ChESA 8th
Chemical Engineering on Science and Applications

AIC 2015
ANNUAL INTERNATIONAL CONFERENCE
UNIVERSITAS SYIAH KUALA

THE 8th CHEMICAL ENGINEERING ON SCIENCE AND APPLICATION
(ChESA)
IN CONJUNCTION WITH
THE 5th ANNUAL INTERNATIONAL CONFERENCE SYIAH KUALA UNIVERSITY
(AIC - UNSYIAH)

PROCEEDING

AAC Dayan Dawood, Darussalam - Banda Aceh, Indonesia
September 9 - 11 , 2015

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SYIAH KUALA UNIVERSITY

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SOCIAL SCIENCES CHAPTER

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in conjunction with

The 5th Annual International Conference Syiah Kuala University

Banda Aceh, 9-11 September 2015

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WELCOME SPEECH FROM THE RECTOR

Assalamu'alaikumWr. Wb.

In the Name of Allah, the Most Beneficent, the Most Merciful

May the peace, the mercy, and the blessings of Allah be upon you.

Ladies and gentlemen, it is an honor indeed to open this conference, the 5th Annual International Conference (the 5th AIC) in conjunction with the 8th Chemical Engineering on Science and Application (the 8th ChESA) conference. On behalf of Syiah Kuala University or Unsyiah, I would like to extend a warm welcome to all participants and our speakers who are with us to make this a notable and exciting event.

This year, Unsyiah commemorates its 53rd anniversary. As part of the celebration, the university has held a number of events, including this interdisciplinary conference from September 9-11, 2015. At Unsyiah, we emphasize the excellence in education and research, and are also committed to innovation and technology. Today, we are facing more challenges in these spheres, therefore, as members of the academic community; we have a duty to find innovative research solutions for them. Hence, this conference is an excellent forum for experts, professionals, researchers, and students, to present, share, and discuss their knowledge and experiences with all of us. As a result, it is a privilege to host you, not just this year, but for years to come, to give and provide opportunities to contribute lasting and practical solutions to the challenges that confront us from time to time.

This conference includes keynote speeches, oral and poster parallel sessions on topics in the Food and Biochemical Engineering, Catalytic Reaction Engineering, and much more. The topics come from the belief to develop clean energy technology for community welfare. We thank our keynote and invited speakers for their contribution, time and support for this conference. Heartfelt appreciation goes to all the authors of the selected papers for their effort and hard work. I also thank the organizing committee of the conference for their exertion in making this event successful. I wish to encourage them to continue more events and other initiatives as well. To support and sustain important research linkage for dialogue and facilitate ideas exchange such as this will certainly generate many new discoveries in years to come.

Finally, I wish you a wonderful stay in Banda Aceh. Please enjoy our university's pleasant learning environment and our city's appealing offer in food and tourism. I am sure the committee of this conference extends their warm hospitality to make your brief stay positively memorable.

May God bless us all with the health to make this event a successful and enjoyable one!

Thank you.

Prof. Dr. Ir. Samsul Rizal, M.Eng

Rector of Syiah Kuala University

Message from the Chairman of AIC

Assalamu'alaikum Wr. Wb.

I take this occasion to cordially welcome all participants of the 5th Annual International Conference (or AIC) in conjunction with the 8th Chemical Engineering on Science and Application (or ChESA) conference. This conference is held in the heart of our campus, Syiah Kuala University or Unsyiah, Banda Aceh, from September 9 to September 11, 2015. Unsyiah, the home of 12 notable faculties and one school of postgraduate studies, is one of the major state universities in Indonesia. Its pleasant surroundings in a city with remarkable history are a spotlight for this congregation. We are assured that the 200 scientific participants contribute to productive discussions and exchanges that impact the success of this conference. Participants from 10 countries; Indonesia, Malaysia, Thailand, South Africa, Japan, Singapore, Taiwan, Germany, England, Australia countries have marked the conference to be in an international scope.

I would like to express my gratitude to the Research Institute of Syiah Kuala University or LembagaPenelitian (Lemlit) and the committee members for helping us with full force in organizing the conference. The conference and proceedings are a credit to a large group of people and everyone should be proud of the outcome.There are four plenary speakers covering the different areas of the conference. From science and engineering, there is Prof. Dr. Evamarie Hey-Hawkins from University Leipzig, Germany. From ChESA, there is Dr. Kazuaki Syutsubo from the National Institute for Environmental Studies (NIES), Japan. From life sciences, there is Associate Professor Dr. Ororat Mongkokporn from Kasetsart University, Thailand. And finally from social sciences, there is Professor Dr. Patrick Daly from National University of Singapore. Their talks cover the full range of the conference topics.

We are delighted with the vast responses of 166 submissions from researchers and practitioners. The knowledge bases that we are aiming to generate on the conferences topics are overwhelming due to the involvement of these experts from various fields of studies. Their papers are published in the proceedings to provide permanent records of what has been presented. The proceedings are divided into Life Sciences, Engineering, Social Sciences, and ChESA sections, and the 158 papers published here exhibit the current state of development in all aspects of important topics that are instrumental to all researchers in the field. They have succeeded in bringing together various aspects of developments and innovations in knowledge and technology that will benefit not only the academic community, but society itself.

It is hoped that this conference does not only provide a member meet, but also offer a common platform for academia and practitioners to discuss issues related to their field of studies. We also wish everyone a pleasant stay in Banda Aceh and have a taste of our best traditional culinary.

Thank you,
Prof. Dr. drh. Darmawi, M.Si

MESSAGE FROM THE CHAIRMAN OF ChESA

Assalammualaikum Wr. Wb.
Honorable Guests, Presenters, and Participants,

First of all, I would like to thank you for your valuable contributions to this conference that is conducted by Chemical Engineering Department of Syiah Kuala University. Our department is one of the largest department in Engineering Faculty. It was established in 1963 driven by a spirit to form a deparment to bring Acehnese to become educated, knowledgeable, and technocrate. Therefore, we try to give our best in contributing our ideas in the field of Chemical Engineering Science and Applications so that we can cooperate to improve our daily lives. We understand that it takes time to achieve the target; however, we believe one effort is much better than nothing.

I am also happy to inform that the committee is very lucky to have 5 Plenary and invited speaker Speakers, i. e. from Japan, Germany, and Indonesia, who supported us from the very beginning with their capabilities to try and personally come and meet you all.

This conference has collaborated with four international journals, i.e. Bulletin of Chemical Reaction Engineering and Catalysis, International Journal of Science and Engineering, and International Journal of Renewable Energy Development. All selected conference papers are then peer-reviewed to meet the highest standards of publication. The peer review of each manuscript is rigorous and concentrates on objective and technical concerns to determine whether the research has been sufficiently well conceived, well executed, and well described.

Finally, I expect all participants have memorable moment through this conference and enjoy your stay in Banda Aceh.

Thank you.
Sincerely,
Chairman of Committee
Dr. Nasrul Arahman, ST, MT

CONTENT – Social Sciences

Antecedents of Brand Loyalty for Mobile Telecommunications Services

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Abstract
This paper aims to report on a study into the antecedents of consumer brand loyalty, in the context of telecommunications service brands in Indonesia. A questionnaire-based survey was used to gather attitudes towards brand loyalty and its antecedents in the context of mobile telecommunications service providers in Indonesia. The questionnaire was distributed, in Indonesia, to university students, lecturers, and staffs in Indonesia, a group selected as being active users of mobile phone services; 312 completed questionnaires were received. Data were entered into SPSS. Structural equation modelling (SEM) with AMOS 18,0 program was applied to identify the antecedents of brand loyalty. Factor analysis identified 4 antecedents of brand loyalty; these can be theoretically clustered into three groups: brand awareness antecedents (controlled communication (advertising), and uncontrolled communication (publicity, word of mouth)); brand image antecedents (price and service quality); brand delivery antecedents (servicescape and employee services); and brand trust. Result showed the contribution of each of these antecedents to brand loyalty. This paper contributes to theorise by proposing and testing one of the first holistic models to integrate consideration of many of the antecedents of brand loyalty.

Key words: Brand loyalty, brand awareness, brand image, brand delivery, mobile telecommunications services

Introduction
The telecommunication sector, especially the mobile phone sector is one of the fastest growing business segments of the country which provide a lot of value addition to the society with it's service and creation of employment opportunities (Paulrajan & Rajkumar, 2011). The number of mobile subscribers has been increased dramatically (Islam, 2010; Price Water House Coopers, 2006). Certainly mobile technologies have a very crucial and important impact on today's businesses (Haghirian et al., 2005). As a result mobile technologies are providing many opportunities for marketing activities, especially direct communication opportunity with consumers anytime, anywhere (Haghirian et. al., 2008). Mobile phone services are becoming so popular primarily because of mobility, safety, price and privacy (DeBaillon & Rockwell, 2005).

Loyalty programmes are similar for mobile-telecommunication users with the objective of rewarding subscribers for their usage (Kim, Park, & Jeong, 2004). According to Kotler and Keller (2009), frequency programmes are designed to provide rewards to customers who buy frequently. These programmes are also evident in the mobile-telecommunication industry.

Branding and brand management have been well-recognized management priorities and strategic aims for companies for many years (Kapferer, 2008; Keller, 2008; Post, 2008). In the service industry, brand management requires brand managers to take a holistic view of the brand that transcends the marketing and service function and makes it a rallying cry for the firm (Smith, 2004). Brand loyalty is considered to be important to businesses as loyal customers spend more money than non-loyal customers (O'Brien & Jones 1995) and act as advocates for the brand by engaging in positive word of mouth (Oliver 1999). Thus "loyal customers are at the heart of a company's most valuable customer group" (Ganesh, Arnold & Reynolds 2000, p66).

The intangibility of services and the associated high perceived risk, appears to place emphasis on the relationship between the service provider and purchaser. The purchaser needs to trust the service provider to provide them with the desired quality service. Thus trust plays an important role in developing the relationship (Gwinner, Gremler & Bitner 1998). Trust is proposed as one of the two key variables of the relationship marketing field (Morgan & Hunt 1994). In this context, brand trust is of crucial importance. Trust has to be considered as the corner stone and as one of the most desirable qualities in the relationship both between a company and its customers and in the relationship between a brand and its consumers. The focus on brand trust is based on findings that there is a strong positive relationship between brand trust and brand loyalty (Chaudhuri & Holbrook, 2001).

While much attention has been given to this issue, the dominant brand loyalty drivers have been service quality, and perceived value (Brodie et al., 2009; Cronin et al., 2000; Dick & Basu, 1994; Oliver, 1997; Zeithaml et al., 1996). These constructs have also been considered the building blocks of customer loyalty (Bolton & Drew, 1991; Lovelock & Wirtz, 2007; Zeithaml, 1988) and important in the services literature (Cronin et al., 2000). Traditionally studied individually or in bivariate models, recent studies find these constructs in models of service evaluation processes related to a brand loyalty such as the behavioral intention (Chitty et al., 2007; Clemes et al., 2009; Cronin et al., 2000; Fornell et al., 1996; Lai et al., 2009).

This paper aims to report on a study into the antecedents of consumer brand loyalty, in the context of telecommunications service brands in Indonesia.

Literature Review
Brand loyalty is composed of two constructs attitudinal brand loyalty, and behavioural brand loyalty. Prior research on attitude indicates that it mediates the effects on other factors on behaviour (Ajzen & Fishbein, 1980; Baldinger & Rubinson, 1996; Dick & Basu, 1994). In this model, attitudinal brand loyalty is proposed as the only construct to have a direct effect on behavioural brand loyalty. The factors that are proposed to directly effect attitudinal brand loyalty is trust. The attitudinal variables measure of loyalty include trust (Swan et al,. 1988. p 1-8; Morgan and Hunt. 1988. p. 20-38; Anderson and Narus. 1988. p. 42-58).

The concept of brand loyalty is comparatively more important for services sector, especially for those who provide services with little differentiations and compete in dynamic environment i.e. telecommunication sector (Santouridis & Trivellas, 2010). Brand loyalty received a great deal of interest and attention in telecommunication sector. Many foreign studies carried out for this sector. For example, France (Lee, Lee & feick, 2001), South Africa (Van der wal, Pampallis & Bond, 2002), Turkey (Aydin & Ozer, 2005), USA (Lim, Widdows & Park, 2006), South Korea (Shin & Kim, 2007) and Greece (Santouridis & Trivellas, 2010).

Based on the above definitions and suggested relationships in the literature, the following hypothesis is formulated:
  - Hypothesis 1   : Brand awareness has a significant effect on brand trust
  - Hypothesis 2   : Brand image has a significant effect on brand trust

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- Hypothesis 3   : Brand delivery has a significant effect on brand trust
- Hypothesis 4   : Brand awareness has a significant effect on brand loyalty
- Hypothesis 5   : Brand image has a significant effect on brand loyalty
- Hypothesis 6   : Brand delivery has a significant effect on brand loyalty
- Hypothesis 7   : Brand trust has a significant effect on brand loyalty
- Hypothesis 8   : Brand awareness is significant related to brand loyalty, mediated by brand trust
- Hypothesis 9   : Brand image is significant related to brand loyalty, mediated by brand trust
- Hypothesis 10   : Brand delivery is significant related to brand loyalty, mediated by brand trust

Figure 1 shows these relationships and hypotheses.
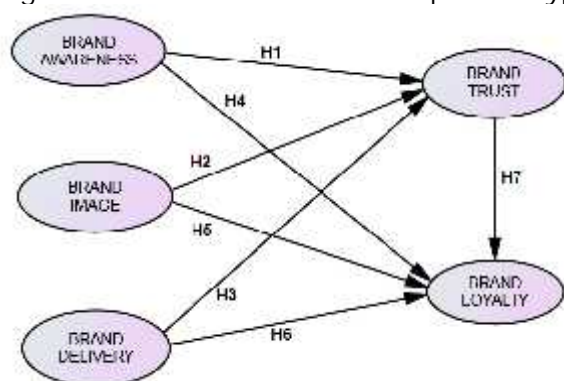
Figure 1. Conceptual model

Research Methods
Considering the research purpose, model, and hypotheses developed, a quantitative approach is used in this research (Malhotra, 2004; Zikmund & Babin, 2007). Moreover, quantitative research methodologies have successfully been used in loyalty studies, particularly in the telecommunication industry setting. The data collection method used was surveys, as self-reported beliefs and behaviours are best measured through a survey instrument (Neuman 1997). Data were entered into SPSS, Structural Equation Modelling (SEM) with AMOS 18,0 program was applied to identify the antecedents of brand loyalty.

Questionnaires are common in survey research. The questionnaire consisted of Likert-type statements about which respondents were asked to indicate their degree of agreement using a five-point scale (with anchors of 1 = strongly disagree and 5 = strongly agree), consistent with Yoo et al. (2000). Respondents were university students, lecturers, and staffs in Indonesia. A multi-stage sample was used; this type of sample is well known for its accuracy and precision (Easterby-Smith et al., 2008). In total 312 usable completed questionnaires were obtained.

A total of 49,6 per cent of respondents were male and 50,4 per cent were female. Ages ranged from 25 to 50 + years of age; most (74,7 per cent) were in the range 25-45. In terms of education, 9,4 per cent were Doctoral students, 36,6 per cent were Master's students, 39,5 per cent were Higher Diploma students, and 5,8 per cent were Bachelor's students.

Results and Discussion
Outlier deletion causes data losses, this method can improve the robustness of multivariate analysis (Hair et al., 2010). There were a total of 27 questionnaires, which were eliminated due to the outliers. To determine the outliers, the Mahalanobis distance (D2) measure was used to assess multivariate outliers. Based on 32 observed variables of the study, the recommended   threshold of chi-square is 65,24722 (p=0.001). Mahalanobis values that

exceeded this threshold were deleted. As highlighted by Kline (2005), deletion of cases that are outliers may also contribute to multivariate normality.

The normality of the data was assessed by using a skewness and kurtosis test on the construct variables. Scholars (Mason & Lind, 1999; Tabachnick & Fidell, 1989) suggest that data is considered as normal if the critical ratios of skewness and kurtosis are in the range of +2.58 (significant at p = 1%) and +1.96 (significant at p = 5%). The results of normality assessment show that most of the data were normally distributed as their skewness and kurtosis values were within the suggested range.

Testing multicolinierity using AMOS software on the proposed research model revealed that the determinant of the sample covariance matrix was equal to 0.000. This result indicates the existence of multicolinierity in the data set. The results of checking normality, outlier, and multicollinierity indicate that the basic SEM assumptions were satisfied.

The reliability of the data is evaluated through coefficient alpha and composite reliability (Nunnally, 1978). The factor loading indicates that all the items in the respective constructs fall above the recommended value, it ranges from 0.600 to 0.983. As Hair, Anderson, Tatham, and Black (2010) highlight, the factor loading above 0.50 can be considered as a good factor loading.

The reliability of the data is evaluated through coefficient alpha and composite reliability. The Cronbach alphas for all the constructs of the study range from 0.736 to 0.875. A Cronbach alpha value of 0.70 and above is generally accepted to demonstrate a high level of homogeneity with the scale (Nunnally, 1978). Hence, the measures of this study are considered reliable and consistent. The reliability test results are shown in Table 1. Likewise, the composite reliability for all the constructs of the study range from 0.752 to 0.933. A composite reliability value of 0.70 and above is generally the accepted norm (Nunnally, 1978).

Table 1. Descriptive statistics and reliability of normalized variables (before transformation)

Construct	No of Items	Mean (Std. Dev.)	Cronbach Alpha	Composite Reliability
Brand Loyalty	3	4.0789 (0.7384)	0,750	0,752
Brand Trust	4	4.0054 (0.7293)	0,796	0,802
Brand Awareness	6	4.2155 (0.6457)	0,771	0,933
Brand Image	12	4.1466 (0.7370)	0,875	0,932
Brand Delivery	7	4.2045 (0.7126)	0,846	0,901

Discriminant validity was assessed using Fornell and Larcker (1981) and Kline's (2005) approaches. The discriminant validity between two constructs is demonstrated if the AVE is greater than the squared correlation between constructs (Fornell & Larcker, 1981), or if the correlation between the constructs is less than 0.85 (Kline, 2005). Table 2 show that all the values in AVE are greater than correlation squares. Thus, the constructs can be said to be unique from each other and discriminant validity among the constructs was relatively satisfied, or to show the absence of multicollinearity.

Table 2. Variance Shared, Variance Extracted, and Correlations between Constructs

	Construct	1	2	3	4	5
1	Brand Loyalty	0.710	0.737	0.019	0.421	0.059
2	Brand Trust	0.731	0.710	0.029	0.483	0.074
3	Brand Awareness	0.015	0.029	0.840	0.076	0.345
4	Brand Image	0.431	0.461	0.064	0.732	0.428
5	Brand Delivery	0.112	0.091	0.319	0.485	0.753

Note: (1) The diagonal entries is variance extracted, (2) The under triangle is correlation between constructs, (3) The upper triangle is squared correlation between construct

Structural model results

The results of the initial estimation of the hypothesized structural model (Table 3) indicate that RMSEA (0.053) falls within the recommended tolerance level, while TLI (0.917) and CFI (0.925) are close to the recommended values. However, GFI (0.846) and AGFI (0.820) do not meet the recommended values. Hair et al., (2006) highlight that the model respecification can improve model fit. Nevertheless, the changes were made to the model that is consistent with the underpinning theory.

Based on the modification indices of covariance and regression weights that are indicated in AMOS, after adding the 4 new paths; the model produces a good level of fit indices, Following Byrne's (2001) recommendation, GFI, CFI, and RMSEA would be used in assessing the fitness of the model, as shown in Table 3.

Table 3. Goodness-of-fit for the conceptual model of brand loyalty

Model	X^2	df	p	GFI	AGFI	TLI	CFI	RMSEA
Initial	800,534	451	0,000	0,846	0,820	0,917	0,925	0,053
Revised	716,831	447	0,000	0,859	0,833	0,935	0,942	0,047

The revised structure model indicates that the results fall within the recommended tolerance levels. The absolute fit indices of GFI (0.859) and the RMSEA (0.047) indicate a good fit. The incremental fit indices of AGFI (0.833), TLI (0.935), and CFI (0.942) also indicate a good fit.

Hypotheses Testing

Based on the revised model of the conceptual model, the hypotheses testing are conducted. It is divided into two sub-sections, namely, direct effect, and indirect effect.

Table 4. Direct impact of revised model – Structural parameter estimate

H	Construct relationship			Stand. Reg. Weight	Critical Ratio	Significance	Status
H1	Brand Trust	<---	Brand Awareness	0,083	0,898	0,369	Not Sig
H2	Brand Trust	<---	Brand Image	0,579	3,654	0,000	Sig
H3	Brand Trust	<---	Brand Delivery	-0,287	-2,133	0,033	Sig
H4	Brand Loyalty	<---	Brand Awareness	0,208	2,275	0,023	Sig
H5	Brand Loyalty	<---	Brand Image	0,657	3,349	0,000	Sig
H6	Brand Loyalty	<---	Brand Delivery	-0,358	-2,443	0,015	Sig
H7	Brand Loyalty	<---	Brand Trust	0,374	2,595	0,009	Sig

The results in Table 4. indicate that the pathways from brand awareness to brand trust (ß=0.083, CR=0.898, p=0.369) (H1) are not significant, brand image to brand trust (ß=0.579, CR=3.654, p=0.000) (H2), and brand delivery to brand trust (ß=-0.287, CR= -2.133, p=0.033) (H3) are significant. Therefore, the hypotheses 2 are fully supported, and 3 are supported, while hypotheses 1 are not supported.

The pathways from brand awareness to brand loyalty (ß=0.208, CR=2.275, p=0.023) (H4), brand image to brand loyalty (ß=0.657, CR=3.349, p=0.000) (H5), brand delivery to brand loyalty (ß=-0.358, CR=-2.443, p=0.015) (H6), and brand trust to brand loyalty (ß=0.374, CR=2.595, p=0.009) (H7) are significant. Therefore, the hypotheses 5 are fully supported, while the hypotheses 4, 6, and 7 are supported.

When there is a mediator in the model, there is a need to compute the effect by comparing it with the direct and indirect effect of mediating variables in the model. According to the authors (Baron and Kenny, 1986; Hair et al., 2010), the mediating roles in the model can be explained in three scenarios with the pre-condition that the mediation requires significant correlations among all the three constructs. They are: (1) If C remains significant and unchanged once the mediator is included in the model, then mediation is not supported, (2) If C is reduced but remains significant when the mediator is included, then partial mediation is supported, and (3) If C is reduced to a point where it is not significantly different from 0 after the mediator is included, then full mediation is supported. The result of testing the mediation effect is presented in Table 5.

Table 5. Indirect impact of revised model – Structural parameter estimate

H	Exogenous		Mediated by		Endogenous	Indirect effect estimate	Direct effect estimate	Total effect estimate	Mediating hypothesis
H8	Brand Awareness	→	Brand Trust	→	Brand Loyalty	0,031	0,208	0,239	Not mediating
H9	Brand Image	→	Brand Trust	→	Brand Loyalty	0,217	0,657**	0,873	Mediated
H10	Brand Delivery	→	Brand Trust	→	Brand Loyalty	-0,107	-0,358*	-0,465	Mediated

Note: * significance at <0.01; ** significance at <0.05

The results in Table 5. indicate that the pathways from brand awareness to brand loyalty that are mediated by brand trust (H8), are not supported, due to the fact that direct effect estimates are more than the indirect effect estimates.

On the other hand, the pathways from brand image to brand loyalty that are mediated by brand trust (H9) and brand delivery to brand loyalty that are mediated by brand trust (H9), are supported. In addition, the decreasing of the coefficient path between brand image and brand delivery (predictor) and brand loyalty (criterion) due to the inclusion of brand image and brand loyalty and brand delivery and brand loyalty path in the model, according to Cohen and Cohen (1983), indicates that the mediation of Brand Trust is partial.

Conclusions
Findings of the study suggest that the level of customer loyalty is still at moderate level. This means that the customers moderately delivered positive word of mouth about the service providers, moderately recommends the service provider to others and have moderate commitment to purchase additional services from the telecommunication company. It suggest that the managers of the telecommunication companies should put in appropriate strategies on customer loyalty, since attracting new customers is more costly than retaining existing.

Findings of the study also suggest that three factors that are brand awareness, brand image and brand trust have positive influence on brand loyalty. The finding gives managers and academicians a much stronger basis than intuition and anecdotes for recommending strategies to ensure high level of brand loyalty. Indeed, mobile phone service providers should strive to improve brand awareness, brand image and brand trust level in their efforts to attain higher level of brand loyalty.

On the mediating effect of brand trust on the relationship between the factors and brand loyalty, such effect exists and it is supported. Brand trust mediated partially relationship between (a) brand image and brand loyalty, and (b) brand delivery and brand loyalty. When customers have positive perception on brand image and brand delivery, getting good values from the exchange and trusted their service providers, their level of brand loyalty will also be increased.

Implications of individual outcome as well as general implication of the study were deliberated to illustrate their significance from the academic and researcher's perspectives. The model can be used as an explanatory model for brand loyalty in another industry, and. In summary, the current study provides beneficial implications for both academic research and practitioners based on an insightful review of the existing work on brand loyalty.

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