

Communication media selection for remote work

Towards a theory of media fitness

Kunihiko Higa

Graduate School of Innovation Management
Tokyo Institute of Technology
Japan
khiga@craft.titech.ac.jp

Rui Gu

Graduate School of Decision Science & Technology
Tokyo Institute of Technology
Japan
gurui@craft.titech.ac.jp

Abstract

A framework towards a theory of media fitness was proposed to help a teleworking group to select appropriate communication media. The degree of fitness of media for a communication task was calculated by considering 9 factors from both media and user aspects. Four environmental limitations were also introduced to decide the fittest medium. Three cases from Japanese companies were used to test the model and positively supported the framework.

1. Introduction

With the rapid development of information technology, an increasing number of communication tools have been devised to satisfy the growing needs of communication. How to choose the appropriate communication media to make the business run more effectively and competitively is becoming a more complex task than 20 years ago. At the same time, how to design the new communication tool to create new communication requirements, and furthermore create a new market is also a challenging and risky task for media tool developers.

To keep up with the changes, scholars tried to propose various theories to provide explanations for media selection: from media richness theory (Daft and Lengel, 1986) to social influence perspectives (Fulk, Schmitz, and Steinfeld, 1990) and from paper based to computer-mediated. All these theories put forward some reasons and factors that were believed to be able to decide or affect the media choice, but scarcely mentioned how to actually do the media selection.

Webster and Trevino suggested in 1995, “We hope to refocus the media choice community on the complementary media choice theories by empirically examining the influences of multiple factors drawn from both rational and social influence perspectives.” The proposed framework in this paper is based on previous media selection studies and attempts to respond to such an expectation.

We propose a framework for the media fitness theory (MFT) and try to answer the simple question: why choose this medium but not that one. The answer we provide is also “simple” enough: because this particular media is the most fit one among all the choices. The basic idea of MFT framework is to decide the degree of fitness for candidate media by quantification. The whole model involves four parts: property definition, value comparison, score calculation, and result analysis.

2. Previous theories related to media selection

2.1 Media richness theory (MRT)

Daft and Lengel (1984, 1986) proposed the information richness theory trying to answer the question, “Why do organizations process information?” Then the focus was shifted to the individual managers’ media choices and the messages they exchange. In MRT the information richness is defined as the ability of information to change understanding: uncertainty and ambiguity influence the information processing required by organizations. Four factors are used to evaluate the richness: the medium’s capacity for immediate feedback, the number of cues and channels utilized, personalization and language variety. In the order of decreasing richness, the media classifications are face-to-face, telephone, written and personal (letters or memos), written and formal (bulletins, documents) and numeric formal (output). Communication tasks high in ambiguity, such as a negotiation about price, require “rich media” which are able to handle rich information. Tasks low in ambiguity do not require rich media, lean media is enough to support the communication. Therefore, appropriate media choice will raise the effectiveness of work.

2.2 Social influence perspectives (SIP)

Fulk et al. (1987, 1990) proposed a social influence model based on the social information processing theory (Salancik and Pfeffer, 1978). They opposed the idea that communication richness is a constant and objective property of the communication medium, and asserted that the media choices of individuals are influenced by those of their superiors and co-workers. In the social influence model, people's perceptions of the richness of media are different, and rationality is subjective and influenced by information provided by others. According to SIP, "lean media" identified by media richness theory may support "rich" communication effectively.

2.3 Other theories

Ngwenyama and Lee (1997) used the name "critical social theory", which was coined by Max Horkheimer in the 1930s, to clarify how richness occurs in managerial communication conditions. They believe that "researchers cannot be mere observers," observers influence and are influenced by the communication system they are studying. They suggested that IS researchers should pay attention to organizational actors and their actions, the use of pluralistic methods, and the relation of research subjects and context.

Dennis and Valacich (1999) proposed the synchronicity theory which proposes that a set of five media capabilities are important to group work. Also, that all tasks are composed of two fundamental communication processes (conveyance and convergence). Communication effectiveness is influenced by matching the media capabilities to the needs of the fundamental communication processes. The theory also proposes that the relationships between communication processes and media capabilities will vary between established and newly formed groups, and will change over time.

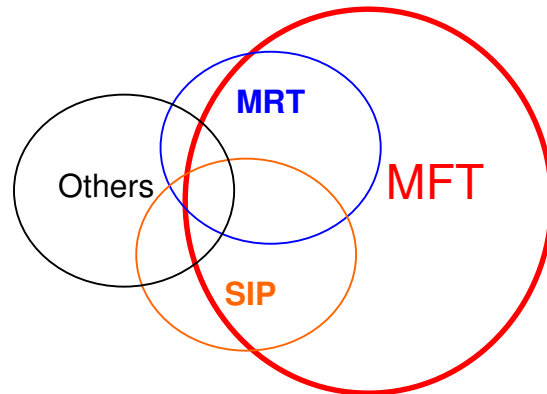
Media richness theory has been under intense examination and critique. Although most studies have found conflicting evidence within the original theories (Kinney and Watson, 1992; Ngwenyama and Lee, 1997; Dennis and Kinney, 1998; Suh, 1998; Dennis and Valacich, 1999, etc.), they are still the most frequently cited theories in study about media selection. Social influence perspectives take an opposite viewpoint to that of MRT. But as Webster and Trevino (1992) pointed out, "media richness and social influence theories are complementary rather than competing". Both media richness theory and social influence perspectives tried to adopt some viewpoints from the other side. And still more new or synthetic theories are being put forward to join the effort of explaining media selection.

3. Definition of media fitness

People choose a certain medium to communicate because it fits in his or her special case. We believe the best way to explain media selection starts from carefully describing the meaning of "fitness". Based on this idea, we propose media fitness theory as: media selection is decided by the fitness of the media with the communication task needs, the communication user and user group, and the supporting environment in which the media being utilized.

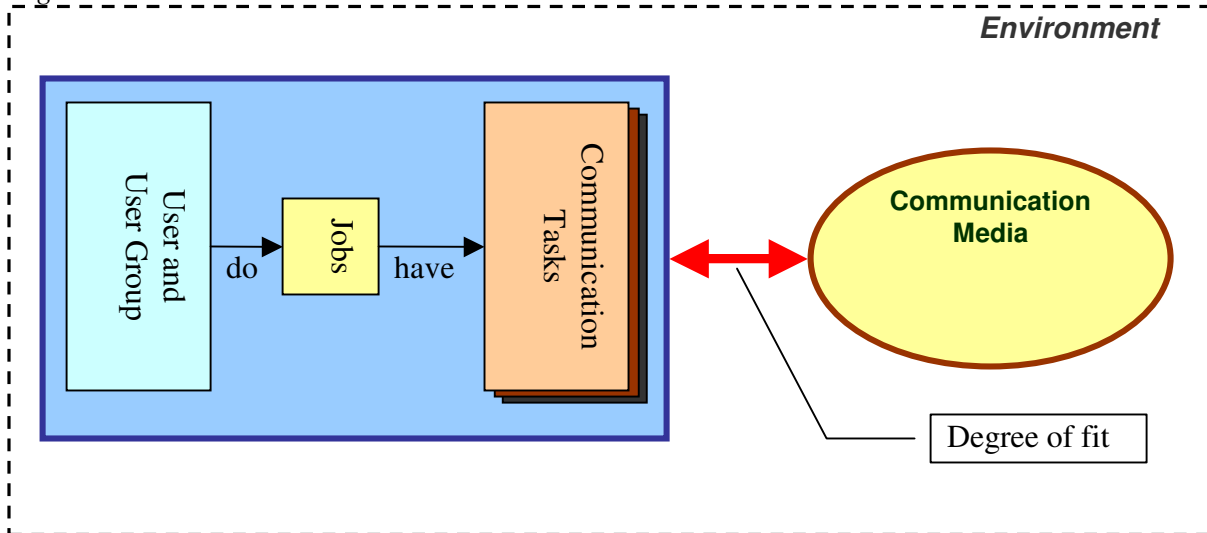
MFT is mainly based on MRT and SIP. Figure 1 shows the relations of MFT with other theories.

Figure 1. The relations of MFT, MRT and SIP



As shown in Figure 2, the main difference between MFT and others is that MFT considers the user/user group and the communication task integrally when calculating the degree of media fitness. More than that, environmental limitations are introduced to complete the framework as a whole.

Figure 2. An overview of MFT



People do jobs, and a job (that requires communication) consists of one or more communication tasks. Each communication task satisfies one or more job needs and can be accomplished by one or more communication media. When facing the problem of choosing media for a job, we are in fact unconsciously evaluating all the communication tasks as a whole. We believe that this is one of the reasons why media choice is difficult. In MFT, a closer look is taken at the broken down communication tasks, and efforts are made to find the relation between task and media.

We enumerate properties that relate to the fitness and group them into three groups, i.e. group I, II and III and define them as follows.

3.1 Definition of properties in group I

Properties in group I are used to describe or distinguish a communication task. From the view of media, properties in this group are the specifications or requirements for the media.

I-1 Response time: after how long an interval must the communicator get the response from the counterparty. This property can be projected onto the feedback ability (Daft and Lengel, 1986) of communication media. The value assignment of this property is from 1 to 5 with the following interpretation.

Response in two or more days=1, response in one day =2, response in one hour or a few hours=3, response in 10 to 30 minutes =4, Real-time/near-real-time response =5

I-2 Security: how secure the contents of the communication should be. As the security issue has become a very serious problem in computer-mediated communication, security need is growing in media selection. This property can be projected onto the security support ability of media. The value assignment of this property is from 1 to 5 with the following interpretation.

To be known by unrelated people is not serious=1, avoid to be known by anyone except certain people=3, nobody except certain people should know=5

I-3 Sharing: whether the exact same information can be shared by a third party. Daft and Lengel (1986) included personalization as one of the factors for the richness of media. It was explained as tailoring information on personal details or characteristics. It reflects the degree to which intent is focused on the recipient. The more a communication is personalized, the harder it becomes to convey the exact same messages to any alternative recipient. That is to say, personalization is contradictory to sharing, which is considered to be very important in modern organizations. This property can be projected onto the sharing support ability of communication media. The value assignment of this property is from 1 to 5 with the following interpretation.

Intentionally designed to be non-sharable or impossible to be shared=1, sharable with significant information loss or distortion (e.g., share a long speech by summarizing all contents into a few key sentences)=2, sharable with insignificant information loss or distortion(e.g., sharable by hardcopy)=3, sharable without information loss(e.g., sharable by softcopy)=4, intentionally designed to be sharable(e.g., stored in database or file sharing server)=5

I-4 Retrieval: how easily the information may be retrieved for later use. During our pilot study, we found that business people placed great emphasis on media's ability to provide evidence. It is not only important in dividing responsibility, but also in providing a memo and clue to the organizational memory. As the amount of information transacted in organizations rapidly grows, the problem of how to effectively index information becomes serious. Simple piled-up data will face the danger of losing itself in the "sea of

data”. We have noticed that many Japanese companies use fast-keyboarding to dictate the contents of a meeting instead of easy voice recording. One of the reasons is that the content of a voice file is hard to be indexed for later use. Retrieving and indexing have already become indivisible, especially in the computer mediated communication environment. This property can be projected onto the retrieval ability and index supporting ability of communication media. The value assignment of this property is from 1 to 5 with the following interpretation.

No retrieval needed=1, needs retrieval but no indexing/simply piled-up=2, manual indexing=3, semi-automatic indexing=4, automatic indexing=5

I-5 Multiparty: how many communication parties need to be involved in the communication at about the same time. Multiparty is different from sharing. Multiparty focuses on how many communicators can cooperate with each other by using the same medium. This property can be projected onto the multiparty support ability of communication media. The value assignment of this property is from 1 to 5 with the following interpretation.

Two (one-to-one)=1, about three to six people=2, about ten people=3, 20-30 people=4, broadcast=5

I-6 Expressive power: This property is derived from the multiple cues and language variety in MRT. It is defined as how many expressive resorts are needed by the communication task. We only use four basic expressive powers here: text, picture (still image), voice (audio) and video (including gestures, expression and all other movements that can be captured in video form). Although there are still more expressive powers (such as smell), only these four expressive powers are generally supported by modern communication tools. This property can be projected onto the expressive power support ability of communication media. The value assignments are by enumeration as follows.

(1) Text: No-need=*; hand script=a, printed=A; non-digitalized=b, digitalized=B; not formatted or formatted only for easy reading=c, strictly formatted/structured according to certain standard=C; plain text=d, rich text=D

(2) Picture: No-need=*; non-digitalized=a, digitalized=A; black and white=b, colored=B; low quality/resolution=c, high quality/resolution=C

(3) Voice: No-need=*; simplex=a, duplex=A; voice clip=b, voice stream=B; low quality=c, high quality=C

(4) Video: No-need=*; simplex=a, duplex=A; video clip=b, live video stream=B; low quality=c, high quality=C

3.2 Definition of properties in group II

Properties in group II are properties of the user and user group. The subjective attitude of the communicating group towards certain communication media is also included in this group.

II-1 Skill of using media: whether the majority of the group members master the usage of certain media. Carlson and Zmud (1999) found that experience is the key for users to convey rich information by email. There are two levels of meaning included in their findings. First, skill is the precondition for anyone before using a medium. Second,

experience of using email with certain people is important to build rich communication. Because experience is positively related to cooperation time, we split the above mentioned experience into two halves: one is skill of using media, the other is group lifespan. The value assignment of this skill is from 1 to 5 with the following interpretation.

Unable to use=1, able to use=3, skillful=5

II-2 Preference of media: whether the superior/majority of the group members like or adapt to use certain media. Schmitz and Fulk (1991) found that the media preference of an individual will affect his or her media choice, and the media preference of colleagues had pervasive effects on others. The preference of media should firstly be decided by the preference of the superior, then by the preference of the majority. For example, the preference of a department manager might decide the choice of media for the whole department. Compared with experience, preference of using media is a more comprehensive and direct reason for media choice.

The value assignment of this property is from 1 to 5 with the following interpretation. Hate=1, no special preference=3, like=5

II-3 Group lifespan: for how long the communication group continuously exists. Fulk et al. (1987) found that the communication requirements of groups will likely differ over time depending upon shared experiences. To sum up with the reason we expressed in the above (property II-1), we use group lifespan as one property to evaluate the weight of importance between skill of using media and preference of media. Namely, as the group lifespan gets longer, the skill of using the media becomes less and less important than the preference of the media. The value assignment of this property is from 1 to 5 with the following interpretation.

For a few days or less=1, for one or a few weeks but less than one month=2, for one or a few months=3, for about half a year but less than one year=4, for one year or more=5

3.3 Definition of properties in group III

Properties in group III are the environmental limitations for using certain media. They represent how many resources may be provided to support the function of media.

III-1 Availability: whether the medium is available for use. The availability is usually restricted by time and space. For example, face-to-face communication might be available for office workers in working days but hard to access at the weekend or during a business trip. If the availability of the medium is different for group members, then the lowest availability (the worst situation) should be used.

III-1-1 Available time: when the medium is available for use. The value assignment of this property is from 1 to 5 with the following interpretation.

Not available at any time=1, available on weekdays and in working hours=3, available anytime=5

III-1-2 Available location: where the medium is available for use. The value assignment of this property is from 1 to 5 with the following interpretation.

Nowhere=1, only available around the workplace/in the office=2, available in fixed places (in the office, at other working sites, at home, etc.) =3, available on a business trip (mobile)=4, available everywhere=5

III-2 Bandwidth: how much bandwidth can be provided for communication media. When evaluating media not based on computer mediated communication, an estimation of the bandwidth should be used. For example, the bandwidth of a common landline telephone can be converted to the bandwidth that is needed to transfer voice of the same quality via a digital network. Note that this bandwidth is the lowest bandwidth if the communication can be done in many places or situations. The value assignment of this property is from 1 to 5 with the following interpretation.

No access or very low (old dial-up networking by low speed modem)=1, low (cheap ADSL connection (ADSL, 2006))=2, medium (moderate ADSL connection or low speed local network)=3, high (expensive ADSL connection or moderate speed local network)=4, unlimited or very high (optical fiber connection, high speed local network or face-to-face)=5

III-3 Cost: how much money can be provided for the running of communication media by the organization. Private expenses are not considered. The cost consists of the initial cost and the running cost. If the running platform of a medium is exclusive, the initial cost should be considered much higher than that for universal purpose. For example, the initial cost of email is very low, because email software is nearly free and the hardware used to run email is usually equipped for more general purposes. But for VCS, things are quite the reverse. Nearly every VCS needs special equipment or expensive software and professional installation.

The running cost includes everything that is needed to keep the medium running normally. Media that need daily or weekly maintenance are obviously higher in cost than those that need nearly no maintenance.

Note that FTF is not a real medium, but it has been popularly viewed as a kind of special medium. For this reason, the cost of FTF should be considered separately. The cost of FTF includes not only the transportation fee, allowance, etc., but also the opportunity cost. FTF communication monopolizes human resources, that is, under most conditions the communicator doing FTF can do nothing else, thus losing the opportunity to respond to other more important jobs. The same kind of specific consideration towards FTF applies to the discussion of all other properties. The value assignment of this property is from 1 to 5 with the following interpretation.

Zero/ very low=1, low=2, medium =3, high =4, very high=5

3.4 Definition of sample media

To find the degree of fitness, we must define what kind of medium is under consideration. Although many varieties of media are used for business communication, six typical media - fax, telephone, email, IM (instant messenger), VCS (video conferencing system), and FtF (face-to-face) - are chosen for this study.

All the media mentioned above do not represent any specific type of medium. For example, although MSN Messenger, Google Talk, Skype, etc. are classified as IM (Instant Messenger, 2006), they might be viewed as totally different communication tools for some users. The above definition tries to establish sample media with the most common features to compare with task needs. For example, if IM were found to be the most-fit medium for certain communication task, that is still one step from deciding which is better, Google Talk or Skype. To differentiate between these two media, a specific redefinition of properties is needed.

We completed this definition with three IT engineers from three different companies. A definition table was passed between them, discussed and revised until an agreement was reached.

During the investigation, we located two more supplementary sample media: scheduler and FTP, which have not been popularly studied by scholars. Scheduler is usually used to coordinate scheduling inside a department or company. The calendar integrated into Microsoft Outlook (Outlook, 2003) is one of the most famous schedulers with a long history. According to our observation, web-based schedulers are becoming popular. FTP refers to file sharing service acts like FTP. Such services may or may not be based on File Transfer Protocol (RFC 959, 1985).

Table 1 *Definition of sample media: properties in group I*

		Fax	Tel.	Email	IM	VCS	FtF	Scheduler	FTP
Response time	Min	1	5	1	3	5	5	1	1
	Best-	1	5	1	4	5	5	2	5
	Best+	3	5	3	5	5	5	4	5
	Max	4	5	4	5	5	5	5	5
Security	Min	1	1	1	1	1	1	1	1
	Best-	1	1	1	1	1	1	1	1
	Best+	3	4	5	3	3	5	2	2
	Max	4	5	5	5	4	5	3	3
Sharing	Min	2	1	3	1	1	1	3	4
	Best-	3	1	3	4	1	1	4	4
	Best+	3	2	4	4	2	2	5	5
	Max	3	3	4	4	2	4	5	5
Retrieving	Min	1	1	1	1	1	1	1	1
	Best-	1	1	2	1	1	1	5	2
	Best+	2	1	4	2	1	3	5	3
	Max	3	1	4	3	2	3	5	4
Multiparty	Min	1	1	1	1	1	1	1	1
	Best-	1	1	1	1	1	1	2	4
	Best+	1	1	3	2	1	3	5	5
	Max	2	1	4	2	2	4	5	5
Exp. Power	Text	aAbcd	*	ABcCdD	ABcCdD	aABcCdD	aAbBcCdD	ABcCdD	aABcCdD
	Picture	Abc	*	AbBcC	AbBcC	AbBcC	aAbBcC	*	AbBcC
	Voice	*	ABC	abc	ABc	ABC	aAbBcC	*	abBcC
	Video	*	*	*	ABc	ABC	aAbBcC	*	AbBcC

The definition of all these sample media is organized in Table 1 and Table 2. The min and max mean the minimum and maximum limits to which a medium supports the corresponding property. The best- and best+ mean the range a medium can exert good support for the corresponding property. More details about this will be discussed later in this paper.

Table 2 *Definition of sample media: properties in group III*

	Fax	Tel.	Email	IM	VCS	FtF	Scheduler	FTP
Available time	4	4	5	4	3	3	4	4
Available location	2	5	3	3	2	3	3	3
Bandwidth	2	3	2	3	4	5	2	3
Cost	2	2	1	1	3	4	1	2

To understand the definitions in Tables 1 and 2, the definition of properties in section 3.1 and 3.3 must be referenced. Take the response time of email as an example. Email is a medium which is supposed to be able to respond from “10 to 30 minutes” (max, value=4) to “two or more days” (min, value=1). But email is commonly recognized as a medium which is suitable for tasks whose response time need ranges from “one hour or a few hours” (best+, value=3) to “two or more days” (best-, value=1). The expressive power of email includes text (ABcCdD), picture (AbBcC), and voice (abc). Although technically it is possible to transmit video clips via email, it is seldom done because of the risk of junk email and other reasons. The email we define here supports printed (A), digitalized (B), unformatted (c) or formatted (C), and plain (d) or rich (D) text. It supports digitalized (A), black and white (b) or color (B), and low (c) or high (C) resolution pictures. And only simplex (a) low quality (c) voice clip (b) is supported by email.

Take telephone as another example. The value of available time of telephone is 4, which means telephone is available beyond “weekdays and working hours” (3) but not “anytime” (5). And because it is “available everywhere” (5), we found that the “telephone” defined here is not a fixed-line phone but a mobile phone which is becoming a necessity for business people.

4. Research Methodology

4.1 Organizations Investigated

Our research involves three departments in three different Japanese companies.

The first case (case A) is the IT solution department of a leading construction company in Japan, which is also one of the top construction companies in the world. The main work of this department is providing IT solutions and support to other departments inside the company.

The second case (case B) is the business creation department of a famous consulting company in Japan, which provides IT solutions, outsourcing, support and system-related services. This department was developed by young elites of the company and was given the utmost freedom to develop business. The main work of this department is to explore new business opportunities by providing IT solution package services from planning to programming.

The third case (case C) is the local new society business integration department of the world's third-largest customer-focused information technology and communication solution providing company. The main work of this department is to create new business opportunities by providing new ideas and plans for the local government under the direction of e-Japan Strategy (Japan IT Strategy Headquarters, 2001).

Table 3 *The comparison of the three cases*

	Case A	Case B	Case C
Main job	IT related (includes programming)	Consulting and IT related (includes programming)	Consulting services
Number of members	12	9	13
Work style	Office worker	Mobile worker	Mainly mobile worker
Media usage	All but IM	All	All but IM

4.2 Data collection

We did not use a questionnaire to do the study because we wanted the respondents to describe their media choice rather than selecting choices defined by us. We used a description template to do the study. The main idea was to let the respondent describe their practical media usage in the format we designed, which made the quantification possible. The template included three parts. The first was a brief explanation of the media fitness theory, followed by an instruction on how to use the template. A sample form was also provided to illustrate how to fill in the template. Attached to the template was a detailed explanation of each property and the value assignment rules.

Data collection involved the following steps:

First, the idea of media fitness and the definition of properties were explained. Suggestions were gathered and considered in order to adjust the items in the property list. Also, the value assignment of the sample media was discussed to ensure that the samples represented the practical situation of average media usage. Second, a pilot study was done to test the function of the whole framework. At last, a formal template was sent to each respondent.

Respondents were required to pick communication tasks which were small enough to implement certain clearly-and-shortly illustratable job needs. Overly complicated cases were dropped or broken down before filling into the template. To avoid impulsive or occasional media choices from being involved, we asked the respondent to use cases that had already existed for a long time. Also, to avoid cases being concentrated into one type, respondent were asked to give four types of communication tasks. The four types of communication were notification/transmission, coordination, creation or decision, negotiation/persuasion, as proposed by Nakamura et al. (1995, 1996).

In total, there were 12 tasks (threes cases, with four tasks each), as shown in Table 4. Note that, if more than one medium appeared in “media using now” in Table 4, the first medium is primary and others are supplementary.

Table 4(a) *Descriptions of all tasks of case A*

Task A-1	Task type	Media used previously	Media using now
Seminar report	Notification	Paper	Email
<p>Task description:</p> <p>A simple report is to be made for the supervisor and colleagues after having various seminars outside of the company. The frequency is about once every two or three months. The report is basically drafted by the one who attended the seminar. If there are other companions, the report may be done together but it doesn't need to be done in the same place or at the same time. One makes a draft and other people do revision.</p>			
Task A-2	Task type	Media used previously	Media using now
Adjust schedule for meeting	Coordination	Tel. and email	Scheduler and email
<p>Task description:</p> <p>Adjust the schedules for arranging a meeting. It used to be difficult to locate the time period available for all by telephone or email. Now, it is easy to find an available time via scheduler and confirm by email.</p>			
Task A-3	Task type	Media used previously	Media using now
Regulation and standard revision for system developing	Creation	FtF	FtF
<p>Task description:</p> <p>The developer makes a draft and sends it by email for exchanging opinions. If the email based discussion is not enough, face-to-face communication will be done. The final decision is made only by a face-to-face meeting.</p>			
Task A-4	Task type	Media used previously	Media using now
Interact with remote designer	Negotiation	FtF	FtF and VCS
<p>Task description:</p> <p>The interaction with a remote designer is not simply exchanging text documents. Face-to-face is usually the main way to communicate because it is convenient to use construction maps and pictures. The new type of video conferencing system is useful because it can convey very accurate images and movies, which was impossible in old VCS. The remote designer can see exactly the same picture drawn by the engineer in the local office.</p>			

Table 4(b) *Descriptions of all tasks of case B*

Task B-1	Task type	Media used previously	Media using now
Secure development and convey information	Notification	FtF	IM
<p>Task description: Go to software companies to commission a developing job after the project plan has been accepted. It is also possible to develop the software individually. Because the location is scattered, it is not necessary to be face-to-face. Recently, telephone, Skype, and MSN messenger are being used. Communication can be done without knowing where the communicators are. And it is more likely that we use IM during the night with programmers who are quick at adopting new communication tools like Skype or MSN messenger.</p>			
Task B-2	Task type	Media used previously	Media using now
Coordination in doing detailed business plans and developing schedules	Coordination	Tel. and Fax	Email and FTP
<p>Task description: Make out a detailed business plan together with experts after the plan has been approved. The most important thing is to estimate the development cost and the developing schedule. It is convenient to manage the history records by email. It is necessary to keep information in the latest version.</p>			
Task B-3	Task type	Media used previously	Media using now
New IT service plan	Creation	FtF	FtF
<p>Task description: Discuss and plan the new business. It is necessary to talk with experts from various fields (researchers, developers, marketing people, managers, lawyers, etc.) face-to-face and do brainstorming. The new plan is made in the form of a paper document and submitted to the planning committee. The frequency is 4 times per year.</p>			
Task B-4	Task type	Media used previously	Media using now
Fund procurement and securing cost	Negotiation	FtF	FtF and VCS
<p>Task description: Visit all the sponsors to ensure the procurement of funds after the plan is made. Several persons in charge will pay visits face-to-face at the same time. To keep the information up-to-date, a meeting is needed.</p>			

Table 4(c) *Descriptions of all tasks of case C*

Task C-1	Task type	Media used previously	Media using now
Daily/weekly/activity report	Notification	Paper	Email
<p>Task description:</p> <p>Daily activities (customer visit, seminar, presentation outside of company) that should be recorded will be shared by email inside the department. At the same time, activities of colleagues can be traced. A weekly report is stored on the net server inside company, recording what has been done this week and the plan for next week. Because records can be gathered on one single worksheet, the activities of all department members can be clearly understood.</p>			
Task C-2	Task type	Media used previously	Media using now
Adjust schedule for meeting	Coordination	Tel.	Email and scheduler
<p>Task description:</p> <p>A scheduling system is being used inside the company. Based on this system, it is easy to find the status (in or out) of other employees if you are authorized. Then an appointment may be arranged by locating the available time period. It might be easier to adjust the arrangement if email is also used.</p>			
Task C-3	Task type	Media used previously	Media using now
Strategic concept design	Creation	FtF	FtF
<p>Task description:</p> <p>To establish a national business and system engineering strategy. The meeting is held in an assembly room with projectors. Powerpoint is usually used during the meeting. The resolution is published by Powerpoint or Word file, and the same contents will be uploaded onto the intranet. Sometimes, related questionnaires are done via intranet. Email is more popularly used to confirm the related materials for final policy decision.</p>			
Task C-4	Task type	Media used previously	Media using now
Concept conveyance	Negotiation	FtF	FtF
<p>Task description:</p> <p>Try to persuade customers to adopt the business concept and answer questions inside and outside of company. Although it is possible to send description files via intranet, face-to-face meeting is still the main way to communicate, especially outside of the company.</p>			

4.3 Data calculation

The calculation methods of properties in the three aspects are different, and described by the following.

Group I:

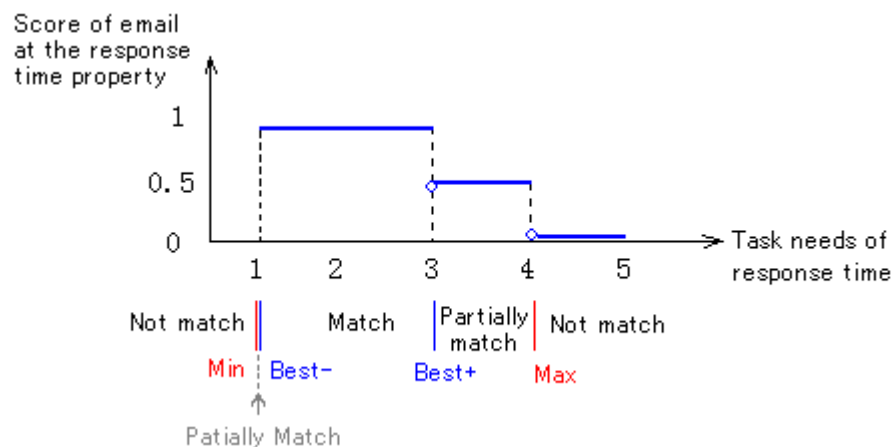
The calculation of properties in group I is divided into two parts. The first part includes all properties but expressive power; the second part includes expressive power only.

For the first part, we use the idea of fuzzy math (Nakashima, 1997) and simplify the score range to 0, 0.5 or 1, which represent non-match (0), partial match (0.5), and good match (1) respectively.

For example, as defined in Table 1, the response property of email is “min=1, best-=1, best+=3, and max=4”. We displayed this definition in Figure 3.

If the response need of certain task is 1, 2 or 3, then the score of fitness of email for response property is 1 (match). It means “email is good for communication tasks that require a response time longer than one hour.” If the need is 4, the score is 0.5 (partial match), which means “email is able to handle tasks that require response in about 10 to 30 minutes, but it is not recommended.” And if the need is 5, the score is 0 (non-match), which means “email is not suitable for real-time or near-real-time communication.”

Figure3. Task needs (response time) and corresponding scores of email



The calculation of expressive power is different from other properties in group I because it consists of four expressive items. The score range of expressive power is 0 and 1. If the requirements of expressive power were fully satisfied, then the score becomes 1, otherwise 0. For example, if the expressive power of email is “text=ABcCdD”, and the need of the task is “text=ABCD”. It is easy to see that all the letters that appeared on the task needs side are included in the expressive power of email, which means email supports the text needs of the communication. But if the need is “text=abCD”, where “ab” is not included in “ABcCdD”, we say that the communication needs cannot be satisfied by email. Only when all the four expressive items satisfy the needs, can the final score be set to 1.

The sum of scores of group I is calculated by weighted average. The weight is decided by the relative importance of each property according to their respective

communication task type (i.e., notification, coordination, creation, and negotiation). Weights are calculated by AHP (Analytic hierarchy process, McCaffrey, 2005)

Group II:

The sum of group II is calculated by the formula $\frac{x}{5} \times (1 - \frac{w}{5}) + \frac{y}{5} \times \frac{w}{5}$, where x is the skill of media usage, y is the preference of media, and w is the group lifespan. The value range of x , y and w is from 1 to 5.

We composed this formula because the lifespan of a group will affect the importance of skill and preference. When the lifespan is very short, skill plays an important role because there is no time for gaining skill, but if the lifespan is long enough, individual members will try to learn the skill of using media to meet with the preference of the group.

Group III:

We used a simple average score to represent the sum of group III. The average score of group III reflects how much is required above the resource limitation. A higher value of the average of group III indicates a less limited resource. Positive value usually means free from resource limitation. But there is a possibility that one or more scores of properties in group III are negative but the average is positive. So, we introduced the “veto” mechanism, namely, no matter how much the average of group III is, if any one of the four properties cannot be satisfied, we will say the whole group III were not satisfied.

For example, in task A-1, the scores of email in group III are 0(available time), -2(available time), 0(bandwidth), 0(cost), then it is easy to get the average score of group III (-0.5). We use “-0.5(-1)” to mark the result, which means for email, the average score of all properties in group III is -0.5 and there is one property that failed to be satisfied (which means email requires more resources than can be provided in task A-1.)

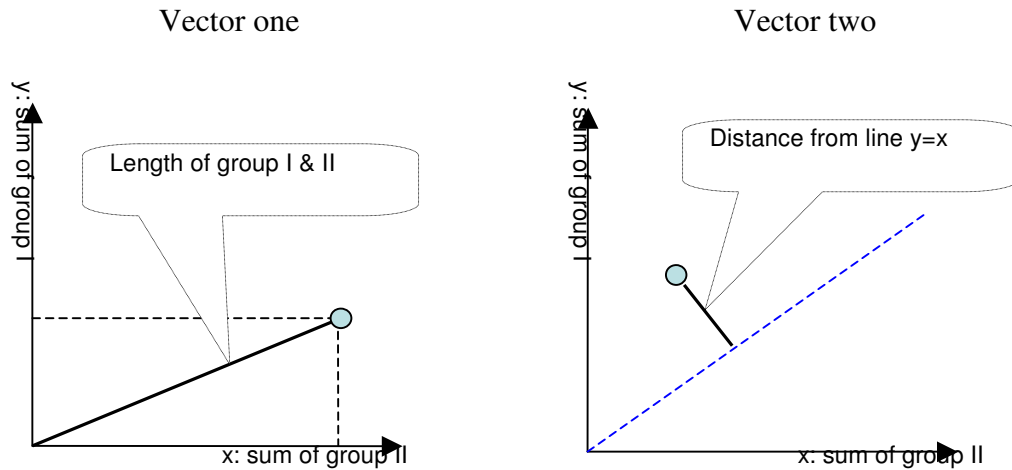
Score of fitness:

The score of fitness is calculated by two vectors.

Vector one consists of the sum of group I and group II. The maximum value of the vector may not exceed $\sqrt{2}$ (as shown in the left part of Figure 4). A higher value of vector one indicates a better fitness.

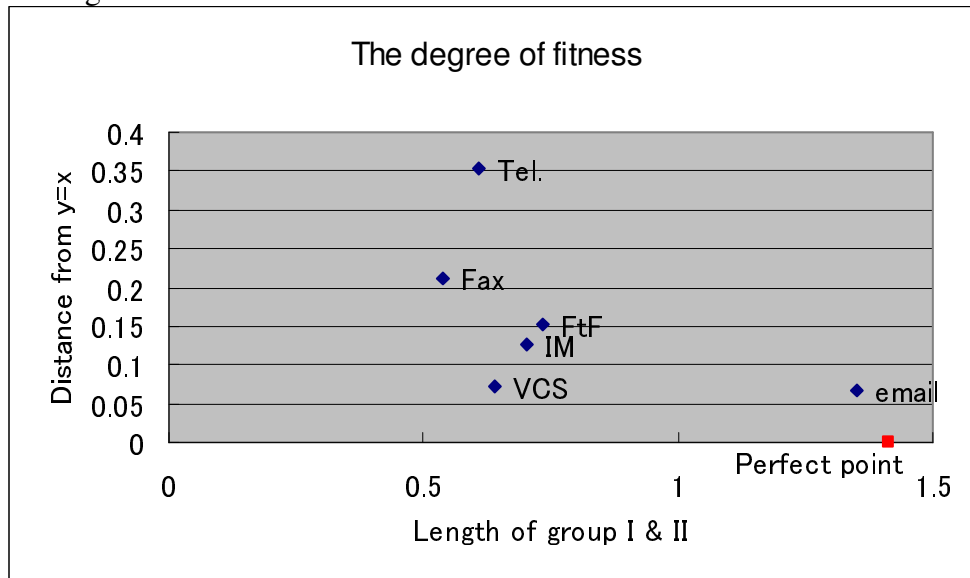
The other vector is the distance of the point (determined by the sum of group I and the sum of group II) from line $y=x$ (as shown in the right part of Figure 4). The line $y=x$ means the more a medium fits the task needs, the more likely the user group is to adopt it. If the point is far away from the line $y=x$, it means the media fits well in group I but badly in group II or vice versa. The maximum value of sum two is half of $\sqrt{2}$. A lower value of vector two indicates a better fitness.

Figure 4. Two vectors are used to calculate the value of fitness



After we get these two vectors, we can finally calculate the score of fitness. Figure 5 illustrates the degree of fitness of all sample media in task C-1. One blue point represents one medium.

Figure 5. Degree of fitness



In Figure 5, the x coordinate value of email is 1.349 (it is the “length” decided by the sum of group I (0.906) and the sum of group II (1.000), as the calculation method shown in the left part (vector one) of Figure 4) and the y coordinate value is 0.067. Email is the closest point to the red “perfect point” among all. This indicates email is the most-fit media candidate. The perfect point is the situation when vector one is at its maximum ($\sqrt{2}$) and vector two is zero, namely, the x coordinate value of perfect point is $\sqrt{2}$ and the y coordinate value is zero. Usually the difference is not as obvious as shown in Figure 5, and then comparison of numbers (the distances from “perfect point”) is needed.

By comparing the value of fitness of all the sample media, we can locate the most-fit medium candidate.

Judging the limitations:

The most-fit candidates will be judged by the sum of group III. If the corresponding sum of group III is positive, then the candidate is the most-fit medium.

But if the sum of group III is negative, we must analyze what is the cause. If it is possible to provide more resources for the medium, then the candidate is still acceptable. Otherwise, the first candidate will not be feasible and next candidate will be considered.

4.4 Result analysis

The calculation results for tasks in case A are listed in Table 5. For scores in group I and II, red, bold, italic and underlined numbers are the best among all media; green and underlined numbers are the second best. For scores in group III, bold, italic and underlined numbers mean the limitations are satisfied.

Referring to the descriptions of tasks in section 4.2 and the calculation method in section 4.3, it is easy to find that the MFT based calculation result matches the real case. But there are still some points about group III that must be noted.

Table 5 Results of media fitness for case A (task A-1 to A-4)

Task A-1	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.54	0.08	<u>1.00</u>	0.68	0.51	0.65	<u>0.81</u>	0.76
GroupII	0.20	0.60	<u>1.00</u>	0.40	0.40	0.40	<u>0.80</u>	<u>0.80</u>
GroupIII	-0.25 (-2)	0.25 (-2)	<u>0.50</u>	-0.25 (-2)	-1.25 (-3)	-1.50 (-2)	<u>0.25</u>	-0.25 (-2)
Fitness	0.87	0.89	<u>0.00</u>	0.66	0.77	0.68	<u>0.28</u>	0.31
Task A-2	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.30	0.06	0.71	0.25	0.21	0.57	<u>0.95</u>	<u>0.77</u>
GroupII	0.20	0.60	<u>1.00</u>	<u>0.80</u>	0.20	0.40	<u>0.80</u>	<u>0.80</u>
GroupIII	-0.25 (-2)	0.25 (-2)	<u>0.50</u>	-0.25 (-2)	-1.25 (-3)	-1.50 (-2)	<u>0.25</u>	-0.25 (-2)
Fitness	1.06	0.90	<u>0.28</u>	0.69	1.13	0.73	<u>0.20</u>	0.30
Task A-3	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.03	0.12	<u>0.57</u>	0.26	0.46	<u>0.65</u>	0.45	0.45
GroupII	0.36	0.68	<u>1.00</u>	0.60	0.60	<u>1.00</u>	0.64	0.64
GroupIII	0.75 (-1)	1.25 (-1)	<u>1.50</u>	0.75 (-1)	-0.25 (-1)	-0.50 (-1)	<u>1.25</u>	0.75 (-1)
Fitness	1.08	0.82	<u>0.40</u>	0.80	0.67	<u>0.33</u>	0.65	0.65
Task A-4	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.11	0.45	0.44	0.54	<u>0.67</u>	<u>0.90</u>	0.48	0.61
GroupII	0.20	0.20	<u>0.60</u>	0.40	<u>0.60</u>	<u>1.00</u>	0.40	0.40
GroupIII	<u>1.25</u>	<u>1.75</u>	<u>2.00</u>	<u>1.25</u>	<u>0.25</u>	0.00 (-1)	<u>1.75</u>	<u>1.25</u>
Fitness	1.19	0.94	0.68	0.75	<u>0.52</u>	<u>0.10</u>	0.79	0.70

Task A-1: the most-fit choice is the same as real case.

Task A-2: the most-fit choice is the same as real case.

Task A-3: does not satisfy one requirement in group III. When traced back to the calculation worksheet, we found the reason is that the cost of FtF is higher than expected. Although it was not reported by the respondent as one of the media being used, we found that email, which is much lower in cost, might be heavily used to balance the cost. The follow-up investigation verified our assumption: information exchange by email always happens before a scheduled meeting. The reason why the respondent listed only FtF is that they believed FtF is the final deciding communication procedure and is irreplaceable for this task.

Task A-4: requirement of cost in group III is not satisfied. VCS is used to cut down the cost. Because of the limitation in its function, the old VCS system had lain idle for a very long time. Many employees doubt the usefulness of VCS. For this reason, although the new VCS is accepted, it is still far from being popular. However, in the future, it may be possible that VCS will be the first choice for the same kind of task for the group.

Table 6 Results of media fitness for case B (task B-1 to B-4)

Task B-1	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
Group I	0.31	0.04	0.84	0.93	0.44	0.65	0.61	0.72
Group II	0.20	0.60	1.00	0.20	0.52	0.88	0.20	0.20
Group III	0.25 (-2)	0.75 (-1)	1.00 (-1)	0.25 (-2)	-0.75 (-2)	-1.00 (-3)	0.75 (-2)	0.25 (-2)
Fitness	1.05	0.90	0.16	0.69	0.74	0.36	0.83	0.76
Task B-2	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
Group I	0.17	0.06	0.71	0.13	0.13	0.47	0.82	0.69
Group II	0.32	0.84	1.00	0.20	1.00	0.60	0.56	0.56
Group III	0.25 (-1)	0.75 (-1)	1.00 (-1)	0.25 (-2)	-0.75 (-2)	-1.00 (-2)	0.75 (-1)	0.25 (-2)
Fitness	1.06	0.79	0.28	1.18	0.74	0.66	0.46	0.53
Task B-3	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
Group I	0.20	0.19	0.58	0.56	0.58	0.62	0.45	0.46
Group II	0.20	0.60	1.00	0.20	0.44	0.96	0.20	0.20
Group III	-0.25 (-1)	0.25 (-2)	0.50	-0.25 (-2)	-1.25 (-3)	-1.50 (-3)	0.25	-0.25 (-2)
Fitness	1.13	0.84	0.39	0.86	0.70	0.36	0.94	0.93
Task B-4	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
Group I	0.17	0.45	0.44	0.65	0.71	0.95	0.48	0.63
Group II	0.20	0.20	0.60	0.20	0.20	1.00	0.20	0.20
Group III	1.50 (-1)	2.00 (-1)	2.25	1.50 (-1)	0.50 (-1)	0.25 (-1)	2.00	1.50 (-1)
Fitness	1.15	0.94	0.68	0.80	0.77	0.05	0.92	0.81

Referring to the descriptions of tasks in section 4.2, it is easy to find that the results match the real media choices except task B-1 in Table 6.

Task B-1: although email got the best fitness score, we may find that the score of IM in group I is the highest. IM failed to be the best choice due to the poor score in group II, which is one of the lowest ones among all media. The figures reflect the fact that the department is switching from email and FtF to IM. After a few months, IM will become

the best fit for the group. The respondent reported that, as most programmers like to work at night, IM is especially useful to find the status of the user, i.e., offline, online, busy, etc. Without IM, it is extremely annoying to call at night, or send an email and wait just to ask for a simple definition of a constant.

Task B-2: for email, the sum of group III does not satisfy the requirement for the available location. This happened because the definition of our sample email is 3 (available in fixed places. Refer to Table 1). Staff in this department are equipped with notebook PCs and wireless capability to ensure mobility. Thus, email should have been 5 (available everywhere) in this case. So, the value of group III has actually been satisfied. As for the combined use of FTP, it is because email does not satisfy the sharing requirement, but FTP satisfies it very well. Although FTP gets a poor fitness score, its special feature made it the supplementary medium to email. As can be seen from this example, MFT can easily explain the combination use of media.

Task B-3: FtF is the best choice but does not satisfy the requirements of group III. Available location is the only property that is satisfied. This made the sum of group III extraordinarily low (-1.25). It seems FtF should be declined. But after we contacted the respondent, we found that because the task is done only 4 times a year and is important, it is possible for it to be costly. Furthermore it is surprising that in reality, the resources provided for task B-3 are actually “squeezed” out from the resources of other works. This is a very strange phenomenon but it is the only solution for this special department. This department acts as the pioneer of the company and stands alone from the whole company structure. They report directly to the head of the company. This arrangement gives them the utmost flexibility but lacks the formal support backup from the company. In this case, the relatively small department is responsible for the whole process from idea generation to the programming work of their own project. The fact is that although they are well equipped, they still have to face the problem of lack of resources, especially time and human resources.

Task B-4: the most-fit choice does not satisfy the cost requirement in group III. To solve this problem, VCS is introduced to replace the FtF communication. The VCS in this company includes several video screens, and each screen shows the figure of a remote communicator, who is working in a remote city. People who use the VCS sit in the middle surrounded by screens. The physical scale of VCS equipment is the biggest among all the three cases.

If we take a look at all four tasks in case B, it is easy to find that a lack of resources to support the most-fit media is the prominent feature.

Table 7 Results of media fitness for case C (task C-1 to C-4)

Task C-1	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.50	0.10	0.91	0.58	0.50	0.62	<u>0.77</u>	0.69
GroupII	0.20	0.60	1.00	0.40	0.40	0.40	<u>0.80</u>	<u>0.80</u>
GroupIII	-1.25 (-3)	-0.75 (-3)	-0.50 (-1)	-1.25 (-4)	-2.25 (-4)	-2.50 (-4)	-0.75 (-2)	-1.25 (-4)
Fitness	0.90	0.88	0.09	0.72	0.78	0.70	<u>0.30</u>	0.36
Task C-2	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.27	0.03	0.71	0.22	0.18	0.57	0.92	<u>0.74</u>
GroupII	0.20	0.60	1.00	<u>0.80</u>	0.20	0.40	<u>0.80</u>	<u>0.80</u>
GroupIII	-1.25 (-3)	-0.75 (-3)	-0.50 (-1)	-1.25 (-4)	-2.25 (-4)	-2.50 (-4)	-0.75 (-2)	-1.25 (-4)
Fitness	1.08	0.91	<u>0.28</u>	0.71	1.15	0.73	0.21	0.33
Task C-3	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.03	0.12	<u>0.57</u>	0.26	0.46	0.65	0.45	0.45
GroupII	0.20	0.60	1.00	0.60	0.60	1.00	0.60	0.60
GroupIII	1.25 (-1)	1.75	2.00	1.25	0.25 (-1)	0.00	1.75	1.25
Fitness	1.22	0.87	<u>0.40</u>	0.80	0.67	0.33	0.67	0.67
Task C-4	Fax	Telephone	Email	IM	VCS	FtF	Scheduler	FTP
GroupI	0.33	0.60	0.44	0.62	<u>0.77</u>	0.95	0.43	0.54
GroupII	0.20	0.20	1.00	0.40	0.60	1.00	0.40	0.40
GroupIII	1.50	2.00	2.25	1.50	0.50	0.25	2.00	1.50
Fitness	1.03	0.83	0.51	0.69	<u>0.45</u>	0.05	0.83	0.75

From Table 7, we may find that the results match the real media choices.

Task C-1: the most-fit medium is the same as the real choice, but the available location requirement in group III is not satisfied. The reason is the same as we mentioned previously. In reality, email software is installed on a notebook PC with wireless access to networks, but the sample medium we defined here is “available in fixed places”.

Task C-2: is almost the same as task A-2, but the most-fit medium is different. But why does the same kind of task choose a different kind of communication media? To answer this question, we carried out a follow-up investigation and compared the differences between using a scheduler in case A and in case C. We found that, in case A, people can easily get access to the scheduler system from outside of the company (say from home). But in case C, because of the tight security policy in the whole company, the scheduler can only be accessed within the intranet. That is to say, the scheduler is unavailable when mobile working as in case C, so email became the first choice. But after returning to the office, the updating of the scheduler is still needed.

Task C-3: most-fit is the same as real choice.

Task C-4: most-fit is the same as real choice.

We summarize all cases into Table 8 and find that MFT performs well in explaining the media choices.

Table 8 *Summary of the data analysis*

Item	Task number											
	A-1	A-2	A-3	A-4	B-1	B-2	B-3	B-4	C-1	C-2	C-3	C-4
1. Does the MFT choice match with the real choice?	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
2. Does the MFT choice satisfy the limitations in group III?	Y	Y	N	N	N	Y	N	N	Y	Y	Y	Y
3. Can the unsatisfied situation (in item 2) be explained?	-	-	Y	Y	Y	-	Y	Y	-	-	-	-
Is MFT effective?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

* Y=Yes, N=No

5. Conclusion

The proposed framework for the Media Fitness Theory is based on the apparently simple idea that media selection is done by evaluating the fitness between the medium and the communication task. The idea of media fitness is simple but hard to describe, evaluate and test.

Firstly we arranged the factors related to media fitness into three groups. These factors came from both existing research works and our own investigation about media usage in business. Detailed definitions and value assignment rules were described. Unlike most studies (Fulk, 1993; Ngwenyama and Lee, 1997; O’Kane and Hargie 2006; etc.) which used only a few media as the research object, we defined six well-known communication media and two supplementary media.

Secondly, we developed a description template to lead the respondents translating their communication tasks into media fitness property values. Together with the careful definitions, a description template was used in an attempt to make the property values reflect the real cases.

Thirdly, we calculated the values and suggested the most-fit candidate media. We began to calculate the most-fit medium, which was also supposed to be the main medium used, then located subsidiary media which might supplement some properties that the most-fit medium failed to fit well. The calculation process provided an explanation for why more than one medium were being used for a single task.

Finally, the environment limitations and differences between the most-fit media were compared with the media that were being used in reality, and interesting findings were found, which furthermore verified the usefulness of the proposed framework.

Some limitations of this study should also be noted. The cases being used are Japanese companies only and their offices are all located in Tokyo. All the departments that were investigated have more or less IT backgrounds, so there is still a slight possibility that the MFT framework is not applicable for traditional organizations. The

breakdown of communication tasks has been touched upon but needs in-depth research (such as how to decide the proportion of tasks to explain the comprehensive media choice for a job). The analysis of cost in group III may be more delicately developed. The interaction of properties has not been thoroughly discussed, and there might be a better arrangement for these properties. Further research on MFT is desired.

Acknowledgements

The authors thank Mr. Masaru Nakata at Kajima Company, Mr. Kenji Kumano at Fujitsu Company, and Mr. Makoto Yoshimura at Nihon Unisys Company for their warm-hearted cooperation during the research.

References

- ADSL (2006). Retrieved December 19, 2006, from the homepage of Wikipedia:
<http://en.wikipedia.org/wiki/ADSL>
- Carlson, J.R. and Zmud, R.W. (1999). Channel expansion theory and the experiential nature of media richness perceptions. *Academy of Management Journal*, 42(2), 153-170.
- Daft, R.L. and Lengel, R.H. (1986). Organizational information requirements, media richness and structural design. *Management Science*, 32(5), 554-571.
- Daft, R.L. and Lengel, R.H. (1984). Information richness: a new approach to managerial behavior and organization design. *Research in Organizational Behavior*, 6, 191-233.
- Dennis, A.R and Kinney, S.T. (1998). Testing Media Richness Theory in the New Media: The Effects of Cues, Feedback, and Task Equivocality. *Information Systems Research*, 9(3), 256-274.
- Dennis, A.R and Valacich, J.S. (1999). Rethinking media richness: Towards a theory of media synchronicity. *Proceedings of the 32nd Hawaii International Conference on System Sciences*, 10-.
- Fulk, J. (1993). Social Construction of Communication Technology. *Academy of Management Journal*, 36(5), 921-950.
- Fulk, J., Schmitz, J. A. and Steinfeld, C. W. (1990). *A social influence model of technology use*, Newbury Park, CA: Sage, 117-140.
- Fulk, J., Steinfeld, C.W., Schnitz, J. and Power, J.G. (1987). A social information processing model of media use in organizations. *Communication Research*, 14(5), 529-551.
- Instant Messenger (2006). Retrieved December 19, 2006, from the homepage of Wikipedia: http://en.wikipedia.org/wiki/Instant_messenger
- Japan IT Strategy Headquarters (2001). Retrieved December 19, 2006, from Prime Minister of Japan and His Cabinet:
http://www.kantei.go.jp/foreign/it/network/0122full_e.html

- Kinney, S.T. and Watson, R.T. (1992). The effect of medium and task on dyadic communication. *Proceedings of the Thirteenth International Conference on Information Systems*, 107-117.
- McCaffrey, J. (2005). The Analytic Hierarchy Process. *MSDN Magazine*, 20(6), 139-144.
- Nakamura, K., Ide, T. and Kiyokane, Y. (1996). Roles of multimedia technology in telework. *Journal of Organizational Computing and Electronic Commerce*, 6(4), 385-399 .
- Nakamura, K., Masuda, Y. and Kiyokane, Y. (1995). Roles of communication media in telework environments. *28th Hawaii International Conference on System Sciences*, 446-455.
- Nakashima, N. (1997). *Talk about the Fuzzy Mathematics*, Tokyo: Baifukan, 167-181 (in Japanese).
- Ngwenyama, O.K. and Lee, A.S. (1997). Communication richness in electronic mail: Critical social theory and the contextuality of meaning. *MIS Quarterly*, 21(2), 145-167.
- O'Kane, P. and Hargie, O. (2006). Intentional and unintentional consequences of substituting face-to-face interaction with e-mail: An employee-based perspective. *Interacting with Computers*, (In press).
- Outlook (2003). Retrieved December 19, 2006, from the homepage of Microsoft Company: <http://www.microsoft.com/office/outlook/prodinfo/overview.msp>
- Panteli, N. (2002). Richness, power cues and email text. *Information & Management*, 40, 75-86.
- RFC 959 (1985). Retrieved December 19, 2006, from The Internet Engineering Task Force: <http://tools.ietf.org/html/rfc959>
- Salancik, G.R. and Pfeffer, J. (1978). A social information processing approach to job attitudes and task design. *Administrative Science Quarterly*, 23, 224-253.
- Schmitz, J. and Fulk, J. (1991). Organizational Colleagues, Media Richness, and Electronic Mail: A Test of the Social Influence Model of Technology Use. *Communication Research*, 18, 487-523.
- Suh, K.S. (1998). Impact of communication medium on task performance and satisfaction: an examination of media-richness theory. *Information & Management*, 35, 295-312.
- Webster, J. and Trevino, L.K. (1995). Rational and Social Theories as Complementary Explanations of Communication Media Choices: Two Policy-Capturing Studies. *The Academy of Management Journal*, 38(6), 1544-1572.