
# How workspace design affects on communication rate, a case study

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## Abstract:

Although so many studies believe that an effective communication amongst employees and teams could be a key factor to reaching to the goals of the project or organization, there are few researches which have studied communication from the architectural point of view. Accessibility, openness and visibility are three recognized parameters in the literature which impact on the communication type and effectiveness. Creative design of work places also may have indirect impact on the communication rate and quality. In this research the hypothesis of the relation between communication rate and workspace distance (as one of the accessibility criteria) has been taken to the test. The small experiment designed and conducted in the Portland State central library. The results confirm that more physical distance leads to less face to face communication rate. Based on the results some suggestions are provided to improve the communication rate at the experiment field.

## Introduction:

Many managers and executives believe that good communication is one of the required for the success of an organization. Poor communication in the work environment can have many consequences such as: "interpersonal conflict, waste money and effort, poor productivity, legal exposure, low morale, and high turnover [1]." Although the electronic communication presented in the 21 century has changed the traditional way of communication it is still a focal point. In addition to that there are different aspects to the productivity and effectiveness of digital communication comparing to the conventional ways of communicating in organizations.

The purpose of this research is to review the management literature and collect the all physical design of the work space aspects which have impact on the employees' communication. It has been heard for a long time that offices layouts, cubicle design versus conventional office design and so forth can impact on the human characteristics of the work space but the particular relation to the communication rarely studied in the past. One of the first studies has been conducted by Thomas Allen in 1977. He concluded then that workplace design can impact on the interaction patterns of people and eventually it can influence the innovation and effectiveness at the workspace [2].

By the way architects are familiar with the relationship between architecture and human communication patterns. John Seiler believes that, buildings influence behavior by structuring relationships among members of the organization [3]. Indeed, the nature of buildings, neighborhood, rooms, lobbies, conference rooms, windows, dividing walls (glass, sheetrock, or etc), textures, the amount and effectiveness of elevators, and etc. can facilitate or limit communication among coworkers, and finally impact on the knowledge creation and knowledge distribution. The IDEO case presented by Allen demonstrates that to reach sustainable organizational and effectiveness workplace, we need a good design of the physical workspace and also "share creative practices, innovation process, and mind–sets" to recreate our daily work experience [3].

## Literature Review

There many researches supporting why design strategies used in new innovative offices enhance interaction and communication, and that spatial layout either can reinforce the separation of knowledge areas or can create a `generative' spatial system. Informal communication needs also to be considered once it is a way to create and reinforce organizational culture; it is seen as a way to

build commitment, spread ideas and share knowledge and skills that go beyond written job requirements. [5]
The workplace-interaction model (figure 1) describes the relationship among space, behavior, and organizational outcome. The spatial attributes included in the model are visibility, accessibility, and openness. The movement in the chart can be defined as the number of people moving along a path of observation; visible co-presence is defined as the number of people visible from a path of observation; and face-to-face interaction can be defined as the number of people engaged in any reciprocal exchanges involving two or more people along a path of observation and in the spaces along it [5].

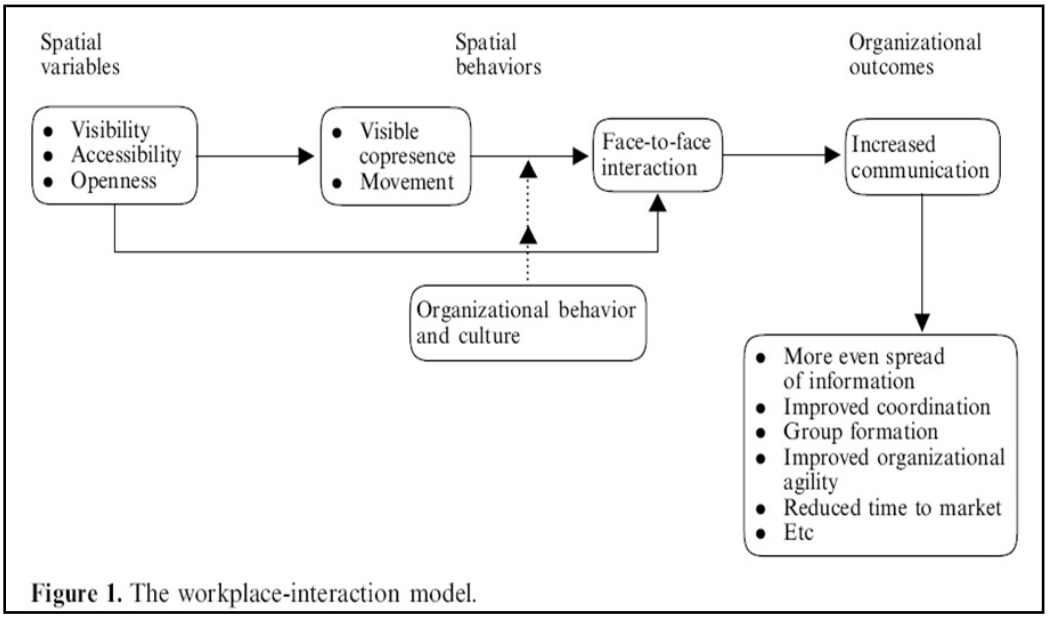


**Figure 1- A model for different inflectional factors in Layout designing borrowed from Rashid [5]**

According to the model an easy accessible and visible common area may have direct positive effects on face-to-face interaction; a high connected layout may have indirect positive effects on face-to-face interaction by facilitating movement; an open-plan office may have indirect positive effects on face-to-face interaction by increasing visible co-presence. The model also shows that the assumed relationship between space and face-to- face interaction is important because any increase in interactions may affect, depending on a particular organization, any or all of the following organizational outcomes: a more even spread of information, improved coordination, group formation, improved organizational agility, innovation, reduced time to market, reduced process redundancy, and greater organizational efficiency.
Here on we're using the three parameters developed by Rashid et al. as the principal elements affecting differentiating workspace design: accessibility, visibility and openness. Also how creative design impacts communication in workplace and privacy in the work environment.

**Accessibility**

Accessibility can be defined as the ``extent to which an employee's individual workspace is accessible to the external intrusions of others'' [6]. Accessibility can facilitate or make more difficult communication in the work place. Allen in managing the flow of technology [2] conducted a study to find out the relation between communication and distance. Figure 2 depicts the probability of a pair of people in an organization communicating with each other declines rapidly as the distance

between them increases [2]. Although the communication rate between members of each department in an organization could be different. [Figure 3]

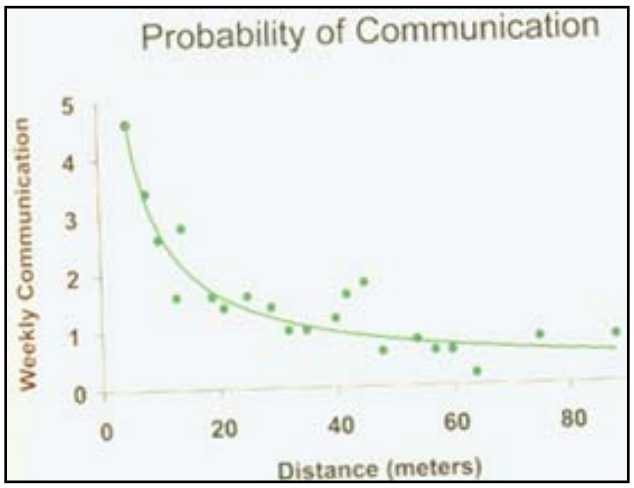

Figure 2- Proximity and communication rate in workplace

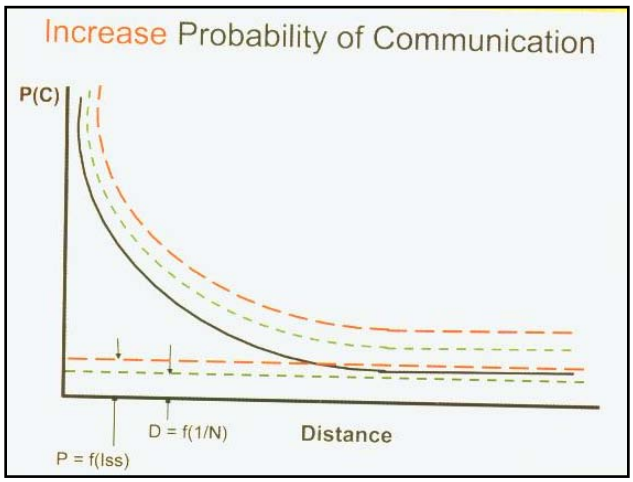

Figure 3 – Different communication pattern in different departments

The walking distance in the workplace can affect communication directly. A curve can then be plotted to show the probability of communication declining with distance like fig.2. The probability that people will communicate with each other reduces with the increase of the distance between.
One very possible explanation for the curve is that it is merely an artifact of the way in which people are located within facilities. Again, managers tend to locate together people who work together. Those people tend to naturally communicate more with one another than with others with whom they have no work relationship [2].

**Visibility**

Many researchers suggest that visibility is one of the factors which impacts on the communication pattern. As an example, when two workers face each other, eye contact and conversation are likely to increase. Also the communication increase if the employee can see a colleague from her/his position [6]. Visibility can be related to openness in a workplace. It is easy for a person to communicate with a person that is in the visual focal, than with a person that is not visible.

**Openness**

Openness has been recognized as one of the key elements for increasing the communication in a workplace. Most of the researches had compared the traditional office space designing to the open office design. Workplace openness refers to ``the ratio of total square footage of the office to the total length of its interior walls and partitions'' [6]. For two workplaces with the same square footage, the one with fewer walls and partitions is considered to be more open. Rashid [5]

Figure 4- Open office design vs. traditional office space design

But at the other side there are some researchers who are not very optimistic about the openness effect on the workspace design, due to its downfalls like privacy trade-off. Employees specially get more sensitive when the openness let employers to monitor them all the time. It's not desirable to think that every sneeze or trip to the water cooler will be logged. That's the essential conflict of workplace monitoring as one of the openness downsides [7].

**Creative design and communication**

The concern of the best way to place workstations to facilitate communication between the workers and increase creativity is an issue in many companies of all the sizes and backgrounds. Communication during work can help increasing the creativity and performance of the employees. According to Allen and Rashid's [2,5] studies, different workplaces design can interfere in the face-to-face (FTF) interaction. An open space office facilitates the increase of communication and information sharing with organization members, but it does not give a good sense of privacy. Contrary to the cellular offices where each individual has an office, this kind of space focuses in privacy and interferes in FTF communication. Another option of space is the multi-space environment, which offers diverse space and places for working, providing privacy when needed and interactions when necessary. [8] They studied different hypothesis comparing open and multi-space offices with cell offices. According to their results, informal FTF communication is higher in open and multi-space offices although the duration it is shorter than in a cell office, also the number of people who participate in the conversation is also higher in cell offices. Fig. 5 shows where are the preferred places for FTF communication according to workers studied by Hua, Loftness, Kraut and Powell. [6]

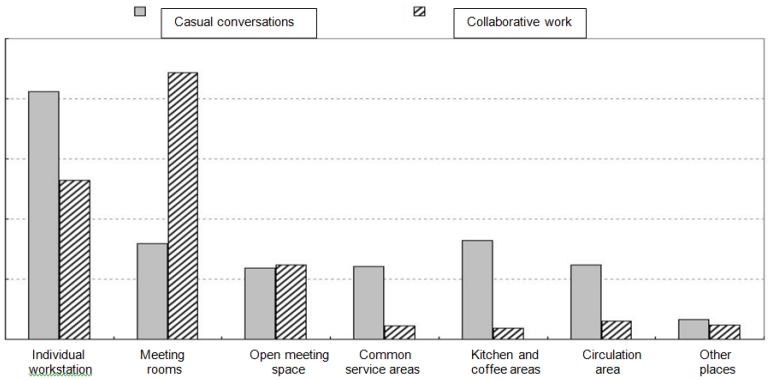


Figure 5 - Self-reported places for interaction and collaboration [6]

The image is clear that individual workstations and meeting rooms are the best place to have FTF communication and contribute with the knowledge sharing and creativity. According to their study the distance can create barriers to FTF communication and interfere in the knowledge share. But also they agree that privacy is affected in open space offices. [6]

Many authors connect the work space and the benefits for communication and creativity. The most relevant points that are made related to this topic is that when workers are able to interact and have FTF communication, fast and creative results can occur. In this case, creates beneficial results for the company. Few disadvantages were also mentioned such as distraction with casual conversation, which can distract employees and increase the time the job is finished.

But there is a large trend especially in recent years which support that creative design of the workspace also can impact increase the quality and quantity of the communication and increase the creativity at the end. Workspace designing in some famous creative companies like Google is one of the best known examples with extraordinary and unconventional workspace design.

## Research Question

Based on the literature, accessibility is one of the factors impact on the quantity and quality of the communication. Allen particularly, conducted a research which shows a strong relevance between the physical distance and rate of communication.

The main goal for the study we conducted was to test this hypothesis in a small scale again and find out if the results are still reproducible. Although the scale of experiment is very small and we may not take it as the solid evidence to confirm or reject the original hypothesis. Also the main study has been done in 1977, very different comparing to today's communication methods. At that time telephone at workspaces was the only dominant alternative communication method for face to face communication. Now a days, cell phone, email, texting, instant messaging, video or voice chats, put a very vast range of communication options in front of employees to select among.

The second goal would be finding any possible relationship between type of communications and distance. Would it be a true hypothesis that, for example by increasing the distance there would be a more tendency to call via phone instead of face to face communication?

## Research Design and methodology

A quantitative field study was conducted to test the Allen's hypothesis of the interrelation between distance and communication rate. The librarians working in the reference desk (2nd floor) at Millar library at Portland State University was chosen for our experiment. This decision was made based on some considerations; first, we had the access to the library and could easily ask for the employees' cooperation for the study. Second, all of the twelve employees are from the same department, and third they are all in same level at the organizational hierarchy. Obviously, the communication rate among the personnel of a department could be different to communication with other personnel in other departments. Also position in the chain of command may affect the type and rate of the contacts, which by this arrangement we diminished such these effects. Appendix 1 shows the plan for the 2nd floor at Miller library and offices layout.

Librarians were asked to fulfill a daily log for two weeks. Log included the number of their daily contacts with each other. The blank log was sent electronically and 7 out of 12 librarians filled out the daily logs for two weeks.

Since whole process was voluntarily done, no supervision was designed at all. Since there was a big chance for losing some data entries by the respondents.

The communications types limited to four major types:

- Face to face
- Phone
- Internet based (email, Skype, IM, etc), and
- Meeting.

By the way content and quality of the contacts was not the study concern. The communication content and purpose could vary from just a simple greeting to a problem solving discussion. The ultimate goal would be to find any relation between the distance and the number of communication in a week. See the sample log used for the data collection at the appendix 2.

The result then compared to the distance of each pair of offices, calculated from the 2nd floor plan and actual offices location.

## Model development

The experiment may lead to a simple model of how communication types and rates may differ regarding the physical distance. In fact the model below is the prediction for this project:

$r = f_1(d) + f_2 + f_3 + f_4$

Where *r* represents the rate of communication and *d* is the distance of offices in meter and

$f_1(d)$ is the rate of face to face communications

$f_2$ is the communications via phone which is expected to be independent from distance.

$f_3$ is internet-based communications which is expected to be independent from distance

$f_4$ is the communication rates in meeting, which probably could be represented independently from distance and therefore is a constant, in our model.

The definition of f would be the goal of this experiment.

## Results and Applications

Table 1 shows the calculated distance for each pair of offices in the 2nd floor (units are Meter). The actual plan of the building was used to calculate the distances. (See the Appendix 1)

| | | 220A | 220B | 220F | 220E | 280D | 220D | 220H | 280E | 220G | 284 | 220C | 230 | 280F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Joan Petit | Linda Abshar | Kris Kern | Gretta Siegel | Kerry Wu | kim Pendell | Michael Bowman | Emily Ford | Sarah Beasley | Chau Hoang | Claudia Weston | Arthur Hendricks | Bob Schroeder |
| 220A | Joan Petit | | 3.92 | 18.82 | 13.33 | 50.96 | 11.76 | 23.52 | 52.53 | 20.38 | 50.18 | 5.488 | 30.58 | 53.31 |
| 220B | Linda Abshar | | | 14.9 | 9.408 | 52.53 | 7.84 | 19.6 | 49.39 | 16.46 | 50.65 | 3.92 | 36.85 | 51.74 |
| 220F | Kristin Kern | | | | 3.92 | 55.66 | 7.84 | 3.92 | 51.74 | 3.92 | 55.74 | 13.33 | 53.31 | 60.37 |
| 220E | Gretta Siegel | | | | | 51.74 | 1.568 | 10.19 | 52.53 | 7.84 | 57.47 | 7.84 | 47.04 | 57.23 |
| 280D | Kerry Wu | | | | | | 51.74 | 59.58 | 3.92 | 56.45 | 25.09 | 48.61 | 65.86 | 7.056 |
| 220D | Kimberly Pendel | | | | | | | 11.76 | 49.39 | 9.408 | 54.88 | 6.272 | 42.34 | 50.18 |
| 220H | Michael Bowman | | | | | | | | 62.72 | 3.136 | 64.29 | 18.03 | 64.29 | 63.5 |
| 280E | Emily Ford | | | | | | | | | 61.94 | 28.22 | 57.23 | 67.42 | 5.488 |
| 220G | Sarah Beasley | | | | | | | | | | 62.72 | 16.46 | 47.82 | 63.5 |
| 284 | Chau Hoang | | | | | | | | | | | 54.88 | 63.5 | 29.01 |
| 220C | Claudia Weston | | | | | | | | | | | | 37.63 | 55.66 |
| 230 | Arthur Hendricks | | | | | | | | | | | | | 71.34 |
| 280F | Bob Schroeder | | | | | | | | | | | | | |

Table 2, shows the aggregated result for communication of the employees for the two week

| | | 220A | 220B | 220F | 220E | 280D | 220D | 220H | 280E | 220G | 284 | 220C | 230 | 280F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Joan Petit | Linda Abshar | Kris Kern | Gretta Siegel | Kerry Wu | kim Pendell | Michael Bowman | Emily Ford | Sarah Beasley | Chau Hoang | Claudia Weston | Arthur Hendricks | Bob Schroeder | Total numeber |
| 220A | Joan Petit | 0 | 0 | 4 | 0 | 3 | 23 | 28 | 4 | 20 | 0 | 2 | 0 | 0 | 84 |
| 220B | Linda Abshar | | 0 | 2 | 0 | 13 | 3 | 42 | 3 | 15 | 0 | 15 | 0 | 0 | 93 |
| 220F | Kristin Kern | 4 | 2 | 0 | 2 | 3 | 2 | 16 | 4 | 15 | 0 | 4 | 4 | 1 | 61 |
| 220E | Gretta Siegel | | | | 0 | 2 | 3 | 15 | 3 | 5 | 0 | 4 | 0 | 0 | 32 |
| 280D | Kerry Wu | 3 | 13 | 3 | 2 | 0 | 3 | 16 | 9 | 7 | 1 | 2 | 4 | 4 | 67 |
| 220D | Kimberly Pendel | 23 | 3 | 2 | 3 | 3 | 0 | 35 | 5 | 11 | 0 | 1 | 2 | 6 | 97 |
| 220H | Michael Bowman | 28 | 42 | 16 | 15 | 13 | 35 | 0 | 12 | 33 | 0 | 26 | 9 | 10 | 244 |
| 280E | Emily Ford | 4 | 3 | 4 | 3 | 9 | 5 | 6 | 0 | 9 | 1 | 3 | 2 | 7 | 58 |
| 220G | Sarah Beasley | 20 | 15 | 15 | 5 | 7 | 10 | 16 | 4 | 0 | | 12 | 2 | 8 | 115 |
| 284 | Chau Hoang | | | | | | | | | | 0 | 0 | 0 | 0 | 0 |
| 220C | Claudia Weston | 2 | 15 | 4 | 4 | 0 | 1 | 14 | 0 | 6 | 1 | 0 | 1 | 1 | 50 |
| 230 | Arthur Hendricks | | | | | | | | | | | | 0 | 0 | 0 |
| 280F | Bob Schroeder | | | | | | | | | | | | | 0 | 0 |
| | | | | | | | | | | | | | | | 901 |

The are some inevitable source of errors in the responses, but since the contact numbers were asked from two persons ( at 7 out of 12 of the times), by a pair wise comparison we chose the biggest number among each two persons which helped us to increase the reliability of the data very much.

By mapping the number of contacts to the associated distances -from table 1-, here is the pattern of face to face communication regarding the distance:

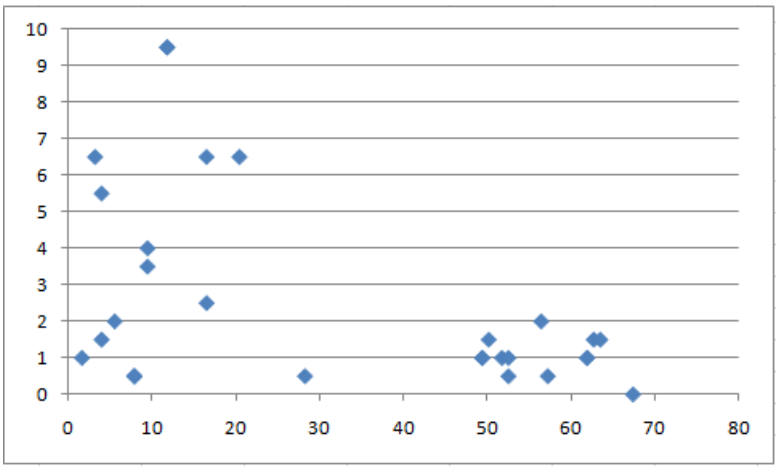


Figure 6 - Face to Face contacts numbers an distance in library

Interestingly, the number of face to face communications regarding the distance follow very similar pattern of Allen's results. After about 20 meters the face to face contacts drops to almost two times a week.

Comparing the data distribution of the results of two study leads to figure below. The best trend line fleeted to the data still cannot describe the diversity as Allen's data and also trend lines are similar are not exactly same.

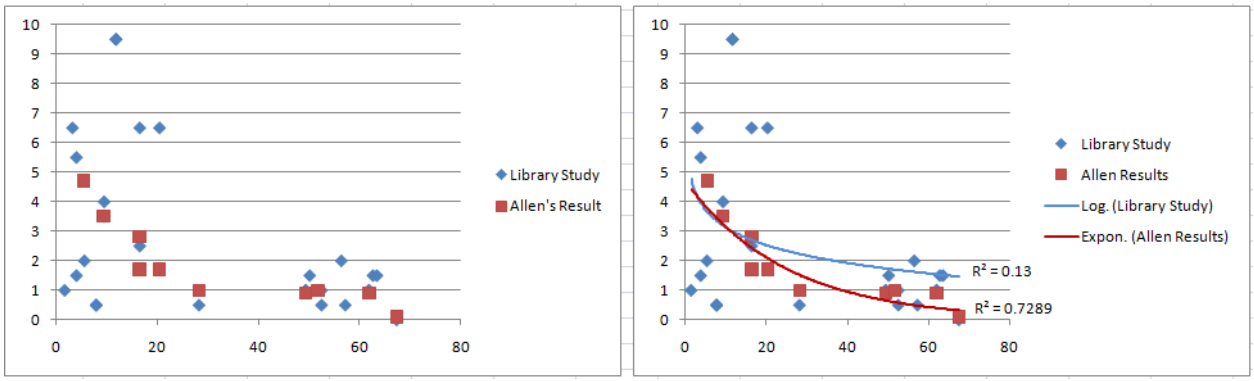


Figure 3 - Comparing the result of the experiment with Allen's data results

As we expected the distribution data for internet-based communication was not affected by the distance of librarians. Due to missing some phone related data, we were not able to do the same analysis for the pattern for contacts via phone.

## Conclusion and Discussion

Based on the results of our experiment, face to face communication rate drops to around two contacts per week after 20 meters distance which is almost same as Allen's research results. It indicates about 70% decline in communication rate, which is a significant impact. As it mentioned earlier the organizational positions of the librarians are almost same and all are located in a same floor in the library building, since the only possible explanation for such a significant reduction in communication rate would be the physical distance.

At the other hand we were not able to apply the same trend to the result data as Allen did. It could still be justified by the very small sample number we had in the experiment comparing to the initial execution of the experiment by Allen in 1977. Also as it was expected, there was no evidence that physical distance have any impact on the internet-based and phone contacts rates, which also could be taken as a validity prove for the experiment methodology.

## Future Researches

One of the aspects that could be investigated more in the future studies would be the quality of the communications and the distance in the workplace. We intestinally looked over to ask the respondents in the experiment to document the purpose and effectiveness of the contacts, due to a student experiment limitations. Studying the purpose and results of each type of communications from conventional face to face to internet-based and via phone will provide the performance pattern of each one which side to side by the result of this study will let to decide whether the physical distance in workspace still maters in the IT era or not.

## Reference:


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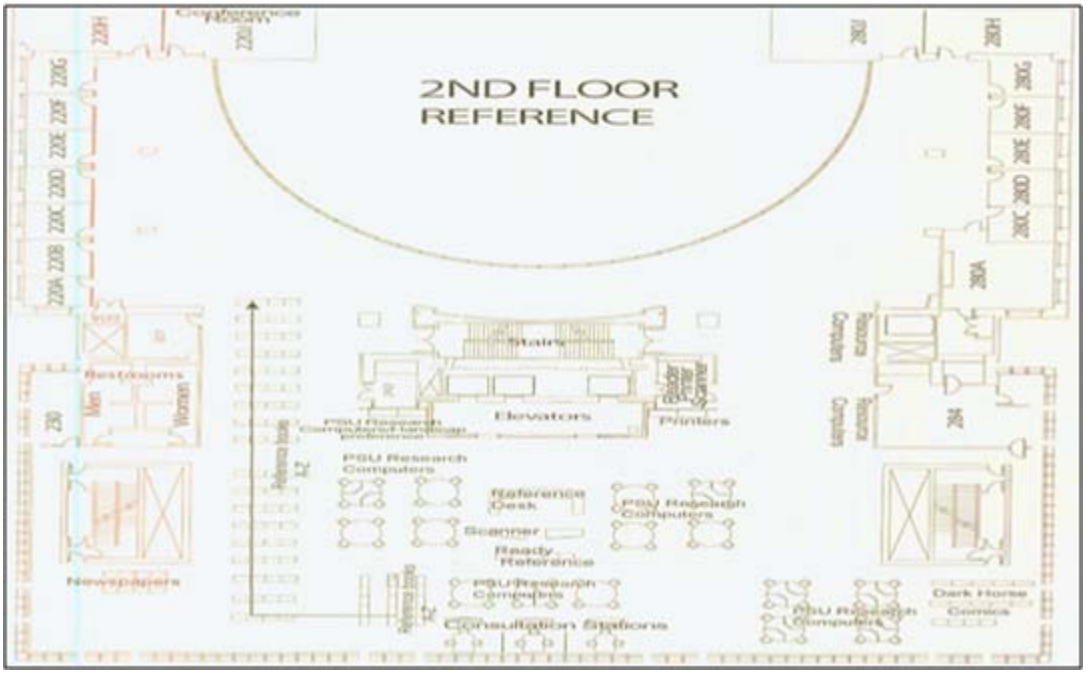
## Appendix 1- Miller Library 2nd floor plan




## Appendix 2- A sample log

| | | Joan Petit | Linda Abshar | Kris Kern | Gretta Siegel | Kerry Wu | kim Pendell | Michael Bowman | Emily Ford | Sarah Beasley | Chau Hoang | Claudia Weston | Tom Raffensberger | Tom Larsen | Arthur Hendricks | Bob Schroeder |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mon | 5/2/2011 | a | | | | ac | a | a | | ac | a | | | | | a |
| Tue | 5/3/2011 | | | a, b | a | c | | cc | | | | | | | | a |
| Wed | 5/4/2011 | | c | | | a | | ac | | c | | | | | | ac |
| Thu | 5/5/2011 | a, d | d | | d | d, c, c | d | d | | d, c, c | | d | | | d | d |
| Fri | 5/6/2011 | Out of office | | | | | | | | | | | | | | |
| Sat | 5/7/2011 | | | | | | | | | | | | | | | |
| Sun | 5/8/2011 | | | | | | | | | | | | | | | |
| Mon | 5/9/2011 | Out of Office | | | | | | | | | | | | | | |
| Tue | 5/10/2011 | Out of Office | | | | | | | | | | | | | | |
| Wed | 5/11/2011 | Out of Office | | | | | | | | | | | | | | |
| Thu | 5/12/2011 | d | c | a, d | d | a, d | a, d, c | a, d | | a, d, c | | a, d | | a, d | d | a, d |
| Fri | 5/13/2011 | Out of office | | | | | | | | | | | | | | |
| Sat | 5/14/2011 | | | | | | | | | | | | | | | |
| Sun | 5/15/2011 | | | | | | | | | | | | | | | |

Options for communication:
A- face to face
B- Via phone
C- Internetbased ( Email, skype, IM, etc.)
D- Meeting