

**Bulletin of the AAS**

# **Mobile Application Development Using MIT App Inventor: An Experiment at Raman Research Institute Library**

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## ABSTRACT

App Inventor for Android is a no-code open platform for mobile app development using the drag-and-drop approach. In this paper, the authors explore the MIT App Inventor, its salient features, and how library professionals can use the tool to develop apps for their library. The article also gives glimpses of the Mobile Application developed by the authors using the MIT App Inventor app developing platform.

## 1 Introduction

Libraries are social institutions. They connect people with people, and people with information. From the ancient age to the digital age, libraries have been confronted with new challenges and adapted their services to changing technologies. The rise of cutting-edge technologies like mobile technology, artificial intelligence, and Internet of Things (IoT) etc. have transformed the way libraries offer many benefits. The use of mobile applications for information seekers have grown tremendously [1]. The smartphone is an information nexus in today's digital age, with access to a nearly infinite supply of content on the web, coupled with rich sensors and personal data. People now view more content on mobile devices than desktop and laptop computers. Mobile applications (Apps) have become of colossal importance in everyone's life and have become essential for personal and professional lifestyle needs. While users are floating in the mobile world, libraries need to provide new services. Today's challenge for library professionals is to deliver its services to smartphones, eBook readers, and tablets. In this, libraries may develop ideas for mobile applications with some requirements, but they face difficulties reaching users due to a lack of programming knowledge and information. Many libraries cannot afford to contact app developers who charge for their services. App development requires programming and coding skills; library professionals may have difficulty starting the project without this. But, one can develop mobile apps with a bit of knowledge of programming and coding. There are many tools available that can help library professionals to develop mobile apps. One such tool is the Massachusetts Institute of Technology's (MIT) App Inventor [2].

## 2 MIT App Inventor: Brief Introduction

The MIT App Inventor (see Figure 1) is an easy-to-use drag-and-drop visual programming tool for designing and building mobile apps for android and iOS. It can convert one's idea into a working application without the need of coding or

programming skills. The App Inventor was first introduced as an open source tool by Google in 2010, and now being maintained by the Massachusetts Institute of Technology (MIT). The App Inventor provides a graphical user interface with all the necessary components required to build mobile apps and enables anyone to build a mobile phone application to meet their needs. The apps developed using this tool can easily be ported to the phone, shared with others, or even sent to the Google Play Store for distribution Worldwide [3].

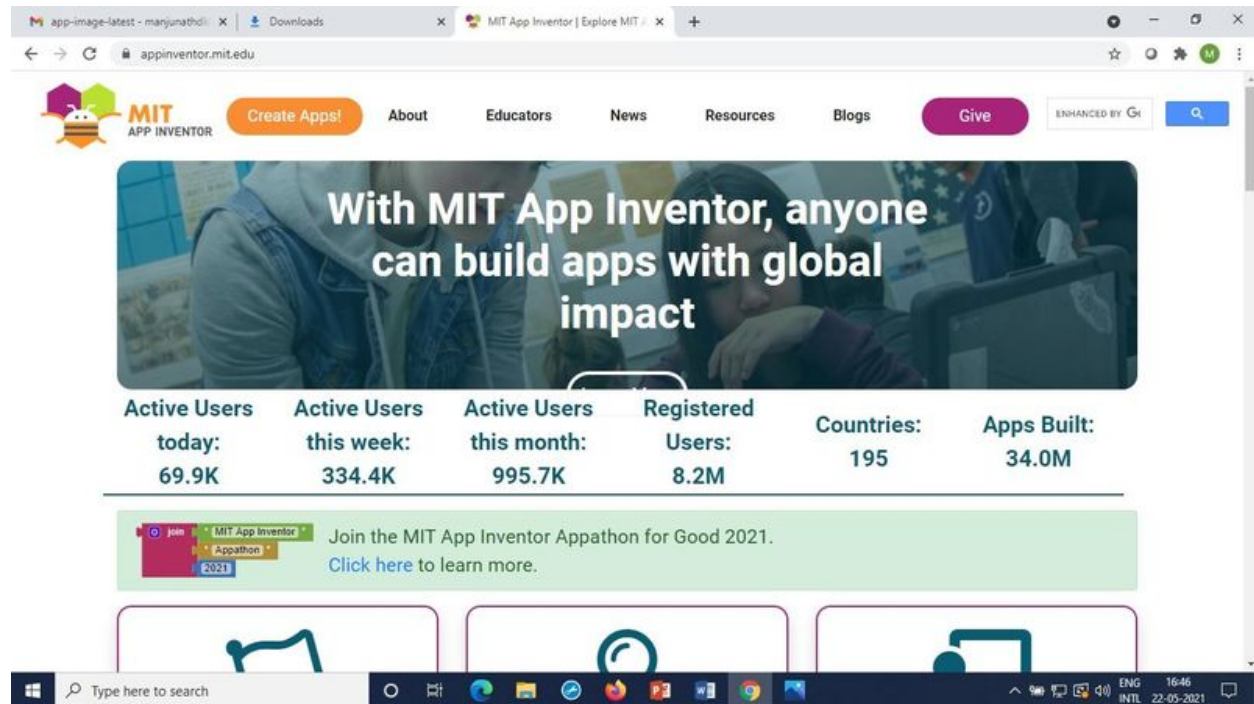


Figure 1. MIT App Inventor Home Page

## 2.1 MIT App Inventor Features

The MIT tool is **free to use**. It allows developers to customize mobile apps according to their requirements.

**Browser-Based:** The best part of MIT App Inventor is it runs on any browser; hence, the developers or the users don't need to install any supporting software onto their computer. The MIT tool works with the user's existing Gmail account.

The MIT App inventor is **cloud-based**. All the app-related projects will be stored on Google Cloud. Therefore, there is no need to keep anything on laptops or computers. Being browser-based, the tool allows users to log in to the account from any device, and all the work will be synced with the cloud database.

The MIT App Inventor's **real-time testing** provides a standalone emulator that enables us to view the behavior of the apps on the virtual machine. There is an MIT AI2 Companion app available on Google Play Store. One has to download and install the app onto a mobile/tablet to test the app that they are working on.

MIT App Inventor has a graphical user interface, built-in component blocks, and logical blocks. One needs to assemble multiple blocks to result in some behavioral action. Prior **knowledge of coding or programming** is not necessary to use MIT App Inventor.

MIT App Inventor has enormous support from the huge developer community from across the world. One can post queries regarding specific topics, and those will be answered quickly [4].

## **Application Design and Implementation**

As previously stated in the Introduction section, the Application was developed using the MIT App Inventor. All we need to experience MIT App Inventor is a valid Gmail Account and an active Internet connection. One can log in to the App Inventor using their existing Gmail ID and password and click on the 'Create App' option to create their first app.

The App Inventor programming environment has three vital parts:

i) A 'Designer' (see figure 2) for selecting the components to the Application and specify their properties ii) the 'Blocks Editor' (see figure 3) to specify how the components should behave (e.g., what happens when a user clicks a button). App Inventor provides an additional app called the iii) 'AI Companion' for developers to test their applications in real-time [4]. One can also try their Application using the emulator that comes with the system. In this way, anyone can quickly build a mobile app and immediately begin to rehearse and test. The following sections describe the development process of the Application with appropriate images.

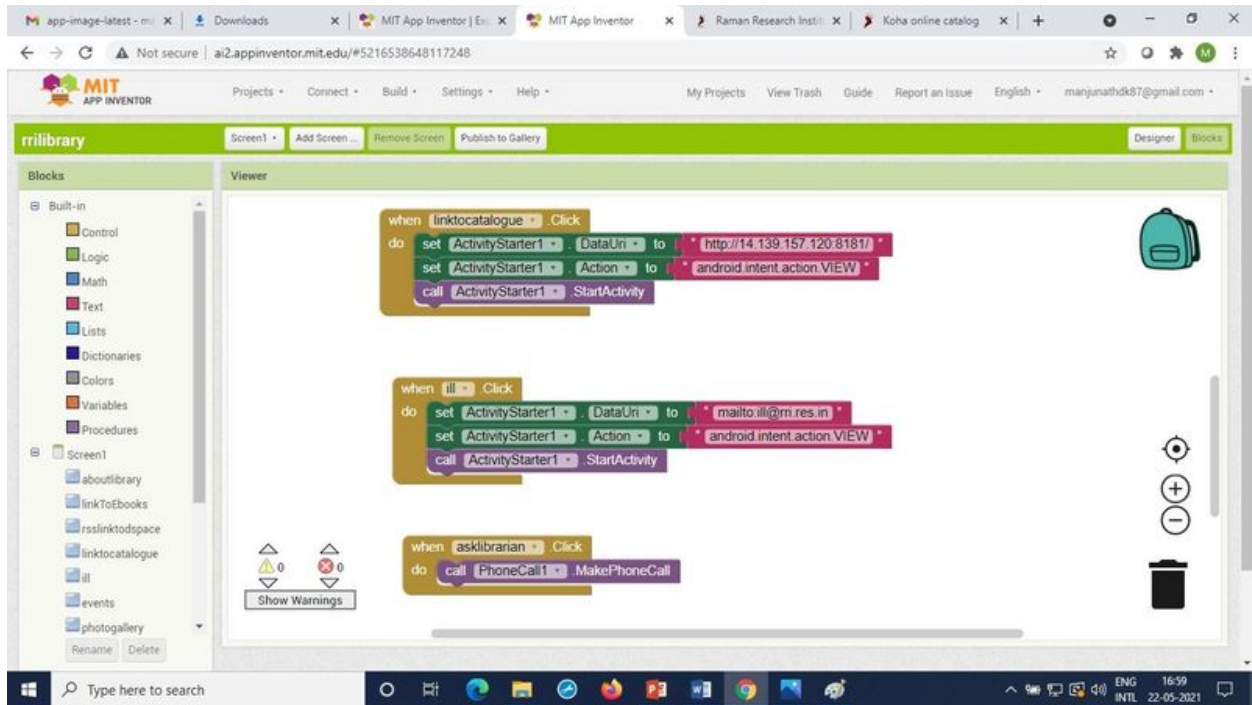


Figure 2. Block Editor for specifying how the app will behave

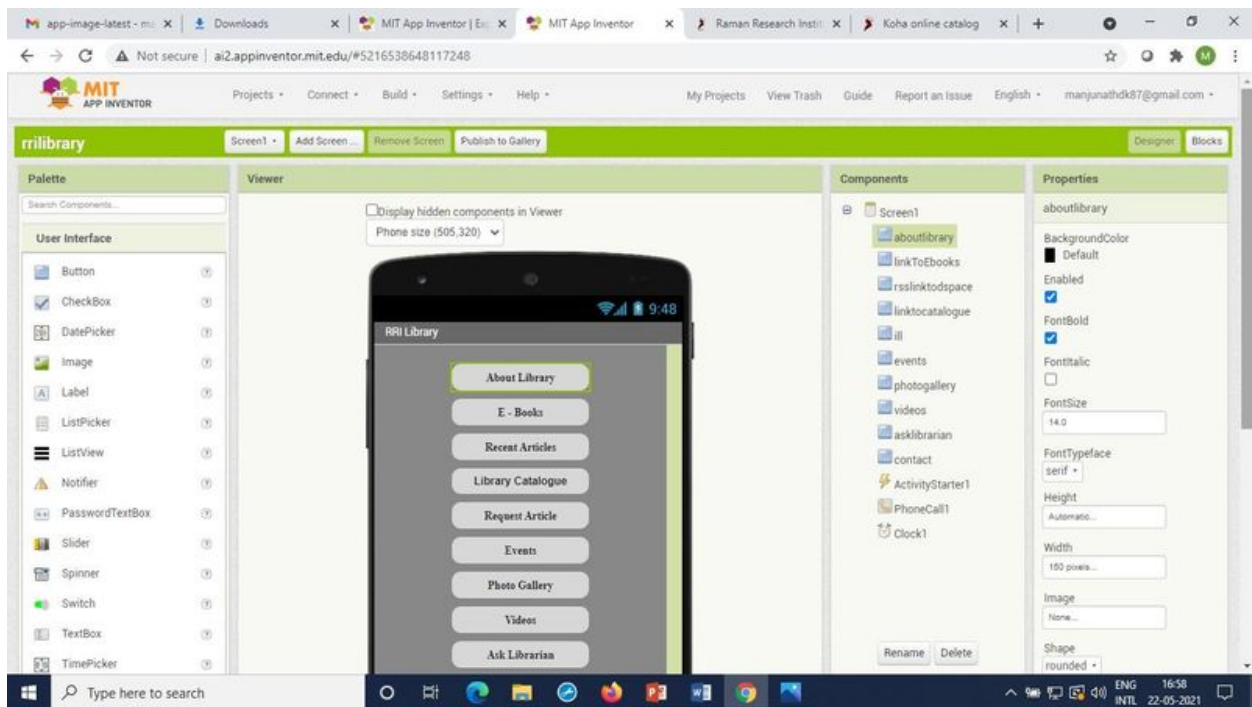


Figure 3. Designer or Design Editor for specifying how the app will look

### 3.1 App Development Process

Before starting the project, the authors discussed it with library colleagues and with some library users. The first discussion was among library staff. One of the authors briefed them on the technological trends and the importance of having a mobile application for the library which can be used to enhance their services. During the discussion, there were suggestions to go for outsourcing the application development project. Still, it was decided to develop a mobile application for the library using a free tool in the later stage.

Raman Research Institute (RRI) had two software options, and they were:

1. Android Studio
2. MIT App Inventor

The authors first tried the Android Studio and found it a little challenging for developing mobile applications without prior knowledge of programming. Later, they tried the MIT App Inventor and found it easy to build mobile applications by following the drag and drop method. The decision was made, and the final choice was to use the MIT App Inventor to build the Mobile Application.

Secondly, the authors discussed with library users and sought suggestions for a mobile application for the library. Library users were delighted with the library's decision to have a mobile application of its own. Different modules and sub-modules were identified through which the library can offer services to handheld devices.

Initially, the following basic requirements were identified to include in the RRI Mobile Application:

- Brief introduction to the Library
- Access to the library catalog
- Access to patron accounts
- Access to recently published articles
- Access to E-resources (e-books, e-journals, etc.)
- InterLibrary Loan (ILL) requests
- Access to scientific videos and Library images
- Ask a Librarian
- Contact information for the library

The RRI Mobile Application modules mentioned below were designed based on the functionalities to be given to the library users.

- About the Library
- Library Catalogue
- Recent Articles
- E-books
- E-Journals
- Request Articles (to facilitate Inter Library Loan)

The other functionalities of the library, like Photo Gallery, Link to Scientific Videos, Ask Librarian, and Contact Information, were included in the submenus of the RRI Mobile Application.

### **3.2 Welcome page**

The Welcome page (figure 4) was designed using ***Inkscape***, a free photoshop software, and imported into the App Inventor for further processing.



Figure 4. RRI Library App Homepage



### 3.3 About the Library

The “About the Library” module (see figure 5) was included in the Application to introduce the RRI library to its users. A new page was designed to have the basic introduction of the RRI library and linked to the About the Library module in the Application. The RRI library was started by the Indian Physicist and Nobel Laureate, Sir C V Raman, at the Raman Research Institute with his collection of Books. He served as RRI’s director carrying on his research until his demise in 1970. After the institute’s activities enlarged from 1972 onwards, the library’s collection developed in the new areas of research activities. Currently, the library collection is vital in astronomy and astrophysics, theoretical physics, optics, and liquid crystals. Apart from acquiring books and subscriptions of journals, the library offers many other services with which many users have benefited. The library helps readers with their literature search and provides a daily current awareness service about new development in science.

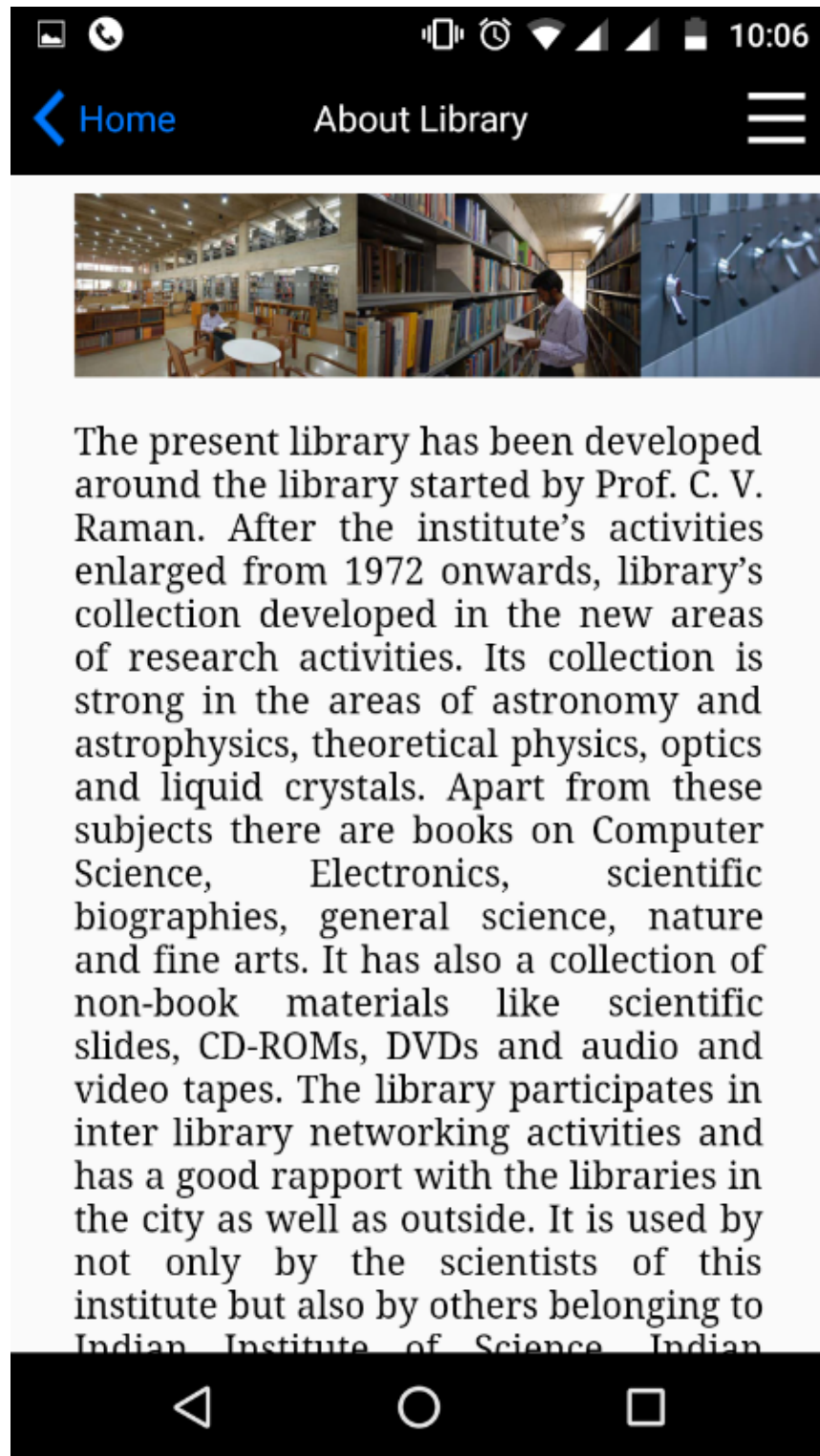


Figure 5. About Library

## **4 Library Catalogue**

Using KOHA software, the library catalog has been computerized, and the OPAC is available for access to the readers both within and outside the Institute campus. A link to the KOHA OPAC (see figure 6) has been provided through a mobile application which users can search the library catalog on the go. Also, users can log in to their respective accounts and check their account details, list of books borrowed, their reading history, and many more. Figure - 7 shows the blocks used to link the RRI Library Catalogue.

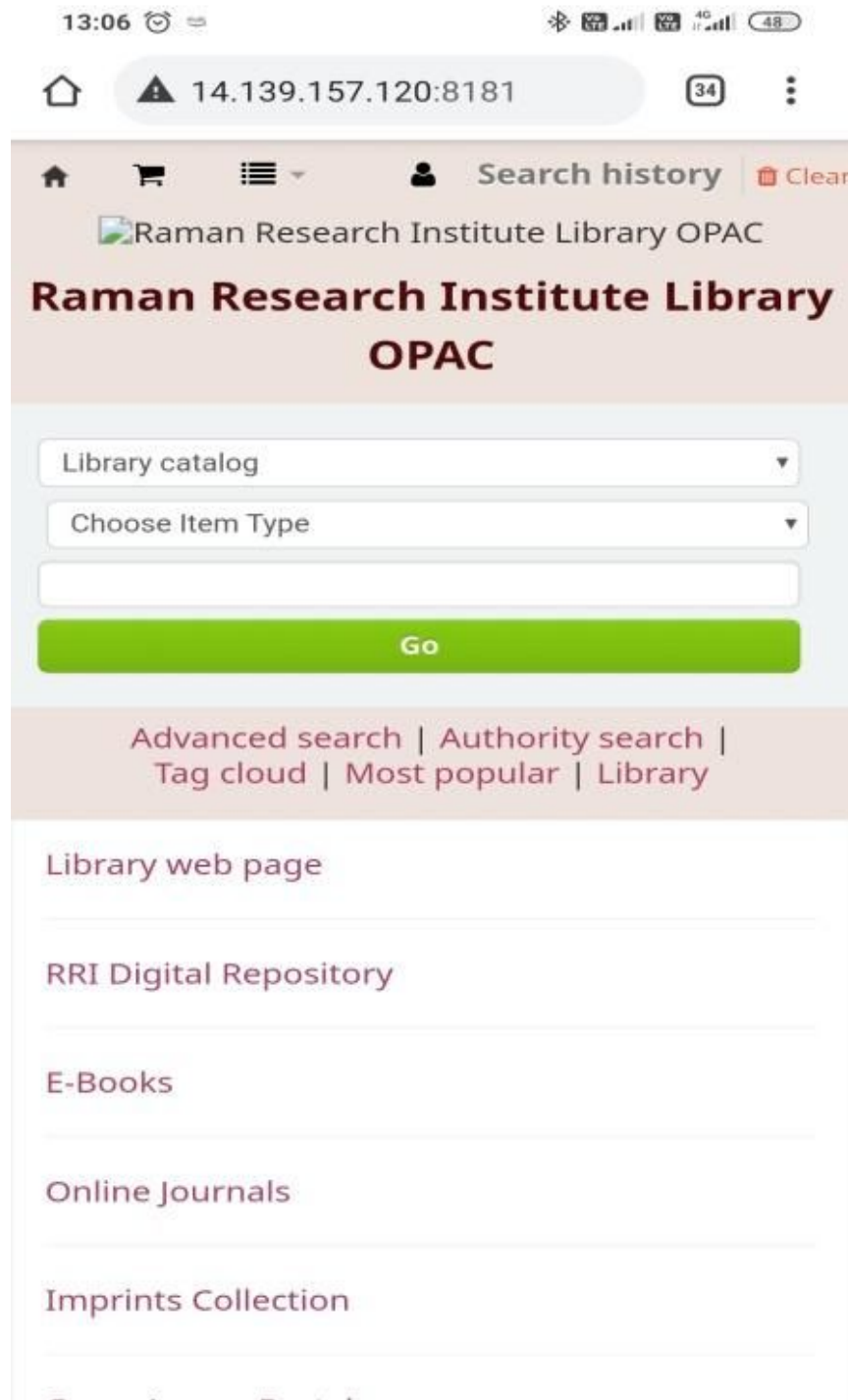


Figure 6. RRI Library Online Catalogue



Figure 7. Blocks for Library Catalogue

## 5 Recent Articles

The RRI Library uses DSpace Open Source Digital Assets Management software to archive the institute's heritage and scholarly scientific output. The RRI Institutional Repository has rare pictures and handwritten scripts of Sir C V Raman. It also hosts the scientific production of the Institute and has registered users worldwide. On average, RRI publishes 150 to 160 research publications every year. To keep the library users up to date on the scientific works of RRI, the library has provided a module in the Application where a user can get to know the recent research works of the Institute. When a user clicks on the Recent Articles module, the module brings RRI Institutional Repository results using its RSS feed (see figure 8).

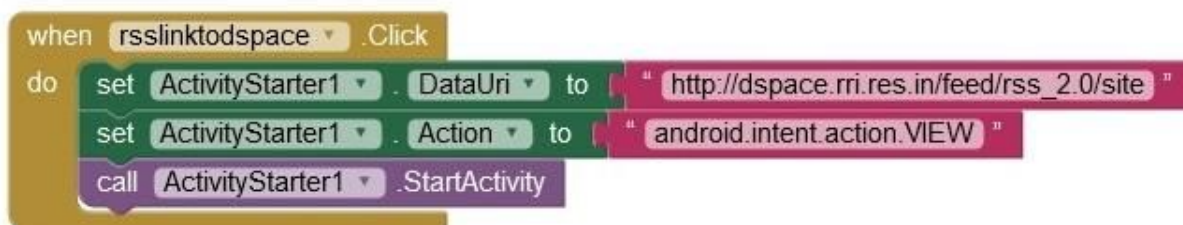


Figure 8. Blocks for Recent Articles

## 6 E-Books and E-Journals

The RRI Library subscribed to many e-books and e-journals from different publishers. The Library has access to over 4000+ journals through the National Knowledge Resource Consortium (NKRC). The E-Books and E-Journals module gives access to subscribed content to its users on the go. The subscribed content can be accessed through different devices if connected through the Institute's WIFI facility.

## **7 Request Articles**

The RRI Library is best known for its Inter Library Loan Service. It is used not only by the scientists of RRI but also by others belonging to the Indian Institute of Science (IISc), Indian Institute of Astrophysics (IIAP), Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), National Aerospace Laboratories (NAL), National Centre for Biological Sciences (NCBS), Tata Institute of Fundamental Research (TIFR) Centre for Applicable Mathematics and others. To help library users get their required information on time and facilitate Inter-Library Loan Service, the Library has provided the Request Articles module (see figure 9) with its android Application. Using this module, users can send their requests to the Library through their handheld devices. Figure - 10 shows the blocks for the Request Article module.

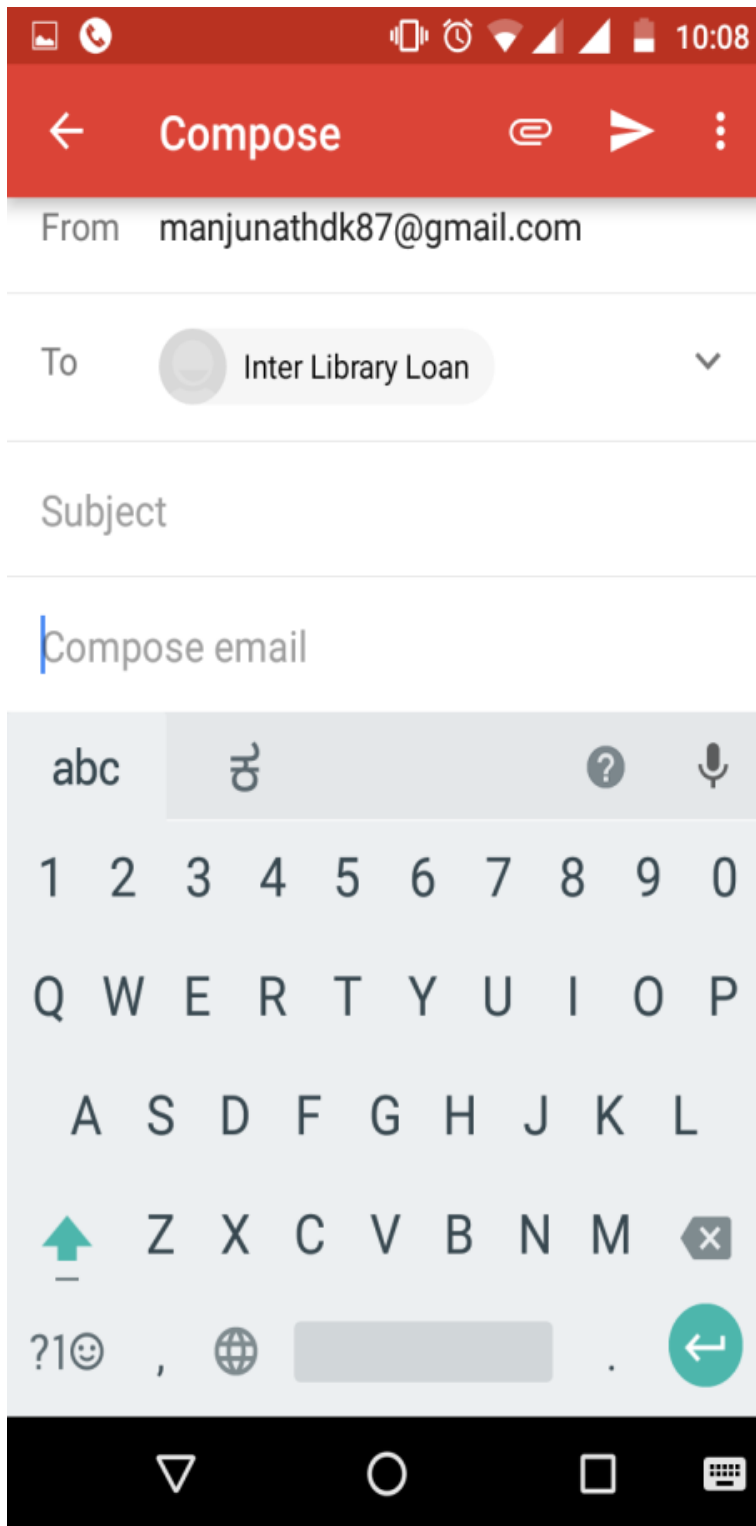


Figure 9. Article Request through Library App



Figure 10. Blocks for Article Request

## 8 Sub-Modules

As mentioned in the previous section, the RRI Library has a rich collection of photos and handwritten scripts of Sir. C V Raman. Recently an Archival Gallery of Raman was inaugurated at the Library. The Archival Gallery is a pictorial biography of Raman. Also, RRI has an official YouTube channel that provides access to many scientific videos and lectures delivered by India's eminent personalities at RRI, on many occasions. A link has been made available to these images and videos through sub-modules of the Application. The sub-modules also have an Ask Librarian function (e.g. see figure 11 for blocks) with contact information.



Figure 11. Blocks for Making a call

## Suggestions and Conclusion

Mobile technology has created a paradigm shift in the new tech savvy world. This shift requires libraries to develop mobile technology plans, design mobile marketing strategies, and develop best practices for mobile services. The MIT App Inventor may be considered a helpful tool for library professionals to meet the users' requirements through handheld devices. Its design and implementation process allows anyone without programming skills and prior programming experience to develop mobile



apps. The drag-and-drop visual programming tool for designing and building fully functional apps for Android lets users quickly design and arrange interface components and connect logic blocks to create mobile applications. The authors have used the MIT App Inventor to develop a mobile application for the RRI Library. The app helped RRI Library to extend its services to its users in a better way. The developed Mobile App is still under review, and new features or modules will be added to the Application in the near future.

## Citations

1. Nisha Mobile Apps For Libraries And Library Services accessed from <https://techware.co.in/Mobile-Apps-for-Libraries-and-Library-Services.php?cv=1> on 25<sup>th</sup> September 2021. [↵](#)
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3. Pokress & Veiga (2013) MIT App Inventor, arXiv:1310.2830v2[[cs.CY](#)] [↵](#)
4. Beniwal (2016) Develop Android Apps: Using MIT App Inventor, Open Source for You, October 2016. [↵](#)