

Designing of a Web App for Hiring Vehicles and Purchasing Travelling Items using Kansei Engineering

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Abstract: In web design, user interface design is crucial. Designing a user interface that meets the emotional requirements of users is critical since the user interface plays an essential part in creating memorable user experiences for websites. A poorly designed user interface gives a wrong impression on users and decreases their comfortability. It will provide them with opposing ideas and less satisfaction. This must be avoided to get the best results from a user interface design in applications. Kansei Engineering, a well-known technique for designing applications, considers the emotions and feelings of particular users. This study attempts to turn users' feelings and emotions into design aspects using Kansei Engineering technology to develop an appropriate travel website by defining a standard web design that fosters emotional engagement. This study proposes and explains the idea of Kansei Engineering and an overview of a developed travel website using Kansei Engineering, including all critical factors considered while designing and statistical data.

Keywords: E-commerce site, Kansei Engineering, Travel

1. Introduction

People need to travel frequently. Despite the fact that we are social creatures of the same species, where we live has an influence on how society functions. We encounter many cultures when we travel. Traveling takes us out of our comfort zones, which inspires us to see, taste, and attempt new things. It continuously puts to the test our capacity to engage with varied people, embrace new experiences as they arise, and share them with friends and loved ones, in addition to our capacity to adapt to and explore new places.

The people who don't have a mode of transportation or travel will find alternative methods. Most of the people like to travel by comfortable medium of transportation for affordable prices. Traveling companies must provide these requirements according to the customers will. There are various kinds of web pages helping the travellers to hire vehicles and buy the items which needed for travelling. But most of them are not user friendly and some of them are not attractive for customers, in some websites the necessary information regarding vehicles and other items are not

mentioned properly. Travel may be addressed in a variety of ways. Students and researchers typically travel in groups or with their families. So the website must clearly contain all the details related to the audience which the design is prepared for. And these websites are oftenly used by tourists. The quantity of tourists arrivals in Sri Lanka increased by 1,917.8 percent year on year to 30,207 in May 2022, as a result of rising vaccination rates around the world and softer restrictions for vaccinated travelers. Largest amount of tourist were arrived from India, accounting for 18.4 percent of total traffic, followed by the United Kingdom (12.3 percent), Russia (10.6 percent), Germany (7.3 percent), and Canada (6.7 percent). Visitors from Europe accounted for 48.8 percent of overall arrivals in Sri Lanka in May, while those from Asia Pacific accounted for 33.3 percent. Monthly visitor arrivals fell by about 52 percent as a result of the consequences of Sri Lanka's present economic and political circumstances, as well as the gradual end of the peak season.

In theory, both user happiness and technological elements are necessary for good design. Understanding and satisfying people's demands is thus one of the most important components of design. Therefore to attract the tourists and travellers in to this kind of web design, the design must be unique and eye catching as well user friendly. Web sites that bring positive emotions to users must meet all three levels like pleasure, usability and functionality (JORDAN'S HIERARCHY OF NEEDS (Jordan, 2000)). The designed web page is for hiring vehicles and needful items for travelling. Using Kansei Engineering this project was focused on the design of the interface of a particular webpage. Psychological factors which describes about the colours, images of the designing were considered. The hiring of the website which is designed here won't supply for permanent travelling.

The term "Kansei" originates in Japanese and has no exact English equivalent. Kansei is defined by Nagamachi as "an individual's subjective sensation from a certain artifact, place, or scenario employing all of the senses of sight, hearing, feeling, smell, taste, and recognition" (Nagamachi, 2001). Kansei Technical Engineering, as the name implies, refers to technology that merges Kansei with engineering domains in order to penetrate people's Kansei into product

design so that the goods can elicit emotional reactions and please consumers (Lokman et al,2009).

Kansei, which varies from person to person and is impacted by people's experience, knowledge, personality, and mood, is too implicit to be assessed directly. Some standard measuring methods based on externalisation have been developed and effectively used in specific domains.

Given the significance and potential of embedding emotions into web site design, as well as the possibility of using Kansei Engineering as a requirement generation technique to improve user experience, this travel website will be very appealing to both tourists and locals in terms of purchasing goods and hiring vehicles.

2. Related Works

Brief description of some travel websites is given below:

A. VacationSpider.com

VacationSpider.com is a website gives the facilities with discount hotel prices from all around the web, making your search for low price travel easy and convenient, great selection of hotels to choose, a luxury hotel or something more budget-friendly in New York or in Las Vegas.

B. Booking.com

Booking.com is a travel website which provides the facilities of booking accommodation places, select flights, cars for hire, attractin places and details on airport taxi services for many countries including Sri Lanka.

C. Expedia.com

Expedia is an online travel website and hotel booking services which has connections with many popular sites of Hotels. It is clean and straightforward with the user interface. Trvelars can add up to five connecting flights, choose to add accommodation for all of their trip, and tag on car rentals too.

D. CheapTickets.com

CheapTickets is a website does things a little differently than Expedia. Travelers can easily add on flight, hotel, and car or any combination of the three for package deals, although multiple flights are under a different option. You can also purchase event tickets from this site.

E. Priceline.com

Priceline is a big deal in the online travel website all over the world. It has the facility of effortless to use with options available for flights, cars, hotels, or any combination. But with this you will not get an incredible bargain if you booked separately.

3. Methodology

This product's methodology is mainly based on Kansei Engineering. Kansei Engineering parametrically connects a

product's or service's features and attributes to the emotional reactions (both physical and psychological) of the consumer. Products can therefore be created to express the desired feeling.

Following figure 1 describes the working principle of Kansei Engineering.

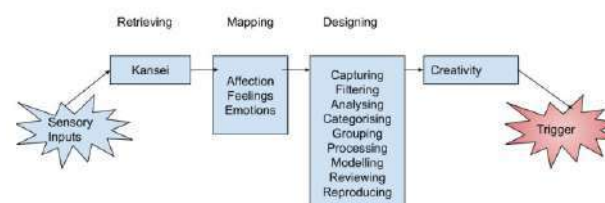


Figure 1. Working principle of Kansei Engineering

Kansei Engineering methodology is started by choosing a domain. Typically, the product is used to pre-select the domain and the target audiences. The choice of a target market segment, as well as the specification of the new product, are all included in choosing the domain. Product examples are gathered to represent the domain based on this data. Then the domain is divided into two sections as in the figure as you move downward:

A. Span the semantic

Kansei Words are gathered using the intended domain as a starting point. The words are then condensed in a subsequent phase to a manageable amount. This is possible utilizing the various tools listed below. The data is compiled uniformly in the last section to make the synthesis process easier to complete. Important Kansei Words can be missed in this phase, which might render the outcome essentially useless. Therefore, it is preferable to choose a few more words than is required.

B. Span the space of properties

Before the data is compiled for the upcoming synthesis phase, the task at hand in this stage is to gather all the attributes corresponding to the chosen domain, choose those that appear to have the biggest impact on the user's Kansei, and select products corresponding to the chosen product properties.

Then the space of properties and the semantic space are connected together in the synthesis process as shown in Figure. A variety of product attributes are discovered that have an impact on each Kansei Word.

Moving on, the next step of Kansei methodology is the test of validity. The information acquired may be used to do a factor analysis, and the outcomes can be contrasted with the Kansei words given from the Semantic Space. The amount of output words was intentionally too high. It is now feasible to identify the words that have no impact on the Kansei by

contrasting the results from the first factor analysis (after the selection of Kansei Words) and the second factor analysis (following the completion of the synthesis). If an iteration process is required, this is given back to the semantic space, and only the new terms are utilized.

The data collected from the synthesis can be presented as a model when the validity tests produce a suitable result, as the final step of Kansei Methodology. (Figure 2)

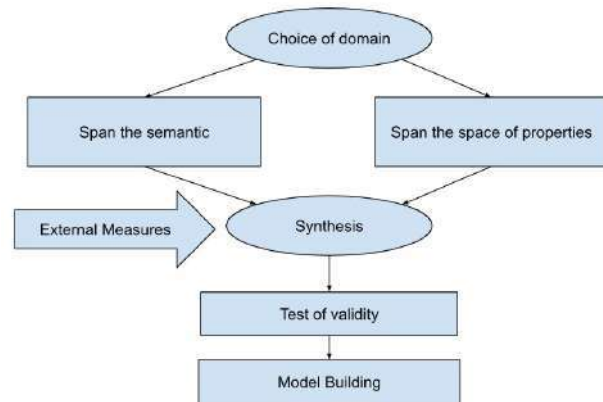


Figure 2. Kansei Methodology

We carried out two studies: one to identify specific design components and the other to assess user's emotional responses to websites for renting cars and other necessary travel necessities. In order to measure the Kansei, we used the Kansei Engineering approach that was discussed in the part before. The Kansei of the visitors and the website samples were then examined to find correlations between Kansei and web design components. The Kansei cluster is then identified by mapping the website samples to the Kansei dataset. (Figure 3)

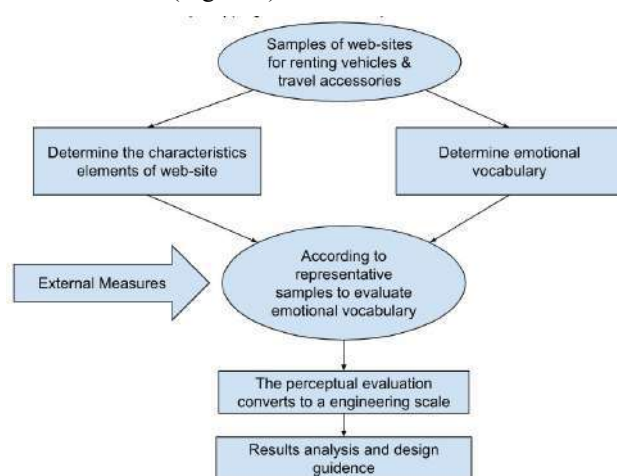


Figure 3. Applying Kansei Methodology for the web-site

4. Results

Using the average evaluation results across subjects, factor analysis and partial least squares analysis were carried out in order to determine the Kansei of the specimen and identify associations between Kansei and design elements.

A. Factor Analysis (FA)

FA is a statistical information minimization technique that reduces the number of unobserved random variables (called factors) needed to explain variation among observed random variables. FA presupposes that a small number of crucial dimensions can be used to summarize all the rating information on various attributes. The relationship between the attributes makes this reduction possible. The influence of other attributes is partially what determines how highly any one attribute is rated.

The psychological structure of the Kansei space is discovered using FA in this study, and the results are detailed on weighted axes. The average value of the evaluation results was used to examine the Kansei space's finer details.

Table 1 displays the factor analysis findings following varimax rotation. The most widely used rotation method that makes it easier to interpret variables is Varimax, which was created by Kaiser (1958). This is so because each original variable tends to be associated with one (or a small number) of factors following a varimax rotation, and each factor only represents a small number of variables. Additionally, the factors are frequently understood by contrasting a small number of variables with positive loadings against a small number of variables with negative loadings.

Table 1. The Table of Contribution and Cumulative contribution

Factors	Variance	Contribution	Cummulative Contribution
1	16.09262	40.23%	40.23%
2	12.29421	30.74%	70.97%
3	3.427578	8.57%	79.54%
4	1.856272	4.64%	84.18%
5	1.810882	4.53%	88.70%
6	0.923415	2.31%	91.01%
7	0.370649	0.93%	91.94%
8	0.250962	0.63%	92.57%

Table 1 depicts that first factor is 40.23% of the total data and the second is 30.74 %. both factors can be taken as the most contributing factors. This table show that the factors provide the highest influence on Kansei Words.

The table below shows results (partial results in ascending order) of FA(Factor Analysis) after doing varimax rotation.

Table 2: The results of Kansei words, Factor Analysis

Kansei	F1	F2	F3	F4	F5	Kansei	F1	F2	F3	F4	F5	Kansei	F1	F2
Cute	0.4961	Creative	0.3949	Feminine	0.0739	Calm	0.3407	Fun	0.0010	Levely	-0.0702			
Refreshing	0.5314	Stylish	0.4081	Childish	0.0529	Delat	0.9398	Cheerous	0.0211	Charming	-0.0477			
Relaxing	0.5442	Professional	0.4212	Adorable	0.0703	Levely	0.9725	Impressive	0.0504	Relaxing	-0.0430			
Fun	0.5845	Calm	0.4121	Cool	0.0735	Beautiful	0.9704	Adorable	0.0504	Nice	-0.0485			
Charming	0.6085	Cool	0.4519	Cute	0.0729	Charming	0.9494	Cute	0.0523	Feminine	-0.0120			
Levely	0.6091	Sophisticated	0.4544	Charming	0.0806	Natural	0.1081	Appealing	0.0531	Refreshing	-0.0131			
Adorable	0.6346	Fun	0.4281	Appealing	0.0829	Cheerous	0.1147	Masculine	0.0706	Delicious	-0.0134			
Pretty	0.6449	Impressive	0.4891	Stylish	0.0863	Cheerous	0.1174	Charming	0.0731	Impressive	-0.0137			
Comfort	0.6518	Light	0.5166	Elegant	0.0857	Stylish	0.1185	Luxury	0.0760	Comfort	-0.0139			
Elegant	0.6548	Comfort	0.5378	Pretty	0.0881	Pretty	0.1222	Elegant	0.1131	Levely	-0.0144			
Levely	0.6707	Cheerous	0.5331	Entertaining	0.0856	Cute	0.1203	Simple	0.1223	Appealing	0.0077			
Appealing	0.6847	Stylish	0.5711	Professional	0.1037	Chic	0.1387	Classic	0.1236	Impressive	0.0082			
Impressive	0.7034	Stylish	0.5893	Mystic	0.1446	Futuristic	0.1622	Old-fash	0.1426	Surreal	0.0133			
Calm	0.7031	Refreshing	0.6804	Simple	0.1534	Surreal	0.1663	Entertaining	0.1444	Cool	0.0138			
Stylish	0.7637	Relaxing	0.6998	Old-fash	0.1773	Professional	0.1834	Pretty	0.1536	Simple	0.0297			
Comfort	0.7878	Levely	0.6778	Comfort	0.1694	Appealing	0.1943	Professional	0.1678	Boring	0.0296			
Classic	0.7941	Applying	0.6871	Refreshing	0.1901	Relaxing	0.2062	Fun	0.1948	Comfort	0.0402			
Professional	0.8028	Pretty	0.6895	Sexy	0.2016	Impressive	0.2129	Levely	0.2029	Adorable	0.0401			
Cool	0.8179	Levely	0.6911	Classic	0.2079	Masculine	0.2154	Levely	0.2134	Comfort	0.0410			
Cheerous	0.8198	Elegant	0.7461	Boring	0.2294	Adorable	0.2384	Beautiful	0.2118	Classic	0.0410			
Impressive	0.8687	Adorable	0.7889	Light	0.2414	Cool	0.2138	Relaxing	0.2340	Light	0.0464			
Simple	0.8927	Charming	0.7773	Nice	0.2317	Interesting	0.2169	Light	0.2486	Fun	0.0467			
Stylish	0.9496	Sexy	0.7943	Calm	0.3026	Comfort	0.1982	Calm	0.2524	Chic	0.1518			
Luxury	0.9739	Cute	0.7985	Relaxing	0.2286	Levely	0.2463	Comfort	0.2265	Old-fash	0.1416			
Adorable	0.9886	Beautiful	0.8171	Natural	0.3518	Refreshing	0.2324	Refreshing	0.1949	Fun	0.2227			
Entertaining	0.9932	Chic	0.8092	Fun	0.3339	Fun	0.5	Natural	0.6051	Cute	0.2747			

The analysis's findings make reference to the Kansei Words' structure. The table makes it clear that Kansei sample websites are organized according to 5 factors. Professional, cool, gorgeous, impressive, surreal, sophisticated, opulent, masculine, futuristic, and mystic make up the first factor. One way to describe this Kansei space is as "sophisticated." Elegant, endearing, endearing, sexy, cute, beautiful, chic, and feminine make up the second factor. This Kansei area can be characterized as "elegant beauty." The third factor can be described as "simplicity" Kansei space because it is composed of nothing more complicated than that. The fourth factor is light, which can be interpreted as the "richness" of Kansei space. The fifth factor, which can be characterized as "comfy" Kansei space, consists of natural and orderly elements.

According to the outcome it is clear that, the samples of the website are organized according to elegant beauty, simplicity, richness, comfort and sophistication.

The first, second, and third factors identified by factor analysis—sophisticated, elegant-beautiful, and simplicity—explain 79.54 percent of the data. Thus, for the Kansei space, the first three factors are essential. It implies that in order to increase their commercial appeal, these three elements ought to be present on every website. The fourth and fifth factors, wealth and comfort, both matter but have little influence. Because of this, it is suggested that these two components be used as background or supporting components in good website design.

B. Partial Least Squares (PLS) Analysis

A technique for building predictive models when there are several, factors that are highly collinear and have interactions which are significant between x variables can be known as PLS. Partially obtained PLS analysis results are described below.

Table 3. Design element and Kansei - PLS results

Category	Item	Adorable	Appealing	Beautiful	Boring	Range
Body Bg Color	Black	0.0984	0.1013	-0.0387	0.1074	-0.0872
	Dark Cyan	0.0909	0.0114	0.0131	0.1034	-0.0816
	Seafoam	0.0906	0.0904	0.0202	0.0352	-0.0420
	Grey	0.0124	0.0287	0.0367	0.0531	0.0848
	White	0.0252	0.0995	0.0403	0.0765	-0.0795
Body Bg Style	Picture	-0.0024	0.0375	-0.0070	0.0406	-0.0018
	Texture	0.0353	0.0366	0.0180	0.0180	-0.0011
	Color Tone	0.0081	0.0333	0.0267	0.0267	-0.0242
Page Shape	Sharp N/S	0.0274	0.0156	-0.0244	0.0247	0.0414
	Round N/S	-0.0274	-0.0244	-0.0244	-0.0214	-0.0244
Page Menu Shape	Curve	0.0094	0.0404	-0.0088	0.0293	0.0644
	Sharp	-0.0449	-0.0449	-0.0449	-0.0449	-0.0449
	Flat	0.0208	0.0237	0.0411	0.0411	-0.0411
Page Style	Frame	0.0191	0.0732	0.0242	0.0732	0.0423
	Table	-0.0404	-0.0366	-0.0299	-0.0299	-0.0404
	None	0.0382	0.0347	0.0382	0.0382	-0.0382
Page Orientation	Banner/Content	-0.0455	0.0719	-0.0455	0.0582	0.0616
	Content/Banner	0.0455	-0.0719	0.0455	-0.0582	-0.0616
Dominant Item	Header	0.0549	0.0443	0.0118	0.0372	0.0372
	Footer	0.0223	0.0223	0.0223	0.0223	-0.0223
	Horizontal Split	0.0194	0.0231	0.0171	0.0171	0.0171
	Vertical Split	0.0231	0.0194	0.0171	0.0171	0.0171
	None	0.0231	0.0231	0.0231	0.0231	-0.0231
Page Color	White Blue	-0.0209	0.1448	-0.0601	0.1009	-0.0209
	Black	0.0249	0.0242	0.0242	0.0242	-0.0242
	Blue	0.0049	0.0049	0.0049	0.0049	0.0049

Purple : Highest value Orange : Lowest

For each Kansei, Table 4 displays a portion of the results for the chosen "Design Element" whose Range value is greater than its Range. To show the dominating design aspect for each Kansei in order of highest to lowest, the results are sorted in descending order.

Table 4. Each Kansei with its dominant design element

Item No	Adorable		Appealing		Beautiful		Boring	
	Design Element	Range	Design Element	Range	Design Element	Range	Design Element	Range
1	Page Color	0.11486	Header Bg Color	0.14714	Picture Existence	0.0566	Picture Existence	0.12338
2	Product Display Style	0.10644	Face Expression	0.14382	Header Bg Color	0.08551	Foot Menu Font Cl	0.12236
3	Header Font Cl	0.10612	Header Font Cl	0.132	Page Color	0.08049	Product view angle	0.12077
4	Left Menu Font Cl	0.10187	Product Display Style	0.12852	Left Menu Link St	0.07868	Header Bg Color	0.10646
5	Header Font Color	0.10218	Body Bg Color	0.12061	Main Font Size	0.0778	Page Color	0.10574
6	Face Expression	0.10024	Page Color	0.11534	Main Font Style	0.07307	Left Menu Font Cl	0.10091
7	Body Bg Color	0.10015	Left Menu Font Color	0.11851	Product view angle	0.06714	Product Display Style	0.10085
8	Dominant Item	0.0998	Picture Style	0.10189	Product Display St	0.06624	Picture Style	0.09771
9	Header Font Size	0.09651	Page Orientation	0.09807	Body Bg Color	0.06569	Top Menu Bg Color	0.09182
10	Main Font Existence	0.08813	Dominant Item	0.0939	Page Menu Shape	0.06454	Main Font Existence	0.09141
11	Main Bg Color	0.08587	Main Font Existence	0.09253	Foot Menu Font Cl	0.06441	Main Font Style	0.08931
12	Main Font Style	0.08582	Main Font Size	0.09126	Left Menu Font Cl	0.06422	Dominant Item	0.08937
13	Main Font Size	0.08324	Header Font Size	0.08926	Page Orientation	0.06176	Empty Space?	0.08359
14	Right Menu Link St	0.07868	Logo Location	0.08588	Picture Existence	0.06774	Main Font Size	0.08352
15	Picture Arrangement	0.07865	Picture Existence	0.08456	Dominant Item	0.06644	Face Expression	0.08208
16	Picture Existence	0.07838	Main Bg Color	0.08322	Body Representation	0.05982	Main Bg Color	0.08194
17	Page Style	0.07782	Main Font Style	0.08036	Face Expression	0.05511	Header Menu Bg Cl	0.08092
18	Picture Style	0.07776	Main Font Color	0.07783	Main Font Arrangement	0.05309	Page Style	0.07968
19	Page Orientation	0.07705	Footer Menu Bg Cl	0.07706	Main Bg Color	0.0526	Page Orientation	0.07832
20	Picture Focus	0.07655	Picture Arrangement	0.0783	Page Style	0.04929	Left Menu Link St	0.07785

C. Design Guideline

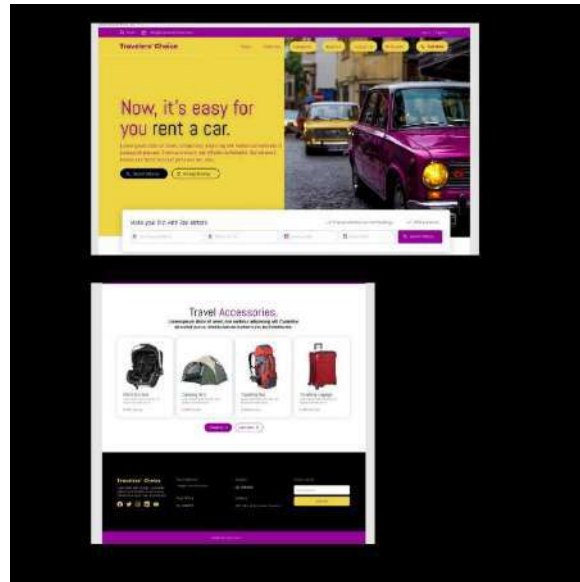
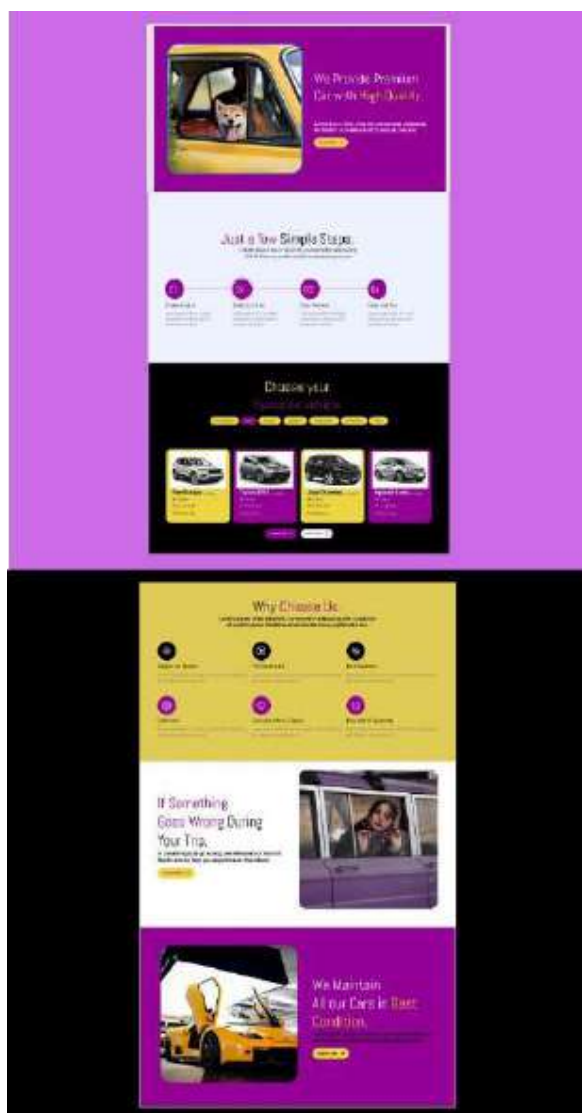
Under FA, the first 3 factors significantly influence the overall score depicts the whole set of variables. The study has also recommended including the next two elements as supporting features, despite the weak influence. Consequently, a total of five factors were chosen to be a part of the design guideline development. The factors that are involved are the Kansei's professionalism, coolness, attractiveness, impressiveness, surrealism, sophistication,

luxury, masculinity, futurism, mysticism, elegance, adorableness, charm, sexiness, cuteness, beauty, chicness, femininity, plainness, simplicity, lightness, naturalness, and neatness. As a result, the Kansei and identified design elements from the PLS analysis can be used as a guide when developing the emotional interface of an e-commerce website. The outcomes of the constructed guideline are displayed in part in the following table.

Table 5. Results of the constructed Guidelines

Kansei	Design element							
	Background Color of the body	Style of the Body	Page Style	Orientation of Page	Dominant Item	Color of the Page	Size of the page	Logo Position
Adorable	Sandstom	Texture	None	Plain	Picture	Sandstom	Small	No
Beautiful	Yellow	Color tone	Frame	V. Split	Picture	dark cyan	Small	No
Charming	White	Color tone	None	V. Split	Picture	White	Small	No
Elegant	Black	Texture	Frame	Content	N's	Purple	Small	No
Natural	Purple	Color tone	None	Vertical split	Picture	Black	Small	No
Masculine	Dark cyan	Color tone	None	Header	Picture	Greyish white	Medium	No
Mystic	Sandstom	Color tone	None	Plain	Picture	Black	Medium	No
Smart	Dark brown	Color tone	None	Vertical split	Text	Sandstom	Medium	Yes
Soft	Sandstom	Color tone	Frame	Footer	Text	Yellow	Small	Yes
Plain	dark cyan	Picture	Table	Content	Text	White	Medium	No
Instructional	White	Color tone	None	Vertical split	Picture	Black	Small	No
Slow	Purple	Color tone	None	Content	Picture	Purple	Small	Yes
Savage	Black	Picture	None	Content	N's	Dark cyan	Medium	No
Soft-hearted	Greyish white	Texture	None	Vertical split	Picture	Brown	Small	No
Serene	Sandstom	Texture	None	Vertical split	Picture	White	Small	No

D. Construction of Web Interface



5. Discussion & Conclusion

The process of system design has evolved into Kansei Engineering as a visual support technology for interpreting personal imagery, becoming consumer-oriented, and adapting to the market development requirements of recent years. The purpose is to understand the relationship between emotional responses to visual design and the credibility of a travel website. A visually pleasing website will increase user satisfaction, improve usability and reduce the amount of time users spend searching for information. This study provides the need for an eye-catching travel website through a detailed example. The significance and potential of incorporating emotion into web design, as well as the ability to use Kansei Engineering as a need-generating technology to enhance the user experience, are considered here.

As a result of this research, we have found the following results:

- Among the Kansei words, adorable, appealing, beautiful and boring are used to describe the visual design of the website interface.
- Using a factor analysis, we were able to determine the number of factors and the psychological structure of the Kansei space, as well as the relationship between Kansei responses and the website. According to the results, there are five factors influencing website samples: sophistication, elegant beauty, simplicity, richness, and comfort. It is estimated that this five-factor combination is responsible for 88.70 percent of the data collected. A factor analysis found that the first, second, and third factors are sophisticated, elegant-beautiful, and simplicity, respectively, explaining 79.54 percent of the data.
- PLS analysis Kansei and identified design elements serve as a guide to creating emotional interfaces for e-commerce sites. The sample web site that best suits

Kansei shows the largest positive PLS score for each Kansei respect to each sample web page. However, the website sample that is the most inappropriate to the Kansei has the biggest negative value.

As such, we can conclude that our proposed travel website design method produces Kansei semantic space in the same way as other Kansei Engineering research in other product design fields.

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Abbreviations And Specific Symbols

- FA - Factor Analysis
- PLS - Partial Least Squares

Acknowledgment

We would like to extend our sincere appreciation to our professor, Dr. LP Kalansooriya, who helped us throughout this research by providing helpful advice, insightful remarks, and motivation to finish this project. This research would have remained only a notion without their steadfast tremendous support.

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