



Food for Life Project

Robotic assistive device with multi-grip tools and vision system for frail elderly's independent life

Presenter:

Jorge Solis, Karlstad University, Sweden
Miki Saijo, Tokyo Institute of Technology, Japan

Contact: jorge.solis@kau.se or saijo.m.aa@m.titech.ac.jp



Collaborated with

Karlstad University, Sweden
Camario Care AB, Sweden
Tokyo Institute of Technology, Japan
Waseda University, Japan
Leave a Nest Co. Ltd., Japan

Today's Content | OUTLINE



- **Background**
 - Social and Elderly-care Context
- **Focus Issues and Milestones**
 - Practicality
 - Goal-oriented Management
- **PHASE 1 | R&D and Other Progress**
 - Practicality and Innovativeness
 - Significance of Bilateral Cooperation
- **PHASE 2 | Our Strategy for Social Implementation**
 - Innovativeness
 - Significance of Industry-academia Collaboration
- **Future Society thorough “Food for Life Project”**
 - Overall Purpose
 - Goal-oriented Management

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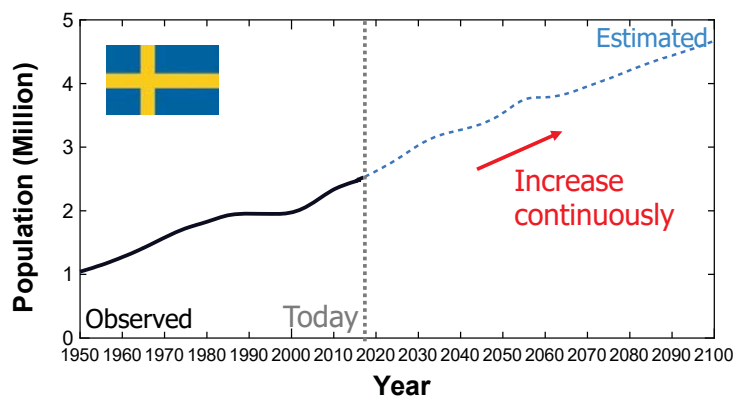
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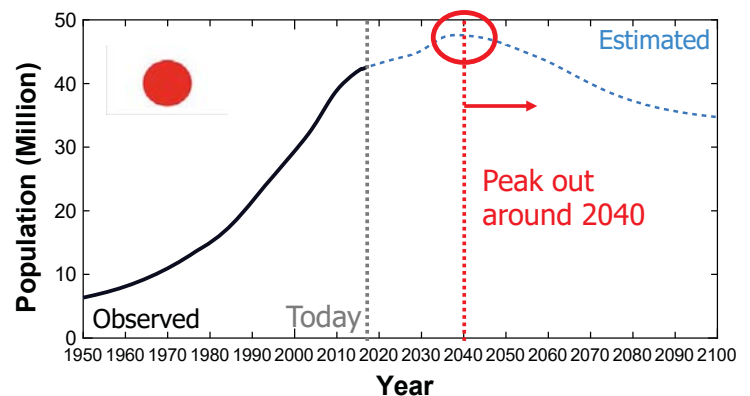
Background | Social Context

Projections Aged Population (1950 – 2100)

Sweden: Population (Age 60+)



Japan: Population (Age 60+)



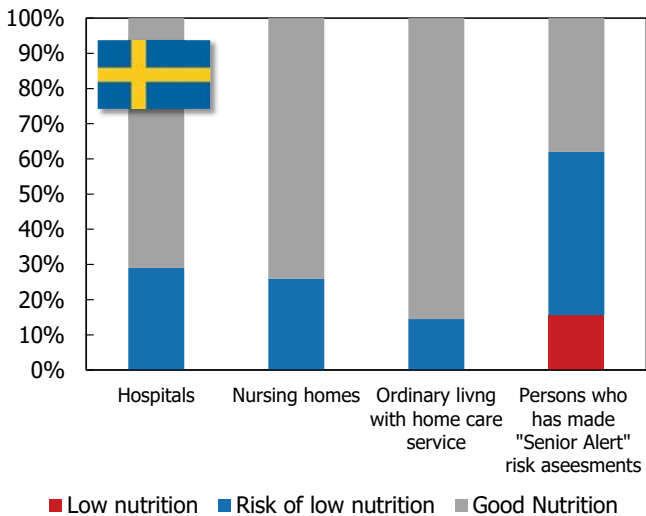
Source: United Nations, Department of Economic and Social Affairs, Population Division (2017).
World Population Prospects: The 2017 Revision, custom data acquired via website.

The population projections are based on the probabilistic projections of total fertility and life expectancy at birth, based on estimates of the 2017 Revision of the World Population Prospects. These probabilistic projections of total fertility and life expectancy at birth were carried out with a Bayesian Hierarchical Model.

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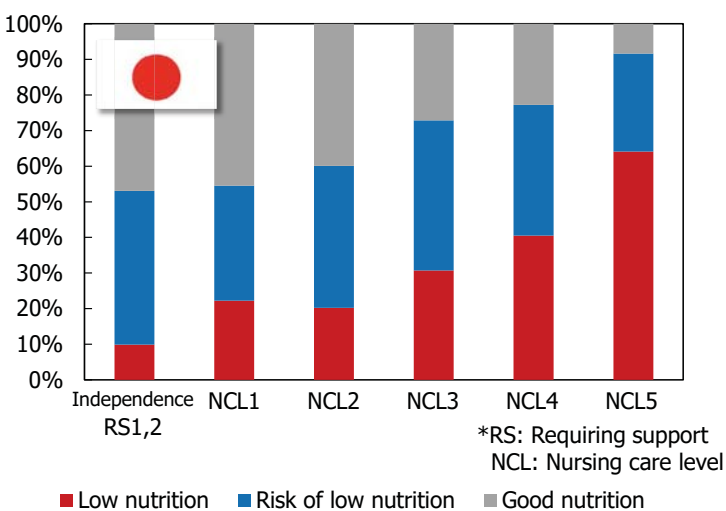
Elderly Society: Risk of Low Nutrition

Nutrition vs. Type of care for the person in Sweden



Source: Nyberg et. al. Eating Difficulties, Nutrition, Meal Preferences and Experiences Among Elderly
A Literature Overview From a Scandinavian Context (2014) and Senior Alert trough SvD (2017)

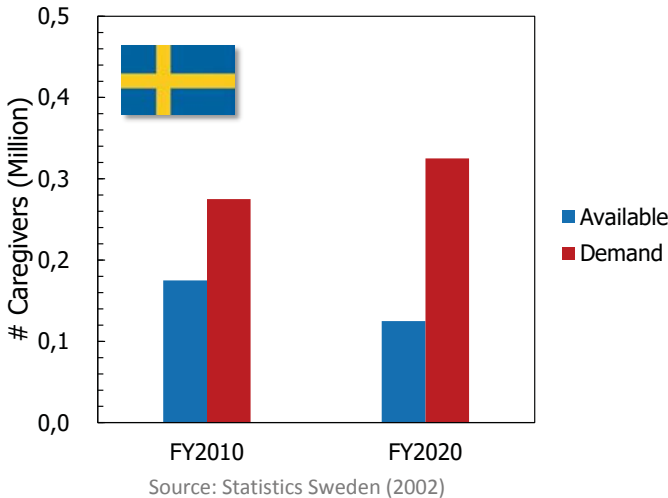
Nutrition vs. Nursing Care Level in Japan



Source: Center for Gerontology and Social Science (2013)

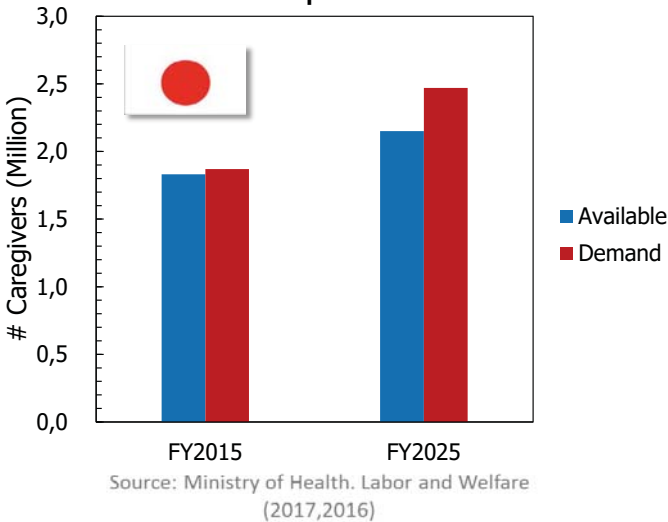
Care-givers Demand

Sweden



Source: Statistics Sweden (2002)

Japan



Source: Ministry of Health, Labor and Welfare (2017,2016)

Care-givers Available/Demand ratio:

64% in 2010 → **39%** in 2020

98% in 2015 → **87%** in 2025

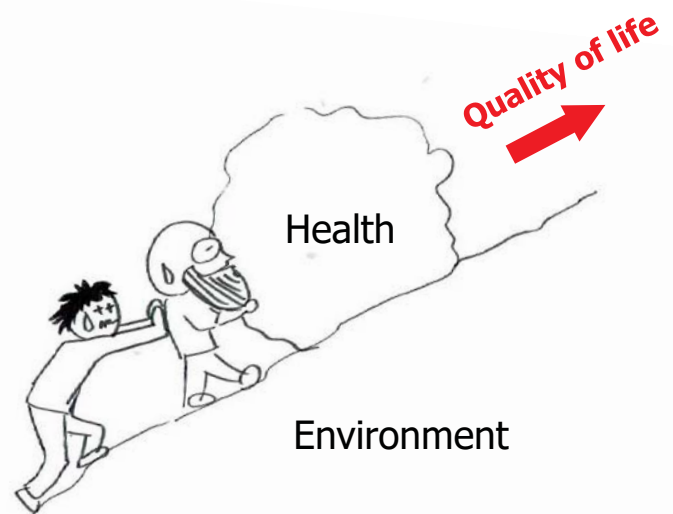
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Problems and Motivation |

Status quo: Elderly Care of Meal Assistance in Aging Society

@ Japanese Care Facility



Meal time of both elderly and caregiver is not pleasant

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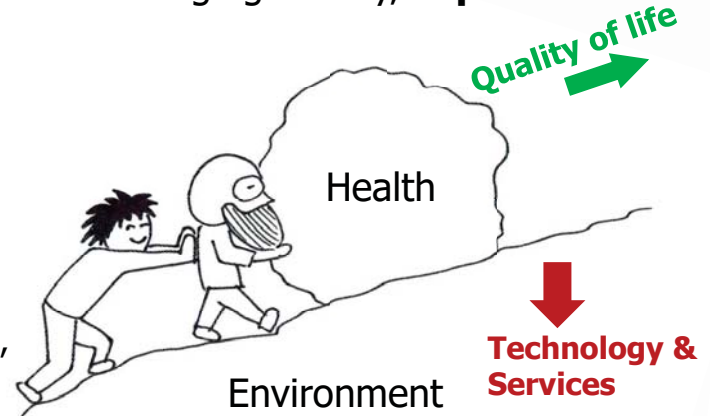
Envisioned Results and R&D Focus of Our Project

Why bilateral cooperation?

- Making **world-wide use case** by applying technology developed in the welfare state, **Sweden** to solve the emerging challenges in the most aging society, **Japan**

R&D Focus

- Technology & Services (PHASE 1 & 2)
 - To decrease burdens of frail elderly & care givers
- Community Support (PHASE 2)
 - To realize community-level care model
 - Incl. elderly, care-giver, hospital, local-government, etc...

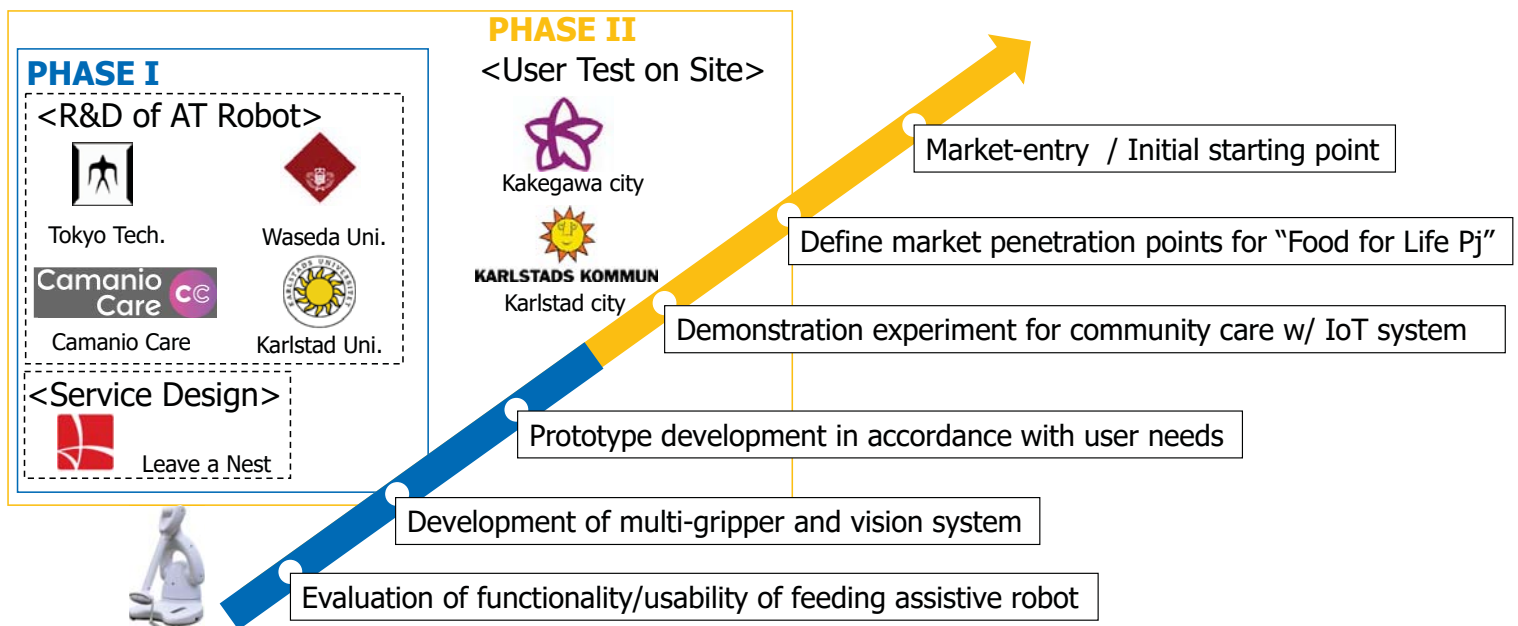


Human friendly aid system for supporting frail elderly's independent life and meal experience

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Food for Life Project from R&D to Social Implementation

Human friendly aid system for supporting frail elderly's independent life and meal experience



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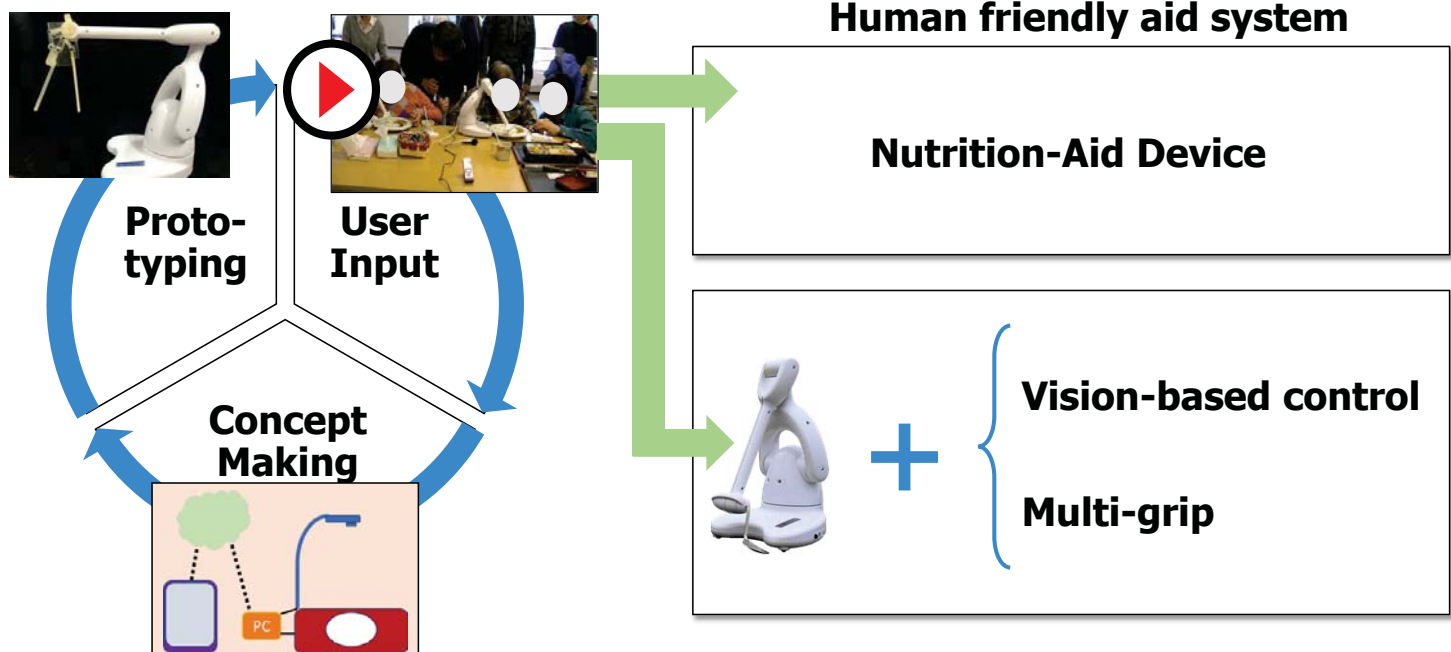
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Practicality | User Centered Process

Work Process in Phase 1

Iteration process for technology development



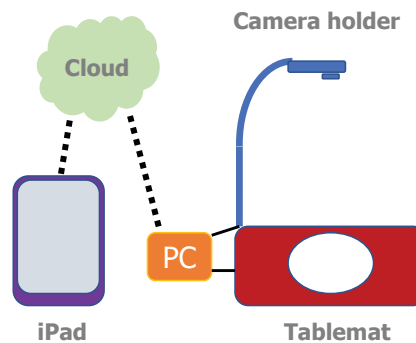
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Nutrition-Aid Device: Automatic Food Intake Report

USER INPUT

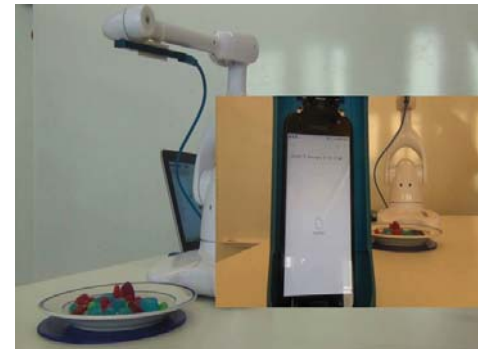
- Significance for the users living at home (living at care centers)
 - Identified undernutrition or risk of undernutrition.
 - Scanning for identify risk of undernutrition
- Significance for the municipalities
 - Evaluation of the distributed lunchboxes.
 - Analysis of correlation between nutrition and other data

CONCEPT MAKING



To collect the first and last picture of every meal eaten at the tablemat during one month time

PROTOTYPING (Current Progress)



Vision system + IoT
(CASE 2018, Germany)

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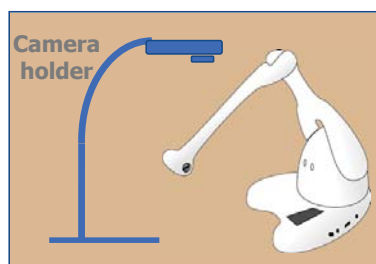
Vision-based Control: Automatic Localization of Food

USER INPUT



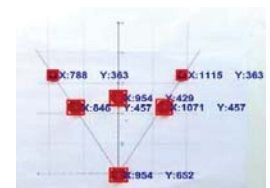
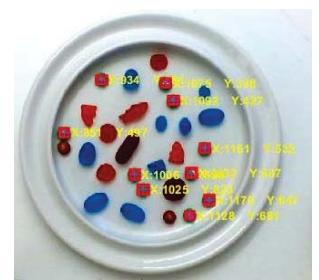
- Significance for the users living at home (living at care centers)
 - Frail elderly who are being fed today and have problem to control Bestic
- Significance for the municipalities
 - Further reducing the working load for caregivers

CONCEPT MAKING



To identify the location of the meal on the plate and to make a prototype a camera holder.

PROTOTYPING (Current Progress)



Identification of food's location
with vision system
(MECATRONICS 2018, U.K.)

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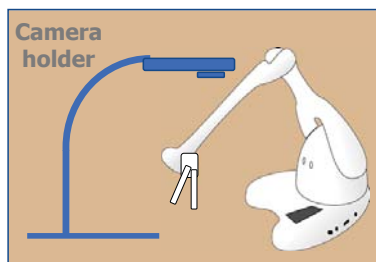
Multigrip tool: Expanding the usability of Bestic

USER INPUT



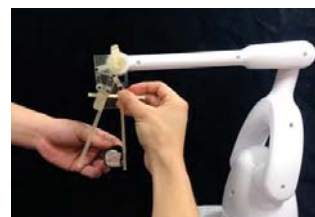
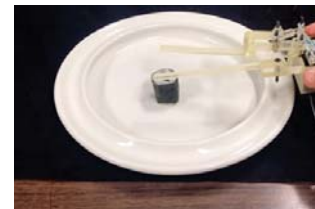
- Significance for the users living at home (living at care centers)
 - Bestic users who wish to be independent in other daily live activities
- Significance for the municipalities
 - Further reducing the working load for caregivers in other daily live activities

CONCEPT MAKING



To do other daily live activities with Bestic as result from the user inputs

PROTOTYPING (Current Progress)



Preliminary grasping test with the Multigrip (MEDER 2018, Italy)

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Outreach Outcome (Jan. 2017 – Jun. 2018)

• Publications

- National conferences: 1 (Sweden), 1 (Japan)
- International conferences: 2 (2017), 3 (2018)

• Exchange students

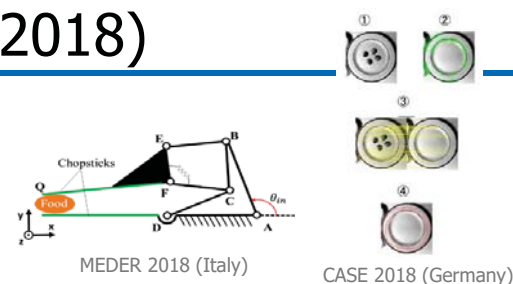
- From Japan to Sweden: 3 (1 week)
- From Sweden to Japan: 1 (3 months)

• Exchange agreements

- 1 (MoU between Karlstad University and Tokyo Institute of Technology under process of signature to facilitate the exchange of students)

• Press Media

- Radio: 2 (Sweden)
- TV: 1 (Sweden)
- Newspaper: 3 (Sweden); 3 (Japan)



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Significance of Industry-academia Collaboration |

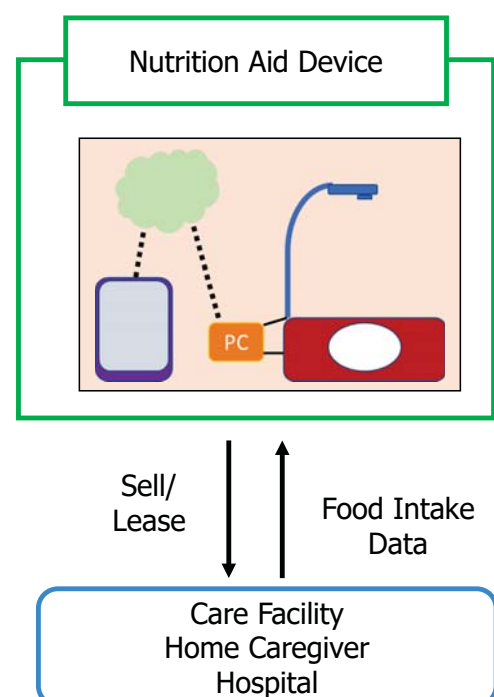
Service Development in Phase 2: Business Model

Nutrition Aid Device for Market Entry

- What if we automate the process of collecting and analyzing the individual nutrition status of frail person?
 - ✓ This solution reduces the work load of caregivers, &
 - ✓ It will also help the nutrition status of frail person.

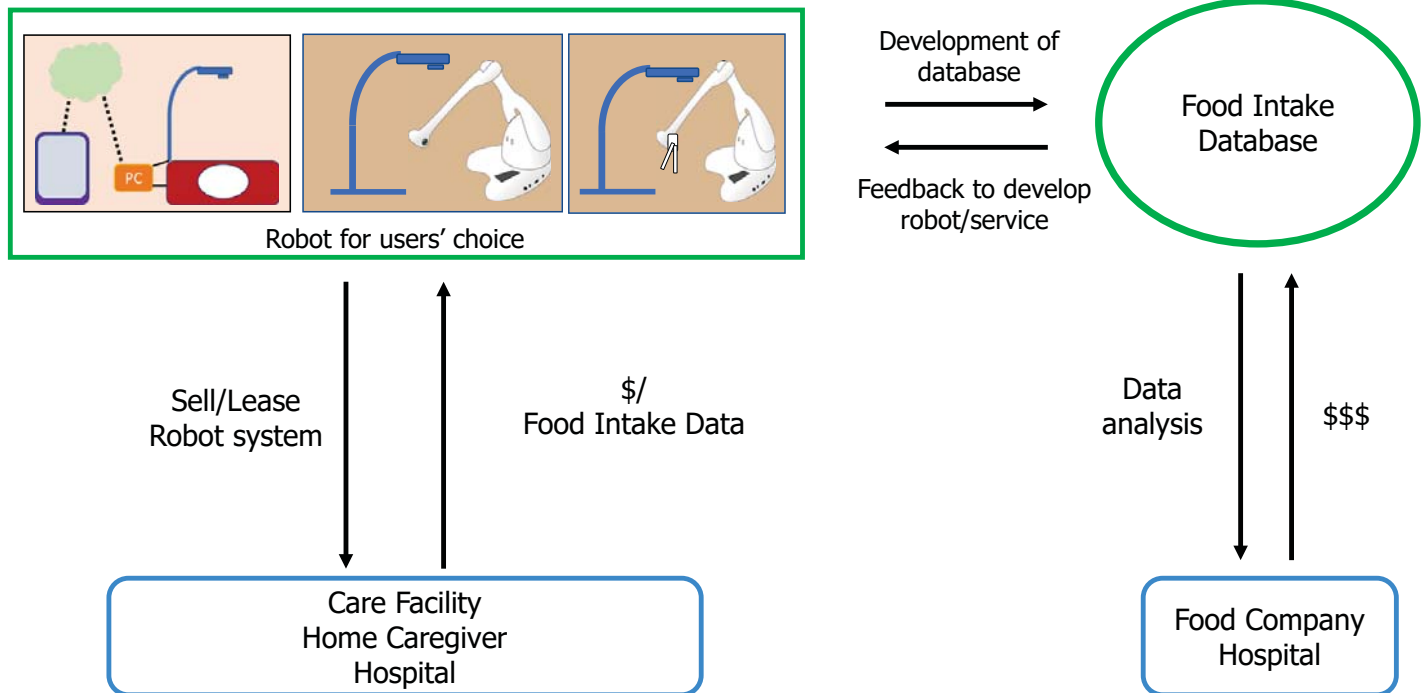
Key features:

- Less burden for caregivers
- Expanded use for persons with need of knowing their nutrition status, e.g. healthy seniors, etc.
- Easier to understand the health status of frail persons



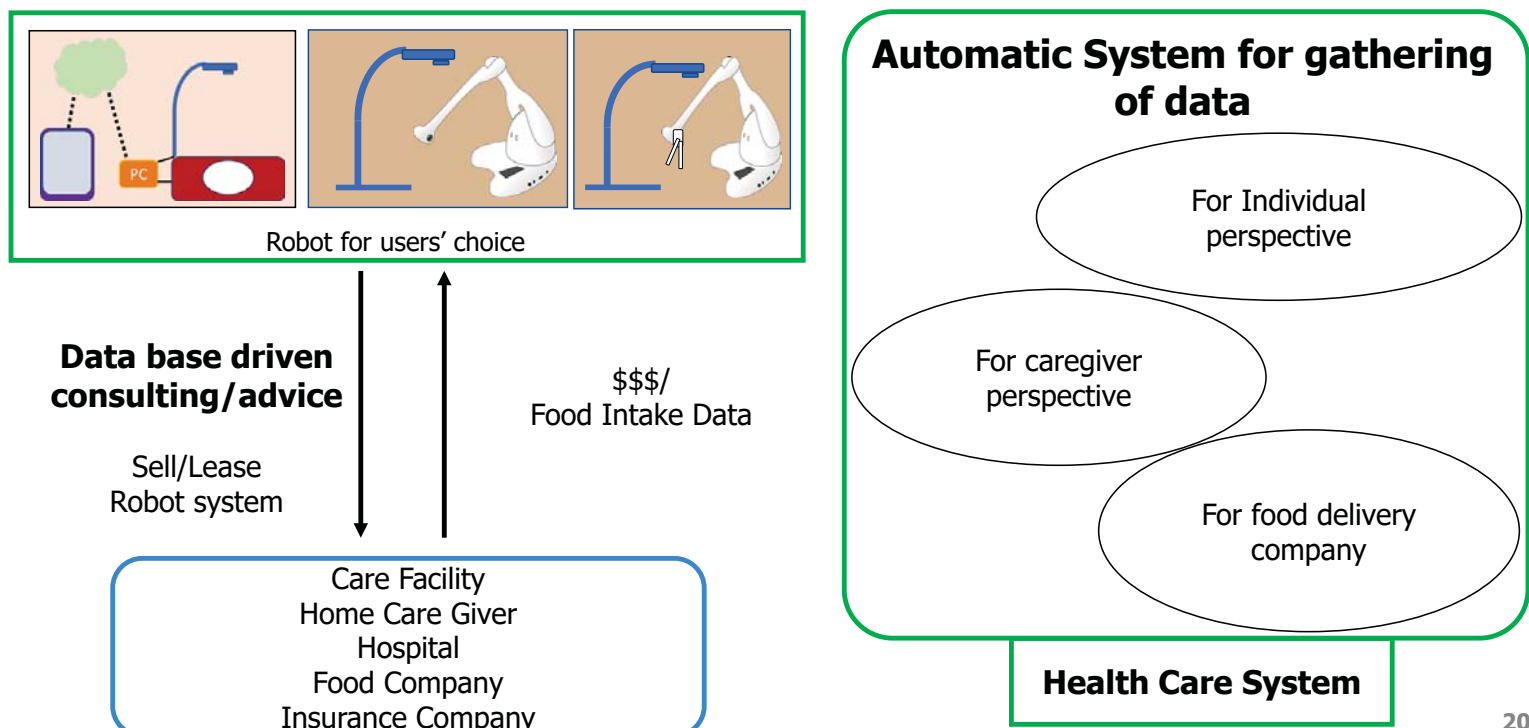
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Service Development in Phase 2: Business Model (2021?)



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Service Development after Phase 2: Business Model (2023?)



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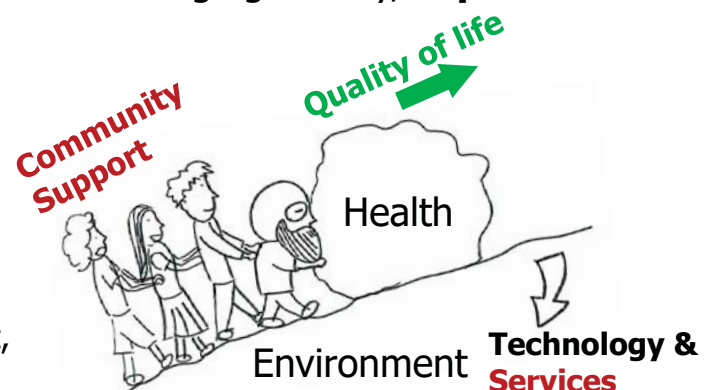
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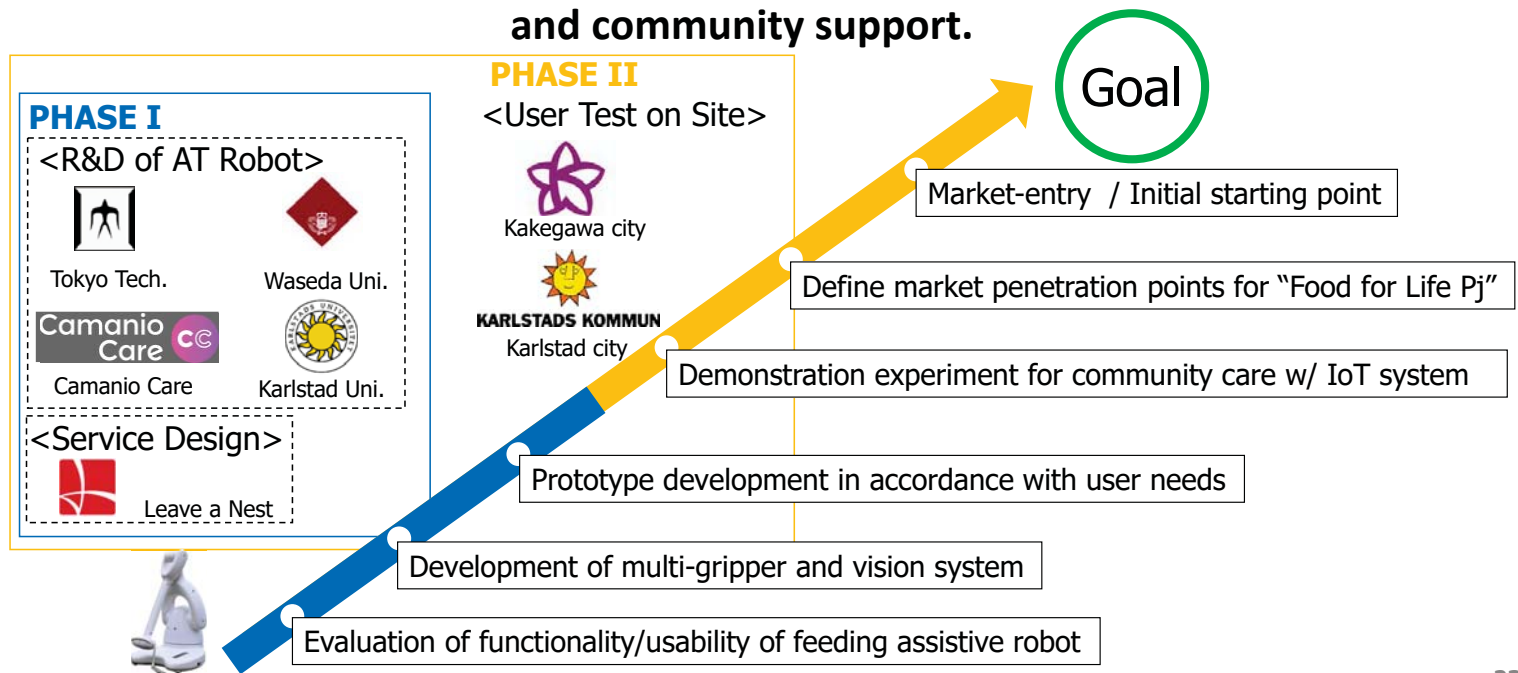


Expansion of frail elderly's life boundary through human friendly aid system and community support

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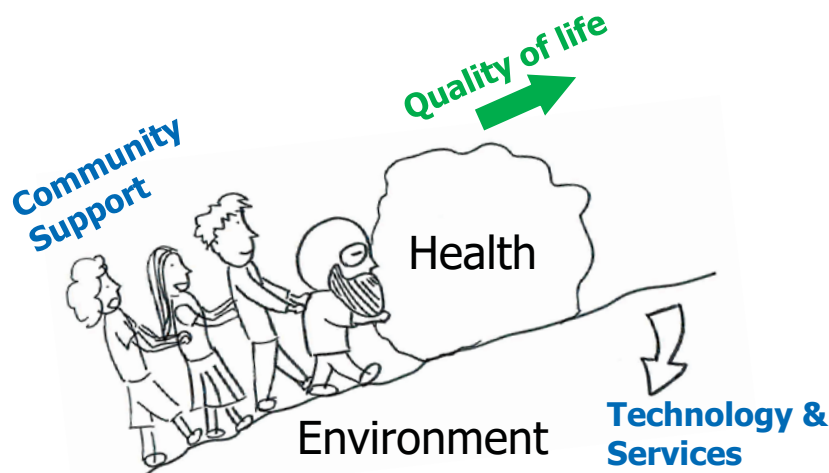


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Food for Life Project

Support for frail elderly's independent life and for meal experience through human friendly aid system



Thank you for listening!