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INVESTIGATING FEATURE CYCLES OF INFORMATION SYSTEM PRODUCTS

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ABSTRACT

The theory of attractive quality describes how product features cause user satisfaction in fundamentally different ways. Some feature types have potential to only cause satisfaction on implementation into the product but no dissatisfaction on non-implementation, others only dissatisfaction on non-implementation by no satisfaction on implementation and still others both satisfaction on implementation and dissatisfaction on non-implementation. But the theory also suggests that feature types are not static but change over time for the same feature. Two multi-year studies were conducted to empirically investigate if this change in feature type can be observed for information systems (IS) product features. The results of both the studies show that IS product features do transition from one type to another over time. These findings have implications for product feature selection and can help IS product managers make strategic product feature upgrade decisions. This article describes the design and results obtained in one of the studies.

Keywords

Feature cycles, information systems, kano survey method

INTRODUCTION

The theory of attractive quality (Kano, Seraku, Takahashi and Tsuji, 1984) has multiple applications. It has been applied in areas of product development, business planning and service management (Watson, 2003). The acceptance of theory of attractive quality has increased over the past 25 years (Lofgren and Witell, 2008). Empirical studies have shown it's relevance to IS products (Zhang and von Dran, 2002; Lehtola and Kauppinen, 2006). The theory of attractive quality suggests that there are three types of requirement:

Basic: They are prerequisites and must be satisfied first at least at threshold levels for the product to be accepted. The customer takes Basic requirements for granted, and therefore does not explicitly ask for them. The other names used for Basic factors are Minimum Requirements (Brandt, 1988), Must-be requirements (Kano et al., 1984). "The fulfillment of basic requirements is a necessary but not a sufficient condition for satisfaction" (Matzler, Fuchs and Schubert, 2004).

Performance: These are requirements that the customer deliberately seeks to fulfill. They are uppermost in her consciousness. Fulfilling these requirements leads to customer satisfaction and not fulfilling them leads to dissatisfaction. The other name for Performance factors is One-dimensional requirements (Kano et al., 1984). As "Performance factors are typically directly connected to customers' *explicit* needs and desires .Therefore, a company should be competitive with regard to performance factors" (Matzler, Fuchs and Schubert, 2004).

Excitement: Excitement requirements are those that the customer did not expect. They surprise the user by adding unexpected value to the product thereby delighting her. The other names for Excitement requirements are Attractive requirements (Kano et al., 1984), Value enhancing requirements (Brandt, 1988). Implementing excitement features differentiate the product from competition.

One of the most interesting developments of the theory of attractive quality is the concept of lifecyle of features (Lofgren and Witell, 2008). Past Studies (Kano, 2001; Nilson, Witell and Fundin, 2005) have provided empirical support for the lifecycle. Kano (2001) suggested that quality attributes transition from being excitement to performance to basic. He gave the example of remote control for televisions which was an excitement feature in 1983, a performance feature in 1989 and a basic feature in 1998. Anecdotal evidence suggests that this transition may be expected even for IS products. GUI (Graphical User Interface) was an excitement feature of an IS product in 1970s. By 1980s it became a performance feature and by 1990s it became a basic feature.

But there is a gap in IS literature. No study has systematically and empirically investigated the transition of feature types over time. This investigation is important for developers of IS products. Knowledge of feature cycle patterns will provide a deeper

understanding of how feature types transition over time. It will help IS product managers make strategic product upgrade decisions by selecting the right type/s of features for sustained success of the product.

METHOD

Experimental Setting

Astrid Task Manager, a mobile app, was chosen as an IS product for investigation in the study. Actual users of Astrid Task Manager provided their response to a pen and pencil based survey in February, 2010 and then later in April, 2012. Previous research demonstrates that the temporal separation between measures reduces potential effects due to Common Method Variance (Sharma, Yetton, and Crawford, 2009). A sample set of the 10 Astrid Task Manager feature requests used as a test instrument in the study is shown in Table 1.

No	Feature description
1	**Choose from a calendar** Allow dates to be chosen from a calendar. Currently the user has to manually enter the date
2	**Auto Color Task** As the user browses through the pending task the color of the task should visually indicate to him how far it is from the due date.
3	**Creating tasks that repeat yearly** Allow creation of yearly recurring tasks to remind users about important events such as birthdays, anniversaries etc. Currently the application allows daily, weekly and monthly recurring tasks only
4	**Geolocation reminders** Provide a feature to remind users that they are passing through an important geolocation. For example if the user is passing a favorite supermarket, then remind her that she is doing so and ask whether she needs to purchase anything.
5	**Grocery shopping list** Provide a feature to enable users to create and update a regular grocery list. This will enable the users to tick off the items purchased from the stores, so that they do not miss anything
6	**Make Quiet Hours completely quiet** Have a new option - "Super Quiet Hours" - during which all reminders should be disabled. Currently during "Quiet Hours' the vibrator is enabled

Table 1. Sample user feature requests used in the study

Subjects

We used a youth cohort (aged 19-24 years) as subjects because youth are recognized as innovators and early adopters of the latest technologies (Ehrenberg, Juckes, White. and Walsh, 2008). 61 subjects who were university students and actual users of Astrid Task Manager participated in Round 1 of the study conducted in February 2010. The subjects' age ranged between 19 and 24 years and female students (32) outnumbered males (29). The average age of the subjects was 21.28 years with the female subjects averaging 21.34 years and the male subjects averaging 21.22 years. Another group of 61 subjects from the same university who were actual users of Astrid Task Manager and demographically similar (age group, gender and education levels) to the subjects who participated in Round 1 participated in Round 2 of the study conducted in April 2012. The subjects' age ranged between 19 and 24 years and female students (31) outnumbered males (30). The average age of the subjects was 21.30 years with the female subjects averaging 21.29 years and the male subjects averaging 21.30 years.

Control Procedures

A number of control procedures were used to eliminate extraneous variables. The subjects were a homogeneous group of 19-24 year olds. The rationale behind this approach is to get as homogenous a group of sample as possible as the objective of the study was to control extraneous variables such as segmental difference in user preferences. The feature requests in the survey instrument were randomly selected from actual pending feature requests of users of Astrid Task Manager posted on user community forum (http://getsatisfaction.com/todoroo/products/todoroo_astrid). They were re-worded in a simple and standard style to avoid bias. Shifts in structure, content and format may introduce unwanted sources of variability that may confound participant response.

Procedure

The categorization of feature types in accordance with the theory of attractive quality was done using the widely accepted Kano survey method (Tan, Xie, and Chia, 1998; Zhang and Von Dran, 2002). The Kano survey includes two questions for the every product feature: a functional question "How do you feel if this feature is present?" and a dysfunctional question "How do you feel if this feature is NOT present?" The first question reflects the consumer reward for including the feature into the product and the second question reflects his penalty for not including the feature into the product. The user has to choose one of the five possible options for the answers for both the functional and dysfunctional question:

1. I like it this way
2. I expect it this way
3. I am neutral
4. I can live with it this way
5. I dislike it this way

Based on the consumer responses to the questions in both functional and dysfunctional form for each of his requirements, the quickest way to assess the questionnaires is to map each response in Table 2 and determine the feature type.

Functional Question	**Dysfunctional Question**				
	Like	**Expect**	**Neutral**	**Live with**	**Dislike**
Like	Q	E	E	E	P
Expect	R	I	I	I	B
Neutral	R	I	I	I	B
Live with	R	I	I	I	B
Dislike	R	R	R	R	Q

B-Must have or Basic requirements
P-Linear or Performance requirements
E-Excitement requirements
R-Reverse, i.e. wrong features, that would make the consumer experience worse
Q-Questionable, i.e. the consumer answers is inconsistent
I-Indifferent, i.e. the consumer does not care about this feature

Table 2. Schema for classifying results

RESULTS AND ANALYSES

The results of the study obtained in Round 1 and Round 2 are summarized in Table 3 below:

Type of Feature	**2nd Round →** / **1st Round ↓**	**1**	**2**	**3**	**4**
Basic (1)	2	2			
Performance (2)	1	1			
Excitement (3)	2	1	1		
Others (4)	5				5
Total	10	4	1		5

Table 3: Results of Longitudinal Study

The results show that the features classified as Basic in the first round were also categorized as Basic in the second around twenty six months later. 1 feature classified in the Performance category in the first round got classified in the Basic category. Of the 2 features that were classified in the Excitement category in the first round one got classified as Basic in the second round and another got classified as a Performance feature. All Indifferent features were classified as Indifferent. Hence we see a movement from Performance -> Basic, Excitement -> Basic and Excitement -> Performance categories in line with expectations. But is the movement of categories in the two rounds statistically significant or random in nature.

Further analysis by mapping the data obtained in the survey (Table 4) show that there were a total of 610 pairs of responses (610 subjects x 10 Task Manager features). To verify that the user responses obtained in Round 1 (Table 4) were not due to random user choices we conducted a chi-square difference test between the observed values in Table 4 and expected values if the subject responses were random. The test showed a significant (p=.000) difference between the observed responses and those expected if the user response were random.

Functional Question	**Dysfunctional Question**				
	Like	**Expect**	**Neutral**	**Live with**	**Dislike**
Like	0	18	71	55	124
Expect	0	21	13	31	10
Neutral	1	23	32	20	66
Live with	3	15	29	11	61
Dislike	6	0	0	0	0

Table 4. Overall results of Kano survey in Round 1

To verify that the user responses obtained in Round 2 (Table 5) were not due to random user choices we again conducted chi square difference test which showed a significant (p=.000) difference in the observed model and the expected model if the user responses were random.

Functional Question	**Dysfunctional Question**				
	Like	**Expect**	**Neutral**	**Live with**	**Dislike**
Like	0	12	33	11	78
Expect	0	23	13	17	90
Neutral	6	17	21	7	88
Live with	5	5	18	6	119
Dislike	6	3	3	26	3

Table 5. Overall Results of Kano survey in Round 2

We then performed a chi square difference test between the observed results obtained in Round 1 (table 4) and Round 2 (table 5) to find a significant (p=.000) difference in the observed data in both rounds indicating that the difference in data obtained in the two rounds did not happen by chance. Thus we can infer that overall the difference in user responses which we

observed in round 1 (Table 4) and those observed in round 2 (Table 5) were significant and were due to conscious user choices. To further confirm that the change was statistically significant for each feature transition we conducted a difference in proportion test between user responses obtained in round 1 and round 2.

	ROUND 1				**ROUND 2**			
Feature Request	**Basic**	**Performance**	**Excitement**	**Others**	**Basic**	**Performance**	**Excitement**	**Others**
1	**34**	18	7	2	**41**	9	5	6
2	**45**	12	2	2	**43**	15	1	2
3	4	**48**	5	4	**32**	17	7	5
4	12	10	**31**	8	13	**40**	3	5
5	6	17	**38**	0	**35**	12	13	1

Table 6. Comparison of results obtained in Round 1 and Round 2

The features that underwent transition from one category in round 1 to another category in round 2 (darkened) showed a significant (p=.05) difference in proportion of users who opted for this category in round 2 compared with users who opted for the category in round 1. Feature request "Geolocation Reminders" (see Table 1 for details) transited from being an Excitement feature in round 1 (February 2010) to Basic feature in round 2 (April 2012). "Grocery Shopping list" changed from Excitement category in round 1 to Performance category in round 2. "Create tasks that repeat yearly" transited from Performance category in round 1 to Basic category in round 2. The features classified in Basic category in round 1 – "Choose date from a calendar" and "Make Quiet hours completely quiet" – remained in the Basic category in round 2.

CONCLUSION

This cross-disciplinary study, a first of its kind, provides evidence that IS product feature types transition over a period of time in the following pattern: Excitement -> Performance -> Basic. This finding provides useful insights to IS product developers. It drives home the point that timing of feature introduction is critical for evolving IS products. Features that were product differentiators (Excitement features) may become features that only meet Basic user requirements a few years later. Product features that in the past would have made the product competitive (Performance features) may become the minimum attributes expected by users of the product later. Thus to have an effective IS product strategy it is important that user responses to feature requests are current. Planning to differentiate the product or make it competitive based on past data may lead to wasted development efforts without achieving the desired product goals.

Developers of IS products can make other useful inferences based on the trends observed in feature cycles. If there are no (or marginal) feature cycles then it implies that the IS product/ product category is static. If there is significant movement in feature categories it implies that the product / product category is evolving. The faster the transition of features to other feature categories the faster the evolution. For such rapidly evolving IS products developers need to be focus on fulfilling user requirements quickly or else face the prospect of the product soon becoming obsolete.

Further feature cycles provide software developers with critical business information on changing user preferences and their perception about the software product. If the majority of user feature requests are Basic requirements, it implies that the product has not yet evolved beyond the market entry stage. If the majority of feature requests are Performance or Excitement requirements, it indicates that the software product has largely addressed the Basic requirements of the users and they are now suggesting innovations to meet their evolving product needs.

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