



# Robotics Middleware Framework for Facilities Management: A Case Study

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# Overview

- > Case for working with robots
- > Exploring the RMF
- > Learnings & Next Steps



# Robots escaping from Factories to the Real World!



Source: [Asmag.com](http://Asmag.com)

**Industrial robots in a factory**



Source: [ChangiAirport.com](http://ChangiAirport.com)

**Waste collection robot in a shopping mall**

# Robots found around Singapore Today



Source: <https://govinsider.asia/>

**Senserbot Shelf-Reading Robot  
at Tampines Regional Library**



Source: <https://grab.com/sg>

**Techmetics Robotics A.H.B.O.I.  
at Payar Lebar Quarter**

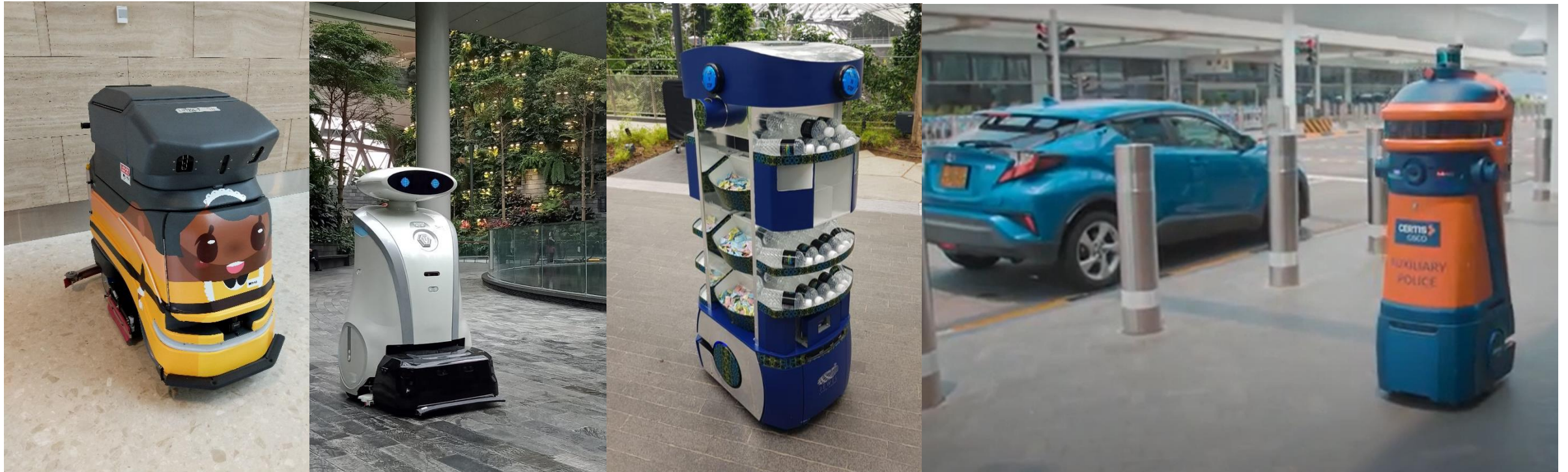


Source: <https://foodpanda.com>

**Wizz Mobility FoodBots at  
National Technological University**



# Robots at Changi Airport



Source: <https://changiairport.com>

**Robots helping with cleaning, providing refreshments, and traffic enforcement**

# Are robots always the solution?



## Viabile Business Model

- Comparing **Humans vs Robots** in terms of
  - Cost
  - Efficiency



## Operational Constraints

- When **human intervention** is required to assist robots to perform their work
  - Navigating between floors
  - Charging

# Challenges to successful adoption of robots



## Integration with existing environment

- How will my robots integrate with my buildings and my current workforce?

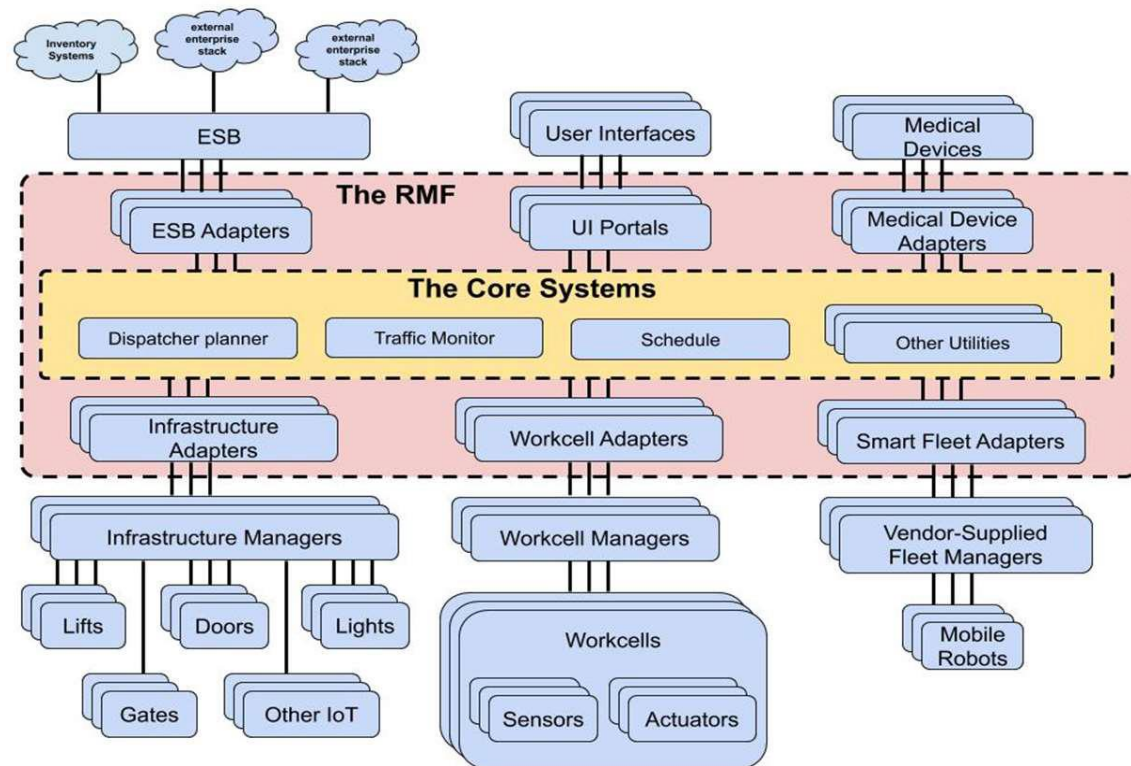


## Task management

- Ultimately a question of cost and efficiency



# Robotics Middleware Framework



Source: Open Robotics

RMF Core is the brain of RMF

A collection of libraries and utilities for assisting vendors to integrate with the RMF

- Pure C++ libraries for:
  - *Path Planning, Conflict detection & resolution*
- ROS2 wrappers of C++ libraries
- Templates and examples of applications
  - *Lift / Door adaptors, Smart Fleet Adaptors*



# Benefits of having a successful RMF



## Crowd Sourcing Solutions

- How do we get the best ideas to the table?



## Greater adoption across fleets

- How do we ensure as many partners are onboarded for this journey?

# Benefits of having a successful RMF



*The rest of us*