Digital Fatigue among Students in Current Covid-19 Pandemic: A Study of Higher Education

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Abstract
Purpose: The present study attempted to measure the level of digital fatigue among the students from University of Jammu (J&K). Study further examines the impact of multiple online platforms used by faculty and technology overload on digital fatigue among students in selected university.

Design/Methodology/Approach: A survey approach was employed to collect data from a total of 400 students from selected university. Data was examined statistically by using structural educational modelling (SEM).

Findings: Results indicated that multiple online platforms and technology overload have a significant positive impact on student's digital fatigue.

Practical Implications: Study highlights that special focus and effort are required to cope up with the digital fatigue among the students. The students should be provided with the proper support to handle the technology, single online platform should be encouraged for online learning to enhance the student well being.

Originality/Value: This research to the small but increasing body of knowledge on a topic that is important to both academics and practitioners. The current study looks at the many reasons of digital fatigue caused by an overreliance on technology in the online education system.

Keywords: Digital Fatigue, Multiple Online Platforms, Technology Overload, Higher Education

Paper Type: Research paper

1. Introduction
The entire globe has been shaken by outburst of fatal disease called Covid-19 caused by a Corona Virus (Dhawan, 2020). The education industry which goes beyond boundaries has been affected adversely during pandemic (Amponsah et al., 2022). The whole world has faced unusual learning conditions in the context of the ongoing international health crisis owing to COVID-19. This leads to the closure of educational institutions forcing stakeholders, faculty and institutional authorities to rethink about education as well as examining viable alternatives to guarantee successful learning (Gopal et al., 2021). This impulsive shut down of educational institutions round the globe has converted the face-to-face mode of instruction to an online mode (Asgari et al., 2021). Thus, digital technology acts as a unique mode of learning and dissemination of information (Yan, 2020). But unfortunately, educational institutions have been facing various challenges in this online mode of education (Dhawan, 2020). Teachers and students all around the world did their hardest to shift education online virtually overnight after being exposed to this new reality in various ways. Everyone get involved in the transfer, mostly unprepared for such a situation but enthusiastically and diligently. However, in this complex time, several harmful effects of technology overuse have been observed (Skulmowski and Standl, 2021). Excessive technology use has increased individual's contact with screen for a longer period of time which has become a serious issue (Pandya and Lodha, 2021). After months of screen usage, a new condition known as digital fatigue arose among the users. This ailment developed as a result of over use of digital technologies in the learning process, resulting in a sense of saturation that can lead
The sudden shift from personal contact to internet-based education has left teachers and students attempting to adapt. Experts have perceived digital fatigue as an unsettling condition with a huge physical and mental impact on both instructors and students.

One more reason for digital fatigue could be the utilization of numerous online platforms like Zoom, Google Meet, and so on by certain instructors. In addition, the absence of traditional face-to-face teaching and interaction, computer-assisted learning is the closest alternative to offline teaching (Khan et al., 2020). Excessive addiction and use of technology lead to student's digital fatigue. Though many research studies have been done to explore the concepts like techno stress, zoom fatigue, internet fatigue (Fauville et al., 2021; Wiederhold, 2020; Dhir et al., 2018) but concept of digital fatigue is still unexplored. So, the present study tries to explore the concept of digital fatigue and various factors which cause digital fatigue among the students. The first objective was to determine whether the use of multiple online platforms by faculty would exert a significant impact on student's digital fatigue. The second was to examine the impact of technology overload on student's digital fatigue. The third was to check the level of digital fatigue among students in selected university. Finally, to provide information that could help institutions to frame effective strategies for the well-being of student community in the current pandemic situation.

2. Literature and Hypotheses Development

2.1 Multiple Online Platforms and Digital Fatigue

According to Abuhassna and Yahaya (2018), contemporary educational technologies are critical in offering a comprehensive online learning experience that is comparable to a face-to-face class despite the students' physical isolation from their professor and other students. Online learning platforms lend itself to a less hierarchical educational technique, satisfying the learning needs of individuals who do not approach new material in a linear or methodical manner (Abuhassna et al., 2020). Online learning platforms are also the best options for self-directed students (Abuhassna et al., 2020; Abuhassna and Yahaya, 2018). Benta et al. (2014) discussed how they used e-learning platforms to supplement face-to-face training in the academic sector. They discovered that e-learning platforms result in a positive teaching/learning experience. The relevance of employing e-learning platforms in higher education was highlighted in the study. Moreover, the use of online teaching platforms, like Zoom, Google meet etc., became popular in 2020 (Wiederhold, 2020). Though online teaching platforms constitute closest substitute to offline teaching (Bailenson, 2021; Supiano, 2020) but education through multiple online platforms bring anxiety among the students (Sundarasen et al., 2020). The continuous use of online platforms the whole day causes the feelings of exhaustion among the students (Bailenson, 2021; Supiano, 2020; Wiederhold, 2020). Moreover, the complexities arise due to technical incompetence to handle the multiple online platforms and their previous experience for using software (Abuhassna et al., 2020). However, not only the faculty but students reported that use of multiple platforms used by faculty causes feeling of exhaustion (Nicandro, 2020; Quintana, 2020). So, on the basis of above literature below hypothesis has been developed.

H1: Use of multiple online platforms significantly leads to digital fatigue among students.

2.2 Technology Overload and Digital Fatigue

According to Grandhi, Jones, and Hiltz (2005) technology overload means the physical as well as psychological burden caused because of the excessive use of several complex gadgets. Numerous research studies put forward that this overload crop up when the skills needed to handle the information and communication technology (ICT) beat the capability of the actual user in the organization which means the technical demands go beyond the competence of user to handle them (Tarafdar et al., 2010, 2015; Galluch et al., 2015; Fischer and Riedl, 2017). Thus, it can be explained as a situation where ICT compel the users to work more hastily and for stretched hours (Tarafdar et al., 2007). Salanova, Llorens, and Cifre (2013) argued that technology overload is a cynical situation rooted by aggressive use of ICT which leads to mental fatigue, anxiety and cynicism. Further, it is observed that if people
use computer technology for learning or for some other purpose, they may feel discomfort, anxiety and stress (Wang, Shu, and Tu, 2008). Additionally, this excessive use of technology can cause dejection, fatigue and physical health, (Okonoda et al., 2017). Thus, the people possibly will show decline in efficiency, frustration, tiredness, and unease (Marchiori, Mainardes, and Rodrigues, 2019). In that case the users start feeling exhausted and start detaching themselves from their work and somehow they show inexpressive approach toward technology (Bondonini et al., 2020). Students' capacity to organize how they study and how much time they spend on studying can occasionally lead to a loss of motivation, and a lack of physical connection and presence of colleagues can make students feel alienated (Dhull and Sakshi, 2017). Disadvantages of E-learning can also be demonstrated in terms of physical health. Online learners and teachers may suffer from vision or back issues as a result of spending so much time seated and in front of a screen, and their outdoor exercise may be curtailed (Nazarlou, 2013). Furthermore, a number of studies have discovered a link between prolonged computer use and physical exhaustion manifested as musculoskeletal discomfort such as neck, shoulder, or hand and arm pain (Bachleda and Darhiri, 2018). So, on the basis of above literature the researcher developed the second hypothesis of the study as follow:

H2: Technology overload significantly leads to digital fatigue among students.

3. Research Methodology

3.1 Instrument Measurement

The questionnaire comprises of two parts; part one comprises of demographic data like age, gender etc., of the students. It was followed by another part which is online multiple platforms, technology overload and digital fatigue scales. The detail description of scales is presented in Table 1.

<table>
<thead>
<tr>
<th>Construct</th>
<th>No. of Items</th>
<th>Scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Online Platforms</td>
<td>6</td>
<td>Song (2010); Abuhassna et al. (2020); Coman, 2020</td>
</tr>
<tr>
<td>Technology Overload</td>
<td>5</td>
<td>Tarafdar et al., (2007); Cho and Lim (2016)</td>
</tr>
<tr>
<td>Student Digital Fatigue</td>
<td>7</td>
<td>Michaelsen (2003); Beneetto et al. (2013); Chalder et al. (1993); Bachleda and Darhiri (2018)</td>
</tr>
</tbody>
</table>

Table 1. Description of Scales Used

3.2 Sample Size, Sampling Technique and Data Collection

The sample size of study consists of 400 students from University of Jammu. The same sample size has been used in the study of Kaya (2020). In addition to this, a sample size above 300 was considered appropriate, which also allowed analysis by structural equation modeling (SEM) (Hair et al., 2006). Data was collected through online surveys with the help of Google Forms (Kaya, 2020). Due to Covid 19 restrictions and little personal access to
respondents, researchers have used online surveys. Similar method has been used by abundant studies conducted during the pandemic situation (Akuratiya and Meddage, 2020; Baczek et al., 2021). Faculty members from above mentioned universities were contacted and requested to send the online questionnaire in their respective online students groups. Participants answered questions on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). After checking these responses, 77 responses had been eliminated due to incomplete data resulting into 323 valid responses with response rate of 80.75%.

4. Results
4.1 Demographics and Descriptive Statistics
About 63% of the students were males; most of the students (i.e. 54%) were in the 20-25 age group. About 41% of them were second semester students; 31% the fourth semester students; 18% the third semester students; and rest were (10%) the first semester students. To uncover the average perception of the students, means and standard deviations were computed. Table 2, illustrated that all the articles obtained an average score above the mid-scale point of 3. Out of all the factors, students ranked 'Technology Overload' (M = 3.37) the highest, subsequently, 'Online Platforms' (M = 3.76) and 'Student Digital Fatigue' (M = 3.46) obtained the least score. Table 2, displayed the mean values of all the measurements.

4.2 Purification of Scale
In present study, principal component analysis technique was applied for extraction and varimax was used as the rotation method. The KMO value came out to be 0.883 which is greater than 0.7 as desirable. Factors with Eigen value >1 were retained as per the Kaiser criterion. It clearly indicates that all items were loaded significantly with positive factor loadings except two items (i.e. MOP1 and SDF7). Factor analysis resulted into 3 factors based on the Eigen values. These factors were named as - Online Platforms, Technology Overload and Student Digital Fatigue. The total variance explained by these factors came out to be 70.468%. Factor analysis and its subsequent results were tabulated in Table 2.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Item Code</th>
<th>Statements</th>
<th>M</th>
<th>SD</th>
<th>FLs</th>
<th>FM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple Online Platforms (MOP)</td>
<td>MOP2</td>
<td>I find using multiple online platforms i.e., Zoom, Google Meet, etc more confusing.</td>
<td>3.35</td>
<td>1.101</td>
<td>345</td>
<td>3.37</td>
</tr>
<tr>
<td></td>
<td>MOP3</td>
<td>I consider multiple online platforms very difficult to use.</td>
<td>3.81</td>
<td>1.071</td>
<td>810</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOP4</td>
<td>I feel irritated in using multiple online platforms.</td>
<td>3.59</td>
<td>1.127</td>
<td>801</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOP5</td>
<td>I need to upgrade adequate skills to use different online platforms.</td>
<td>3.80</td>
<td>0.980</td>
<td>840</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOP6</td>
<td>It is problematic for me to switch from one educational platform to another.</td>
<td>3.65</td>
<td>1.054</td>
<td>744</td>
<td></td>
</tr>
<tr>
<td>Technology Overload (TO)</td>
<td>TO1</td>
<td>This technology has compelled me to work much more quickly.</td>
<td>3.82</td>
<td>0.877</td>
<td>762</td>
<td>3.76</td>
</tr>
<tr>
<td></td>
<td>TO2</td>
<td>This technology is forcing me to perform more work than I can handle.</td>
<td>3.69</td>
<td>0.972</td>
<td>811</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO3</td>
<td>Because of this technology, I'm obliged to work on incredibly tight deadlines.</td>
<td>3.80</td>
<td>0.907</td>
<td>848</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO4</td>
<td>To adapt to new technology, I ha ve had to adjust my working habits.</td>
<td>3.86</td>
<td>0.924</td>
<td>826</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO5</td>
<td>Because of the increased technological sophistication, my workload has grown.</td>
<td>3.66</td>
<td>0.984</td>
<td>705</td>
<td></td>
</tr>
<tr>
<td>Student Digital Fatigue (SDF)</td>
<td>SDF1</td>
<td>I feel exhausted after online classes.</td>
<td>3.69</td>
<td>1.057</td>
<td>768</td>
<td>3.46</td>
</tr>
<tr>
<td></td>
<td>SDF2</td>
<td>Excessive screen time is causing stress on my eyes.</td>
<td>3.94</td>
<td>1.088</td>
<td>850</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDF3</td>
<td>I often feel headache.</td>
<td>3.67</td>
<td>1.234</td>
<td>845</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDF4</td>
<td>I felt tired very quickly during online class.</td>
<td>3.25</td>
<td>1.139</td>
<td>789</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDF5</td>
<td>I am suffering from decreased and disturbed sleep.</td>
<td>3.26</td>
<td>1.210</td>
<td>791</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SDF6</td>
<td>After online classes, I tend to avoid social situations.</td>
<td>2.97</td>
<td>1.219</td>
<td>726</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Descriptive Statistics, Standard Loadings and Factor Mean
Source: Author's Calculation
4.3 Confirmatory Factor Analysis (CFA)
In measurement model, all items were having SLs in between 0.71 to 0.89. Further, the fit indices showed that the measurement model fitted the data satisfactorily where, CMIN/DF = 2.839, RMR=0.33, GFI = 0.954, AGFI = 0.900, CFI = 0.914 and RMSEA = 0.077.

4.4 Reliability and Validity
Internal consistency (?) and Composite reliability (CR) was within adequate range (i.e.>0.7) in the measurement models. The average variance extracted (AVE) were also within the acceptable range i.e. >0.5. Since, the AVE values were greater than the square multiple correlation between the constructs of all latent variables, it was confirmed that the model has adequate discriminant validity (Fornell & Larcker, 1981).

4.5 Structural Equation Modeling-Hypothesis Testing Results
As reflected in Table 3 and Figure 2, path estimates indicated that both the hypotheses i.e. H1 and H2 stand accepted. In addition, the integrated model also showed the satisfactory model fit indices (i.e. CMIN/DF=3.705, GFI=0.939, AGFI=0.845, CFI=0.877, RMR=0.404 and RMSEA=0.071).

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Paths</th>
<th>Coefficients ($β$)</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Multiple Online Platforms → Student Digital Fatigue</td>
<td>0.54**</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>Technology Overload → Student Digital Fatigue</td>
<td>0.65**</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Note: ** p < 0.01, * p < 0.05
Source: Author's Calculation

5. Discussion and Implications
For the present study data was collected from the students regarding digital fatigue during the COVID-19 pandemic. Over time, educational technology has progressed. There are multiple advanced online education platforms available today, as well as numerous specialized educational resources for an array of disciplines (Chakraborty et al., 2021). Collaborative learning is also possible with several online educational platforms (Adhikary et al., 2010). However, several empirical research studies has also revealed that students are experiencing stress and anxiety as a result of the pandemic.
(Arora et al., 2020; Islam et al., 2020). So, the present study assumed relationships between independent (i.e. multiple online platforms and technology overload) and dependent variable (i.e. digital fatigue) through structural equation modeling (SEM). The standard regression weight between the multiple online platforms and student digital fatigue (SRW = 0.54, p < 0.01) is showing a significant impact of using multiple online platforms on student digital fatigue, hence established the hypothesis first (H1) of the research study. In addition to this, standard regression weight between the technology overload and student digital fatigue (SRW = 0.65, p < 0.01) shows the significant impact of technology overload on student digital fatigue. This confirms the second hypothesis (H2) of the study.

Furthermore, the overall model fit indices (CMIN/DF = 2.839, RMR = 0.33, GFI = 0.954, AGFI = 0.900, CFI = 0.914 and RMSEA = 0.077) were within the acceptable range. Thus, it can be concluded that the model demonstrate a rational fit to the data.

From the above discussions, some of the theoretical as well as practical implications can be drawn. The present study makes two substantial additions to theory and literature; foremost, it broadens the understanding of concept of digital fatigue among the university students. Though, many studies have been conducted on related constructs like zoom fatigue (Fauville et al., 2021), technology fatigue (Halupa and Bolliger, 2020), social media network fatigue (Dhir et al., 2019) but digital fatigue is hardly studied. Next, the study adds on to the literature by identifying two major factors affecting digital fatigue i.e. multiple online platforms and technology overload. Further, since use of multiple online platforms has a significant impact on student digital fatigue, it is an implication for the faculty members that they should not switch frequently to multiple video-conferencing applications (Zoom, Google Meet, etc). If faculty members are switching due to connectivity issues or other features of the apps, then it must be implemented deliberately after training and familiarity with the application prior hand. Otherwise, students will become confused and are likely to feel mental fatigue. Furthermore, technology overload also has a positive impact on student digital fatigue. Thus, it is recommended to offer technical support to the students to handle the technology. Moreover, the classes must be planned and scheduled in a way that offer sufficient time to complete the work and students are able to manage the stress or else they may feel exhausted after continuous online classes.

6. Conclusion
It can be concluded from the result of the study that use of multiple online platforms and technology overload significantly leads to digital fatigue among students. It has been remarked that in education sector, it is not possible to maintain social distance. Thus, it is imperative to take essential measures concerning the education in order to cope up with pandemic situation (Afacan and Avci, 2020). Such pandemic restrictions stranded universities round the globe to shift from conventional mode to online mode of learning (Manea et al., 2020). But teachers as well as students have to faced pros and cons of online mode (Kamal and Illiyan, 2021). Overuse of digital tools for the learning resulted in burnout among the students. Moreover, several online platforms used by different teachers may create a situation of turmoil and make it difficult for the students to organize and likely to cause a fatigue. The findings of the study suggest that online video conferencing platforms can be used as an important mean for instruction if used in proper framework with appropriate training and preparation. However, using multiple online apps or excessive technology can equally strengthen or may create weariness among the users. Furthermore, technology overload may result in anxiety, particularly eye discomfort, dejection and fatigue among the students. Thus, the people possibly will show decline in efficiency, frustration, tiredness, and unease. The excessive use of technology has turned our life as digital life during the pandemic which have long run negative consequences like distressing temper, ambiguity and pessimistic sentiment like bad temper and violent behaviour (Rajkumar, 2020).

7. Limitations and Future Scope
Though the study offers some helpful discoveries, it also has several flaws that might serve as a foundation for future research. MOP, TO, and SDF are the study’s main constructions.
The model built in this study has proven to be highly useful and definitive; however, future research may include additional variables that may have an impact on SDF. Second, only students from the University of Jammu in J&K were included in the study. As a result, the findings cannot be applied to India's whole higher education system. Future studies may widen the coverage of the population by considering students from various colleges. Similar studies might be carried out in various industries to increase the generalizability of the findings. Third, the current study is based on cross-sectional data acquired at a certain moment in time for the study. As a result, longitudinal research might be used to collect data across many time periods in order to explore digital fatigue more thoroughly. Researchers may also look into the extent of digital fatigue among faculty.

References
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