

RFID and Organizational Transformation in the National Library Board of Singapore

Paul Raj DEVADOSS

Organizational Background

The National Library Board (NLB) in Singapore enjoys a history dating back to 1823. Launched as a school library, it grew into a public library by the 1960s. In 1994, a report charting the future of public libraries in Singapore titled “Library 2000” was presented to the government. It was the result of a two-year effort by a committee formed to study the state of the libraries, and tasked with finding a vision for their development that would be in tune with the needs of the nation for the next 15–20 years.

The Library 2000 vision document identified as a primary objective, the development of an adaptive, networked public library system with a co-ordinated collection policy. It further envisioned the development of quality services with linkages among community members and businesses. The vision document proposed that such an effective public library system would help Singapore in its position as an information society and help leverage knowledge arbitrage opportunities across the world. These were the strategic thrusts identified in the vision document.

Library 2000 also identified three key enablers in the development of the desired public library system in Singapore. First, to allow the organization flexibility in formulating the necessary policies and running the public library network, the report proposed establishing a statutory board. Statutory boards are instituted by the government through a special act. They are governed by a board of governors appointed by the government, and are allowed flexibility in operational decisions and policy formation, which government agencies would otherwise not enjoy. Second, the report identified staffing requirements that should be developed to cater to the

new needs arising from changes to the library system. Third, the report identified the importance of using suitable information technologies to achieve the strategic goals set for the libraries in Singapore. In short, the three enablers would make possible the development of an adaptive and borderless public library network.

Following the recommendations of the vision document, the government instituted the NLB in 1995 to transform Singapore's library services in the information age. NLB as a statutory board is governed by a board appointed by the government. The Chief Executive Officer (CEO) heads the organization, with directors overseeing various divisions related to NLB's operations such as Library Services Group, Library Management and Operations Group, Management Services Group, and Business Group, apart from corporate functions. At the time of writing, the NLB operates 39 national public libraries, of which three are large regional libraries, 18 community libraries and 18 children's libraries. In addition, it provides collection augmentation and library management services for libraries established by other public institutions. In all, NLB provides services for 70 libraries in Singapore. Its founding CEO summarized the board's business operations as follows:

“All of these services sit on two logistics operations: the Library Supply Services which underpins our supply services and the Network Operations Center which, of course, faces the customers, our library users. These two services cover our entire operations”.

The various branch libraries are managed by the Library Management and Operations Group. Each library is headed by a library manager. In addition, each library is staffed by librarians, library officers, systems library officers, and library assistants. The staff strength depends on the size of the library, and the collections held at the library.

The founding CEO, who was appointed at the formation of NLB in 1995, was the first head of the public libraries in Singapore who came from a computer science background and had no library science experience. He commented:

“I have a background in optimization. . . and have been on the other side of IT. I was supplying IT R&D services in my previous job”.

Librarians see libraries as their preserve and the library staff at the newly formed NLB perceived their new CEO to be beyond this traditional frame of mind. A librarian recalled the initial reaction of many:

“Our staff were cautious in welcoming the change in the beginning, but as we saw his approach, we accepted him”.

The CEO focused on the development of the organization, and demonstrated his commitment to improving what librarians would love most of their job: being information providers. This objective and the ensuing process as articulated by the CEO endeared the top management to the rest of the organization.

Another notable aspect of NLB was the project-centric approach that the management inculcated in the organization. The CIO candidly reported this about NLB:

“NLB is a project-centric organization”.

All NLB staff were trained in basic project management skills, which gave the organization a common language with which to communicate the value of their ideas and the changes that were sweeping the organization. The CEO explained:

“We wanted to give everyone a common language to talk about the changes we were implementing”.

In addition, a librarian noted:

“When we learnt project management, we could present the bottom line of any proposal clearly to the committees. We knew we were talking their language”.

These committees for various tasks were drawn from different levels of the organization. A manager commented:

“As a representative of my department, I knew that my boss trusted my input on a proposal which impacted our department”.

Such cross-functional project teams also created communication within the entire organization. A corporate communications manager noted the value of a project team:

“It was very useful to me, since if I needed any information, I knew someone somewhere whom I could call directly”.

The sharing of project management knowledge gave individuals and departments in the organization common grounds for understanding the value of changing a process and the objective of providing good service quality at a reasonable cost. Project teams were drawn from across the organization, involving staff from all levels in relevant functions related to the project. Such project teams were usually made up of a project sponsor, a project manager, team members, and extended team members. A complete project schedule was also provided once a project was approved and the team formed.

The tasks, for which project teams were formed, were defined from the strategic goals set by the top management or from the recommendations made by various staff. These strategic goals were then discussed and shaped by inputs from various segments of the organization and project team members. The project teams then derived a set of tasks, which was presented to a management committee for approval. Teams discussed and implemented the tasks through a variety of related activities within a given time frame. Project teams co-ordinated through meetings, emails, and 'team rooms'. Team rooms were shared folders based on Lotus Notes, where documents were deposited for project members to access. Team activities were co-ordinated through the steering committee and the management committee, which oversaw and commissioned various projects in the entire organization. The committees also involved the top management with the projects throughout their progress within the organization. Such opportunities and encouragement within the organization allowed staff to take ownership of the various improvements and developments that were proposed within the organization. This created user identification with improvements and developments, and exerted social influence among peers within the organization.

Identifying IT for NLB

With a mission towards expanding the learning capacity of the nation, NLB set about the task of increasing its annual book loans from about 10 million in 1994. The management began by examining internally all business processes in the organization. An extensive business process re-engineering exercise took place in 1996. Staff from various divisions and all senior managers were involved in identifying potential business processes

for change and consolidation. The exercise identified the need for radical solutions since there was a great mismatch between NLB's existing capabilities and the targets set by the Library 2000 report. The exercise presented the organization with a holistic view of the processes involved in managing its customers. Processes were re-engineered, with key process owners being involved in developing important performance targets together with the management. The exercise created awareness among staff about the desired performance targets, through their involvement in identifying processes that could be redesigned to deliver better service quality. The CEO noted:

“We knew we had to start right then because we had such high targets set for us through Library 2000 for the following years. If we didn't start then [1996], we'd never reach there!”

Several technology solutions were considered potentially useful, including the implementation of more self-service stations for library services and the introduction of more services that customers would like. In the words of the CEO:

“We started to look at three things that people didn't like in our libraries: long queues, the time (we took) to provide new items, and (how we were) serving open-ended enquiries”.

The barcode system in use at the libraries at that time was difficult for library users. To loan a book, library users had to carefully align the book with the barcode reader before the machine could read the code at all. Meanwhile, book returns were handled manually. To speed up returns, NLB had introduced book return chutes; these were located at library entrances, and they allowed users to drop off books any time of the day. However, library users still had to wait for the staff to update the loan records in the system. For example, library users could return books over the weekend when the library was closed, but until the library staff updated the overnight pile-up of books in the chute against the loans records of the respective library users, the library users could not check out other books.

Scouting for a better technology to handle book loans, NLB identified Radio Frequency Identification (RFID) as a potential. In the mid-1990s, RFID was touted as a technology of the future for supermarkets where products would identify themselves to computers and help in managing inventories. In Singapore, ST Logistics had been exploring the use of

RFID for logistics operations for a couple of years; its technology partner, ST Electronics, held the RFID expertise in Singapore. NLB saw a similarity between its operations and the logistics business. An NLB manager commented:

“Libraries are similar to logistics companies in operational terms”.

Since the operational aspects were similar, the CEO of ST Logistics (which has since become Sembawang Logistics) invited the head of ST Electronics to discuss the potential of RFID for library use. Along with NLB, the partners worked together to develop a prototype for library use. A demonstration was conducted in November 1997. The project manager recalled:

“When the book with the RFID chip was dropped down a reader-embedded container, the reader successfully recognized the drop. There began the journey towards its application in libraries”.

Deploying RFID

The use of RFID tags on all books at NLB was a key project that had NLB's Assistant CEO as project sponsor. A number of other project teams carried out other service developments, layered over the RFID project.

To tag a book, an RFID chip was embedded in the spine of the book (currently, with a much smaller chip becoming available, it is pasted on the last page of the book), allowing scanners to identify the book in close proximity. The chip used the signal from the scanner to power a response returning the data embedded in the chip. This is known as passive RFID technology. (An active RFID can be picked up by scanners at a longer distance and its signals are constantly available for scanners, but power is required for the transmitter in the chip to operate.)

All NLB library items are now tagged with an RFID chip, containing information pertaining to the book, the library branch to which the book belongs, and the number of the rack where the book is shelved. RFID scanners read the data stored in an RFID chip to identify the library item. In a book loan or return process, the data is used together with the library user's identification to manage the library user's loan information. The data is initially stored in a local server, which operates with a backup and is then synchronized with the centralized data servers.

ST Logitrack, a joint venture company by ST Logistics and ST Electronics, was formed in January 1998 to manage the development of RFID applications. Its project manager reported:

“The system is developed with a lot of redundancy to prevent failure”.

In the months following the RFID demonstration, ST Electronics developed a prototype for a library that NLB was renovating. Its ISD manager noted:

“In those nine months from early 1998 to November 1998, before Bukit Batok Community Library reopened after renovation, we worked on designing the system, developing the software, the interfaces — the whole package. I can say that we were the first fully functional library with over 100,000 items on loan using RFID”.

The General Manager of ST Logitrack commented on the collaborative effort:

“We worked with NLB in developing the software since we honestly didn’t possess the domain knowledge of library operation. So NLB had a hand in the look and feel and the functions of the checkout counter which we were designing for library users”.

An NLB manager summed up library users’ reaction to the new technology:

“There was a sense of amazement. You could put the book in any direction, and it still worked. We used Bukit Batok Community Library as the test bed. The technology worked great there. The public loved it and that is why it is still there!”

The RFID technology made it easier for users to check out books. The checkout counters, called borrowing stations (Figure 1), were designed with a simple interface offering options for the four official languages of Singapore (English, Chinese, Malay, and Tamil). Users could log into the system by placing their identity cards into the machine. The users could then proceed to place each book they wished to check out on the reader, and the screen would confirm the loan by displaying the title of the book being checked out and the loan record status of the library user. A systems

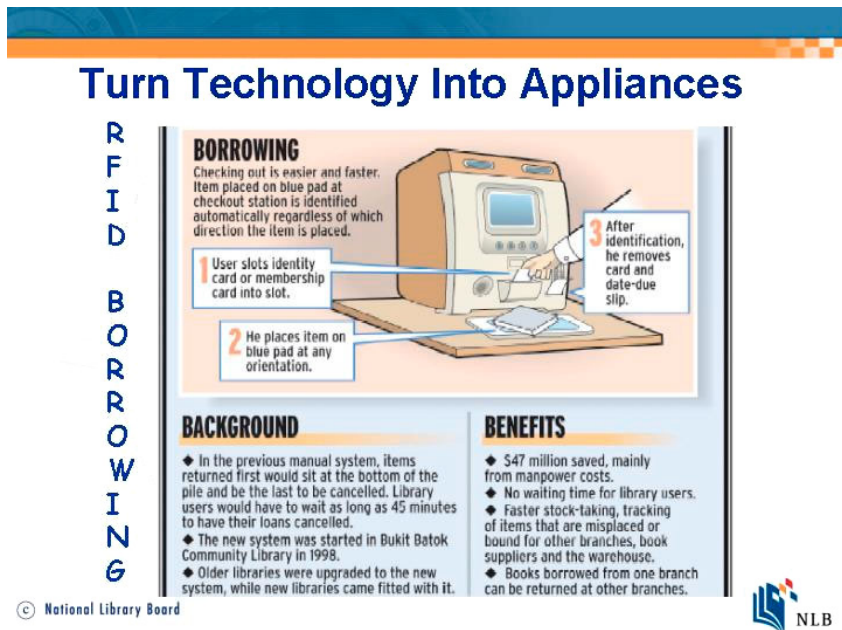


Figure 1 Illustration of a borrowing station

analyst from ST Logitrack explained how the teams from NLB and ST Logitrack worked together to develop the system:

“Take for example the borrowing station. The main objective was to serve faster, right? So they know how much would be considered faster, and too fast also, because the machines could work very fast, but they had to be set at a speed at which humans could interact with them. So for all these reasons, NLB gave us the guidelines on how fast the machines would process a loan, and all that. So it’s a kind of interaction and proposal, and then the teams sat down to finalize the requirements. The same happened in implementation: you received feedback onsite, and then you might want to make some modifications”.

Users’ habits and constraints were clearly a consideration in the design of the system. This was reflected in the design of the new book drop chute for the returning of books. An NLB manager commented:

“The technology could support many books being dropped in at a time, but we’d rather that the users drop the books in one at a time

as that would help them be aware of the books they dropped in. . .
That was a human constraint”.

A library officer elaborated:

“Sometimes users dropped in non-NLB books like their school library books or school text books! We had to send such books to our ‘Lost and Found’ section during sorting and shelving”.

The RFID-enabled book drop chute is now a feature at every NLB library. Located at the entrance of the library, it allows library users to return books any time of the day. An advantage of the RFID system is that it allows instantaneous update of users’ account, enabling the immediate renewal of users’ loan quota. This is achieved by placing an RFID scanner in the book drop chute. At the book drop, the user drops the book in the chute, and the RFID scanner updates the system on the user’s book loan records instantaneously.

The introduction of RFID was a welcomed change for library users. A manager commented:

“With the old system, users sometimes asked why their loan quota was not restored after they had returned a book. Our staff would then have to retrieve the book from the pile of books collected overnight and speed up the updating of the user’s records”.

A librarian summed it up as follows while commenting on the sorting process:

“With the RFID system in place, the sorting process is a breeze because this computer (attached to the scanner) even shows the shelf number for the book”.

The efficiency of loaning books and returning them at book drops at any library improved user experience at libraries, further helping in the growth of book loans at NLB. The CEO said:

“This was a proof of concept”.

The organization was learning from the deployment of the system, observing it in operation, and working on improving it at the next implementation within a year. The project manager added:

“If we had rolled it out at all the libraries immediately, we’d have replicated our mistakes everywhere. So we took it one at a time”.

The whole implementation was again piloted at the next library due to reopen after renovation, namely the Toa Payoh Community Library, in 1999. Revised versions of the system were piloted at two more libraries before the system was functioning to the satisfaction of NLB. NLB then invited global tenders to implement the system across all its libraries in 2000. ST Logitrack was awarded the tender and has since rolled out the RFID systems in all NLB libraries in Singapore. The entire process was completed in April 2002. The success of the technology during pilot testing prompted other libraries to request for the system. The project manager reported:

“When the other libraries saw what we could do with RFID, they too wanted it. RFID was helping them achieve targets which would otherwise consume tremendous resources”.

With IT being increasingly adopted, awareness of its potential was recognized and accepted by users. The CIO added:

“Now we had the pleasant problem of managing this demand. We achieved our targets without retrenching staff. Our retraining was focused on service quality rather than technology since the system was easy enough to use. To the library users, we were giving better service quality. In fact, to the library users, there was no longer any need to even talk to our staff, but if they needed to, our staff would have more time to do so!”

Impacts of IT at NLB: IT as Enabler

NLB’s adoption of RFID was essentially an instance of IT deployment to achieve organizational goals. RFID demonstrated its potential in removing queues, delivering better service quality and giving employees more time for value added tasks. Further, IT made innovation of new services possible at libraries. According to the CEO:

“The introduction of this technology eliminated queues; it saved staff from the mundane work of simply standing at the counter to attend to customers. Now customers can just go to the machine and check out books while our staff can do some other value added work. Librarians are not there just to shelve books or stamp books; they are there to help you find information, which is higher value added work”.

With the introduction of new technologies, training in their use was necessary. Also, being freed up from mundane work, staff needed to be trained to handle greater value adding tasks. Thus, staff were retrained in order to develop new skills in the context of the new systems. The CIO noted:

“IT helps relieve mundane work. Staff are then trained to do more productive work in the back room or trained to become professional librarians where they help to organize information, select books and catalogue books, and they get to read the latest in the publishing industry. That adds to their intellect. So that’s how staff come to accept new technology at the workplace: ‘Yes, IT helps me in that’”.

A librarian noted more vividly:

“With the new system, we now have more time to walk around the library, answering queries from users instead of being tied to a desk. Our job satisfaction is driven by our ability to quickly answer user queries satisfactorily”.

As we have described earlier, book drop chutes have made it easier for users to return books. Behind a book drop chute, an operations room exists where books are sorted. As the book slides into the book drop, it is recognized by an electronic scanner that updates the user’s account (Figure 2). The books are then sorted by staff, who keep aside books belonging to other branches for pickup by the postal service for delivery to the respective branches. For the books to be shelved locally, a computer displays the shelf code encoded in the RFID chip in order to simplify the sorting process. A library officer demonstrating the process noted:

“This system makes it easy to sort the books and identify their shelves”.

After sorting by the shelf code, the books are carted off for shelving. A color-coded label on the spine of each book, which indicates the collection to which it belongs, also helps in the process. The color-coding is uniform across all NLB libraries, and helps staff visually pick out wrongly shelved books. The project manager noted the role that staff feedback had played in this feature:

“The library staff gave us feedback that it was difficult to pick out a wrongly shelved book among all these books. So we accepted their feedback and put a label on the spine of the book”.

Turn Technology Into Appliances

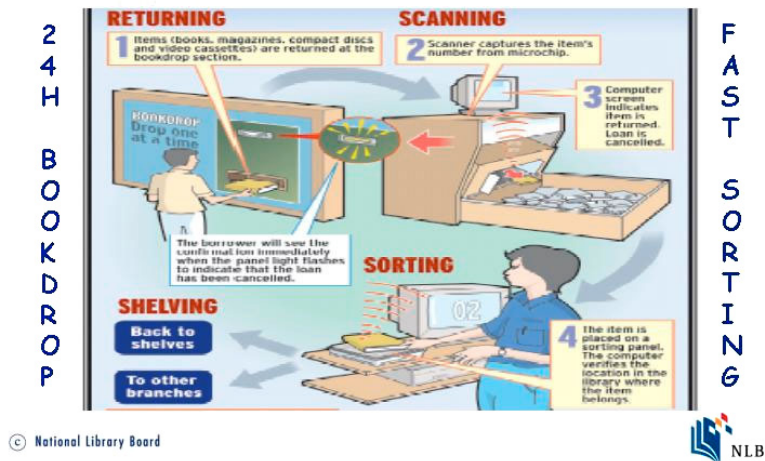


Figure 2 Illustration of the book returning process at an NLB library

With the improvements, growing loans also meant an increasing number of returns, thus placing a heavy burden on the staff handling the shelving of books. In apparent recognition of the good that IT as an enabler had done so far, an older staff commented:

“This is a tedious process — returning books to the shelves all day! Especially during school vacations, the volume increases a lot. I wish this could be automated. It’s a hard thing to do all day, but it can’t be automated — putting books back on the open shelves. It can only be done with books on closed shelves”.

NLB now employs part-time workers who help the regular staff with shelving. This strategy helps NLB carve the tedious work process into smaller manageable schedules allocated to the part-time staff. In addition, several community programs have been implemented to bring in volunteers to help shelve books. Such programs also benefit NLB by helping it reach out to the community and engage them in its daily work process. A librarian officer noted:

“We now have more time to do things like working on book selection or community programs, or answering queries which is a very satisfying part of our job”.

One of the junior staff who had progressed from “*stamping books all day*” commented:

“If I can answer a user’s query well, then I am most satisfied with my job. We now have plenty of resources to do just that”.

Impacts of IT at NLB: Addressing User Apprehension

A negative impact of the adoption of IT at NLB was job insecurity. This was a growing concern at NLB when the new system was introduced. It was evident that the new systems provided immense savings in terms of manpower in the organization and the staff were concerned that it would mean the loss of jobs to some. This fear was felt particularly among those who had little knowledge of information technologies. The changes at NLB were seen as a shift in the culture of the people within the organization. Such a shift was also viewed as necessary to NLB in its growth and ability to deliver excellence in its services. The CEO commented:

“It’s a culture change more than anything else. We had been stereotyped as a strict, dull place too often, and we just aren’t so anymore”.

The management positioned the shift in the organization as a value proposition that redefined routine job tasks, but they recognized that some might query the change. The CEO noted:

“Our librarians were asking why we were asking them to switch on computers instead of stamping books, or what if a machine broke down. . . I think we had an even distribution of people who were for the changes, people who were reluctant to change and those sitting on the fence, waiting to see what developed”.

One long-time staff admitted that she was at first “*terrified of the possibility of having to learn IT at work*” at her age. Another staff remarked:

“It was no problem to me. I knew it could only help in my work”.

One librarian noted:

“At first, we didn’t know much, but when we saw it, we knew it could help”.

Another staff who was with the library organization for over 25 years remarked:

“I was afraid of using the computers. At my age, I considered retiring instead. But I decided I should give it a try instead, to make an effort

to learn. And I have not regretted my decision. Now, I even train others in the use of IT services at NLB”.

A mixed approach in implementing the IT systems was taken in response to the mixed ground feel. A service engineer from ST Logitrack commented of his dealings with NLB staff:

“I tried to teach them some small tricks that they could try. Some wanted to know more and some didn’t want to learn at first. But I tried to explain to them nevertheless. After a while they were okay with the system”.

A systems library officer managed an NLB library’s IT systems, monitored its performance and kept them operational (Figure 3). Such officers relied on the technical support from the IT helpdesk as well the technical support from ST Logitrack on the RFID systems. A systems library officer explained:

“I fixed small problems with our machines. If I needed help, I called the helpdesk. And if it’s a bigger problem, I called the service technician at ST Logitrack”.

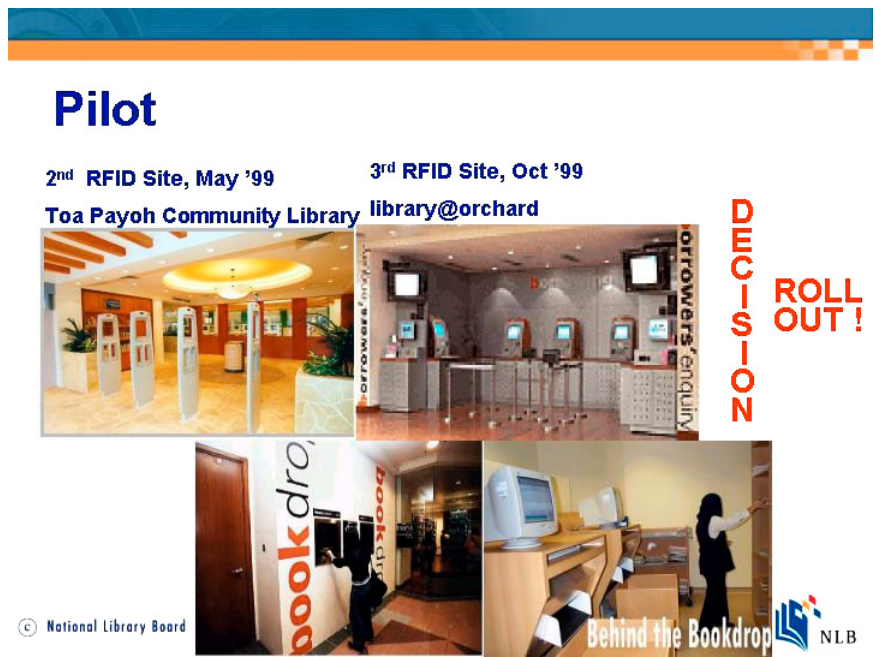


Figure 3 Pictures from NLB showing the entrance to a library, borrowing stations, a book drop and the scene behind a book drop

Another junior library staff added:

“Actually, much of our training was in improving our skills, customer service, etc. I went to self improvement sessions to help improve my communication with library users and they were very useful”.

There was an element of mandated use of IT, particularly given the context of Library 2000 and the strong support from the top management in using IT. However, this was also seen as opportunity to develop self-efficacy by some staff. A manager pointed out:

“We had a choice of staying and enriching ourselves. . . The entire world was moving towards a knowledge economy and it’s the same everywhere”.

Mixed opinions were shared on the need to learn IT within the organization. A librarian commented:

“Well, one of my colleagues left after many years with National Library because she wasn’t comfortable learning to use computers and all that. At her age, she felt she’d rather leave. But it didn’t happen often because we had plenty of training and encouragement”.

Sometimes, staff even handheld colleagues who were unfamiliar with the systems to help them adapt. Proficient or learning users often pitched in to help others who were lagging. A manager commented:

“Some of the drivers didn’t know how to use IT. So when everything went electronic, they would approach me. I’d teach them step by step. If they didn’t get it right, we’d just repeat the learning exercise”.

One of the staff supervising the shelving process, and who had been with NLB for over three decades, noted:

“I never used a computer in all my years with the library. Now I have my own email ID. We have an hour when we use the computer to answer queries or read circulars. It’s exciting sharing all this with my grandchildren!”

The management recognized the fact that some staff were unwilling to take the step into the future that the introduction of the RFID system heralded, namely greater use of IT in their daily work routines. The management also took into consideration the other events that were happening in the organization, to understand the mixed feeling towards the introduction of the RFID system. The CEO summed up the situation:

“We had so many things changing: the front office with the RFID system, the back office with the HR/FIS system, and there was an

overlap for about three years. It was a huge strain on the organization, and naturally, people were stressed. This was when we had to show patience and trust, and give people time to adjust”.

A significant outcome of the stress within the organization was the high attrition rate that NLB faced with the junior staff between 1997 and 1998. The CEO reported:

“We measured around 80% attrition within three months for junior staff”.

However, this could partly be attributed to the rapid growth in the economy during the period. The CEO summed up the impact of changes in the organization when he further added this information about NLB:

“Since 1999, we hardly have a problem with attrition”.

Impacts of IT at NLB: Engaging Users in Dialogue

The top management engaged the staff in dialogue and conveyed the message that the newly introduced technologies were meant to help increase productivity. Commenting on the organization after the formation of NLB, the CIO noted:

“When a new management introduces something, staff worry if their jobs are safe”.

NLB also provided training sessions, opportunities for skill development, and redeployment of some staff to other jobs. The CEO made frequent visits to all libraries and met with the staff and held tea sessions where staff aired their suggestions and concerns. The CIO reported:

“Such ‘tea sessions’ became opportunities for the management to allay the fears of retrenchment within the organization. The staff also gained confidence in the role of IT as an enabler and were forthcoming with suggestions”.

Such exchanges were useful to developing a channel of communication. The CEO’s personal rapport with the staff was also evident in the organization, with the common use of “my CE” in reference to the CEO. One staff called him an “icon” in the organization, who was motivating and caring towards the staff. The staff member further described him as a “*trusting*

boss, so unlike any usual boss". The CIO added:

"My CE became a person whom staff could identify with, of course, along with the senior management team as well. I say it's not easy, but my CE took the time to go down [to all libraries to meet the staff] because he felt it's worth it".

Further, through extensive communication and assurances on the role of technology adoption and change in the organization, the management developed the support and trust of the staff. The CEO promised that the role of technologies would be that of supportive value addition to employees. Further, the management promised no retrenchment and better career opportunities at NLB. The CEO summed up the effort:

"We promised two things: zero retrenchment and a good career".

The management developed trust in the organization by directly engaging the staff in discussing their apprehensions, being transparent in their plans, and by involving staff where possible in planning and executing projects. Trust was echoed in discussions with various members of the organization. A library officer who headed a project on data collation declared:

"I knew my organization trusted me".

Another librarian added:

"We trust the management because they have been transparent and communicated with us constantly".

A manager noted the value of trust amid the changes that IT was bringing about in the organization:

"A lot of trust, a lot of encouragement. That actually allowed us to do a lot of things differently".

In addition to trust, encouragement to adopt new technologies, communicate, and innovate in their work are some of the other positive steps that were reported by the staff. This NLB attitude of encouraging its employees and partners was also manifested in NLB's willingness to experiment with new initiatives in order to achieve the best in service quality. A project manager at ST Logitrack noted:

"They were always willing to try new things. So it helped when we took back suggestions on improving the features of the RFID system".

A manager at NLB concurred with this opinion when explaining the project-centric approach of the organization:

“Any one of us could propose a project and were given an opportunity to present our ideas to the committee. If the value proposition was right, we usually got to manage the project regardless of our seniority in the organization!”

Transforming the Organization

In addition to the adoption of IT, NLB also adopted a lifestyle approach in designing the library environment, changing the perception of a library. A librarian commented:

“Our libraries are no longer dull places; they are vibrant and fun places to hang out at”.

This approach meant locating libraries in shopping malls to make them accessible to users, setting up a cafe within the library, and changing the ambience of a library from the traditional somber one to a more vibrant atmosphere to attract visitors. The lifestyle concept changed the nature of libraries in Singapore.

Today, NLB libraries are cozy places where visitors could browse a variety of book and multimedia collections and tap into various services amid plush surroundings. The libraries are also equipped with web surfing terminals and multimedia kiosks. Digital resources are available through terminals at the library, as well as the e-library hub (www.elibraryhub.com), which complements NLB's existing services. At NLB libraries, users can tap into broadband Internet services through their own laptops and PDAs with surfing accounts from a private vendor, which includes access to NLB's digital libraries.

With increasing adoption of RFID technology at more branches, books loans at NLB and library user visits to the various NLB branches grew annually. The increased productivity was managed with retrained staff from other functions that had become redundant due to the introduction of IT. As RFID was adopted at each new library with more services that were automated, fewer staff were needed to man a library. NLB countered this by

increasing the responsibilities of lower rank staff to the extent that the first fully self-service library was launched with just one Systems Library Officer and one concierge. This minimally staffed library manages approximately 2000 loans a day. A senior manager summed it up as follows:

“Since we had all the services available for users to use on their own, we removed all our staff and put these services and a smartly dressed concierge at the Sengkang DIY (Do-It-Yourself) Library”.

Sengkang DIY Library illustrates the value addition presented by the adoption of IT at NLB to its staff, library users, and the organization. According to NLB’s chairman, the residents of Sengkang had in fact voted in favor of a library, over other choices such as a child care center, an elderly care service, Cineplex, etc. In response, NLB had designed a new library. The library manager explained the advantage this had brought:

“The Sengkang Community Library was developed fresh from scratch. So we had a lot of flexibility in developing it”.

It is equipped with the various self-service stations, ranging from new user registration (introduced at the Sengkang library), book loans and returns to payment services. Visitors to the library are greeted by a concierge to present a human presence at the library. The various sections in the library would be familiar to regular visitors across all NLB libraries, with color-coded sections indicated through uniform signage. Catalog reference stations guide users to the available collections. Self-service borrowing stations are available for checking out books, or users can use an enquiry station to manage their account. If there are any payment transactions to perform, payment stations are available for users. Book drop chutes offering 24-hour service are also available at the library as with all NLB branches. Also, subscribers to third party Wireless LAN service can surf at the library with their own computers or PDAs. The systems library officer manages “*the entire daily operations in addition to participating in other projects and sharing with colleagues on work*”.

To help users with queries at the DIY library due to the absence of librarians, NLB introduced a new service named Cybrarian (Cyber Librarian). At the library, the Cybrarian terminal is equipped with a computer screen and a telephone, through which users could be connected to NLB’s call

center. All library-related enquiries are answered by call center staff. Users can see on the screen demonstrations on how to use the library electronic catalog terminals to search for books or for information over the Internet. If users need directions to particular book sections or facilities, a floor map is displayed on the screen to guide them.

Cybrarian services are enabled by a personal computer at the users' end in the library, which call center staff can remotely control. Upon a caller's request, a call center staff connects to the remote PC at the users' end and runs the appropriate demonstration on the monitor. Before its launch at the DIY library, extensive surveys and focus group studies were conducted with users to gather information on Cybrarian services. The manager highlighted the thinking behind the facility:

“We are always experimenting with new things... anything that improves user experience”.

The Cybrarian service, the centerpiece of NLB's DIY library at Sengkang, marks the introduction of managing customer relationship to library services. The call center handle simple enquiries at remote libraries about its services and is manned by four officers who handle phone calls and one officer who handles email enquiries. The call center staff is a team of para-library staff, trained in call center practices, and equipped to handle simple queries pertaining to the libraries. Currently, Cybrarian services are available to library users from three libraries, including the Sengkang DIY library, where it was first introduced. The call center handles on average 500 calls a day, and 30 e-mails of enquiries from users through the Cybrarian web portals.

At the end of 2002, NLB's annual loans (Figure 4) were over 32 million, and its collection numbered approximately 8 million, including books and multimedia material. Its visitors were at about 31.7 million, with memberships at 2.1 million, and it handled 1.8 million enquiries in the year. NLB estimates that given its over 30 million loans per year and less than a minute per transaction at the counter service at present, it would need to add 2000 more staff to its workforce to keep up current service levels. Through the adoption of technology in its various services, NLB has

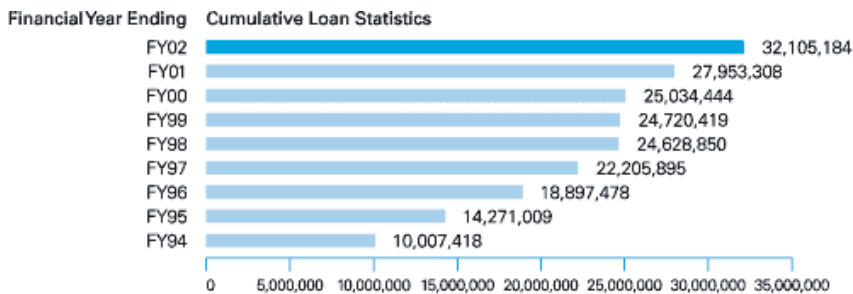


Figure 4 NLB's loan statistics (NLB annual report 2002–2003)

managed to increase book loans and dramatically improve services without any increase in manpower costs (Figure 5).

NLB is now equipped to quickly deploy loan services even at remote community events, thus taking the library to the people. This service works by connecting to the library network using a laptop and a virtual private network. The computer is attached to a scanner, which reads the RFID and logs the loan. A library manager commented:

“It is now much more efficient... we used to write down the call numbers and then key them in later, which was error prone and slow”.

RFID-tagging its collections has also helped NLB drastically reduce the time spent in stocktaking. None of its libraries now close for stocktaking, and the entire exercise at a library is completed overnight, except for the anomalies in reports which are followed up later. NLB is pursuing a change in RFID chip technology to further improve the efficiency of the system. A manager reported:

“We currently experience an accuracy rate of about 80%. The errors are due to technological limitations caused by too many chips on the shelves responding simultaneously within the range. We are exploring different chips to sort this out and improve accuracy”.

NLB constantly strives to identify potential business problems and find solutions that address a set of related processes. The CEO summed up the

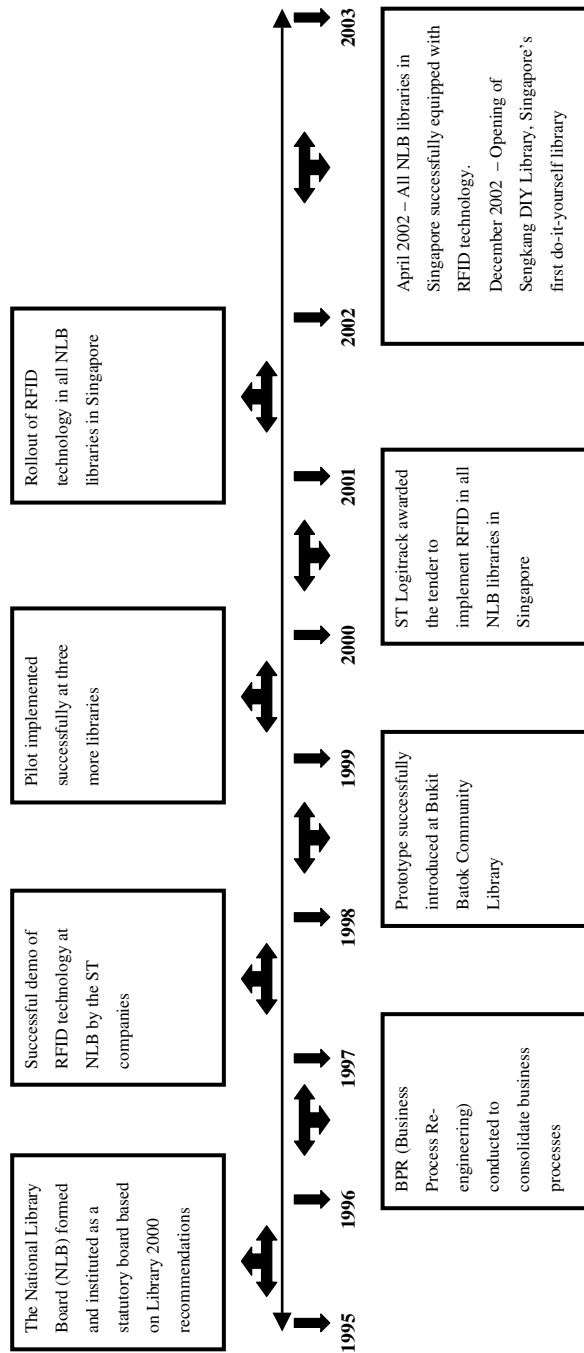


Figure 5 Implementation and use of RFID at the National Library Board

approach:

“An optimized, automated solution to an immediate problem is our objective”.

However, the future for NLB is not in merely increasing loans at the libraries it manages. The CEO commented on the future direction of the organization:

“Our population is limited... so it’s not our objective to go on to 40 million loans and so on. We will grow our e-collections because those are beyond boundaries”.

Discussion Questions

1. Identify the key actors in NLB’s organizational transformation.
2. Discuss the role of NLB’s CEO in championing NLB’s IT adoption and transformation.
3. Identify and discuss the role of key enablers in NLB’s transformation.
4. Compare and discuss the changing perceptions of NLB’s staff about the role of information technologies in the organizational transformation.
5. Discuss the extent of technology pervasiveness in NLB and its impact on NLB’s transformation.
6. Identify the impact of a purely self-service library such as the Sengkang DIY library on the organization.
7. Discuss the impact of ‘de-skilling’ and ‘re-skilling’ observed at NLB.
8. Given the objectives of Library 2000, draw up a task list for NLB at the beginning of its transformation.
9. Identify and discuss new services enabled by the adoption of information technologies at NLB.
10. Discuss new business opportunities that NLB should consider, given its infrastructure and domain expertise.

Teaching Notes

Motivations and Objectives

The NLB case study covers the transition of the organization from a traditional library organization, stereotyped as a 'difficult to change' organization to a technology friendly organization. Traditional libraries are considered to have low technology adoption and to be resistant to changes that could transform their business practices. However, NLB was formed with the objective of transforming the business of the National Library and making the organization relevant in the information age. Library 2000 detailed the objectives and the key enablers in achieving those targets. The adoption and implementation of information technologies at NLB illustrate an organization-wide transformation. The same also highlights the need to create business value to the organization as well as to provide better career opportunities or value additions for staff.

This case provides interesting discussion material on organizational transformation enabled by IT adoption. IT adoption in traditional organizations is prone to several known issues such as staff computer efficacy; resistance to changes or restructuring; and fears of retrenchment. NLB's experiences are a case demonstrating the positive outcome of IT adoption: in value generation through the provision of new services, and in value addition to staff work routines. Several organizational issues are further illustrated in NLB's experiences. The case study also shows an organization's experience in the adoption of a specific new technology. NLB's application of RFID technology illustrates the value of adopting ubiquitous technologies to deliver higher value addition and innovative services. Process redesign, coupled with a vision of radical change, has tremendously benefited NLB. The case is a suitable study in business process design and the role of IT as an enabler towards radical transformations.

Methodology

Data for this case study was collected between September 2003 and August 2004. We conducted 43 interviews with staff from various divisions of NLB. The selected interviewees were chosen to represent a variety of service terms at NLB, varying from 6 months to 32 years. Visits were made to 13 NLB libraries to interview library staff, in addition to the staff at NLB's headquarters and its supply center. The interviews were unstructured and open ended to allow the gathering of data on a variety of issues and perspectives. In the early stage of data collection, interviews were also conducted with ST Logitrack, NLB's technology partner providing RFID. These interviews helped gather information on the technical details of RFID and its application. ST Logitrack also provided useful secondary opinions on NLB's technology adoption and use.

Apart from one-to-one interviews, data was gathered through various secondary documents such as press releases, internal reports, internal magazine write-ups, research reports, and general press articles. Such data supplemented the information gathered on the scope of projects, objectives, achievements and issues handled during the various stages of IT adoption at NLB. Since the study covered a period of adoption over a number of years, such secondary sources which are dated, help in the consolidation of data gathered through interviews. Data was also gathered through personal observations at NLB's libraries and at its office premises.

Teaching Suggestions

This teaching case study is suitable for classroom discussion at both the undergraduate and graduate levels of study. The case demonstrates organization-wide impacts of transformation enabled by IT adoption. Process redesign, impacts on the organization, and changes resulting from IT adoption are some key themes that may be discussed based on this case study. Group discussions preceded by a

presentation on key issues relating to these themes should provide a stimulating classroom session. Data from a cross section of the organization provides an opportunity to discuss NLB's implementation strategies and perceptions, and the organizational impacts of information technologies.