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E-government in the public health sector: Kansei engineering method for redesigning website

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Abstract: The role of government health websites as a source of referrals and credible health information is very important, especially now that everything is digital. People use the internet and make health websites as the first step in finding health information, government policies related to health, and public health services. So it is very important to consider the user aspect in designing the appearance of an appropriate health website. This study utilizes the Kansei Engineering KEPack type 1 in analyzing various emotional factors related to the e-government website interface in the health sector. So that it can be found that the psychological emotional factors of users are important and become the main recommendations in the design of the website interface. We are focuses on user preferences for the e-government site interface of the Karawang District Health Office with the Kansei Engineering Type I approach. The Kansei Engineering study was conducted to analyze various emotional factors related to the user interface by comparing 5 specimens of e-Government sites in the health sector. A total of 20 kansei words were identified which were then processed using the multivariate statistical method Cronbach's Alpha (CA), Coefficient Correlation Analysis (CCA), Factor Analysis (FA). The result is that 4 kansei words have a high influence and successfully present a matrix of design element recommendations with 7 main elements and 45 sub-criteria for specific design elements.

Keywords: Human Computer Interaction; Kansei Engineering; E-government; Psychological Statistics.

INTRODUCTION

Modern society uses the internet as a source of health information. Non-medical professionals use health websites as a first step in seeking health information, government policies related to health and public health services (Puspitasari & Cahyani, 2018).

The Ministry of Health of the Republic of Indonesia through the Directorate General of Public Health in 2016 has launched the Healthy Community Movement (Germas) (Kesmas, 2017) which focuses on districts and cities in order to tackle serious challenges of the double burden of disease which is suspected to be the cause of the epidemiological transition in the last 30 years (Zainul et al., 2019). The Germas program is carried out jointly by the entire community with awareness, willingness, and ability to behave in a healthy manner to improve the quality of life.

The local government supports the Germas program with various efforts, one of which is through campaigns using digital media. Regional Apparatus Organizations and government agencies have developed official websites as one of the main tools in providing health services for the community, including the provision of verified public health information, introducing and campaigning for a healthy lifestyle to prevent the spread of infectious diseases, as well as ensuring that local community health services are adequate.

Delivering public health information electronically requires careful and sophisticated information processing, rigorous evaluation, and strict adherence to standards. To facilitate the effective presentation of health information, it is important to design a system based on user needs and incorporate interaction design and usability principles.

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Given the importance of information on e-government sites in the health sector, the website of the Karawang District Health Office in its development is suspected to have not paid attention to aspects of user considerations and user convenience factors, even though these aspects are important in achieving information goals. This aspect is believed to have a major influence on the health information service business for the community.

A good website interface helps visitors and users in performing the desired tasks thereby increasing their effectiveness. The method that can be used as a representation of the wishes and feelings of visitors or users of e-government sites in the health sector is kansei engineering. According to Nagamachi, Kansei Engineering is considered superior compared to other similar methods. Kansei Engineering translates users' emotional needs into product attribute parameters through engineering (Mitsuo Nagamachi, 2011) (Kusumaningtyas et al., 2017).

The rest of the paper is organized as follows: Section 2 and 3 describes literature review, and proposed method respectively. In Section 4, result and discussion The last section summarizes and concludes the importance of our findings.

LITERATURE REVIEW

There are many important elements on a website such as security, functionality, and of course the interface because the website has the main purpose of conveying information to users. a good and appropriate interface will greatly assist users in visiting it. One approach that can be used as a representation of the wishes and feelings of website visitors is kansei engineering. according to(Mitsuo Nagamachi, 2011) the Kansei Engineering approach translates users' emotional needs into product attribute parameters through engineering, and is strengthened by research (Kusumaningtyas et al., 2017). Research describes Kansei Engineering type I or often called KEPack in analyzing web-based e-learning systems. From the data of 10 specimens to be implemented with 20 kansei words, after being processed using multivariate statistical methods, the results showed that 2 specimens were considered the interface design desired by respondents with "enthusiastic" emotions as the largest value. In (Hadiana, 2019) a kansei engineering study was conducted as a method for analyzing various kinds of emotional factors related to the user interface of a web-based child control information system. 18 kansei words are used to measure the influence of the user's emotional factors through several proposed interface designs based on cellular system interfaces.

While research on the implementation of Kansei on other e-learning websites was carried out by (Megasyah, 2019) they discussed the implementation of kansei engineering on e-learning applications for vocational high schools. They used 8 specimens that were tested on 80 students and succeeded in producing 3 display design recommendations that represent the data of students who are participants. They use Cronbach's Alpha, Coefficient Correlation Analysis (CCA), Principal Component Analysis (PCA), Factor Analysis (FA) and Partial Least Square (PLS) analysis in processing the data.

Based on these existing problems, we investigated Kansei Engineering for optimizing the e-government website interface in the health sector. This study will use the kansei engineering KEPack approach as an approach in analyzing various emotional factors related to the e-government website interface in the health sector. So that it can be found the psychological emotional factors of users and recommendations for interface design of e-government websites in the field of public health.

Egovernment

Since 2001 e-government has become one of the main applications in the Information and Communication Technology domain, especially in countries in Europe and America at that time (Álvarez Sabucedo et al., 2010). There are several opinions regarding the definition of e-government, some of which focus on the role of service, other opinions state the point of view of citizens and there are also those who say that e-government is a focus on internal administrative processes.

Research by Alvarez Sabucedo et al mentions three definitions of e-government, namely the first use of ICT in public administration combined with organizational change and new skills to improve public services and democratic processes and strengthen support for public policies. Second, the use of information and communication technology (ICT) and its application by the government for the provision of cool public information and services to the people. The third sense, e-government is the use of information technology by government agencies (such as Wide Area Networks, Internet, and mobile computing) that have the ability to transform relationships with citizens, businesses, and other government agencies.

Currently, Indonesia is leading to bureaucratic reform to accelerate the achievement of good governance from the Ministry to local governments (Afrizal, 2020). This step is a good start for the progress of the nation. The existence of e-government in the health sector shows the performance of the government as an organization that has a great responsibility in providing health services equally for the whole community. Quality is a benchmark for the performance of appropriate health services based on professional standards and the standards of a service

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that focuses on the potential of resources and facilities (Kurniawan & Atmojo, 2020). Optimizing the potential according to the portion and benefits available at the puskesmas or hospital effectively and efficiently and not neglecting ethical, legal, and socio-cultural values based on maximum performance in service and making community satisfaction the most important. The quality of a service will be created with an optimal performance from the implementing party or providing a service for the community (Ainurrahmah, 2017).

Human Computer Interaction

HCI is a discipline about the design, evaluation, and use of interactive computing (Megasyah, 2019). In another sense, HCI is seen as a process of dialogue and action between computer and human devices. In general, in HCI the emphasis is on user factors, implementation and implementation and system design and not on the beauty of an interface.

Research (Mika Immonen, 2018) confirms that the research model to explain the value of direct interaction in service encounters among aging users includes three parts: factors related to service use behavior, factors that explain technology use capabilities, and factors that describe user health. The concepts applied in this study are the value of human interaction, service self-efficacy, perceived physical limitations regarding computer use and perceived behavioral control over computers.

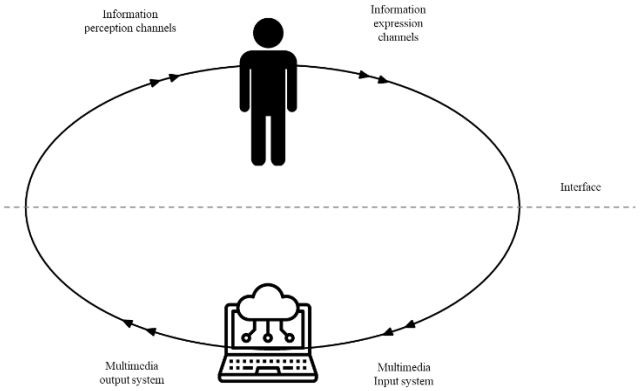

Fig. 1 HCI Diagram based on (Karpov & Yusupov, 2018)

Meanwhile (Karpov & Yusupov, 2018) suggested that interfaces began to develop in the world in the 1980s where the first computer systems to use them were developed at MIT to combine speech commands and hand indications to manipulate 2D numbers on the screen. Meanwhile, at present, multimodal interfaces have developed rapidly and have covered wide use, in some practical applications for information systems and robotics, "smart" spaces, and intelligent spaces; audiovisual recognition and speech synthesis; movement information processing; biometry and so on (Romeo et al., 2020; Yang et al., 2021). Figure 1 shows the interface as a bridge for the interaction of a device and humans where the actions taken by humans are on the input/output on the system.

Kansei Engineering

The Kansei Engineering method is a technology-oriented user psychology as the basis for developing a product. This method was developed by Nagamichi. Etymologically, Kansei is a Japanese word meaning the feelings or emotions of users or customers regarding a new product. When the user decides something, it will be based on feelings of like, happy, sad, luxurious, strong, funny and so on. The kansei engineering approach is a technology that translates user/customer emotions from the design elements of a product (Mitsuo Nagamachi, 2011). Kansei is described implicitly as a mental function, or as a higher brain function. The Kansei process begins with gathering the senses of related functions such as feeling, emotion and intuition, through the five senses (namely sight, hearing, smell, taste and skin sensation) (Harada, 1998). Kansei and the five senses in the brain structure are shown in Figure 2.

When these senses are triggered, psychological cognitions related to perception, judgment, and memory emerge. In the scenario of going to an unfamiliar restaurant, your vision, smell, taste and cognition will judge whether the restaurant is "very friendly" and/or provides "good service". This is "Kansei". Kansei emerges through cognition with several sensations contributing to its place. Product emotion has been recognized as a major aspect of consumer satisfaction and market success. Over the years, Japan has always been ahead of other countries in developing new and innovative products. Their success largely depended on their sensitivity to the

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demands of the implicit needs of consumers, namely Kansei, through the application of the technology now known as kansei engineering.

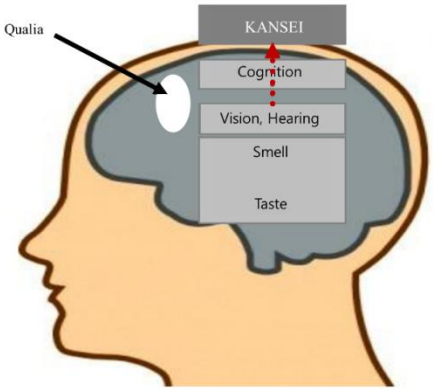

Figure 2 Kansei based on (Lokman, 2010)

According to (Lokman, 2010) Implicitly the Kansei process cannot be measured directly. What can be observed is actually not Kansei but the cause and effect of the Kansei process. Therefore, Kansei can only be measured indirectly and partially, by measuring sensory activity, internal factors, and psycho-physiological and behavioral responses. Within the scope of Kansei's study, sensory activity was measured by evaluating the impact of certain sensory stimuli on brain activity. Physiological measures are carried out by evaluating responses to certain external stimuli. Responses can be physiological or behavioral (measured by electromyography (EMG), heart rate, electroencephalography (EEG), event-associated potential (ERP), or functional magnetic resonance imaging (fMRI)) or expressive (body or facial expressions). Psychological measurement can be done with personality tests, semantic differential scale methods, or other questionnaires.

METHOD

Our propose Kansei engineering approach with details of 9 main stages that will be carried out starting with determining objects, collecting Kansei words, compiling a semantic differential scale (SD Scale), determining specimens, classifying design elements, distributing questionnaires, statistical analysis, interpreting data into elements. design, matrix analysis results (Nugroho et al., 2019).

Kansei Word Candidate Collection

The initiation stage begins with the collection of candidate words that will be used as kansei words. The trick is to search for words that can represent the user's feelings or emotions on the e-government site interface in the Health sector as a specimen in this study. The collected Kansei words came from previous literature which also conducted research related to the Kansei engineering website and then linked it to the e-government site in the Health sector. There are 30 kansei word candidates that will be used in this study, which can be seen in table 1.

Table 1. Kansei Word Candidate

No.	Kansei Word	Keterangan
1	Professional	Have the impression of a certain intelligence
2	Interesting	Fun because it's good
3	Creative	Have the ability to create
4	Experience	In touch with nature
5	Beautiful	Gives a nice impression
6	Modern	Gives a new impression according to the times
7	Simple	Gives a simple impression as it is
8	flashy	Gives a bright impression
9	Comfortable	Gives the impression of being easy to use
…	…	…
30	Feminism	Gives the impression of tenderness, patience, kindness

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Specimen Collection and Selection

Collection of specimens is carried out using the google search engine where the website for prospective specimens is selected based on the keyword "health service website". The 10 specimens are shown in table 2.

Table 2. Specimen Candidate

No	Official	URL	Traffic
1	Health office of Jakarta	http://dinkes.jakarta.go.id	11,722
2	Health office of Bogor	http://dinkes.kotabogor.go.id	2,553
3	Health office of Bandung	http://dinkes.bandung.go.id	8,042
4	Health office of South Tangerang	http://dinkes.tangerangselatankota.go.id	6,961
5	Health office Java east	http://dinkes.jatimprov.go.id	9,576
6	Health office Jogjakarta	http://dinkes.jogjaprov.go.id	45,408
7	Health office West Borneo	http://dinkes.kalbarprov.go.id	5,694
8	Health office Aceh	http://dinkes.acehprov.go.id	17,741
9	Health office Lampung	http://dinkes.lampungprov.go.id	5,036
10	Health office Denpasar	http://dinkes.denpasarkota.go.id	1,222

Furthermore, 10 specimens that have been obtained which is 5 selected specimens were then designated as specimens in this study. The selection of these specimens is determined based on the highest traffic according to Ubersuggest (Neilpatel, 2021) with the consideration that the characteristics of one website with other websites have striking differences in each interface element. The five specimens include: website health office Jogjakarta, website health office Aceh, website health office of Bogor, website health office of Karawang.

RESULT AND DISCUSSION

Coeficient Correlation Analysis (CCA)

We analyzed and calculated by Coefficient Correlation Analysis (CCA). CCA is a statistical calculation method used to determine the magnitude or strength of the correlation between two Kansei Words. By using CCA, it can be seen the strength of the pair correlation between 20 Kansei Words. Table 2 shows the results of Kansei Word data analysis using CCA.

Table 3. Detail Matrix CCA

Variables	Professional	Interesting	Creative	Beautiful	Modern	Simple	Colorful	…
Professional	**1**	0.837	0.913	0.958	0.955	0.307	0.602	…
Interesting	0.837	**1**	0.957	0.929	0.883	0.278	0.430	…
Creative	0.913	0.957	**1**	0.947	0.939	0.298	0.490	…
Beautiful	0.958	0.929	0.947	**1**	0.907	0.146	0.676	…
Modern	0.955	0.883	0.939	0.907	**1**	0.535	0.356	…
Simple	0.307	0.278	0.298	0.146	0.535	**1**	-0.568	…
Colorful	0.602	0.430	0.490	0.676	0.356	-0.568	**1**	…
Informative	0.714	0.944	0.895	0.873	0.715	-0.024	0.561	**…**
Unique	0.754	0.321	0.436	0.636	0.564	0.004	0.711	…
formal	0.442	-0.021	0.155	0.167	0.447	0.625	-0.065	….
Luxurious	0.871	0.520	0.715	0.760	0.749	0.102	0.689	…
Impressive	0.971	0.699	0.796	0.873	0.909	0.362	0.557	…
Easy to use	0.634	0.784	0.755	0.611	0.832	0.799	-0.169	…
Cool	0.832	0.863	0.961	0.833	0.893	0.363	0.363	…
Elegant	0.848	0.760	0.903	0.775	0.912	0.495	0.288	…
Advanced	0.904	0.975	0.933	0.965	0.913	0.286	0.501	…
Flashy	0.458	0.218	0.307	0.506	0.183	-0.665	0.974	…

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Variables	Professional	Interesting	Creative	Beautiful	Modern	Simple	Colorful	…
Matching	0.900	0.822	0.925	0.829	0.973	0.578	0.268	…
Spectacular	0.987	0.798	0.867	0.958	0.897	0.175	0.708	…
Comfortable	0.968	0.894	0.955	0.929	0.998	0.478	0.414	…

Table 3 show correlation between two Kansei Words has a strong correlation or a weak correlation. A strong Kansei Word correlation will be positive, whereas a weak Kansei Word correlation will be negative or close to a value of 0 or less than 0.3. From Table 3, as an example of how the relationship between the Kansei Words "Comfortable" and "Modern" turned out to be a value of 0.998, it means that the two emotions or feelings shown by these two Kansei Words have a very strong relationship. While other examples, such as the relationship between the Kansei Word "Striking" and "Simple" have a value smaller than zero, namely -0.665, meaning that the relationship between the two emotions/feelings shown by the two Kansei Words is very weak. CCA results can later be used as supporting data when analyzing the strength of each Kansei Word using Factor Analysis. Thus the results from the analysis with CCA can help to find alternative interface design models that can be considered based on psychological aspects, or can strengthen the analysis of user emotions which will be used as the basis for drafting design element recommendations.

Factor Analysis

The average recapitulation data is used as a factor analysis material using varimax rotation to get more accurate results.

Table 4. variance percentage

	D1	D2	D3
Variability (%)	56.394	19.616	20.665
Cumulative %	56.394	76.010	96.675

Table 4 shows the results of the percentage of variance using Factor Analysis. The table shows two factors that are considered to have a strong influence on the user's emotional factors, namely D1 and D2 by more than 70%. These two factors display two values, namely variability and cumulative. Table 4.11 shows the correlation between factors and emotions.

Analysis Result Matrix

Matrix of design elements is created. This matrix contains the values that each design element should use, as listed in Table 5. The value used is the largest coefficient value from each category.

Table 5. Detail Analysis Result Matrix

Header	Logo	Location	Left
		Size	Small
		Title	Exist
	Font	Type	Poppins
		Size	18px
		Color	Grey
Manu Navigation Bar	Font	Type	Poppins
		Size	14px
		Color	Blue
Image Slider	Dominant Color		Orange
	Second Color		Blue
	Size		Large
	Logo		No Existance
	Infographics		Existance
	Font	Color	Black
		Size	16px
		Type	Segoe Ui
Content	Font Article	Type	Poppins

*name of corresponding author

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		Color	Grey
		Size	15px
	Font Heading/Subtitle	Type	Poppins
		Color	Black
		Size	24px
	Images	Size	Medium
		Color Scheme	Monochromatic
		Total Images	<5
		Small	0-5
		Large	>1
		Medium	>4
	Video		No Exist
Layout		Color Shceme	Triad
		Type	Landing Page
		Hamburger Menu	No Exist
		Mobile-Frendly Layout	Respnsive
		White Space	Exist
Footer	Font Text	Type	Poppins
		Size	15px
		Color	White
	Font Title	Type	Poppins
		Size	20px
		Color	White
Social Media Icon	Location		Footer
	Color		Blue
	Type		Solid Icon
	Size		Small

CONCLUSION

This study applies an investigation to the design of the e-gornment website interface of the Karawang Regency Health Office based on user preferences. The study that has been carried out has resulted in the following conclusions: first, Based on the most significant Kansei Word, 7 elements have been found that have a high influence on the interface of e-government sites in the health sector of Karawang Regency. second, succeeded in identifying as many as 20 Kansei Words where 4 words greatly influenced the interface design of the e-government site of the Karawang District Health Office. The four kansei words are creative, interesting, colorfull, striking where the word attractive has the highest influence of the 5 specimens of e-government sites in the health sector. This research has limitations which in future research are expected to be improved and improved so that the position of research and science in the field of kansei engineering continues to grow, such as the use of machine learning and deep learning algorithm.

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