Application of Kansei engineering in Thai government hospitals

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Abstract

Nowadays, Thai health care sector is a highly competitive. All health care services focus on improving the levels of service quality in different ways. Hospital is one part of the health care sector. Most hospitals have to increase competitiveness by enhancing both service quality and customer emotions. Customer emotion is one of the key factors to improve service quality. Kansei Engineering or Affective Engineering can translate customer emotions into products and service designs. This method determines the relationships between customer feelings and design attributes. This study applied KE which can account to customer needs in service design. More specifically, the author applied KE with SERVQUAL model in order to classify health care service attributes. SERVQUAL is an instrument for measuring service quality and obtaining a higher predictive of customer satisfaction. Thai government hospitals were selected as the domain of a study. One hundred participants who have previous experience with government hospitals took part in the questionnaire survey. The reliability of a pilot test was assessed with Cronbach's alpha. The relationships between customer emotions and service attributes were analyzed using multiple linear regressions. The result of this study shows that "friendly" was the most significant of customer emotions. The modern equipment and the patients feeling safe in transactions of hospital should be focused by health care executives for service attribute improvement.

Keywords: Kansei engineering, SERVQUAL, government hospitals, service design

<div style="text-align:center">Introduction</div>

One of the fastest growing Thai industries in the service sector is the health care industry. The health care services have determined strategies to improve their services because of the global competition (Andaleeb, 1998). However, many Thai hospitals have concentrated and made an effort to improve their services with the standards of Hospital Accreditation of Thailand, ISO9001, ISO14001, ISO18000 and the Joint Commission International Accreditation. In addition, many health care organizations began to achieve customer satisfaction as a key point of their strategy. According to product design and development, Kansei Engineering (KE) has been used to fulfill customer needs and satisfactions. KE methodology can translate human psychology such as feelings and emotions into desired product design attributes such as size, shape, and other engineering characteristics (Nagamachi, 2001). The applications of KE not only focus on the design of physical products, but also can apply in service design. Even though, there are few of researches that have used KE to examine the services. For example, the relationships between service attributes and service characteristics of home delivery service were examined by KE (Chen, Hsu, Chang, and Chou, 2015). Hartono (2012) integrated KE, Kano model and quality function deployment (QFD) to give a guideline for service

managers of luxury hotel. On the other hand, service quality is the concept of customer perceived quality, which is based on the customer's perspective of service (Parasuraman, Zeithaml, and Berry, 1988). The SERVQUAL scale has been the most widely used and accepted tool for service quality measurement (Ladhari, 2009). In health care industries, health care services are required to meet the physical, psychological and social needs of patients (Purcare, Gheorghe and Petrescu, 2013). There are many researchers that have assessed the perception of health care service using SERVQUAL in many countries, for instance, Romania (Purcare, Gheorghe and Petrescu, 2013), Indonesia (Fitriati and Rahmayanti, 2012; Handayani, Hidayanto, Sandhyaduhita, Kasiyah, and Ayuningtyas, 2015), Pakistan (Sabir et al., 2014), Turkey (Yeilada and Direktör, 2010), Bahrain (Ramez, 2014) and Thailand (Yousapronpaiboon and Johnson, 2013). This study brings the concept of KE and the SERVQUAL model to associated relationships between service qualities and customer's emotional perceptions in Thai government hospital service. The executive directors can create a systematic procedure for the design of services. Furthermore, the perceptions of Kansei words which customers emphasize will help health care enterprises understand what the customer needs and continuously improve their service quality.

Methodology

This study applied KE and SERVQUAL scale based on model procedure as presented by Schütte and Eklund (2005). The procedures of this study represented in (Figure 1). The procedure for health care service is presented as follows.

Choice of domain

Thai government health care service was selected as the domain of service design. The participants were patients who have previous experience with government hospitals that he or she had already frequently used. According to the statistics issued by the Office of the Permanent Secretary for Public Health, the total number of the in-patients from health service units in 2012 was 12,445,264 (National Statistical Office of Thailand, 2012). Thus, the sample size was determined using the following formula of sample size (Yamane, 1967) as in Eq. (1). The sample size of the study was 100 participants at 90 % of the confidence level.

$$n = \frac{N}{(Ne^2 + 1)} \tag{1}$$

where; n: the sample size, N: the population size = 12,445,264, e: the acceptable sampling error = 0.10

Span the semantic space service

Kansei words were collected from advertisements, internet, magazines, literature reviews and so on. Some of these Kansei words that were unclear or have the same meaning were omitted in the screening step. After discussions with the professors and experts in health care service, convenient, attractive, confidence, happy, impressive, elegance, friendly, modern, relax, rapid, specialized, economical, safe and careful were selected as Kansei words to be used in this study.

Span the space of properties

This study applied the SERVQUAL model to define the service attributes that can have an impact on the emotional response. There are 27 service attributes which are deployed into five dimensions; i.e. tangibles (10 items), reliability (6 items), responsiveness (4 items), assurance (4 items) and empathy (3 items) as shown in (Table 1). The health care service attributes were translated into Thai language in a questionnaire.

Synthesis

1. The data collection device

The survey questionnaire was composed of three parts. The first part assessed demographic characteristics of the hospital patient including gender, age, occupation, education level, marriage status, income and frequency of use. The second part was the evaluation of Kansei words regarding to the ratings of emotions rated by the participants. We used the five point Likert scale which ranged from 1 (meaning absolutely negative agreement) to 5 (meaning absolutely positive agreement). In the third part, 27 service attributes from applied the

SERVQUAL model were assessed the participants' perceptions of service quality that related to Kansei words.

   2. Data collection process

   A pilot test before conducting the formal survey was used to confirming reliability of questionnaire. In the pilot test, there were 30 participants. The reliability of the scale was tested using Cronbach's alpha. The Cronbach alpha values obtained were 0.93 that indicated good internal consistency as Cronbach alpha values greater than 0.70 are basic research reliability (Nunnally, 1978). Formal

questionnaires were collected in 2016. Data collection process was conducted in Bangkok and Chiang Mai which are major cities of Thailand.

   3. Synthesis

   The relationships between customer emotions (Kansei words) and service attributes were analyzed by using multiple linear regressions (MLR) (Ishihara, 2001). MLR is one of statistical techniques that analyze the relationship between the explanatory variables and the response variables (Investopedia, 2015).
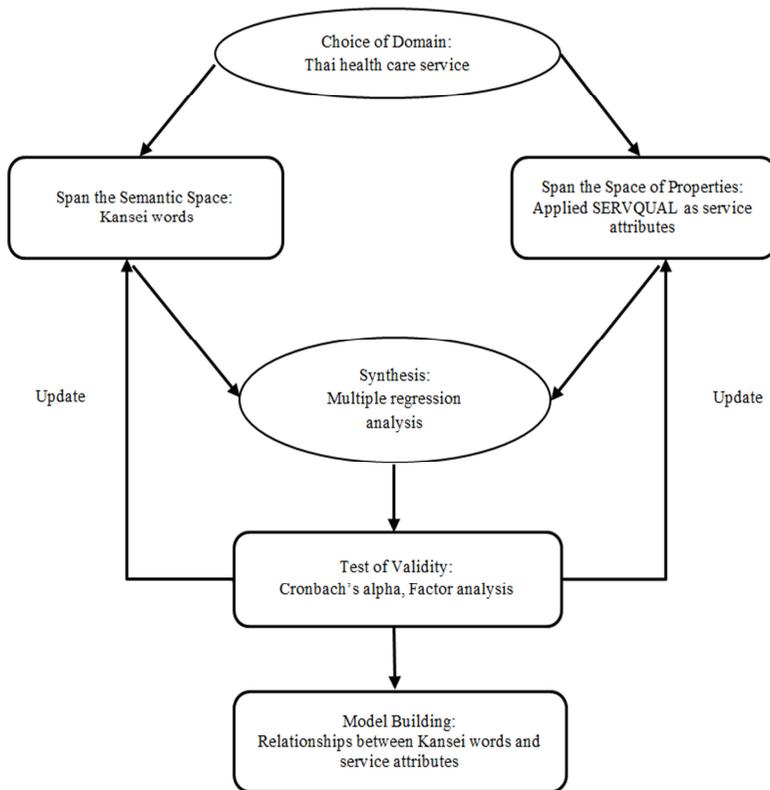

Figure 1 Research methodology.

Table 1 The health care service attributes.

tangibles (T)
T1. the physical facilities and environment at hospitals are visually appealing
T2. hospitals have modern looking equipment
T3. materials associated with the service are usually appealing
T4. employees have neat appearing
T5. hygiene of the hospital and personnel are clean
T6. the atmosphere of cafeteria is inviting appetite
T7. the meals served at the hospital are delicious
T8. the hospital's lobby is comfortable
T9. the shops in hospital are attractive
T10. the scent in hospital is refreshing

reliability (Rel)
Rel1. hospitals tell patients exactly when services will be performed
Rel2. hospitals provide a service at the time they promise to do so
Rel3. when patient has a problem, hospitals show a sincere interest in solving them
Rel4. hospitals provide service right the first time
Rel5. hospitals give accurate and consistent information (e.g., cost, diagnosis of the disease, etc.)
Rel6. hospitals protect customer confidentiality (e.g., information about patients, etc.)

responsiveness (Res)
Res1. employees give prompt service to patients
Res2. employees are always willing to help patients
Res3. employees are never too busy to respond to patients' requests
Res4. hospitals have the availability of all kinds of service

assurance (A)
A1. the behavior of employees insist of confidence in hospitals
A2. patients feel safe in their transactions
A3. employees are consistently courteous with people
A4. employees have knowledge to answer patients' questions

empathy (E)
E1. hospitals give patients individual attention
E2. hospitals have their patient's best interests at heart
E3. employees understand the specific needs of their patients

Test of validity

Using ideas about the semantic space by Weinreich (1958), it is possible to conduct a factor analysis (FA) from the data gathered and compare the results with the Kansei words delivered from the semantic space. In addition, FA is used to identify the priority of Kansei words for improving service attributes.

Model building

When the validity tests give a satisfactory result, the data gathered from the synthesis can be presented as a model. Models are proposed that relate between each of Kansei words and service attributes of health care service.

Results

Demographic profiles of the participants

From 100 participants, more than half (55%) were male, aged between 31-40 (32%) and have university degrees (58%). Some of the participants were married (62%), income levels varied from 15,001-25,000 baht (47%) and company employees (52%). Most of the participants went to hospitals once a year (44%) as shown in (Table 2).

Results of factor analysis

The objective of factor analysis (FA) is to identify independent latent factors. This technique is able to reduce the set of factors in a dataset by the interdependencies between observed factors (Wikipedia, 2017). Accordingly, FA was used to extract homologous Kansei words from a total 14 Kansei words and forms new groups which reduced input dimensions into fewer latent dimensions. The results of factor loading using two factors after varimax rotation are shown in (Table 3). The extracted two factors have a contribution of 34.4% and 19.0% of the total variance, respectively. The total variance explained by the model was 53.4% that illustrated the result of FA is acceptable to extract representative Kansei words. In Factor 1, we can see that Kansei words such as friendly, impressive, careful, and convenient were important effectors and this factor was named "friendly". The factor loading of "friendly" is the highest value (0.836) in the first factor, therefore this Kansei word was named. Similarly, in Factor 2, "specialized" had the largest weight (0.900) and this factor was named "specialized". These important Kansei words should be selected as higher priority for service design improvement. Furthermore, the Cronbach's alpha of each factor was 0.90 and 0.86, respectively, which indicated a high reliability for survey instrument.

The relationship between Kansei words and government hospital attributes

This study used MLR to examine the relationships between hospital service

characteristics and Kansei words. As (Table 4) shows, 21 service attributes significantly related to Kansei words were analyzed. In contrast, only 6 service attributes were insignificant, namely, T6, T8, T9, Rel1, Rel6, and A3. Most of the predictive models had significant influence on the comprehensive of Kansei words, but only model of happy was insignificant. If health care service managers need to increase individual values of Kansei words, they should improve the service attributes with greater influence. For example, the physical facilities and environment at hospitals (T1) should be upgraded in order to be visually appealing to provide customers with a feeling of convenience and relax.

According to the results of FA, the service attributes with higher priority Kansei words were first considered for health care service improvement. The service attributes that signify to "friendly" and can prioritized by values of the linear coefficient were T2, A2, T4, E1, Res2, Rel3, and Res3, respectively. Similarly, T4 and T3 were positively related to "specialized". These attributes should be concentrated on by health care executives. Finally, the expert team was asked about the results of this study. In their opinion, they agreed with T2 (the modern equipment) and T4 (the neat appearance of employees) are the most important service attributes to be the first priority if the hospitals want to improvement or investment.

Table 2 Profile of participants.

profile	percentage (%)
gender	
male	55
female	45
age	
below 20 years old	12
20 - 30 years old	23
31 - 40 years old	32
41 - 50 years old	17
51 years old and over	16
education level	
under college or university degree	35
college or university degree	58
post graduate	7

Table 2 Profile of participants (continue).

profile	percentage (%)
married status	
single	36
married	62
divorce	2
occupation	
student	6
public servants	26
company employees	52
private business	10
unemployed	6
monthly income	
below 15,000 THB	22
15,001 - 25,000 THB	47
25,001 - 35,000 THB	21
35,001 - 45,000 THB	9
more than THB 45,001	1
frequency of used	
once a year	44
twice a year	40
four times a year	10
every month	6

Table 3 Rotated components of Kansei words.

	factor 1	factor 2
convenient	0.741[*]	0.209
attractive	0.637[*]	0.248
confident	0.412	0.632[*]
happy	0.316[*]	0.004
impressive	0.814[*]	0.213

Table 3 Rotated components of Kansei words (continue).

	factor 1	factor 2
elegant	0.784[*]	0.194
friendly	0.836[*]	0.228
modern	0.314	0.524[*]
relax	0.620[*]	0.145
rapid	0.332	0.104
specialized	0.096	0.900[*]
economical	0.555	0.611[*]
safe	0.397	0.632[*]
careful	0.743	0.361
variability (%)	34.419	18.983
cumulative (%)	34.419	53.401

[*] significant at level p < 0.05

Table 4 The significant MLR model of Kansei words and health service attributes.

Kansei words	equation of the model	p value R^2	service attributes with positive
convenient	convenient = 2.32117+0.80364T1[*]-0.03097T2+0.10619T3-0.20854T4+0.32680T5+0.09330T60.81790T7+0.43388T8+0.98278T9-0.19246T10-0.16817Rel1+0.74406Rel2+0.88160Rel3+2.18050Rel4-2.01568Rel5+0.34431Rel6-0.22436Res1-1.03867Res2-0.78122Res3+0.76587Res4-0.12519A1-1.15844A2+0.29427A3-1.19714A4+0.49867E1+1.93340E2-0.62005[*]E3	p=0.0007 R^2=0.49	T1[*]
attractive	attractive = 2.43424-0.29694T1+0.37083T2+0.05706T3-0.05520T4+0.10811T5+0.42623T6+0.99462T7[*]+0.41464T8+0.13581T9-1.81899T10[*]+0.10761Rel1+0.17012Rel2-0.16963Rel3-0.18908Rel4+0.72949Rel5[*]+0.58096Rel6-0.55650Res1-0.70084Res2+0.14270Res3-0.25649Res4+0.93716A1[*]-0.09783A2+0.31523A3+0.04828A4-0.49192E1+0.54092E2-0.69341E3	p=0.0031 R^2=0.46	T7[*], Rel5[*], A1[*]

Table 4 The significant MLR model of Kansei words and health service attributes (continue).

Kansei words	equation of the model	p value R^2	service attributes with positive
confident	confidence = 3.62918-0.76406T1*-0.15304T2+0.13372T3+ 0.56250T4+0.19584T5+0.02877T6-0.10267T7+1.07140T8- 1.80802T9+0.16609T10-1.03218Rel1+1.08719Rel2+0.06924Rel3+ 0.21045Rel4-0.02127Rel5+0.01434Rel6+0.00378Res1+ 0.57001Res2-0.03343Res3-0.02079Res4+0.87127A1*+ 0.35808A2-1.06145A3*+0.19237A4-0.28899E1-0.12712E2-0.04156E3	p=0.0048 R^2=0.45	A1*
happy	happy = 1.95703+1.08411T1-0.05425T2-0.41624T3-2.13198T4+ 0.57871T5-3.48071T6+0.84591T7-1.67273T8-2.33153T9+ 4.15799T10+0.16115Rel1-1.29045Rel2+9.72914Rel3*+ 1.90201Rel4+2.49021Rel5-4.69688Rel6+0.42497Res1-0.95087Res2- 2.58228Res3-1.81359Res4-0.55142A1+0.23289A2+ 1.42309A3-0.29416A4-1.86960E1-0.86977E2+1.52642E3	p=0.3252 R^2=0.30	Rel3*
impressive	impressive = 2.55421+0.56484T1+0.05529T2-0.32160T3+ 0.77218T4*+0.52285T5+0.36812T6+0.65589T7-0.17429T8-0.11961T9- 0.47856T10-0.12958Rel1+0.02970Rel2+0.15614Rel3- 0.44104Rel4+0.71208Rel5-0.24522Rel6+0.44912Res1-0.72893Res2+ 0.75137Res3*-0.16851Res4-0.15623A1+0.20878A2+0.10907A3- 0.16007A4-0.26117E1-0.60851E2+0.05153E3	p=0.0011 R^2=0.48	T4*, Res3*
elegant	elegant = 2.24764+0.39825T1+0.04897T2-0.08441T3+0.38189T4+ 0.03331T5+0.50302T6+0.39412T7+0.10564T8-0.63013T9+0.68436T10- 0.12073Rel1-0.73467Rel2+0.67785Rel3*+0.52569Rel4+0.87973Rel5- 1.14668Rel6-1.51442Res1+0.75616Res2+0.49522Res3-0.12712Res4- 0.36268A2+0.22120A3+0.31876A40.37526E1+0.10592E2-0.08190E3	< 0.0001 R^2=0.60	Rel3*
friendly	friendly = 1.70787-0.80309T1+1.50803T2*-1.72102T3*+1.04793T4*+ 3.18058T5-3.54704T6+0.65913T7+0.28858T8+0.66692T9-0.89830T10+ 0.49218Rel2+0.50533Rel3*-0.34603Rel4-0.54129Rel5-0.72511Res1+ 0.64816Res2*+0.49433Res3*-0.68577Res4-0.86278A1*+1.06413A2*- 0.07638A3+0.61476A4*+0.71487E1*+0.14525E2-0.40338E3	<0.0001 R^2=0.76	T2*, T4*, Rel3*, Res2*, Res3*, A2*, E1*
modern	modern = 2.83581+0.59151T1*+0.92890T2+0.16419T3-0.50830T4+ 0.75171T5*+0.64729T6+0.60271T7+0.48313T8-1.00351T9-0.72302T10- 0.33502Rel1+0.62886Rel2-1.62920Rel3+0.47561Rel4+0.11485Rel5+ 0.02168Rel6-0.95076Res1+1.17218Res2+0.55347Res3+0.08798Res4- 0.16338A1+0.42794A2+0.48515A3-1.23724A4-0.21493E1+0.04242E2	0.0151 R^2=0.41	T1*, T5*

Table 4 The significant MLR model of Kansei words and health service attributes (continue).

Kansei words	equation of the model	p value R^2	service attributes with positive
rapid	rapid = 1.15080+0.79073T1+0.04721T2+0.73092T3*+0.61867T4*-0.55112T5+9.65633T6-2.75410T7-1.79543T8-4.67620T9+0.64105Rel1-0.56734Rel2-0.12994Rel3-1.93059Rel4*-1.11105Rel5*+3.79508Rel6+2.60548Res1*+1.31163Res2*-0.21659Res3-0.26442Res4+1.94016A1-3.03051A2-4.76025A3*+0.60794A4*+2.06572E2*+0.22451E3	<0.0001 R^2=0.77	T3*, T4*, Res1*, Res2*, A4*, E2*
specialized	specialized = 3.75075-0.32106T1+0.24642T2-3.10228T3*+3.79869T4*-0.04113T5+0.61813T6-0.76054T7-3.08410Rel1*+3.26756Rel2*+0.18854Rel3+0.27026Rel4+0.38661Rel5-0.32377Rel6-0.59685Res1+0.56001Res2+0.02168Res3-0.48585Res4*-0.01296A1+0.44987A2*-0.23182A3+0.34524A4*-0.28107E1+0.06934E2-0.38151E3*	<0.0001 R^2=0.56	T4*, Rel2*, A2*, A4*
economical	economical = 2.76217+0.58496T1+0.20518T2+0.14478T3-3.02184T4*+10.40032T5*-5.49021T6*+0.34168T7+1.90419T8-5.41806T9*-1.14506Rel1+1.24193Rel2+0.28731Rel3-0.21204Rel4+0.50143Rel5*+0.31157Rel6+1.77583Res1-1.14651Res2-0.26207Res3+1.22529Res4*-0.06236A1+0.46282A2-3.60212A3+0.09348A4+0.02482E2+0.83042E3*	<0.0001 R^2=0.52	T5*, Rel5*, Res4*, E3*
safe	safe = 3.06414+1T1+0.26002T2-2.77712T3*+3.85203T4*-0.26255T5-0.29037T6-1.71532T7+3.16220T8-0.74598T9-1.09533Rel1+0.49705Rel2-0.91381Rel3+0.54439Rel4*+0.64336Rel5*+0.38783Rel6-0.72592Res1+0.50886Res2+0.04700Res3+0.72816Res4*+0.43747A1-0.08679A2-2.67581A3*+1.71433A4*-0.66630E2+0.10846E3	<0.0001 R^2=0.52	T4*, Rel4*, Rel5*, Res4*, A4*
careful	careful = 1.85291-3.60281T1*+3.25485T2*+0.30949T3+1.14780T4*+1.28083T5*-0.54296T6-0.07780T7-0.21977T8-1.92151T9*-0.04817Rel1+0.83631Rel2*+1.10112Rel3*-1.02135Rel4+0.67719Rel5-0.59306Rel6+0.28044Res1-0.02408Res2+0.57897Res3*+0.18513Res4-0.58232A1-1.30991A2*-0.28578A3+0.44059A4+0.27024E1+0.95549E2+0.45348E3	<0.0001 R^2=0.68	T2*, T4*, T5*, Rel2*, Rel3*, Res3*

* significant at level $p < 0.05$

Discussion

To our knowledge, this is the first time KE technique has been used in a health care service survey. An investigation of health care service attributes and customer's emotion based on KE and SERVQUAL models in Thailand was conducted using data from 100 participants having experience in public hospitals. Not all health service attributes

were considered significant to their emotions. As the findings indicate, the emotion of "friendly" was the most two significant Kansei words which enhanced consumers' feelings toward service attributes. The most important service attribute was the modern equipment (T2) and the neat appearance of employees (T4). This supports prior research by Yousapronpaiboon and Johnson (2013), confirming that public hospitals should improve in the areas of creating a visually appealing environment and physical facilities within hospital. Similarly, the patients feeling safe in transactions of the hospital (A2) was the most significant assurance to inspire trust and confidence. If a customer needs to go to hospital, a customer has the right to choose which hospital he or she feels safe. Moreover, individual attention (E1), willing to help (Res2), interest in solving problems (Rel3) and responding to requests (Res3) were indicated by the level of empathy, reliability and responsiveness by which employees response to customers or patients.

A similar finding was reported in a study by Ramez (2014) who suggested managers and doctors of health care centers located in Bahrain should work together to respond and comply with patient requests and enquiries. Although government funding, lacking sufficient health care service in rural areas, and overload public hospitals with high birth rate are some of factors that affect poor quality of government health care services (Irfan and Ijaz, 2011). Government hospital executives can identify service attributes which higher priority of customer emotions, and also way to improve them.

Conclusion

In the face of increasing competition, the health care service is seeking new tools to create competitive advantages. Consequently, the best techniques or methodologies are selected for improving their service quality. Service quality will become a key factor of continuous improvement and sustainable development. In terms of measuring the service quality in the health care service, the SERVQUAL model has been applied as a tool for classifying service attributes. KE was used to determine the relationship in between the service attributes and customer emotions. This study brings the concept of KE and the SERVQUAL model to associated relationships between service qualities and customer's emotional perceptions in Thai government hospitals. From 100 participants in this survey, more than half were male, aged between 31-40, have university degrees and went to hospitals once a year. By calculating MLR, we investigated the associations between the 27 service attributes and the Kansei words, from which we obtained the significantly service attributes related to customer delights and

emotions. Thai government hospitals should improve the content of their existing services or create new services by becoming aware of the service attributes and emotions that customers emphasize. For example, modern equipment in hospitals was the most important relationship that related to the emotion of "friendly", therefore this attribute should be concentrated or be the first priority to investment and improvement.

Acknowledgement

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