will be less stressed or find better work-life balance by not having to travel, which could affect employee satisfaction. Moreover, the use of internal or external competencies can be done more efficiently. At this stage it makes sense to discuss VM&VC in relation to objectives like reduction in meeting costs, travelling and emissions from travelling. It also makes sense to talk about effects on employee job satisfaction, flexibility, availability, business continuity and usage of skills. The main objective is to show that investments in VM technology pay off in terms of reduced costs and reduced emissions.

Scenario 2: Diffusion stage

In 2014 you are making a project plan for project B. You now have access not only to video-conferencing, but also chat rooms and a shared project space, which you take into account when planning. In order to prove any cost, time or emission savings from reduced travelling you must calculate how much your team would have travelled during the project, if no collaborative tools had been in place. The problem is that if you would not have any virtual collaboration in place, you would not have organised the team in the same way and the project plan would have looked totally different. On the other hand, you can plan for the same amount of deliveries using much fewer resources.

In this stage, existing work routines and processes are still unchanged, but VM&VC solutions are accepted and promoted as a preferred method of working. The value of meeting and working virtually is acknowledged; the organisation is pushing for standardisation of tools and supports development by training initiatives.

In the diffusion stage a large effect on the organisation's meeting culture is noticeable. As new forms for meetings are added and taught, the number and types of meetings will change. As the use of VM&VC is spreading, the effects on employee job satisfaction begin to spread. Virtual work methods will also start to influence how the organisation plans its work in teams and where it is located geographically. Organisational culture starts focusing more on the goal orientation, where employees are allowed to work more freely in time and space as long as the targets are achieved.

In this stage, costs and emissions are still interesting points of measurements, since virtual work methods are spreading through the organisation. It is also time to start looking for increased meeting efficiency and productivity. Even though travelling costs and emissions could be stabilising at new levels, the push for further development will come from the evidence that virtual work methods lead to more efficient use of resources and to increased economic activities.

Scenario 3: Integration stage

In 2015 it is time for project C. Your company has now transformed itself from a staff/line matrix organisation in two locations, to a distributed organisation with virtual competence teams in many locations, whereof some are literally the homes of the employees. The methods of collaborating virtually are now inherent to the organisation itself. In order to estimate cost, time and emission savings, you will now have to make assumptions about how the whole organisation would have worked without collaborative tools.

VM&VC tools and work methods are now fully integrated into the processes, and even necessary for the organisation to keep up its activities. The organisational structure and its connections to the outside world are built on the premises of working virtual methods. We have reached a new level of collaboration where competencies and resources from inside or outside the organisation are tied together in virtual, goal-oriented teams.

At this stage, objectives like reducing travelling and its associated costs and effects are irrelevant since there is no longer any working baseline for comparison. The initial increase in flexibility and availability is irrelevant. Employee job satisfaction levels have also lost some of its relevance. Instead, the organisation will see effects on its employer branding and thereby its capability to recruit and retain the competency it needs.

For a period, but not indefinitely, the organisation should be able to show improvements in productivity linked to its changed work processes. Emission reductions related to decreased travelling are obsolete, but as long as the productivity is increasing, emissions in relation to the value of the output will constitute a relevant target.

Conclusions and future implications

There is no doubt that cost reduction, time-savings and increased work efficiency are prime targets for an organisation that is on the verge of extending its use of VM&VC. However, one should be aware of the fact that organisations

that have been using these technologies for a longer period seem to have growing difficulties in relating VM&VC to such targets. Instead, the increased use of VM&VC leads to more communication, changes in work processes, increased business activity and a drive for additional implementation of collaborative tools.

The propositions that have been put forward in the analysis and discussion can be summarised as follows:

- Virtual meetings should be seen as a subset of and a driver for virtual collaboration,
- Due to potential rebound effects, VM&VC will not by default lead to decreased levels of travelling and decreased emissions,
- Through implementation of effective policies, an organisation is able to drive changes in behaviour that could mitigate rebound effects,
- It is crucial that the organisation decides on what it aims to achieve with its VM&VC strategy. This will help identifying and measuring the potential effects from VM&VC,
- VM&VC will eventually lead to fundamental changes in work processes, organisational structure and the way in which internal and external collaboration is performed,
- The presence and magnitude of organisational effects of VM&VC partly depends on the level of the organisation's virtual maturity,
- In the long run, as virtual collaboration becomes inherent to the organisation, all organisational effects are likely to wear off.

Strategies, indicators and technologies in the field of VM&VC as well as integrated travel- and meeting policies are only emerging albeit at a very fast pace. The entire range of these technologies is likely to have more significant and progressively growing impact in the coming years. VM&VC will increasingly affect how we organise our work and run the projects, how professional teams are set up and how we prefer to manage the competence. Perhaps the use of VM&VC is not a way to decrease costs and environmental impact, but instead it might be a way to stimulate economic growth without increasing the former parameters.

Suggestions for future research

- Examine the link between employee satisfaction, staff turnover and VM&VC more in detail,
- Develop a method for organisations to determine their virtual maturity, thereby giving them a map of what effects to expect.

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