

TECHNOLOGY ENABLED SERVICES IN LIBRARY AND INFORMATION SCIENCE

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Abstract: The technology enabled flexible learning system (TeFL system) because of its inbuilt learner friendly feature and flexibility has the potential to enable the learners to deal with the challenging and difficult task of acquiring skills. Through flexible learning methodology and with the help of Information and Communication Technology (ICT), virtual laboratory and virtual workshop a large number of persons can be trained / retrained with a specific skill. The existing work force can also take advantage of re- training or upskilling through the TeFL. This study discuss some of the digital initiatives of the Ministry of Human Resource Development (MHRD), Government of India for greater access to higher education.

Keywords: ICT, digital initiatives, flexible learning

1.0 Introduction:

In the 21st century, variety of factors such as globalization, mobility and the wave of automation are changing the work environment. New jobs are replacing the age old job rolls and the present job seekers lack the skills and expertise which are required for success in the emerging environment. According to the Indian skills report (2019), about 65% of graduates and 57% of post graduates in India are unemployable to any job. In such situation it is important to keep an eye on market trends and be ready to deal with the changes. These issues can be solved by technology enabled flexible learning system (TeFL). The TeFL system because of its inbuilt learner friendly feature and flexibility has the potential to enable the learners to deal with the challenging and difficult task of acquiring skills. Through flexible learning methodology and with the help of Information and Communication Technology (ICT), virtual laboratory and virtual workshop a large number of persons can be trained / retrained with a specific skill. The existing work force can also take advantage of re- training or upskilling without leaving their present job through the TeFL.

With the advent of technology the entire system of learning is changed and it creates challenges for the lecturers and students to update themselves in under to cope up with the changing system.. Digital learning made educators to release the benefits of transforming physical classroom to digital classroom for enhancing their teaching skills, mode of assessing students and providing quality content to improve student learning at a faster pace. A person may access a well designed online academic content to increase his /her skill and or knowledge at any time and anywhere. Digital platform facilitates self learning, personal learning , peer learning to clear doubts or to solve a problem.

ICT has brought out significant changes in all walks of life and provided wider opportunities in achieving and accessing knowledge in the digitised form. Publishers and Libraries are also changing their publication and information storage pattern with the help of ICT to fulfil the needs of the information society. Modern Libraries provide services entirely different from the earlier ones. Now-a-days the world of information is available in a small window like smart phone and it reaches every corner of the world.

2.0 National Mission on Education through ICT (NMEICT)

The quality of learning outcomes can be improved by using technology in digital education. For improving the quality of learning outcomes the Ministry of Human Resource Development now named as Ministry of Higher Education has launched a comprehensive project named National Mission on Education through ICT aimed at embracing digital education solutions to increase access to high-quality material and learning outcomes. Despite the fact that the NMEICT programme has supported a wide range of initiatives, the most visible current initiatives are SWAYAM, SWAYAM PRABHA, the National Digital Library (NDL), e- Yantra, FOSSE, Spoken Tutorials, and Virtual Labs, which are being implemented by a number of higher education institutions.

3.0 `Digital initiative of Government of India in Higher Education

India being the second largest populated country in the world has one of the biggest learner or student base in the world. The government has launched several programmes such as 'Digital India' and 'Skill India' to spread digital literacy, create a knowledge based society in India, and implement three principles "access, equity and quality" of the education policy. The Ministry of HRD along with support of many state governments, AICTE and leading universities also provide multiple platforms for the benefit of users. Some of them are listed below:

- **Baa Dal:** It is cloud orchestration and virtualization management software initiated by MHRD under NMEICT scheme and developed and maintained by IIT Delhi. It ensures optimum utilization of the infrastructure and speeds up the development and deployment of eGov applications for academic needs.
- **Digital Locker:** It is a flagship initiative of Ministry of Electronics & IT (MeitY) under Digital India Corporation (DIC). Digilocker aims at "Digital Empowerment" of citizen by providing access to authentic digital documents to citizen's digital document wallet.
- **E-acharya:** It is an integrated e-content portal developed under National Mission for Education through ICT (NME-ICT). The portal provides facility to search and browse the learners all learning materials includes audio, video, textual materials, etc. through a single interface. The portal cover quality learning resources from top institutions in the country in eight subject categories viz. Agriculture Science, Biological Science, Chemical Science, Physical Science, medical and Health Science, Engineering and Technology, Social Science, and Arts and Humanities.
- **e-Yantra (www.e-yantra.org):** It is a robotics outreach project, an initiative of the Department of Computer Science and Engineering at the Indian Institute of Technology, Bombay. It is funded by the Ministry of Education, Government of India, under the National Mission on Education through ICT (NMEICT). The goal of e-Yantra is to complement existing Higher Education systems worldwide and solve local problems across a variety of domains such as Agriculture, Disaster, Manufacturing, Defense, Home, Smart Cities and Service Industries through technology.
- **Virtual Labs <http://www.vlab.co.in/> :** The vision of the Virtual Labs Project is to develop a fully interactive simulation environment to perform experiments, collect data, and answer questions to assess the understanding of the knowledge acquired. In order to achieve the objectives of such an ambitious project, it is essential to develop virtual laboratories with state-of-the-art computer simulation technology to create real-world environments and problem-handling capabilities. IIT Delhi as the coordinating institute with other 10 institutes are undertaking this initiative. There are about 120 such labs that are operational, with more than 1200 experiments and benefitted more than 25 Lakh students in the country. About 1100 colleges/universities have been enrolled as Nodal Centres and participated in holding about 2500 workshops across the country. More than 15 Lakh users across the Globe had visited Virtual Labs' website (www.vlab.co.in) during the COVID-19 pandemic and more than 2 Crore Page Views have been recorded.
- **Shodh Shuddhi:** The Ministry of Education, Govt of India through its initiative called Shodh Shuddhi provides access to Plagiarism Detection Software (PDS) to all Universities including Central, State, Deemed and Private Universities as well as Centrally Funded Technical Institutions (CFTIs) in India through central funding to enhance academic integrity in Institutions and also to curb plagiarism w.e.f. September 01, 2019. The program is launched during CIBE meeting at Delhi by the Hon'ble Minister of Education and being executed by INFLIBNET Centre, Gandhinagar. The Plagiarism Detection Software (PDS) is being provided to 1038 Universities/Institutions identified by the Centre by creating a User ID and Password for University Coordinators (UC) with admin rights. Admin of the University can create their own users depending on demand. As on 7.12.2020, total of 828381 documents have been submitted for plagiarism check by 98613 users since its inception. 4,83,126 documents were submitted from 1st April to 30th Nov 2020 with a monthly average of 53680 documents
- **E-kalpa:** An MHRD initiative under NMEICT programme, named e-kalpa creating digital learning environment for design in India has successfully demonstrated the achievement of the following project objectives, on completion of its phase-
Digital online content for learning design with e-learning programs on design
Digital design resource database including the craft sector
Social networking for Higher Learning with collaborative learning space for design
Design inputs for products of National Mission in education through ICT.
The content of e-kalpa website named "D'source".
- **Application of Spoken Tutorial: Spoken Tutorial (<https://spoken-tutorial.in> :** It is a 10 minute long audio-video tutorial created for national level ICT training through open source software. These tutorials are created for self learning, dubbed into all our 22 languages (including Spoken Sanskrit), and usable offline. There are

more than 1,000 Spoken Tutorials, and more than 10,000 dubbed version of them, covering about 75 topics. These cover topics, such as C/C++, Java, PHP, Linux, Perl, Ruby, Scilab, Python, DWSIM, OpenFOAM, OpenModelica, R, QGIS, eSim and Arduino. There are also topics to the beginners, some examples being LibreOffice Writer, Calc, Impress, and introduction to computers. During the past 7-8 years, the Spoken Tutorial team has trained 70 lakh students. Spoken Tutorials have been used extensively during the COVID pandemic. Spoken Tutorials are now extended to other skills, the most notable being health and nutrition. The Spoken Tutorial team has trained 30,000 health workers, nurses, doctors and mothers on exclusive breastfeeding.

- **Enterprise Resource Planning (ERP-SAMARTH):** Samarth eGov Suite is a University Information Management System project designed and developed by Institute of Informatics and Communication (IIC), University of Delhi. It is an ICT initiative sponsored by the Ministry of Education to revolutionize the current education management system by implementing an automation engine for various universities and other Higher Education Institutes (HEIs). Currently, Samarth e-Gov Suite offers more than 40 modules to facilitate the automation of operational processes in a University. Samarth has helped the universities to migrate from paper and non-uniform third party ERP systems to a system which is more robust and compliant with UGC guidelines. Samarth has been provisioned on “Software As A Service (SAAS)” model to a total of 29 universities/HEIs across India. Apart from these, Samarth has also been provided on a non-SAAS self-hosted and self-managed basis to 20 TEQIP-3 Institutes. Apart from these, many state and regional universities have also been requesting implementation of Samarth e-Gov Suite. More than 8000 employees from all CUs have been registered on Samarth instances. Samarth has enabled the HEIs to conduct online recruitment in compliance with latest UGC and state guidelines for various teaching and nonteaching positions. More than 23 lakh online applications for admissions have been processed through Samarth. Samarth was instrumental in helping the learning community during COVID-19 pandemic. Samarth project enabled the University of Delhi to conduct “novel” Online Open Book Examination and online evaluation for more than 2.5 Lakh final year students across 200+ programmes in July 2020. The second cycle of OBE has been started in December, 2020 for all students who choose for online mode of examination. A learning management system (LMS) along with video conferencing facility was also deployed for various stakeholders from learning community. Target fixed by Delhi University is for implementation of Samarth E-Gov suite in total 40 Central Universities by March, 2021.
- **Shodhganga** <http://shodhganga.inflibnet.ac.in/>
The term Shodhganga was established to characterise the INFLIBNET Centre's digital archive for Indian Electronic Theses and Dissertations. D Space, open-source digital repository software developed by MIT in conjunction with Hewlett-Packard, is used to organise the shodhganga (HP). Shodhganga is a platform for researchers to deposit their Ph.D. theses and make them freely available to the academic community. Researchers can submit ETDs (Electronic Theses and Dissertations) to the repository, which can subsequently be recorded, indexed, stored, disseminated, and maintained.
- **Shodhgangotri** <http://shodhgangotri.inflibnet.ac.in/> : Under the Shodhgangotri initiative, universities are required to deposit an electronic version of approved synopses produced by research scholars in order to register for the Ph.D. programme, which has since been expanded to include Emeritus Fellowship and other options. On the one hand, the repository would reveal the patterns and directions of research at Indian universities, while on the other, it would avoid research duplication.
- **E-Shodh Sindh (ESS)** <http://ess.inflibnet.ac.in/> :Based on the recommendation of an expert committee the MHRD has formed e-Shodh Sindhu merging three consortia initiatives, namely UGC-Infonet Digital Library Consortium, N-LIST Programme and INDEST-AICTE Consortium. More than 15000 international electronic journals and e-books are made available to all the higher educational institutions through the e-Shodh Sindhu initiative. This allows access to be best education resources in the work using digital mode.
- **National Digital Library of India NDLI** (<https://ndli.iiitkgp.ac.in> or <https://www.ndli.gov.in>)
National Digital Library of India (NDLI) is an alldigital library that stores information (metadata) about different types of digital contents including books, articles, videos, audios, thesis and other educational materials relevant for users from varying educational levels and capabilities. It provides a single-window search facility to access digital contents currently existing in India as well as other digital sources under a single umbrella. It is developed, operated and maintained from Indian Institute of Technology Kharagpur.
- **e-PG Pathshala** <http://epgp.inflibnet.ac.in/index.php>
It is an initiative of the MHRD under its National Mission on Education through ICT (NME-ICT) being executed by the UGC. The content and its quality being the key component of education system, high quality, curriculumbased, interactive e-content in 70 subjects across all disciplines of social sciences, arts, fine arts

- **FOSSEE** <https://fossee.in>
FOSSEE (Free/Libre and Open Source Software for Education) project is part of the National Mission on Education through Information and Communication Technology (ICT), Ministry of Education (MoE), Government of India. It project promotes the use of FLOSS tools to improve the quality of education in our country. It aims to reduce dependency on proprietary software in educational institutions. It encourages the use of FLOSS tools through various activities to ensure commercial software is replace by equivalent FLOSS tools. It also develop new FLOSS tools and upgrade existing tools to meet requirements in academia and research.
- **Global initiative of Academic Networks (GIAN)** <http://www.gian.iitkgp.ac.in/>
Union Cabinet has approved a programme titled Global Initiative for Academic Networks (GIAN) in Higher Education. Aimed to tapping the talent of the strong academic network of the country Scientists, entrepreneurs at international level. To encourage their engagement with Higher Education Institutes in India so that country's existing academic resources can be augmented and accelerate the pace of the quality reforms. Further to elevate India's technological and scientific capacity to gain the global excellence. • **Know your College:** The Ministry of Human Resource Development (MHRD) has launched a Know Your College (KYC) portal that promises to be a one stop shop for students and parents to know about various colleges in the country. The portal is updated with relevant information about every college like lab facilities, faculty, intake, hostel facilities, library etc.
- **National Academic Depository (NAD)** <https://nad.gov.in/>
The vision of National Academic Depository (NAD) is born out of an initiative to provide an online store house of all academic awards. National Academic Depository (NAD) is a 24X7 online store house of all academic awards viz. certificates, diplomas, degrees, mark-sheets etc. duly digitized and lodged by academic institutions / boards / eligibility assessment bodies. NAD not only ensures easy access to and retrieval of an academic award but also validates and guarantees its authenticity and safe storage.
- **National Institutional Ranking Frame work (NIRF)** <https://www.nirfindia.org>
The National Institutional Ranking Frame work was approved by the MHRD and launched by Honorable Ministry of Human Resource Development on 29th September, 2015. The framework outlines a methodology to rank institutions across the country. The methodology draw at by a core committee set up by MHRD, to identify the broad parameter for ranking various universities and institutes. The parameters broadly cover "Teaching, Learning and Resources", "Research and Professional Practices", "Graduation Outcomes", "Outreach and Inclusivity" and "Perception".
- **Know your College** <http://www.knowyourcollege-gov.in/>
The Ministry of Human Resource Development (MHRD) has launched a Know Your College (KYC) portal that promises to be a one stop shop for students and parents to know about various colleges in the country. The portal is updated with relevant information about every college like lab facilities, faculty, intake, hostel facilities, library etc.
- **NPTELL** <http://nptel.ac.in/>
The National Programme on Technology Enhanced Learning (NPTEL) was initiated by seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee) along with the Indian Institute of Science, Bangalore in 2003. Five core disciplines were identified, namely Civil Engineering, Computer Science and Engineering, Electrical Engineering Electronics and Communication Engineering and Mechanical Engineering. In this phase 235 courses in web/video format were developed. The main goal of NPTEL Phase II (2009-14) was to build on the engineering and core science courses launched previously in NPTEL Phase 1. An additional 600 web and video courses were created in all major branches of engineering, physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level. Several improvements such as indexing of all video and web courses and keyword search were implemented.
- **OSCARR** <http://oscar.iitb.ac.in/>
Project OSCAR (Open Source Courseware Animations Repository) is to build a large repository of webbased, interactive animations and simulations, referred to as learning objects (Los), for teaching and learning concepts in science and technology. These could be useful not only for a classroom environment but also for enabling independent learning and distance education. The current goal is to develop Los for topics in various subjects at the Undergraduate and Postgraduate levels.
- **Sakshat** <http://www.sakshat.gov.in>
The Ministry of Human Resource Development has designed an education helpline named "Sakshat". It is perceived to be a single stop education portal for addressing the needs of students, scholars, teachers and

lifelong learners. It is a free portal launched by the Hon'ble President of India on 30th October 2006. Students can make one to one interactions with subject experts selected by the MHRD and CBSE.

- **SoS Tools** <http://sos-tools.org/>
Software and Simulation packages are useful tools for the analysis of systems and solving problems by the students of Science, Social Science, Engineering, Management and related disciplines. Many commercial software packages are available for the above. But many of these software packages are quite costly and require yearly license fee for updates and maintenance. The objective of this project is to develop software tools for analysis of systems and computations, create adequate manpower to teach students to use open source software and to develop simulation tools. The developed software should be user friendly and properly documented. Such packages, tailored to suit the needs of our students will be ported on Sakshat for making freely available to any student, teacher or institution willing to use them.
- **Swayam** <https://www.swayam.gov.in/>
Study Webs of Active Learning for Young Aspiring Minds (SWAYAM) is a programme initiated by Government of India and designed to achieve the three cardinal principles of Education policy viz., access, equity and quality. The objective of this effort is to take the best teaching learning resources to all, including the most disadvantaged.
- **Swayam Prabha** <https://www.swayamprabha.gov.in>
The INFLIBNET Centre maintains the web portal. It is a group of 34 DTH channels devoted to telecasting of high-quality educational programmes on 24 X 7 bases using the GSAT-15 satellite. Every day, there will be new content for at least four hours which would be repeated five more times in a day, allowing the students to choose the time of their convenience. The Channels are up linked from BISAG, Gandhinagar. The contents are provided by NPTEL, IITs, UGC, ECE, IGNOU, NCERT and NIOS.
- **Talk to a Teacher Program** <http://aview.in/>
A VIEW is part of Talk to a Teacher Program coordinated by IIT Bombay and we are funded by the Ministry of Human Resource Development (MHRD) under the Indian Government's National Mission for Education using Information and Communication Technology (NME-ICT) along with various other projects in Virtual labs Haptics and Natural Language processing. A-VIEW is now deployed at several IITs, NITs and other leading educational institutions across the nation
- **Vidwan:** It is the premier database of profiles of Scientists / researchers and other faculty members working at leading academic institutions and other R & D organization involved in teaching and research in India. It provides important information about expert's background, contact address, experience, scholarly publications, skills and accomplishments, researcher identity, etc. The database developed and maintained by Information and Library Network Centre (INFLIBNET) with financial support from the National Mission on Education through ICT (NME-ICT).
- **CEC-UGC Youtube Channel:** This portal provides access to an unlimited number of educationally related lectures at no cost. This channel has 379K subscribers on YouTube. This channel was launched on April 16, 2012, and it currently has a viewership of 28,287,115.

4.0 ICT-Based Library Services to its Users

- **Library Webpage:** Library webpage can be defined as gateways for searching information about the library. It provides integrate access to the metadata of a library's multiple databases, e-journals and library catalogues and deliver detailed information about a library and also provide access to all computer based services like library collection, library timing, library working hours, list of subscribed online journals, CAS/SDI/Reference services, popular documents based on circulations, reservations, user feedback, etc offered by a library. With the help of library webpage, library can easily propagate its services and facilities to the academic community worldwide
Keep informed about library activities and new services
Saves the time of the user
Allow easy bridging of distances
Gateway
- **Web-based Online Public Access Catalogues (Web-OPAC):**
The internet and web-based technologies have made it possible for the libraries to provide access to their catalogues globally. It helps the library users to access to information from anywhere in the world when OPAC is available on the internet. to networked information services
- **Web Forms:**
Interactivity is a key feature of successful webbased services and web forms are good examples of interactivity. Most of the library websites have web forms for inviting feedback from the users such as:

Suggestions for services; Users Survey; Comments on the website and suggestions to improve it; Requests for library to acquire certain titles or materials; Reference Service (often Ask-A-Librarian); Interlibrary loan or other document delivery services .

- **Web Based User Education:**

Libraries are using ICTs, especially the web, to implement online based bibliographic or library use programmes targeting their users Web guides and teaching tools are found everywhere on the web because they are easily updated, accessed and printed on demand. The web based user education provides a high degree of interactivity and flexibility to the users. The library websites can use web-based user education for imparting training to users in the following area: Basic library skills along with glossary of library terms; Using Library OPAC/ Web OPAC, locating books, magazines and other library materials; Instructions for searching CD-ROM and web based databases and other electronic resources; and Instructions on subject search training, using Boolean operators and searching internet resources through search engines.

- **Readers' Advisory and E-Reference Services:**

ICTs offer libraries an opportunity to provide web-based versions of readers' advisory services and reference services. These include services such as informing users via the web about new releases or additions to the library collection, selective dissemination of information, announcements, and facilities for readers to interact with reference staff, etc. in academic institutions offering courses via distance learning, libraries are able to support their students through ICT based advisory services

- **Bulletin Board Service:**

A bulletin board is an electronic communications forum that hosts posted messages and articles connected to a common subject or theme or interest. It allows users to call in and either leaves or retrieves messages. The messages may be directed to all users of the bulletin board or only to particular users. But all messages can be read by all users. Several libraries are using bulletin boards for their webbased library service

- **Electronic Mail (E-mail) Services:**

E-mail is very useful for sending messages to and from remote areas with the enhanced network. It is also useful in various aspects of the library environment. Thus, it may be stated that e-mail may play a significant role in information dissemination services. Library professionals can use this web medium for various purposes especially for delivering some web-based services. It also helps to contact the vendors and publishers. It serves as an excellent current awareness service to the scientists.

- **Digital Library Service:** A digital library service is an assemblage of digital computing, storage, and communications machinery together with the software needed to reproduce, emulate, and extend the services provided by conventional libraries based on paper and other material means of collecting, storing, cataloguing and finding.

- **Electronic Document Delivery Service:**

The libraries are implementing ICT-based Inter-Library Lending (ILL) using networks to deliver copies of journal articles and other documents in digital format. It is one of the most useful services for users.

- **Institutional Repository Service:**

An institutional repository is defined as a database with a set of services to capture, store, index, preserve and redistributes an institution's research outputs in digital formats.

- **Current Awareness Service-CAS:**

Current Awareness Services has been an important means for keeping the users up to date in their areas of interest. A large number of electronic publishing sites or portals now offer current information via email to registered users.

- **Electronic these and Dissertations:**

It is a digital document suitable for machine archives and worldwide access. It may incorporate such features as enhanced graphics, sound, and animation. In addition, ETDs enable users to perform comprehensive searches using words, phrases, or symbols.

- **Online Chat Services:** Online chat may refer to any kind of communication over the Internet, which offers an instantaneous transmission of text-based messages from sender to receiver. In libraries, it can be used for online reference service and real-time consulting service. Online chat may address as well as point-to-point communications as well as multicast communications from one sender to many receivers.

- **Internet Service:** The internet is described as a worldwide network of computer and people. It is an important tool for global online services. Internet connects all kind of educational institutions for information sharing and exchange. Access to information through the internet has changed the total scenario of librarianship.

- **Reprographic Service:** The reprographic facility is still widely used in libraries globally. Most of the research libraries have a reprographic machine and provide photocopies of any document on demand.
Document Scanning Services: Scanner is important equipment in the digital library. It is useful for scanning text, image and content pages of books and providing great help for establishing a digital and virtual library.
- **Audio-Visual Services:**
Audio-visual materials are important sources of information, education, and entertainment. Many libraries particularly media libraries and large academic and public libraries hold audiovisual material such as music, films, pictures, and photographs etc.
- **Open-Source Software Service:**
Open-source software is freely available computer software, which allows altering the source code and customizing the software to anyone and for any purpose. The development of a number of ILS products in the open source world such as Integrated library systems like Koha; Digital library software like Greenstone; Digital Repository Software, like DSpace; Content Management Software like Moodle, etc.
- **Ask-A-Librarian Service:**
Ask-a-Librarian services are Internet-based question and answer service that connects users with individual who possess specialized subject knowledge and skill in conducting precision searches. Most “As-A-Librarians” services have a web-based question submission form or an email address or both. Users are invited to submit their queries by using web forms or through e-mail. Once a query is read by a service, it is assigned to an individual expert for answering. An expert responds to the query with factual information and or a list of information resources. The response is either sent to the user’s e-mail account or is posted on the web so that the user can access it after a certain period of time
- **Virtual Library Tours** Websites of libraries provides virtual library guide to the physical facilities including collections, services and infrastructure available in the library. The combination of library maps and floor plans, library departments and photographic views are used for the tour. Virtual library tours are also using new technologies such as QuickTime movies etc and are beginning to replace image maps on main campus Web sites
- **Library Network Service:**
The important function of the network is to interconnect computers and other communication devices so that data can be transferred from one location to another instantly. The networks include the local area network (LAN) in library housekeeping and resource sharing and wide area network (WAN) that covers wide geographic area such as a country or state. The major WAN in India are DELNET, ADINET, INFLIBNET, NICNET, MALIBNET etc.

5.0 Conclusion

ICT has transformed libraries and its services to reach the remote users and improved the information access to its users with various digital platforms and tools. The government has also launched supporting programmes to enhance quality and standard of Higher Education in India. The technology enabled library services has improved teaching learning scenario in efficient manner to reach the targeted users.

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