

Forging Ahead with Smarter Implementation in the Post-Covid-19 Pandemic Era @ Lien Ying Chow Library, Ngee Ann Polytechnic

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Abstract

As Singapore strives towards its vision of becoming a Smart Nation, the libraries in Singapore are also aiming to drive transformation through innovative services, resources, and facilities. The COVID-19 pandemic has accelerated the digitalisation effort of Lien Ying Chow Library (LYCL) of Ngee Ann Polytechnic (NP) to explore and adopt efficient use of innovative digital technologies to better streamline processes, improve productivity, and enhance patron experience.

This paper discusses how the COVID-19 pandemic has posed challenges to LYCL's business continuity plans and how LYCL has responded and embraced the unprecedented rapid need for changes to design and implement stop-gap measures. LYCL has also effected sustainable measures that are aligned with its 'Library of the Future' initiative (process, service, and product innovations) to forge ahead into the post-pandemic era. Several implementations and initiatives in the area of smart infrastructure, smart learning resources, and digital solutions continue to be relevant and will continue to be employed in the post-pandemic era which will continue to be very much hybrid in nature.

Keywords:

smart infrastructure, smart resource, Smart Book, smart service, smart locker, interactive virtual chat, dynamic online real-time payment, PayNow, digitalisation, smart initiative, smart library, library of the future, COVID-19, COVID-19 pandemic

Introduction

The COVID-19 pandemic has posed unprecedented challenges to libraries' business continuity plans over a period of more than two years from February 2020 to April 2022.

When the Singapore government declared that the ¹Disease Outbreak Response System Condition (DORSCON) had changed from yellow to orange on 7 February 2020, LYCL's physical sites had to close (total duration of at least half a year). The libraries could then re-open with a series of Safe Management Measures (SMM) imposed to mitigate the risk of COVID-19 transmission at the libraries and to keep the environment safe for both staff and patrons. The SMM changed each time the COVID-19 situation changed. The SMM include the downsizing of the capacity of the library, seat distancing, resource quarantine, patron wellness check, regular wipe-down, as well as sanitisation, and eventually, Vaccination-Differentiated SMM (VDS). The DORSCON level was only adjusted back from orange to yellow from 26 April 2022

¹ Disease Outbreak Response System Condition (DORSCON) is a generic colour-coded framework that reflects the current disease situation at the point in time and is used as a gauge as to when an organization will activate its business continuity measures and adopt infection control measures at their respective workplace consistent with the advisories on public health measures.

with the easing of the SMM restrictions. The DORSCON orange period was an unprecedented period of more than two years.

Lien Ying Chow Library (LYCL) of Ngee Ann Polytechnic, being a future-oriented library has been working on digitalisation and smart solutions for a 'Library of the Future' (Freyberg, 2018, Hoy 2016). During the pandemic period, LYCL had to accelerate its digitalisation plan and respond to the changing requirements to ensure good business continuity with more prominent 24x7 online presence (especially when the physical library had to be closed from March to October 2020), increase our support to the academic schools (being an academic library) when classes had to go fully virtual while continuously adapting to the evolving SMM to ensure the well-being of our patrons as well as our librarians and at the same time, complying with national guidelines.

This paper discusses how LYCL responded and embraced changes to design while simultaneously implementing stop-gap measures as well as accelerating sustainable measures aligned with our 'Library of the Future' initiative (process, service, and product innovations) to forge ahead in the post-pandemic world. Several of these initiatives and implementations will be retained in LYCL and introduced to the other polytechnic libraries through the Joint-Polytechnic Libraries Collaboration (JPL) in the future.

Making Library E-resources and E-services More Prominent Online and Alternative Access to Library's Physical Resources and Services Beyond Operating Hours or Closure (such as the COVID-19 Pandemic Short-Breaker)

Despite the physical library closure, LYCL library staff continued to work behind the scenes remotely to ensure that online resources and services were not disrupted.



LYCL very rapidly made our 24x7 online presence more prominent through our LYCL Library Portal (through our Library Service Platform or Library Management System) and further promoted our electronic resources – E-books and E-databases for use and loan anytime, anywhere online.

Some existing LYCL strategies and collaborations implemented in earlier years came in extremely timely and helpful during this pandemic period. For example, the LYCL E-strategy which was implemented from August 2018 made available a wide spectrum of relevant E-resources to patrons. The collaboration of LYCL with the National Library Board (NLB) sealed in October 2018 to increase the LYCL E-books offering with NLB E-books also came in handy.

In terms of process and service innovation, LYCL connected with our patrons with electronic Direct Mailers (eDMs) through emails and mobile platforms. LYCL also augmented 'LYCLCares4U' library policies to address the COVID-19 pandemic disruption. Patrons were granted automatic extension of their membership period (at no cost for paid external members) and loan periods. Regular changes to SMM were also communicated with patrons seamlessly

and promptly through eDM, for example, the need to register in advance before visiting the physical LYCL when capacity had to be managed.

To facilitate queries from our patrons, LYCL made the chatbot more prominent on our Library Portal and further enhanced it with more knowledge of LYCL operations during the COVID-19 operations.

When remote services pivoted during the COVID-19 pandemic period to support full or blended Home-based Learning (HBL) and Work from Home (WFH), LYCL felt that it was important for patrons to be able to connect with LYCL librarians in real-time on resource and reference queries. Hence, LYCL accelerated our planned initiative to implement the virtual interactive chat platform through the use of Social Intent in April 2020. Several literature findings show that many libraries supported the need to have a virtual chat service (Radford et al 2021, Cote et al 2016, Fruehan & Hellyar 2021).

To allow patrons to be able to pay their library fines easily via their mobile devices, LYCL accelerated the planned initiative to implement a smart secured digital payment using peer-to-peer fund transfer service – Dynamic PayNow. With the successful launch of the FinTech solution in November 2019, the library's existing payment mechanisms – mobile NETS payment via bank cards and the AXS payment via kiosk and web services were decommissioned. This service and product innovation also brought about process innovation in terms of productivity savings in reconciliation of payment charges. Several libraries have also explored smarter ways for patrons to pay their fines remotely via new payment models as reflected on their libraries' websites (University College London, University of Melbourne, University of Edinburgh, University of Wisconsin-Madison, and Hong Kong Public Libraries, to name a few).

To inculcate the self-service attitude of patrons and lesser dependence on counter services at the physical library after office hours or when the physical library is closed, LYCL also accelerated its plan and implementation of the Library GO! which is a self-service one-stop borrow and return service with a smart locker in July 2021. Several libraries and retail outlets that have installed smart lockers have concluded that these enhanced their users' experience (Bradford Systems Corporation, 2022, Iannaccone et al 2021, Luis et al 2022, Luxer 2021).

The virtual interactive chat, mobile payment, and the Library Go! proved popular with patrons. More information on these are detailed in the following "Sustainable Smart Implementations @Lien Ying Chow Library" section of this paper.

Providing Smart Learning Resources to Academic Schools and NP Community in Support of Full or Blended Remote Home-based Learning (HBL) and Work from Home (WFH)

When remote services pivoted during the COVID-19 pandemic period, LYCL felt it was important to equip the academic schools (lecturers and students) and NP community with smart learning resources to support them when they were doing full or blended Home-based Learning (HBL) or Work from Home (WFH).

With the increased adoption of hybrid learning, there is a need for students to tap on resources conveniently 24x7. The shift towards a technology enhanced learning environment would require learning materials to be delivered seamlessly in a smart learning environment (Klimova & Simonova 2015). To support hybrid learning, lecturers are constantly looking for innovative resources that provide personalisation and adaptive learning features to help them track and assess students' knowledge and skills. Adaptive learning resources personalise learning by continuously evaluating each student's performance in real time (Taylor et al. 2021).

Smart Book is an example of an adaptive learning resource that assesses students' knowledge and skill levels as they read and highlight content that focusses their attention on the topics and concepts that they have yet to master. However, it is noted that the literature review showed that there is still a paucity of research done on the effectiveness of Smart Books on student learning. Most articles focussed on the vendors' write-ups on their offerings of Smart Books to the libraries.

Despite this, LYCL started making a foray into Smart Books in October 2018 with the pilot use of McGraw-Hill Connect for modules in the NP School of Business. With some success, LYCL started promoting this to all the other academic schools as well as exploring other Smart Books from other publishers, namely, Pearson and Cengage. Currently, LYCL has introduced Smart Books in various disciplines – business, humanities, nursing, science, and technology.

LYCL librarians had curated valuable reading lists in the following topics that can be found at <https://np.edu.sg/library>

- COVID-19: Positivity, Wellness, Fact, and Fake
- Effective Home-based Learning (HBL)
- Effective Work from Home (WFH)
- Physical & Mental Wellness
- Staying Relevant
- Interacting with Others
- Tech Big Moments – Technology Innovations inspired by COVID-19 pandemic

These reading lists were aimed at helping patrons to be more aware, discerning, and effective in taking care how they work, teach, and learn remotely while inspiring patrons on innovations and ideas that the patrons could use as research ideas or final-year projects.

During this period, LYCL continued its quest to enhance the flagship Digital Life@Polys™ framework and the various Digital Literacy E-learning resources available to all polytechnic students in Singapore. Digital Life@Polys™ is a Joint-Polytechnic Libraries Collaboration (JPL) between Ngee Ann Polytechnic, Nanyang Polytechnic, Singapore Polytechnic, and Temasek Polytechnic. This framework and its suite of E-learning resources (bite-sized videos) are designed and developed to equip students with a set of digital literacy competencies spelt by agencies such as the Ministry of Education (MOE) and SkillsFuture.



Moving into the post-pandemic era, the various smart learning resources and services implemented by LYCL will continue to remain important and relevant as lessons will be largely hybrid.

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 Pick up research hacks in this interactive e-learning course.
- 3 - 7 MAY**
Wellness
 Self-care online and adjusting to Poly life takes time and effort. Find some tips here.
- 10 - 14 MAY**
Research
 Find relevant resources to meet your academic needs.
Plagiarism & Copyright
 Use information ethically and cite your sources correctly.
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Visit our webpage for more information and resources!
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As part of Digital Life@Polys™, a flagship cross polytechnic event – Power UP! was organised by the JPL team led by NP LYCL in April-May 2021. This virtual event saw many industry partners present interesting and useful webinars on digital literacy and research skillsets using library resources for the polytechnic community. As the entire event is virtual, the polytechnic libraries staff also picked up new skillsets on conducting tours and exhibitions virtually and the use of interactive and augmented media.

Smart Infrastructure Augmentations for Process, Service, and Product Innovations

When LYCL re-opened on 19 October 2020 after the COVID-19 circuit breaker period, there was strict Safe Management Measures (SMM) in terms of facility capacity, safe distancing, mandatory mask-on, and restricted group size.

LYCL had to be agile and respond promptly to the evolving SMM as required. Despite some fear of the disease as well as additional work demands, the LYCL staff pulled together and helped redesign facilities and rearranged furniture to comply with the SMM. Library staff also regularly sanitized various touch-points as well as served as SMM ambassadors to patrol around the library.

A simple pre-registration system to visit LYCL was implemented in the initial library re-opening when LYCL had to manage a restricted capacity. To allow greater flow of patrons, a two-hour block duration in the library per patron with a sticker system was implemented.

A simple self-service temperature-taking kiosk was constructed to allow for patrons to take their own temperature before entering the library. This solution was lower in cost compared with the automated temperature scanning machine system.

LYCL implemented an Internet of things People Counting System to automatically count the number of people at various levels of the library (termed as zones) so that LYCL staff would be able to manage the traffic flow per zone within the library.

Many of the solutions put in place to manage the library operations and SMM during this period were either stop-gap measures or isolated digital solutions. Moving forward to the post-pandemic era, LYCL is looking at how to integrate these into sustainable permanent features for our upcoming renovation in 2023 to move into a Smart Unmanned Library of the Future. This will include smart gantries with biometrics (e.g. facial recognition) ability to manage patron traffic and capacity adjustment in real time, flexibility to configure facilities and capacity, heatmap to show occupancy density and analytics of various facilities within LYCL, UHF RFID implementation for 'borrow and go' concept, as well as visual surveillance on safety and security within the library.

Sustainable Smart Implementations @ Lien Ying Chow Library (LYCL)

As LYCL transits into the post-pandemic period, the library is faced with higher patron expectations such as demand for greater customisation, personalisation, and one-stop integration of 24x7 services. This calls for smarter processes, service, and product innovations by the LYCL. To seize the opportunities in this changing service landscape, libraries should continuously build-on and value-add to its current implementations.

Several LYCL innovative implementations are actually part of the LYCL Library of the Future roadmap, however several of these implementations were accelerated for piloting in order to manage the COVID-19 pandemic situation in terms of processes, service, and product innovations. The following details a few of these implementations and the immediate future enhancements moving forward into the post-pandemic era.

Smart Infrastructure – One-stop Service to Collect, Return, and Discover



One of the 'smart infrastructure' that LYCL implemented in July 2021 is Library GO! @Atrium (Blk 1, Level 1). This is a one-stop service to collect, return, and discover information (with a smart locker). This is the designed extension to our physical LYCL (Blk 1, Level 2).



Library GO! further serves the NP community 24x7 beyond LYCL's operating hours. Library GO! has allowed easy as well as convenient return and pick-up of reserved library resources via a smart locker while also updating patrons on various library happenings and updates (discover component).

This initiative is part of LYCL's unmanned library and patron engagement mission to enhance patron experience through contactless services. A review of this implementation revealed that it has helped enhance patron experience by providing them with the convenience to collect and return books on their way to school or when they leave the campus. With fewer patrons requesting for the reserved books from the counter, it has helped to ease the operations load. Part-time students and external members of the library who come back to campus after the Library's operating hours could easily pick up and return their books at Library Go!. There are also plans for returned items through Library Go! to automatically update the Library Management System which would further reduce the load for library staff.

In support of an inclusive workplace, the smart locker which is located on the ground floor of the Block 1 building is accessible to wheelchair bound patrons. LYCL has also extended Library Go! to enable patrons to reserve for on-shelf items (titles with "available" status) conveniently from the library catalogue and collect them from the smart lockers. Previously, patrons could only reserve books that were out on loan and collect them at Library Go!.

This project has also availed opportunities for LYCL to identify areas of harmonisation across the four polytechnic libraries and NP's internal departments to achieve collaboration and cost optimisation. LYCL led the joint-tender with Temasek Polytechnic and NP's Students and Alumni Services (SAS) to procure smart lockers and the outcome yielded substantial cost savings in terms of aggregate demand savings in equipment, maintenance, as well as manpower in working on the tender process and evaluation work.

Learning Transformation – Innovative Learning Resources and Tools



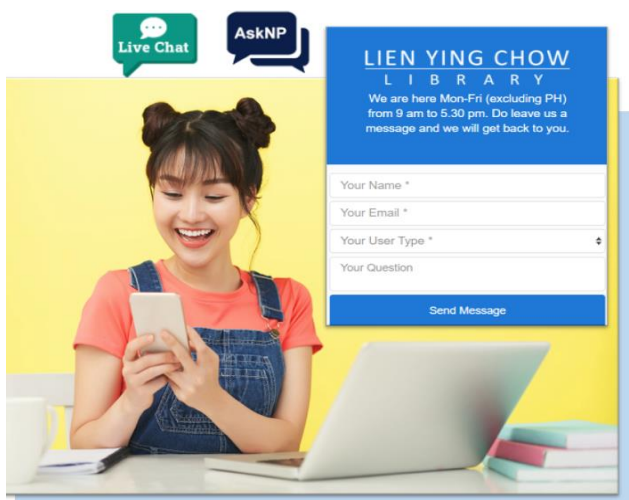
In support of NP's initiative in remote learning and flipped classroom teaching, LYCL introduced a Smart Book (Digital Course E-books) from McGraw-Hill Connect, Cengage OWLv2, Pearson Mastering, and MyLab to support students with their self-directed learning.

For the lecturers, the Smart Books had provided them with quality curricula materials for delivery, assessment, and smart tools to track students' learning and performance. The Smart Books contain instructor resources, test bank, pre-built assignments, reporting capabilities on students' learning, and visual analytics dashboard to facilitate their teaching.

The strategy that LYCL had taken to kick-start the adoption of Smart Books was to collaborate with an academic school who has a lecturer who was willing to champion the cause to roll out the use of Smart Books with the students. LYCL together with the School of Business & Accountancy (BA) piloted the use of McGraw-Hill Connect in October 2018 semester (Academic Year AY2018) with 500 BA students. With the successful pilot, LYCL and BA then jointly conducted sharing sessions to the campus community. Into AY2019 and 2021, more schools had also embarked on the LYCL Smart Book initiative. The onboarded schools now include the School of Design & Environment (DE), School of Film & Media Studies (FMS), School of Health Sciences (HS), as well as School of Life Science & Technology (LSCT).

To enhance the support of hybrid learning, flipped classroom teaching (a type of blended learning where students learn the content at home and discuss the content in class facilitated by the lecturers) and provide the Schools with wider selection of subjects across disciplines in the post-pandemic era, LYCL had sourced additional Smart Books sources – Mastering & MyLab by Pearson and OWLv2 from Cengage Learning that were piloted with the Schools.

Innovative Digital Solution – Virtual Interactive Chat Service Anywhere



In support of LYCL's digitalisation towards self-service and support patrons' enquiries during the HBL and WFH period, the Library implemented a Live Chat Virtual Library Service (Social Intent) to provide enhanced online assistance for the patrons' information and research needs.

Leveraging on this innovative digital solution has helped LYCL work smarter as it has cut down on the processes of handling queries and provided patrons with a more convenient approach to get online assistance. This Live Chat is provided in

addition to the Library's existing chatbot service, AskNP. A pilot run of the Virtual Chat started in April 2020 to enable library staff to identify the pattern of queries and review the effectiveness of the virtual chat for queries. A review in 2022 has shown that patrons were largely satisfied with the timely response by library staff to help them with their information needs and are at ease in using this platform to connect with LYCL staff and pose queries. The review also revealed that the virtual chat provided more opportunities for library staff to engage with patrons.

Moving into the post-pandemic world, LYCL is looking at seamlessly integrating the Chatbot and virtual chat through a NP campus integrated solution. An analysis of the counter services and queries will be made so that simpler and less-meaningful queries can be managed by the chatbot and Robot Temi, leaving the virtual chat to manage the more complex reference queries. This is aligned on further streamlining our procedures and processes to move towards an unmanned.

Innovative Digital Solution – Digital Mobile Payment of Library Charges Anytime, Anywhere



LYCL's digital transformation to adopt mobile E-payment started in November 2019 with the payment of membership fees by external members via AXS m-Station (mobile app) and the AXS E-station (web based). In July 2020, the Library implemented PayNow Payment with static QR Code through the national unified payment QR code, SGQR, to collect library charges. This allowed payment of library charges to be made anytime and anywhere. To provide better user experience and improvement in productivity, the library launched Dynamic PayNow for digital payment of library fines and external membership fees. This dynamic QR Code integrated in the patron's My Account on the library catalogue has made it more convenient for library patrons

as payment for outstanding library charges can be done online securely, instantly, and seamlessly 24x7.

Innovative Digital Solution – Smart Library Assistant Robot Alpha and Temi

LYCL started exploring the use of robotic solutions in October 2018 as part of the Library of the Future roadmap. Our first prototyping pilot was a Smart Library Assistant Robot – Alpha and it served as a platform for our library staff to explore the capabilities of a robot.

The second generation of the Smart Library Assistant Robot – Temi was accelerated for development and launch in December 2020. Temi was our Library Assistant that could:

- Conduct LYCL library tour
- Guide and Wayfinder to various sections and facilities of LYCL
- Answer queries of patron with reference to LYCL Chatbot
- Cheer up patron with jokes or songs
- Connect patron to a LYCL librarian remotely



During the COVID-19 pandemic, Temi was further customised to assist with the COVID-19 Safe Measures Management (SMM) in reminding patrons to put their masks on at all times and to keep a safe distance of at least one metre apart.

Temi was also dressed up for different occasions (as part of the “LYCLCares4U” initiative) to cheer up patrons with well wishes as well as candies and flowers, such as during the examination period and Valentine’s Day.

The use of robots in LYCL will continue into the post-pandemic era. Future possibilities would be for the robot to be enhanced with visual recognition to identify patrons using facial recognition or if patrons have their masks on or off. Other exploratory and collaborative efforts with industry partners include using AI to shelf-read or having AI devices attached to the robot to be able to shelf-read. This will be a more cost-effective solution opposed to buying dedicated shelf-reading robots that would cost more.

Conclusion

The COVID-19 pandemic had indeed brought about much disruption and challenges to individuals, businesses, and education. Libraries were also not spared and had to be agile to respond to the disruption and challenges.

One of challenges faced by the Library was to ensure the safety and well-being of its patrons. To address this, LYCL conducted simple quarantine of physical resources and books returned by patrons by keeping them aside for at least a day initially to at least three hours subsequently with reference to various literature advisory on the effectiveness of resource quarantine.

LYCL also implemented stop-gap measures as well as accelerated its exploration and implementation of some of the initiatives of our Library of the Future workplan on processes, services, and product innovations to forge ahead in the post-pandemic era.

The post-pandemic world will continue to operate in a hybrid mode with flexible work arrangement for staff and lessons continue to be blended - physical and remote (i.e. Home-based Learning). Patrons have higher expectation of the libraries in being able to meet their demands in terms of customisation, personalisation, and having a one-stop seamless integration of 24x7 services.

The various implementations in terms of smart infrastructure, smart learning resources and services, as well as smart digital solutions during the pandemic period will continue to be relevant and sustainable in the post-pandemic world. The LYCL Library of the Future workplan has to be further accelerated to meet the increasing demands of the post-pandemic world.

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