Mobile Multimedia: Identifying User Values Using the Means-End Theory

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ABSTRACT
This paper shows how basic human values are related to behavior patterns of the usage and production of mobile multimedia content. For these purposes we applied an interview technique called “Laddering”, a technique referring to the means-end theory. These in-depth interviews establish relations between product characteristics (attributes), user behaviors (consequences) and basic values and user goals. We carried out interviews with 24 respondents. We found that the entertainment of other people, the exchange of content, the desire to save time and strategies to influence one’s mood are the main driving forces for multimedia usage. Those are strongly related to basic values like social recognition, pleasure and happiness as well as to ambition. It is shown that usability aspects, like an intuitive UI, are strongly related to the users’ desire for being effective and ambitious. Summarizing, we report the method’s applicability in the realm of (mobile) HCI.

Categories and Subject Descriptors
J.4 [Social and behavioral sciences]

General Terms
Design, Human Factors

Keywords
Means-End Theory, Laddering, Mobile Multimedia, Human Goals and Values, User Experience, Value-Centered Design

1. INTRODUCTION
The consumption of multimedia content in the last years has undergone a significant change. Technical inventions and the availability of different tools on mobile devices offer possibilities for consumers in multiple ways. Thus, not only the ways of consuming but also the pervasive production of multimedia content is a topic of interest. Mobile phones offer integrated tools to record and store photo and video material on the device. Mobile multimedia content is integrated in living spaces and people’s lives significantly. For those reasons, people who are listening to their mp3 collection in the underground or on the bus is already a common situation in the same way as others are laughing and giggling over their mobile phones showing self-recorded clips and videos to their friends. Devices with potent cameras integrated leverage the pervasive production of content and will – as we believe – spread out even wider within the next years.

For this study we considered audio and video consumption as well as the production of mobile multimedia content. Different studies show that there are particular goals that people aim at when consuming mobile audio and mobile video on their devices. These goals differ from conventional non-mobile behavioral patterns. Therefore, in our study we wanted to investigate deeper towards users’ goals and values in the field of mobile multimedia. We wanted to find out which circumstances are important to users in order to fulfill principle goals and desires. Furthermore, we wanted to find out why mobile multimedia devices and their particular functions support people during their everyday and social activities and why these are important to them.

For these reasons we applied a qualitative method called Means-End Approach [17]. The according interview and analysis technique is called “Laddering”. Applying the method to mobile multimedia it is possible to identify direct and indirect links between device attributes, (e.g. device usability, device design, data storage, etc.) purposes of use (store memories, self entertainment, etc.) and human values (happiness, achievement, etc.). The main result – called Hierarchical Value Map (HVM) – shows all dominant paths and linkages in a hierarchical order. This method was elicited because of its explorative character. On the one hand it shows how users experience their device and how they use it; on the other hand it helps to show dependencies between behaviors, device characteristics and basic human values. Thus, we were able to show how existing findings (out of literature) fit into the network of device attributes, behaviors and values that we established in this study. We were able toexplore new behavior-patterns and dependencies and finally could show which human aims and values are satisfied by the consumption and production of mobile multimedia content. In our opinion - referring to value-centered design [3],[4] - “Laddering” proves to be a good technique to evaluate and uncover values related to mobile multimedia. The Study’s results will help designers to understand the context and the users they design for in the area of mobile HCI.

After a discussion of the related work we will give a brief introduction to the means-end theory. In the following chapters we will show the Laddering process and its analysis. In the last section of this paper we present general and detailed results.
2. RELATED WORK

There exist several studies on how, where and when users watch or listen to content with their mobile devices. O’Hara [12] showed that consuming video on mobile devices differs significantly from classical media consumption. In his study he published basic usage strategies and identified different contexts of mobile video consumption [12]. According to O’Hara the main purposes of video consumption are “to manage solitude”, “to disengage from others”, “to manage transitions between spaces” and “to share space without the need to share content”. Mobile video consumption may as well take place at home where it co-exists with TV or DVD. According to O’Hara people show content to others and - not surprisingly - exchange data. These findings were affirmed by a study by Repo et al. [15]. Repo reports that mobile video was used for social and entertainment reasons as well as for managing solitude.

Reponen et al. introduced the terms “Primary context” and “Secondary context”. The first refers to the context in that the content is produced and the latter to the consumption and exchange of the content. Reponen et al. argue that the pervasive production of content in the users’ context with mobile devices (especially with mobile phones) significantly differs from recording with classical video and photo cameras because mobile devices are “always on” and “always with” [16]. Further, both contexts – first and secondary – would mix up as the primary context gets relevant to the people of the secondary context although time, place and present people are different. Especially for the use of photos taken on camera phones House et al. report that self-expression and self-identification as well as maintaining social relations were common behavior patterns as those have the potential to store memories [7]. Further, Jacucci indicates that mobile multimedia production is appreciated by people to co-experience special events (sports, concerts, etc.) [9].

Nettamo’s [11] research study was concentrating on mobile music consumption. It is shown that music was used by people for entertainment purposes and relaxation but as well for representation purposes. Nettamo reports that the devices itself (with their particular design) were used for self-identification and self-representation purposes. Furthermore, the mobile audio content is used to maintain social contacts by sharing and showing content. Music sharing is reported as a traditionally strong indicator of group identity [21]. Nettamo’s results show that the purposes of use strongly depend on cultural backgrounds.

In contrast to social behavior, an important reason to consume audio content is “mood management”. Furthermore, mobile multimedia devices support people in creating their private space in public spaces [11],[12]. The latter is as well described by Mainwaring as “Cocooning” [10].

These studies mainly used explorative methods in the users’ context like diary studies accompanied by pre- and post-interviews [compare [11], [12]]. In contrast “Laddering” as in-depth interviews directly relate to the user’s experience as people during the interviews tell their expectations, experiences and feelings related to mobile multimedia consumption. By applying the means-end theory it was possible to show what consumer and producers of mobile multimedia content think, why they stick to a certain behavior and which basic values they are able to satisfy.

3. MEANS-END THEORY AND LADDERING STUDY

Laddering interviews are a qualitative research technique referring to Gutman’s Means-End Theory [17]. This theory was established to identify important meaning that consumers associate with products. The means-end theory distinguishes three abstraction levels of meanings: attributes, consequences and values. First, attributes are equated with characteristics of a product (hard disk size, audio quality, etc.). Consequences are more abstract and refer to the possibilities offered by the product’s characteristics (store huge/small data sizes on the device; listen to a certain kind of music). Lastly, values represent abstract meanings, motivational constructs and beliefs that are directly tied to emotions [17]. Schwarz describes values as desirable goals that people strive for [18]. As a result the Means-End theory builds linkages between the different levels of abstraction and shows why attributes and consequences are important to users [17].

So far the Means-End theory and the interview technique “Laddering” has been used in computer science to investigate in the area of organizational information systems [13]. In e-commerce research the means-end approach has been applied to analyze differences between entertainment and information web sites. [20]. “Laddering” served the GigaPort research project to identify user needs for new services for “next generation TV applications“ [8]. Furthermore, the quality of software products was evaluated by methods related to the Means-End Theory [22].

Laddering is focusing on product characteristics that are important to the user and have an explorative character. It is assumed that these characteristics are the reason why people use or buy certain products. The interviewer tries to find out why these characteristics are important to the interviewee by asking “Why is this important to you?”. This leads to an increased level of abstraction and lets the interviewees articulate certain behaviors. In the consecutive interview attributes will lead to consequences. A consequence – when no further level of abstraction is possible – will end up in a personal value. The following example (of the study at hand) demonstrates this abstraction process:

During the interview the respondent (TP3) indicated that it was important to him that a device should be easy to use (interface and menu structure) and that different functions should be easily accessible.

Interviewer: Why is it important to you that your device’s is easy to use and the function are easy accessible?

Interviewee: Because when I’m on the way and want to record a short video sequence or shoot a photo I have to react spontaneously.

Interviewer: Why is that spontaneous recording action important to you?

Interviewee: Otherwise I will miss the unique moment!

Interviewer: Why is it important to you that you do not miss the unique moments with your recordings?

Interviewee: Because the recordings later on help me to remember.

Interviewer: Why is that important to you?

Interviewee: Because I can relive the moment and the experience.

Interviewer: Why is that important to you?

Interviewee: It gives me a feeling of happiness and satisfaction.

This interview sequence shows that consequences may not directly lead to values in any case but may lead to other
consequences – although the abstraction level rises. In the example interview above the interviewee indicated that “Device usability” (attribute) is important as he wants to “use the device spontaneously” (consequence) and continuously to “store and evoke memories”. This finally conveys him a feeling of “Happiness and Satisfaction” (value). At this point it is important to note that not every chain must irrevocably reach the highest abstraction level. Thus, not every chain ends up in a value. This is often due to the fact that a respondent simply did not want to talk about personal emotions and values and refused to reach a certain level of abstraction. Although certain interview techniques helped us to overcome some of these barriers, it was not always possible to finish each ladder [17].

There is detailed information for the analysis process given in [17]. The study at hand sticks to the process as described by the authors and is further described in chapter 3.1.2. The next sections describe the interview setup. Results are discussed in section 4.

### 3.1 Study and Interview Setup

#### 3.1.1 Respondents

For the laddering interviews 24 Respondents were recruited. 11 of them were male and 13 of them female. All respondents were between 20 and 30 years old (average age 24.5). We decided for a homogeneous group of people to gather more balanced results being aware that the results could undergo changes when examining a different target group. Overall, our purpose was not to create the basis for statistical evaluations but rather to find out what goals and beliefs underlie certain behavior patterns. Twelve respondents were students. The educational level was relatively high. 20 respondents had high-school diplomas or higher. Respondents lived in cities and urban communities in Austria.

All recruited respondents were owner of one or more multimedia devices. 22 owned mobile phones that had integrated mp3, camera and video functionality. 20 respondents owned mp3 players and 3 of them owned mobile video players. All of them indicated that they would use their device daily or at least several times a week. 20 respondents showed a strong affinity to the production, sharing and exchanging of content. Those respondents stated that they were members of online communities, where most of them published self produced content (18 respondents) as video clips and photos.

#### 3.1.2 Conducting the Interviews

The 24 interviews were conducted in autumn 2007, each with an average length of 1.25 hours.

According to Reynolds the choice of product attributes is essential for good results [17]. Although there is no default method to elicit the most important characteristics different election strategies are proposed. For the study at hand we decided to let the respondents name different functions of their own multimedia devices. Hence, at the beginning of the interview respondents where asked to mention basic device characteristics. Most of them mentioned between 4 and 6 characteristics. In succession respondents had to rate the characteristics they named on a chart from 7 to 0 (“from very important to me” to “not important to me”). To proceed we took the four characteristics with the highest rate and constructed ladders with each.

It is possible that ladders split up in two separate means-end chains indicating that interviewees related different values to one particular device characteristic. Those branched out ladders were taken in to account as two separate ladders. Therefore, the number of completed values does not exactly overcome with the number of mentioned attributes. With the number of 96 pre-assumed ladders we had profound data material for further considerations and for the construction of the Hierarchical Value Map (HVM).

### 3.2 Analysis

There is a detailed description of the construction process of the Hierarchical Value Map (HVM) given in [17]. In our study we closely stuck to the analysis process proposed. There are three steps that had to be considered: Establishing Content Codes out of the sum of respondent’s statements, building ladders for each individual respondent and finally, bringing them together in one Implication Matrix that served as the basis for the HVM.

#### 3.2.1 Content Codes

After conducting the interviews the raw material had to be analyzed in order to introduce so called Content Codes. These are categories that contain different answers of respondents that refer to one similar meaning. (E.g. Statements like “I like to have different genres of music on my device” and “I collect as many data as I can get” are grouped into one category called “Strive for data diversity”). There are Content Codes for attributes, consequences and values. Typically there are more than 20 content codes but less than 30. Too many of these categories would influence the results by offering too little abstraction involving the impossibility of showing dominant branches and links between items in the HVM. Too little Content Code categories would prevent from a certain level of detail [17]. The gathered Content Codes are described in Table 1.
The next sub-section describes the Content Codes for the three abstraction levels and their particular meaning:

3.2.1.1 Attributes

<table>
<thead>
<tr>
<th>Code</th>
<th>Attributes</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>content usability (GUI, interaction, etc.)</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>device usability</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>data storage (size of hard disk)</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>actions, movement, etc.</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>device design</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>mobile device functions</td>
<td>13</td>
</tr>
</tbody>
</table>

Robust, aesthetic and portable design: Describes the visual design of the device. Respondents mentioned the terms “portability”, “robustness” and “design”. In our study these design aspects were not further separated. Therefore, they are summed up in one single attribute.

Device availability specifies the device’s battery power.

3.2.1.2 Consequences

The construction of meaningful Content Codes for consequences out of several interviews was a challenging task. One had to go through the raw interview material classifying the respondents’ answers into groups that correspond semantically. Consequences describe a higher abstraction level as a result of various attributes. Thus, a consequence is an activity, a behavior or a user experience that is enabled by an attribute.

Easy data management and control over data: Describes the wish to have a good overview on a certain range of data that is easy to browse.

Avoid spending time on technical issues: Addresses users’ wish to avoid any effort on technical issues (e.g. charging batteries).

Save time: The respondents wish to save time, fasten up an activity or simply have time for other activities.

Improve quality of content data: Describes the size of the devices display, the resolution of the camera on the device and the quality of the audio play back.

Pervasive and spontaneous use and production of content: Describes the fact that a mobile device is ready to use “anytime, anywhere” with no further burden for the user.

Store and evoke memories: Relates to the fact that respondents use video clips and photos as well as audio clips to remember certain moments and situations.

Strive for data diversity: The Content Code sums up statements that address respondents’ behaviour of collecting different types of videos and music (different genres, different sources, etc.).

Control environment, separation from environment: Refers to the usage of multimedia content to disengage from the actual surrounding (e.g. noise).

Exchange and produce content: Addresses any activity with the purpose of exchanging or producing content in the actual context of the user using the multimedia device (e.g. record a video clip and/or send it to a friend).

Self entertainment: Indicates that respondents use multimedia content for entertainment reasons without referring to a particular context or content genre.

Entertain other people: Describes the explicit wish of people to entertain other people by showing or hand content over to friends or relatives.

Possibilities of self representation: This Content Code merges statements indicating that the multimedia device or the multimedia content is used for self representation purposes.

Use device during other activities: Describes the use of the device and its content during activities without demanding the primary attention of the user (e.g. during sport).

Influence mood, and pastime: Describes the use of audio and video content within no further defined period of time. The consumption of the content is a pastime.

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Table 1: Content Codes and Number of Mentions

<table>
<thead>
<tr>
<th>Code</th>
<th>Attributes</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>easy data management and control over data</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>avoid spending time on technical issues</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>save time</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>improve quality of content data</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>pervasive and spontaneous use</td>
<td>35</td>
</tr>
<tr>
<td>12</td>
<td>store and evoke memories</td>
<td>15</td>
</tr>
<tr>
<td>13</td>
<td>strive for data diversity</td>
<td>14</td>
</tr>
<tr>
<td>14</td>
<td>control environment, separation from environment</td>
<td>7</td>
</tr>
<tr>
<td>15</td>
<td>exchange and produce content</td>
<td>19</td>
</tr>
<tr>
<td>16</td>
<td>self entertainment</td>
<td>12</td>
</tr>
<tr>
<td>17</td>
<td>entertain other people</td>
<td>8</td>
</tr>
<tr>
<td>18</td>
<td>possibilities of self representation</td>
<td>7</td>
</tr>
<tr>
<td>19</td>
<td>use device during other activities</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>influence mood, distract and pastime</td>
<td>16</td>
</tr>
<tr>
<td>21</td>
<td>like to own pretty and aesthetic tools</td>
<td>11</td>
</tr>
<tr>
<td>22</td>
<td>bridge waiting time</td>
<td>14</td>
</tr>
<tr>
<td>23</td>
<td>pursue personal interests</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Values</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>leisure, relaxation</td>
<td>11</td>
</tr>
<tr>
<td>B</td>
<td>happiness, pleasure (and emotional security)</td>
<td>48</td>
</tr>
<tr>
<td>C</td>
<td>aesthetic recognition</td>
<td>12</td>
</tr>
<tr>
<td>D</td>
<td>ambitious, capable</td>
<td>25</td>
</tr>
</tbody>
</table>
Like to own pretty and aesthetic tools: outlines respondents wish to work with a visual attractive and portable designed tool.

Bridge waiting time: Describes the use of a mobile device within a defined period of waiting time (e.g. waiting in public means of transport, at the waiting room, etc.)

Pursuit personal interests: Addresses user statements that indicate that mobile devices and its content are used to follow personal interests (e.g. watch news).

3.2.1.3 Values
The means-end theory specifies that each behavior, choice and preference is based on underlying values. There are different studies classifying basic human values. Rokeach classified 18 basic instrumental values and 18 terminal values – better known as RVS (Rokeach Value Survey) [14]. Former classify behavioral characteristics that are seen as socially desirable (e.g. politeness, honesty, cheerfulness, etc.), latter are interpreted as end states of existence (e.g. true Friendship, social recognition, pleasure, wisdom, etc.). Schwarz in contrast formed 10 basic classes of values. Those are more general - but in fact all 32 values of the RVS are assignable to the classes by Schwarz. Although there are other value classifications like the List of Values (LOV) or the VALS (Value and Lifestyle Segmentation) [17] in our study we were focusing on Rokeach’s study to classify the appearing values. The following four values were found during the interview and are described in reference to [14] and [18]:

Leisure, Relaxation: Leisure describes the human aim of loosing tension and stress towards an idle state of being. We will as well use the term “relaxation” to describe this value.

Happiness, Pleasure, Cheerfulness (and emotional security): Describes the values and ambition of people to contentedness, leisure and an enjoyable live. In the study at hand we also use the term “emotional security” to describe the fact that people wish to avoid angerness and emotional instability in their lives.

Social recognition describes the ambition to be socially integrated, to achieve respect and admiration [14]. Within our study we will use this term also to describe the ambition to stabilise and maintain social networks and to interact with other people.

Capable, Ambitious: Describes the fact that users want to have the feeling of being effective. Within this study this means that people are capable to produce or consume content in a way that gives them a feeling of effectiveness. This was as well expressed as “being able to finish a task”. Respondents mentioned that they would feel a kind of satisfaction knowing that they own a tool that offers them powerful possibilities: A feeling of being able to act self determined and ambitiously. By Schwartz this is comparable with “self-direction” and the freedom of choosing, creating and exploring [18].

3.2.2 Individual Respondents Ladders
After establishing Content Codes (see Table 1) ladders had to be built out of the interview material indicating the sequences in which respondents had constructed their ladders from attribute over consequences to abstract values. Every interview had to be analyzed and respondent’s statements had to be displayed by

Content Codes. The result was a list of ladders that are described by Content Codes and further reflect the sequence of statements in each respondent’s ladder.

As an example, Table 2 shows three individual ladders of Respondent Nr. 3. The respondent gave the highest rating to the attributes “multiple device functions” (that refers to Content Code Nr. 4), “a device easy to use” (1) and “a device with a visually attractive design” (5). Table 3 further shows that one ladder branched out in two different directions. Therefore two ladders were built beginning with attribute “multiple device functions” (4).

There is the attribute “multiple device functions” (4) leading first to consequence “save time” (9) as the respondent said this enables him to do different tasks when he is in transit and wants to bridge waiting time (22). “Bridge waiting time” leads further to “managing mood” (20) and finally into the value (A) “leisure and relaxation”.

Table 2: Example of respondent ladders

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Attribute</th>
<th>5</th>
<th>19</th>
<th>23</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td></td>
<td>1</td>
<td>11</td>
<td>12</td>
<td>B</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>9</td>
<td>22</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>15</td>
<td>13</td>
<td></td>
<td>D</td>
</tr>
</tbody>
</table>

Secondly the respondent appreciated the Bluetooth function of his device, which as well is part of the attribute “multiple device functions” (4). The respondent indicated that this is important to him in order to “exchange data with friends” (15). Further, this was important to him as he wants to have a big data collection as he “strives for data diversity” (13). This finally would give him a “feeling of Ambition” (D).

3.2.3 Implication Matrix
The ladders of all respondents were summarized in a two-dimensional matrix indicating the direct and indirect links between attributes, consequences and values (Table 3). As we wanted to use the method by the book it is applied as per description in [14]. Each row shows how many relations one attribute or consequence has got to each of the other elements (Numbers in front of the period stand for direct relations, numbers after the period show the indirect relations). Following this rule the matrix indicates that the attribute “device usability” (1) has two direct relations to the consequence “easy data management and control over data” (7) and one indirect relation. Indirect relations indicate that there is at least one consequence between two items.

3.2.3.1 Extracting important Relations and Dependencies:
For the construction of the HVM the important connections between attributes, consequences and values had to be found. This was done by finding strong relations between attributes, consequences and values. Elements with strong connections are displayed in a two-dimensional matrix called “Implication Matrix”. As only relevant connections should be displayed in the Hierarchical Value Map a cut-off level was chosen. In our study we chose a cut-off level of three. This means that relations lower than 3 were not taken into account when constructing ladders. The following example demonstrates the ladder-building task:

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1 The Terms to summarize values (Leisure, Relaxation, etc.) correspond to Rokeach’s Value Survey.
The Attribute “data storage” (3) shows a strong direct relation to the consequence “strive for data diversity” (13). Row 13 shows that this consequence has got – beside two others - a relation to “influence mood” (20) with 3 direct relations and further 4 to “pervasive and spontaneous use” (11). This is already a ladder with three elements: (3) to (13) to (20). “influence mood” (20) has got a direct relation to the value “leisure, relaxation” (A) and also to “happiness, pleasure” (B). This indicates that the ladder splits up. As values do not have further connection the ladder terminates at this point. To finish the ladder one has to check if there are other split-ups. Going back to “data storage” (3) there are no other strong relations to other elements. “Strive for data diversity” (13) shows one further connection to elements (11) and (15), and the ladder splits up again. As there are no other strong relations the ladder (3) to (13) to (20) and further to (A) and to (B) is finished and may be added to the HVM.

4. RESULTS: Hierarchical Value Map (HVM)
The Hierarchical Value Map – the main result of our study - is shown in Figure 1. At the top level the four values are displayed. At the bottom the attributes are listed (all elements refer to the Content Codes in Table 1). The consequences, each with its Content Code, connect attributes and values hierarchically.

Pervasive and spontaneous use: Not surprisingly there is the central consequence “pervasive and spontaneous use” (11) that reflects the main user experience of mobile multimedia. There are three strong connections to the element from “device availability” (6), “content quality” (2) and “multiple device functions” (4). “Pervasive and spontaneous use” (12) owns four outgoing connections. One leads directly into the value “ambitious, capable” (D) which indicates that the possibility of using the device anytime and anyhow conveys a feeling of being effective and ambitious. Another outgoing connection is leading to “self-entertainment” (17). This indicates that respondents wanted to use their device for entertainment purposes, which is inducing a feeling of pleasure (B). As already reported by different studies “bridge waiting time” (22) is an important reason why mobile multimedia content is consumed. This refers mainly to the findings of O’Hara [12] indicating that “managing transitions between spaces” is one main reason of multimedia usage. Apart from this coinciding finding we can show that bridging waiting time is mainly used to “influencing mood” (20). The HVM shows that “influence mood” is the dominant desire when people are waiting. Further we can show that “influencing mood” conveys a feeling of leisure and relaxation and also of happiness and pleasure.

As reported by O’Hara[12] “sharing experiences” is an important reason to use mobile video content. Nettamo reports that the exchange of content can be explained by the pursuit of social inclusion [11]. House et al. showed that photo sharing is used to maintain social relationships to express feelings and to inform and entertain others [7]. “Entertaining others” is also explained by one of Schwarz’ basic values called benevolence [18]. This value describes the wish to preserve and enhance the welfare of people with whom one is in frequent personal contact [18]. These

|   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | A   | B   | C   | D   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 2.1 | 6.0 | 2.4 | 1.0 | 3.2 | 0.5 | 1.0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.8 | 0.1 | 0.6 |
| 2 | 1.0 | 1.0 | 0.2 | 8.0 | 4.0 | 0.2 | 0.3 | 0.1 | 0.2 | 0.1 | 0.1 | 1.2 | 1.4 | 0.2 | 0.1 | 0.8 | 0.2 | 0.5 |
| 3 | 1.1 | 0.6 | 0.1 | 12.0| 0.5 | 0.3 | 0.2 | 0.1 | 0.3 | 0.1 | 0.2 | 0.8 | 0.1 | 0.2 | 0.9 | 0.2 | 0.6 |
| 4 | 1.0 | 2.0 | 1.1 | 6.1 | 0.3 | 0.1 | 3.3 | 0.2 | 0.2 | 0.2 | 0.2 | 1.1 | 0.2 | 0.4 | 0.2 | 0.6 |
| 5 | 6.0 | 0.4 | 0.1 | 0.4 | 1.1 | 0.1 | 2.3 | 4.0 | 0.6 | 11.0| 1.1 | 0.2 | 0.2 | 0.1 | 0.5 | 0.3 |
| 6 | 1.0 | 5.0 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.1 | 0.3 |
| 7 | 2.0 | 1.0 | 0.1 | 0.2 | 1.1 | 0.1 | 1.0 | 0.1 | 1.1 | 0.1 | 2.1 | 0.2 | 1.1 |
| 8 | 0.1 | 6.0 | 3.0 | 0.1 | 1.2 | 0.1 | 0.1 | 1.0 | 0.3 | 1.4 | 1.5 |
| 9 | 1.0 | 2.0 | 1.0 | 1.0 | 0.1 | 0.1 | 0.2 | 1.0 | 2.0 | 1.1 | 2.4 | 4.3 |
| 10| 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 0.1 | 0.2 | 1.0 | 2.0 | 1.1 | 2.4 | 0.1 | 0.2 |
| 11| 0.2 | 7.2 | 1.3 | 1.5 | 4.1 | 2.3 | 3.1 | 4.2 | 2.2 | 2.3 | 1.15| 0.5 | 4.5 |
| 12| 4.0 | 2.0 | 1.0 | 6.4 | 1.2 | 1.1 |
| 13| 1.0 | 4.1 | 0.2 | 3.2 | 1.2 | 0.2 | 0.1 | 3.0 | 1.0 | 0.2 | 0.7 | 0.1 | 1.3 |
| 14| 1.1 | 1.0 | 2.1 | 1.0 | 0.1 | 4.0 | 0.1 | 1.1 | 4.5 | 3.3 | 2.2 |
| 15| 1.0 | 2.1 | 1.0 | 1.0 | 4.0 | 0.1 | 1.1 | 4.5 | 3.3 | 2.2 |
| 16| 2.0 | 1.0 | 0.1 | 1.1 | 2.0 | 0.2 | 5.4 | 1.0 |
| 17| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 5.1 | 0.9 |
| 18| 1.0 | 1.0 | 2.0 | 1.0 | 0.2 | 0.2 | 0.1 |
| 19| 0.1 | 1.0 | 2.0 | 1.0 | 0.2 | 0.2 | 0.1 |
| 20| 1.0 | 1.0 | 1.0 | 1.0 | 5.1 | 1.0 |
| 21| 3.0 | 1.0 | 1.0 | 1.0 | 0.1 | 0.1 | 2.1 |
| 22| 2.1 | 1.0 | 5.0 | 0.2 | 1.3 | 2.5 | 2.1 |
| 23| 1.0 | 1.0 | 0.1 | 1.0 | 1.0 | 0.1 | 2.1 |

Table 3: Implication Matrix. Each row shows how many relations one attribute or consequence has got to each of the other elements (Numbers in front of the period stand for direct relations, numbers after the period show the indirect relations).
findings out of different disciplines are confirmed by the element “store and evoke memories” (12) in the HVM. This consequence is leading to “exchange content” (15) and further to “entertain other people” (17) that finally ends up in the value “happiness and pleasure” (B). At this point the HVM indicates that users want to exchange content in order to entertain others and to satisfy an intrinsic desire for “happiness and pleasure”.

This confirms the finding that the task of exchanging and showing content serves people to maintain social relations and friendships although in the users’ experience it mainly provides pleasure and happiness to them. It seems that the production of content is at least as beneficial to the users as the social feedback provided by the receivers.

Bentley reports that users use photos (that are sent to friends or relatives) to retell stories and to convey a feeling of a particular context. The photo itself is not the centre of a conversation but rather the reason for conversation [1]. Likewise, Reponen defines two contexts of multimedia video that refer to the same fact: The primary context (recording) and the secondary context (consuming) [16]. This sequence of action is mapped in the HVM. First, taking photos and recording short video sequences starts at “pervasive and spontaneous use” (11) further leads to “store and evoke memories” (12) and finally to “exchange content” (15). This indicates that all those types of recordings have a very spontaneous factor integrated. It seems that the production of the content in question is rather unplanned and is therefore strongly supported by (multifunctional) devices like mobile phones including a camera.

With mobile devices users are able to capture different contexts that are used as basis for conversations. During the interviews we found that this could be the reason why respondents strongly wish to “improve quality of content data” (10) as the aim of people is to capture a context as good as possible. These findings show that mobile devices strongly support spontaneous and unplanned production of contextual content but that the content should also be in high quality - which is actually not the common case. Concerning this matter we believe that the development of better cameras on mobile multimedia devices satisfies one of the basic needs of users of today’s mobile phones.

**Strive for data diversity** is an important behavior which leads directly to the element “influence mood” (20). The attribute “data storage” (3) therefore strongly supports mood management. This is based on the fact that large memory capacities let people store different kinds of content types for different occasions. Without this feature the mobile multimedia device would not enable users to induce certain emotional states. Also Nettamo [11] reports that users want to have plenty of different types of music on their devices. This study shows that people use individual and multiple playlists in order “to stick out of the crows” (respondents in New York) and on the other hand to maintain social contacts (respondents in Honk Kong). In contrast to Nettamos in our study there were hardly any statements addressing the wish to express individuality by eliciting certain types of content. In the study at hand the main purpose for diverse data on one device is due to the users’ wish to influence mood. This consequence leads to the values “leisure and relaxation” (A) and “happiness” (B). These differences may be due to cultural differences between Europe, the USA and Asia.

**Avoid spending time on technical issues**: As O’Hara reports time spent to solve technical issues causes frustration [12]. In the study at hand this consequence is strongly depending on the

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**Figure 1: Hierarchical Value Map (HVM):** The thickness of arrows corresponds to the number of direct connections between elements (strength of relation).
attributes “device usability” (1) and “device availability” (6). During the interview respondents expressed the wish to use the device without any further burden. They want to have as little usability problems as possible and do not want to care about their batteries and file transferring difficulties (or similar). The direct relation to “save time” (9) shows that all additional efforts would give the user a feeling of loosing time. The fact of saving time further establishes the feeling of being effective, capable and ambitious (D). Further this finding indicates that the availability of the device at hand conveys the user a feeling of control of the situation – and vice versa causes frustration if the device is not working.

Like to own pretty and aesthetic things: The fact that the design of a multimedia device is important to the user is already shown by Nettamo [11]. It is reported that design is an important indicator of self-expression. In contrast the HVM indicates a very strong relation from the attribute “portable and aesthetic design” (5) to the consequence “like to own pretty and aesthetic things” (21) which finally leads to the value “happiness and pleasure”. There is only a weak relation to “self-representation purposes” (18). This element does not overcome the cut-off level and therefore is not shown in the HVM as it is not dominant. The main reason why people want to own an aesthetically designed device is because it conveys them a feeling of pleasure and happiness – even if they would express their individuality with the device and would use it subconsciously for representation purposes.

To sum up, the results show that the values happiness and pleasure are one of the main values that mobile multimedia contributes to people’s lives. Nevertheless, social interaction and relaxation play an important role. The finding that mobile multimedia devices let respondents feel effective, capable and also ambitious is a finding that supports the “anytime, anywhere” paradigm of mobile devices.

5. CONCLUSIONS and DISCUSSION

Using the “Laddering”-technique for exploring means-end chains proved to be a good method for uncovering values and behavior purposes. We were surprised by the fact that almost all of the respondents were able to express their motivations and goals clearly and honest. There were fewer ladders abandoned than previously assumed. The means-end theory has the potential to show user experiences on certain topics and is – as we believe – well applicable to further topics within the HCI domain. The method requires skills in conducting structured interviews. The researcher needs to create and empathic atmosphere that encourages the respondent to express her/his values and feelings.

We experienced the length of interviews as optimal for the given study (average of 1.25 hours). However, shorter interviews will as well work. This strongly depends on the number of ladders the researcher seeks to construct. More than 100 ladders produce a good data basis but increase the effort of analysis. We believe that 50 ladders will as well reveal dominant means-end chains. Less “Ladders” still show means-end chains but will not result in a data basis for profound analysis and argumentation. Overall, applying the method one has to be aware that users need a certain experience with the system that is to be analyzed. Therefore, the method is limited to evaluations of given systems, products and final prototypes and may not be used in early design stages.

The study shows findings indicating relations between purposes of mobile multimedia usage. The constructed Hierarchical Value Map (HVM) directly links device characteristics to consequences and finally to values. The found behaviors and purposes correspond to existing findings [7],[11],[12],[16]. The Hierarchical Value Map (HVM) indicates how these behavior-patterns relate to each other and shows why the single device attributes are important to the users of mobile multimedia content.

Not surprisingly “pervasive and spontaneous use” (11) is one of the central reasons of mobile multimedia consumption and production. Exchanging and showing content with the device is a task performed in order to maintain social relationships. The process of exchanging content and entertaining others is experienced by users as pleasurable. This is what Reponen called the “secondary context” [16]. Exchanging content leads to users’ social inclusion but also – and that was slightly surprising – to their intrinsic happiness and pleasure. The HVM shows also that today’s mobile multimedia devices let users feel capable and ambitious.

Summarizing, we believe that “Laddering” may contribute to mobile HCI by providing a technique that serves designers to uncover values, desires and goals. As Friedman states out every system embodies human values. In fact it is not possible to design a product without addressing peoples values. She argues that designers must be aware of such factors. Friedman coined the term “value-sensitive design” [5]. This design approach implies that it is simply not sufficient using certain usability and interface methods to measure and evaluate a system. It is important to go one step further and to understand which values a system, a product or an interaction design embodies. “Laddering” may help designers to uncover such values.

Furthermore, Cockton introduces the term “value-centered design” [3]. He argues that systems are rather worthless if they fail to deliver value. Cockton further remarks that products are considered worthy if they give users expected or even unexpected values [3]. In value centered design users’ opportunities have to be analyzed and values have to be evaluated, designed and iterated [4]. As an example, in mobile multimedia applications functions that enhance or facilitate data exchanges are used to evoke and store memories and to entertain others. Further, users want to use such functions pervasively and spontaneously. The correspondent values are pleasure and happiness as well as social inclusion. These facts are displayed in the HVM and designers should keep these in mind. The method may be applied in value-centered design processes to evaluate and assess the value impact of a system. Findings displayed in the resulting HVM may be as well used for the definition and the refinement of Personas [4].
6. FUTURE WORK

“Laddering” proved to be a potent technique for user experience research. One of the biggest questions arising from this study is whether its results may be transferred to other user groups. The reproduction of this study with different user groups (age and cultural differences) may lead to results from which the multimedia research community as well as researchers on these groups may strongly benefit.

Furthermore, we believe that the method has a huge potential for the research on user experience factors. Laddering interviews may help us to uncover the desires and values that lie behind user experience factors like the ones reported by Steen et al. [19]: e.g. Nostalgia, Fantasy, Surprise, etc.

Further work may also focus on the intrinsic motives (happiness, pleasure) of content sharing and on the way how these motives may be supported by future mobile multimedia interfaces.

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