

An experimental deprivation study on technology indispensability

Elisabeth Platzer, Otto Petrovic, Wolf Rauch

Institute for Information Science and Information Systems

Karl Franzens-University of Graz

Universitätsstraße 15, 8010 Graz, Austria

{elisabeth.platzer, otto.petrovic, wolf.rauch}@uni-graz.at

Emanuel Maxl

evolaris next level

Hugo-Wolf-Gasse 8/8a, 8010 Graz, Austria

emanuel.maxl@evolaris.net

Abstract. *In the course of an experimental deprivation study the participants give up mobile phones, internet and TV for two weeks each. During this period data of changes in their perceived dualities concerning the technologies is collected and compared. Also the expected indispensability before deprivation and the experienced indispensability during deprivation are measured and compared.*

The first results of the study show the differences between the three technologies' indispensabilities and the perceptions people experience when using them or especially when not using them. Also qualitative data on technology indispensability is gathered and will be used for future research activities in this domain.

Keywords. technology indispensability, technology deprivation, experimental study, perceptions of dualities

1 Baseline and Research Question

In September 2008 the International Telecommunication Union announced that the number of mobile phone subscribers will pass the four billion mark before the end of the year. This implies a worldwide mobile phone penetration rate of more than 60 %. More and more people use mobile phones in increasingly different ways. Nowadays mobile phones are not only used for simple voice calls but also for data services which account for an important part of mobile revenues. As so many people use mobile phones so often and for so many tasks the question if mobile phones are indispensable suggests itself.

- Could those four billion people live without mobile phones?
- Which expressions of mobile phone indispensability are observable and what do people perceive themselves?

- Are mobile phones particularly indispensable or are they comparable to other technologies?
- Are non-mobile technologies like Internet and TV which are regarded as “essential” technologies [6] as well indispensable for our lives to a similar extent and in the same way as mobile phones are?

2 Theoretical Framework

When indispensability is regarded as a quality that makes it impossible for people to live without the particular thing it is obvious that the indispensable thing plays a prominent role in the persons' lives. Fundamental ideas of our indispensability model which is displayed in Fig 1 derive from Hoffman's work on Internet indispensability [2].

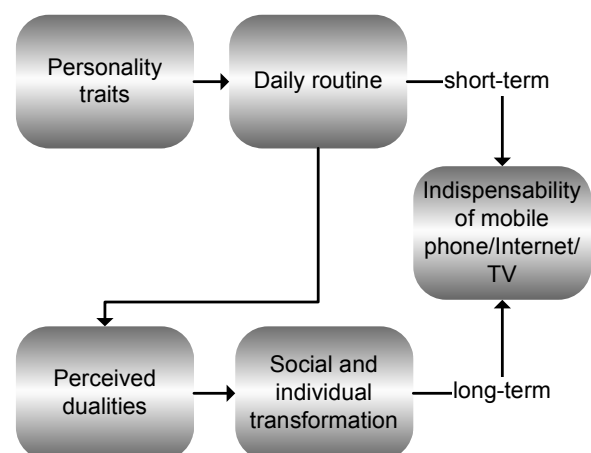


Figure 1: Research model

We believe that a person's readiness to embrace a new technology measured by Technology Readiness Index [5] is a personality trait that fosters involvement of a technology into the person's daily routine. If a technology is part of the daily routine it seems

indispensable to him or her quickly. On the long-term the perception and resolution of dualities [1; 3; 4] concerning the technology in question might lead to transformations of the individual or even the society in form of completely new behavioral patterns and social structures. This will also lead to indispensability of the technology but in a more persistent way.

2.1 Indispensability

There exist two very different ways to analyze indispensability of technologies. One of them is positioned at the perceptions of test persons. People are asked whether they find a technology indispensable or not. Results of these studies are based on perceived qualities and estimations of people. Hoffman [2] differentiates between three types of Indispensability:

- ⇒ general indispensability
- ⇒ task indispensability
- ⇒ readiness to give up the technology.

The other path leads to objective data gathered by observation of facts. The duration of possible non-usage-phases is an objective indispensability factor and it derives directly from our definition of indispensability. Also the number of dropouts during a non-usage phase gives information about indispensability of the particular technology.

For this experiment we combine both ways and compare the results afterwards.

2.2 Dualities

Dualities are paradox feelings a person experiences in the context of technology usage. They are arranged in oppositional pairs of positive negative reactions. Most people experience both of them at the same time.

Eleven of those contradictorily statements are explained below:

- **Control/Chaos**

A technology can help to control ones life and at the same time create chaos and upheaval.

- **Freedom/Enslavement**

While providing a person with more freedom a technology can also enslave him.

- **Empowerment/Entrapment**

Technology usage is able to empower people and taking over their lives in the same breath.

- **New/Obsolete**

Technologies can provide people with new things and give them the feeling of not being up to date at the same time.

- **Competence/Incompetence**

On the one hand technology can enable a person to do things he or she couldn't do without it but make them feel incompetent as well.

- **Augment thinking/Cognitive Overload**

Technology might augment a persons thinking while the amount of information that is provided is overwhelming.

- **Efficiency/Inefficiency**

Technology can act as a time-saver but technology usage can also take up a lot of time.

- **Fulfills needs/Creates needs**

Technology supports people to fulfill their needs and makes them wanting things they didn't want before as well.

- **Assimilation/Isolation**

Technology usage is able to bring people together and making them withdraw from direct human interaction at the same time.

- **Engaging/Disengaging**

Using technology might be intrinsically enjoyable for people but also disengaging.

- **Addressability/Anonymity**

A persons identity can be revealed when using technology but technology might also enable people to be whoever they want to be.

2.3 Hypotheses

Based on the general characteristics of the three technologies involved in the experimental setting some fundamental assumptions concerning their differences can be hypothesized but not all of them are tested in this paper:

H1: Possible non-usage-phase durations are different for mobile phones, Internet and TV.

H2: The number of breaks of the media-non-usage-rules is different for mobile phones, Internet and TV.

H3: Perceptions of Indispensability are different for mobile phones, Internet and TV.

H4: Perceptions of dualities are different for mobile phones, Internet and TV.

In the context of subjective and objective indispensability the following hypotheses are tested:

H5: High subjective indispensability values lead to shorter possible non-usage-phases.

H6: High subjective indispensability values lead to a higher number of dropouts.

Regarding the changes during the course of non-usage-phases in the experiment the following hypothesis are suggested:

H7: The perceived dualities change in the course of the non-usage phases.

H8: The perceived dualities change when breaking media-non-usage-rules.

One hypothesis relating to the personality trait construct is to be tested:

H9: High Technology Readiness Index leads to higher indispensability.

3 Research Design

A total of 64 students of "Management and International Business" took part in the study. They

were previously informed about the general aims of the experiment and the planned procedure which is depicted in Fig 2.

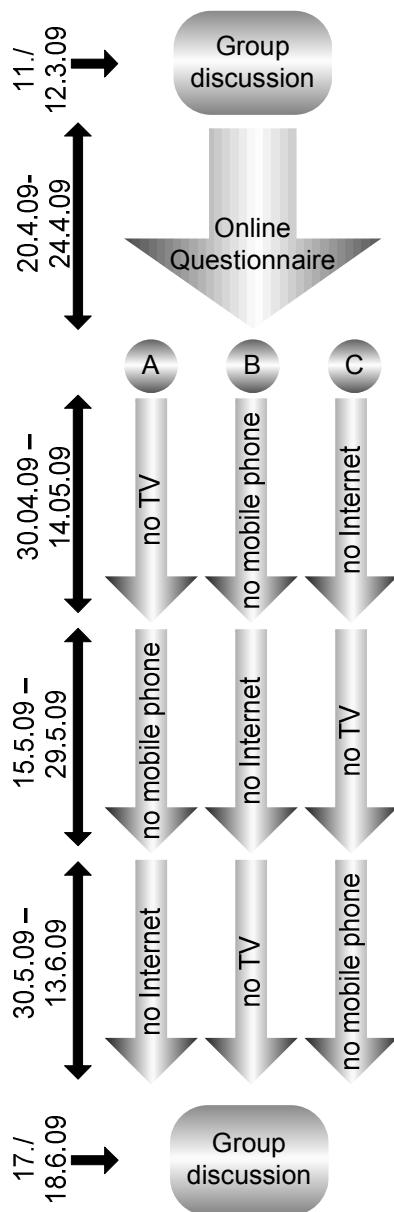


Figure 2: Experimental schedule

3.1 Pre-experimental group discussion

In the course of a plenary discussion the participants were invited to discuss the experimental setting we suggested and to tell us which problems they think might occur. From this discussion we draw a lot of information for the “media-non-usage-rules”. They also pointed out their expectations concerning the deprivation of the different technologies. Most of them thought it would be the easiest thing to do without TV. The estimations for mobile phone and internet deprivation were not clearly distinctive.

3.2 Online questionnaire

The next step was an online questionnaire where the participants had to answer questions concerning their general technology readiness drawn from Technology Readiness Index [5], the dualities [2] they experienced concerning mobile phones, internet and TV, their impressions of indispensability [2] of the three technologies and some statistical questions about their media equipment at home.

3.3 Experimental groups

Then the participants were divided into three groups (A, B and C) and got diaries for the duration of the technology deprivation phases. As shown in figure 2 there was a rotation of deprivation phases for the three technologies to avoid effects of sequence. This rotation and a complex system of questionnaires the participants had to answer during the period which is described in 3.5 made it necessary to provide the participants with clear instructions for each day of the experiment. The diaries were designed to ensure that every participant knew exactly when he or she had to forego which technology, when he or she had to answer which questions and that there was a standardized comprehension among the participants of what “not using a particular technology” meant.

3.4 Media-non-usage-rules

Internet-non-usage-phase was defined as:

- no www-browser on PC/Notebook
- no emails on PC/Notebook/mobile phone
- no Internet on mobile phone
- no Internet on computers on the university campus in Internet cafés (or similar locations)
- do not have other people read your emails to you
- usage of PC/Notebooks is allowed (without www)
- business related Intranets are allowed

Mobile phone-non-usage-phase was defined as:

- mobile phone is switched off (silent alert is not the same as switched off)
- no usage of other peoples mobile phones
- no phone calls via Internet from Notebooks
- landline calls are allowed
- calls from phone boxes are allowed
- carrying the switched off mobile phone is allowed (The students insisted on this because of eventual emergencies.)

TV-non-usage-phase was defined as:

- no switching-on of the TV set
- no TV on the Internet
- no mobile TV
- no Videos, DVDs or similar
- no game console
- no TV in pubs, cafés etc (e.g. live-sport)

- pubs, cafés etc. with mute background TV is allowed

Every infringement of the rules above ends a non-usage-phase. The next non-usage-phase starts by closing the www-browser, switching off the mobile phone or switching off the TV set.

3.5 Experimental diary

On the first day of each deprivation phase the participants were asked to name the three activities that might provoke a dropout of non-usage and weight them with the likelihood they expect them to be a reason for them to break non-usage-rules.

Every day they had to answer four open questions:

- “Today a positive aspect of doing without mobile phone/internet/TV was...”
- “Today a negative aspect of doing without mobile phone/internet/TV was...”
- “Today the thing that led me most into temptation to break media-non-usage-rules was...”
- “Today reactions from my environment concerning my doing without mobile phone/Internet/TV were...”

And two closed questions:

- “In general today I feel ... without mobile phone/Internet/TV” with five rating possibilities from “very good” to “very bad”.
- “I broke the non-media-usage-rules today” as a yes/no-question.

At the end of each deprivation phase they had to answer the questions concerning indispensability and dualities for the particular technology we already used in the Online-questionnaire.

Whenever they broke the media-non-usage-rules they had to note why they broke them and what for. Then they had to answer the questions concerning the dualities they felt regarding the technology.

During the whole period the participants had to keep the minutes of their media-non-usage phases in form of a journal.

3.6 Post-experimental group discussion

Afterwards a second plenary discussion was organized in order to discuss the different experiences the participants had during the experimental phases. It was a possibility to talk about their previous estimations about how easy it would be doing without the technologies and their opinion after really experiencing deprivation.

4 Results of the Empirical Study

Average durations of non-usage-phases were:

- 36 hours and 6 minutes for mobile phones,
- 37 hours and 32 minutes for internet and
- 82 hours and 22 minutes for TV.

Only one participant preserved all three consecutive non-usage-phase. Table 1 shows the exact distribution of drop-outs for the three media types.

Table 1: Number of drop-outs during non-usage-phases

Number of drop-outs	mobile phone	internet	TV
none	6 %	2 %	8 %
1	4 %	6 %	18 %
2	12 %	6 %	20 %
3-5	20 %	24 %	37 %
6-10	22 %	41 %	14 %
11-20	33 %	22 %	4 %
>21	4 %	2 %	0 %

More than a third of the participants documented more than ten drop-outs during the mobile phone non-usage-phase. For internet numbers are slightly lower. About one quarter of the participants dropped out more than ten times. In the case of TV-non-usage only 4 % of the participants broke rules of non-usage more than ten times.

The interpretation of these results could be that internet and mobile phones are indispensable to a similar degree but as the mobile phone is an immediate medium of communication participants had to use it more often than the internet. An email is kept in the inbox whereas a missed phone call is missed. In the group discussion following the deprivation phase the participants reported that they saved up tasks they wanted to carry out with the help of the internet for one drop-out in the evening or every two days whereas this was not possible for mobile phone tasks.

4.1 Indispensability

Beside the observable indispensability also perceived indispensability was measured. In Tables 2, 3 and 4 the results for accordance with statements concerning indispensability of mobile phones, internet and TV are listed. Each table shows mean scores of pre- and postexperimental questioning. Significance of alterations (differences of mean scores) was tested using a t-test. Significant changes (95 %) are marked with * whereas high significant changes (99 %) are marked with **.

Table 2: Mobile phone indispensability items in pre- and postexperimental questioning

Indispensability item	pre	post
The mobile phone is part of my daily routine.	1,70	1,50
The mobile phone improves my communication with friends and family.	1,80	1,60
The mobile phone helps me to do the tasks of daily living better.	2,60	1,90**

The mobile phone is indispensable to my daily life.	3,30	2,60*
The mobile phone helps me to do my job better.	2,90	2,60
The mobile phone is absolutely essential to me.	3,40	3,00
My life is richer now that I have a mobile phone.	3,90	3,10*
I cannot imagine my life without the mobile phone.	3,40	3,70
I would have no problem adjusting if mobile phones ceased to exist.	3,70	3,80
I could live without the mobile phone in my life.	4,60	4,10
I would be unwilling to give up the mobile phone for even a single day.	4,30	4,50
If mobile phones ceased to exist, that would be no problem for me.	4,60	4,70
No matter how much a mobile phone cost, I would not give it up.	5,60	5,10
The mobile phone makes it easier to shop.	5,60	5,50

Table 3: Internet indispensability items in pre- and postexperimental questioning

Indispensability item	pre	post
The internet is part of my daily routine.	1,60	1,50
The internet helps me to do my job better.	1,80	1,90
The internet helps me to do the tasks of daily living better.	2,20	2,00
The internet is absolutely essential to me.	2,70	2,60
The internet is indispensable to my daily life.	2,70	2,70
My life is richer now that I have the internet.	2,80	2,70
The internet improves my communication with friends and family.	3,20	3,00
The internet makes it easier to shop.	2,90	3,40
I cannot imagine my life without the internet	3,30	3,50
I would have no problem adjusting if the internet ceased to exist.	4,40	3,50*
I could live without the internet in my life.	4,50	4,20
No matter how much the internet cost, I would not give it up.	4,60	4,70
I would be unwilling to give up the internet for even a single day.	4,50	4,90
If the internet ceased to exist, that would be no problem for me.	5,00	5,10

Table 4: TV indispensability items in pre- and postexperimental questioning

Indispensability item	pre	post
I would have no problem adjusting if the TV ceased to exist.	2,90	3,00
The TV is part of my daily routine.	3,70	3,10
I could live without the TV in my life.	2,80	3,30
If the TV ceased to exist, that would be no problem for me.	3,30	3,40
My life is richer now that I have TV.	4,90	4,20*
The TV is indispensable to my daily life.	5,30	4,80
I cannot imagine my life without TV.	4,90	4,80
The TV is absolutely essential to me.	5,50	4,90
No matter how much the TV cost, I would not give it up.	6,10	5,80
The TV improves my communication with friends and family.	6,70	5,90**
I would be unwilling to give up the TV for even a single day.	6,30	6,00
The TV helps me to do the tasks of daily living better.	6,60	6,10*
The TV helps me to do my job better.	6,70	6,40
The TV makes it easier to shop.	6,50	6,50

Results of perceived indispensability are consistent with the observed data above. Mobile phone and internet received higher indispensability values than TV. The statements concerning giving up a technology like “I could live without...” got high values of agreement concerning TV but not for the other two tested technologies.

When comparing the mean scores of the indispensability items for mobile phones and internet huge differences are observable. Mobile phones are more important for communication related tasks and social activities than internet whereas the data for job related tasks is the other way around.

4.2 Dualities

In Tables 5, 6 and 7 show the results for accordance with items out of dualities concerning mobile phones, internet and TV. Mean scores of pre- and postexperimental questioning are depicted in each table. Significance of alterations (differences of mean scores) was tested using a t-test. Significant changes (95 %) are marked with * whereas high significant changes (99 %) are marked with **.

Table 5: Duality items concerning mobile phones in pre- and postexperimental questioning

Duality item	pre	post
The mobile phone is a real time-saver.	2,70	1,80**

The mobile phone provides me with more freedom.	2,80	1,90**
The mobile phone facilitates control of my life.	2,60	2,00*
The mobile phone brings people together.	3,00	2,00**
The mobile phone enables me to do things I couldn't do as well without it.	2,70	2,10*
Using the mobile phone is intrinsically enjoyable.	3,20	2,30**
The mobile phone helps me satisfy my needs.	3,60	2,40**
When I use the mobile phone, my identity is revealed.	4,30	3,50*
My use of mobile phone empowers me.	4,40	3,70
I am a slave to the mobile phone.	4,60	4,10
Using the mobile phone can be disengaging.	4,00	4,30
The mobile phone is taking over my life.	5,50	4,60**
There is always something new on the mobile phone.	3,00	4,70**
The mobile phone causes people to withdraw from direct human interaction.	3,90	4,80*
The amount of information on the mobile phone is overwhelming.	4,30	5,10**
Using the mobile phone takes up a lot of time.	6,10	5,30**
The mobile phone augments my thinking and helps me be smarter.	5,80	5,50
On the mobile phone, I can be whoever I want to be.	5,30	5,60
The mobile phone creates chaos and upheaval in my life.	5,50	5,70
The mobile phone makes me want things I didn't want before.	5,70	5,70
The mobile phone changes so rapidly, it is hard to keep up.	4,30	5,80**
The mobile phone makes me feel incompetent.	6,60	6,50

Table 6: Duality items concerning internet in pre- and postexperimental questioning

Duality item	pre	post
There is always something new on the internet.	1,50	1,80
The amount of information on the internet is overwhelming.	1,30	1,80**
The internet enables me to do things I couldn't do as well without it.	1,70	1,90
The internet is a real time-saver.	2,30	2,10
Using the internet is intrinsically enjoyable.	2,20	2,20
The internet provides me with more freedom.	2,50	2,30

The internet facilitates control of my life.	2,60	2,50
The internet helps me satisfy my needs.	2,60	2,50
The internet augments my thinking and helps me be smarter.	2,00	2,50*
The internet brings people together.	3,00	3,20
The internet changes so rapidly, it is hard to keep up.	3,60	3,50
My use of internet empowers me.	3,50	3,70
The internet causes people to withdraw from direct human interaction.	2,60	3,70**
Using the internet can be disengaging.	3,60	3,90
The internet makes me want things I didn't want before.	3,30	4,00*
On the internet, I can be whoever I want to be.	3,00	4,10**
Using the internet takes up a lot of time.	4,00	4,20
When I use the internet, my identity is revealed.	4,50	4,30
I am a slave to the internet.	5,00	4,40
The internet is taking over my life.	5,20	4,50
The internet creates chaos and upheaval in my life.	5,90	5,70
The internet makes me feel incompetent.	6,30	6,10

Table 7: Duality items concerning TV in pre- and postexperimental questioning

Duality item	pre	post
Using the TV is intrinsically enjoyable.	3,30	2,70
Using the TV takes up a lot of time.	3,50	3,10
There is always something new on TV.	3,80	3,50
The TV causes people to withdraw from direct human interaction.	3,30	3,60
The amount of information on the TV is overwhelming.	4,10	3,80
The TV helps me satisfy my needs.	4,30	3,90
The TV augments my thinking and helps me be smarter.	3,90	3,90
On the TV, I can be whoever I want to be.	3,70	3,90
The TV makes me want things I didn't want before.	4,10	4,40
Using the TV can be disengaging.	4,50	4,50
The TV brings people together.	5,80	5,10*
I am a slave to the TV.	5,70	5,20
The TV provides me with more freedom.	6,10	5,50*
The TV enables me to do things I couldn't do as well without it.	6,20	5,50*
The TV is taking over my life.	6,10	5,70

The TV changes so rapidly, it is hard to keep up.	6,30	5,70*
The TV facilitates control of my life.	6,10	5,80
The TV creates chaos and upheaval in my life.	6,10	5,90
My use of TV empowers me.	6,50	6,10*
The TV is a real time-saver.	6,20	6,30
When I use the TV, my identity is revealed.	6,70	6,50
The TV makes me feel incompetent.	6,70	6,70

While there were only five significant changes concerning agreement with duality statements for internet and TV from our questioning before to the one after the deprivation there were 14 of them concerning mobile phones. This could result from the fact that the mobile phone is the newest of the three technological mass phenomena. Dimensions of the experiences people made with it are not as well-defined as with the other technologies.

Comparison of the duality statements for the three media with highest mean scores, corresponding to high agreement with those statements, shows that mobile phone was the only technology with only positive experiences in the top three: efficiency, freedom and control. The top three for internet were new, cognitive overload and competence where cognitive overload is a negative experience. TV is regarded as engaging, inefficient and new where inefficient is obviously negative. The difference between the negative duality statements for internet and TV is that the contradictorily statement concerning cognitive overload (1,80) which is augment thinking (2,50) also received high values of agreement while TV is only regarded inefficient (3,10) but not efficient (6,30) at the same time.

6 Outlook and Further Research Questions

As the results presented in this paper are only of statistical nature there is a need for further data analysis. The qualitative data from the experimental diaries will be treated and in order to test the research model multivariate analysis methods will be applied in the course of a further experiment with an increased number of participants.

Future research activities could emphasize on antecedents of daily routine:

- Cross-cultural studies could lead to interesting results in this area as in some cultures mobile phones, internet and TV are not essential or indispensable parts of the daily routine (yet).
- Studies among different age-groups could provide us with information about unequal integration of technologies in daily routines depending on age.

External perceptions of a person who does without a technology are a promising field for further

research too. Studies in this area could provide deep insight in social structures that turn technologies into indispensable technologies.

References

- [1] Hoffman D. L.; Novak T. P., Venkatesh A. : **Has the Internet become indispensable?**, Communications of the ACM 47 (7), 2004, pp 37-42.
- [2] Hoffman D. L.; Wright L.: **Internet Indispensability and Consumer Welfare**. Chapter in preparation for the section "Technological Fronts" in: Mick, D. et al (ed.): Transformative Consumer Research for Personal and Collective Well Being: Reviews and Frontiers. 2009.
- [3] Mick, D. G.; Fournier, S.: **Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies**, Journal of Consumer Research 25 (2), 1998, pp. 123-143.
- [4] Orlikowski, W. J.: **The Duality of Technology: Rethinking the Concept of Technology in Organizations**, Organization Science 3 (3), 1992, pp. 398-427.
- [5] Parasuraman, A.: **Technology Readiness Index (TRI): a multiple item scale to measure readiness to embrace new technologies**, Journal of Service Research 2 (4), 2000, pp. 307-320.
- [6] Williams M. E, Bryant J. A: **To have and have not. Deprivation and the rational-emotional bridge**, Qualitative, 3/2007, 2007, pp. 101-110.