

News Release

April 17, 2023

To the media and press

Tokyu Land Corporation
Tokyu Community Corp.
SoftBank Corp.
Nikken Sekkei Ltd.

Tokyu Land, Tokyu Community, Softbank and Nikken Sekkei announce the results of their joint research aimed at establishing a robot-friendly environment

Confirmed challenges in realizing a robot-friendly environment and effective measures from the standpoints of facilities, people and robots

Tokyu Land Corporation (Headquarters: Shibuya-ku, Tokyo; President and CEO: Hiroaki Hoshino; “Tokyu Land” below), Tokyu Community Corp. (Headquarters: Setagaya-ku, Tokyo; President: Shohei Kimura), SoftBank Corp. (Headquarters: Minato-ku, Tokyo; President & CEO: Junichi Miyakawa; “Softbank” below) and Nikken Sekkei Ltd. (Headquarters: Chiyoda-ku, Tokyo; President and CEO: Atsushi Omatsu; “Nikken Sekkei” below) announce that they have sorted out challenges that affect the operation of robots and draft measures from the standpoints of facilities, people and robots as investigative research endeavors aimed at the establishment of robot-friendly environment that enables smooth robot operation. These initiatives were selected as part of the “2022 Innovative Robot Research and Development, Etc. Infrastructure Building Project” subsidized project by the Ministry of Economy, Trade and Industry, and were jointly implemented by the aforementioned four companies.

■ Challenges sorted out from standpoints of facilities, people and robots and response policy

In recent times, there have been concerns of a serious labor shortage amid the declining birthrate and increasingly gray population being experienced by Japanese society, leading to greater expectations of the utilization of service robots. This in turn has resulted in the call for the realization of a robot-friendly environment within office buildings and other facilities in which people and robots can safely and comfortably coexist. In this recently-implemented joint research project, challenges aimed at the realization of robot-friendliness at the Tokyo Port City Takeshiba Office Tower facility managed and operated by Tokyu Land were sorted out with the “robot level” evaluation indicators proposed under that project in 2021 as the standards of evaluation, and options for measures to promote the introduction of robots were examined for each of those challenges.

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Area	Evaluation Indicators	Evaluation of Ease of Implementing Measures				Response Policy	Verification Method
		Facility (newly-built)	Facility (existing)	Robots	People (operation)		
Architectural challenges	Sloped surfaces	○	×	×	△	Facility-side response ideal	Desktop verification
	Differences in level	○	△	×	△	Facility-side response ideal	
	Ditches	○	×	×	△	Facility-side response with narrowed-down scope of application	
	Passageway width	△*	×	×	△	Facility-side response ideal; combined application with ideas for operation required	
	Fixture width/specifications	△*	×	×	△	Facility-side response ideal; combined application with ideas for operation required	
	Elevator car/door width	△*	×	×	△	Response possible with standard-sized elevator cars that fit 11 persons	
	Floor surface sliding/luster	○	×	△	△	Selection of floor materials with no slipping or luster upon facility design	
	Floor surface resistance	○	○	×	△	No use of carpets with long piles on facility side	
	Wall surfaces	○	△	○	△	Selection of wall finishing materials with no luster Response also possible following completion if challenges are localized	Demonstration experiment
	Environmental light	△	△	△	○	Operation with avoidance of locations and times that are affected	
	Communication connection	○	○	△	△	Response with Wi-Fi for management use and non-sensitiveness of LTE required on facility side	
	Obstacles to travel paths	△	△	△	○	Operation with no placement of obstacles in principle	
	Charging docks/standby spaces	○	△	×	○	Facilities in mid-planning: Securing of space ideal Existing facilities: Selection of locations with no impediments to operation ideal	
	Danger of falling on escalator, stairs, etc.	△	△	△	△	Establishment of areas where travel by robots is prohibited as a general rule; however, this is insufficient in terms of safety. Note that safety measures at facility and in operation are also required.	
	Effects of wind (within facility)	△	×	○	△	Caution in locations where floor airflow A/C, etc. is conducted required Localized response with disabling of robot sensor also possible	
Operational challenges	Effects of people standing still	△	×	○	○	Response with robots/people more rational	
	Corners	△	△	○	○	Response with robots/people more rational	
	Riding in elevators	△	△	○	○	Establishment of operation routes for robots required	
	Door fronts	△	×	○	○	Establishment of areas where travel by robots is prohibited rational	

[Legend] ○: Relatively easy to incorporate measures. △: Possible to implement measures, albeit with challenges. ×: Difficult to implement measures from the standpoint of robot-friendliness.

*: Items that should be examined in the comparatively early stages of the architectural plan.

Table: Summary of sorting out of challenges aimed at realizing a robot-friendly environment and an evaluation of the ease of implementing measures

■ Verification of concrete measures

Challenges were largely sorted out into architectural challenges (those related to physical environment) such as braille blocks and handling of the reflection of light and operational challenges (those related to travel within the facility) such as corners, congested passageways and other areas that come into contact with people. Draft measures to address such challenges were then listed up together with a response policy following an evaluation based on how easy those measures are to employ from various standpoints that include facility-side actions such as eliminating differences in level and securing space, robot-side actions such as adjusting alarm sounds and route settings, and people (operation)-side actions such as restricting travel areas and configuring operation rules. While “achieving co-existence between people and robots,” which relates to the operation side, posed a considerable challenge, efforts such as demonstrative experiments for avoiding collisions between people and robots at corners made it possible to identify effective measures to propose. Through the compilation of draft measures from multiple standpoints, efforts will also be made to promote the examination of the introduction of robots in existing buildings, whose physical environment is difficult to alter.

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No measures



Measure 1: Spreading awareness with floor stickers



Measure 2: Turning with wide turns



Measure 3: Emitting alarm sounds



Figures: Example of demonstration experiment for avoiding collisions between people and robots at corners
Verified that “alarm sounds” and “wide turns” were highly effective following a comparison of multiple measures

■ Future developments

As these initiatives are further pursued and guidelines, etc. are formulated, outcomes such as improved cost-effectiveness upon the introduction of robots and lower hurdles to that introduction are anticipated. At the same time, because it is also crucial to promote the standardization of the specifications and operation of robot-friendly buildings, going forward, Tokyu Land, Tokyu Community, Softbank and Nikken Sekkei will continue to promote initiatives aimed at successfully establishing robot-friendly environments together with numerous individuals involved with robots, the Ministry of Economy, Trade and Industry, the Robot Friendly Asset Promotion Association (RFA) and other implementing organizations.

For details on this project, please also see the website of the Japan Machinery Federation (executive organization for this subsidized project)

(Link to report/Japanese language only) <http://www.jmf.or.jp/houkokusho/2948/3196.html>

Overview of Project

Purpose	<ul style="list-style-type: none"> • To perform evaluations based on level evaluations for robot-friendliness • To extract operation challenges with robots based on the securing of user safety, facility management, and other standpoints • To examine proposed solutions to those challenges based on the individual perspectives of facilities, people, and robots
Location	Tokyo Port City Takeshiba Office Tower (1-7-1 Kaigan, Minato-ku, Tokyo)
Period	September 2022 to March 2023
Role of Each Company	<ul style="list-style-type: none"> • Tokyu Land Project management, provision of sites of implementation and evaluation of measures from perspective of business operators • Tokyu Community Sorting out of operational challenges with cleaning and security robots, implementation of proposed solutions for those challenges and verification of their effects • Softbank (certain operations to be reconsigned to Asratec Corp.) Sorting out of operational challenges with delivery robots, implementation of proposed solutions for those challenges and verification of their effects • Nikken Sekkei Evaluation of robot-friendly environment, analysis of physical environment factors and examination of proposed solutions to challenges

■ Tokyu Land

A core company of the Tokyu Fudosan Holdings Group, Tokyu Land is a comprehensive real estate company with operations in Urban Development, Residential, Infrastructure & Industry, Wellness, Overseas Businesses and more. At present, the company is leveraging its development capabilities backed by a proven track record and taking advantage of its steady earning power as it develops businesses to implement environmental management and DX, which are espoused under the Tokyu Fudosan Holdings Group’s long-term vision, GROUP VISION 2030, and the company’s Medium-Term Management Plan 2025. Simultaneously, the company is turning its attention to various challenges pertaining to communities, society and the environment as it develops each of its businesses. Tokyu Land aims to maximize its businesses through partner co-creation with collaborative companies and communities.

URL: <https://www.tokyu-land.co.jp/english/>

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■ Tokyu Community

A core company of the Tokyu Fudosan Holdings Group, Tokyu Community is a general real estate management company that conducts condominium, building and facility management, public facility management and operation, and maintenance, management and operation of buildings with various uses, including sports facilities and airport-related facilities, across Japan. Providing services by leveraging its expertise based on its track record, the company will continue contributing to the living environment of its customers and the improvement of their asset value through the formation of a high-quality real estate portfolio. By putting a digital platform utilizing an abundance of know-how, data and customer contact points in place, Tokyu Community provides solutions backed by data to its customers.

URL: <https://www.tokyu-com.co.jp/english/>

■ Softbank

Under its corporate philosophy of “Information Revolution – Happiness for everyone,” with its “Beyond Carrier” strategy, SoftBank goes beyond the conventional business model of a telecommunications carrier to provide innovative services in a wide range of industrial areas as it strives for further growth. Focusing on robot-related research and development as well, the company is engaged in a number of initiatives alongside its Group companies with a view to developing the robot industry and implementing robots in society. These endeavors include research and development for the likes of the “Cuboid” autonomous driving robot, indoor delivery experiments through linkage between office building elevators and robots, and outdoor delivery experiments through linkage between automated driving robots and traffic signals, which succeeded for the first time in Japan.

URL: <https://www.softbank.jp/en/>

■ Nikken Sekkei

Nikken Sekkei is a professional service firm that engages in the design and supervision of architecture and civil engineering, urban design, and related surveying, planning and consulting operations. For 120 years since it was founded in 1990, the company has tackled value creation through “social environment design” intended to address both actual and latent social challenges in order to meet the demands of society and the various needs of its clients. Nikken Sekkei has been involved in a myriad of projects in Japan, China and the ASEAN and Middle Eastern regions up to this point, and has also been developing its business in India and Europe in recent years. In March 2021, the company issued its “Climate Emergency Declaration” with a view to initiatives geared towards a decarbonized society. For challenges surrounding the shrinking working population, the company has proposed “Smart Operation Building,” an idea for reducing the time and effort associated with building management through architectural ideas and IoT technology, and is currently endeavoring to realize robot-friendly buildings.

URL: <https://www.nikken.co.jp/en/>