

## **Geographical dispersion and spontaneous interaction in an R&D environment.**

SSE/EFI Working Paper Series in Business Administration No 2002:2

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### **ABSTRACT**

This study investigates how spontaneous interaction in an R&D environment is affected by temporary absence from the work site. Previous studies have shown the central importance of spontaneous interaction in R&D activities, but not how this is linked to the amount of co-presence. By using work diaries to collect data on time spent on spontaneous interaction, two groups are studied, one working from a remote location for part of the time, and one working at the central location all the time. The assumption is that spontaneous interaction is either constant during time of co-presence, or it is saved until time of presence. In the latter case this would result in more spontaneous interaction when present. The results from the study show that the spontaneous interaction is directly linked to the amount of time the person is present, and that no compensation is made for the time of absence. Spontaneous interaction takes place when opportunities occur, and lost opportunities are not compensated for by more spontaneous interaction when opportunity is given later. This has implications for geographical dispersion in environments where spontaneous interaction is vital such as in R&D settings and in managerial roles. Part-time geographical separation will decrease the amount of spontaneous interaction in the group, which is likely to influence the outcome.

Spontaneous interaction, or unplanned informal interaction, is a part of everyday life in organisations, and has been studied in many settings. Several studies [1,2,15,23,29,40] stresses the importance of informal and unplanned interaction. An overview of the literature has shown that little is written on when this interaction takes place, and how it is distributed in time. A question that arises, linked to a discussion on geographically dispersed teams, is if spontaneous interaction can be delayed, or saved until later. This study sets out to investigate this, studying a group of product developers, which is separated geographically from each other, and from the rest of the organisation, for part of their working time. In what way is co-presence influencing the amount of spontaneous interaction in a group? We start out by looking into previous studies on informal interaction and communication, to then specify the area of this study. The study is performed using a work diary, which is described in the following section. This is then followed by the results of the study, and discussion on theoretical and practical implications of these findings.

## **COMMUNICATION IN R&D GROUPS**

Communication, and informal interaction, plays a central role in organisations, as discussed already by the Human Relations School, in the middle of the 20th century [4,17,30]. Taking this further, social interactionism [8] and social constructionism [7] stress the centrality of social processes and informal interaction to the way groups and organisations function. This necessity for various communication modes is restated by recent studies on R&D management and geographical dispersion[15,16,20].

Communication can be viewed as a vehicle to solve problems or unclear situations [6]. A traditional or rational approach to problem solving is that more information will solve a problem, or, in other words, that the problem is a matter of uncertainty [12]. Tushman [38] observes that high-performing research projects showed extensive and decentralised communication within the project. A more turbulent environment was associated with more intense and decentralised communication. Intra-firm communication was also found to be intense in successful projects. Tushman is basing his investigation on an information processing perspective [6], where the issue is one of finding the right mechanism to increase the amount of information.

A complementing view on the role of communication in problem solving assumes that the main issue is not information on how the problem can be solved, but the formulation of the problem itself. This approach stresses ambiguity rather than uncertainty [39]. In this case, more information will not solve the problem, but this is dependent on mutual agreement. The communication need is different in the two cases. This categorisation may also be labelled "problem finding" for the more ambiguous situation and "problem solving" for the reduction of uncertainty [34]. Problem finding involves clarification and agreement between parties. Problem solving mainly involves information processing. Problem finding is a less structured activity, and may be more dependent on rich communication with possibilities for feedback and agreement on redirecting the focus [11]. When dealing with ambiguous issues, face to face communication is found to be central [23]. Previous studies has also suggested that novel or surprising information tends to be discounted as unreliable when immediate feedback and explanation is not available [33]. In spontaneous communication participants have less time to harden their preconceived

notions about the topic, but tend to ask for more clarification and be more receptive to ideas [15]. Impromptu face-to-face encounters are shown to be extremely important in increasing the perceived quality of information in communication between marketing and R&D people [15].

Creative activities such as product development require informal interaction to resolve ambiguities [1,40]. The relationship between professional communication and physical closeness has been studied in an R&D setting by Allen. Communication is found to be greater within organisational units than between units [1]. A physical distance of less than 30 meters is highly influential on communication. When people are more than thirty meters apart, communication decreases drastically. The findings are used to argue that separation in a group should be minimised, preferably by a circular layout. The advantage of integration-promoting facilities is also discussed, such as copiers, coffee machines and water coolers [1]. The highlighting of these contact-points shows the importance of non-controlled and non-planned communication. Keller has investigated predictors of successful R&D projects [14], and finds that group coherence is the most important factor in a successful project. This, and related studies, is summarised by Brown & Eisenhardt [9] to suggest that internal communication improves team performance. Cross-functional teams with fluid routines and a variety of internal communication flows improve performance.

It is suggested that there is a minimum amount of face-to-face interaction required for any type of social organisation to work effectively [24]. Other forms of communication than face-to-face media are in this situation primarily useful when presence is not possible, or when the task is not important enough to justify the possible cost of co-location. The distancing from colleagues and the use of other communication media rather than face-to-face communication may influence the result in a negative way [23].

A similar type of task is the task of the manager. This is studied, among others, by Mintzberg [18,19], who notes that managers prefer verbal communication, and that written communication is given less time and a more cursory treatment. Unscheduled meetings and telephone are categorised as informal media. These are used by managers when the parties are well known or/and when information and requests must be transmitted quickly. Unscheduled meetings are preferred to telephone calls. Very current information is also preferred by the managers, and gossip, hearsay and speculations are favoured, routine reports and written information is not. The manager is not characterised as a planner but as an adaptive information manipulator. In this role, the unplanned, informal meeting plays a vital role.

Informal communication has been studied taking a network approach by Rogers [29,30]. The focus in the network procedure is identifying communication links and their strengths, between individuals or between cliques, within an existing system. The approach also measures various structural indexes, such as connectedness. One problem in this approach is that different communication patterns appear for different types of communication (professional, social) for the same group. Another problem is the immense number of connections that exist in a large organisation. This problem is handled by limiting the study object and by studying cliques instead of individuals. A normal procedure is to 1) gather sociometric data, 2) identify cliques and 3) superimpose these cliques on the formal organisation, to look for correspondence or misfits. For the personal communication network, a relevant variable is integration. Integration measures links *between* the persons included in the personal network.

These studies all indicate that informal interaction is important for activities dealing with complex and ambiguous issues. Previous studies on communication and social network studies deals mainly with who talks to whom, or what communication media are used, but not when the informal interaction takes place. Allen noted the importance of proximity, but not how this is handled if the proximity varies over time. We see that a question arises: how is informal interaction influenced when proximity varies over time? This is the focus of the present study. To study this we need to introduce a time dimension in informal interaction. Thus we choose to label what we study spontaneous interaction, as will be discussed further below.

### **Defining spontaneous interaction**

Various typologies of communication has been proposed in literature [10,11,15], and richness [10] and spontaneity [36] are often used to classify communication. Media richness refers to the ability of a media to handle rich information, while information richness refers to the amount of information contained in a message. Information richness may be defined as the ability of information to change understanding within a time interval [11]. The reasons for differences in media richness include the medium's inherent capacity for immediate feedback, number of cues and channels used, personalisation and language variety. Spontaneity refers to whether one or both of the persons involved in the interaction has no advanced notice that the communication will take place [15]. Richness and spontaneity are connected since a requirement for spontaneity is speed (instant communication), and speed is a subset of richness. Spontaneous communication is often verbal and face-to-face, and thus using rich communication media.

Informal communication can either imply a non-formalised way of communicating, or refer to formal organisational structure, and mean communication through non-formal channels. Informal communication as communication through non-formal channels, focuses on whom you communicate with. In this study the focus is on the form and content of the communication, and not on routes of communication in the organisational hierarchy. We will call this informal interaction. The informal interaction may be planned, but performed in an informal way, thus not having a set agenda or subject. The focus of this study is on unplanned informal interaction. To distinguish this from informal interaction, it is labelled spontaneous interaction. Spontaneous interaction is here defined as unplanned, informal interaction, and not necessarily related to a specific issue. It can be many forms of work-related chat, exchange of unfinished ideas, ad-hoc opinions, and off-the-record assistance. Spontaneous interaction is not necessarily related to work issues. Even if the interaction is social, this may have impact on mutual understanding and future co-operative activities. In the present study we have chosen not to distinguish between work related and non-work related spontaneous communication.

A further limitation is that spontaneous interaction is seen as dependent on a face-to-face situation, which means that presence is required. This limitation excludes all other media than face-to-face communication from being defined as spontaneous interaction. This is supported by Maltz [15], where spontaneous telephone calls are seen as less useful in improving perceived information quality, while spontaneous interaction (or hall talk) is seen as extremely important in increasing the perceived quality of information. There may be possibilities for other forms of spontaneous interaction, as will be discussed at the end of this chapter, but for the purpose of this study, physical presence and face-to-face interaction is seen as a requirement for spontaneous

interaction. Spontaneous interaction is thus described as unplanned and informal face-to-face interaction.

## **THE STUDY**

The following section will describe the organisational settings for the study, starting with a brief overview of telecommuting. Since other chapters of this book go deeper into telecommuting and its history, this article choose to focus on defining what is considered telecommuting in this study, to come back to telecommuting in the discussion at the end. The definition of telecommuting is followed by an elaboration on the research question, and methods used in the study.

### **Telecommuting**

Telecommuting, or working part of the time from another location than the regular office, has been tried in several organisations over the last years [31]. Since the geographical distancing from colleagues during working hours makes spontaneous communication as defined above impossible, the telecommuting situation is ideal to study how this is handled. There may be different ways to deal with the fact that one is deprived of spontaneous communication for part of the time. One may not handle it at all, and thus have less spontaneous communication. One may become more active when at the work site, and in that way make up for the time at home. One may also use other media more, and change communication patterns, and in this way substitute the spontaneous communication with other forms of communication. In this study we have chosen to focus on two of these possibilities, and find out whether spontaneous communication is saved until later.

There is no general agreement on how to define telecommuting. Several attempts has been made to establish definition (for an overview see [28,32]. Telework is sometimes used synonymous to telecommuting, but telework is generally used in a broader sense, covering a wider array of distributed work. In most attempts to set a general definition, telecommuting is very broadly defined. When specific aspects of telecommuting is studied, the problem or interest area is often more narrow, and a more stringent definition is needed. In this study the following choices and limitations are made. The present study deals with absence from the regular work site on a part time basis, at least 1 and no more than 4 days a week. The category of work studied is professional non-routine tasks, with an interaction component in the work. The selected group of telecommuters is a group of skilled professionals, working with R&D projects. Both solitary work and interaction is parts of their tasks.

### **Research question**

This study takes interest in how the total amount of spontaneous interaction over time is affected when face-to-face communication is not an option for part of the time. In this case, we have two possibilities. One possibility is that the need to communicate is left for a later occasion. In this case, the amount of time spent on spontaneous interaction will be higher during the time when this is possible; this is when face-to-face communication is possible. In other terms, the spontaneous interaction is buffered, and the time at the office will have more spontaneous interaction for those not present all the time.

The other possibility is that the amount of spontaneous interaction is dependent on the opportunities given, and that these will be more or less constant over time. In a given organisation a certain person will have a number of instances of spontaneous interaction during a given time period. Irrespective of the underlying mechanism, this will be observed as a constant level of spontaneous interaction, regardless of previous absence. Spontaneous interaction is not buffered, but constant during presence

These two possibilities may be stated as the following two propositions:

- **Proposition 1**

*The need for spontaneous interaction is "saved up" during absence, leading to increased spontaneous interaction during co-presence.*

- **Proposition 2**

*Spontaneous interaction is constant during co-presence.*

These propositions are tested by studying a group of telecommuters, absent from the office for part of the time, as will be described in the following section

## **Method**

For this study, we need to measure how much time is spent on spontaneous interaction in various situations for selected groups. Work diaries, communication diaries, or duty studies, is a data collection method where the respondent himself logs his activities during a study period. This is an option for collecting data on spontaneous interaction. The advantage of this approach is the rich information possible to obtain, the directness of the data (not dependent on the respondents memory, but logged continuously) and that large amounts of data can be gathered with limited effort from the researcher [42]. Disadvantages are the high need for co-operation, and the willingness of the study object to devote time to fill in the diaries. Due to the close cooperation with the studied organisation, it was considered to be possible to get full cooperation from the respondents, and thus a full set of data.

To be able to compare between the two situations, spontaneous interaction when absent for part of the time, and spontaneous interaction when present, the study was set up with two groups, one which were working from home two days a week, and one working at the regular work site. These two groups filled in detailed work diaries. Three sets of data is thus obtained, spontaneous interaction for time spent at home and at the office for the telecommuters, and spontaneous interaction (at the office) for the control group.

The diaries were designed as pre-printed schemes with one row per hour and columns for various activities. The diaries have 8 main categories, and a possibility to comment in text on each entry. The categories are as follows: e-mail, writing, reading, other computer related work, incoming telephone, outgoing telephone calls, spontaneous meetings, planned meetings, Pause and Others. After a reclassification of some activities coded in others (all of these have a written comment attached to them) others accounted for only around one per cent of the total, and were therefore

excluded from the rest of the analysis. In this case, the category spontaneous meetings is the one of primary interest.

To select statistical tools, a test on normal distribution for the data had to be made. Since the fit was low, with a more flat distribution, and distribution tails was limited by the total time available in one day, the approximation to the normal distribution was rejected. This left us with non-parametric test tools. To examine if the difference in mean values between two independent groups, not normally distributed, is significant, the Mann Whitney test is recommended [35]. This test investigates if the two tested samples are drawn from the same population. Since the telecommuters and the control group were selected to be similar, but not paired, a paired test was not viable in this case. On testing the difference between telecommuters at home and at the office, a paired test might be used, and in this case both a Mann-Whitney test, as above, treating each day as a sample, and a Wilcoxon test, treating each person as a sample, may be performed. The chosen approach was to use the standard module of a Mann-Whitney U - Wilcoxon Rank Sum W Test from SPSS. This approach gives an answer to where the difference between the two groups tested is significant.

### **The studied organisation**

To study the impact of geographical dispersion on spontaneous interaction, we need to choose an organisation with spontaneous interaction, as well as with geographical dispersion. In this study we had the opportunity to follow the introduction of telecommuting in an R&D organisation. This fulfils both these criteria. The studied organisation can be described as a knowledge intensive organisation. The studied group is a unit within the research and development department in an IT-company. Of the employees, more than 70% has a university degree. The research division as a whole has basically a matrix organisation, with a line manager taking care of personnel responsibilities and administrative responsibilities. All activities are organised in projects of various sizes, and people have their main belonging in projects, which is also the main production structure. The tasks for the two groups were similar, and a parallel study showed that the organisation and the overall formal communication patterns were not significantly influenced by the telecommuting introduction (reference to be added). The main changes due to the geographical dispersion were found in the personal work patterns and planning for the telecommuters.

Each organisational member has high degree of discretion on how to manage and perform his or her own work. This permits a highly flexible managerial approach, with little constraint set on subordinates. As standardisation of work process or output is difficult in this type of activity, the organisation has to rely on mutual adjustment for co-ordination. The level of bureaucracy can be described as low, with few (coercive) rules and a high amount of freedom left to each member of the organisation. The administration and the actual work tend to blend in to a single effort, which calls for a high degree of communication between project members. Planning is difficult and frequent contact between project members is a must. Formality is low, and communication structures are complex and shifting. Persons can hold several roles simultaneously, and roles change frequently. This situation implies that unplanned and spontaneous interaction is part of the communication patterns.

### **The test set-up**

The study is performed on an organisation where telecommuting was introduced as an option for part of the studied department. 11 out of 40 persons were allowed to work from home for two days a week. These were followed, together with a control group of 10 colleagues selected to be as similar to the telecommuters as possible. The groups were selected from a population of possible telecommuters, where the control group and the telecommuter group was given as similar characteristics as possible, with the same mix of tasks, age and experience. This selection was made by representatives of the company, with previous knowledge of the participants. The studied groups were followed during two years, using both interviews and a detailed work diary to collect data on their work situation.

Work diaries were handed out to be filled in during a full day, either at the office or at home. The work diaries were handed out and collected during a chosen week, for both groups. The respondents were allowed to choose two typical days. This logging procedure has been followed up by telephone calls during the week and short interviews afterwards, to identify problems and adjust the diaries if necessary. The telecommuting initiative was followed during a period of 6 months using these diaries, with a total of 129 diaries, covering approximately 1000 hours of work time. The time spent on each activity during the day is recorded. The diaries were filled in on a minute-to-minute basis, but some respondents filled in the diary on a more aggregated level, with 5-10 minutes accuracy. Each diary gives us approximately 20 to 50 data points, stating activity, time and duration, and comments when needed. The diaries were distributed on five occasions. Each time the completion of the diaries were prompted by the research group, and support was given if respondents were insecure on how to use the form.

The reliability of the data in the diaries was ensured by following up the first sets of diaries with short interviews. Differences were adjusted and the filling in of diaries was co-ordinated between the respondents. The process of collecting the diaries included reminders to the respondents, since there was some reluctance at first to spend time to fill them in. When prompting for the diaries, spontaneous comments were collected, and the habit of filling in the diaries was checked. The follow up procedure resulted in a high answer rate; all respondents returned at least 3 diaries per situation, with a total of 86% of all diaries returned.

After collecting the diaries, the total amount of time spent at each activity is summarised, and the percentage of time spent at each activity in each setting is calculated. Differences between groups and between work sites in use of time for different activities were examined using statistical methods. The findings are presented below.

### **FINDINGS ON GEOGRAPHICAL DISPERSION AND SPONTANEOUS INTERACTION**

To investigate the propositions three tests were made on the collected data. First, the difference between telecommuters at home and at the office is tested, to see if there is a significant difference in spontaneous interaction at home and at the office. This is assumed in the set-up of the study, but needs to be verified. Then the two groups are compared for time at the office and for total time, to see if there is a significant difference in time spent on spontaneous interaction in any of these situations. If there is a significant difference between telecommuters and the control group when being at the office, with more spontaneous interaction for the telecommuters, it is

likely that the spontaneous interaction is buffered by the telecommuters, and proposition 1 is supported. If there is no significant difference at the office, but a significant difference regarding overall aggregated time spent on spontaneous interaction, it is likely that spontaneous interaction is not buffered, and proposition two is supported. The results of the Mann-Whitney test are presented below, in figures 1-3.

The first test is on the difference between the amount of spontaneous interaction for telecommuters at home and at the office. The numbers in figure 1 shows that the two groups clearly differ in this respect. The probability for the two groups (telecommuters spending time at home and control group spending time at the office) to be from the same population is 0.00% regarding time spent on spontaneous interaction.

	Telecommuters at Home	Telecommuters at Office
% of time spent on spontaneous interaction	<b>0</b>	<b>10,3</b>

Probability of being from the same population P = **0,0000**

Test Statistics	Spont int.	Ranks	N	Mean Rank	Sum of Ranks
Mann-Whitney U	171,000				
Wilcoxon W	874,000	TC home	1,00	37	23,62 874,00
Z	-6,367	TC off	2,00	38	52,00 1976,00
Asymp. Sig. (2-tailed)	,000	Total	75		

**Figure 1**  
**Comparison between telecommuters meeting activities at home and at the office**

The second test is on the difference between the amount of spontaneous interaction for telecommuters at the office and the control group at the office. In this case we can not show that the two groups differ. The probability for the two groups to be of the same population is 41%.

	Telecommuters at Office	Control Group
% of time spent on spontaneous interaction	<b>10,3</b>	<b>8,6</b>

Probability of being from the same population **P = 0,412**

Test Statistics	Spont int.	Ranks	N	Mean Rank	Sum of Ranks
Mann-Whitney U	941,000				
Wilcoxon W	2481,000	TC off	2,00	38	49,74 1890,00
Z	-,821	C GR	4,00	55	45,11 2481,00
Asymp. Sig. (2-tailed)	<b>,412</b>	Total		93	

**Figure 2**

**Comparison between telecommuters meeting activities at the office and the control group**

The third test is on the difference between the amount of spontaneous interaction for telecommuters overall and the control group at the office (which is also their overall situation). Given a limit of 1% for significant differences, we can assume that the two groups differ. The probability for the two groups to be of the same population is 0,002.

	Telecommuters average	Control Group
% of time spent on spontaneous interaction	<b>5</b>	<b>8,6</b>

Probability of being from the same population  
**P = 0,002**

Test Statistics	Spont int.	Ranks	N	Mean Rank	Sum of Ranks
Mann-Whitney U	1453,000				
Wilcoxon W	4303,000	TC avg	3,00	75	57,37 4303,00
Z	-3,033	C GR	4,00	55	76,58 4212,00
Asymp. Sig. (2-tailed)	,002	Total		130	

**Figure 3**  
**Comparison between telecommuters meeting activities overall and the control group**

These tests show that the level of spontaneous meetings is not significantly different for the telecommuters and the control group for the time spent at the office. The level of spontaneous meetings is approximately at the same level for both groups for the time spent at the office. There is a slight difference in absolute figures, but this is not shown to be significant. The overall time spent on spontaneous interaction is significantly lower for the telecommuters. The telecommuters have less spontaneous meetings than their colleagues, when the total work situation is compared. This is since the telecommuters do not have any spontaneous interaction during the time at home, and the same amount of spontaneous interaction when at the office.

This answers the research question, where the first proposition; *“spontaneous interaction is saved up” until the opportunity is given, and is increased after absence*, is shown to be incorrect, and the second proposition; *“spontaneous interaction is constant during the period when it is possible”* is supported. This situation may result from a number of mechanisms, and in the following section, we will take examine a few possible underlying mechanisms for the lack of buffering of spontaneous interaction. This is linked to previous findings in the management of R&D groups.

## **DISCUSSION: SPONTANEOUS INTERACTION**

As shown above, the lack of opportunity for face-to-face communication at home is not compensated for by having more spontaneous interaction during time spent at the office. What may the reason for this be? The low impact on the level of spontaneous interaction found in this study may be parallel to the concept of communication genres [41]. Communication patterns and media use are found to be stable over time, and can be described as local institutions [13,27]. If a parallel is drawn to spontaneous interaction, the frequency in which persons in a group interact may be hard to change. If this is the case, a pattern of informal interaction is established in a

group, and this is not changed even if members are absent for part of the time, or in other words, a communication genre is established around spontaneous interaction. This study shows that patterns of interaction in a group are stable in a given situation, and not affected by temporary absence, which links well to the concept of communication genres.

What other mechanisms may hinder an increase in spontaneous interaction when the telecommuters are at the work site? A possibility is that the wish for informal interaction is not fulfilled even when persons are constantly present at the work site. If this is the case, an increase of spontaneous interaction is not possible for those who have been absent. This is not shown in the present study, but may be an explanation for the found observations, and needs to be examined further. There may be a greater need/wish for spontaneous interaction than what is actually taking place, a latent need for spontaneous interaction that is not fulfilled. In this case, every opportunity for spontaneous interaction needs to be taken care of, and utilised when possible. To find opportunities for spontaneous interaction a person needs to be alert to every chance to interact with other persons with whom he has an issue to resolve. This opportunity scanning for spontaneous interaction links to the favoured geographical proximity in teams discussed by Allen and Mintzberg [1,19]. Persons in close range rely more on unplanned meetings than colleagues located at a distance. The issue can be resolved at the spur of the moment and the planning and formalisation phase of meeting to discuss the issue is not necessary. These instances when spontaneous meetings can take place is likely to happen when paths cross, and this happens more frequently for closely located colleagues than for more distant ones. On the other hand, a deliberate “path-crossing” is in many cases not an option, the opportunity needs to be grasped when present, when the colleague happens to be available, and the issue is fresh. These opportunities may be a limiting factor for spontaneous interaction.

This opportunity scanning for spontaneous interaction could be going on all the time in the presence of other people. It is proposed that each person has a number of issues he would like input on pending at each time, and takes the chance to resolve one or more of these when the chance appears. The chance appears when an unplanned encounter takes place, and an issue may be resolved by exchanging a few words. Each of these issues may not be enough to call for a regular planned contact, but can be raised at the spur of the moment when a person is at hand. When colleagues are temporarily in sight, colleagues can take advantage of this. If the opportunities for meeting someone are the critical factor, this would hinder an increase in spontaneous interaction during presence. In this case, when the possibility for spontaneous interaction is limited, absence will increase the need for spontaneous interaction during presence, but this cannot be compensated for.

## **IMPLICATIONS**

The role of informal interaction in tasks involving a high degree of complexity and ambiguity is discussed, and linked to temporary absence. The study focuses on how the interaction is handled when persons are absent for part of the time. It is shown that the level of spontaneous interaction during co-presence is constant. The effect is that dispersed groups do not have the same overall level of spontaneous interaction as co-located groups with an otherwise similar situation. Loss of spontaneous interaction during time of absence is not compensated for during time of presence.

These findings have implications for the organising of R&D activities and the geographical location of team members. The feasibility of virtual teams and global dispersion of R&D activities is influenced, as well as the use of telecommuting as an option in an R&D environment.

### **Geo disp and R&D**

In an R&D environment the importance of informal interaction and face-to-face communication is stressed [1,29,38]. This study complements their findings with the observation that the amount of spontaneous interaction is directly related to the time of presence. If spontaneous interaction is important, the amount of time when group members are co-present is also important, since this is directly related to the amount of spontaneous interaction. In activities such as the creative phase of product development, where a high level of spontaneous interaction may be positive [1,37], a high level of co-location is necessary.

Other activities where spontaneous interaction is seen as important are management-related situations and situations that are seen as ambiguous [19,40]. Typical situation where the ambiguity is high are managing R&D projects involving a high level of newness or complexity. The normal reliance of managers on verbal and impromptu communication is enforced by the nature of the task, and managing R&D projects may thus be critically linked to presence at the project site. The level of co-presence determines the amount of spontaneous interaction, and the possibility to resolve minor issues that may otherwise grow into larger issues or may slow down progress. Since spontaneous interaction is important [15], co-presence is necessary for part of the time.

### **Telecommuting and virtual teams**

The practice of telecommuting has not been as high expected in the past years [5], and this may partly be explained by the effect telecommuting is shown to have on spontaneous interaction. Since a large group of telecommuters are knowledge workers with characteristics such as managerial aspects of their work, and the need to relate to complex and ambiguous issues [21,22], telecommuting will influence the ability to do this in a negative way.

Telecommuting reduces the time of co-presence, and thus the amount of spontaneous interaction, and this is less desirable for certain groups and tasks. Besides the rational, output-related issues discussed above, there is a symbolic aspect to presence and telecommuting. Telecommuting is also shown to be problematic due to symbolic and cultural reasons [25,26]. The need to be present and visible at the work is linked to the concept of work and commitment to work [3,25], and these factors have been shown to have influenced the development of telecommuting over time in organisations [31]. This can be linked to the visibility aspects, which in its turns is linked to the spontaneous interaction taking place when present at the work site. Since absence is not compensated for regarding spontaneous interaction, this becomes an issue for the telecommuters, and telecommuting in an R&D environment should at least be limited during certain phases.

Telecommuting is part of a larger discussion on globalisation and dispersion of the R&D activities. This is often discussed as “virtual teams”, or “imaginary organisations”. The findings in this study on the difficulties to uphold informal and spontaneous communication when distanced for part of the time raises some questionmarks on the feasibility in dispersing R&D activities. If spontaneous interaction indeed is central, as proposed by several previous studies

[1,15,20,30], and not possible to buffer in time, a dispersed group will have a significant disadvantage compared to a colocated group when it comes to handling more ambiguous and complex issues.

### **Proposed future studies**

This needs to be examined further, by capturing the perceived importance of spontaneous interaction, and the reason for having more spontaneous interaction than today. The present study will be followed by a further examination of the perceived change in spontaneous interaction in the same group, and the reasoning around this. This will indicate what importance is placed on spontaneous interaction, and what may lie behind the lack of buffering of spontaneous interaction in this case.

A limitation of this study is the definition of spontaneous interaction as dependent on a face-to-face situation. There may be possibilities for spontaneous communication using other media than face-to-face. One major difference between face-to-face communication and other forms of communication is the possibility of opportunity scanning. When physically present, coincidental presence of other persons may trigger communication. This option is at the present time not possible for most other media, except for some forms of computer presence indicators, such as ICQ and AOL instant messenger<sup>1</sup>. Another determining factor is that other communication media than face-to-face communication has no established pattern of spontaneous interaction.

Spontaneous interaction decreases with absence, but this may possibly be compensated for by changing the opportunities for spontaneous interaction while present. This is not covered by this study, but may be an interesting track to examine further. If it is possible to increase the overall spontaneous interaction at the office by some means, this may be used to balance for absence. A possibility is to increase the opportunities for unplanned meetings. Another issue to look into is if there is an optimal level of spontaneous interaction. Too much spontaneous interaction will probably take time from other activities, and will influence the amount of solitary work, which may lead to lower output.

**Acknowledgements:** This research has been made possible by the Swedish Council for Work Life Research (RALF) and by the Swedish Board for Communication Research (KFB). The project was performed within a program at the Institute for Management of Innovation and Technology (IMIT) at the Stockholm School of Economics.

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<sup>1</sup> ICQ is an acronym for I seek You. ICQ and AOL instant messenger are both programs that monitors chosen persons on the net, and makes it possible to send messages and to see if colleagues are currently on line.

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