STUDYING HINDRANCES AND ENABLERS IN KNOWLEDGE WORK PROCESSES

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New ways of working contexts

Digital work

Mobile and multi-locational work

Virtual and distributed work
Knowledge work in context
**Knowledge work**

(a) **creation, distribution or application of knowledge** (intangible resources) as task contents (Davenport, 2002; Harrison, Wheeler & Whitehead, 2004; Jones & Chung, 2006),

(b) **by highly skilled and/or trained workers** (Drucker, 1995; Pyöriä, Melin & Blom, 2005) who have autonomy in their work (Mäki, 2008; Pepitone, 2002; Scott, 2005)

(c) **who use tools** (e.g. ICT) and theoretical concepts (Pyöriä et al., 2005)

(d) **in order to produce** complex, intangible and tangible **results** (Drucker, 1995; Lönnqvist, 2007)

(e) to provide a competitive advantage or some other benefit **contributing towards the goals of the organization** (Harrison et al., 2004).
Knowledge Work Productivity (KWP)

- KW is non routine, complex and situation specific
- It seldom has one single correct result or correct way of doing it, and it is difficult to quantify
- KW is intangible and hard to measure with traditional productivity measurements, i.e. outcome or output from production process per unit of time or per unit of input.
- Increase in individual productivity may not always be seen in the organizational outcome
- In order to assess the collective productivity and performance the team is a proper level at which to analyze knowledge work productivity and performance
- Input/output productivity formula and measurement alone may not be applicable in KW; therefore a wider perspective is needed

\[
\text{KWP} = \text{Task factors (what)} \times \text{Contextual factors (where)} \times \text{Team processes (how)}
\]
KNOWLEDGE WORK SYSTEM IN ITS ENVIRONMENT

Task, e.g. product design

Subject

Tools

Work process ‘performance’

Workspaces

Object

Outcomes, e.g.
- products
- team productivity
- quality of work
- well-being
- job satisfaction
**Knowledge Work Process in Its Environment II**

- **Task, e.g. design**

- **Individual work performances**

  - Incompatible physical space
  - Unusable and unattainable virtual space
  - Disruptive and interruptive social space

**Outcomes**
- **Creativity**
  - e.g. new ideas generation and implementation

- **Innovativeness**
  - e.g. % of new product revenue
  - new product profitability
  - innovative climate

- **Productivity**
  - e.g. planned vs. actual results

- **Well-being**
  - stressed vs flow
Changes on different levels influence on work processes

Trials to adapt

- Change in a person’s work
- Change in personnel structure
- Change in business-idea
- Change in the needs of global customers
- Missing knowledge on customers
- Missing and changing knowledge on product
- Missing competencies and expertise
- Error, question, additional work
- From a mass product to taylorized
- Other cheaper technological solution
- From temporary external worker

(From Tiina Kalliomäki-Levanto 2008)
Mental regulation of actions under pressure

Self-evaluation
Internal speech, e.g. reflecting, inventing, finding and repairing mistakes

Emotional-motivational regulation

Cognitive regulation
- Intellectual
- Conceptual-perceptual
- Sensorimotor

PREPARATION

Activity – actions - operations
Thinking, e.g. reasoning, knowledge building
Verbal, e.g. speaking, conceptualising
Physical, e.g. producing, moving

Orientation
Sub-goals
Decision-making

External feedback from activity environment
Comments
Showing, demonstrations
Physical limit

Codified knowledge
Information seeking

Personified knowledge
Dialogue

External feedback from activity environment
Comments
Showing, demonstrations
Physical limit
WORKPLACES OF KNOWLEDGE WORKERS

- Many knowledge workers work in multiple workplaces in addition to their main office, e.g., at a customer site, at home, hotels, travelling etc.
- Physical workplaces are typically divided as individual workplaces and collaborative places.
- Each workplace can be seen as an integration of imbedded spaces consisting of
  - **Physical space** like an office or a customer site where a knowledge worker works;
  - **Virtual space** in which people meet and collaborate with help of ICT e.g., email, teleconferencing, video conferencing;
  - **Social space** in which people meet formally and informally, e.g., meetings, coffee room, hall ways
- Workspaces have different kind of hindrances and enablers that have impact on the way work is performed
Daily working events in multiple locations

Home

Main office

A customer’s place

A car

A restaurant
A context consists of spaces

<table>
<thead>
<tr>
<th>Physical spaces</th>
<th>Home</th>
<th>Main workplace(s), 'Office'</th>
<th>Moving places, i.e. trains, airplanes, ships</th>
<th>'Other workplaces', e.g. clients' and suppliers' places</th>
<th>'Third workplaces', e.g. hotel, cafe, congress venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Settings</td>
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<td>- Arenas</td>
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<td>- Environments</td>
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<td>- Tasks</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Virtual spaces</th>
<th>PC, phone, Internet, broadband, wlan</th>
<th>Intranet, communication and collaboration systems</th>
<th>Mobile devices, wlan</th>
<th>Intra- and extranet, Internet</th>
<th>Laptop, internet, wlan</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Connections</td>
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<td>- Devices</td>
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<td>- Purposes</td>
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<td>- Functionality</td>
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</table>

<table>
<thead>
<tr>
<th>Social spaces</th>
<th>Family: emotional support</th>
<th>Peers: social support, feedback, disruptions</th>
<th>Strangers: security</th>
<th>Partners</th>
<th>Mostly strangers</th>
</tr>
</thead>
<tbody>
<tr>
<td>- G&amp;O and HRM issues</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mental spaces</th>
<th>Tranquility, well-being</th>
<th>Shared goals and values, 'stress', identification</th>
<th>Change and solitude</th>
<th>Trust</th>
<th>Interruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Cognitions and emotions, self-regulation</td>
<td></td>
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</tbody>
</table>
SOCIAL INTERACTION IN PHYSICAL AND VIRTUAL SPACES

<table>
<thead>
<tr>
<th>Working in solitude</th>
<th>Working virtually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working f-t-f with many</td>
<td>Working alone, e.g. reading e-mails, preparing documents</td>
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<tr>
<td></td>
<td>Communicating asynchronously without time limit, e.g. sending e-mails, SMS, MMS, documents</td>
</tr>
<tr>
<td></td>
<td>Communicating asynchronously with time limit, e.g. chat, communication chains</td>
</tr>
<tr>
<td></td>
<td>Communicating synchronously with few, e.g. calls, Sametime chat</td>
</tr>
<tr>
<td></td>
<td>Communicating synchronously with many, e.g. teleconference, videoconference</td>
</tr>
<tr>
<td></td>
<td>Communicating f-t-f with few, e.g. official and ad hoc one-to-one and one-to-few meetings</td>
</tr>
<tr>
<td></td>
<td>Communicating f-t-f with many, e.g. official and ad hoc large meetings</td>
</tr>
</tbody>
</table>
Process of group/team knowledge work towards group productivity

ORGANIZATIONAL CONTEXT
Structure, culture, identity, strategy, policies, reward system management

TIME SPEND BY TEAM IN
Modes
- Solo
- Technology mediated
Tasks
- Routine
- Creative
- Coordination

PHYSICAL, VIRTUAL AND SOCIAL SPACES

GROUP/TEAM
Structure & composition: size, diversity, team members’ skills, knowledge
Team process: interpersonal, planning and action processes

Enablers
Hindrances

OUTCOMES
Productivity
Effectiveness
Efficiency
Innovativeness & Creativity
Job satisfaction
High quality interaction
Well-Being

Intra-group processes to be supported

*Interpersonal exchange processes*

- **Communication**, i.e. exchanging signals and symbols and using communication tools. Communication has a special status in that it is basic to the other task and group-oriented processes.

*Task-oriented processes*

- **Information sharing** and learning, i.e. exchanging (sharing) and developing information, views and knowledge.
- **Co-ordination**, i.e. adjusting the work of the group members; this includes leadership.
- **Co-operation**, i.e. working together, co-decision making, co-editing, etc.

*Group-oriented processes*

- **Social interaction**, i.e. group maintenance activities, developing trust and cohesion, conflict handling, reflection.

(Andriessen, 2003, pp. 7–8)
A case study: Observations on mobile employees’ workdays
Questions to be answered

For what purpose (task), how (mode of communication and collaboration) and where (place) and with whom (network) they act and communicate?

How physical, virtual and mental/social spaces support or should support employees and teams in their work.

In order to create

Knowledge for understanding, how to best support mobile and distributed work.
Unit of analysis: Mobile Team’s Communication and Collaboration

For what purpose (task), how (mode of communication and collaboration) and where (place) and with whom (network) they act and communicate? How physical, virtual and mental/social spaces support or should support the team in its work?
Approach and Methods

STUDYING DISTRIBUTED WORK IN WORK SPACES AND PLACES

Data collection
(a) Self-observation diary during seven days
(b) Interviews
(c) Workshop for validation

Reporting
I Working and communicating during a week and a day
II Contents of work: working in solitude, cognitive requirements, contents of asynchronous communication
III Collaboration with others and synchronous communication: types and purposes of meetings
IV Physical places in use: main workplaces, multilocational work, ‘worst’ and ‘best’ places and aesthetics, ideal working environment
V ICT tools in use
I (a) A working day is blurred
I (b) A working day is a continuum of changing workspaces

Working in solitude  Working virtually  Working face-to-face

Asynchronity  Synchronity
### II Contents of Work: Cognitive Requirements of Solo Work

<table>
<thead>
<tr>
<th>Required level of cognitive regulation</th>
<th>When working alone my work consists of ....</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doing routine tasks</td>
<td>e.g. reserving tickets, organizing and booking meeting rooms, registration of working hours, doing travel bills, room reservations, reading news mails</td>
<td>18</td>
</tr>
<tr>
<td>Working based on familiar rules and guidelines</td>
<td>e.g. working on e-mails (answering simple questions), standard answers to customers like “for what we are working”, classifying mails, continuing others’ work</td>
<td>14</td>
</tr>
<tr>
<td>Applying rules and guidelines in many familiar contexts</td>
<td>e.g. customising based on a basic set of offerings</td>
<td>15</td>
</tr>
<tr>
<td>Combining familiar rules and guidelines in new contexts</td>
<td>e.g. identifying the mobility needs among internal customers, complex customising</td>
<td>31</td>
</tr>
<tr>
<td>Creating new plans and solutions</td>
<td>e.g. usually done in groups by brainstorming, considering new technologies that could be utilised, forecasting future, doing drafts 0.1, documents to be worked on with others</td>
<td>22</td>
</tr>
<tr>
<td>ALL together</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>
III FROM SOLO WORK TO COLLABORATION: COMMUNICATION CHAINS

- Combined multimedia chains are used for analysing information and creating new knowledge
- May consist of 30-40 persons, may last from some minutes to several months
- Not well-managed

An example of a simple SMS message chain from D to KK, LJ and JR
III Synchronous Communication and Collaboration with Others: Types and Purposes of Meetings

- **Calls**: much less than e-mails, a bit more than SMS
- **Online chat**: quite popular, used for quick checking
- **Small and large teleconferences**: supported by online chat and shared documents were used for exchanging information and opinions
- **Face-to-face meetings**: with teleparticipants were organised quite often, not functioning well
- **Small official and ad hoc face-to-face** (2 persons) meetings were very popular and successful used for all purposes
- **Larger** (2-4 persons) meetings are best for problem solving and generating ideas
- **Large** (5-10) used for exchanging information, one-way sharing
- **Really large** (more than 10) used for distributing information → often participants started to work in solitude!
- **Larger** (3-5) ad hoc f-t-f meetings were problematic
- The **most satisfactory** meeting: a meeting with success and progress
- The **most unsatisfactory** meetings: no progress, waste of time
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Calls (n=14)</th>
<th>Chat o-to-o (n=12)</th>
<th>2-4 (n=3)</th>
<th>5-10 (n=5)</th>
<th>f-t-f + telep. (n=4)</th>
<th>2-4 (n=16)</th>
<th>5-10 (n=8)</th>
<th>Large ➔ 10 (n=2)</th>
<th>Ad hoc f-t-f (n=24)</th>
<th>2-5 (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting to know s-body</td>
<td>+2</td>
<td>+2</td>
<td>0</td>
<td>0</td>
<td>+2</td>
<td>+7</td>
<td>+6</td>
<td>+6</td>
<td>+1</td>
<td>+1</td>
</tr>
<tr>
<td>Exchanging opinion</td>
<td>+8</td>
<td>+4</td>
<td>+2</td>
<td>+5</td>
<td>+3</td>
<td>+11</td>
<td>+9</td>
<td>+11</td>
<td>+2</td>
<td>+8</td>
</tr>
<tr>
<td>Persuasion</td>
<td>+2</td>
<td>+3</td>
<td>0</td>
<td>-2</td>
<td>+3</td>
<td>+9</td>
<td>+8</td>
<td>+4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bargaining</td>
<td>0</td>
<td>+2</td>
<td>+1</td>
<td>+1</td>
<td>+3</td>
<td>+6</td>
<td>+4</td>
<td>+2</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td>Exchanging info</td>
<td>+8</td>
<td>+4</td>
<td>+7</td>
<td>+10</td>
<td>+6</td>
<td>+10</td>
<td>+9</td>
<td>+8</td>
<td>+8</td>
<td>+12</td>
</tr>
<tr>
<td>Resolving disagr.</td>
<td>+1</td>
<td>+2</td>
<td>0</td>
<td>0</td>
<td>-1</td>
<td>+6</td>
<td>4</td>
<td>+2</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td>Problem solving</td>
<td>+7</td>
<td>+6</td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>+7</td>
<td>10+</td>
<td>+4</td>
<td>-2</td>
<td>+8</td>
</tr>
<tr>
<td>Generating ideas</td>
<td>+2</td>
<td>+3</td>
<td>-2</td>
<td>0</td>
<td>-3</td>
<td>+7</td>
<td>+9</td>
<td>+3</td>
<td>-3</td>
<td>+5</td>
</tr>
</tbody>
</table>
IV Use of physical spaces: (a) working in many workplaces

- Main workplace: 37%
- Home: 33%
- Other company workplaces (other offices): 18%
- Third places (seminars, hotels, city ...): 5%
- Other workplaces (ext-company): 1%
- Vehicles: 6%
IV Use of physical spaces: (b) changing places
ESCAPE FROM OFFICE: EXTERNAL AND INTERNAL INTERRUPTIONS IN WORK

(retrieved from Gonzalez & Mark, 2005, 118).
## V ICT TOOLS IN USE

<table>
<thead>
<tr>
<th>Media in use</th>
<th>Indispensable</th>
<th>Ideas to improve</th>
</tr>
</thead>
</table>
| - Basically the same **standard** tools.  
- Phone (calls, sms, smash, push, e-mail, chat, intranet, internet, contacts, calendar), laptop (e-mails, power point, sametime chat, teleconference, online presence, Trackview, Lotus Notes-based Teamroom for documents, intra- and internet, mindmap, hour reporting, MsOffice), paper documents, PostIt, Locus magazine, Irma for showing slides with phone.  
- Most team members have a home office connection. | - It depends on what you are doing. For making things to happen, **chat** is the number one. Although other person is in a meeting, by using chat you can manage things. Chat is unnoticeable. Nobody waits for long answers, just quick ones. Instead of putting things into mailbox, it is good.  
- If **PC** is taken off, everything becomes paralyzed.  
- **E-mail** is the best and worst media: quick, multifaceted, mobile access but used too much. | - **E-mails** are used too many. Instead all the material could be put to Teamroom and the e-mail would just include links.  
- There are too many **meetings**.  
- Because e-mails are used so much, other tools are suffering.  
- **Needs for videoconference** if it would be properly arranged. It is a hindrance to get opposite side to a right place.  
- Centralized calendar is a problem, because you cannot know where the others are, and traveling may take some time.  
- Virtual meetings tools should be more flexible.  
- Communication tools are not problems as such; **people just do not know how to communicate**. |
Research assignment: a day in a life of a knowledge worker
PURPOSE OF THE STUDY

This method is used to collect data from the physical, virtual and social working environments of a knowledge worker during his/her working day. In addition, feelings and moods of a subject is collected. The study is done as collaboration between a subject and a researcher. The purpose is to find out, what kinds of positive and negative factors there are in work and working context from the viewpoint of work fluency. The data is collected by pre-interviews, self-observations and/or shadowing of a subject, and complemented with retrospective interviews.
Knowledge WorkSpace

Physical space
1. Where are you just now? (photo)
2. Please, name the place: ____ (audio, text)
5. What were positive aspects of the place? (audio, text)
6. What were negative aspects of the place? (audio, text)
7. How functional was the place for your task (1-5)

Knowledge work and tasks
3. What did you do in this place? (your task)
4. How complex was your task? (1-5)
23. Did you accomplish your task? (1-5)
24. How well did you succeed in your task? (1-5)

Mental space
16. How did you feel the event in all? (text, audio)
17. How well did you perform? (1-5)
18. Was you absorbed in what you was doing (1-5)
19. Did you feel stress? (1-5)
20. Did you feel energetic? (1-5)
21. Did you feel enthusiastic? (1-5)
22. Did you feel creative? (1-5)

Virtual space
8. What ICT tools did you use? (audio, text)
9. Which were the most functional tools?
10. What problems did you have in using tools? (audio, text)
11. How functional were the tools for your task? (1-5)

Social space
12. With whom did you interact? (photo, audio, text)
13. What were positive aspects of interaction? (audio, text)
14. What were negative aspects of interaction? (audio, text)
15. How successful was your interaction? (1-5)

Scale 1-5:
1 = not at all
2 = little
3 = to some extent
4 = much
5 = very much/well
I PRE-INTERVIEW

- The purpose of the meeting and interview is to get to know the subject and his/her work (e.g., what (s)he is doing) and working environment (e.g. what kind of organization). Write up main points and if possible record the session. Also ask documents if available telling about the organization and work.

- In this meeting, you should tell him/her about the research and its background and also AGREE about the next steps!
II ACTUAL DATA COLLECTION

- Each subject writes down (a) point of time, (b) event/task (what (s)he is doing and (c) his/her observations relating to different spaces (see FORM FOR SELF-OBSERVATIONS).

- The form is filled from morning till evening. The focus is on work events and places where they are done.

- Point of time, events/tasks and places

- Typically there are several places to work, and a person is doing many tasks during a day. The basic idea is to identify those hindrances that make working difficult and also those features (enablers) that help or facilitate working making it fluent. Usually there are from 3 to 10 events/task/places to be used during a working day.

- Make an observation and a note always when working place and/or event (task) clearly changes.
FORM FOR SELF-OBSERVATIONS FOR A SUBJECT (COPY AS MANY AS NEEDED)

<table>
<thead>
<tr>
<th>Point in time:</th>
<th>1. Place and task/event: PHYSICAL SPACE</th>
<th>VIRTUAL SPACE</th>
<th>SOCIAL SPACE</th>
<th>MENTAL SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point in time:</td>
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</table>
A researcher interviews a knowledge worker, for example next day or day after it.

In the interview, the form (FORM FOR SELF-OBSERVATIONS) filled by the subject and Knowledge WorkSpace picture are used.

A researcher makes notes and record the interview for later transcription.
IV DATA ANALYSIS AND SUMMARY

- After data collection period, the researcher compiles all the data and summarizes the main observations to the OBSERVATION SUMMARY FORM FOR A RESEARCHER.
# OBSERVATION SUMMARY FORM FOR A RESEARCHER

1. Place and task/event (questions 3, 4, 23, 24):
   **Eg. home**

<table>
<thead>
<tr>
<th>Place and task/event</th>
<th>PHYSICAL SPACE (questions 1, 2, 5, 6, 7)</th>
<th>VIRTUAL SPACE (questions 8-11)</th>
<th>SOCIAL SPACE (questions 12-15)</th>
<th>MENTAL SPACE (questions 16-22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOME</td>
<td>+ =</td>
<td>+ =</td>
<td>+ =</td>
<td>+ =</td>
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<tr>
<td></td>
<td>- =</td>
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</table>

2. Place and task/event:

<table>
<thead>
<tr>
<th>Place and task/event</th>
<th>Fyysinen tila</th>
<th>etc</th>
<th>etc</th>
<th>etc</th>
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<td>Fyysinen tila</td>
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</table>

3. Place and task/event:

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<tr>
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<th>etc</th>
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<tbody>
<tr>
<td>Fyysinen tila</td>
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</table>

4. Place and task/event

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<thead>
<tr>
<th>Place and task/event</th>
<th>etc</th>
<th>etc</th>
<th>etc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Place and task/event

<table>
<thead>
<tr>
<th>Place and task/event</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
AN EXAMPLE OF A FILLED OBSERVATION SUMMARY FORM

<table>
<thead>
<tr>
<th>1. Place and task/event (questions 3, 4, 23, 24):</th>
<th>PHYSICAL SPACE (questions 1, 2, 5, 6, 7)</th>
<th>VIRTUAL SPACE (questions 8-11)</th>
<th>SOCIAL SPACE (questions 12-15)</th>
<th>MENTAL SPACE (questions16-22)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ = peaceful</td>
<td>+ = laptop ok</td>
<td>+ = progress in research plan</td>
<td>+ = good feeling about progress, rest</td>
</tr>
<tr>
<td></td>
<td>- = no</td>
<td>- = voice problems in skype</td>
<td>- = not mutual understanding</td>
<td>- = children coming from school and “shouting”</td>
</tr>
<tr>
<td></td>
<td>+ = usual auditorium</td>
<td>+ = wlan working well</td>
<td>+ = easy to sit and lesson</td>
<td>+ = peaceful</td>
</tr>
<tr>
<td></td>
<td>- = a bit cool</td>
<td>- = microphone failures</td>
<td>- = one-way communication</td>
<td>- = bored</td>
</tr>
</tbody>
</table>

| 2. Place and task/event: at home, skype meeting | etc |

| Place and task/event: at a customer, listening lectures and sending emails | etc |

| Place and task/event: etc | etc |

| Place and task/event: etc | etc |
V FINAL REPORT

The research and its findings are documented as a final assignment report. Its length is from 8-10 pages in addition to appendixes. See reporting below:

Contents

1. Introduction (including research questions)
2. Theoretical background
3. Research design and methods
4. Findings
  4.1 Facilitating issues
  4.2 Hindrances
5. Discussion and conclusions
  - Main observations
  - Development and design proposals

References
Appendixes
How complex was your task?
PLACE, STRESS AND CREATIVITY

- Did you feel stress?
- Did you feel creative?
TASK, STRESS AND CREATIVENESS

**Did you feel stress?**

**Did you feel creative?**


