A LADDERING STUDY OF GAMING VIA NATURAL MAPPING

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ABSTRACT
In this paper we argue that the Laddering method and the underlying Means-End approach provide a valuable research method for understanding player experiences and for linking these experiences to product attributes. We demonstrate the feasibility of Laddering via a practical case study on the player experience of gaming via natural mapping.

INTRODUCTION
In the past years, the Laddering method has gained increasing interest from human-computer interaction researchers [3,6,10,16,17,18]. It has particularly been welcomed to better understand user experiences and how to design product attributes that deliver value.

The Laddering method originated in consumer research and relies heavily on Means-End Chain theory as proposed by Gutman [5]. Means-End Theory states that people choose a product because it contains attributes (the means) that are instrumental to achieving the desired consequences and fulfilling values (the ends). In other words, users' product choices and consumer behavior are dependent on how they perceive certain product attributes as most likely to have certain desired consequences, which also seem beneficial to their individual values. The common generic means-end chain, therefore, consists of attributes (A), consequences (C) and values (V) (see Figure 1).

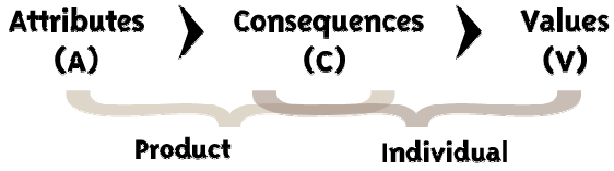

FIGURE 1. A GENERIC MEANS-END CHAIN

The Laddering method [13] consists of a specific interviewing technique, geared at unveiling these means-end chains, through repeated 'Why-probing'. Interviewees are first asked to list salient attributes that are important to them, and next, to climb up the ladder via this why-probing mentioning consequences and finally values.

Full Laddering not only consists of the interviewing technique for delivering rich qualitative user information, it also includes a specific quantitative data analysis. The resulting transcripts from the user interviews are used for following content analysis. First, the recurrent elements (A, C and V) need to be assessed and coded. Secondly, the number of links between all possible pairs are counted. A link expresses that one element was mentioned in the same ladder as another element. These links are not simply counted per individual interview but summed over the entire dataset. Finally, the dominant means-end chains are derived i.e. those chains that are representative of a larger group. Therefore, a researcher needs to choose a specific cut-off level. The cut-off level represents the minimal number of links that need to exist between two elements. Links between element pairs that are above the cut-off are kept and marginal links (links below the cut-off) are ignored. The retained links are then visually presented as chains in what is termed an hierarchical value map or HVM (see figure 2). The goal of Laddering -as with all Means-End approaches- is to understand the linkages between the range of attributes, consequences and values, rather than merely deriving an inventory of attributes, consequences or values. The hierarchical value map provides this insight in a visual way, depicting the relationships between attributes, consequences

and values. Hence, researchers can easily understand the meaning that product attributes bring to users, or the motives that users have for product usage. The real interest therefore lies in the associations between elements. A more extensive explanation of the Laddering theory and method is beyond the scope of this paper but can be found in [13].

To demonstrate the value of Laddering for studying player experiences, we present a Laddering study on gaming via natural mapping. More particularly, the aim of this study was to understand to what extent playing via natural mapping alters the player experience.

METHOD

PARTICIPANTS

In total, 86 participants took part in the laddering interviews, 46 men and 40 women. As the tape recordings of four participants were not of sufficient quality to be described verbatim, 82 respondents (44 male and 38 female) remained in the final dataset.

ELICITING THE SITUATIONAL CONTEXT

Laddering interviews start with eliciting salient product attributes. For this phase, 'grounding in context' is important, as emphasized by Reynolds & Olson [14]. Whereas in consumer research the grounding in context is often realized by showing picture cards or asking consumers to recall memories of purchase or usage situations, we elicited the situational context by providing the actual gaming experience prior to the interviews. All participants played a computer game (Mario Kart for Nintendo Wii) with a steering wheel (as a controller offering gaming via natural mapping) as well as with a classical controller. The total gaming experience with both controllers took approximately ten minutes.

ATTRIBUTE ELICITING VIA PREFERENCE INDICATION

Following this gaming experience, the interviewer started the laddering procedure by soliciting a preference for either one of the conditions. Preference soliciting can be considered as a ranking exercise and is often used in Laddering studies [2,13,18].

LADDERING

When asked for the preferred product or prototype, it is rather likely that a user starts his or her ladder by listing functional or psychosocial consequences, rather than by mentioning attributes [18]. In this case, we ensured that the respondent first climbed down the ladder (*backward laddering* or *funneling*). The interviewee was prompted to descend from the level of functional consequence to the level of concrete attribute before being 'ushered up' the ladder again. This was typically done by asking the question "What caused this?". The transcript below from one laddering interview demonstrates how this backward laddering was realized.

TRANSCRIPT 1. AN EXAMPLE OF BACKWORD AND FORWARD LADDERING

Asking for Preference indication
Interviewer: Which alternative has your preference?
R: I would prefer the classic controller (CC).
Starting laddering
I: Why?
R: It's much easier (FC)
Backward laddering
I: What exactly makes it easier?
R: Well, I am more experienced (FC) with the CC.
I: What makes that you are more experienced with the classic controller?
R: I have a PlayStation at home (AA) and it has the same layout of buttons and the little joystick on the side (CA).
Forward laddering
I: I see. … Why is it important that you are more experienced with a controller?
R: Well, then I am better at it of course? (PSC)

I: Why is it important that you are better at it?
R: If you are better, you are more likely to win. Because I want to win (PSC), I want to beat the game, yes, that's me, I always want to be the best (PSC).

Considering these responses, the means-end chain, established from the laddering interview transcript given above is: Same layout of buttons and joystick (Concrete attribute or CA) -> similar to PlayStation controller (Abstract attribute or AA) -> More experienced (Functional consequence or FC) -> Easier (FC) -> More control (Psycho-Social consequence or PSC)-> Playing to win (Psycho-Social consequence or PSC).

TOOLS AND METHODS

All interviews were recorded and transcribed verbatim. Next, interviews were coded and analyzed with the aid of QSR nVivo 8. Finally, the ladders were entered into LadderUX, an on line tool designed and developed by the author for the quantitative analysis of Laddering data. LadderUX is currently freely available on line, and can be accessed at http://www.ladderux.org.

TABLE 1. AN OVERVIEW OF THE LADDER ELEMENTS

Conditions	
1	Steering wheel
2	Classic controller
Concrete attribute	
3	Buttons/Joystick
4	Wireless
Abstract attribute	
5	Movements
6	Gamepadlike
7	Realism
8	Novelty
9	Oversensitive
Functional consequence	
10	Intuitive
11	More control
12	Less control
13	Difficult
14	Sitting relaxed
15	Experienced
16	Ease-of-use
Psycho-social consequences	
17	Immersion
18	Frustration
19	Fun
20	Social Fun
21	Winning

QUALITATIVE DATA ANALYSIS

Coding was conducted in two rounds. First, the transcripts of the interviews were analyzed to establish the core elements from the interviews. All elements were classified according to their position in the Means-End chain, as either a concrete attribute, an abstract attribute, a functional consequence, or a psycho-social consequence. Secondly, the interviews were reanalyzed with the list of 21 elements (Table 1), resulting in 163 ladders derived using these core elements. This was independently performed by two coders. On the basis of these two datasets, the intercoder reliability could be assessed. Cohen's Kappa was 0.77 ($p < .001$), which is an acceptable level of agreement between coders [11].

QUANTITATIVE DATA ANALYSIS[1]

The 163 ladders were entered into a 'score matrix' which lists all ladders of individuals by means of their elements and their sequence. From this score matrix, an 'implication matrix' was generated which computes link strength between all elements (see Table 2 in the appendix), as specified by Reynolds and Gutman [13], direct links are listed before the punctuation, indirect links are listed after the punctuation. The cut-off levels for these link strengths were set at six for all elements, implying that all link strengths above six are kept[2]. This cut-off level of six resulted in 70% of all links retained[3]. Next, the hierarchical value map (HVM) is constructed, which maps dominant means-end chains between controller types, associated attributes, consequences or benefits and values. From this HVM, the dominant perceptual orientations can be derived (see Figure 2).

RESULTS

Results from the HVM (see Figure 2) demonstrate that attributes and associated benefits which define preferences, are fundamentally different for the different type of controllers. We found that playing with the steering wheel links to the psycho-social consequence of 'fun', 'social fun' and 'immersion'. The attributes that linked to the steering wheel were 'movements' which gave way to a sense of 'realism', and

1 A detailed elaboration of the quantitative analysis of a laddering study is beyond the scope of this paper: find more on the technical details of performing the quantitative analysis in the chapter by Reynolds and Olson [14].
2 In order to calculate link strength, Reynolds and Gutman [13] suggest that direct and indirect links can be summed, thus a link strength of 1.5 equals six, just as a link strength of 4.2.
3 A rule of thumb found in literature is that approximately two thirds of all links should be kept [12:20]; this ratio amounts essentially to a 'goodness of fit' indicator.

'intuitiveness' and then linked to 'immersion'. 'Movements' also linked to 'oversensitivity' and 'less control', and made gaming more difficult. Interestingly, this did lead to fun and schadenfreude, or the pleasure derived from the misfortune of others in the game. In contrast, the classic controller is linked to the 'joystick/buttons' and the resemblance to other gamepads and leads to 'more control' and 'ease-of-use' and to the psycho-social consequence of 'winning'.

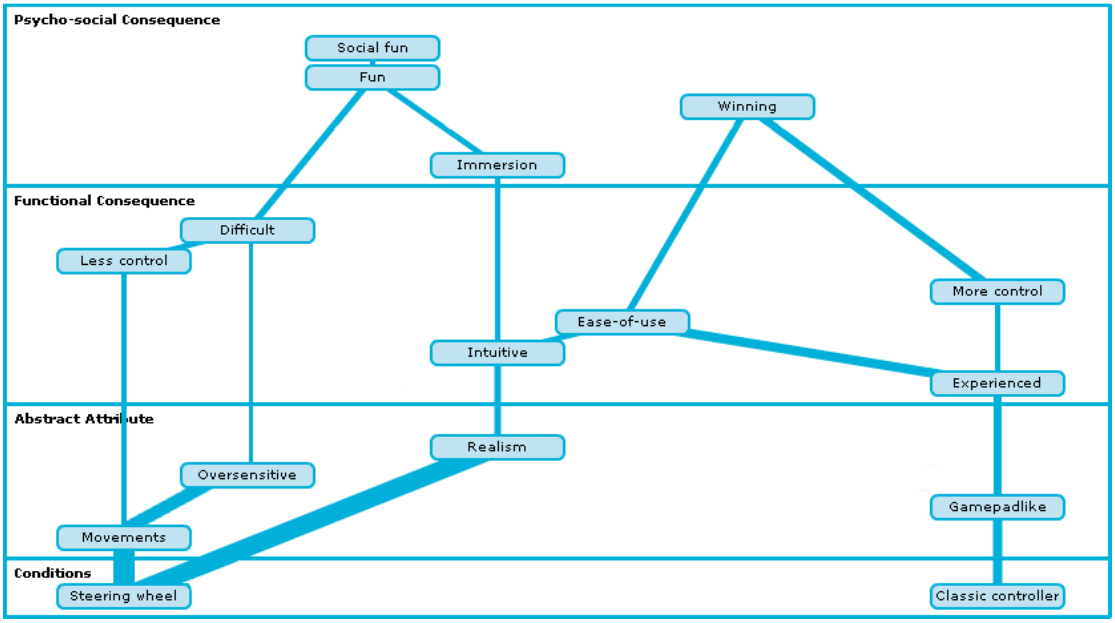

FIGURE 2. THE HIERACHICAL VALUE MAP DERIVED FROM THE LADDERING STUDY[4]

DISCUSSION

The Laddering study shows that different motives are at stake when gaming. Our findings suggest that players using a classic controller may be driven more by a desire to win the game (hard fun) while playing with a motion-based controller supports having fun and being social (social fun). The HVM also reveals that the construct of ease-of-use is multidimensional and addresses both issues of intuitiveness and control. Intuitiveness is associated with the sense of realism (provided by the steering wheel. Control is associated with the classic controller likeness to other game pads, and to the joystick and buttons that enable controlling.

Additionally, these findings also demonstrate that the Laddering method can unveil the product attributes that underlie player experiences. Our study provided an insight into the network of meaningful associations between attributes of gaming via natural mapping (i.e., motion-based characteristics) and the psycho-social consequences for players.

CONCLUSION

In this paper we elaborated on laddering as a promising research method for in game user research. The ultimate goal of the Laddering method is to provide an insight into the network of meaningful associations between attributes (i.e., characteristics of play) and the psycho-social consequences and values for players. Understanding these links between attributes and values of players contribute to insights useful for designing an optimal experience of play.

The LadderUX software for the quantitative data processing is developed and currently in beta version. We therefore invite all interested researchers to make use of the software, available at www.ladderux.org,

[4] The thickness of the lines within the HVM (Figure) represents the relative link strength, as compared to the link strength between other elements.

and to contribute to a greater body of knowledge surrounding laddering as a means to investigate user experiences.

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APPENDIX

Table 2. The implication matrix, derived from the Laddering interviews

	Buttons/joystick	Wireless	Movements	Gamepadlike	Oversensitive	Realism	Novelty	Experienced	Intuitive	Ease-of-use	More control	Less control	Difficult	Sitting relaxed	Immersion	Frustration	Winning	Fun	Social fun	Total
Steering wheel		4.0	29.2		13.7	17.1	5.6	0.1	5.15	2.10	2.1.	6.14	8.16		0.15	0.2	0.1	3.22	0.7	94.131
Classic control	12.0			12.2			1.0	13.1	0.1	11.2	11.1	1.2	4.1	0.3	0.1		0.15	0.4	0.1	65.81
Buttons/joystick				2.0				3.2		2.3	3.2	1.0	1.1	0.2	0.1		1.2	0.1		13.14
Wireless			2.0			1.1	0.1		0.1	0.1		0.1								4.4
Movements									3.3	0.3		7.2	3.3		1.5	0.1		0.6		14.23
Gamepadlike								13.0	0.1	0.8	2.3									15.12
Oversensitive												6.0	5.3			0.1		2.1		13.5
Realism									10.0	2.3	0.1				8.6			3.8	0.1	23.19
Novelty									1.0		1.0		2.0		0.1			1.4	0.1	5.6
Experienced									1.0	10.4	8.1	1.0					0.5			5.6
Intuitive										8.0					5.2			3.2	0.1	16.5
Ease-of-use											1.0			2.0	2.1		10.0	0.1		15.2
More control														1.1			5.6			6.7
Less control													8.0			2.0		3.0	0.1	13.1
Difficult																		9.1	0.4	9.5
Sitting relaxed															1.0			0.1		1.1
Immersion																		7.0	0.1	7.1
Frustration																				
Winning																				
Fun																			9.0	9.0
Total	12.0	4.0	31.2	14.2	13.7	18.1	6.7	29.1	20.2	35.5	28.2	23.1	31.2	3.6	17.3	2.4	16.2	31.5	9.17	342.327