Perceived quality of mobile cell phones: an initiative to develop local product

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Abstract: The objective of the study was to develop mobile cell phones characteristics based on consumer perceived quality. For this purpose, questionnaire was used as a research instrument. Questionnaires were distributed to 390 mobile cell phones consumers and all were valid to be proceeded to data analyses. Quality function deployment was used to analyse the data. Research findings showed that product characteristics to be developed in order to be success in competition in descending order of importance were the application, the capability of processor, hand anthropometry, batteries, image density, shape, keypad size, navigation buttons, internal memory, data packet technology, MP3 facilities, external memory, screen size, structures material, antivirus, warranty, data exchange device, a gap, and the page on short message service. Other factors should be taken into consideration were increasing trading partners (retailing or agent) and outlets, improving labours, and post purchase warranty.

Keywords: perceived quality; mobile cell phone; quality function deployment; QFD; Indonesian market; house of quality; HOQ; consumer.

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1 Introduction

Free trade is one of the major challenges faced by any country in the world as a result of globalisation. Indonesia has been actively involved in free trade and has signed various agreements that bind these countries thus eliminating any protection to domestic products. Indonesia as a developing country does not seem to be fully prepared with a variety of rules that bind them. A point of concern is the weakening of domestic production due to competition from imported products.

Indonesia is one of the most potential markets in the world. Stable levels of economic growth, population dominated by youth, and the growing of middle class contribute in adding the attractiveness and competitiveness of Indonesian market among other countries. Various imported products/commodities are sold in Indonesian market. One among them is mobile cell phone product.

Data from the Ministry of Commerce in 2007 and 2012 showed that mobile cell phone was the fifth largest of imported product to Indonesia. According to Badan Pusat Statistik (BPS, 2016), 51.49% of Indonesian citizen possessed mobile cell phone in 2014. This statistics was believed increasing in 2015 and 2016. It implies that Indonesia is a big market for mobile cell phone, taking into account that Indonesia is the fourth biggest country based on population over the world. Population of Indonesia in 2015 was around 250 millions. This situation certainly emerges concerns that foreign exchange will be influenced by this import. Local producer for mobile cell phone should be promoted. Or else, Indonesian trade balance internationally will be worse than now. Yet international trade balance of Indonesia 2015 and during first quarter 2016 is surplus but highly susceptible to be negative (BPS, 2016).

Government of Indonesia should immediately take note of this situation by defining a variety of policies that support domestic industry. Researchers and entrepreneurs as well should work together with government to develop domestic products competitiveness or by developing new products.

Keyword to win the competition is to understand the needs and desires of consumer (Webster, 1992). Producer should understand well their current customers, potential customers, benefits expecting by customers, customers' preferences, needs and problems (Rowley, 2002). Fulfilling consumer wants and needs are equal to satisfying consumers. Satisfy customer will perform re-purchase (Abdinnour-Helm et al., 2005). In turn it will generate loyalty (Kim, et al., 2015; Bodet, 2008; Gable et al., 2008). Subsequently loyalty will increase market share (Keel and Padgett, 2015) because loyal customers show attachment and commitment toward the company, enhancing positive word of mouth (Zeithaml et al., 2009; Matzler et al., 2008; Anderson et al., 2004) and are less likely to switch to competitor (So et al., 2013). Finally it will improve and maintain a company's economic performance (Pappu and Quester, 2006; Bendixen et al., 2004; Ailawadi et al., 2003) by influencing profitability significantly (Shi et al., 2014; Kale and Klugsberger, 2007).

Consumer wants and needs must be translated into the technical language so that producers are able to produce it. Research on consumer behaviour are abundant and performed on varies cultures. And although linking customer needs and wants with technical capabilities has been suggested on product innovation and development literature in order to win market share, evidence showed that this topic has received less

attention from research scholars. Therefore, there were two folds that make this study become interesting. First, to provide useful information for future local mobile cell phone to win the market share in Indonesia, secondly, this study was important as we integrating customer needs and wants with technical characteristic in empirical study using quality function deployment (QFD).

The purpose of this study therefore was to identify the wants and needs of consumers towards mobile cell phone product. Desires and needs of consumers were then converted to the technical characteristics of the product. This study was expected to provide insight in developing local product of mobile phone.

2 Literature review

In the era of high technology and faster information spread, products life cycle is shorter than previously. A brand might grow very fast but decline faster, such as 'Nokia', 'Blackberry', etc. We are witnessing high competitive business environment. No one consider in 1990s up to early 2000 that 'Nokia' will disappear from market. Similar case with 'Blackberry', for a decade, during the period 2000s, before 2014, no one can imagine that android will win the market. It raises question why mature product such as 'Nokia' and 'Blackberry' declined very fast.

Keyword to answer this enquiry could be 'innovation'. Technological innovation significantly and positively affects overall operational, cost, delivery performance, flexibility and innovative performances. In another side, managerial innovation significantly and positively affects overall operational, quality performance, delivery and flexibility performance. Both technological and managerial innovations influence customer satisfaction directly and indirectly through operational performance (Abdallah et al., 2016). Mobile cell phone is a kind of product that requires extensive sustainable development and innovation.

Innovation is not just come from engineering side but also from customer. The role of customer in creating value is no doubt. Oluwatope et al. (2016) research confirmed that firms depend more on information from market sources such as clients and suppliers for their innovation activities. In services case for instance, many researchers (such as Tanev et al., 2011) found the positive role of customers in improving services. In mobile phone business both services and manufacture, the role of customer in innovation process has been proved. Mishra (2015) studied consumer preferences in multi-attribute decision making, to the design of mobile phone service packages and determination of the relative importance of attributes in consumer choice processes. Gupta and Sahu (2015) examine the impact of relationship marketing dimensions (namely trust, long term relationship, technology orientation, service quality, satisfaction, loyalty program and brand image) on customer loyalty in the mobile telecom market in India.

Customer needs should be translated into production characteristic. When designing a new product or improving a current product, QFD is a flexible system that could translate customer requirements into company's design requirements (Bottani and Rizzi, 2006). QFD is a systematic method that can translate customer requirements into technical requirements for each stage of product development (Tseng and Lin, 2011). QFD can be applied to practically any manufacturing or service industry. Locatelli and Mancini (2013) used QFD in deciding power plant choice.

In transforming customer requirements (WHATs) into design requirements (HOWs), house of quality (HOQ) is a commonly tool. HOQ consists of seven components:

1 customer requirements

2 importance of customer requirements

3 engineering characteristics

4 relationship matrix for customer requirements and engineering characteristics

5 correlation among engineering characteristics

6 benchmark analysis

7 prioritisation of design requirements (Tseng and Lin, 2011).

The use of QFD has tangible and intangible benefits. Tangible benefits are related to reduction in the number of changes during product development (Carnevalli and Miguel, 2008), design time (Devadasan et al., 2006; Raharjo et al., 2008; Carnevalli and Miguel, 2008), costs and complaints (Carnevalli and Miguel, 2008), improvement in reliability (Carnevalli and Miguel, 2008), customer satisfaction (Carnevalli, et al., 2010) and increasing revenues (Carnevalli and Miguel, 2008).

Customer satisfaction was drawn from the expectancy-disconfirmation paradigm (Oliver, 1980). Customer satisfaction is important in retaining customer through relationship oriented loyalty strategies (Murugan and Rajendran, 2013). The expectancy-disconfirmation model remains one of the most widely discussed and tested approaches in measuring customer satisfaction (Mittal et al., 1999). This model assumes that individuals evaluate offerings' performances by comparing the perceived performance with their expectations (Oliver, 1997). It suggests that customer satisfaction is related to disconfirmation, which is defined as the difference between an individual's pre-purchase expectations and post-purchase performance of product as perceived by the customer (Tse et al., 1990). The intangible benefits of QFD are a flexible method, with communication improvement, assistance in decision making and priority setting, and increased company knowledge preservation and customer satisfaction.

3 Research method

Unit analysis was mobile cell phone. In order to propose a new product, it is important to use an existing similar product as a patron, since a new product may not convince a customer to buy it if its technical functions require extended effort and time to learn (Benner et al., 2016; Swilley, 2010). Mobile cell phone brand 'Siemens' from Germany was used as a patron of mobile cell phone product development. 'Siemens' was chosen because it was very popular for certain of time duration but then totally collapse. Something missed during the maturity life of product that was not well maintain by management, that was product innovation. Product innovation is recognised as key strategic assets that play a fundamental role in firm growth and success (Slotegraaf and Pauwels, 2008). It is important to learn from this such phenomena so thus future local of similar product will not fail because of similar mistakes.

Consumer wants and needs were explored to understand the perceptions (actual service level) and expectations for mobile cell phone products. Research variables thus were the perception and expectation of consumers towards mobile cell phone. Since perception and expectation are latent in nature, questionnaire was developed to collect data. Accordingly, data type required in this study was primary data.

Table 1 Dimensions and statements of perception and expectation

Dimension		*Statement*
Product quality performance	1	Compatible with internet (P1)
	2	Longer durable battery (P2)
	3	Better camera resolution (P3)
	4	Support various application (P4)
	5	Has many characters on message services (P5)
Durability	1	Has strong structure (K1)
	2	Non-vulnerable virus (K2)
	3	Water resistance (K3)
Maintenance	1	Easy to find service centre (PRW1)
	2	Maintenance service is satisfy (PRW2)
	3	Long warranty (PRW3)
	4	Spare part is available (PRW4)
Aesthetic	1	Attractive shape and trendy (E1)
	2	Elegant design (E2)
	3	Various accessories (E3)
Consumer perceived quality	1	Easily keypad (KU1)
	2	Easily navigation (KU2)
	3	Easily grasp (KU3)
	4	Faster (KU4)
	5	Free of error (KU5)
	6	Easily sending data (KU6)
Quality conformance	1	Camera quality consistent with specification (KE1)
	2	Longer standby (KE2)
Product reliability	1	Has many function (KDL1)
	2	Capable to perform various application simultaneously (KDL2)
Product feature	3	Big internal memory (F1)
	4	Provide agenda (F2)
	5	Use high speed processor (F3)
	6	Provide external data memory (F4)
	7	Provide music player (F5)

Questionnaire was developed in closed form. This type of questionnaire was chosen because of a possible answer predetermined so that respondents have been limited in providing answers to the Likert scale. Questionnaire consisted of two parts, i.e., respondent profiles and measurement of the perception and expectation of 'Siemens'

mobile cell phone. The questionnaire included questions attributes of eight dimensions, comprises product quality performance, durability, maintenance, aesthetics, quality received, compliance with standards, reliability, and features. Each dimension consists of statements as shown on Table 1.

Research respondents were students who had an experience using 'Siemens' mobile cell phone. Prior to deploying as a research instrument, the validity and reliability of questionnaire was tested. Data collected furtherly was processed using gap analysis to calculate the gap between the expected and actual service levels (measured by perception) (Danaher and Mattsson, 1997; Parasuraman et al., 1985, 1988, 1991; Teas, 1993). To develop the technical characteristics of the product, QFD method was deployed.

4 Result and discussion

4.1 Validity and reliability tests

Scale development is vital to empirical research in operations management (Adam and Swamidass, 1989; Flynn et al., 1990; Hensley, 1999; Stratman and Roth, 2002). Without reliable and valid measurement scales, it is less capable to estimate empirically the relationships that tie various operational concepts together. Thus, questionnaire was tested for validity and reliability.

For validity and reliability tests, questionnaires were distributed to 30 respondents. Validity test was performed using product moment correlation technique. The idea was to correlate each statement with its dimension and furtherly to compare the correlation value of each statement with critical value of 0.361 for significant value of 0.05. Validity test result is shown on Table 2. All indicators of all dimensions were proven valid.

Reliability test was conducted using alpha Cranach technique. Cut point was 0.7. All alpha scores were above 0.7 so that it can be stated all the items were reliable to measure respondents' perceptions and expectations of mobile cell phone products consistently.

Overall, validity and reliability tests showed all questionnaire statement items were valid and reliable. All statements were considered consistent, accurate, reliable, and capable to reveal what were intended by the researcher. It means that questionnaire developed was valid and reliable to be used as research instrument.

4.2 Characteristics of respondents

In order to collect data, questionnaire was distributed to 390 mobile cell phone customers, particularly 'Siemens' brand customers. All were successfully returned and filled up completely. Consumer characteristics often provide different effects in marketing efforts, such as gender difference in customer loyalty (Haj-Salem et al., 2016; Melnyk et al., 2009). Therefore, consumer profiles were captured on the study. Among respondent, 75.4% was male and 24.5% was female. Based on age, 5.4%, 26.2%, 29.0%, 19.0%, and 20.5 respectively were on 19, 20, 21, 22, 23 years old. Based on monthly allowance, 54.9% of respondents receipt less than one million Indonesian Rupiah, 36.7% got allowance one million up to less than three millions, and 8.5% got allowance three millions up to six millions.

Table 2 Validity test result

Dimension	*Statement*	*Correlation*	*Result*
Product quality performance	P1	0.678	Valid
	P2	0.674	Valid
	P3	0.371	Valid
	P4	0.431	Valid
	P5	0.679	Valid
Durability	K1	0.644	Valid
	K2	0.523	Valid
	K3	0.692	Valid
Maintenance	PRW1	0.590	Valid
	PRW2	0.756	Valid
	PRW3	0.383	Valid
	PRW4	0.555	Valid
Aesthetic	E1	0.531	Valid
	E2	0.696	Valid
	E3	0.505	Valid
Consumer perceived quality	KU1	0.536	Valid
	KU2	0.750	Valid
	KU3	0.555	Valid
	KU4	0.428	Valid
	KU5	0.426	Valid
	KU6	0.472	Valid
Quality conformance	KE1	0.734	Valid
	KE2	0.892	Valid
Product reliability	KDL1	0.854	Valid
	KDL2	0.808	Valid
Product feature	F1	0.445	Valid
	F2	0.461	Valid
	F3	0.694	Valid
	F4	0.518	Valid
	F5	0.416	Valid

4.3 Analysis of consumer satisfaction

Table 3 shows the index of cell phone brand 'Siemens' consumer satisfaction, which was the difference between an individual's pre-purchase expectations and post-purchase performance (perception) of mobile cell phone 'Siemens'.

Table 3 Consumer satisfaction indexes

No.	*Dimension*	*Statement*	*Mean*	*Expected mean*	*Gap*
1	Product quality performance	Compatible with internet	3.067	4.695	–1.628
2		Longer durable battery	4.051	4.669	–0.618
3		Better camera resolution	3.559	4.477	–0.918
4		Support various application	1.649	4.292	–2.643
5		Has many characters on message services	3.482	3.797	–0.315
6	Durability	Has strong structure	4.549	4.549	0.000
7		Non-vulnerable virus	3.459	4.469	–1.01
8		Water resistance	3.595	4.303	–0.708
9	Maintenance	Easy to find service centre	3.500	4.500	–1.000
10		Maintenance service is satisfy	3.382	4.485	–1.103
11		Long warranty	2.687	4.382	–1.695
12		Spare part is available	3.472	4.274	–0.802
13	Aesthetics	Attractive shape and trendy	2.546	4.210	–1.664
14		Elegant design	4.423	4.274	0.149
15		Various accessories	2.505	3.877	–1.372
16	Quality perceived	Easily keypad	3.405	4.321	–0.916
17		Easily navigation	3.685	4.151	–0.466
18		Easily grasp	3.990	4.205	–0.215
19		Faster	3.405	4.321	–0.916
20		Free of error	3.500	4.256	–0.756
21		Easily sending data	3.441	4.338	–0.897
22	Quality conformance with standards	Camera quality consistent with specification	2.923	4.454	–1.531
23		Longer standby	4.474	4.518	–0.044
24	Reliability	Has many function	3.454	4.374	–0.920
25		Capable to perform various application simultaneously	2.728	4.179	–1.451
26	Features	Big internal memory	2.403	4.533	–2.130
27		Provide agenda	4.428	4.149	0.279
28		Use high speed processor	2.367	4.431	–2.064
29		Provide external data memory	2.538	4.492	–1.954
30		Provide music player	2.508	4.738	–2.230

Overall it can be stated that consumers are not satisfied with 'Siemens' product. It was proved by the average value obtained for the total attributes of –1.051. Individually, almost all values showed negative gap. Respondents were satisfied only with strong

structure indicator of durability dimension. This indicator showed same values of perceptions and expectations which was 4.549 so that the gap value was 0. Evidence showed consumer perception based on strong structure was in accordance with consumer expectations.

Another dimension that showed positive gap was in aesthetics dimension i.e., various accessories statement. Accessories embedded to product exceeded consumer expectations. Although these two dimensions showed good performance, innovations and improvement should be performed continuously as the competitor does similar efforts and activities. Overall, a total of 28 indicators must be improved urgently in order to meet consumer expectations. It means in the intention to develop new product, product development team should work carefully with those indicators.

This is very important as ample researches have shown that satisfaction plays as antecedent of loyalty (Murugan and Rajendran, 2013; Hallowell, 1996). Loyalty subsequently has been proved by many researchers as a factor that capable to retain existing customer (Murugan and Rajendran, 2013; Al-Hawary, 2013). Researchers have proved that loyalty influence customer share which is at the end influence company profit (Hallowell, 1996).

The most important indicators needed to be improved compare to control were application, music player, and processor. Considering the advance of technology currently, those indicators are not difficult to improved not either too costly. Last few years Android technology has been developed better and more advanced. Not to mention Simba technology used by Blackberry. New product development team should take into consideration new development technology of Android and Simba.

4.4 Technical characteristics of product development

In order to convert consumers' needs and wants into product technical characteristics, variables and dimensions were classified into primary, secondary, and tertiary levels, as shown on Table 4. Primary level in this case was consumer desires. Table 4 also showed the level of importance calculated from respondents' responses.

Technically speaking, the level of difficulty in producing a product was very important to evaluate. The degree of difficulty in meeting customer's desire was shown by assigning a value of 1 up to 5. The meaning of 1, 2, 3, 4, and 5 values respectively are 'strongly not expected, not expected, reasonably expected, expected, and strongly expected'. Subsequently, technical characteristics of mobile cell phone products were developed. It resulted that main effort should be allocated to develop technology embedded to mobile cell phone, on product feature itself, and maintenance. Some of proposed product characteristics for product development based on customer desire were shown on Table 4, and its description on Table 5.

Based on dissatisfaction indicators aforementioned and products technical characteristics, it was defined technical characteristics that should be improved in order to produce mobile cell phone and the level of difficulty in achieving target improvement,

as shown in Table 6. Target suggestion was formulated based on expert interviews. Values of 1, 2, 3, 4, and 5 represent respectively the degree of difficulty was very simple, easy moderate, difficult, and very difficult to do.

Table 4 List of consumer desires (WHAT) and level of importance

Secondary	*Tertiary*	*Level of importance*
Product quality performance	Compatible with internet	4.695
	Longer durable battery	4.669
	Better camera resolution	4.477
	Support various application	4.292
	Has many characters on message services	3.797
Durability	Has strong structure	4.549
	Non-vulnerable virus	4.469
	Water resistance	4.303
Maintenance	Easy to find service centre	4.500
	Maintenance service is satisfy	4.485
	Long warranty	4.382
	Spare part is available	4.274
Aesthetics	Attractive shape and trendy	4.210
	Elegant design	4.274
	Various accessories	3.877
Quality perceived	Easily keypad	4.321
	Easily navigation	4.151
	Easily grasp	4.205
	Faster	4.321
	Free of error	4.256
	Easily sending data	4.338
Quality conformance with standards	Camera quality consistent with specification	4.454
	Longer standby	4.518
Reliability	Has many function	4.374
	Capable to perform various application simultaneously	4.179
Features	Big internal memory	4.533
	Provide agenda	4.149
	Use high speed processor	4.431
	Provide external data memory	4.492
	Provide music player	4.738

Table 5 Proposed product characteristics (HOW)

Secondary	*Tertiary*
Technology	Package data technology
	Graphic density
	Application
	Message box
	Anti virus
	Processor
	Internal memory
	External memory
	Data transfer tool
	MP3 facility
Product	Structure material
	Gap
	Battery capacity
	Screen wide
	Shape
	Keypad size
	Navigation button
	Hand anthropometri
Maintenance	Selling partner
	Labour
	Warranty
	Outlet

Table 6 Technical product characteristic description

Tertiary	*Description*
Package data technology	Using advance internet technology
Graphic density	Small picture density will result good picture
Application	Complete application to satisfy all consumers needs
Message box	Higher message page will increase characters per short message (SMS)
Anti virus	Use the best anti virus
Processor	High processor to support faster process
Internal memory	High capacity internal memory in order to anticipate fail processes
External memory	High capacity external memory to save data
Data transfer tool	Develop Bluetooth technology with longer distance capacity
MP3 facility	Since mostly music listened is MP3, use MP3 facility good performance
Structure material	Use high quality material

Table 6 Technical product characteristic description (continued)

Tertiary	*Description*
Gap	In order to minimise gap, keypad is right next to casing and lid using rubber material
Battery capacity	Use high capacity battery
Screen wide	Wide screen
Shape	Elegant and trendy
Keypad size	Suitable keypad size in order to be easy to be used
Navigation button	Easier and good navigation button is using sensor
Hand anthropometri	Adjustable with user hand anthropometri
Selling partner	Enhance accessories partner which produce varies accessories, and also service partners for maintenance
Labour	Enhance labour skill so that capable to provide good services
Warranty	Need longer warranty so that product quality should be enhanced
Outlet	Enhance outlet in order to provide all consumer needs for accessories, maintenance, and other services.

Table 7 Technical characteristics target

No.	*Technical characteristics*	*Target*	*Degree of difficulty*
1	Package data technology	Use 3G technology	3
2	Graphic density	Use camera 5 MP, 2,592 × 1,944 pixels	3
3	Application	Use Android 4.0 technology	3
4	Message box	Support seven pages message box	3
5	Anti virus	Antivirus Kaspersky	3
6	Processor	Quadcore processor	3
7	Internal memory	2 GB internal memory	3
8	External memory	32 GB external memory	4
9	Data transfer tool	Bluetooth 2.2	4
10	MP3 facility	Winamp player	3
11	Structure material	Alloy material	4
12	Gap	No open gap design	3
13	Battery capacity	lithium-ion (li-ion)	3
14	Screen wide	2,8”	4
15	Shape	Thin	3
16	Keypad size	Wide size keypad	3
17	Navigation button	Use *trackpad*	3
18	Hand anthropometri	Adjustable to hand anthropometri	3
19	Selling partner	Partners in all regions	3
20	Labour	Expert labour	3
21	Warranty	Two years warranty	4
22	Outlet	Outlet in all regions	3

In order to increase market share, product development team should posses a good knowledge about competitor product. 'Siemens' brand from German in this case was used as competitor product. In doing so, consumer perception towards 'Siemens' brand was explored. Based on customer's views, there were some product characters that have to be developed to enter the market. Table 7 represents product features that should be developed based on customer views on 'Siemens' brand. Values of 1 up to 5 were also deployed in order to describe performance level of developed and competitor products. Value 1 up to 5 represented respectively 'very poor', 'poor', 'moderate', 'equally to good', and 'very good'.

Table 8 Assessment of competitor and developed products performances

No.	*Technical characteristics*	*Performance level*	
		Competitor	*Developed product*
1	Package data technology	2	5
2	Graphic density	2	4
3	Application	2	4
4	Message box	2	4
5	Anti virus	2	4
6	Processor	2	4
7	Internal memory	2	4
8	External memory	2	4
9	Data transfer tool	2	4
10	MP3 facility	3	5
11	Structure material	2	5
12	Gap	2	4
13	Battery capacity	3	5
14	Screen wide	2	4
15	Shape	3	4
16	Keypad size	3	4
17	Navigation button	2	4
18	Hand anthropometri	2	4
19	Selling partner	3	4
20	Labour	3	4
21	Warranty	3	4
22	Outlet	4	5

Next step was building HOQ. This is the first of HOQ in which consumer needs and desires (WANTS) was correlated to product characteristics (HOW). Deploying HOQ in determining product characteristics guide us to put HOW aspects on top roof and WHAT aspects on side roof. Each aspect of WHAT was correlated with each aspect of HOW. Prior to performed correlation between WHAT and HOW, it was performed correlation between indicators within WHAT and within HOW. Table 9 described the correlation between HOW indicators as an example.

Table 9 Correlation direction between aspects within HOW

No.	*Description correlation of technical characteristics*	*Correlation direction*
1	Application and antivirus are related, as antivirus presence, all applications are able to run perfectly.	Positive
2	Application and processor are strongly correlated. High speed processor support multi running applications.	Strong positive
3	Screen wide and shape are strongly correlated, if screen wide enhance then product shape should be changed.	Strong positive
4	Product shape and keypad size are strongly correlated, if keypad size enhance then product shape should be changed.	Strong positive
5	Product shape and navigation button are correlated strongly.	Strong positive
6	Product shape and hand anthropometri are strongly correlated.	Strong positive
7	Labour skill and warranty are correlated. High skill labour will be able to produce high quality product so that longer warranty can be offered.	Positive
8	Labour skill and outlet are correlated. High skill labour will be able to satisfy consumers, so that high skill labour should be recruited for all outlets.	Positive
9	Standby mode will be longer when the battery lifetime is longer	Strong positive
10	Support various application so that is capable to fulfil various needs	Strong positive
11	Support various application including agenda facility	Positive
12	Support various application including music player	Positive
13	Internal memory should has big capacity in order to save various basic applications	Strong positive
14	External memory to save various applications others than basic applications	Strong positive
15	The presence of agenda facility supports various needs	Positive
16	The presence of music player supports various needs	Positive
17	High capacity of internal memory is needed to avoid failure processes	Strong positive
18	To faster process running, high speed processor should be used	Strong positive
19	In order to run the application simultaneously, high speed processor should be used	Strong positive
20	In order to run the application simultaneously, high capacity memory should be used	Positive
21	Camera quality is fulfil predetermined standard	Positive

In order to develop product as expected by consumers, performance of existing product (‘Siemens’ brand in this case) was evaluated. Furtherly consumers were asked to rate the importance of all those indicators expected performed by new product. Table 10 represents the importance of indicators to be considered on development. Based on all information above, HOQ 1 was built. In summary, result of HOQ 1 is shown on Table 11.

Table 10 Consumer desires and importance level

No.	*Consumer desires*	*Importance level*	
		Competitor	*Developed product*
1	Compatible with internet	3	5
2	Longer durable battery	4	5
3	Better camera resolution	4	4
4	Support various application	2	4
5	Has many characters on message services	3	4
6	Has strong structure	5	5
7	Non-vulnerable virus	3	4
8	Water resistance	4	4
9	Easy to find service centre	4	5
10	Maintenance service is satisfy	3	4
11	Long warranty	3	4
12	Spare part is available	3	4
13	Attractive shape and trendy	3	4
14	Elegant design	4	4
15	Various accessories	3	4
16	Easily keypad	3	4
17	Easily navigation	4	4
18	Easily grasp	4	4
19	Faster	3	4
20	Free of error	4	4
21	Easily sending data	3	4
22	Camera quality consistent with specification	3	4
23	Longer standby	4	5
24	Has many function	3	4
25	Capable to perform various application simultaneously	3	4
26	Big internal memory	3	4
27	Provide agenda	3	4
28	Use high speed processor	2	5
29	Provide external data memory	4	4
30	Provide music player	3	4

Table 11 Technical characteristic and priority level

No.	*Technical characteristics*	*Priority level*
1	Package data technology	55.6
2	Graphic density	81.0
3	Application	184.5
4	Message box	34.2
5	Anti virus	40.5
6	Processor	174.2
7	Internal memory	64.5
8	External memory	53.4
9	Data transfer tool	38.7
10	MP3 facility	55.2
11	Structure material	41.4
12	Gap	38.7
13	Battery capacity	82.8
14	Screen wide	50.7
15	Shape	76.5
16	Keypad size	76.5
17	Navigation button	75.6
18	Hand anthropometri	114.3
19	Selling partner	154.8
20	Labour	40.5
21	Warranty	39.6
	Outlet	79.2

Based on above result, the most important to be considered in developing new mobile cell phone was the application. Mobile cell phone should support various applications. The result supported the shifting of a mobile phone concept. The cultural meaning of the mobile phone has moved beyond that of a *simple* tool or *appliance*. Instead, it has become a commodity. It was earlier on its invented that a mobile phone was a phone that can make and receive telephone calls over a radio link while moving around a wide geographic area. Embedded various application is increasingly required since the entry of internet to mobile phone. To support browsing activity on internet for instance, most of modern mobile phones are incorporated with browsing applications such as Opera Mini, Internet Explorer, Mozilla fire fox, Opera and Google chrome. It was also important to develop or partnering to develop new application to fulfil various needs of consumers.

Considering that the respondent to this study was higher education student, the need for various and high technology of application does make sense. Mobile phone is demanded to support various applications which are used in mobile learning such as short message services (SMS), GPS, camera, browsing, downloading, Bluetooth, WiFi, voice calls, gaming, etc. (Kafyulilo, 2014; Carnevalli et al., 2010).

Following in the second order is processor. However to be capable in running various application, high speed processor should be supported. Surprisingly, warranty came at the fourth to the last priority. The result supports the evident of habit of Indonesian consumers, i.e., changing gadget frequently. Gadget was just like other fashion goods, it was change as new model launched.

5 Conclusions and suggestion

This study represents unique contribution both for theoretically and practically. Practically, this research provides useful information for future local mobile cell phone development to win the market share in Indonesia. Theoretically, this study was important as we integrating customer needs and wants with technical characteristic in empirical study using QFD.

Practically speaking, we found that consumer was dissatifastify towards control product used. In developing new mobile cell phone, product's features that should be put on first priority should be the application. The company should recruit the best programmer to develop application that is best suit with consumer needs and wants. Following in the second, third and fourth orders were processor, partner and hand anthropometry. Those four characteristics showed highest priority compare to others. Batteries, image density, branch outlets, shape, keyboard size, navigation buttons, internal memory, data package technology, MP3 facilities, external memory, screen size, structures material, antivirus, labour, warranty, data sending device, gap, and the page on SMS came in order to less priority. It showed that technological innovation is important in satisfying customer (Abdallah et al., 2016).

For the application feature, Android 4.0 technology is suggested. Using this technology, local mobile cell phone product is expected capable to compete with other similar products. This study used non-existence brand in order to learn from its failure. However, it is important to evaluate from existence brand. Further research was recommended to refine the results of this study, by using more control brand, especially a market mobile phone leader, such as 'Samsung' nowadays.

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