Infodemic surrounding COVID-19: Can LIS students recognize and categorize "problematic information" types on social media?

Shamima Yesmin

Institute of Information Sciences, Noakhali Science and Technology University, Noakhali, Bangladesh, and

S.M. Zabed Ahmed

Department of Information Science and Library Management, University of Dhaka, Dhaka, Bangladesh

Abstract

Purpose – The purpose of this paper is to investigate Library and Information Science (LIS) students' understanding of infodemic and related terminologies and their ability to categorize COVID-19-related problematic information types using examples from social media platforms.

Design/methodology/approach – The participants of this study were LIS students from a public-funded university located at the south coast of Bangladesh. An online survey was conducted which, in addition to demographic and study information, asked students to identify the correct definition of infodemic and related terminologies and to categorize the COVID-related problematic social media posts based on their inherent problem characteristics. The correct answer for each definition and task question was assigned a score of "1", whereas the wrong answer was coded as "0". The percentages of correctness score for total and each category of definition and task-specific questions were computed. The independent sample *t*-test and ANOVA were run to examine the differences in total and category-specific scores between student groups.

Findings – The findings revealed that students' knowledge concerning the definition of infodemic and related terminologies and the categorization of COVID-19-related problematic social media posts was poor. There was no significant difference in correctness scores between student groups in terms of gender, age and study levels.

Originality/value – To the best of the authors' knowledge, this is the first time an effort was made to understand LIS students' recognition and classification of problematic information. The findings can assist LIS departments in revising and improving the existing information literacy curriculum for students.

Keywords Bangladesh, Social media, LIS students, Covid-19, Infodemic, Problematic Information

Paper type Research paper

Introduction

The current COVID-19 pandemic has created a global public health crisis and resulted in an unprecedented ethical challenge in managing the information resulted from this outbreak. The first instance of COVID was reported in the Chinese city of Wuhan in December 2019 and subsequently the spread of the virus became global at the end of February 2020. At the same time, there has been an exponential growth in the amount of COVID-related information that are made available online. PAHO/WHO (2020), in a factsheet published on

1 May 2021 reported that, the number of searches for COVID updates on the internet has increased by 50%–70% since the beginning of the pandemic, whereas nearly 361 million new YouTube videos were uploaded in April 2020 and approximately 19,000 scholarly articles were indexed by Google Scholar in March 2020. It was estimated that about 628 million tweets were posted about coronavirus until May 2020 (Tweet Binder, 2020).

While there is an abundance of information on COVID, the increased volume of information often contains certain wrong, fraudulent and inaccuracies that make it difficult for the public to obtain reliable information and advice when they need them most. This situation is referred to as "infodemic". WHO (2020) defined it as rapid increase in the volume of information in a short period of time concerning a problem such that the solution become more difficult. While the infodemic surrounding COVID-19 was caused mainly by sharing "misinformation", that is, unintentionally false information (Pennycook et al., 2020; Garrett, 2020; Mian and Khan, 2020), a number of researchers argued that the real problem is not only the unintentional falsity but also the spread of "disinformation", i.e. deliberately misleading information (French and Monahan, 2020; McCloskey and Heymann, 2020). The same distinction was reported by other authors where they defined misinformation and disinformation as both being informative with possibility being true, complete and current, while disinformation is purposefully deceptive (Karlova and Fisher, 2012; van der Linden, 2017; Lazer et al., 2018). Additionally, spreading "fake news" through social media has become a global concern. According to Wu et al. (2019), fake news is circulated in the format of news and is often used as a propaganda tool to get viral through news media and social media. Other researchers defined it as being news that is intentionally and verifiably false that attempts to mislead the readers (Allcott and Gentzkow, 2017), viral posts based on fictitious accounts made to look like a real news report (Tandoc et al., 2018), and intentionally misleading news circulated to influence public opinion (Kanekar and Thombre, 2019). At the same time, proliferation of "rumour" on social media creates a state of panic among the general public. Zubiaga et al. (2018, p. 2) defined rumour as "an item of circulating information whose veracity status is yet to be verified at the time of posting". According to Kumar and Sangwan (2019), rumour is an unverified claim or account of an event which initiates from a single or multiple sources but it eventually propagates across networks. Table 1 presents the features of misinformation, disinformation, fake news and rumour.

In the context of social media, distinguishing the features of misinformation, disinformation, fake news and rumour is not always feasible. For example, a post that is initially created or shared to deceive people may continue to be shared unknowingly, and vice versa. Therefore, the difference between misinformation and disinformation is not sufficient when classifying social media posts as the intention of an actor creating or sharing the post is hard to assess. At the same time, fake news can be regarded as a type of disinformation in the form of a news post. Further, a rumour can fall into the category of misinformation or disinformation as its intent cannot be verified at the beginning of propagation. Because the intent of the purveyors is often difficult to determine, "misinformation" is often used as an umbrella term to describe a variety of different types of inaccurate information in the existing literature.

Table 1.
A Summary of features of misinformation, disinformation, fake news and rumour

Problematic information types	Informative	True	Complete	Current	Deceptive
Misinformation	Yes	Yes/No	Yes/No	Yes/No	No
Disinformation	Yes	Yes/No	Yes/No	Yes/No	Yes
Fake news	Yes	No	Yes/No	Yes/No	Yes
Rumour	Yes	Yes/No	Yes/No	Yes	Yes/No

Social media platforms are often regarded as hotspots for sharing problematic information (Berghel, 2017; Herrera, 2020; Kaur, 2020). According to Jack (2017), problematic information refers to those kinds of information which are "inaccurate, misleading, inappropriately attributed, or altogether fabricated". Such information can create public anxiety and fears and, thus, make the situation worse. In Bangladesh, a number of violent incidents occurred in recent months due to spread of fake news and false rumours on Facebook that resulted in several mob attacks and deaths. Most recently, attacks on the minorities were reported in a district of Bangladesh after allegedly sharing a Facebook update criticising a religious leader (The Daily Star, 2021). Thus, there has been concern that spread of fraudulent information via social media platforms concerning COVID-19, along with low health literacy among the members of the general public, can make people more easily misinformed about the disease and practice wrongful health behaviours. One such COVID-19-related post in Bangladesh that went viral through Facebook and YouTube was the claim that drinking *Thankuni* (*Centella asiatica* or Indian pennywort) juice can protect against the virus. As a result, many people started searching their surrounding for the plant and the price for its leaves went up to five-times higher in the market.

While the spread of erroneous information on social media platforms has become a centre of focus within many subject areas, it has become a topical and emerging issue for Library and Information Science (LIS) field. Understanding the characteristics of different types of problematic information can be of particular importance during this COVID-19 pandemic situation if such classification can be successfully applied to analysing social media posts. It is on this premise that this current study was undertaken to investigate LIS students' perception of and their knowledge about different categories of problematic information, i.e. misinformation, disinformation, fake news and rumours regarding COVID on social media.

Literature review
Information about COVID-19 is being transmitted and shared very quickly on social media platforms. While access to information is vital in this current pandemic, verifying the accuracy of COVID-19-related health information on social media platforms can be particularly challenging (Zarocostas, 2020). According to Wilson and Wiysonge (2020), the propagation of misinformation on social media created a major threat to public health. The presence of health-related misinformation about COVID-19 was identified in a number of studies, such as wearing face mask does not work (Hornik *et al.*, 2021); COVID-19 does not spread in hot and humid climate (Carlson *et al.*, 2020); hot water mixed with salt-vinegar can cure COVID infection (Al-Zaman, 2021); smoking and drinking alcohol can prevent COVID-19 (Luk *et al.*, 2020), chloroquine/hydroxychloroquine and ivermectin can prevent COVID infection (Hashmi *et al.*, 2020), etc.

An investigation by BBC (2020a) reported that the human cost of misinformation regarding COVID-19 could be enormous as it weakens the public health messages. For example, misinformation about wearing face masks contributed to low use of masks and consequently higher COVID-19 infection rates (Lyu and Wehby, 2020). Luk *et al.* (2020) found that exposure to health misinformation that smoking and drinking alcohol can protect against COVID-19 was associated with self-reported increases in their consumption among the Chinese population. Further, Islam *et al.* (2020) reported that approximately 800 people died and 6000 people were hospitalized around the world due to a similar misinformation belief that drinking highly concentrated alcohol can disinfect the body and kill the virus. Other health-related misinformation such as chloroquine/hydroxychloroquine can prevent COVID infection resulted in increased prices for this medicine alongside hospitalizations and deaths from overdosing (Hashmi *et al.*, 2020).

There has been an increasing use of social media such as Facebook, Twitter, YouTube, etc. for searching COVID-related information. Among them, Facebook was found to be the biggest single source for spreading fake news about COVID-19 by Kenyan international students in China (Ong'ong'a and Demuyakor, 2020). Atehortua and Patino (2021) also found Facebook as the most frequently used social media for sharing COVID fake news. Broniatowski et al. (2020) reported that the volume of tweets on COVID-19 is enormous but the majority of shared links cannot be assessed for their credibility. They found a sharp increase in the amount of state-sponsored propaganda among non-credible and less credible sources and commented that COVID-19 can be utilized as a tool for spreading misinformation and disinformation for political purposes. In another study, Kouzy et al. (2020) analysed 673 tweets related to COVID-19 and found 24.8% of them included misinformation, whereas 17.4% included unverifiable information. Li et al. (2020) reported that nearly 23%–26% of YouTube videos on COVID-19 were found to be involved in spreading misinformation.

A number of studies reported that the use of social media is linked to increased misinformation beliefs. Analysing the propagation of misinformation on social media, Barua et al. (2020) revealed that general misinformation beliefs, conspiracy beliefs and religious misinformation beliefs had negative impacted on individual responses to COVID-19, whereas credibility evaluation of information about COVID-19 had a positive impact on individual responses. Allington et al. (2020) found that the higher the people relied on Twitter, Facebook or YouTube as their main information sources, the higher is the likelihood that they believe more on COVID-19-related conspiracy theories. Su (2021) also found that the use of social media is positively associated with COVID-19-related misinformation beliefs.

There has been a tremendous growth in the number of fact-checking services since the COVID-19 began. Professional fact-checking organizations and social media networks are actively taking measures to stop COVID-related misinformation in an effort to minimize the damage that this type of information may cause to users. Brennen et al. (2020) analysed a sample of 225 pieces of misinformation on COVID-19, published in English from January to the end of March 2020, from a corpus of fact-checks maintained by First Draft. They found that 59% of the samples were reconfigured where existing and often true information were spun, twisted, re-contextualized or reworked. It was reported that Facebook flagged warning labels on nearly 90 million posts during March–April 2020 (BBC, 2020b) and removed more than 50 million posts in April 2020 (Sumbaly et al., 2020) because they were associated with COVID-19 misinformation. At the same time, Twitter removed thousands of accounts alleged to have linked with spreading COVID misinformation (Bernard et al., 2021). Although fact-checking and removal of account and contents are helpful to prevent the spread of false information, these actions may not be adequate particularly considering the volume and the velocity at which misinformation is created and shared on social media platforms.

The COVID-19 pandemic created a substantial challenge to global public health and health care system. Unlike other natural calamities, the spread of the coronavirus mainly depends on human actions. Thus, the quality of information to which people are exposed to during a search for COVID-related information online directly impacts their actions. The review of literature indicated that infodemic surrounding COVID-19 has proliferated on social media. A number of authors reported that lack of knowledge of online environments and the subsequent belief in online information, in addition to indolence in verifying the source and lack of skills to do so, are the reasons that contribute to people sharing problematic information (Khan and Idris, 2019; Talwar et al., 2019). While social media

organizations and individuals have the duty and responsibility to prevent spreading fraudulent information, LIS professionals are in the forefront to educate the public and to provide righteous information concerning COVID-19 as part of the pandemic response. In this context, LIS students should possess the knowledge, skills and competencies required to identify fraudulent information as future professionals. It is against this background that this paper investigated LIS students' perception of and their knowledge about problematic information types regarding COVID-19 using examples from social media posts.

The following research questions were investigated in this study:

RQ1. What are the sources that LIS students use to access information on COVID-19?

RQ2. Are LIS students aware of infodemic and related terminologies, and can they define these terms correctly?

RQ3. Can LIS students categorize problematic social media post related to COVID-19 correctly?

Methodology

The participants of this study were LIS students from a public university situated at the south coast of Bangladesh. The university launched a four-year undergraduate program in LIS in 2017 under an institute where the students reached up to their third year. All enrolled students were invited to take part in an online survey in September 2020 when the university remained closed but the students continued to take part in online classes. A detailed information about the study objectives and procedures was sent to the students via email groups for the respective batches. The online survey tool automatically verified that all questions were answered before submitting the responses.

The survey required students to respond to a number of demographic questions, such as gender, age and study level. The sources used by students for accessing COVID-19-related information were also identified. LIS students' awareness of infodemic and related terminologies and their ability to identify the correct definition of these terms, and whether they can categorize the instances of problematic information types related to COVID using examples from social media were investigated through the survey. A follow-up email was sent to all students to complete the survey on time. The questions on the definition of the infodemic and related terms were as follows:

- What is infodemic?
- How would you define misinformation?
- What is disinformation?
- Do you know what is fake news?
- What are the rumours?

Students were strongly advised not to look for the answer in dictionaries or other reference resources including a web search, rather they were asked to identify the correct definition from a list of five options for each term based on their own understanding. Further, students were given five examples of problematic information related to COVID-19 (see Appendix) and were told to categorize them based on their inherent problem characteristics. For each definition and task question, the correct answer was assigned a score of "1" whereas the wrong answer was coded as "0". Thus, the total maximum score was "10" and the minimum score was "0". For each definition and task-related category, the maximum score was "5"

and the lowest score was "0". Students' demographic and study-level data and their preferred sources for obtaining COVID-19-related information were analysed using descriptive statistics. The total, definition and task-specific scores were converted to percentages and means and standard deviations were computed by gender, age and study level groups. Finally, statistical procedures such as t-test and ANOVA were conducted to find out the differences in correctness scores between student groups. IBM® SPSS® Statistics was used for analysing the data from the survey.

Results

A total of 114 LIS undergraduate students (out of a total of 125 students in the department; response rate 91.2%) participated in the survey. Although the males and females were almost equally represented, a majority of the students (71.9%) were from the 21–23 years age group. Third year students comprised the highest number of respondents (40.4%) in the survey. Table 2 shows students' demographic and study level information.

In response to the question about the sources used by students for accessing COVID-related information, students used a number of sources. The vast majority of them obtained COVID-19 information through Facebook (93.9%), followed by TV news (68.4%), government bulletin (50.0%) and YouTube (40.4%). The lowest percentages of students used WhatsApp (8.8%) and Instagram (9.6%), respectively (Table 3).

Students were asked if they had heard about infodemic and associated terminologies. As shown in Table 4, the highest percentage of respondents (68.4%) knew the term "infodemic", followed by 61.4% heard the term "rumour", 58.8% knew about "misinformation" and 57.9% heard about "fake news". Less than half of the students (53. 46.5%) knew about the term "disinformation".

Demographic and academic level	Respondent group	No. of participants ($n = 114$)	(%)
Gender	Male	58	50.9
	Female	56	49.1
Age	18–20 years	32	28.1
	21–23 years	82	71.9
Study level	1st year	31	27.2
	2nd year	37	32.5
	3rd year	46	40.4

Table 2.
Demographic and academic information of participating students

Sources for obtaining COVID-19 information	Frequency ($n = 114$)	(%)
TV news	78	68.4
Government bulletin	57	50.0
Facebook	107	93.9
Twitter	21	18.4
YouTube	46	40.4
Instagram	11	9.6
WhatsApp	10	8.8
Other	26	22.8

Table 3.
LIS Students' preferred sources for obtaining COVID information

Students' overall score along with the percentages of correct answer for five definitional questions and five COVID-19 related practical tasks were shown in Table 5. As can be seen, the overall correctness score was poor. The mean ($\pm$SD) for the total, definition and practical task scores for male students were 32.1 ± 15.9, 37.9 ± 25.3 and 26.2 ± 18.0, respectively. For the female group, the total, definition and task-specific scores were 34.3 ± 19.7, 40.4 ± 28.2 and 28.2 ± 20.5, respectively. Although female students obtained a higher correctness score compared to male participants, the t-test result found no significant difference between the two groups.

Further, the percentages of total, definition and task-related scores were higher for the 21–23 years age group than the 18–20 years group, however, the difference was not statistically significant. Among the study level groups, the percentages of total and practical task scores were higher for 2nd year students compared to other study level groups. On the other hand, 3rd year students had a better definition score than the other groups. The ANOVA test, however, found no significant difference between the mean scores by study level groups for total, definition and task-specific answers.

Discussion

COVID-19 is one of the most alarming public health problems facing in the world today. Millions of people have been, and continue to be, infected while several million people have lost their lives in this pandemic. Spreading false information via social media platforms has

Terms	Frequency ($n = 114$)	(%)
Infodemic	78	68.4
Misinformation	67	58.8
Disinformation	53	46.5
Fake news	66	57.9
Rumours	70	61.4

Table 4. Participating students' awareness of infodemic and related terminologies

Demographic and academic status	Total score (%)	Definition score (%)	Practical task score (%)
Gender			
Male	32.1 ± 15.9	37.9 ± 25.3	26.2 ± 18.0
Female	34.3 ± 19.7	40.4 ± 28.2	28.2 ± 20.5
t/p-value	−0.663/0.509	−0.484/0.629	−0.556/0.579
Age			
18–20 years	29.1 ± 20.4	36.3 ± 31.5	21.9 ± 17.9
21–23 years	34.8 ± 16.6	40.2 ± 24.6	29.3 ± 19.4
t/p-value	−1.543/0.126	−0.717/0.475	−1.867/0.065
Study level			
1st year	29.4 ± 21.1	35.5 ± 30.4	23.2 ± 18.0
2nd year	34.9 ± 18.4	36.8 ± 27.7	33.0 ± 23.2
3rd year	34.3 ± 14.7	43.5 ± 22.8	25.2 ± 15.5
F/p-value	0.978/0.379	1.049/0.354	2.655/0.075

Table 5. Mean $\pm$ SD of correctness score (in percentages); for demographic and academic variables, p-values were obtained using independent sample t-test or ANOVA to compare the means between groups

made the situation even more challenging as recipients of such information are often engaged in wrongful health practices. In the present study, LIS students from a public university in Bangladesh were invited to participate in an online survey where they reported their gender, age and study levels. It was found that the vast majority of students accessed COVID-related information through Facebook. A number of studies also reported that Facebook was the preferred platform for accessing COVID-19 health information (Fletcher *et al.*, 2020; Subedi *et al.*, 2020). The findings reported that more than two-third of the students obtained COVID-related information from television news, whereas half of the respondents relied on government bulletin for such information. Television was regarded as one of the major information sources due of its availability in almost every household in the country. Additionally, Government of Bangladesh provides a daily online bulletin on COVID-19 updates which is broadcasted live on government and private TV channels. Additionally, all TV channels place scrolling information about coronavirus updates. Although students were not asked about the device that they used to connect internet, the amount of time spent on the internet or their access type, it is assumed that a large number of students at the time of this study were using mobile data to access the internet. Many of them may not have the financial capacity to buy adequate internet data due to its high price. This might be same reason why less than half of the participating students used YouTube for accessing COVID-related information as video streaming is more data intensive than other social media applications.

In this study, students were asked if they had heard about infodemic and related terminologies, which many students had. But still a significant number of students never heard about the terms such as fake news and misinformation, while less than half of the students had not heard about disinformation. The majority of students were unable to define the terms correctly. Additionally, students' knowledge was assessed on their categorization of practical task-specific problematic information from social media posts. Based on the scores obtained for task-specific scores, it can be seen that the students participated in this study had a poor knowledge of problematic information types. The success scores were poor in term of defining the terms (M $\pm$ SD: 39.1 $\pm$ 26.7), identifying the correct problematic information types (M $\pm$ SD: 27.2 $\pm$ 19.2), and regarding the total score (M $\pm$ SD: 33.2 $\pm$ 17.8). It was expected that the LIS students would have a better understanding of problematic information and its categories. As noted, the terminologies associated with infodemic such as those used in this study are closely related and are often used interchangeably in the literature. Still, LIS students should have the clear knowledge of the terminologies and should have the capability of defining and categorizing them correctly.

Knowledge of infodemic and related terminologies may vary depending on students' demographics and study levels. The findings of this study reported no such differences in total, definition and task-specific scores between gender, age and study level groups. This means that the participating students had a similar poor understanding across groups. If LIS students have such a poor skill level, the knowledge of problematic information among the members of the general public can be readily envisaged. As a result, spreading misinformation and fake news on social media, particularly those that originated locally and in the native language (Bangla), is a regular event in Bangladesh. It is important that social media users are educated on how to assess the credibility of information on these platforms which could help them to identify the prevalence of COVID-19-related false information and respond accordingly.

In terms of recommendations on the basis of the findings of this present study, the LIS department should take necessary steps to understand why most of its students were unable to answer the definition and task-specific questions. One possible answer to this failure may

lie in the present curricula of the department. The "Information Literacy" course is currently offered to first-year LIS students which focuses primarily on teaching students how to evaluate both print and electronic resources for academic purposes. With the continuous rise of questionable information online, it is important that LIS students acquire the knowledge and skills required for evaluating information in a non-academic setting, particularly in social media and other similar online platforms. Although there is a section on media literacy in the current curriculum, there should be more focus on teaching the students about the challenges pose by social media and how to deal with them. Additionally, there is a need for integrating practical training with media literacy skills within the course curriculum which would provide more opportunities for students to apply what they have learned in the classroom. Integrating theory and practice would help LIS students to reduce the knowledge gap that has been evident from the findings of the present study.

Study limitations and strengths
This study involved a large percentage of LIS students (91.2%) from a particular university in Bangladesh. Since the LIS department is relatively new, it lacks adequate infrastructure, manpower and ICT facilities. Further, the university where this study was conducted enrolled students from different demographic and socio-economic backgrounds. The findings thus may not be representative of other universities offering LIS programs in Bangladesh or elsewhere. In addition, student involvement with social media platforms is relatively low in developing countries like Bangladesh. The students who took part in this study might have even lower access to social media as the study site for this study is a remote coastal area where access to mobile internet is not always readily available. The results of this paper showed a depressing picture of social media literacy skills among LIS students. However, the findings are not all negatives as many students knew about the terminologies associated with infodemic; all that is required is to further educate them about different types of problematic information and the ways to categorize them based on their inherent characteristics.

Conclusion
The main conclusion that can be drawn from this study is that there is a poor level of knowledge among LIS students at a university in Bangladesh in defining infodemic and related terminologies and in classifying practical task-specific problematic information concerning COVID-19. It was revealed that a significant proportion of LIS students had not heard about infodemic and relevant terms. If LIS students in Bangladesh were not aware of these terms and failed to categorize the task-specific problems, the ability on detecting problematic information among the general population can be readily imagined. For the LIS departments in Bangladesh, there is a need to integrate media literacy skills with practical training that can help students in improving their ability in detecting and classifying problematic information. There is also a need for large-scale awareness programs for the general public to educate them on various aspects of problematic information on COVID.

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Appendix
Practical task questions

Based on the inherent problem characteristics, classify the following problematic information to one of the following categories (i.e., misinformation, disinformation, fake news or rumour)

- A person unknowingly shared a post on social media claiming that drinking the juice of *Thankuni* (*Centella asiatica*, commonly known as Indian pennywort) leaves can be used to treat coronavirus. This is an example of. . . . . .

- In mid-April 2020, several social media groups forecasted that about two million people will die from coronavirus disease in Bangladesh. It is a. . . . . .

- In August 2020, a news post intentionally shared on social media sites, without any sort of proper evidence, claiming that certain types of medicines can be used for successful treatment of coronavirus and hence asking everyone for stocking up these medicines. It is an example of. . . . . .

- During the pick of COVID-19 outbreak in July 2020, an individual was knowingly involved in spreading a fake report which accuses the Government of covering up the number of deaths from coronavirus. It is a case of. . . . . .

- A news that went viral on social media during June–July 2020 alleging that government agencies are throwing off COVID-19 dead bodies into rivers in an attempt to defame the government. This is an example of. . . . . .

About the authors
Shamima Yesmin is Assistant Professor of the Institute of Information Sciences at Noakhali Science and Technology University, Noakhali, Bangladesh. Her research interests include the use of various cataloging tools in higher education institutions, user training and information literacy instructions.

S.M. Zabed Ahmed is Professor of the Department of Information Science and Library Management, University of Dhaka, Bangladesh. He holds a PhD and an Academic Fellowship in Information Science from Loughborough University, UK. He was a Visiting Scholar at the Institute of East Asian Studies, Thammasat University, Thailand under Asia Fellows Award. His research interests include human use of electronic resources and services. He is particularly interested in usability testing with such resources and services and in adopting a user-centred approach in designing user interfaces for the end-users. His recent research interests also include information literacy, service quality assessment, bibliometrics and impact of rural information provisions. S.M. Zabed Ahmed is the corresponding author and can be contacted at: smzahmed@du.ac.bd