Virtual Technology Consulting

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Abstract:
Can virtual technology consulting replicate the success of face-to-face consulting when the primary goal is not system development, but helping the client to build new technical skills? The course 15-391 Technology Consulting in the Community has a long track record of successful one-one-one consulting partnerships. Virtual consulting will enable CMU students to consult with organizations that would be otherwise unreachable due to travel issues. Here we analyze the difficulties of virtual consulting and discuss what steps can be taken to overcome them. The effectiveness of these measures is investigated through a demonstration virtual consulting engagement.

The logistical benefits of virtual consulting do not come without a price. In fact, these benefits cannot be realized at all without a conscientious effort to mitigate the risks of distributed partnerships. These risks include both technological and sociological barriers. The sociological barriers are especially important to recognize when the success of the consulting task requires expanding the capacity of the client. Our strategy will be to analyze all the risks, the methods to overcome them, and how they work in practice. Although virtual partnerships require more thought and effort than collocated partnerships, they are still a feasible opportunity.

Shared Understanding: The Problem

One of the popular problems with virtual consulting is developing a shared understanding within the partnership. "A shared understanding is a collective way of organizing and communicating relevant knowledge, as a way of collaborating" (Hinds 23). There are many different types of shared understandings that can be grouped into these categories:

- **Availability Awareness**: Knowing if others are available to meet and for how long.
- **Process Awareness**: Having a sense of where the tasks fit into the stages of the project, what the next step is, and what needs to be done to move things along. This can also be referred to as shared goals.
- **Social Awareness**: Knowledge about other group members including knowledge of their expertise as well as personal information (Weisband 312).

A significant component of a team's ability to coordinate work and perform well is their ability to create a shared understanding. It allows a person to anticipate and predict teammates' actions. For example, if a consultant knows that his or her client is

busier in the beginning of the week then the end, the consultant will know not to put things off till Monday. A lack of a shared understanding motivates people to hedge their bets against the errors of others, which will cause inefficiency and duplication of work (Hinds 21). Unfortunately, within virtual teams the ability to build a shared understanding is more difficult. Different working environments, different technologies, and geographic distance all have a negative impact on building a shared understanding (Hinds 25).

Shared Understanding: Developing Shared Understandings

One thing to note is that diversity inhibits the development of a shared understanding (Hinds 25). Therefore, the consultant should emphasize the similarities between the community partner and the consultant (Maznevski 225). Other factors that contribute to a shared understanding are shared experiences, having the opportunity to learn about each other over time, communicating over time, and developing team spirit (Hinds 24). To help here, it is advisable to have the first meeting be collocated. This will give the community partner and the consultant an initial boost in the development of a shared understanding. In Armstrong's study he found that successful distributed teams had face-to-face meetings that "first focused on gaining commitment to the group's purpose because shared understandings are so vital when working across distances" (Armstrong 179).

It is also advisable that the remainder of the virtual communication not be void of personal and day to day information. One way to facilitate the spread of personal information is to use some of the less tedious forms of communication like the phone or instant messenger (Hinds 29). Ultimately, it may take some initiative on the consultant's part to keep the flow of information from being entirely task related.

Finally, frequency of communication is also important for creating shared understanding. Groups that communicate frequently especially in the beginning of the project frequently do better than teams that do not interact frequently because the communication creates group awareness (Weisband 325). Therefore consultants should avoid long gaps in communication.

Shared Understanding: In Practice

In the experimental virtual consulting engagement, the first meeting was intentionally face-to-face and at the client's site. The meeting was successful at creating many shared understandings. For example, the consultant was able to notice that while the client was in her office she is often interrupted by phone calls or people at the door. Therefore, later in the task, the consultant knew that if the client did not immediately respond to an instant message, it did not necessarily mean she was not in her office, she could be temporarily occupied by someone else's attention. This knowledge made communication easier, because the consultant knew to wait a little longer for a response.

On the client side, the client learned that the consultant knew little about the Pittsburgh area despite living there for four years and that he was very bad with directions. Therefore, the client not only gave very detailed directions but was also not surprised when the consultant got lost the second and third time driving there. Therefore, she anticipated the difficulty and she scheduled the committee meeting 30 minutes after the consultant was suppose to arrive.

Common Ground: The Problem

Another problem is the establishment of common ground. Common ground can actually be considered the types of shared understanding surrounding language and communication. "Common ground refers to that knowledge which the participants have in common, and they are aware that they have it in common" (Olson 17). Common ground allows a person to tailor a conversation to what they know about the receiver. For example, in the case of giving directions, it would result in making directions shorter to a native of the area than to a tourist. It is therefore obvious that the more common ground that is established the less labor intensive conversations become. Furthermore, a misunderstanding in common ground could lead to conflict or disruption (Olson 8). Using the same example, if the person giving directions told someone unfamiliar with Pittsburgh to "go through the tubes" there would be obvious confusion. Without collocation a lot of cues for determining common ground are unavailable and much of the spontaneous conversation that aids common ground is lost.

Common Ground: Establishing Common Ground

Establishing common ground requires many of the same things as developing a shared understanding. Fortunately, people who have established a lot of common ground have been proven to communicate well even over impoverished media (Olson 20). Therefore, it is crucial to attempt to establish as much common ground in the initial face-to-face meeting by keeping the intensity of interaction very high (Maznevski 483). Ways to keep interaction intensity high may include:

- Avoid doing separate tasks. For example, do not have the consultant inventory hardware while the client queries his co-workers about tasks for the consultant.
- If there is a gap in the conversation, attempt to use the opportunity to share or inquire about personal information. For example, if the client stops to find a file to show you, you can mention how you personally can never find any of your papers (if applicable).
- Do not exclude personal information from the information flow.

Also it is beneficial if the initial meeting be held at the client's location because this will provide much of context for common ground and shared understanding (Hinds 33). By visiting the client's site, the consultant is able to develop some common ground with no verbal communication.

Common Ground: In Practice

As mention earlier, the first meeting was collocated for the purpose of developing a shared understanding and common ground. In regards to common ground, a large portion of the advantages of this meeting came by establishing what the consultant did not know. For example, the consultant knew very little about the client's business sector and therefore the client was careful to explain the terminology when she used it.

The building of common ground was not limited to the initial face-to-face meeting. As the client and the consultant shared more communications the extent of the common ground between them increased. Eventually, the client was able to talk about the different locations and staff members without detailed explanation. For example, in an email she mentions "Tim" as appose to "Tim Freyder, a computer technician that works in my building." This clearly made communication more efficient in both email and instant messaging.

This is not to say that there were never misunderstandings in common ground. For example, at one point the client mentioned the Wrap program. Since the consultant did not know what this was, he asked for clarification. Since confusion regarding common ground is ultimately unavoidable, even in collocated relationships, it is important to confront the misunderstandings as soon as they are recognized.

Social Capital: The Problem

Another obstacle for virtual consulting is the difficulty of building social capital within the partnership. Social capital refers to the "intangible resources lying in relationships among people," (Maznevski 197) in particular, the strength of ties between people and the density of the entire communication network. For processes such as teaching, it is important to have strong ties (Maznevski 208). For example, one is more likely to listen to the advice of a close friend then a random stranger. Also if the consulting task involves designing something internal, the transfer of knowledge will only be there if strong links exist with key constituents within the company (Maznevski 207). Furthermore, evidence suggests that creating and collaborating requires strong ties, whereas for combining and compromising, weak ties will suffice (Maznevski 207). The internal, collaborative learning experiences that are characteristic of the process consulting model therefore emphasizes the necessity for the consultant to have strong ties to the community partner and links to the necessary people in the non-profit organization. However, the challenge lies in the fact that it is difficult to build strong ties without face-to-face relationships (Maznevski 210).

Social Capital: Building Social Capital

The methods for building social capital are also similar to developing a shared understanding and establishing common ground. The best way to build strong ties is to meet face-to-face, however this does not mean the team needs to be together often or even for prolonged periods of time (Maznevski 210). It is recommended that these face-to-face meetings be at regular intervals. For this project, it might be feasible to have three face-to-face meetings: one initial meeting as mentioned earlier, another booster meeting after seven weeks, and then a final hand-off meeting. Because face-to-face time is limited, it is important for the consultant to spend it obtaining good relations with the right people (Maznevski 198). Therefore, I recommend that the community partner should be instructed to be prepared to facilitate the meetings with key individuals during the first visit. Another possibility to help build social capital is to have two community partners. This would mitigate some of the risk of having only one person in contact with the consultant while also building a denser communication network. In addition, access

to transactive memory systems (knowledge of who knows what) helps to promote lateral communication and a denser network (Gibson 411).

Social Capital: In Practice

In this engagement, we planned three onsite meetings which served very well at building strong ties between the community partner and the consultant. Although the consultant was introduced to rest of the staff, there ended up being very little communication directly from the consultant to anyone but the community partner. The community partner ended up acting as the sole liaison from the consultant to the rest of the organization. In this smaller consulting task this sufficed, however in a more complicating consulting task, where the consultant is attempting to increase the capacity of more than just one person, this shortcut might not work.

During the committee meetings, the consultant was able to use his ties with the community partner to make it easier to offer suggestions to the whole committee. However, there was some awkwardness because the consultant did not know anyone else except for their name. If anything this shows that to maintain strong ties one must maintain communication in between the face-to-face meetings, otherwise the benefits of the face-to-face meetings are lost.

Trust: The Problem

Yet another barrier is a lack of trust amongst members of a virtual partnership. All interdependent work entails uncertainty about others' behaviors (Weisband 311). Will the others do their share of the work on time? Will their work be of good quality? The way people answer these questions is often effected by the fundamental attribution error. The attribution error refers to ones tendency to direct blame on internal causes (they are lazy, they are not smart enough) when one is the observer, but to attribute blame to external causes (you were tired, the problem was impossible) when one is the actor. Unfortunately, the attribution error is exacerbated for distributed groups relative to collocated groups for the following reasons:

- **Differences in Information**: When people are not collocated, it is impossible to have direct observation and monitoring of team members. Computer based communication does not provide sufficient evidence of the other person's attentiveness, warmth, or trust level (Gibson 61). Therefore, since there is less information about the outcomes of the other person's work and there is also less information about their environmental stimuli, one is more likely to make an incorrect attribution (Crampton 195).
- **Salience and Cognitive Load**: The human mind is limited in how much information in can process at one time. Unfortunately, in virtual groups there is much more information to consider when making an attribution and people can only process so much, especially in high-pressure situations. Therefore, people often make attribution mistakes because they cannot see things in context (Crampton 195).

Obviously, incorrect attributions will only foster more distrust amongst team members. This will lead to affective conflict that will greatly hinder the progress of any virtual partnership. However, once a team has trust, it acts as a buffer, keeping misunderstanding from escalating into conflicts (Armstrong 182).

Trust: Building Trust
In virtual teams, trust is harder to obtain but more important for survival. As with shared understanding, common ground, and social capital, the initial face-to-face meeting will prove crucial to building trust. In addition, "open and prompt communication among team members is believed to be an indispensable characteristic of trusting relationships" (Gibson 69). In order to facilitate this, it is important to avoid establishing a defensive communication climate. Creating the following norms early on can help to avoid that problem:

- **Proactive Information Exchange**: This not only includes sharing all information but continually following up on communication (Gibson 72). In addition, avoid assuming things are the same and proactively ask about holidays, the nature of job responsibilities, the availability of equipment, etc.
- **Active Listening:** This involves requesting elaboration and clarification when needed (Gibson 72).
- **Framing:** This means taking their cultural context into consideration (Gibson 72). To assist in this, it is important for all sides to share personal and situational information. This will facilitate attributions that are situational as appose to solely dispositional (Crampton 202).
- **Identify Conflict:** It is especially important not to avoid conflict, but to address it as soon as it is noticed (Gibson 417).
- **Benefit of the Doubt**: Although information to support it is not always available, it is advisable to give the virtual team member the benefit of the doubt (Cramton 225). This is not to create an excuse to avoid confronting conflict but rather to emphasize the importance of doing so carefully.

Trust: In Practice
The initial face-to-face meeting proved to be invaluable in building trust. Not only was it an opportunity to share personal information to get know each other better, but it also was an opportunity create protocols and standards so we knew what to expect from one another. We scheduled regular weekly phone meetings that were to serve as status updates. As it turned out, the phone was also a convenient medium for sharing personal and situational information. Therefore, these meeting also served the purpose of ensuring that we were updated on the situational information that trust relies on. The meetings did not have to last long because we were combining them with other forms of communication. There were a total of seven phone meetings with an average length of 28.6 minutes. In addition, the regularity of the phone meetings helped to ensure that our progress did not stagnate. Because we knew we had to report our progress every week, we were forced to be aware of the task and what the other people are doing.
The day before each phone meeting, the consultant sent out an agenda for the meeting. This served multiple purposes. First, it helped both the consultant and the

client think about what to say before the meeting. Second, it created to make a checklist for both parties to make sure they covered during the meeting. Both these points are important because of the scarcity of the phone meetings and because the cost of calling again may prevent someone from bringing something up if they forget it during the phone meeting. Finally, the agendas served as a reminder about the meeting the next day. Therefore, the agenda ensured that the partnership was able to get the most out each phone call and avoid conflict due to poor coordination.

Technology Mediated Communication: The Problem

Virtual consulting is also hindered by the many disadvantages of technology mediated communication. Technology mediated communication is inferior to face-to-face communication on many levels:

- **Rapid Feedback:** Face-to-face communication is as quick as it gets and allows for quick corrections of misunderstandings or disagreements unlike technology mediated communication (Olson 10).
- **Labor Intensity:** Technology mediated is more labor intensive and often leads to the omission of details to save time (Cramton 219).
- **Paralinguistic Cues:** Face-to-face communication has more paralinguistic cues (pitch, loudness, rhythm, and hesitations) and messages are understood more easily with them (Cramton 219). Also face-to-face allows for other channels of communications like facial expressions, gesture, and posture, which allow for more ways to convey a subtle or complex message (Olson 10).
- **Nuanced Information:** Face-to-face allows for subtle messages to flow easily and therefore convey very small differences in meaning (Olson 10).
- **Common Ground:** It is easier to establish common ground in face-to-face communication than in computer mediated communication because there are more cues to use in face-to-face to establish common ground. More common ground means easier communication with less conflict. (Olson 18).
- **Confirmation:** Computer mediated communication lacks the same amount of confirmation of messages than face-to-face. This is a combination of the lack of rapid feedback, lack of common ground and extra time required for computer mediated communication. Lack of confirmation can lead to misunderstandings and unnecessary explanations. It also blocks the necessary corrective feedback loops (Armstrong 170).
- **Synchronization:** Computer mediated communication tends to get out of sync, especially with email. In the situations where community partners only check their email once a day, there is a likelihood of simple responses taking multiple days (Cramton 219).
- **Eye-contact:** Eye contact is proven to be useful for managing attention as well as social bonding (Whittaker 95).
- **Conveying Saliency:** It is often difficult to convey the important part of a message within a long email. People often misjudge what is important and quickly read over parts of the message (Cramton 219).

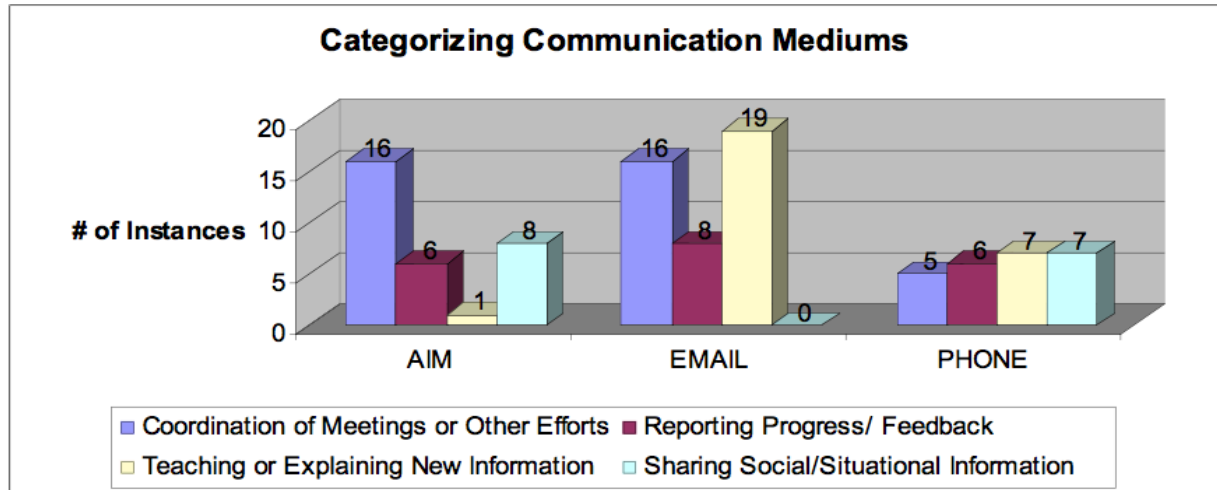**Technology Mediated Communication: Overcoming Its Limits**

As mentioned earlier technology mediated communication is inferior to face-to-face communication on many levels. A good strategy to overcome these issues is to combine different forms of communication to exploit each of their benefits. In general, "function should follow form" when choosing a communication method and "the more complex the message the richer the medium used and the longer the duration" (Maznevski 484). For example, for complex or nuanced conversations one would use a communication method that allows for immediate feedback like instant messaging or, better yet, the telephone. In situations where an archival record of the communication is important, email is a good option. In fact, for very simple messages, a lean medium such as email is not only sufficiently effective but most efficient because extraneous information is eliminated (Walther 238). All things the same, the default should always be the most accessible mode of communication (Maznevski 485).

Another very important step is to establish procedures for communication including separate procedures for social, task, and contextual communication (Cramton 225). Creating communication norms will mitigate the risk of communication failure (Gibson 80). This should not only involve the exchanging of contact information but also preferred contact method and time, the time(s) that people check their messages, procedures for sharing files, etc. The consultant and community partner will need to refine or reinforce these protocols depending on how conditions change, otherwise these protocols risk becoming a burden (Gibson 417). Leadership is proven to be very important in maintaining these protocols.

It is also important to realize that in general decisions will take more time using technology-mediated communication. It is necessary to budget your time accordingly because rushing decisions through an already impoverished mode of communication is a bad idea (Walther 242). This is yet another reason why the first meeting should be face-to-face, because many decisions must be made early that will affect the rest of the consulting task.

Technology-Mediated Communication: In Practice

Combining the different forms of technology-mediated communication was invaluable for this partnership. The following graph shows a breakdown of the three main types of communication used in this consulting task. Every instance of communication was coded into one or more of the following categories: coordination of meetings or other efforts, reporting progress/feedback, teaching or explaining new information, and sharing social/situational information. For instant messaging, conversations were recorded using an instant message client that supported logging and then categorized in the end. Coding the email involved analyzing all email in both the consultant's inbox and sent box. The phone conversations were coded using the agenda and meeting notes for each phone conversation.

Categorizing Communication Mediums

This graph implies a few things about how the different mediums of technology-mediated communication are used in practice. For example, email is not once used for sharing social/situational information. Because of the labor intensity of emails, and the fact that people often skim emails anyways, this is not surprising. Since a strong case has already been made towards the importance of continually sharing social and situational information, this suggests that a partnership cannot rely on email conversation alone.

On the other hand, email does appear to be useful for coordinating meetings and sharing new information. Email has the advantage that it can be sent to an additional person with little marginal cost. This makes it very suitable for organizing meetings with multiple people. The archival capabilities of email also made it a popular choice for sharing information, especially when the information is not that complex.

Instant messaging also played a useful role in this consulting task. Instant messaging is less intrusive then a phone call but more likely to garner a fast reply then an email. It is therefore very useful for negotiating future phone meetings (Walther 247). In fact, instant messaging was mainly used for coordinating phone or other meetings during this partnership. However, the "most extraordinary aspect of IM is that you can create a persistent connection with someone for hours even if you only talk sporadically" (Walther 247). Whether or not you are actually talking with someone on IM, you can tell their availability and how busy they are by whether or not they are online.

Phone communication proved to be effective in all four categories. It was especially useful for explaining complicated tasks. Because of the additional cost of arranging the phone calls, it was the least used of all the mediums.

As mentioned in earlier in regards to trust, communication protocols were established during the first onsite meeting. This was extremely helpful it the facilitating a smooth us of technology mediated communication. Although communication was definitely slower than face-to-face, and agreements took longer, especially through email and with multiple people, it was definitely manageable.

Shared Visual Workspace: The Problem

By definition, a virtual partnership will require working in separate workspaces. The lack of a shared visual workspace is another disadvantage of not being collocated. A shared visual work space allows for the easy establishment of joint reference to objects and therefore communication can be simplified with deictic terms (Olson 10). Without a shared visual workspace, conflict can result from misunderstanding deictic terms (Armstrong 168). In a study by Armstrong, he witnessed confusion in a telephone conversation referring to a document when the parties on the phone were on different pages in the document. Also a shared workspace allows for spatiality reference meaning that a whole concept or set of ideas can easily by referred to by pointing at an object.

Shared Visual Workspace: Using Shared Virtual Workspaces

There exist several applications that allow the creation of a shared virtual workspace that attempt to compensate for the lack of an actual shared visual workspace. These programs, like TightVNC or Windows XP's Remote Desktop, allow distant users to look at the same file and overcome some of the disadvantages of not having an actual shared workspace. If the consultant does attempt to set up any shared visual network material, which will depend on the task, it is recommended to do that at the onsite visit (Gibson.415). In general, it is a bad idea to introduce new technologies late in the consulting task, therefore it is important to plan all advanced technology use carefully. Because students may have varying knowledge of shared virtual space applications, this might require educating the students about their options early on. In practice, Remote Desktop seems simplest if the community partner has Windows XP.

In regards to using video conferencing, it is probably not a good idea for these consulting tasks. Often setting up video conferences can be more trouble than it is worth. As evidence, here is a testimonial to difficulties of video conferencing in the present day:

"We have seen the first half-hour of an hour-long meeting devoted to getting all the parties on line. People speaking were not on camera because no one knew how to work the remote camera. People were not only not heard clearly (with no one adjusting the volume or moving toward the microphones) but those who should have heard opt to call the key person later to clarify." (Olson 12)

My personal experiences with video conferencing correspond with this. However, what is even more discouraging is the fact that "video has been shown to add nothing to the outcome performance of people engaged in a variety of tasks: design, service provision, instruction, among others" (Olson 12). On a related note, in Jessica Lipnack and Jeffery Stamps 1997 book *Virtual Teams* they suggest to "go digital wherever possible, as soon as possible, all other things being equal." At first this may seem like the naïveté of the pre-bubble burst mindset. However, the statement is grounded earlier by saying "with purpose, size, and timeframe [of the project] in hand" (Lipnack 199). In other words, a consulting project about building a technology plan should not turn into one about integrating online calendars and using advanced teleconferencing software.

Shared Visual Workspace: In Practice

For this partnership, the consultant and the client decided to use Tight VNC to create a shared virtual workspace. We used the first on-site meeting to download the Tight VNC server onto the client's computer and explain how it works. Unfortunately, because the consultant left his computer at home they could not test it at that meeting. Therefore, at the first phone meeting they were able to test the VNC program however because of a problem on the consultant's end they were not able to get it work. Finally, on the second phone meeting they set up the program correctly.

Tight VNC did become useful in a later meeting when the client was attempting to explain how an obscure inventory software package they used worked. The consultant was able to VNC into the client's computer and see exactly what she was describing on the phone. If the client and consultant had not set up Tight VNC earlier, they might not have bothered to try to use it. Even if they had, it is likely that the consultant would have had the same problem he had when he tried to set up TightVNC for the first time. This would have likely resulted in the consultant missing out on valuable information as well as frustration for both sides.

Conclusion

"Organizational and virtual teams, however, are not technological systems; they are sociotechnological systems, that is, social systems completely intertwined with technological systems, no matter how advanced the technological infrastructure becomes, virtual teams will not be exceptional knowledge managers unless the social systems are given at least equal attention" (Maznevski 197).

In summary, this paper is not to say that distance does not matter, rather that it is feasible to overcome the barriers that are imposed by it. With advanced knowledge and planning, a student consultant should be able to complete a virtual consulting project within one semester. An important concept to always keep in mind is to "invest in beginnings" (Lipnack 199). Most of the strategies mentioned work best if implemented early in the consulting relationship and are often ineffective if administered too late.

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