



Identifying Effects of Mixed Marketing in Solar Devices

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ABSTRACT

The Sun is one of the main sources of renewable energy which can serve as a useful source of energy supply in most parts of the world. Using solar energy is not only necessary but also will be inevitable in future. The aim of this study is to investigate the effects of marketing Mix on using solar devices. Hypothesis discussed in the paper is: Marketing mix (price, product, place and promotion) affects using solar devices by consumers. The population of this study includes sell customers of solar energy products in Tehran, Iran and according to Cochran formula for determining the volume of Unlimited Data the sample size is 384, in 2013 to collect opinions of the people. Data collected using questionnaires and structural equation modeling (SEM) in Lisrel software was used for data analysis. The obtained results identify four aspects of the marketing mix (price, product, promotion and place) and related indicators of measured dimensions. All the proposed hypotheses were confirmed and thus each of the four marketing mix elements (price, product, place and promotion) has a significant impact on the amount of solar devices used.

Keywords: Marketing mix, solar energy, Structural Equation Modeling (SEM).

1. INTRODUCTION

Fossil fuels are the most common ones these days. Although the abundance of them makes using them economical, they damage the environment and endanger human health. Moreover since they are limited and not endless, they cannot be considered as permanent resources. Therefore replacing them with endless energies is totally essential. Using new energies not only resolves the energy crisis, but also (because of clean energies) can resolve the environment and pollution crises. New energies include solar energy, wind energy, fuel cell energy, geothermal energy, hydro-electric energy, bio energy, ocean's energy and nuclear energy.

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All the energies mentioned are renewable except for the nuclear energy (Duncan, 2001). The energy radiated from sun to the earth in 3 days equals the energy produced from burning the whole fossil fuels stored inside the earth, which means the energy radiated from the sun during forty days equals the energy needed for a century. Therefore, applying solar reactors we can benefit from the unlimited and free source of energy and save a great amount of fossil fuels (Baechler & Lee, 1991).

According to the amounts of selling and applying solar devices, it can be concluded that majority of people are unfamiliar with the benefits of this energy and are unwilling to buy such devices. Hence solar devices' producers should pay great attention to marketing their products. In the current over competitive world, recognizing the competition structure is the secret to survive. To attain such recognition, managers should be aware of the requests and opinions of the customers and should evaluate and use marketing mix (product, price, place and promotion) in the market to achieve a bigger market share. Hence the question of the paper is: what is the effect of each element of marketing mix on the intention to purchase solar devices?

2. LITERATURE REVIEW

The elements of marketing mix are some controllable marketing variables that are used by companies to achieve marketing goals in the target market and to provoke desirable reactions. The mix includes any acts of the company about its products for affecting the demands (Bussiere, 2000). Marketing mix represents the fundamental activities of marketing managers. After selecting the target market, marketing managers need to develop a systematic plan for selling and establishing long-term relationships (Devlin & Ennew, 1997). Marketing plan includes decisions about product, price, promotion and distribution. They are the most important parts to which the marketing managers dedicate the resources of the company to achieve the sales and profit making goals (Goldsmith, 1999).

Marketing mix demonstrates the changes the companies may make to market their products (Rafiq & Ahmed, 1995). Marketing mix is a mixture of tools, techniques and mediums generally used in marketing planning (Yadin, 2002). Borden claims that he is the one who coined the term 'marketing mix'. He claims that the term marketing mix is based on Culliton (1948) that describes "executive business" as "mixture of ingredients". However Borden did not officially define the term marketing mix. In fact, his definition included mixing ingredients and important factors for developing a marketing plan (Kotler & Keller, 2006). McCarthy (1964) improved the definition to a mixture of all the ingredients that are available for marketing managers to satisfy the target market. McCarthy and Perreault (1987) define marketing mix as controllable variables that an

organization can organize to satisfy its target market. The definition is widely accepted with small modifications Kotler and Armstrong (2000) applied in it: marketing mix is a set of controllable marketing variables which are mixed by a company to satisfy the needs of target market (Kotler & Armstrong, 2000).

In marketing literature, the 4Ps concept is an accepted principle. 4Ps stand for product, price, promotion and place. Marketing mix was introduced by Neil Borden in 1950s and was known as 4Ps (Gronroos, 2000). Marketing mix overtook the traditional methods and models of market management such as Alderson's dynamic functionalist method and other systemic methods and also the parameter theory developed by Copenhagen University in Europe. The new methods such as product view, function view, geographic view also were overtaken. Only a few models could survive along with the 4Ps concept (Gronroos, 2000).

Developing 4Ps is so general that many authors of course books consider marketing as an equal for 4Ps in the introductions - Pride and Ferrell (1989), Stanton et al (1991). Although the proposed 4Ps model by McCarthy is very public, there is no consensus over the elements of marketing mix. 4Ps model has been criticized a lot. For example, Kent (1986) argued that 4Ps model is very simple and misleading. Other authors also have called the 4Ps model non-standard and proposed some modifications. Robins (1991) introduced a substitute term for marketing mix that included 4Cs which stand for the Customer (buyers of the products or services), the Competition (providers of substitute products or services), the Capacity and the corporation itself. Inn (1967) offers a more comprehensive list except for environmental macro subjects and relates internal factors to external factors. Although he does not do it in the best way, Ohma offers 3Cs model in a similar framework which includes customers, competitors and corporation and puts emphasize on strategic relationship between the factors (Zineldin and Philipson, 2007). In present paper, 4Ps marketing mix is used to investigate the effects of marketing mix on using solar devices by customers. Therefore, the hypotheses of the research are:

- H1:** Price is significantly and positively associated with using solar devices.
- H2:** Product is significantly and positively associated with using solar devices.
- H3:** Place is significantly and positively associated with using solar devices.
- H4:** Promotion is significantly and positively associated with using solar devices.

3. RESEARCH METHOD

The present research is an applied and descriptive-exploratory research. Pearson correlation test and structural equations were used to test the hypotheses of the research. LISREL and SPSS were used for analyzing the data. The population of the research included all the customers and users of solar devices in Tehran. Due to the vast population, random sampling is applied. Sample size was determined using Cochran formula. Based on Cochran formula, the sample size was defined to be 384. The literature was studied through books, papers, magazines, research reports, documents and Internet databases. Interviews were conducted with experts and questionnaires were distributed to collect data. The participants were expected to answer close questions of Likert five-point scale from 1 = Very high to 5 = Very low. The reliability of the research was assessed using Cronbach's alpha and the results are presented in Table 1. Since the coefficients of Cronbach's alpha for every variable is higher than .70 the reliability of the questionnaire is verified. The validity of the questionnaire was verified based on the validity of the contents. For this purpose, the questionnaire was reviewed by marketing experts finally verified.

Table 1: Reliability Coefficients of Variables

Variables	Number of elements	The coefficient of Cronbach's alpha
Product	7	.784
Promotion	5	.803
Distribution	4	.846
Price	4	.817
Purchase intention	2	.871
Questionnaire	22	.923

4. HYPOTHESES TESTING

4.1. Testing Normality of Variables

Before testing the hypotheses, we need to make sure that the variables are standard (normal) first, hence Kolmogorov–Smirnov test was used for testing the normality of sample distribution. The Kolmogorov–Smirnov test can serve as a goodness of fit test. It compares cumulative distribution of your values with the cumulative distribution of the same values in a specific theoretical distribution. If the distance between them is big enough, the test shows that the values do not fit one of the theoretical distributions. In this test if P-Value < .05 then the null hypothesis is rejected which means the distribution is not a normal, Posion,

exponential or steady one. For the purpose of the test the following hypotheses are developed:

H0: the distribution of the values is normal.

H1: the distribution of the values is not normal.

The results are represented in Table 2.

Table 2: Normality Test Results

	Product	Promotion	Place	Price	Purchase intention
Normal indicators	3.25	3.17	3.38	3.54	2.47
	.4	.42	.44	1.04	.98
Kolmogorov–Smirnov	.867	1.207	1.129	1.33	.89
Significance level	.44	.108	.156	.056	.404

The results of normality test are presented in table 2 and since all the significance levels are higher than .05, they indicate that all the variables are normal.

4.2. Correlation test

In the second step, we need to make sure that a significant association exists between variables first and then evaluate the hypotheses using structural equations models (which are based on regression analysis and investigates the causal relationship between variables). Since all the variables are normal Pearson correlation analysis is used. The results of correlation analysis are presented in table 3. Regression analysis result represents a significant association between the variables and it can be claimed that in .99 of confidence level all variables have significant association with each other.

Table 3: Pearson Correlation Coefficients between the Variables

Variables		Product	Promotion	Place	Price	Purchase intention
Product	Correlation coefficient	1	0.502	0.536	0.550	0.478
Promotion	Correlation coefficient	0.502	1	0.579	0.615	0.614
Place	Correlation coefficient	0.536	0.579	1	0.615	0.421
Price	Correlation coefficient	0.550	0.615	0.615	1	0.681
Purchase intention	Correlation coefficient	0.478	0.614	0.421	0.681	1

The significance levels of all variables were investigated and all the values obtained are 0.000 and since they are lower than 0.05 error level, the correlation between the variables is acceptable. Referring to the results the relationship between the price and purchase intention has the highest correlation coefficient. In other words, the two variables are strongly related. The correlation coefficient of place and purchase intention was 0.421 which was the lowest coefficient. Therefore, the two variables are weakly related.

4.3. Structural Equations Modeling

Structural Equations Modeling is applied for two purposes: a) Measuring events and b) Assessing the relationship between the events. In this research both functions, measuring and testing the (structural) hypotheses and measuring goodness of fit of the model have been studied. In the following figures standard coefficients and significance levels of each relationship are represented respectively.

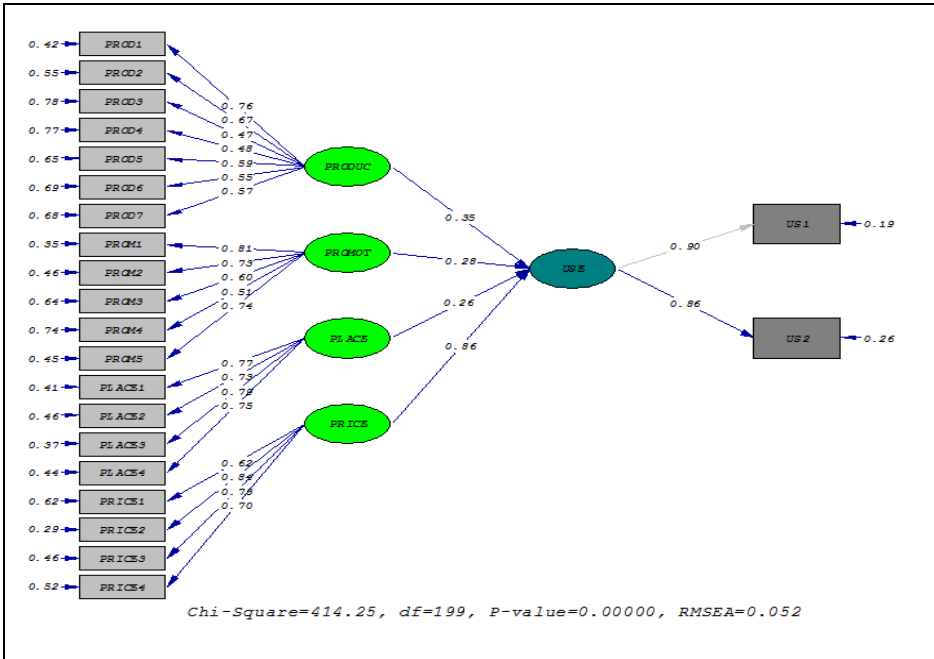


Figure 1: Standard Coefficients of Structural Equations Modeling

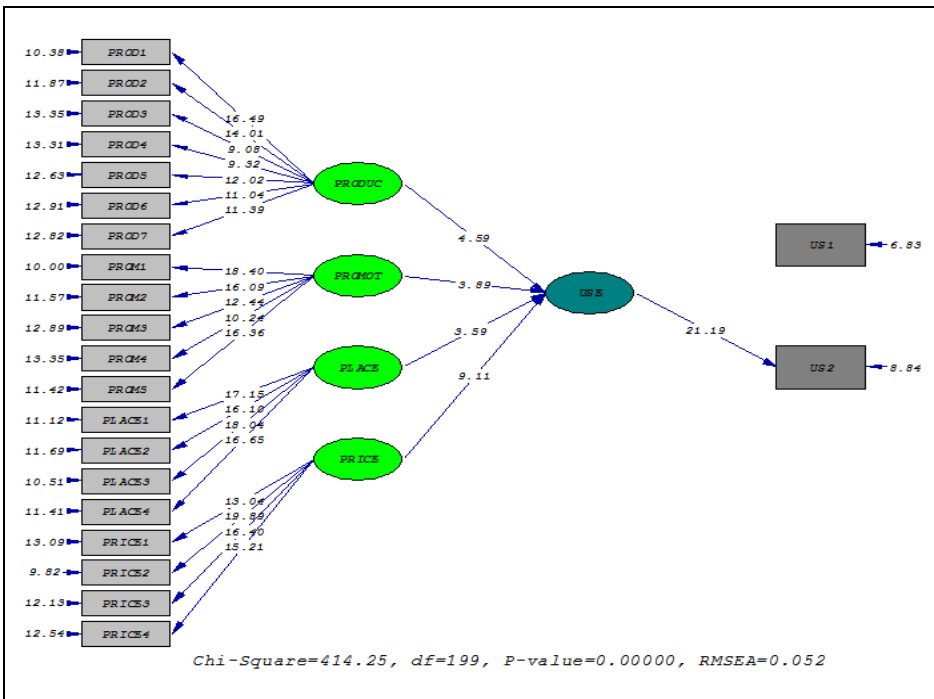


Figure 2: Significance Levels of Structural Equations Modeling

Based on the obtained results the hypotheses were accepted or rejected. In Table 3, the standard coefficients, significance level and the confirmation or rejection of the relations are presented respectively.

Table 3: The Results of Structural Equations Modeling

Relation	Standard coefficient	Significance level	Result
Price-purchase and use intention	0.86	9.11	Accept
Product- purchase and use intention	0.35	4.59	Accept
Place (distribution)-purchase and use intention	0.26	3.59	Accept
Promotion- purchase and use intention	0.28	3.89	Accept

Considering that the results presented in the table indicate that all the significance levels are higher than 1.96, the significant association of the variables is confirmed. The positive values of standard coefficients indicate that the variables are positively associated. Consequently all hypotheses are confirmed. The values of goodness of fit are presented in Table 4.

Table 4: Goodness of Fit Indicators of the Research

Indicator	بعد	حد مطلوب	Result
χ^2/df	2.08	<3	Very excellent
RMSEA	0.052	<0.1	Good
RMR	0.043	Approximately near to zero	Acceptable
NFI	0.97	>0.9	Acceptable
NNFI	0.98	Approximately near to one	Very excellent
CFI	0.98	>0.9	Very excellent
RFI	0.96	0.9>	Very excellent
IFI	0.98	0.9>	Very excellent
GFI	0.91	0.9>	Very excellent
AGFI	0.93	0.9>	Good

Since RMSEA is 0.052 and CFI, GFI, NNFI and NFI are higher than 0.90 it can be concluded that goodness of fit is accepted.

5. DISCUSSIONS AND CONCLUSION

Great dependence on energy resources – as the basis of growth and economic activities- on one side and limited oil and other fossil fuels supplies on the other side has created the challenge of how to supply energy in the future. After studying the literature, we decided to investigate the effects of factors of marketing mix on the intention of buying solar devices. The hypotheses of the research are discussed as follows:

Hypothesis 1: Price is significantly and positively associated with using solar devices.

Referring to structural equations modeling, the significance level of the price variable is 9.11 and standard coefficient is 0.86. Therefore, since the significance level is higher than 1.96 and the standard coefficient is positive it can be claimed that price is significantly and positively associated with using solar devices. Based on the standard coefficients obtained from structural equations modeling, the possibility of referred payment and special buying agreements 0.84, discounts 0.78, seasonal or periodic sales 0.70, more reasonable prices of solar devices comparing to conventional ones 0.62, identified the price variable. Verifying the hypothesis means that the more reasonable the price or the other indicator affecting price are the more these services are used. Amongst the four factors of marketing mix price had the greatest effect on customers' intention to use these services hence increasing the factors affecting the price will increase their sales. Selling agents are private corporations and usually try to increase their benefits of selling solar devices. The selling agencies are interested working with the money of the companies because the discounts the agencies receive for paying in cash is less (about 3%) than the value of the money gained in cash transactions.

Hypothesis 2: Product is significantly and positively associated with using solar devices.

Considering the significance level of 4.59 and standard coefficient of 0.35 it can be claimed that product is an important factor in marketing mix and is significantly and positively associated with using solar devices. The knowledge of a customer about a product is the main factor in choosing a product. The distributors and sellers also need to have a good knowledge about the goods they are working on so they are able to sell their product and defend the product against similar products when necessary. Knowing a product well does not mean only knowing characteristics or applications of it but having other information. Some important characteristics of a product are: competitive price, name, producer, quality, substitute products, similar products, appearance, design, color, packaging, purchasing conditions, delivery time, delivery service, quality guarantee, after sale services and the size of the product. The results of factor

analysis introduced 7 indicators for this factor. Referring to the results of structural equations modeling the quality of the solar devices as the main factor of the product variable 0.76, using new technologies 0.67, the physical shape and suitable appearance 0.59, the installation services provided by the companies 0.57, quality and appearance of packaging 0.55, famous and trustable trademarks and names and finally trustable and sure after sales services. Quality as the main factor of marketing mix is always a concern of customers and the companies should relieve the concern applying policies such as reaching standards and getting certification and offering trustable after sale services. The results of the current study correspond with the findings of Zeinoding and Philipson (2007).

Hypothesis 3: Place (distribution) is significantly and positively associated with using solar devices.

Since the significance level of 3.59 is higher than the critical level of 1.96 and standard coefficient is +0.26 it can be claimed that place is significantly and positively associated with using solar devices. It means that increasing and improving the factors involving this variable increase using solar devices. Place (distribution) is the simplest term in marketing mix but plays an important role. Distribution simply means delivering the customer's desirable product in the desirable time to the desirable place. The distribution channels are normally formed based on the needs of markets. The main utilities of the channels include place utility, product combination and information. Since the utilities are an important source of value and competitive advantage, selecting a suitable strategy for distribution channels is one of the key decisions the marketing manager should make. Referring standard coefficient of structural equations modeling, acceptable stock of selling agencies 0.79, diverse and broad distribution channels 0.77, on time delivery 0.75, good condition of goods delivered (without any damages) 0.73 identified the place (distribution) variable. Referring to the results place is not as important as the other variables, but it does not mean the managers can ignore such an important variable. The results of the research correspond with the findings of Caplan and Hanlin (2009) and Domgan (2008).

Hypothesis 4: Promotion is significantly and positively associated with using solar devices.

Since the significance level of 3.89 is higher than 1.96 (the critical level) and standard coefficient is +0.28 it can be claimed that promotion is significantly and positively associated with using solar devices. Promotion or advertising in marketing mix means getting connected with the customers in order to inform them and affecting their attitudes and behaviors. Advertising products or services of an organization necessarily incurs some cost. Advertising is used to inform people about products and encourages customers to buy the products of a certain

mark. Generally advertising policies are informative, prepare the conditions for effective information and also when the customer tries to decide between two similar products helps him or her decide. Referring to the results, good relationship between the producer and the sales representatives (agents) 0.81, rewarding the customers in prize draws 0.74, good relationship between sellers and sales representatives 0.73, face to face selling 0.60, suitable advertisements in public media 0.51 identified promotion. Promotion is an important variable in most of the researches and the positive effect of this variable is verified in many researches such as Triling and Peterson (2010) and Anderson (2005).

6. RECOMMENDATION

Referring to the results, it is suggested that because of the effect of price on the purchase intention, suitable discounts should be offered in new ways. When the quantity of production increases the prices fall down. Solar products should be produced in the areas where plenty of workforces are available and the company can access inexpensive resources. Referring to the effect of marketing mix on purchase intention the quality of the products should be improved by reaching standards and getting respective certification. The customers should be periodically surveyed about the quality of the products and the customers' opinions and the experts views should be applied in designing products. The products must be adapted to the design of contemporary buildings. To improve the place (distribution) dimension it is suggested that broader distribution channels be developed and the distribution channels that are accepted by customers should be used. Delivery cost is an important subject in the customers' view hence the company should pay for it.

Considering the effect of promotion on purchase intention, reputable people should be selected to become the representative (agent). To reward and thank them prize draw should be used. Billboards with the content that solar energy is way of having clean air should be installed in public places. Informative advertisements should be developed with the cooperation of the Environment Organization and played on public media.

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