Measuring User Experience through Future Use and Emotion

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Abstract
This work-in-progress shows a relationship between future use of technology and emotional experience and describes how this relationship can be used as a measurement of the user experience. We found a consistent relationship between future use of technology and emotional experience under different contextual scenarios in two studies of the interruptive notification user experience. Implications for research and future work are also discussed.

Author Keywords
Emotion; future use of technology; user experience.

ACM Classification Keywords
H.1.2. Models and Principles: User/Machine Systems.

Introduction
User experience (UX) is defined as a user's "perceptions and responses that result from the use of or anticipated use of a product, system, or service" [7]. Good UX is a critical factor in user performance, user enjoyment, user acceptance and continued use of a system. However, understanding UX is highly dependent on understanding context. Factors within that context can be critical to a successful system design.

In this poster we report findings related to the relationship between two measures of UX, emotion and intent to use, under various contextual scenarios that can impact UX.

Emotion is a visceral indicator of a positive or negative experience by measuring the emotional response to a technology. Emotion is an important aspect of UX and influences how users understand, interpret, experience, and interact with technology [6]. Emotional experiences have a direct influence on shaping future plans for use of technology.

Research has found a relationship between emotion and intent to use technology [1]. Future use of technology is a behavioral indicator of a positive or negative experience by measuring intended continued use of a technology. Intent to use has been shown to be a direct determinant of user behavior [11].

In our previous work, we also found a relationship between emotion and future intent to use technology [9]. In this work-in-progress, we evaluate the robustness of the relationship between Emotion and Future Use for UX by testing the relationship in specific UX contexts.

Methods: Measuring User Experience

In order to study the relationship between these two dimensions of the UX, we decided to use a User Experience Report (UXR). A UXR is a type of experience sampling method [2][5][10] that utilizes a semi-structured report to be completed *in situ* soon after the participant experiences the study phenomena. Experience sampling is an effective way of studying emotion [3]. A UXR is different from a diary study in that it is a record of a single experience by a single participant, rather than an ongoing journal of multiple related experiences by a single participant.

The UXR collects data to measure the notification UX using Future Use of Technology and Emotion. Future Use was measured by asking if the participant would like a similar experience again in the future through a yes/no question [9]. Emotion was measured by evaluating the emotional tone in the One Word Response [10]. The responses were coded using an emotional word dictionary as *positive* or *negative* or not at all if they were not emotional words.

Two independent studies were conducted using the UXR. Both studies used tailored versions of the UXR previously described. The data collection took place as part of a larger study examining how context affects the UX of interruptive desktop notifications.

Study 1 explored general notification UX [10]. The study was implemented using Amazon Mechanical Turk (AMT). Participants were recruited through AMT and asked to report on any recent desktop notification experience. 123 responses were collected and analyzed for the Future Use X Emotion relationship.

Study 2 explored notification UX in the KDE desktop environment [8].The study was implemented using a web-based survey tool. Participants were recruited from the open-source KDE software community and asked to report on a recent KDE notification experience. 235 responses were collected and analyzed for the Future Use X Emotion relationship.

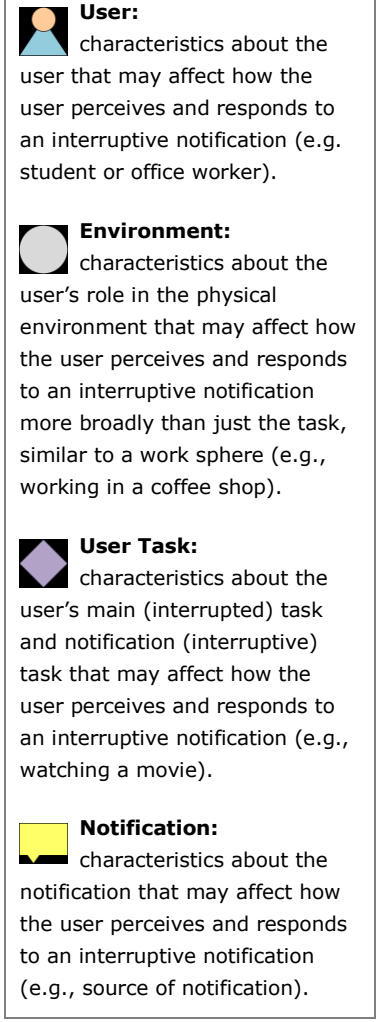

Figure 1: Dimensions of the Notification User Experience

Model Validity

We tested the relationship between Future Use and Emotion through two independent studies of notification UX.

Future Use and Emotion factors were coded from the two questions in the UXR. X^2 was used to test if a relationship existed between two factors. Fisher's Exact Test was used when assumptions were not met for X^2 (e.g., when the sample size was too small). Cramer's V was used to measure the strength of the relationship.

Relationship between Future Use and Emotion

In Study 1, we found a strong relationship between Future Use and Emotion factors (FET: p<.000; Cramer's V: r=.850, p<.000; Table 1) [9]. In Study 2, we found a significant moderate relationship between Future Use and Emotion factors (X^2: value=54.967, p<.000; Cramer's V: r=.589, p<.000; Table 2)[8].

These two studies show a consistent moderate-to-strong positive relationship between Future Use and Emotion in the notification UX.

Future Use and Emotion in Notification UX Model

While a consistent relationship between Future Use and Emotion was important, we also wanted to know if the relationship between these factors was consistent within specific contexts. Study 2 collected many more UXRs than Study 1 and allowed us to investigate the relationship between Future Use and Emotion within the context of four notification UX dimensions (Figure 1).

We found that the relationship between Future Use and Emotion was consistent across factors within each of the notification UX dimensions, providing evidence that the relationship between Future Use and Emotion is independent and not influenced by other factors.

Study 1: General Notification UX [9]			
Emotion	**Future Use**		
	Yes	*No*	*Total*
Positive	30	1	31
Negative	2	13	15
Total	32	14	46
Fisher's Exact Test			p<.000
Cramer's V	df=1	r=.850	p<.000

Table 1: Emotion x Future Use relationship for Study 1.

Study 2: KDE Notification UX [8]			
Emotion	**Future Use**		
	Yes	*No*	*Total*
Positive	110	3	113
Negative	22	23	45
Total	132	26	158
X^2	df=1	value=54.967	p<.000
Cramer's V	df=1	r=.589	p<.000

Table 2: Emotion x Future Use relationship for Study 2.

User Dimension: Working Role							
Working				**Not Working**			
Emotion	**Future Use** *Yes*	*No*	*Total*	**Emotion**	**Future Use** *Yes*	*No*	*Total*
Positive	37	0	37	*Positive*	61	2	63
Negative	7	10	17	*Negative*	14	13	27
Total	44	10	54	*Total*	90	15	90
Fisher's Exact Test			p<.000	**Fisher's Exact Test**			p<.000
Cramer's V	df=1	r=.703	p<.000	**Cramer's V**	df=1	r=.553	p<.000

Table 3: Emotion X Future for the Working Role characteristic for Notification UX Dimension: User.

Environment Dimension: Computing Platform							
Desktop				**Laptop**			
Emotion	**Future Use** *Yes*	*No*	*Total*	**Emotion**	**Future Use** *Yes*	*No*	*Total*
Positive	11	9	20	*Positive*	51	2	53
Negative	53	1	54	*Negative*	10	14	24
Total	64	10	74	*Total*	61	16	77
Fisher's Exact Test			p<.000	**Fisher's Exact Test**			p<.000
Cramer's V	df=1	r=.561	p<.000	**Cramer's V**	df=1	r=.623	p<.000

Table 4: Emotion X Future Use for the Computing Platform characteristic for Notification UX Dimension: Environment.

User Dimension: Working Role

Participants were asked to identify if they were working at the time of the notification experience reported in the UXR. The relationship between Future Use and Emotion was independent of if participants were in a working role (Table 3). There was a strong relationship between Future Use and Emotion for those who were working (FET: p<.000; Cramer's V: r=.703, p<.000). There was a moderate relationship between Future Use and Emotion for those who were not working (FET: p<.000; Cramer's V: r=.553, p<.000).

Environment Dimension: Computing Platform

Participants were asked the type of computer they were using at the time of the notification experience reported in the UXR. The relationship between Future Use and Emotion was independent of if participants were using a Desktop or Laptop computer (Table 4). There was a moderate relationship between Future Use and Emotion for those who used were using a desktop computer (FET: p<.000; Cramer's V: r=.561, p<.000). There was a strong relationship between Future Use and Emotion for those who were using a laptop computer (FET: p<.000; Cramer's V: r=.623, p<.000).

Task Dimension: Task Suspension							
Suspended Task				**Did Not Suspend Task**			
Emotion	**Future Use** *Yes*	*No*	*Total*	**Emotion**	**Future Use** *Yes*	*No*	*Total*
Positive	45	0	45	*Positive*	59	3	62
Negative	8	10	18	*Negative*	13	13	26
Total	53	10	63	*Total*	72	16	88
Fisher's Exact Test			p<.000	**Fisher's Exact Test**			p<.000
Cramer's V	df=1	r=.687	p<.000	**Cramer's V**	df=1	r=.534	p<.000

Table 5: Emotion X Future Use for the Task Suspension characteristic for Notification UX Dimension: Task.

Notification Dimension: Message Socialness							
Social				**Not Social**			
Emotion	**Future Use** *Yes*	*No*	*Total*	**Emotion**	**Future Use** *Yes*	*No*	*Total*
Positive	27	0	27	*Positive*	83	3	86
Negative	5	2	7	*Negative*	17	21	38
Total	32	2	34	*Total*	100	24	124
Fisher's Exact Test			p=.004	**Chi-square**	df=1	value=45.262	p<.000
Cramer's V	df=1	r=.491	p=.004	**Cramer's V**	df=1	r=.604	p<.000

Table 6: Emotion X Future Use for the Notification Socialness characteristic for Notification UX Dimension: Notification.

Task Dimension: Task Suspension

Participants were asked to report in the UXR if they suspended their task in order to attend to the notification. The relationship between Future Use and Emotion was independent of if participants suspended their tasks to attend to a notification (Table 5). There was a strong relationship between Future Use and Emotion for those who suspended their task (FET: p<.000; Cramer's V: r=.608, p<.000). There was a moderate relationship between Future Use and Emotion for those who did not suspend their task (FET: p<.000; Cramer's V: r=.534, p<.000).

Notification Dimension: Notification Socialness

Participants were asked to describe the source and the purpose of the notification message, from which notification socialness was determined. The relationship between Future Use and Emotion was independent of if participants received a social notification (Table 6). There was a moderate relationship between Future Use and Emotion for those who received a social notification (FET: p=.004; Cramer's V: r=.491, p=.004). There was a strong relationship between Future Use and Emotion for those who received a not social notification (X^2: value=45.262, p=.000; Cramer's V: r=.604, p<.000).

Discussion

Previous work has shown a relationship between two important factors in UX: Future Use and Emotion [1][9]. Since context is important to UX, we set out to test how well the relationship between Future Use and Emotion holds up in different contexts. Our research shows a consistent relationship between Future Use and Emotion in a variety of related contexts. Future Use and Emotion had a moderate to strong relationship in all the context scenarios we studied. These results provide evidence that supports the proposal for the relationship between Future Use and Emotion as a measurement for UX.

Since both Future Use and Emotion are often used in the study of UX, it is important for UX researchers and practitioners to be aware of this relationship. For example, the UX of a system can be evaluated by measuring Future Use, Emotion, or the relationship between both factors. Unexpected values in the relationship between these two measures can identify areas for further investigation into the UX of the given system. Additionally, practitioners can evaluate the impact a design decision may have on UX by thinking about the effect on Emotion and Future Use.

Future Work

We continue to use Future Use and Emotion in our notification UX research. We are also exploring additional factors that may have a relationship with Future Use and Emotion that could be applied similarly as a general UX measurement. We intend to use these factors in additional UX studies to see if Future Use and Emotion can be used to measure UX in other contexts.

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