

An NLP-Based Approach to Explore Factors Affecting Intention to Use various E-Services

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Abstract

This investigation endeavors to clear a way for future analysts to investigate various methods so as to increase further experiences from 'data rich' printed information accessible through online client surveys. This investigation has attempted to investigate the various qualities from the utilization esteem hypothesis position which are regarded significant in various settings by examining client surveys from three diverse e-specialist organizations, to be specific, Zomato (online nourishment conveyance), MakeMyTrip (online travel office) and Coursera (internet learning stage). Aftereffects of this examination show that various qualities are significant in various settings: e-Learning (epistemic and utilitarian), OFD (contingent and epistemic), OTAs (useful and passionate). This investigation finishes up with different ramifications and degree for future research..

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I. INTRODUCTION

The increasing penetration of the internet in this recent era has seen a growing demand for internet enabled services ranging from healthcare to food delivery to education. The rise of these internet-based services or better known as electronic services or e-Services has affected the daily lifestyle of people [1]. In this study, we try to explore the factors that affect intention to use e-services by focusing on three contexts, namely, e-learning, online food delivery and online tourism. E-Learning services or online learning services has led to the availability of a large number of courses which can be learnt by the user at his/her own pace and from anyplace [2]. Some

well-known e-learning platforms in India are Coursera, Lynda, Udemy, Udacity, etc.

Online food delivery services or OFDs refer to the delivery of food to the place desired by the customer for orders placed online through OFD service provider webpage or mobile applications [3]. OFDs have revolutionized the traditional restaurant industry by delivering the food from our favorite restaurants to our doorsteps. Some well-known OFD services in India are Zomato, Swiggy, UberEats, etc.

Online travel agencies or OTAs denote the services provided by third party owners in the tourism sector, where users can book hotels or

events or packages through online platforms. OTAs has made booking easier and convenient [4]. Unlike traditional ways of booking, the presence of OTAs has increased the visibility of hotels and helped the customer to choose easily from a wide range of choices. Some well-known OTAs in India are MakeMyTrip, Yatra, OYO, etc.

For exploring the factors that affect usage intention of users in case of various services, research over the years has concentrated mainly on qualitative or quantitative or mixed-method based approaches. While the qualitative-based research focusses on understanding the in-depth perspectives, experiences, beliefs, values, ideas, etc. from the participants [5], a quantitative based approach deals with statistically testing the model or hypotheses [6]. A combination of these two approaches in any order results in a mixed-method approach [7]. However, there are hardly any studies that have fully focused on Natural language processing (NLP) based approaches to explore the factors of importance that people value more.

This study tried to address this gap by utilizing an NLP-based approach to explore factors that affect user's usage intentions in three different contexts, namely, e-Learning, OFDs and OTAs. For this study, online customer reviews from 2485 OTAs users (MakemyTrip.com), 799 OFDs users (Zomato.com) and 3229 reviews from e-Learning users were analyzed. Results of this study show that different values are important in different contexts: e-Learning (epistemic and functional), OFD (conditional and epistemic), OTAs (functional and emotional).

Section 2 discusses the Literature review. Section 3 contains the conceptual model and hypotheses formulation followed by the methodology in Section 4. Section 5 presents the results and Section 6 contains the discussion. This article finally concludes with the implications, limitations, and scope for future research.

II. LITERATURE REVIEW

2.1. e-Learning services

The global e-Learning market is expected to reach revenues of around USD398.15 billion by 2026 [8]. Over the years researchers have explored the various factors that affect e-learning services quantitatively or qualitatively. There are hardly any studies that try to understand the user's perspectives from the user reviews. Some important factors that affect usage intention of e-Learning services as explored by earlier researchers are system functionality, ease-of-use, usefulness [9], content quality [11], flexibility [9], information quality [11][12], etc. In this study we try to explore the factors based on our conceptual model from user-generated content

2.2. Online food delivery services (OFDs)

The OFD sector is expected to reach revenues of USD 137.60 billion by 2023 [13]. Earlier researchers have explored factors like staff behaviour, food quality [14], past experiences [15], functionality, usability [4], offers, discounts, ease of use [16], safety [17], etc. affects customers usage intention in case of OFDs. However, there are hardly any studies that have explored the user's perspectives from online OFD user reviews.

2.3. Online Travel Agencies (OTAs)

It is expected that OTAs will generate revenues of around USD 2.3 billion by 2020 for the e-travel agents [18]. Researchers in the OTA segment has found factors like, website design and responsiveness [19], process quality [20], website functionality, information quality, customer safety [21], pricing [22], etc. affects customers intention to use OTAs to satisfy their needs. Lately researchers have started exploring online user reviews in the OTA segment [23]. Using customer reviews to understand their perspectives in OTA context is still in its nascent stage.

2.4. Online customer reviews

In this modern era, due to easy accessibility of smart phones and penetration of the internet, users post comments/reviews in various social platforms ranging from Facebook to company sites. This user-generated content is rich in information and if analyzed properly can reveal deeper insights [24]. Topic modeling is a popular technique for textual data analysis. The various techniques to perform topic modeling are latent semantic analysis or indexing (LSA or LSI) [25], latent dirichlet allocation (LDA) [26], hierarchical LDA (hLDA) [27][28], etc. Online customer reviews are really important for companies since they also serve as important sources of information for future prospects [29].

III. CONCEPTUAL MODEL AND HYPOTHESES FORMULATION

In this study we have formulated a simple conceptual model based on consumption value theory (CVT) [30]. We have used four independent variables, namely, functional values, emotional values, conditional values and epistemic values, and one dependent variable, namely, usage intention. The conceptual model is shown in Figure 1.

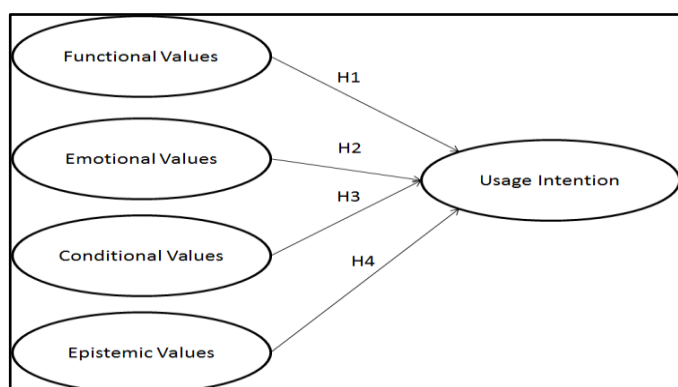


Figure 1. Proposed model (Source: Sheth, Newman, and Gross, 1991)

Functional values refer to the various functionality related benefits related to the service provided. It includes the ease-of-use, system quality,

website/app. responsiveness, etc. Researchers [31][32] over the years have found a positive relation between functional values and usage intention. Hence, in this study we also propose that:

H1: Functional values and usage intention are positively related.

Emotional values refer to the various emotional aspects that arise customer's feelings for the service. It can be in the form of customer's expression of love for the service, customer's love for the brand, etc. Researchers [31][32] have found a positive relationship between emotional values and usage intention. Hence, we propose:

H2: Emotional values and usage intention are positively related.

Conditional values refers to the various offers and benefits that attract a customer to a service which are situation based [33]. Researchers have found a positive relationship between conditional values and usage intention in various contexts like online shopping [34], tourist's behaviour for local food [35], etc. Hence, we hypothesize:

H3: Conditional values and usage intention are positively related.

Epistemic values denote the novelty, and information provided by the service. Epistemic values generally denote the credibility of information provided and the information cover [35]. Earlier researchers have found a relationship between epistemic values and usage intention in various contexts like, tourism [35], mobile health services [36], etc. Thus, we suppose:

H4: Epistemic values and usage intention are positively related.

IV. METHODOLOGY

In this study an NLP-based approach has been followed. Topic modeling is used since topic

modeling generates new and important topics from the textual data [37] without potential biases impacting the results [38]. LDA is also used in our study since LDA has the ability to generate an estimated probability of a document being represented by a topic and the probability of a word used to represent a topic [26]. In this study, we have tried to find out the percentage of users who value each factor using topic modeling. The steps followed are summarized below:

Step 1: Extract data related to user reviews from service provider's webpage using certain web-mining technique.

Step 2: Reviews in languages other than English are removed.

Step 3: Cleanse the data by removing stop-words, punctuations, and "not so useful words".

Step 4: Stemming is performed on the textual data.

Step 5: LDA-tuning is performed to find out the optimal number of topics relevant to each dataset. Each user review is treated as a separate document in this case.

Step 6: Topic modeling is performed on the dataset to generate the topics-terms matrix and the probabilities matrix.

Step 7: The topics for each document are arranged based on priority (here probability scores in descending order).

Step 8: Analysis is done to see which topics are of utmost importance to users.

We have not performed any test-of-significance in this study. This will be taken up in a separate paper. This study is to explain an alternative avenue of traditional research approaches. This study has utilized R 3.4.0 and Python Enthought Canopy for the various analyses.

V. RESULTS

The results of the LDA-tuning are shown in Figure 2a, 2b and 2c. In the LDA-tuning graphs, we need to find the x-axis value which minimizes the Cao Juan and Arun scores, and maximizes the Deveaud and Griffiths score. These are part of the 'ldatuning' package in R. We find that the optimal number of topics in case of e-Learning services, OFDs and OTAs are 89, 13, and 45 respectively. After the topic modeling was performed on the different datasets, the topics which are most relevant to the factors present in the conceptual model were selected manually and were discussed with another expert. It is more of a thematic based analysis, where the themes relevant to the factors under consideration are chosen separately by two or more researchers/experts and comparison is done to select the most conforming ones. Once this step is completed, the probability scores of the selected topics are analyzed to find out the ones that are of utmost priority to customers.

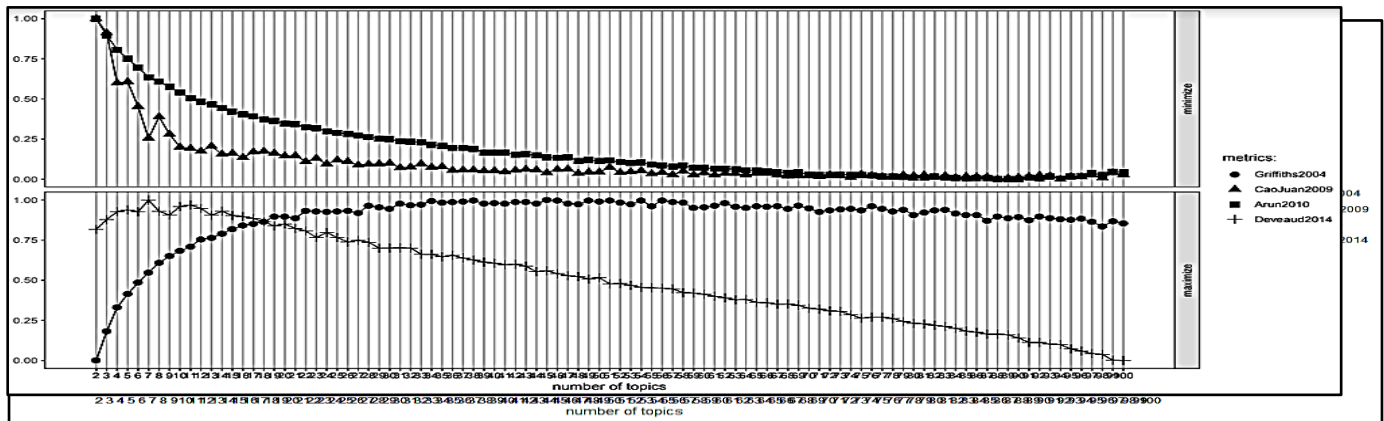


Figure 2a. Optimal number-of-topics (e-Learning dataset)

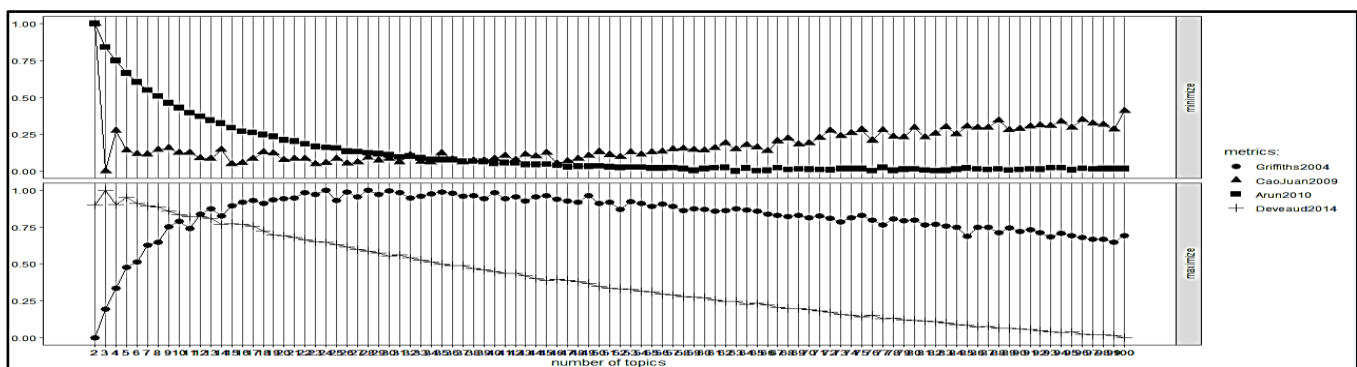


Figure 2b. Optimal number of topics (OFD dataset)

Figure 2c. Optimal number of topics (OTA dataset)

Table 1 shows the topic/theme comparisons for the three different datasets. These are actually the themes that are derived from the results of the topic modeling analysis. The themes emerged are results of the discussion among the two co-authors. We can see how the themes for the same construct differ based on the context of study. Along with the topics/themes, their percentage of being the user's first priority is shown in brackets beside each theme.

Measure	Related Topics/Themes (1 st priority Percentage)		
	eLearning	OTA	OFD
Functional Value	Web/app. design(11.83 %); functionality (15.79%);	Easy booking process (22.94%); user-friendly app./website	User-friendly app (15.52%) ;

Emotional Value	Love/enjoy course(13.87 %); Best topics (14.09%); High interest(12.73 %);	(19.64%); Good/best service (20.12%); Past experience (20.24%);	Good services (friendly) (19.40%) ; Past experiences (23.27%) ;
Conditional Value	Great deals (7.22%);	Best deal (19.92%); Offer/discount (18.59%)	Offer/discount (20.28%)
Epistemic Value	Real-life examples (14.09%); New techniques (12.57%); Topic cover (13.47%); Practical (11.55%)	Schedule booking (19.80%); Site information (19.28%);	Information in website/app. (20.53%) ; Order tracking (24.41%) ;

Table 1. Topics/themes and their priority-percentage related to the respective constructs for the e-services

VI. DISCUSSION

In this study, we see that for e-Learning services, functionality (15.79%) was the highest talked about point among the consumers. In case of OTAs, we found 'easy booking process' (22.94%) was the most talked about point among OTA users. In case of OFDs, we find that order tracking (24.41%) as the most talked about points among OFD users. Based on the average percentage, we find that while in case OFDs epistemic values (22.47%), emotional values (21.34%), and conditional values (20.28%) as the most important values; in case of OTAs, we find that functional values (21.29%) and emotional values (20.18%) are valued most by consumers; in case of e-Learning services, we find that functional values (13.81%), emotional values (13.56%), and epistemic values (12.92%) are the most valued ones by the e-Learning users. This is also relatable in real-life. In case of e-Learning services, conditional values may not be so important, but the course content and functionality is more important. In case of OFDs, customers may not be so concerned with the web or app. functionality, but they may be more interested in the offers/discounts, information credibility, etc. In case of OTAs, users are more concerned with the functionality since they want smooth hotel booking, and their past experiences affect their usage intentions.

This study has several implications. From the managerial point of view, this study can help service providers understand the customer perspectives easily and look into factors that are most important. If they find some negative aspects, they can take appropriate steps to rectify the gap that exists. From an academicians' point, scholars can utilize this process and the available abundant user-generated content in various other contexts.

VII. CONCLUSION

To conclude, this study has utilized a NLP-based approach to explore the various values that affect usage intention in various contexts like, e-Learning, OFDs and OTAs. In future, scholars can also look into other ways of extracting important information from these textual data. Additionally, future researchers can also find out techniques to test the significance of the hypotheses under study.

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