

## **Project Title**

Real-time Wheelchair Location & Inventory System

## **Project Lead and Members**

Project Lead(s): Stewart Tai

Project Members: Donald Wai, Tony Yang, Raymond Chew, Richard Jang, Keegan Lim, Syafiq Yeoh, Edgina Winartio, Kannan Shanmugapriyan, Nur Nabila Binte Abdul Razak, Koo Zheng Hua, Alex Yew Wei Feng, Liu Chun Yi

## **Organisation(s) Involved**

Alexandra Health Pte Ltd, Khoo Teck Puat Hospital

## **Healthcare Family Group(s) Involved in this Project**

Healthcare Administration

## **Project Period**

Start date: Mar 2021

Completed date: Jun 2022

## **Aim(s)**

KTPH Facilities Management (FM) team worked with a vendor, IOT Workz, to develop Singapore's first wheelchair tracking program. With this solution, Patient Greeters can easily locate available wheelchairs faster, making them more efficient and productive. In addition, inventory is accurate as the wheelchairs are accounted for, reducing the case of missing or misplaced wheelchairs.

## **Background**

See poster appended/ below

## **Methods**

See poster appended/ below

## **Results**

See poster appended/ below

**Lessons Learnt**

See poster appended/ below

**Conclusion**

See poster appended/ below

**Additional Information**

See poster appended/ below

**Project Category**

Care & Process Redesign, Build Environment, Facilities Management Improvement,  
Value Based Care, Patient Satisfaction, Productivity, Time Saving

**Keywords**

Tracking Online, Tracking System, Portering, Facilities Management

**Name and Email of Project Contact Person(s)**

Name: Mr Stewart Tai  
Email: tai.stewart.yf@ktph.com.sg

# Real-time Wheelchair Location And Inventory System (RTWLIS) in Khoo Teck Puat Hospital (KTPH)

Author: Syafiq Yeoh  
Co-author: Keegan Lim

## Background And Aims

- **Background** - Patient Greeters and Portering team of KTPH have trouble finding wheelchairs scattered around the hospital.
- This leads to decreased productivity and workflow efficiency of Patient Greeters and Porters.
- **Aim** - To find a way to improve the wellbeing of staff by keeping track of these wheelchairs to ensure they can be easily found

## Methodology

- Research

Through interviews, the team found that the staff needed a way to keep track of the wheelchairs and thus we produced multiple solutions. To select the final one, a Decision Matrix was created based on four criteria: Cost of implementation, Practicality, Effectiveness and Resistance to staff. Based on these, the use of 'ZigBee' technology was chosen. Zigbee, like Wi-Fi, is a wireless and secured network of smart devices that allows for low-cost and low-powered automation.

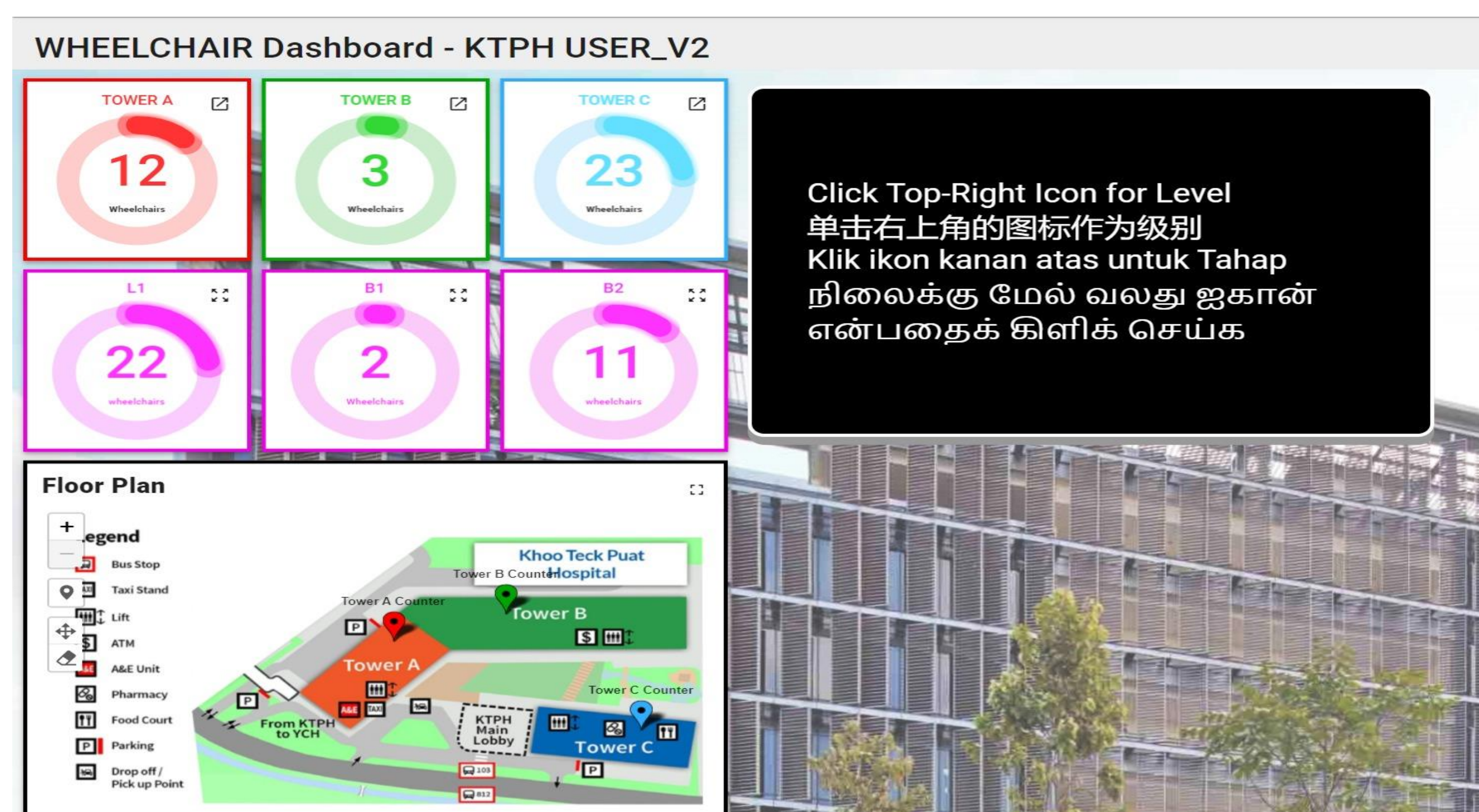
- Materials

The team had collaborated with IOT Workz Pte Ltd who has supplied the project team with materials such as Zigbee coordinators, routers and support services. The project also utilised multiple software applications to program and deploy the wheelchair tracking system in KTPH.

- Implementation


A tracker consisting of a printed circuit board and battery is placed on every wheelchair, Zigbee routers are placed around the hospital to form a Zigbee network. Within the network, any Zigbee device with the correct configuration is tracked. The project was tested and subsequently implemented on 380 wheelchairs in KTPH since April 2021. In addition, a user dashboard was created in which Patient Greeters and Porters can view on their smartphones the number of wheelchairs at each tower and level.

### User Dashboard



## Sustainability & Follow-Up

Standard Operating Procedures (SOP) are required to teach the staff on how to use the application. The procedures are listed below:

- Receive a website link to the dashboard given by the Facilities Management team.
- Scroll through to see number of wheelchairs in each level or tower.
- Tap the  icon at the top right of each box for more information on the wheelchair's locations.

## Results And Project Impact

To test for functionality and data accuracy, the team installed a tracker on wheelchair '261' and tracked its location within the three towers of KTPH for a month:

Location of Wheelchair '261'	Frequency of wheelchair location in each tower (%)
Tower A	61
Tower B	26
Tower C	13

This means that the dashboard was able to track the movement of wheelchair '261' accurately within the three towers.

To collect results, an observation was done before and after implementation. Through it, the duration to replenish wheelchairs at the bays in the 3 different towers in KTPH was taken down:

Average time taken (in mins) to restock wheelchair bays at the different towers in KTPH		
Location	Before	After
Tower A, Level 1	30	20
Tower B, Basement 2	13	5
Tower C, Level 5	10	4

Feedback from the users of the RTWLIS was collected as well:

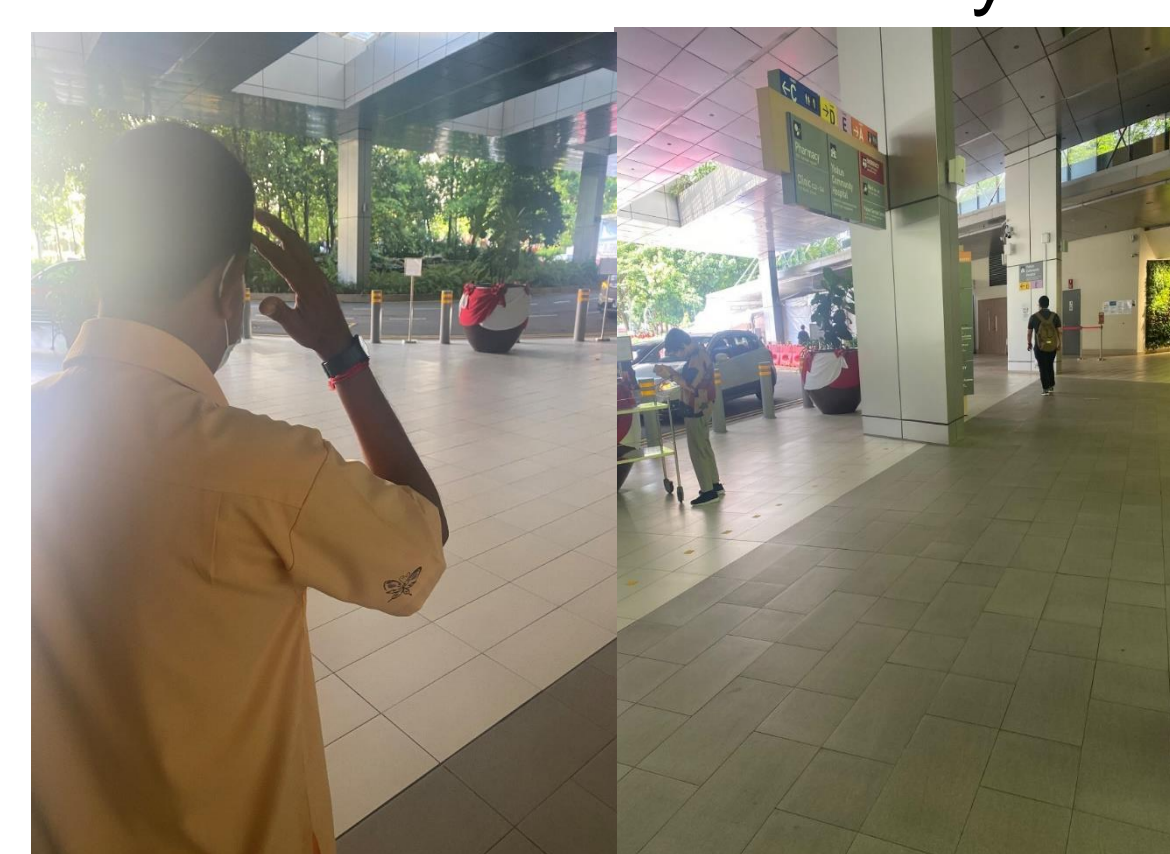
Questions asked	Answers
How does the tracking system help to improve your work? Please indicate specific used cases.	"It helps us to top up wheelchairs quickly since we can locate them on the dashboard"
How much time does the system help you save?	"More than 10 minutes"

## Conclusion

- They can locate wheelchairs within a short span of time using the user dashboard.
- Workflow is more efficient, resulting in improved patient care and experience.
- This project has significantly improved the wellness for Patient Greeters and Portering team, who now do not need to walk for long periods of time to look for wheelchairs, hence increasing their productivity.

### Before

Patient Greeters have to look for wheelchairs manually.



### After

Wheelchairs are found more easily using the user dashboard of RTWLIS

