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Targeting as the Basis for Pre-Test Market of Lithium-ion Battery

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Abstract. This article discusses about market segmentation and targeting as a first step in pre-test market of a new technology. The benefits of targeting towards pre-test market are pre-test market can be conducted to focus on selected target markets so there is no bias during the pre-test market. In determining the target market then do some surveys to identify the state of market in the future, so that the marketing process is not misplaced. Lithium ion battery which is commercialized through start-up companies is the case study. This start-up companies must be able to respond the changes and bring in customers as well as maintain them so that companies can survive and evolve to achieve its objectives. The research aims to determine market segments and target market effectively. Marketing strategy (segmentation and targeting) is used to make questionnaire and cluster analysis in data processing. Respondents were selected by purposive sampling and have obtained data as many as 80 samples. As the results study, there are three segments for lithium ion battery with their own distinguished characteristics and there are two segments that can be used as the target market for the company.

INTRODUCTION

The role of university in the new company development is increasingly getting more attention. Due to pressure in contribution of economic development, technology commercialization, and research capitalization; there is a new understanding how universities can enhance new company development [1]. A spin-off has been chosen as the best way for the start-up company in Sebelas Maret University [2]. Before a spin-off company is launched, university must analyse the time and provides a framework to launch it qualitatively [3]. According to the Institute for Research and Community Services (LPPM) of Sebelas Maret University (UNS), there are 80 considerable innovative products as 22 patents, 43 brands and 10 copyrights in 2013. However, there is no any single study output has been successfully commercialized [4].

Sebelas Maret University has three inventions that are incubated in PIT and directed to be a university spin off [5]. In order to commercialize the spin offs successfully Technology Innovation Center of Sebelas Maret University (PIT-UNS) conducts cooperation with Technology Incubator Center of Agency for the Assessment and Application of Technology (BIT-BPPT) in incubating tenant. One of the companies is PT Futura Energi Nusantara (FEN). Product of PT FEN is 18650 lithium ion batteries, called Ferphos. Lithium ion (Li-ion) is one of the rechargeable batteries [6]. The Li-ion battery is a potential technology for commercialization as it can contribute more to market of secondary battery industry in Indonesia [7]. Based on previous research studying about mini manufacturing plant for battery 10kWH, it is feasible to implement a Li-ion battery company [8]. The technical feasibility for this lithium ion battery can meet the level 7 of TRLs [9].

Ferphos has passed one of commercialization testing step, production testing. The next stage is pre-test market. A preliminary research is conducted to determine target market of lithium ion battery as the basis of pre-test market. By doing targeting is expected to the company can focus its resources to the most profitable market segments and companies can focus on the market segment that most understandable by the company, so there is no bias during the pre-test market. This study is also interesting to do because there is no pre-test market research that begins with targeting.

Targeting has an essential role to result a better conversion [10]. For that purpose, company has the technology to locate and target consumers [11] [12]. With improved targeting technology, companies are increasingly interested in optimizing their advertisement through targeting specific consumer segments, especially when introducing new products [13].

Basically, all forms of enterprises are oriented to high profit and prosperity for all stakeholders. A company is always encouraged to achieve good outcome and acceptance of their products in the market. Various attempts were made in order to obtain maximum sales volume [14]. However, not all of those efforts are in accordance with their expectations. Some companies suffered losses due to a mismatch in determination of the marketing strategy as well as errors in the selection of market segmentation, target and position [15].

Due to the urgency for every company especially in beginning stage, the marketing strategy becomes an inevitably essential foundation of a company. It will contribute in company survival, where a good marketing strategy will be beneficial particularly in obtaining a lot of turnover, a large market, and consumers loyalty to the company's products [16]. Modern strategic marketing core consists of three main steps which are segmentation, determination of target markets and positioning [17]. Those three steps are often called STP (segmenting, targeting, positioning).

STP measurement can be used as a basis for product planning. Product planning includes process in designing products that related to marketing goals and environmental changes. Products planning based on marketing strategy will enable the company to produce products that can meet the consumer's needs [15]. Almost all of companies are applying the concept of segmentation, targeting and positioning. Due to that concept, the company may be able to recognize and classify their potential customers based on their similarities and differences [18].

Based on Fig 1, Vishal Sapru divided the consumer segment into four types for global consumption. The consumer segment, which accounted for 60.3% of total lithium-ion battery revenues in 2013, is expected to see its market share reduced to 23.9% in 2020 [19]. Based on that study, the motivation of this research are to determine the segments and target markets for lithium ion battery products especially in Indonesia. This activity becomes one of the steps for PT FEN in preparation to be a university spin-off and one part of the company's market testing.

This study is limited to identification the segments and target market of consumer lithium-ion batteries, while market positioning is not addressed. This is due to determine market position, its should compare these products apple to apple with other similar products. While the lithium ion batteries manufactured by PT FEN is a new product with custom size A5 and rarely found in the market, so is it hard to do market positioning.
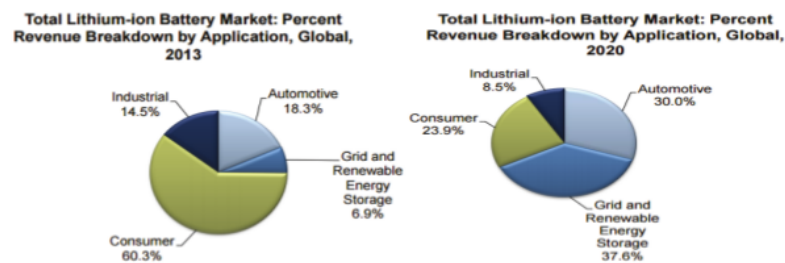
FIGURE 1. Market Overview

LITERATURE STUDY

Marketing is an activity aimed at achieving the company's goals. It is done by fulfilling the needs of customers or clients then directing the flow of goods and services that meet them from producer [20]. In that case, the company must choose the marketing strategy which will determine the target market and marketing mix [17]. Almost any marketing textbook will tell that the key to successful marketing can be summed up by the STP strategy—

segmentation, targeting, and positioning. This approach suggests that the mass market consists of some number of relatively homogeneous groups, each with distinct needs and desires [15].

Segmentation is the process of separating a market into groups of customers, prospective customers, or buying situations as some members of each resulting group are more like with those in same group than members of the other group. [21]. There are several variables that can be used as the basis for segmentation [22]:

1. Geographic: a marketing activity carried out by dividing up the market in some geographical unit characteristics such as area, population, density, and climate.
2. Demographics: a marketing activity undertaken by dividing the market into groups with the variables of age, gender, income, occupation, education, family size, religion, race, generation, citizenship, and social class.
3. Psychographics: a marketing activity carried out by dividing consumers into groups by lifestyle and personality variables.
4. Behavior: marketing activities which split consumer status over different groups by usage status, benefits sought usage occasions, readiness to buy and attitudes towards products variables.

After determining the market segments, the next step is to choose a segment that will be the target market. Target market is one or few market segments that will be the focus of marketing activities [23]. Once segments have been identified, decisions about how many and which customer groups to target can be made [24]. In choosing a target market, there are several criteria that need to be considered [23], which are:

1. The target market should be responsive to the products developed.
2. Potential sales should be quite extensive.
3. Adequate growth.
4. Target market can be achieved optimally.

Positioning includes the design and supply of corporate image for the target market and it is important to know company's position from competitor's view [25]. "Branding"," service "," reliability" and "attraction" emerged as the most dominant positioning strategy [26]. To determine the position of the product, there are three steps [23]:

1. Identify comparative advantage.
2. Choose a competitive advantage.
3. Establish and communicate the position.

Some of the basis used in the determination of the position, include: attributes, price and quality, the use of the product, class of products, and competitors [27].

STP strategy can be used as a prefix in the pre-test market as the appropriate consumers in target market will be the respondents in the pre-test market survey. Pre-test market models are increasingly being used by consumer products company for evaluating new products prior to market testing [28]. As the result from pre-test market, the products may proceed to market testing with a much higher chance of going to a national introduction. Pre-test market has long been applied to a wide range of products or services like advertising [29]. Entrepreneurs from PIT as the instance, has done a pre-test market for their technology-based products such as acoustic panels [30] and clinic management application [31]. The position of the current study are described in Table 1.

TABLE 1.   Research Positions

Author	The Object of Study		Research Focus
	Segmentation	*Targeting*	
Mittal et. al (2016) [32]	√		Demographic segmentation, a cluster analysis approach
Young et.al (2005) [33]		√	Customer targeting method: customer map
This research	√	√	Geographic, demographic, psychographics, and behavior segmentation; cluster analysis; crosstab analysis

METHODOLOGY

The research methodology of this paper is shown in Fig.2. This research uses descriptive analytic survey method and aims to describe segments and target market of lithium ion batteries manufactured by PT FEN. The rationale to conduct the market segmentation has attracted considerable interest in marketing [27] [34] [35]. The research begins with literature study. After that, customer segments and potential markets of lithium ion batteries are analyzed. Then,

it is continued with targeting that will be set in the minds of customers. In this paper, there are four segmentation variables which are: geographic, demographic, psychographic, and behavior.
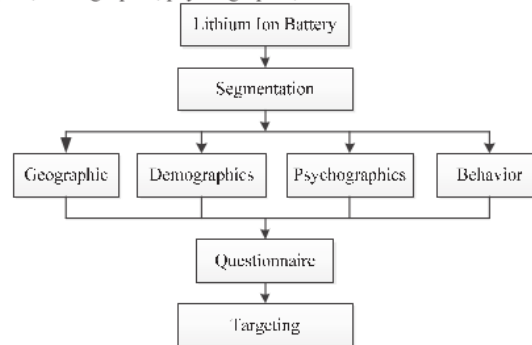

FIGURE 2. Research methodology

Primary data were collected by distributing questionnaires to the end-customer of battery. The population of this research is all batteries consumer in Indonesia. While the number of research samples were taken by 80 respondents who have bought and used lithium ion batteries.

The first step in data processing in this study is the examination of the completeness of the questions contents list. The next step is entry the respondent's answer data and integrated them in the form of a code into the computer. Then, data analysis is done by descriptive analysis to all variables and cluster analysis to learn the market segment. After that, the determination of market segments that will be targeted is done by the justification of researchers based on type of lithium ion battery manufactured by the company.

This research is used as a basis for pre-test market of products 18650 cylindrical rechargeable lithium ion battery cell from PT FEN. Products manufactured by PT FEN has a trade name Ferphos. This battery has 3.2 V voltage and 1300 mAh capacity. While the size of the battery is 18 mm of diameter and 65 mm of height. The product is shown in Fig. 3.

FIGURE 3. Ferphos rechargeable battery

RESULTS AND DISCUSSION

This research uses a public survey to collects data. Data processing and analysis is run by software SPSS 20 which include descriptive analysis, cluster analysis, and crosstab analysis. As the results, segmentation and target market of lithium ion battery products can be identified.

Description the Profile of Respondents

Descriptive analysis is used to describe the data that have been collected in order to make the data more easily and quickly understood by others. The profile of respondents is shown in Table II. Here is a descriptive analysis based on the results of the questionnaire for the lithium ion battery.

	Variable	n	%
Gender	Male	28	35%
	Female	52	65%
Year of birth	> 1993	6	8%
	≤ 1993	74	93%
Education	SD/SMP/SMA	70	88%
	Diploma	1	1%
	Bachelor	8	10%
	Master	1	1%
Work	Student	1	1%
	College student	68	85%
	Government employees	2	3%
	Private	3	4%
	Entrepreneur	6	8%
Income	< IDR 1.000.000	29	36%
	IDR 1.000.000 to IDR 2.500.000	38	48%
	IDR 2.500.001 to IDR 5.000.000	11	14%
	> IDR 5.000.000	2	3%
Using of battery each month	1-3 pieces	74	93%
	4-8 pieces	5	6%
	> 8 pieces	1	1%
Place to buy battery	Online	3	4%
	Outlet	59	74%
	Exhibition	4	5%
	Supermarket	7	9%
	Electrical appliance shop	7	9%

TABLE 2. The Profile Of Respondents

According to Table II, many respondents of this research using 1-3 lithium ion batteries each month (93%) and make purchases at outlets (74%). Some respondents (31%) had suffered damage when using batteries. Among respondents mention the type of damage that occurs is leaking battery, the battery expands, and battery drop.

Based on descriptive analysis it can be known what kind of applications of lithium batteries that have been used by the respondent. Most respondents are already using lithium in electronic devices such as smartphones, tablets, notebook and power bank as shown in Fig.4. While in Fig. 5, it is noticeable that durability, long lasting, battery capacity, quality and price in sequence are dominating criteria used by respondents as consideration in purchasing lithium ion battery.
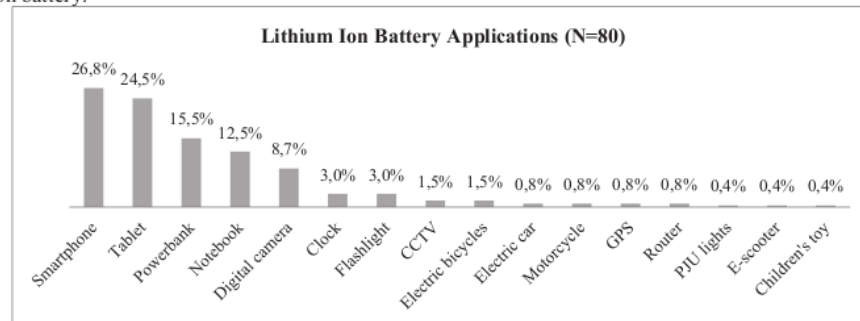
Lithium Ion Battery Applications (N=80)

26,8% 24,5% 15,5% 12,5% 8,7% 3,0% 3,0% 1,5% 1,5% 0,8% 0,8% 0,8% 0,8% 0,4% 0,4% 0,4%

Smartphone, Tablet, Powerbank, Notebook, Digital camera, Clock, Flashlight, CCTV, Electric bicycles, Electric car, Motorcycle, GPS, Router, PJU lights, E-scooter, Children's toy

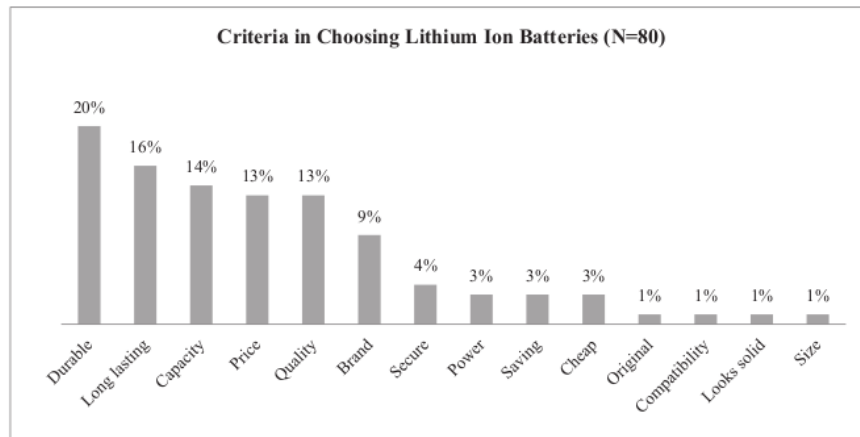**FIGURE 4.** Lithium ion battery applications

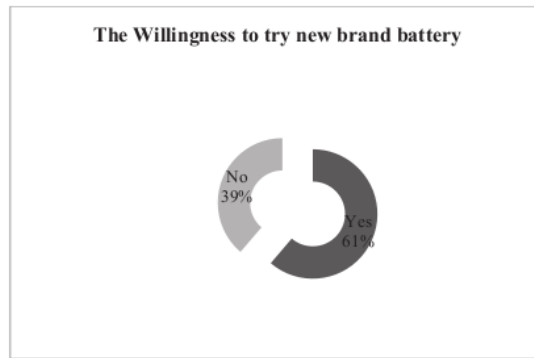**FIGURE 5.** Criteria in choosing lithium ion batteries

FIGURE 6. The willingness to try new brand battery

Based on Fig. 6, we also know that from 80 respondents, 61% or 49 respondents were willing to try a lithium ion battery with a new brand, while the remaining 39% or 31 respondents are not.

Cluster Analysis Lithium Ion Battery as a Market Segmentation

Based on the results of cluster analysis using SPSS software 20, it is known that there are three groups of segmentation. The characteristics of each cluster can be found in appendix 1. Based on the analysis in appendix 1, the characteristics of respondents in cluster 1 dominantly are women with age less than 23 years old and the education level is elementary/junior high/high school. Job status is a college student with pocket money less than IDR 1.000.000,- per month. The number of batteries that are used every month is 1-3 batteries and majority buy battery at the retail outlet.

Characteristics of respondents in cluster 2 majority are women with age less than 23 years old and the education level is elementary/junior high/high school and the majority of jobs are college students. Amount of pocket money for every month is between IDR 1,000,000 to IDR 2,500,000. Most of them using 1-3 batteries every month and buy these batteries at the retail outlet.

Cluster 3 majority are women with age less than 23 years old and the education is elementary/junior high/high school. Job status is as a college student with a monthly allowance of < IDR 1,000,000 to IDR 2,500,000. They majority use 1-3 batteries every month and buy these batteries at the outlet.

The group division is based on the variables used in the survey questionnaire. Each cluster has a different main characteristic in buying lithium battery products. The list of the main characteristics is shown in Table 3.

TABLE 3.   The Main Characteristics Market Segmentation Of Lithium Ion Battery

Cluster		
1	*2*	*3*
- Using Li-ion battery products for meeting the needs. - Buying Li-ion batteries as needed	- Consider the country of origin of the product manufacturer. - Assume Li-ion battery products used by middle-class society - Choosing a Li-ion battery with packaging that has local ethnic characteristic - Using Li-ion battery instead of Lead Acid batteries. - Buying products Li-ion battery of the brands are well known and trusted - Buying products Li-ion batteries because they are attracted to the brand. - Using Li-ion batteries because the batteries are environmentally friendly. - Buying products Li-ion battery by considering the promo price. - Assume products Li-ion batteries easily obtained. - The shape and color of Li-ion battery packs influence buying decisions. - Buying Li-ion battery as interested in advertising - Comparing other brands before buying Li-ion - Assume that the Li-ion battery product prices more affordable than conventional batteries.	-Assume Li-ion batteries are mostly used by the upper class -Assume products Li-ion battery is very easy to use. -Assume Li-ion battery gives the impression of a high-tech. -Having an electronic device using Li-ion batteries is more than one. -Distance to point of sale affect buying interest. -Buying Li-ion battery because it has warranty. -Buying Li-ion battery because it has a strong level of resistance / durability. -Buying Li-ion battery because it has a light weight. -Buying Li-ion batteries because many friends are using it.

Based on the results in Table 3, it can be concluded that Cluster 1 is composed with type of customers who will buy lithium batteries that satisfy their needs. Cluster 2 consists of consumers who consider the brand of product, country of origin of the product manufacturer, price promotions, advertisement, and using lithium batteries instead of lead acid batteries. While member in cluster 3 are consumers who think that the lithium battery has a high-tech and electronic appliance, use a lithium battery more than once, consider the distance of the purchase point, warranty, durability and weight of the battery, as well as the influence of friends in purchasing of battery products.

Variables that are considered important enough for the three groups are simplicity of use, the needs of respondents, respondents' intention to have more than one electronic devices, environmental aspect, affordability, warranty, high durability and a light weight.

The next analysis is to determine the profile of the formed cluster by using crosstab analysis for some general questions. An analysis of cluster results will be carried out with the questions of lithium ion battery that has been applied to any products owned by each respondent.

According to Table IV, respondents in the first cluster are likely to apply lithium ion battery on a smartphone, tablet, notebook, power banks, clocks, flashlight and digital camera. While the second cluster member prefer to use the battery for smartphones, tablets, power banks, notebook, digital camera, flashlight, clocks, CCTV, and electric bike. The remaining respondents in third cluster tend to utilize it for smartphone, tablet, notebook, power banks, wall clocks, flashlights, digital camera, e-scooter, and electric bike.

TABLE 4.	Cluster Groups Based On Lithium Ion Battery Application	
Cluster		
1	*2*	*3*
The majority using lithium batteries to be applied on a smart-phone, tablet, notebook, power banks, clocks, flashlight and digital camera.	The majority of respondents use lithium batteries for smart-phones, tablets, power bank, notebook, digital camera, flashlight, clocks, CCTV, and electric bike.	The majority of respondents using lithium as a smartphone, tablet, notebook, power banks, wall clocks, flashlights, digital camera, e-scooter, and electric bike.

Determination of Target Market Analysis

The market has different characteristics and it is naturally a compulsory for the company to be able to select markets in accordance with their ability. Market segmentation is a way for companies to classify heterogeneous market into homogeneous parts market. As the execution, the company should be able to determine and select the target market (the same market, the different market or concentrated market) and market needs so that marketing can run effectively.

Segmentation is the first step for the company to determine who will enter the market and offer the company's products to the market. After determining the market segments to be served the next step is to choose one or more target markets which potentially provide benefits to the company.

Based on segmentation upon the characteristics of the respondent, PT FEN can enter the segment 2 and segment 3 (Fig. 7). The criteria for the respondents are as follows:

1. Income between 1 million to 2.5 million
2. Use a lithium ion battery for 1-5 years
3. Apply the battery on a smartphone, tablet, notebook, power bank, digital camera, flashlight, clocks, e-scooter, and electric bike
4. Use 1-3 lithium ion batteries
5. Prefer to buy batteries at the outlet, exhibitions, and online
6. Choose the battery with the characteristics of durable, long lasting, good quality, capacity on demand, and trusted brand.

Regarding to the company's ability that has been yet possible to produce various types of lithium ion batteries, the company may try to market their products to consumers who have been also using the battery pack in their development. Electric bike users, service providers such as children's toys (odong-odong), electric motorcycles and electric cars for children are the examples.
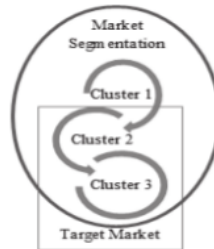

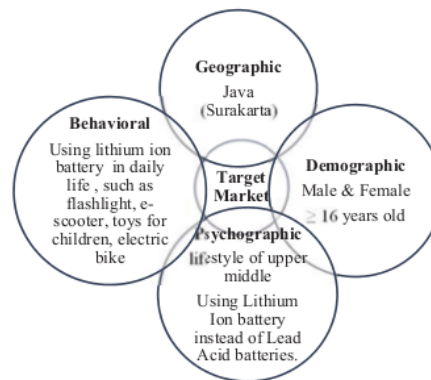FIGURE 7. Cluster segment for pre-test market lithium ion battery

FIGURE 8.   Target market for pre-test market lithium ion battery

From the results of market targeting can be made a managerial implication for the company as shown in Table 5. The managerial implication can increase company productivity by increasing the capacity, quality, efficiency and effectiveness of existing resources.

TABLE 5.   Managerial Implications From The Result

Research Result	Managerial Implications
Price effect on consumer choice	The price of environment-friendly products is positively related to consumer preference. Consumers tend to use price as an indicator of quality. So as long as quality of lithium ion batteries product are high can generate high consumer satisfaction, in which case consumers feel has got a safe product, has joined protecting the environment and has been getting a product that is comparable in quality to the price, but do not close the possibility for consumers to choose products with a promo price.
Environment-friendly products effect on consumer choice	With increasing awareness of consumers to consider environmental issues in their purchasing behavior, then the company should not just maintain the quality of its products, but even more so to be able to create new innovations of products that are reliable, environmentally friendly and understand the needs of consumers.
Places effect on consumer choice	Provide commodity place that is easily accessible by potential customers, even by providing a delivery service for busy consumers and have a narrow time for shopping.
Advertisement effect on consumer choice	Consumers pay attention to ads when purchasing a product that needs to be widely advertising through print and social media nor word of mouth.

Unlike the target market of the old technology, the new technologies-Ferphos lithium ion battery-has a size A5 to the battery cell and battery pack. Hence it can be used for electronic devices that use cell batteries such as flashlights and toys, as well as electronics that use a battery pack such as electric bicycles, e-scooters, and small generators. It allows new technology of lithium ion battery to be applied to various electronic instruments. Therefore, the results of research on the target market is expected to be used as a reference in implementing the pre-test market for lithium ion batteries.

CONCLUSION

Based on segmentation and targeting of the lithium ion battery product, there are three segments of consumer. Each segment has unique characteristics, profiles, and different behavior where it could affect consumer choice. Most customers of lithium ion batteries use the batteries for smartphones, tablets, notebook and power bank.

They use lithium ion batteries because of high-tech impression, popular among friends, and the country of origin of battery makers is trusted. The important things that are considered important by respondents about the lithium ion battery is environmental aspect, affordability, warranty, high durability and light weight.

From this research can be seen the characteristics that describe the consumer nature and behavior of each segment. These characteristics can be used as a consideration in making a new product to meet consumer needs in accordance

with the segment. The creation of products that comply with the segmentation can be used as a potential investment for business.

Further research can be conducted more in-depth study of the market survey for lithium ion battery that produced by PT FEN. The company may conduct a pre-test market based on target market obtained from this study by implementing the batteries test usage to consumers. The findings can be used as product improvements and developments by the company.

ACKNOWLEDGMENT

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