Infodemic And Student Satisfaction With COVID-19 Related Information On The College Website

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Abstract

The outbreak of covid-19 generated a vast disruption in the whole workflow mechanism in higher education institutions (HEIs). Nevertheless, on the contrary, the possibilities of positively reforming the teaching and learning process can be witnessed simultaneously, along with a renewed outlook and growth within the higher education (HE) system. Correspondingly, Oxford Business College (OBC) has faced a reconfiguration in its academic setting due to the sudden and unplanned shift to the digital learning space during the pandemic.

The present study aimed to examine students' satisfaction with COVID-19 related information that the college provided its students through its Website. A quantitative approach was adopted, and an online survey was used to collect data from students at Oxford Business College UK. Survey data was primarily collected from N=969 OBC students. The data was analysed using RStudio version 1.4.1106 to build and train the regression model and subsequently validate it. The outcome variable was recoded into three categories for adequate sample size in each contingency cell, and the baseline category was set for the low satisfaction group. The multinomial logistic regression results showed significantly marginal effects on the simultaneous estimation regression model. The model's accuracy for the training data set was found to be 65% correct prediction, and misclassification error was 34%, whereas correct prediction for test data showed less discrepancy. The results confirmed that more than 80% of students were highly satisfied, as compared to the low satisfaction group, with the regular updates and relevant information about covid-19 and found it very important for guiding and avoiding any academic loss throughout the pandemic.

Keywords: Infodemic, Covid-19, OBC Website Information, Student Satisfaction

Introduction

The **Co**rona **Vi**rus **D**isease 20**19**, commonly known as COVID-19, initially appeared in Wuhan, China, in December 2019 and subsequently expanded throughout Europe and the United States in the early 2020s. As a result, COVID-19 created significant challenges for all industries worldwide, including higher education (Qureshi et al., 2020). Some of the challenges were the closure of educational institutions, switching to online teaching and maintaining the pace of learning and teaching through severe interruptions. At the apex of the crisis, over 1.6 billion learners in more than 190 countries were out of school (UNICEF, 2021). The situation was identical with higher education, as 220 million students were impacted by the global closures of higher education institutions (HEIs) (UNESCO-UNICEF-World Bank, 2021). In addition, international students have been cash cows for many English-speaking countries, and COVID-19 also affected them (Qureshi and Khawaja 2021).

Higher Education Institutions (HEIs) In The UK During The Covid-19 Pandemic

Higher education institutions (HEIs) in the UK provide tertiary education irrespective of whether public. The UK quality code for HE clarifies expectations and is used as a reference point for all the HE providers in the country. The quality code includes all four nations of the UK (England, Northern Ireland, Scotland and Wales). It is accountable for protecting student interests (QAA, 2014), meeting all the academic standards and expectations during the interruptions throughout the pandemic phase of all nations worldwide.

On 23 March, UK prime minister announced the first lockdown in the UK, ordering people to "stay at home" (Institute for Government analysis, 2021). Consequently, campus closures compelled HEIs to reinforce their online learning provision (UNESCO, 2020) and keep students and staff well informed about COVID-19 updates.

Literature Review

The world has witnessed a massive infodemic in the wake of the Pandemic. The word infodemic was coined by the World Health Organization (WHO), which means an overabundance of information and the rapid spread of misleading or fabricated news, images, and videos (WHO, 2020). The WHO confirmed that the COVID-19 Pandemic was accompanied by an 'infodemic' of misinformation (WHO 2020).

The vast volume of misinformation on social media and websites that contained inaccurate information about the COVID-19 outbreak has prompted a global 'infodemic'. The public is bombarded with extensive amounts of information, which is not scientifically, and medically correct. In addition, rumours and half-backed conspiracy theories from unfiltered channels are often disseminated through social media, websites and other outlets. Fake news is unarguably a threat to society (Panke, 2020), and it became a challenging problem during the COVID-19.

The virus's proposed underlying origins, such as 5G radio waves, theories around government operations, and untested therapies and prevention methods, are examples of widespread misinformation. According to an Ofcom survey (2020), more than 2,000 people found that, within the first week of the 'stay at home' measures, 46% encountered false or misleading information. Within this group, 66% reported seeing COVID-19 misinformation at least once daily, and 55% said they did nothing about it. The study further found that 40% of adults in the UK find it hard to know what is true or false about the virus. Similarly, a study in the United States reported that 64% of US adults were confused about the basic facts of current events due to the spread of fake news (Barthel et al., 2016). The study further found that 23% say they have shared a made-up news story either knowingly or not.

This infodemic poses a severe problem for public health. In such a rapidly changing situation, with millions of people on lockdown, social media platforms such as WhatsApp, Twitter, Facebook, and Instagram became significant sources of information about the crisis.

Research by the Bruno Kessler Foundation in Italy showed that every day in March 2020, there was an average of 46 000 new posts on Twitter linked to misleading information about the pandemic (Hollowood & Mostrous, 2020).

COVID-19 Vaccine Misinformation

False or unsubstantiated claims concerning the safety, effectiveness, efficacy, ingredients, adverse effects and purpose of COVID-19 vaccinations have been widely disseminated. Fake news on COVID-19 was a much bigger problem as it influenced people to take extreme measures by believing that the news was trustworthy. For example, fake news ('Alcohol is a cure for COVID-19') led to many deaths and hospitalisations in Iran (Karimi and Gambrell, 2020). Other examples include:

- False claims that the COVID-19 vaccination contains 'microchips' that can be used to track and control people
- False claims that the vaccine causes infertility or death
- False claims that the vaccine will alter human DNA
- False claims that the pharmaceutical industry has fabricated the results of vaccine trials or covered up harmful side effects to boost its profits.

(Christie, 2021)

One of the media used to spread information is a website. Users of the website can easily and rapidly access information. Higher education institutions usually have their websites. Today, HEIs' websites have become an essential part of the lives of students, staff, and people worldwide to share information. Millions of students have been using websites to search for information and would like to find it fast, accurate and updated. Currently, the World Wide Web revolution has swept through many HEIs. Over the past few decades, HEIs have progressed from little or no use of the Web for distributing information to using the Web as a powerful and increasingly dominant method of distributing information. The web provides an exciting and constantly growing opportunity for HEIs to enhance their national and international reputation for sharing information on excellence in research, scholarship, teaching & learning, graduation ceremonies, epidemics, business, and community links.

The HEI's homepage is the "face to the world and the starting point for most user visits" (Nielsen, 2002). The intensity of updates on the website is the aspect that determine the vehemence of the website visits.
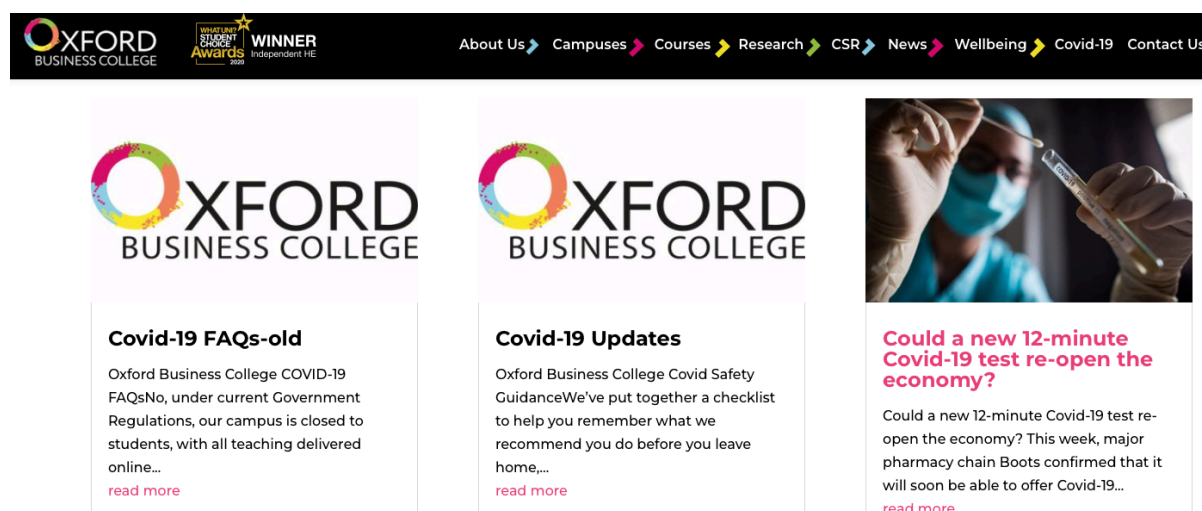
Fig 01: Overview of Internet Use
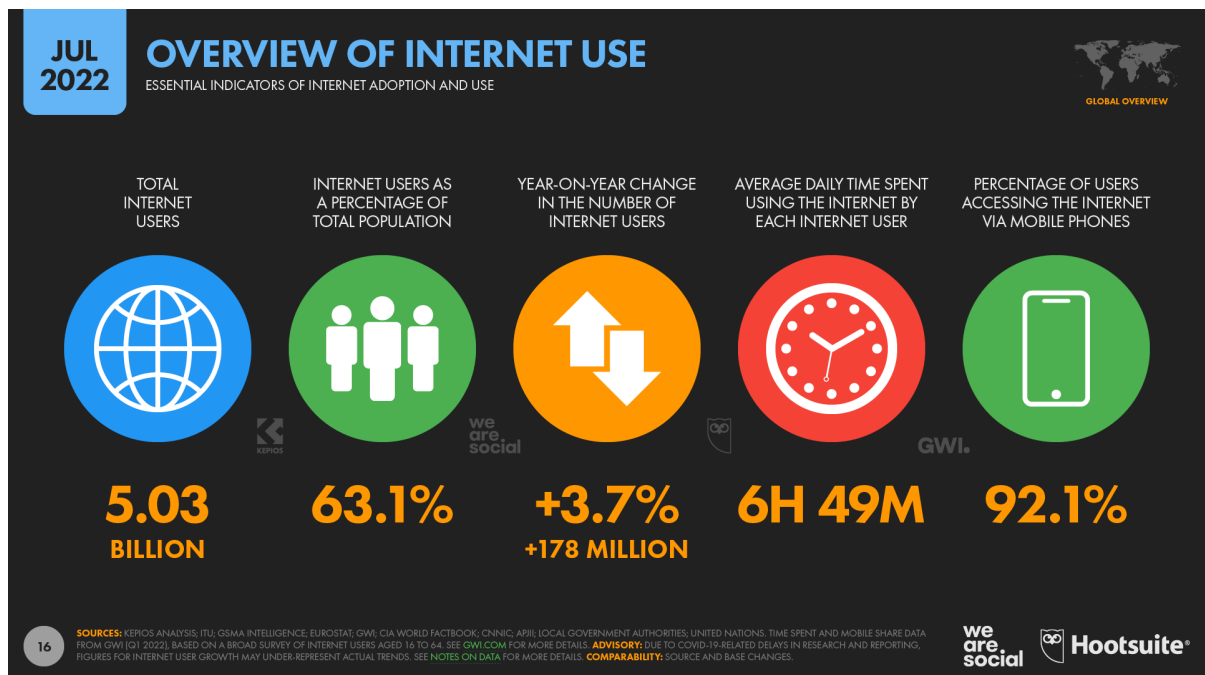
Source: DataReportal, (2022)

A total of 5.03 billion people around the world use the Internet today – equivalent to 63.1 percent of the world's total population.

Internet users continue to grow too, with the latest data indicating that the world's connected population grew by almost 180 million in the 12 months to July 2022.

Oxford Business College (OBC) also faced a reconfiguration in its academic setting due to the sudden and unplanned shift to digital learning space. OBC is one of the fast-growing independent private higher education colleges in the UK, known for its high academic standards and highly qualified staff.

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Fig 02: OBC webpage on Covid-19

Source: Excerpt from the OBC website

Fig 03: OBC webpage on Covid Safety and Guidance
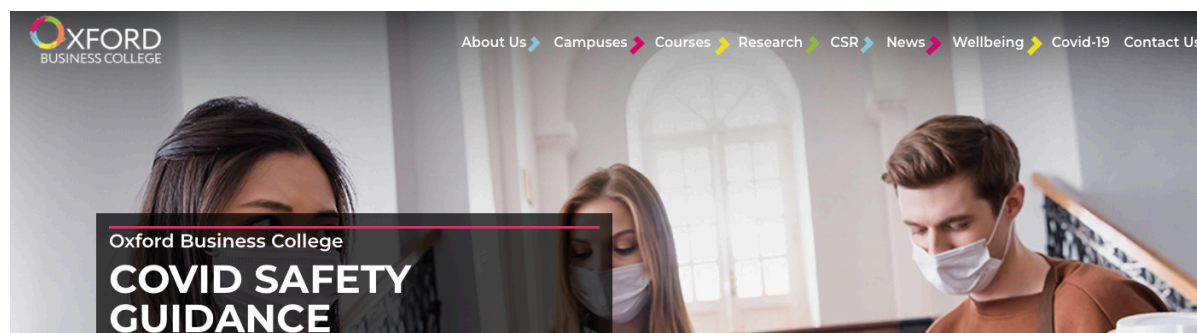
The OBC website provided all details related to Covid-19 preventive measures, guidelines, events and toolkits. The Covid-19 related information on the college website covers all the necessary preventive measures to be taken, such as encouraging staff to work from home, maintaining social distancing, strictly following the government guidelines on safer working, using hand sanitiser and wearing a mask, etc.

In addition, the OBC always encourages students to rely on information from authentic sources such as the following table for reliable information on COVID-19.

Table 01: Top Ten Most Reliable Websites for COVID-19 Information

S.NO	Websites
1	*The World Health Organization (WHO)* The World Health Organization (WHO) is publishing rolling updates on the coronavirus situation as well as useful infographics and explainers, and should be your first port of call for new assessments of what is going on.
2	*The National Health Service (NHS)* The UK's NHS is another excellent resource. It includes easy to understand advice about symptoms, and what to do if you think you have them. It also gives details of how and under which circumstances you need to self-isolate, and for how long, and on how to get a self-isolation medical advice note to get to your employer.
3	*The Centers for Disease Control and Prevention (CDCP)* The US Centers for Disease Control and Prevention has collated a lot of useful information and resources on COVID-19, including how to protect yourself and what to do if you're sick, as well as information about travel, schools and childcare, and for businesses and employers. There are also regular news updates, and a map of cases reported so far in the US. You can also sign up for email updates.
4	*The British Broadcasting Corporation (BBC) Podcast* The BBC has launched a Coronavirus Global Update podcast, which includes a daily round-up on the spread of coronavirus.
5	*COVID-19 Facts* The COVID-19 Facts website works to collate information from sources including the London School of Hygiene and Tropical Medicine, the World Health Organization, and the Economist Intelligence Unit. It also features a series covering myths around coronavirus, including analysis by the Economist Intelligence Unit of where the myth came from, and what experts say about it.
6	*The New Scientist Podcast* The New Scientist podcast is becoming increasingly focused on COVID-19 — including episodes and pandemic preparations; the spread of COVID-19 and the importance of hand washing; the coronavirus vaccine; and a coronavirus special on disaster preparation and environmental change.
7	*The Bill & Melinda Gates Foundation* The content platform of the Bill & Melinda Gates Foundation, the Optimist, is sharing stories, research, and news stories about coronavirus from the Foundation. The platform works to convene expert voices from across the global health sector, including sharing expert perspectives and updates on the response to COVID-19 — and you can also sign up for the Optimist's news digest. Disclosure: The Bill and Melinda Gates Foundation, a funding partner of Global Citizen.
8	*The London School of Hygiene and Tropical Medicine* The LSHTM launched its new podcastLSHTM Viral in January 2020, in response to the outbreak of COVID-19, and is releasing a new episode every week. It specifically focuses on the science behind outbreaks and how we respond to them. Meanwhile, the LSHTM is also launching an online short course, for those who want to better understand the emergence of COVID-19, and how we respond to it moving forward. The free-of-charge course launches on March 23, and will cover topics like: how COVID-19 emerged and was identified; public health measures worldwide; and what's needed to address COVID-19 in the future

9	**The RELX SDG Resource Center** RELX is a British publisher of scientific, technical, and medical material, and has launched a resource center with the aim of supporting the UN's Global Goals for Sustainable Development (SDGs). It's got lots of content all about driving forward the SDGs, and achieving an end to extreme poverty. In response to COVID-19, it's launched a podcast series exploring with experts from across sectors the impact that the pandemic could have on the SDGs, exploring issues including water and sanitation access, the climate, and sustainable economies.
10	**European Centre for Disease Prevention and Control** ECDC is an EU agency aimed at strengthening Europe's defences against infectious diseases. ECDC is monitoring the COVID-19 pandemic and assessing the risk to the EU. https://www.ecdc.europa.eu/en/covid-19

Source: Authors' selection

In an early endeavour to define "user satisfaction" as a concept, Tessier et al. (1977) stated that satisfaction was "ultimately a state experienced inside the user's head" (p.383) and therefore was a response that "maybe both intellectual and emotional" (p.384). Ives et al. (1983) define user satisfaction as the "extent to which users believe the information system available to them meets their information requirements" (p. 785).

Bruce (1998) defines satisfaction as a state of mind that represents the composite of a user's emotional and material responses to a particular activity, such as information seeking.

Users are emotionally satisfied when the outcomes match their expectations, task orientation and goal determination (Waern, 1989; Applegate, 1993). Therefore, users are satisfied because their experience associated with information is accurate, precise, updated, and trustworthy. Therefore, satisfied users may prolong their website usage, revisit it, and recommend it to others (Zhang & von Dran, 2000).

According to Nielsen (1993), website usability has five components: learnability, efficiency, memorability, errors and satisfaction. Website design and content have a significant impact on user satisfaction (Zhang & von Dran, 2002).

Methods

The study's primary purpose was to examine student satisfaction at OBC regarding COVID-19 information on the college website during the pandemic.

Research Questions:

The following research questions were taken into account as the dependent variable.

Q. How satisfied are you with covid-19 information on the college website during the pandemic?

Do the students' satisfaction levels for managing learning and teaching throughout the pandemic depend on the participants' opinions on COVID-19-19 related information on the college website?

The survey was comprised of categorical variables such as age, gender and course of study that were considered to be the demographic features of the participants under study.

To make the results more interpretable, we divided the satisfaction dependent variable into three categories- 0- low satisfaction, 1-moderate satisfaction 2- high satisfaction.

A quantitative research design was used to analyse the primary data collected online using Google Forms. The original data comprised 1290 participants' responses. Unfortunately, the preliminary analysis omitted 288 responses from the respondents who did not see or read the COVID-19 related information (advice, support and updates) on the college website), 33 missing values, and we left with a sample of N=969 for examining the research questions under study using RStudio version 1.4.1106 (RStudio Team, 2020). The data analysis statistics was multinomial logistics or multi-class logistic regression. The participants were informed that their information/data would be kept confidential and used for research purposes only.

Results And Interpretation

We used different in-build functions from the R packages: 'haven' for importing data set into the R environment (Wickham & Miller, 2021), 'plyr' package (Wickham, 2011) for 'lapply' function for converting all variables into categorical variables and 'nnet' package (Venables, & Ripley, 2002) for 'multinom' function which helps carrying out multi-nominal regression.

Descriptive statistics, frequencies and percentages of the categorical variables were calculated using the 'summary tools' package (Comtois, 2021).

Table1: Demographics: Descriptive Statistics (N=969)

Variables	Gender		Age (in years)				Course of Study*						
Categories	Male	Female	18-30	31-40	41-50	Above 50	1	2	3	4	5	6	7
f	532	437	319	405	195	50	692	179	21	03	62	10	02
P (% age)	54.90	45.10	32.92	41.80	20.12	5.16	71.41	18.47	2.17	0.31	6.40	1.03	0.21

*1-BA (Hons) in Business Management with Foundation year, 2- BA (Hons) in Business Management, 3- BA (Hons) in Business Innovation and Management (top up), 4- International Masters of Business Administration, 5- HND Business, 6- International foundation (Business, English, law), 7-English language course

The demographic characteristics of the population under study comprised of more than 50% of male participants as compared to females. On the other hand, most students belonged to the age group 31-40 years enrolled. The course of study at OBC wherein the majority of students enrolled in BA (Hons) in Business Management with Foundation year, and the least preferred course amongst students is the English language course (Table1).

Frequencies of the categorical predictors:
OBC Website (Covid-19 Information): Please choose one response per statement. On a scale of 5 (5 being most important and 1 is least important)-
S1. Good source of information on Covid-19
1: 31; 2: 38; 3: 162; 4: 298; 5: 440
S2. Provides relevant information related to Covid-19
1: 30; 2: 41; 3: 147; 4: 327; 5: 424
S3. Provides latest information regarding Covid-19
1: 39; 2: 34; 3: 152; 4: 322; 5: 422
S4. Convenient source of information regarding Covid-19
1: 33; 2: 42; 3: 158; 4: 327; 5: 409
S5. Provides complete information on Covid-19
1: 33; 2: 38; 3: 160; 4: 324; 5: 414
S6. Provides regular updates on Covid-19
1: 33; 2: 47; 3: 142; 4: 316; 5: 431

Regression Analysis

We focused on three major components necessary to carry out the logistic regression for a dependent variable with more than two categories: building a regression model and interpretation of marginal effects, confusion matrix and misclassification error, and prediction and model assessment. Wald test was used to dissipate the assumption of normality. The value of -2LL (Log-Likelihood) was reduced from 636.097 to 430.812 after 60 iterations and showed a significant convergence and improvement in the model.

The reference category of outcome variable was 'low satisfaction', and all 6 statements related to covid-19 on the college website were taken into account as independent variables with 5 categories each. Since each statement had different response categories without any order, the response 'least important' was considered the reference category.

The data was parted into training (60%) and test data (40%). This means that 60% of data was trained by the building model and validated on the remaining 40% to check the model's accuracy. The results showed significant results for 5 statements except statement 3 viz., 'provides the latest information regarding Covid-19' and were removed from the final model. In addition, the results showed that statements 1,2,4,5, and 6 were associated with students' satisfaction levels.

Table 2: *Multinomial Regression Model: Coefficients and p-values*

Statements (S)		1. Moderately Satisfied		2. Highly Satisfied	
		β	p	β	p
S1. Good source of information on Covid-19	2	3.750	0.002	-9.461	0.00
	3	4.576	0.000	-8.507	0.00
	4	5.338	0.000	-7.624	0.00
	5	6.178	0.000	-5.799	0.00
S2. Provides relevant information related to Covid-19	2	0.347	0.849	24.979	0.00
	3	-0.389	0.826	23.543	0.00
	4	0.497	0.783	23.959	0.00
	5	0.307	0.86	22.689	0.00
S4. Convenient source of information regarding Covid-19	2	-12.44	0.00	-12.22	0.00
	3	-10.97	0.00	-11.05	0.00
	4	-11.07	0.00	-11.08	0.00
	5	-11.42	0.00	-11.50	0.00
S5. Provides complete information on Covid-19	2	9.47	0.00	-25.01	0.00
	3	9.259	0.00	-26.263	0.00
	4	8.756	0.00	-26.553	0.00
	5	6.876	0.00	-27.270	0.00
S6. Provides regular updates on Covid-19	2	-0.358	0.822	21.468	0.00
	3	0.346	0.837	24.109	0.00
	4	-0.085	0.963	24.183	0.00
	5	0.708	0.723	25.334	0.00

Intercepts (coefficients): **1**- -1.3861, **2**- -0.4700; Intercepts (p): **1**- 0.0795, **2**- 0.4097
Ref. Category: IV: **S1** (least important), DV: **0** (low satisfaction)

As we can note from the above table that students' responses from all statements in the training model were associated with either least satisfied, moderately satisfied or highly satisfied.

1. *Regression Model Equation:*

A. $\ln(P(\text{satisfaction}=\text{moderate})/P(\text{satisfaction}=\text{low})) = \beta_{10} + \beta_{11}(S1=2) + \beta_{12}(S1=3) + \beta_{13}(S1=4) + \beta_{14}(S1=5) + \beta_{15}(S2=2) + \ldots\ldots + \beta_{34}(S6=5)$

B. $\ln(P(\text{satisfaction}=\text{high})/P(\text{satisfaction}=\text{low})) = \beta_{20} + \beta_{21}(S1=2) + \beta_{22}(S1=3) + \beta_{23}(S1=4) + \beta_{24}(S1=5) + \beta_{25}(S2=2) + \ldots\ldots + \beta_{44}(S6=5)$

The results (Table2) are interpreted as follows:

- The log odds of being moderately satisfied vs. least satisfied will increase by 6.178 units when opinions for statement 1 moved from least important to most important.
- The log odds of being highly satisfied vs. least satisfied will increase by 22.689 units when opinions for statement 2 moved from least important to most important.
- The log odds of being moderately satisfied vs. least satisfied will decrease by 11.42 units when opinions for statement 4 moved from least important to most important.
- The log odds of being highly satisfied vs. least satisfied will decrease by 11.50 units when opinions for statement 4 moved from least important to most important.
- The log odds of being moderately satisfied vs. least satisfied will increase by 6.876 units when opinions for statement 5 moved from least important to most important.
- The log odds of being highly satisfied vs. least satisfied will increase by 25.334 units when opinions for statement 6 moved from least important to most important.

The regression results were based on students' opinions on the information provided on the OBC website regarding covid-19. We can say that the satisfaction level of HE students was moderate to high for most of the statements as compared to the low satisfaction group. Statements 2 and 6 were found to be the most significant statements regarding student satisfaction levels at OBC. Those who found the following two statements most important were highly satisfied with the college managing the students and learning throughout the pandemic:

S2. Provides relevant information related to Covid-19

S6. Provides regular updates on Covid-19

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2. *Confusion Matrix and Misclassification Error for Training data set:*

Table3: Confusion Matrix: Actual (A) vs Predicted (P) values for Training Data

P \ A	0	1	2
0	16	8	7
1	11	47	36
2	26	114	314

The model's accuracy for the training data set was found to be 65% correct prediction, and the misclassification error was 34%.

When validating the accuracy of the model and its prediction on the test data set, we found 62% correct prediction (Table 4), and a misclassification error was 37%, slightly higher than the misclassification error for the training data set.

Table 4: Confusion Matrix: Actual (A) vs Predicted (P) values for Test Data

P \ A	0	1	2
0	11	7	7
1	13	14	23
2	12	85	218

3. *Predictions and Model Assessment:*

The accuracy and sensitivity must be checked to understand the model and gain better insights into it. Suppose we do not build any model and label every student as highly satisfied. In such a case, our prediction is correct 61% of the time. Nevertheless, if we create a statistical or machine learning model, that model should perform better, which is true in our case.

The overall misclassification seems reasonable enough, but for one specific group, for instance, the low satisfaction group, it may be a concern. The accuracy of the training data set showed that the model is doing 30% correct classification for students of the low satisfaction group.

Similarly, 27% correct classification for students of moderate satisfaction group and 87% for students of high satisfaction group. From 30%, the correct classification and accuracy of the model drop to 27% and then increase again for the larger group. So, we can say that the model is confused about the students with low satisfaction levels compared to students with moderate satisfaction levels with the information provided on the college website throughout the pandemic. Nevertheless, the model is satisfactorily accurate and performs better when compared to the low and high satisfaction group and the low and moderate satisfaction level group.

The results of the accuracy of the test data set model showed good repeatability as the training data set model. We found 30% correct classification for students in the low satisfaction group and 13% and 87% for students of moderate and high satisfaction level groups, respectively. So, there was a loss of accuracy for the moderate satisfaction level group. The rest was considerably interpretable.

Discussion

To understand the mechanism and depth of the effects of the pandemic, many research studies have been carried out across the world. The present research aimed to examine overall student satisfaction by assessing their opinions on the Covid-19 related information on the OBC website. In this paper, we focused merely on the OBC student population that provided more than 900 valid responses. The pandemic had an intense effect on the HE sectors. However, most colleges and universities managed the detrimental effects of the pandemic by providing e-learning platforms and teaching and learning guidance. Therefore, students' satisfaction level in e-learning environment has been given much importance, and researchers are unceasingly trying to figure out the factors that shape success in implementing e-learning systems in educational sectors (Sun, Tsai, Finger, Chen & Yeh, 2008; Abdullah, Ward & Ahmed, 2016).

Challenges do not end with immediate crises (OECD, 2020b). The disorganised way of dealing with the unexpected switch from physical classes to online platforms among most HEIs, either due to infrastructure unavailability or the lack of suitable pedagogic projects or digital poverty among students, could be seen in early and peak stages of the covid-19 outbreak (Adedoyin & Soykan, 2020; Dutta & Smita, 2020). Gradually, with the provision of relevant information and regular updates on the covid-19 and ways of dealing with the situation, students were satisfied enough with the managerial sector of OBC. It has been reported that providing students with clear, updated and sufficient information and quality content is essential for their satisfaction level (Al-Fraihat, et al, 2020). The quality of the information provided by the educator/institution has been considered to be a factor of perceived satisfaction in previous studies that support our findings to some extent (Eom, Wen, & Ashill, 2006; Chopra, Madan, et al., 2019; Al Fraihat et al., 2020; Shahzad, Hassan et al, 2021).

OBC provided an e-learning environment to their students during the pandemic and all necessary information regarding the covid-19 situation on their easily accessible website. So far, with many curtailments, OBC has witnessed a significant collaborative learning outcome. According to past research and taking into account the new circumstances, we built a model for predicting and explaining students' satisfaction level based on their opinions on the information provided by the college regarding covid-19. After data partition, the regression model could predict the outcomes quite well. Our model correctly predicted 65% of the given students' dataset. More than 80% of students were highly satisfied with the regular updates and relevant information about covid-19 and found it very important for guiding and avoiding any academic loss throughout the pandemic.

Conclusion

As mentioned elsewhere, more than 80% of respondents were satisfied with the COVID-19-related information on the College website. Therefore, we can conclude from the results that students' satisfaction level depends on their opinions on the information provided on the college website. Therefore, OBC successfully provided a relevant, good source of information and regularly updated the information concerning covid-19 during the pandemic, which answers the research question of this study.

Declaration of Conflicting Interests
The authors declare no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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