THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN USERS' INTERACTION BETWEEN THE ACADEMIC STAFFS – SCIENTISTS/ENGINEERS IN MALAYSIA

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Abstract. Recent workplace studies claim that the latest advancements in Information and Communication Technologies (ICTs) and flexible work arrangements have enabled alternative ways of working that can now provide a wider scope of interactivity across geographic distances, a scope that would have once restricted interaction among groups, if not prohibited it altogether. Such claim has challenged the conventional understanding which asserts that proximity among firms provides crucial face-to-face interaction in the inter-organisation collaboration.

It is, however, debatable that the acceptance of the alternative workplace depends on the nature of the work, context, and culture of the organisation or nation. Therefore, this research examines the extent to which traditional locational assumptions and the proclaimed transformations performed in a developing country, such as Malaysia. The aim is to investigate the impact of university location – in terms of the characteristics of place and distance between places – to users' face-to-face, and ICT interactions in the collaborations.

This research analysed a structured interview conducted with 32 academic staffs in two universities, and 25 scientists and engineers in 15 research organisations. The findings showed that face-to-face interaction has strong relationship with distance, and the impact of telecommunication technology in replacing face-to-face interaction is rather small.

Keywords: ICT, face-to-face interactions, communication, location, distance, inter-organisation collaboration

1.0 INTRODUCTION

This study investigates how knowledge workers in the universities and industrial firms interact by face-to-face and using ICT as an alternative work arrangement. The aim is to increase our understanding of workers' communication across organisational boundaries. The study was conducted at public research universities and high-technology industrial firms in Malaysia. Each of the three universities and industrial firms are located at different locational environment. The study involved structured interviews of 32 academic staffs from two universities, and 25 scientists and engineers (SEs) from 15 high-technology firms. The respondents are involved in the research work that includes providing analysis, advice, and technical expertise in relation to research works. Each respondent has conducted trips to their counterpart premises, made contacts via ICT, and has access to information and internet technology in their

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workplace and home. The study examines how these knowledge workers interact over distance.

2.0   ORGANISATION, COMMUNICATION, AND WORKPLACE

Corporate communications are increasingly being perceived as an essential tool to support an organisation in its pursuit of strategic objectives and goals. Communication has proven to be central to the concept of organisation and it is the single-most important process to the success or failure of an organisation [1]. Increased attention has been given to this aspect because today's organisational structures demand more extensive communication. Leahey [2] pointed out that 60% of the working population is engaged in creating and processing information. He also argued that high productive performance, in some way, depends on the quality of communications. In the big picture, communication is important not just from the functional point of view of getting the message across, it is also central to the development and maintenance of positive working relationships, harmony, and trust [3]. Corporate communications integrate three forms of communication: management communication to both internal and external target groups, marketing communication such as advertising and selling, and organisational communication [4]. As such, communication is crucial to organisations, both internally and externally.

There is a growing number of literature and studies giving attention to the physical workplace environment in relation to communication. Studies from various literature [5-8] have shown that several characteristics of the new physical workplace have been identified, and the major emphasis of these characteristics involves improving communication among the workers.

One example on increasing communication in the workplace is shown by Becker and Steele [6] at Steelcase Incorporation. The workplace's emphasis on informal communication results in stimulating face-to-face interaction, especially among groups such as project engineering, industrial design, and marketing, which are the key element in creating a design centre. The corporation's emphasis on informal communication was based on the work of Allen [9], which found that performance in Research and Development settings is related, in part, to the number of informal contacts people have with others outside their own department, discipline, and project team, as well as communication within teams. The significance of this finding has convinced the corporation to create a working environment that encourages informal communication across project teams and disciplines, as well as stimulates creativity.

In spite of this understanding on the importance of a working environment that enhances workers' communication, the findings are rather limited to the workers' communication beyond the organisational boundary or interaction over spatial distances, especially in the less-developed countries. It is also important to address this issue as the nature of knowledge of the workers' job which includes both interactions, inside and outside the organisation's workplace.

The first section of this paper discusses the issues of ICT on the location of workplace. The second section describes the research method of the research and the next section presents the findings of the research. Finally, the final section discusses implications for future research on human resource management policy.

3.0   THE ISSUES OF LOCATION AND ICT

Workers, especially those at the professional and managerial levels, have increasingly interacted and communicated, with professionals and clients from other organisations. According to Fulk *et al*. [10] and Rockart [11], the widely accepted view is that the merging of computers and ICT has been seen as the essential component, facilitating drastic changes in workers' communication with one another and their modes of working.

The advances in telecommunication and information technology have greatly enhanced our ways of accessing and working with spatial-related activities. It is argued that the new ICT infrastructure has the potential to stimulate a paradigm shift from the transportation infrastructure that has significant impact on professional's interaction and workplace location decisions in the past. ICT is viewed to bolster decentralisation in space as the new infrastructure (the electronic superhighway) that compresses distance, space, and reduces turnover time.

With respect to this development, organisations have considered a variety of alternative work environment choices as the ICT has been seen as liberating the influences of location on workers' interaction. For example, the recent developments in ICT have created an increasing number of telecommuters and other virtual workers. The new kind of work arrangement breaks the relatively modern concept of office as a place to which people commute, spend the day working, then travel home again [12-14]. As Eley and Marmot [15] quoted, 'your office is where you are'.

However, one should be cautious about accepting the proclaimed shift and its lauded benefits. Despite widespread recognition of the potential and popularity of ICT, there exist many substantive criticisms on its strategic use and applications. There are some reservations on the acceptance to the new alternative workplace, both in organisations and across continents. It is still unclear how many organisations, and what kinds of organisations, by sector or specific culture, have successfully implemented this strategy. Interestingly, most of the literatures on telecommuting are based on the experiences from the United States (US) and not much information is gathered from Europe and Asia.

The analysis from several studies have revealed more perplexing picture of the ICT-led alternative workplace than what is generally presented. Considering all the attention that telecommuting is getting these days, it is rather surprising to find that the acceptance of alternative workplace as exemplified in telecommuting is not to the expectation, even in the industrialised countries [16-18]. For example, the National Economic Development Office's (1986) prediction that 10 to 15% of the UK workforce would be

working from home by 1995 has proved to be vastly over-estimated. The British Labour Force survey (1997) quoted a figure of 4% [17]. Data taken from the European Telework Online website (http://www.eto.org.uk/index.htm) shows that the practice is most common in USA, and then Scandinavia [19].

The factor that influences an individual's choice of communication medium has also been the subject of many research. It is also argued that what influences an individual's choice of communication medium is subjected to the task he or she wanted to accomplish [20]. Although ICT can provide communication across spatial barriers, such system has limited capacity. According to Nohria and Eccles [21], electronic forms of communication cannot transmit all the required information and therefore, employees will not be motivated to use it for a range of tasks. Daft and Lengel [22] added that face-to-face communication is perceived as richer because the information being received reduces uncertainty, is clearer or less ambiguous. In this sense, e-mail is not considered as a 'rich' medium since there is a range of tasks which it is not suitable for. In supporting this view, several studies [23-24] have shown that people ignored the electronic medium when they can communicate face-to-face.

Cultural factors between different groups and those within the same groups have also shown to play an important role in the pre-deposition and selection of electronic communications media. Straub [25] found that US companies exploit the advantages of IT, such as electronic-mail while the Japanese firms do not. Within the organisation, Fulk [26] suggested that the motivation to use ICT may depend on organisational context and the existence of a 'culture' of e-mail use. Similarly, organisational studies which have focused on the use of new communication technologies [27] have suggested that emerging communication patterns are much more dependent on the pre-existing organisational context and culture.

ICT has also been seen to have unsatisfactory performance in supporting the group work, such as in collaborative research work. Using computer-mediated communication to accomplish collaboration will be difficult, especially for tasks that require interactive and expressive communication [28]. This is more apparent in inter-organisation collaboration. As Litter *et al.* [29] have shown, collaboration between two firms requires frequent face-to-face communication among all involved parties. Dickson [30] pointed out that whether the collaboration is successful or not, a personal relationship is often established, which may prove useful. Similarly, Harrison and Laplante [31] found that the absence of reciprocity in co-operation and partnership is an obstacle during the transition to a more harmonious relationship, which is fundamental to the development of co-operation between actors. Littler *et al.* [32] concluded that collaboration is an evolutionary process in which, management skills of learning, mutual adaptation, and accommodation can be more important than the eventual success of a collaboration. In this sense, face-to-face contact is crucial and ICT does not appear to be supportive of group works.

Despite ranges of issues and criticisms that challenged the acceptance and application of the alternative workplace, the consensus suggested that the alternative workplace is not altogether unacceptable. It depends on some conditions such as the types of works, and the organisations or national context, and culture. For example, Schrage [33] mentioned that several cases of successful collaboration on complex, non-routine tasks took place "at a distance" in the domain of scientific research, arts, etc.. In such cases, direct face-to-face contact is not necessary although the activity is complex and non-routine. Nevertheless, contradictory to these findings are the reports of several researchers that stressed the importance of actual face-to-face presence of people who participate in non-routine activities [21-22].

Therefore, whether ICT actually leads to more flexibility in work practice for employees is still a debatable issue. Taking the above criticism into account, it is unwise to generalise that ICT may alter the concept of traditional location advantages, especially in different socio-cultural contexts, places, and organisational settings.

This research compared the frequency and pattern of users interaction through ICT and highway infrastructure (i.e. by face-to-face) because of the two common functions; namely in terms of linking scattered and distant places, and speeding up work processes. This comparison aimed at providing managers and policy makers some findings based on the decentralising effect of ICT, to enhance collaboration activities.

4.0   RESEARCH METHOD

This research involved structured interviews of 32 academic staffs from two universities and 25 scientists/engineers from 15 industrial firms. The selection of the respondents from the public and private sectors was intentionally done to observe if there is any difference between the knowledge workers in the private sector and public sectors organisations' interactions patterns with their counterparts from other organisations. One of the universities is located in the city of Kuala Lumpur and the other is located in Johor, 350 km from Kuala Lumpur. 17 of the industrial personnel work at firms that are located around the city of Kuala Lumpur while the remainings work with firms that are located outside the region of Kuala Lumpur. All the respondents are involved in science and technology based research works. The idea of selecting organisations from different locations is to observe any differences in the interactions between the knowledge workers from different locations.

Most of the respondents are the key players in their research teams and have the experience of more than 4 years in research work. The respondents regularly interact with their counterparts by both face-to-face interactions and using ICT.

The interviews were conducted in their offices, laboratories, coffee shops, during seminars, Science and Technology (S&T) exhibitions, and via telephone for about 10-15 minutes per person. Respondents were contacted when necessary for follow-up enquiries by using e-mail and other electronic communication media.

5.0   RESEARCH FINDINGS

The findings of this research have shown that spatial distance has a significant impact in knowledge workers' interactions. The importance of spatial distance in this context can be described in two interrelated aspects:

(1) the importance of face-to-face interaction and its strong relationship with distance, and
(2) the small impact of telecommunication technology in replacing face-to-face interaction.

Although the frequencies of using telecommunication technologies are two times higher than by face-to-face contact (Table 1), it does not necessarily mean that these technologies are more important kind of communication medium. Both the university's and industrial firm's personnel considered face-to-face interaction as more important type of communication medium than the ICT. Since there are no significant differences in the above results, with the universities and firms located in different environment or region, this implies that face-to-face interaction is an important type of communication medium in all sectors of research works, at any location.

Table 1   Frequency of face-to-face and ICT meetings (per month) for all respondents

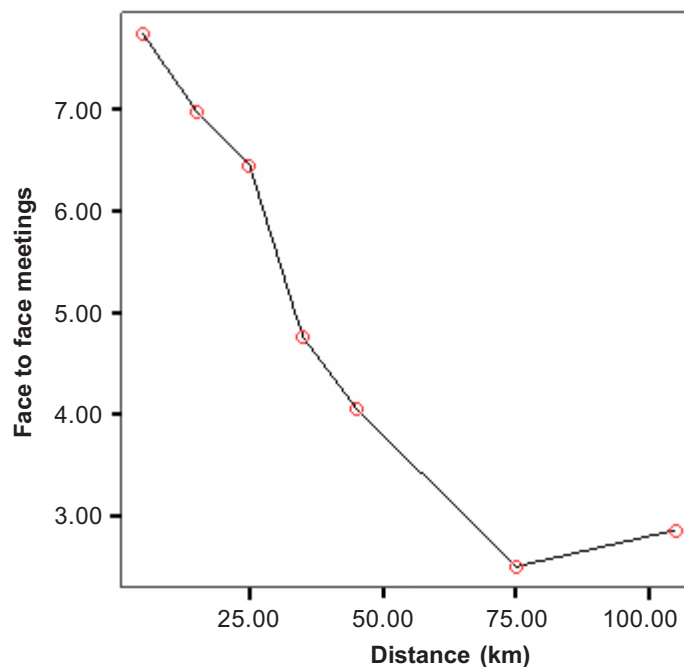|	Face-to-face meetings	Meetings via ICT
Responses	57	57
Mean	5.2430	14.1447
Standard deviation	2.6022	3.5175

Although the professionals from both organisations consider face-to-face interaction as more important than interaction via ICT, the frequency of visits made by personnel from industry to the university are lower compared to the visits made by academic staff to the firms' facilities (Table 2). One explanation for this result is that the academic

Table 2   Frequency of face-to-face and ICT meetings (per month) for academic staffs and firm's personnel

	Academic staffs		Firm's personnel	
	Face-to-face meetings	Meetings via ICT	Face-to-face meetings	Meetings via ICT
Responses	32	32	25	25
Mean	6.3156	12.5641	3.8700	16.0820
Standard deviation	3.0375	2.7904	1.6421	3.3492

staff spend about 20-30 hours per week (45 – 67% of the time) for teaching and other formal commitments, thus, having more time to allow them to travel more frequently than the firms' professionals.

The frequencies of the visits are expectedly related to the geographical proximity between the organisations (Figure 1). The face-to-face interactions of the professionals from both organisations are inversely related to distance. The result is consistent with the traditional locational theory [34] which hypothesised that interaction is affected by distance between two places. This is also consistent with several authors [35] who indicated that the role of geographical distance and the importance of face-to-face contacts have clearly been recognised in terms of communication and research performance.

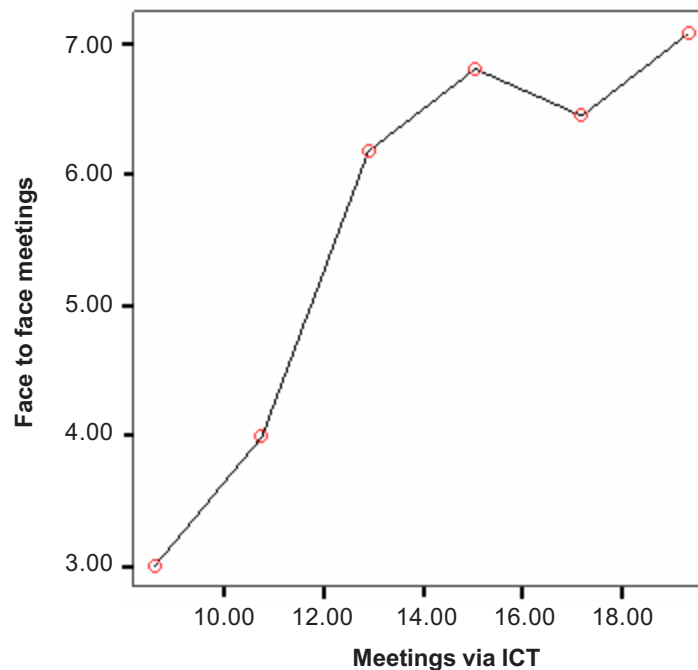**Figure 1**   Correlation between face-to-face meetings and distance

Although the frequency of using IT combined with other telecommunication technologies as communication medium is two times more than face-to-face interaction, there is no strong evidence that the technologies are replacing face-to-face interaction or compressing distance. Almost all of the findings from this research scheme did not show any of the followings:

(1)   significant (negative) correlation between the frequency in using the telecommunication media with face-to-face interaction, or

(2) significant (positive) correlation between the frequency in using the telecommunication media with distance between the organisations.

In fact, this study observed the reverse to the expectation when the frequency in using telecommunication media is positively correlated to face-to-face interaction (Figure 2).

Figure 2   Correlation between face-to-face meetings and meetings via ICT

In other words, the results showed that the groups of users that interacted more frequently by face-to-face were also interacting more frequently using telecommunication media. One explanation of this may be derived from the conclusion drawn by Nohria and Eccles [21], that the viability and effectiveness of an electronic network will depend critically on an underlying network of social relationships based on face-to-face interaction. This suggests that telecommunication technology complements and goes hand in hand with face-to-face interaction, instead of replacing it. Another explanation to this finding is that probably much of the research works are rather complex [36,37] that may necessitate face-to-face interactions.

This finding is not surprising as it has been discussed earlier that even in the industrialised countries, the impacts of ICTs on teleworking are not up to the expectations. Considering this view, it is suggested that the issue on the impact of ICT

on distance and its ability to replace face-to-face interaction in research works, whether in Malaysia or anywhere else, is still premature.

In view of the discussion above, it is likely that the trend of decentralisation as reflected by teleworking, teleproducing, teleconferencing, satellite officing, remote telecentres, and virtual officing facilitated by telecommunication technologies may be less dependent on face-to-face communication considerations, or communication related factor is considered as secondary to other factors.

6.0   CONCLUSION

This result reflects the importance of face-to-face interaction in research works which modern telecommunication technologies are yet to replace. When face-to-face interaction is necessary, the distances between places will affect users' interaction. Frequent use of ICTs does not wholly support the ideals of the virtual interaction without some form of face-to-face interaction. In spite of their fascinating potentials and opportunities, ICTs alone cannot be seen as the main source to the trend of decentralisation, as reflected by various virtual activities (e.g. teleworking, virtual office). The inclusion of advanced telecommunication technologies, especially the ICTs as a new factor in spatial theory cannot be seen as a crucial factor for alternative working arrangement and decentralisation trend. Therefore, further research on location and decentralisation pattern must also take into consideration of other crucial factors than ICTs.

The study has shown that the impact of telecommunication technology on distance and face-to-face interaction if any, is rather small. As such, it is best to view telecommunication technology as complementing face-to-face interaction, rather than replacing it. As the impact of advanced telecommunication technology on location is still far from expectation, even in the industrialised countries, it is unlikely that telecommunication technology will have a drastic impact on location in Malaysia in the near future. It is still premature to give credence that the extensive diffusion of telecommunication infrastructure and services can stimulate a new conception of locational advantages (accessibility).

The immediate issue on ICTs is about how we can dictate or control its use. Future direction should look forward on how organisations and users are becoming more critical of the technology and its uses, and the influences of these processes, rather than discussing whether ICT supports new ways of working. Insight into communication behaviour and understanding on how to dictate or control the technologies can help organisations better understand effective and ineffective applications of appropriate communication medium at the individual level, which in turn affects the larger system. In this way, we can draw conclusions on their relationship to new organisational forms.

Research organisations need to consider the importance of locations that are in proximity with other research organisations as research works require greater frequency

of face-to-face interaction. On the other hand, an alternative working arrangement can be developed as a long-term strategy for other types of research works (e.g. social sciences) that require low frequency of face-to-face interaction. Therefore, organisations are urged to consider both aspects in response to the changing environment and also to improve research activities.

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