The perceived customer satisfaction of the Fitbit activity tracker
The Internet of Things as a potential business marketing tool

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ABSTRACT
The Internet of Things is an upcoming concept that is quickly increasing in numbers and ranch. More and more, we find connected systems in the world around us, such as our smartphones, smart cars and smart watches. This research attempts to find out how different product requirements of the Fitbit Charge activity tracker wristband, can be categorized in terms of the Kano model, how the results influence the pursuit of customer satisfaction, and whether the Internet of Things is a potential business marketing tool. Next to six of the product requirements distinguished by Fitbit, the concepts of transparency and accountability were also taken into account. Constructing and performing a Kano questionnaire has shown which of the Fitbit Charge's features fall into which of the three categories, which then resulted in suggestions on what to do with this information. Must-be requirements indicate the features that need to be functional in order for the customer to reach a neutral stage of (dis)satisfaction, and this research has shown that battery life, transparency, and accountability, are viewed as such. One-dimensional requirements make the customer more satisfied as they are fulfilled more, and this research has shown that the ability to track activity and a display are viewed as such requirements. Lastly, Attractive requirements have no negative influence on customer satisfaction, but do have the potential to drastically increase it. The tracking of sleeping patterns, wirelessly syncing data across platforms, and the call notifications were categorized as such. For Fitbit, this research has led to insights on which product requirements are valued most by their (potential) customers, and which they should pay attention to. As for the Internet of Things, this research has shown that users do view connected systems as attractive, which means that it does have potential as a marketing tool.

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1. INTRODUCTION

In today's environment, more and more is arranged by using an app on your phone. From the radio and heating in your house, to tracking your parcel all the way to your front door, or even controlling your car remotely. The Internet of Things (or shortly, the IoT) is a form of technology that is quickly gaining popularity, and enables situations such as the aforementioned. The most interesting and novel part of the IoT is not the technological or functional aspect, but rather the expectation that the range of this technology will increase drastically, which could lead to billions of so called Smart Objects to be connected in the future. (Kopetz, 2011)

Activity trackers are another example of this relatively new phenomena. These trackers are equipped with technology that make it possible for users to keep track of, for example, their heartrate, how many steps they have taken in a day, and they also give access to many more features.

Users may experience all of this as highly desirable and useful, however, the risks and downsides of data collection are still present. Even if users are not paying attention to, or are not fully aware of these risks, companies might still feel the moral and ethical pressure to pay attention to these issues.

This thesis aims to find out how a potential group of users of the Fitbit Charge activity tracker and app experience the different possibilities, which features they value the most, and how they view the safety and the data collection of the wristband. For Fitbit, this could lead to insights on what issues should be addressed, and what features are the most important to their (potential) clients.

The research questions to be answered in this thesis, can be formulated as follows:

1) *How can the product features of the Fitbit Charge activity tracker wristband be categorized in terms of the Kano model, and what do the results imply for Fitbit?*
2) *What is the potential of the IoT as a business marketing tool?*

1.1 Fitbit Charge Activity Tracker

In this research, the Fitbit Charge is the product that will be used. The Fitbit Charge is an activity tracker wristband, that allows you to keep track of a variety of activities, from all-day activity and exercising, to your sleep rhythm. It also has a variety of extra features, such as a display with a watch and daily statistics, wireless syncing with compatible devices, and the option to receive call notifications from connected smartphones.

Fitbit also offers an app, which should allow the customer to make optimal use of their Charge wristband. The app is said to have *'a purpose for every part of your day'*, and gives insights on the recordings the Fitbit Charge makes. It gives the possibility to have insight on the progress made while exercising, on the trends in your sleeping pattern, and also gives the option to connect with other people to motivate each other.

Fitbit describes the Charge wristband as a way to *'energize your day'*, and *'an advanced wristband to elevate every day'*. The wristband should push users to keep improving every day, and make the most of it.

2. PRIOR LITERATURE

2.1 The Internet of Things (IoT)

The Internet of Things is a relatively new development, a development that has combined the digital world with the actual world around us. The IoT can described as a connecting network between the internet and physical devices (Kopetz, 2011), which enables users to remotely control systems and devices, or share information across different platforms. This network consists of interconnected systems and devices, or so-called 'Smart Objects'. These smart objects are equipped with capabilities such as, for example, sensing, processing, and networking capabilities. (Kortuem, Kawsar, Fitton, & Sundramoorthy, 2010). Smart Objects together build the network that we call the Internet of Things.

As mentioned in the introduction, it is not necessarily the technology itself that makes the Internet of Things so interesting, but rather the increasing range, and the speed at which it does so. The quick and massive increase in the number of smart objects brings forward problems, such as privacy and maintenance issues, that were not previously relevant (Kopetz, 2011).

The Internet of Things takes form in many ways, and its reach is growing every day. It is therefore beneficial to look into its potential, and research whether this could actually result in innovating, new business opportunities.

2.2 Data collection

Data collection is necessary for the working of the Internet of Things, because smart objects rely on the information coming from data collection and processing to perform. According to Awad and Krishnan (2006) *"The ability to collect, analyze, and respond to user information is of growing importance … As the ease and availability of e-business reduces face-to- face interaction, firms must use consumer information to attempt to offer personalized service that will increase value and consequently, consumer loyalty."* (p.13).

However, more and more personal data is 'floating around', and *"information technology (IT) continues to increase in capability and to decline in cost, allowing information to be used in ways that were previously impossible or economically impractical."* (Culnan & Armstrong, 1999, p. 104) . Users therefore feel the need to know what is happening with their personal information, and how well it is protected by companies processing and using it. This means that the concepts of privacy, transparency and accountability have become increasingly important over the last years, and they will therefore be discussed more extensively in the next sections.

2.2.1 Information privacy

Defining information privacy starts with defining privacy itself. According to Westin (1967), privacy can be defined as *"the ability of the individual to control the terms under which personal information is acquired and used"* (p. 7). Consequently, Stone et al. (1983) state that this results in *"the ability of the individual to personally control information about one's self"* (p. 461) as the definition for information privacy.

People are not always aware how much they share online, and do not always fully comprehend how far this shared information reaches. They could be feeling that their privacy is violated, while it could be they themselves who have let the information reach further than intended. The line between a customer's

consent and outrage over the use of their personal information is not always clear, and businesses have to carefully consider how they handle this. This is illustrated in the article written by Mary J. Culnan, already in 1993, where she describes several instances in which this line had been crossed, and notes:

"Detailed knowledge about individual preferences is increasingly valuable to decision makers in the competitive global economy. Advances in information technology facilitate the collection and use of this information. However, … it may be difficult for firms to pursue the opportunities enabled by technology without risking a consumer backlash if the applications do not reflect a common set of values or a shared understanding about privacy." (p. 342)

This illustrates that while for customers it is important to pay attention to what personal information and details they share online, for businesses it is important that they are transparent about their data collection. If do not live up to their customer's expectations, they might not be able to keep their good name.

2.2.2 Transparency

As stated above, transparency has become of more and more importance when it comes to dealing with customer's personal information.

Although consumers do want to know what happens, they do not always actively seek the information telling them what happens. An example of this is the Facebook scandal at the end of 2014 concerning the 'new' privacy settings, that would be active from the first of January 2015. Facebook had already been using user's updates, photos and videos for, amongst others, the personalization of advertisements. It been this way for quite some time already, but the new privacy documents were simply more transparent than before. Facebook received a storm of criticism, even though users of the social networking site had already agreed to these terms by creating and using a Facebook account.

In 2015, the Ranking Digital Rights Corporate Accountability Index evaluated 8 of the biggest and most powerful world-wide internet companies on their policies on freedom of expression and privacy, and Facebook only managed to stay above Tencent and Mail.Ru, while seriously staying behind on other big internet companies.

Ranking Digital Rights noted that *"The company's disclosure about collection of user information from third parties was especially poor, and like most companies, Facebook, Inc. ignores the "Do Not Track" standard that allows users to opt-out of certain types of web tracking."* and *"The company's disclosures about if and why it shares user information with third parties were in the middle of a group that generally needs improvement."* (Ranking Digital Rights, 2015). The problem here lies with the fact that people felt their privacy was violated without their knowledge, and apparently it had been that way for years already.

The Facebook example shows how important transparency is, if businesses want to keep their good names. At the same time, this also opens up the opportunity for companies to obtain competitive advantage over other companies, since stakeholders tend to choose transparent companies over opaque ones. (Elia, 2009)

2.2.3 Accountability

Accountability is a broad concept, and some variations in the definition exist. Mulgan (2000) describes the core sense of accountability as *"being called to account for one's actions"* (p. 555), but also states that the scope and meaning have extended beyond that core sense.

The Organization for Economic Co-Operation and development (OECD) (2005) define accountability as

"the obligation to present an account of and answer for the execution of a set of responsibilities" (Lewis, O'Flynn, & Sullivan, 2015, p. 401).

Lastly, Bovens (2007) elaborates on this definition, and defines accountability as

"the relationship between an actor and a forum, in which the actor has an obligation to explain and justify his or her conduct, the forum can pose questions and pass judgement, and the actor may face consequences." (p. 450)

Although these definitions vary a bit, they all share the same core meaning; namely, that there are two parties, and the 'performing' party can be called out on those performances by the second party, and should be prepared to defend themselves if necessary.

In the business to consumer market, a business is the performing party, and the consumer the second party able to call out the performing party. When a consumer provides a business with information, he or she should be able to trust the business to do the right thing with it, and not to take advantage of this trust.

The three aforementioned concepts of information privacy, transparency, and accountability have become increasingly important since consumers (have to) share more and more information online. Data collection is necessary for the working of systems within the Internet of Things, but, as mentioned before, being transparent and accountable is also an opportunity for businesses to obtain competitive advantage over other businesses. For consumers it is important to know that their personal data is used and stored in a proper way, so that they can enjoy their services (whether that is the use of a Facebook account, or an activity tracker) without worrying about their privacy.

2.3 Customer satisfaction

In a world where online reviews and consumer experiences travel the world via the internet, satisfied customers are more important than ever. One dissatisfied customer combined with a web care employee who's not having a good day, could potentially do a company's image serious harm. This recognized importance of customer satisfaction is not new however, and was already acknowledged long before the rise of the online review, at the start of the 1990's (Business Week, 1990).

When talking about customer satisfaction, the simplest explanation is that the higher the customer perceives the quality of the product, the more satisfied he or she will be, and the other way around (Matzler & Hinterhuber, 1998). A more elaborated definition is that *"satisfaction is an outcome of purchase and use resulting from the buyer's comparison of the rewards and costs of the purchase in relation to the anticipated consequences"* (Churchill & Surprenant, 1986, p. 493). Both definitions incorporate that customer satisfaction is based on 'the feeling' a customer gets from using a product.

Satisfied customers are important in a business environment, because they provide security for companies, as a high level of customer satisfaction often results in a high level of customer

loyalty, which in turn results in securing future cash flow. (Matzler & Hinterhuber, 1998).

3. METHODOLOGY

Now that the literature has been reviewed, the methodology to be used in this research can be explained. This includes the research method and its different steps, the target group, and the method of evaluation and interpretation.

3.1 The Kano model

The Kano model (Kano, N. Seraku, F. Takahashi, & S. Tsuji, 1984) is a model designed to determine the different factors that influence customer satisfaction.

Kano distinguishes between three different factors; Must-be requirements, One-dimensional requirements, and Attractive requirements. Each of these requirements will be discussed in detail before elaborating on the Kano model.

3.1.1 Must-be requirements

Must-be requirements are the requirements that have to be fulfilled, in order to prevent extreme dissatisfaction of the customer. However, they do not cause the customer to be satisfied, when fulfilled. "The must-be requirements are the basic criteria of a product" (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996, p. 1). This results in the customer taking them for granted. For example, if you purchase a phone, you expect to be able to use it for phone calls. You will not experience extreme happiness or satisfaction when this is the case, because you would be expecting this, but you will be annoyed or dissatisfied when it does not work.

As a result, must-be requirements are important competitive factors. Non-fulfillment leads to customers having no interest in buying the product at all, although fulfillment of these requirements merely leads to the company being able to compete with other companies. (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996).

3.1.2 One-dimensional requirements

One-dimensional requirements are requirements that the customer explicitly demands, and where the level of fulfillment directly and proportionally influences the customer's satisfaction. The internet-speed provided by a company is an example of a one-dimensional requirement. The faster the speed of your internet, the more pleased the customer will be. As shown in figure 1, one-dimensional requirements are articulated and measurable. (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996)

3.1.3 Attractive requirements

According to Sauerwein et al. (1996), attractive requirements have the most influence on the customer satisfaction. This is caused by the fact that customer does not explicitly express the need for such requirements, nor does he or she expect them, but rather considers them as extra, or a bonus. Therefore, there is no dissatisfaction when the requirement is not present (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996).

An example of an attractive requirement is the design of a certain product. The newest model Apple iPhone will likely have similar capabilities to the newest model Samsung Galaxy, but a certain customer may prefer the simplistic design and interface of the iPhone. Similarly, another customer may prefer the interface of the Samsung Galaxy.

The relationship between the level of fulfillment of a certain requirement and the (dis)satisfaction of the customer is shown in figure 1.

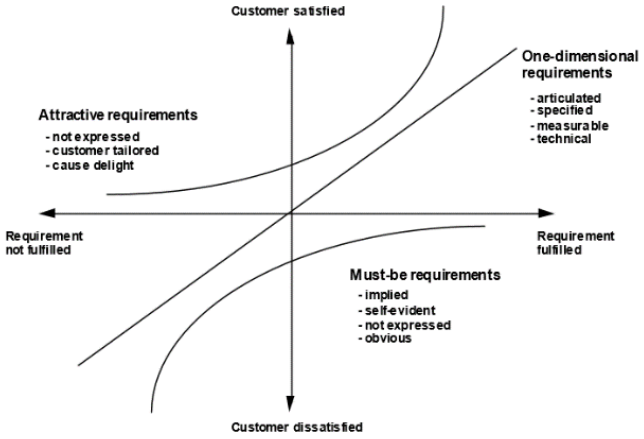

Figure 1: Kano's Model of Customer Satisfaction (Berger, et al., 1993)

The information gained from performing a Kano questionnaire (which will be explained later), can be of enormous importance to a company. The results ought to indicate which of your product's features fall into which category, which leads to insights in what to improve to make your customer more satisfied. *"A Kano questionnaire helps categorize criteria related to consumer satisfaction into different types of qualities and indicates how much attention should be paid to each product criterion to achieve the desired customer satisfaction."* (Chen & Chuang, 2008, p. 671)

For example, Must-be requirements have to function, or the customer will be dissatisfied. However, there is no use in making these requirements extra 'fancy' or 'advanced', since in theory, they will not lead to higher customer satisfaction (Chen & Chuang, 2008). The opposite goes for Attractive requirements. These are the requirements that a company can pay special attention to, in order to drastically improve customer satisfaction.

All and all, the Kano model is a useful tool to distinguish between your product's features, and gives insights on how and, most importantly, which features to improve. The Kano model should point out the bottlenecks and opportunities, which can help a company improve their customer's satisfaction.

3.2 The target group

In this research, young adults (age 18-30) will be the targeted group. It can be argued that out of the whole range of potential users, young adults have the most affection with technology and devices such as the Fitbit Charge, and are therefore a group worth investigating. This research aims to find out how young adults assess the value of the different features of the Fitbit Charge, how they would categorize them in terms of the Kano model.

3.3 The Kano questionnaire

The Kano questionnaire is a research tool that can be used to assess how (potential) users categorize the different aspects, or

features, of a product in terms of the Kano model, and how much or little they value them. According to Sauerwein et al. (1996), there are four steps in the process of categorizing product features in terms of the Kano model:

- Step one: Identification of product requirements
- Step two: Construction of the Kano questionnaire
- Step three: Administering the customer interviews
- Step four: Evaluation and interpretation

3.3.1 Identification of the product requirements

Identification of the product requirements is the first step to be taken in determining how to classify the requirements in terms of the Kano model. According to Fitbit, the Charge activity and sleep wristband has six distinct features:

- Tracking 'All-Day Activity', such as steps taken, and the calories burned in a day.
- 'Watch + Display', which gives access to daily statistics, a watch and the exercise mode on the display.
- 'Caller ID', the ability to get call notifications from compatible and connected mobile devices.
- 'Long Battery Life'
- 'Auto Sleep + Alarms', the ability to monitor your sleep, even automatically, and set an alarm
- 'Wireless Syncing', communicating the data from your wristband to connected smartphones and/or computers

Next to the features that Fitbit lists, two other aspects of using the Charge wristband can be of relative importance to (potential) users, namely transparency and accountability.

These eight features, that will be referred to as product requirements from here onwards, are the ones that will be used in the Kano questionnaire, in order to assess how they are valued by (potential) users.

3.3.2 Construction of the Kano questionnaire

The Kano questionnaire consist of a pair of questions per product requirement; a functional question (*How do you feel when the feature is present?)* and a dysfunctional question (*How do you feel when the feature is absent?)*. As a result, 16 questions have been formulated for this research, a functional and dysfunctional question per product requirement.

For example, for the first product requirement (tracking 'All-Day Activity'), the following two questions were constructed:

"If the wristband tracks all-day activity (such as how many steps you've taken and how much calories you've burned), how do you feel?" (functional)

"If the wristband does not have the ability to track all-day activity (such as how many steps you've taken and how much calories you've burned), how do you feel?" (dysfunctional)

The questionnaire is divided into a short introduction and three sections with questions. The first section contains the functional questions on the product requirement, whereas the second section contains the dysfunctional questions. The third and last section contains some general questions on age, gender, nationality, and education level.

The full version of the constructed Kano questionnaire can be found in the appendix. (See Appendix I)

3.3.3 Administering the customer interviews

The customer interviews are to be conducted via an online questionnaire. The questionnaire will be set up in Google forms, and will be distributed and brought to the attention via different channels, such as the Facebook groups for IBA cohort '13/'14, '14/'15, and '15/'16, and other personal channels, such as social media and a more direct approach of simply emailing or texting the link to the questionnaire.

3.3.4 Evaluation and interpretation

The evaluation of the Kano questionnaire consists of three parts (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996).

Firstly, the answers from the functional and dysfunctional question are combined, which results in a classification of the product requirement. This is done with the help of the Kano evaluation table, which is shown in figure 2.

Customer requirements → / ↓		Dysfunctional (negative) question				
		1. like	2. must be	3. neutral	4. live with	5. dislike
Functional (positive) question	1. like	Q	A	A	A	O
	2. must-be	R	I	I	I	M
	3. neutral	R	I	I	I	M
	4. live with	R	I	I	I	M
	5. dislike	R	R	R	R	Q

Customer requirement is ...

A: Attractive
M: Must-be
R: Reverse
O: One-dimensional
Q: Questionable
I: Indifferent

Figure 2: Kano Evaluation Table (Sauerwein, et al., 1996)

The classifications 'Attractive' (A), 'Must-be' (M), and 'One-Dimensional' (O) speak for themselves, as they represent the three product requirements that the Kano model distinguishes. 'Reverse' I, 'Questionable' (Q), and 'Indifferent' (I) however, require a bit more explanation.

If the combination of the functional and dysfunctional questions results in 'Reverse' (R), it indicates that the customer does not want the feature, and even expects the opposite, or 'Reverse' (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996).

A 'Questionable' (Q) result, indicates that there was a fault somewhere in the procedure, since this is not normal that the combination of answers results in 'Questionable'. It could mean that the question was phrased incorrectly, or that the respondent misunderstood the question and/or filled out the 'wrong' answer by mistake. (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996)

The result 'Indifferent' (I) indicates that the customer is indifferent (as the name suggests) to the presence of the feature, but is not willing to pay extra for it. (Sauerwein, Bailom, Matzler, & Hinterhuber, 1996)

Product requirement	A	O	M	I	R	Q	Total	Category
Tracking All-Day Activity	18	**31**	19	22	9	1	**100%**	**O**
Watch + Display	16	**37**	20	22	4	1	**100%**	**O**
Caller ID	28	10	8	**36**	18		**100%**	**I**
Long Battery Life	3	8	**38**	8	1	**42**	**100%**	**Q/M**
Auto Sleep + Alarm	**31**	7	2	**31**	24	5	**100%**	**A/I**
Wireless Syncing	23	21	13	**31**	11	1	**100%**	**I**
Transparency	8	18	**47**	20	1	6	**100%**	**M**
Accountability	4	36	**47**	9	2	2	**100%**	**M**

Table 2: Table of Results

The second step in the evaluation is listing the individual results of the individual product features in an overall frequency table, as shown in table 1. This should in the end indicate in which category the different product requirements fall.

Product requirement	A	O	M	I	R	Q	Total	Category
Tracking All-Day Activity							100%	
Watch + Display							**100%**	
Caller ID							100%	
Long Battery Life							**100%**	
Auto Sleep + Alarm							100%	
Wireless Syncing							**100%**	
Transparency							100%	
Accountability							**100%**	

Table 1: Table of Results (to be filled out)

The last step is to interpret the results. This can be done in one of three ways, but in this research the first, and simplest, method will be used, if possible. This method includes interpreting the results based on the frequency of the answers given.

The frequency table should provide a clear answer as to which category each product requirement belongs. This is done by looking at the frequency (as the name implies) of the answers given. The category that scores the highest percentage is the category to which the product requirement belongs, in terms of the Kano model.

However, it is also possible that the results of the questionnaire give frequencies that spread out over more than one category. This results in an unclear classification of the product requirements, as there are multiple categories in which the requirement could possibly fall. In this case, the extent of satisfaction and the extent of dissatisfaction can be calculated (see Berger, et al., 1993). These calculations estimate the average impact on satisfaction or dissatisfaction, and therefore indicate whether a product requirement causes increased customer satisfaction, or merely prevents customer dissatisfaction (Matzler & Hinterhuber, 1998). Both can be calculated as follows.

The extent of satisfaction (positive customer satisfaction (CS) coefficient):

$$\frac{A + O}{A + O + M + I}$$

The extent of dissatisfaction (negative customer satisfaction (CS) coefficient):

$$\frac{O + M}{(A + O + M + I) \times (-1)}$$

The positive CS coefficient ranges from 0 to 1, where 0 stands for very little influence and 1 for maximum influence on customer satisfaction. The negative CS coefficient ranges from -1 to 0, where the more the negative CS coefficient approaches -1, the more influence it has on customer dissatisfaction.

4. RESULTS

The Kano questionnaire was filled out by a 100 respondents between the age of 18 and 30 years old. After this number was reached, the Google Form in which the questionnaire was set up was closed, and the results per product requirement per individual respondent were recorded in a table of results, such as the one shown in table 1. The results for this particular research are shown in table 2.

As explained in the methodology, the highest scoring category is the category to which a product requirement belongs. According to this system, the distribution of the product requirements per category is as shown in table 3.

Category	Product requirements
Must-be requirements	*Long Battery Life**
	Transparency
	Accountability
One-dimensional requirements	Tracking All-Day Activity
	Watch + display
Attractive requirements	*Auto Sleep + Alarm*,*
Indifferent	Caller ID
	Auto Sleep + Alarm,*
	Wireless synching

Table 3: Product Requirements per Category

**As can be seen in table 2, Long Battery Life should be categorized as 'Questionable'. This will be addressed in the section 'Discussion'.*

Secondly, with this method, Auto Sleep + Alarm can be categorized as both an attractive and indifferent requirement.

As can be seen in table 2, the frequency of the answers for some of the product requirements are somewhat spread out over two or more categories. As discussed in methodology, the next step here is to calculate the extent of satisfaction and dissatisfaction, in order to interpret the results properly. The results of these calculations can be found in table 4.

Product Requirement	Extent of Satisfaction	Extent of dissatisfactio
Tracking All-Day Activity	0,54	-0.
Watch + Display	0,56	-0.
Caller ID	0,46	-0.
Long Battery Life	0,19	-0.
Auto Sleep + Alarm	0,54	-0.
Wireless Syncing	0,50	-0.
Transparency	0,27	-0.
Accountability	0,41	-0.

Table 4: Extent of Satisfaction and Extent of Dissatisfaction per Product Requirement

Based on the results of these calculations, a clearer distribution of the product requirements can be made, which is shown in table 5.

Category	Product requirements
Must-be requirements	Long Battery Life
	Transparency
	Accountability
One-dimensional requirements	Tracking All-Day Activity
	Watch + display
Attractive requirements	Auto Sleep + Alarm,
	Caller ID
	Wireless synching

Table 5: New Distribution of Product Requirements per Category

The product requirements with a higher negative CS coefficient and a low to moderate positive CS coefficient are classified as Must-be requirements, since they are more potentially harmful than helpful when it comes to satisfying customers.

Product requirements with both a moderate to high positive and negative CS coefficient are classified as One-dimensional requirements, since they both influence customer satisfaction and dissatisfaction.

Lastly, the product requirements with a high positive CS coefficient and a low negative CS coefficient were classified as Attractive requirements, since they have a high positive influence on customer satisfaction, and are thus more potentially helpful than harmful.

All defined product requirements have been categorized in terms of the Kano model now, which means that results can interpreted and discussed in the next section.

Figures 3-6, which can be found in the appendix (See Appendix II), show the distributions of the general statistics of the respondents of the Kano questionnaire. This data was also used to analyse whether there are significant differences between the different demographic groups.

Firstly, all data was converted to SPSS. The answers were then converted to a numerical value, ('I like it that way' = 1, 'It must be that way' = 2, etc.). After that the variables Must-be, One-dimensional, and Attractive were constructed by combining the answers of the functional and dysfunctional question for a specific requirement, and by stating the conditions under which the requirement was labelled as one of the categories. For example, the variable 'tracking All-Day Activity – Attractive' was constructed by formulating that a respondent categorized the requirement as attractive when he answered the functional question with 1 ('I like it that way'), and the dysfunctional with either 2, 3, or 4 ('It must be that way', 'I am neutral', or 'I can live with it that way'). This resulted in each respondent being labelled with 0 (not having the categorized the requirement as attractive) or 1 (having categorized the requirement as attractive). This was done for each product requirement, for each of the three categories Must-be, One-dimensional, and Attractive requirements.

After the variables were constructed, the demographic data was compared with the variables, in order to see if there are significant differences between the different groups, such as males and females, or the different age groups. This was done by performing a cross tabulation with the computed category variable (e.g. 'tracking All-Day Activity – Attractive') as the dependent variable, and the demographic variables as the independent variable.

Together with the cross tabulation, a Chi Square and Fisher's Exact Test were performed. With one dependent variable, and one independent variable with two or more levels, a Chi Square test is the best option. However, one of the assumptions of this test is that the expected cell count is at least five. Since in this research, this was not always the case, Fisher's Exact Test comes into play. This test can be used when the expected cell count is lower than five. However, SPSS can only perform this test when both the independent and dependent variable have only two categories. This problem can be solved letting SPSS calculate the exact p-value, which allows the variables to have more than two levels. (Mehta & Patel, 1996)

In this manner, 96 tests (eight product requirements, four demographic variables, and three categories) were performed, out of which six showed significant exact p-values. This means that six of these tests showed p-values under 0.05. In hypothesis testing, this threshold ($\alpha = 0.05$) is often used to distinguish significant results. When this is the case, the null-hypothesis can be rejected, which is often formulated as 'there is no difference'.

The cross tabulations for the six 'significant' cases can be found in the appendix (See Appendix III). These results will be discussed in more detail in the next section.

5. DISCUSSION

As shown in the 'Results' section, we have now gained information on which product requirement of the Fitbit Charge activity tracker wristband fit into which category. The results answer the first research question "How can the product features of the Fitbit Charge activity tracker wristband be categorized in terms of the Kano model, and what do the results imply for Fitbit?". For Fitbit, this information thus indicates what features they can improve in order to improve customer satisfaction for (potential) users.

According to this research, the Must-be requirements of the Fitbit Charge are the battery life, and the transparency and accountability of the company. This means that these product requirements need to be fully functional and working, or the customer will be extremely dissatisfied. This seems logical, as transparency and accountability are features that are not particularly satisfying to customers; it simply needs to be safe to use the Fitbit Charge.

It also makes sense for the battery life. However, issues were encountered in the Kano questionnaire. As was shown in table 2, a 42% majority of the respondents gave a combination of answers that is not supposed to be given, and is therefore classified as 'Questionable'. In the questionnaire, the words 'long' and 'short' battery life were avoided, in order not to

influence the respondent. In most (40 out 42) of the cases, both the functional and dysfunctional question were answered with 'I dislike it that way'. As explained above, this does normally not lead to a valid answer. Nevertheless, it might actually make sense in this case. (Potential) Users of the Fitbit simply do not find 7-10 hours of battery life enough. The problem was also solved by calculating the extent of satisfaction and dissatisfaction, where this number was not taken into account, and 'Long Battery Life' was categorized as a Must-be requirement nevertheless.

It does seem surprising that the respondents did not consider 'Tracking All-Day Activity' a Must-be requirement for an activity tracker, but a One-dimensional requirement. A possible explanation for this is that this specific target group might buy an activity tracker for a different purpose, such as for exercising or as some sort of 'Smart Watch'. For Fitbit this might actually be good news, because it means that if they can find ways to improve this requirement, they might be able to satisfy their (potential) customers more. This also goes for the 'Watch + Display' requirement, as it was also categorized as a One-dimensional requirement.

The requirements that were classified as Attractive, are maybe the most interesting for Fitbit. If these features, 'Auto Sleep + Alarm', 'Caller ID', and 'Wireless Synching', are not fulfilled to the wishes of the customer, according to this research, nothing should be wrong. Customers would not be dissatisfied, but maybe just less satisfied than they could have been. This means that if Fitbit can keep improving these requirements to better fit their (potential) customer's needs, they might be able to drastically improve their customer's satisfaction.

For a time where information is shared across platforms, with friends, businesses, and the world, it also seems interesting that 'Wireless Synching' was not considered a Must-be requirement, but rather an Attractive one. Potentially, this could be cause by the fact that the targeted group of potential users still views this kind of technology as a novelty, and still becomes excited by it, rather than that they will be expecting it in every product.

As mentioned in the 'Results' section, the apparent significant differences between the levels of the demographic groups will now be discussed.

As can been seen in appendix 3.1, Fisher's exact test indicates that there is a significant difference between the respondents of different education levels, and whether they categorize 'Tracking All-Day Activity' as Attractive. Which of the education levels is more likely to categorize this product requirement as Attractive, can be determined by looking at the percentage of Attractive 'voters' within that education level. As can be seen in appendix 3.1.1, the level 'VMBO/MAVO' shows the highest percentage of Attractive 'voters'. Therefore, based on the results of this research and these tests, you could say that young adults with a 'VMBO/MAVO' education level are more likely to categorize 'Tracking All-Day Activity' as Attractive. However, since there was only one respondent with this education level, it seems very unwise to base conclusions for a whole group of people on this one person.

In appendix 3.2, the results of the Fisher's exact test show that there is a significant difference between males and females when categorizing 'Accountability' as Attractive. As can be seen in the cross tabulation in appendix 3.2.1, males are supposedly more likely to categorize Accountability as Attractive than females. However, zero females in this group of respondents seem to have categorized 'Accountability' as Attractive, and only four males. Again, it seems unwise to base conclusions on sample where not all cells contain at least 5 cases, where even 50% of the cells do not match this requirement.

We could keep discussing these apparent significant results, but what has been said above, applies to the other apparent significant results as well. The cell counts are too small to base conclusions on.

Therefore, based on the performed tests, this research has found no proof or indication that there are significant differences between people of different ages, males and females, people of different nationalities, and people with different education levels in categorizing the product requirements.

6. CONCLUSION

The aim of this research was to classify the product requirements of the Fitbit Charge activity tracker wristband in terms of the Kano model, and to determine the potential value of these requirements for Fitbit. The Kano questionnaire has proven to be an effective tool to distinguish what (potential) users value in a product, and the results of this questionnaire have shown a clear overview of the different product requirements in the different categories. The results could be a source of information on what to improve for Fitbit, and could help them and their customers by addressing important aspects of the Fitbit Charge activity tracker wristband.

This research has also once more shown the value of the Kano model, in terms of categorizing product requirements, and has provided a logical and theoretically proven support for claims as to what customers value.

The Internet of Things can be found in the product requirement 'Wireless Synching' of the Fitbit Charge, which was classified by this research as an attractive requirement. One of the research questions posed in this thesis was, "What is the potential of the IoT as a business marketing tool?", and these results indicate that the use of the IoT in commercial products is still very attractive to customers. Therefore, it seems that the Internet of Things does have potential as a marketing tool.

7. ACKNOWLEDGMENTS

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9. APPENDIX

9.1 Appendix I: The Kano Questionnaire *(typed version, later converted to Google Forms)*

Thesis questionnaire: The Internet of Things

Thank you for your participation in this questionnaire! All your answers will be treated confidentially, and you will remain anonymous.

This questionnare is about certain features in an activity tracker wristband, and it consists of two parts. In the first section, you are asked to answer some questions about the presence of the features, whereas in the second section there will be questions on the absence of these same features. The target group for this research is young adults, aged between 18-30.

There are no right or wrong answers, the aim is to find out how you feel towards the presence or absence of the different features!

Janique Westerbeek

BSc International Business Administration, University of Twente

First section

Imagine you are looking to buy an activity tracker wristband. In this section, you will be asked to rate how you feel about the presence of different features of such a wristband.

You can choose between:

1. I like it that way
2. It must be that way
3. I am neutral
4. I can live with it that way
5. I dislike it that way

1. If the wristband tracks all-day activity (such as how many steps you've taken and how much calories you've burned), how do you feel?
2. If the wristband has a display that shows the time and daily statistics, how do you feel?
3. If you can receive call notifications from your phone on the wristband, how do you feel?
4. If the wristband has a battery life of 7-10 hours, how do you feel?
5. If the wristband monitors your sleep and sets an alarm automatically, how do you feel?
6. If the wristband connects to other devices (such as laptops and smartphones), and communicates data across these platforms, how do you feel?
7. If the producer of the wristband clearly communicates how your personal data is collected, processed and stored, how do you feel?
8. If the producer of the wristband takes it very seriously when there are issues with the data collection, and takes full responsibility for it, how do you feel?

Second section

In this section, you will be asked to rate how you feel about the absence of different features of the wristband.

Again, you can choose between:

1. I like it that way
2. It must be that way
3. I am neutral
4. I can live with it that way
5. I dislike it that way

1. If the wristband does not have the ability to track all-day activity (such as how many steps you've taken and how much calories you've burned), how do you feel?
2. If the wristband does not have a display, that shows the time and daily statistics, how do you feel?
3. If you cannot receive call notifications from your smartphone on the wristband, how do you feel?
4. If the wristband has a battery life of 2-5 hours, how do you feel?
5. If the wristband cannot monitor your sleep and set an alarm automatically, how do you feel?
6. If the wristband cannot be connected to other devices (such as laptops and smartphones), so it does not communicate data across platforms, how do you feel?
7. If it is not clear to you how the producer of the wristband collects, processes and stores your personal data, how do you feel?
8. If the producer of the wristband does not take action when there are issues with the data collection, and takes no responsibility for it, how do you feel?

Last but not least

You have now finished the questionnaire, but please fill in these last general questions

What is your age?

- 18-22
- 23-26
- 27-30

What is your gender?

- Male
- Female

What is your nationality?

- Dutch
- German
- Chinese
- Turkish
- Other: …

What is your level of education?

- VMBO/MAVO
- HAVO
- VWO
- MBO
- HBO (university of applied sciences)
- WO (university)

If you want to participate in the lottery for the chocolate bars, please fill in your email address below. Your answers will not be matched with your email address.

…

9.2 Appendix II: General statistics of the respondents of the Kano questionnaire

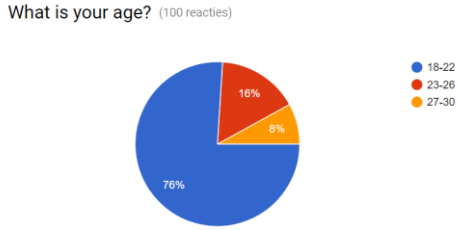

Figure 3: Distribution of the age of the respondents

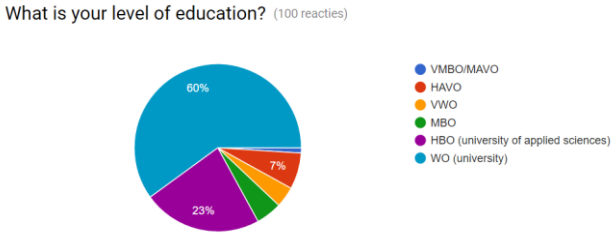

Figure 4: Distribution of the level of education of the respondents

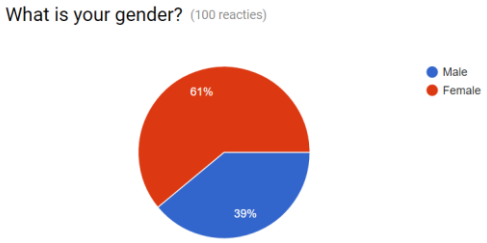

Figure 5: Distribution of the gender of the respondents

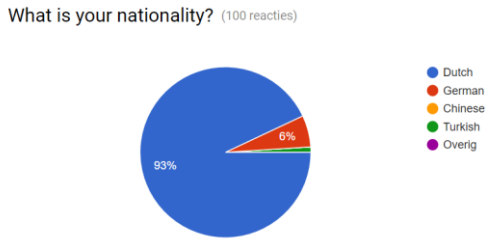

Figure 6: Distribution of the nationality of the respondents

9.3 Appendix III: 'Significant' cases

*9.3.1 Attractive – Education level * All-day tracking*

Crosstab

Count

		All-day tracking - Attractive		
		not attractive	attractive	Total
Education level	VMBO/MAVO	0	1	1
	HAVO	5	2	7
	VWO	2	2	4
	MBO	4	1	5
	HBO (university of applied sciences)	22	1	23
	WO (university)	49	11	60
Total		82	18	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	10,783[a]	5	,056	,057		
Likelihood Ratio	9,958	5	,076	,077		
Fisher's Exact Test	10,267			,038		
Linear-by-Linear Association	2,739[b]	1	,098	,117	,068	,021
N of Valid Cases	100					

a. 8 cells (66,7%) have expected count less than 5. The minimum expected count is ,18.

b. The standardized statistic is -1,655.

9.3.1.1 Cross tabulation with percentages

Education level * All-day tracking - Attractive Crosstabulation

			All-day tracking - Attractive		
			not attractive	attractive	Total
Education level	VMBO/MAVO	Count	0	1	1
		% within Education level	0,0%	100,0%	100,0%
		% within All-day tracking - Attractive	0,0%	5,6%	1,0%
	HAVO	Count	5	2	7
		% within Education level	71,4%	28,6%	100,0%
		% within All-day tracking - Attractive	6,1%	11,1%	7,0%
	VWO	Count	2	2	4
		% within Education level	50,0%	50,0%	100,0%
		% within All-day tracking - Attractive	2,4%	11,1%	4,0%
	MBO	Count	4	1	5
		% within Education level	80,0%	20,0%	100,0%
		% within All-day tracking - Attractive	4,9%	5,6%	5,0%
	HBO (university of applied sciences)	Count	22	1	23
		% within Education level	95,7%	4,3%	100,0%
		% within All-day tracking - Attractive	26,8%	5,6%	23,0%
	WO (university)	Count	49	11	60
		% within Education level	81,7%	18,3%	100,0%
		% within All-day tracking - Attractive	59,8%	61,1%	60,0%
Total		Count	82	18	100
		% within Education level	82,0%	18,0%	100,0%
		% within All-day tracking - Attractive	100,0%	100,0%	100,0%

*9.3.2 Attractive – Gender * Accountability*

Crosstab

Count

		Accountability - Attractive		
		not attractive	attractive	Total
Gender	Male	35	4	39
	Female	61	0	61
Total		96	4	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6,517[a]	1	,011	,021	,021	
Continuity Correction[b]	4,120	1	,042			
Likelihood Ratio	7,796	1	,005	,021	,021	
Fisher's Exact Test				,021	,021	
Linear-by-Linear Association	6,452[c]	1	,011	,021	,021	,021
N of Valid Cases	100					

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 1,56.

b. Computed only for a 2x2 table

c. The standardized statistic is -2,540.

9.3.2.1 Cross tabulation with percentages

Gender * Accountability - Attractive Crosstabulation

			Accountability - Attractive		
			not attractive	attractive	Total
Gender	Male	Count	35	4	39
		% within Gender	89,7%	10,3%	100,0%
		% within Accountability - Attractive	36,5%	100,0%	39,0%
	Female	Count	61	0	61
		% within Gender	100,0%	0,0%	100,0%
		% within Accountability - Attractive	63,5%	0,0%	61,0%
Total		Count	96	4	100
		% within Gender	96,0%	4,0%	100,0%
		% within Accountability - Attractive	100,0%	100,0%	100,0%

*9.3.3 Must-be – Age * Caller ID*

Crosstab

Count

		Caller ID - Must-be		
		not Must-be	Must-be	Total
Age	18-22	73	3	76
	23-26	13	3	16
	27-30	6	2	8
Total		92	8	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7,349[a]	2	,025	,043		
Likelihood Ratio	6,041	2	,049	,043		
Fisher's Exact Test	7,223			,024		
Linear-by-Linear Association	7,022[b]	1	,008	,018	,018	,013
N of Valid Cases	100					

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is ,64.

b. The standardized statistic is 2,650.

9.3.3.1 Cross tabulation with percentages

Age * Caller ID - Must-be Crosstabulation

			Caller ID - Must-be		
			not Must-be	Must-be	Total
Age	18-22	Count	73	3	76
		% within Age	96,1%	3,9%	100,0%
		% within Caller ID - Must-be	79,3%	37,5%	76,0%
	23-26	Count	13	3	16
		% within Age	81,3%	18,8%	100,0%
		% within Caller ID - Must-be	14,1%	37,5%	16,0%
	27-30	Count	6	2	8
		% within Age	75,0%	25,0%	100,0%
		% within Caller ID - Must-be	6,5%	25,0%	8,0%
Total		Count	92	8	100
		% within Age	92,0%	8,0%	100,0%
		% within Caller ID - Must-be	100,0%	100,0%	100,0%

9.3.4 Must-be – Gender * Caller ID

Crosstab

Count

		Caller ID - Must-be		
		not Must-be	Must-be	Total
Gender	Male	32	7	39
	Female	60	1	61
Total		92	8	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8,598[a]	1	,003	,005	,005	
Continuity Correction[b]	6,525	1	,011			
Likelihood Ratio	8,841	1	,003	,005	,005	
Fisher's Exact Test				,005	,005	
Linear-by-Linear Association	8,512[c]	1	,004	,005	,005	,005
N of Valid Cases	100					

a. 2 cells (50,0%) have expected count less than 5. The minimum expected count is 3,12.

b. Computed only for a 2x2 table

c. The standardized statistic is -2,918.

9.3.4.1 Cross tabulation with percentages

Gender * Caller ID - Must-be Crosstabulation

			Caller ID - Must-be		Total
			not Must-be	Must-be	
Gender	Male	Count	32	7	39
		% within Gender	82,1%	17,9%	100,0%
		% within Caller ID - Must-be	34,8%	87,5%	39,0%
	Female	Count	60	1	61
		% within Gender	98,4%	1,6%	100,0%
		% within Caller ID - Must-be	65,2%	12,5%	61,0%
Total		Count	92	8	100
		% within Gender	92,0%	8,0%	100,0%
		% within Caller ID - Must-be	100,0%	100,0%	100,0%

9.3.5 Must-be – Nationality * Wireless Syncing

Crosstab

Count

		Syncing - Must-be		
		not Must-be	Must-be	Total
Nationality	Dutch	82	11	93
	German	5	1	6
	Turkish	0	1	1
Total		87	13	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6,877[a]	2	,032	,155		
Likelihood Ratio	4,263	2	,119	,155		
Fisher's Exact Test	4,899			,096		
Linear-by-Linear Association	4,940[b]	1	,026	,074	,074	,053
N of Valid Cases	100					

a. 3 cells (50,0%) have expected count less than 5. The minimum expected count is ,13.

b. The standardized statistic is 2,223.

9.3.5.1 Cross tabulation with percentages

Nationality * Syncing - Must-be Crosstabulation

			Syncing - Must-be		Total
			not Must-be	Must-be	
Nationality	Dutch	Count	82	11	93
		% within Nationality	88,2%	11,8%	100,0%
		% within Syncing - Must-be	94,3%	84,6%	93,0%
	German	Count	5	1	6
		% within Nationality	83,3%	16,7%	100,0%
		% within Syncing - Must-be	5,7%	7,7%	6,0%
	Turkish	Count	0	1	1
		% within Nationality	0,0%	100,0%	100,0%
		% within Syncing - Must-be	0,0%	7,7%	1,0%
Total		Count	87	13	100
		% within Nationality	87,0%	13,0%	100,0%
		% within Syncing - Must-be	100,0%	100,0%	100,0%

9.3.6 One-dimensional – Gender * Caller ID

Crosstab

Count

		Caller ID - One-dimensional		
		not One-dimensional	One-dimensional	Total
Gender	Male	32	7	39
	Female	58	3	61
Total		90	10	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	4,488[a]	1	,034	,044	,039	
Continuity Correction[b]	3,157	1	,076			
Likelihood Ratio	4,385	1	,036	,084	,039	
Fisher's Exact Test				,044	,039	
Linear-by-Linear Association	4,443[c]	1	,035	,044	,039	,032
N of Valid Cases	100					

a. 1 cells (25,0%) have expected count less than 5. The minimum expected count is 3,90.

b. Computed only for a 2x2 table

c. The standardized statistic is -2,108.

9.3.6.1 Cross tabulation with percentages

Gender * Caller ID - One-dimensional Crosstabulation

			Caller ID - One-dimensional		Total
			not One-dimensional	One-dimensional	
Gender	Male	Count	32	7	39
		% within Gender	82,1%	17,9%	100,0%
		% within Caller ID - One-dimensional	35,6%	70,0%	39,0%
	Female	Count	58	3	61
		% within Gender	95,1%	4,9%	100,0%
		% within Caller ID - One-dimensional	64,4%	30,0%	61,0%
Total		Count	90	10	100
		% within Gender	90,0%	10,0%	100,0%
		% within Caller ID - One-dimensional	100,0%	100,0%	100,0%