

PROBLEM SPACE

SOCIAL ROBOT CO-DESIGN CANVASES

What problem are you solving?

USER

Group(s)	Characteristics	Needs
Who are the users? Are there supporting users? For example: students and teachers.	What are the users like?	What do the users need?
library customers looking for book	doesn't use library so often	has positive experiences of consulting staff
primary users	interested in certain topic or author or book	wants value through information easiness
secondary users		
librarians	busy	more time to focus on more complex tasks
	good at performing complex tasks	
Goal(s)		
What do the primary and secondary users want to accomplish?		
finding a certain book	customer saves time	customers learn to be more independent
primary users		
secondary users		
	librarian saves time	money savings
SHORT-TERM		LONG-TERM

ROBOT

Task(s)
What task does the robot perform?
knowing where book is
going to book
checking if book is loaned
loaning book for customer?
recommending books
collecting data on which books and book categories are popular
finding e-books
SHORT-TERM
LONG-TERM
Advantages
What advantages does using a robot bring (compared to a computer or human)?
help people with social anxiety, who have trouble inter- acting with humans
can understand and quickly give info about the whole li- brary service
Social skills
User's emotional response
Personalization
Precise tasks
finds book faster with RFID?
guiding people
can access a lot of data about the library
Data collection with sensors
Mobility
Environment manipulation
Connection to systems



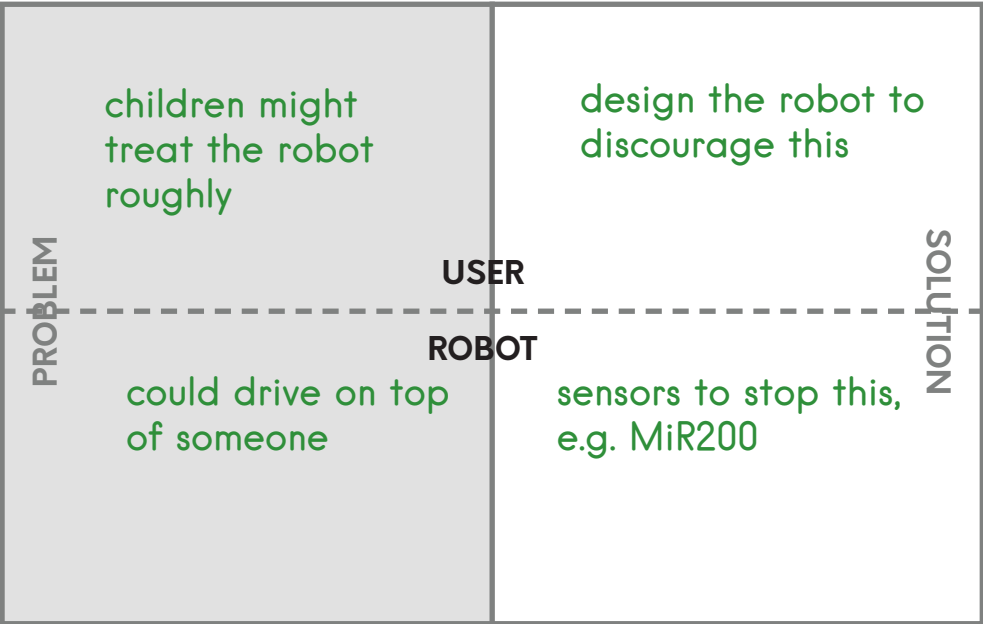
ETHICAL CONSIDERATIONS

SOCIAL ROBOT CO-DESIGN CANVASES

Consider potential ethical problems, and potential solutions –both from the user’s and robot’s perspectives.
Consider the boxes to be guidelines: you don’t need to fill each one.

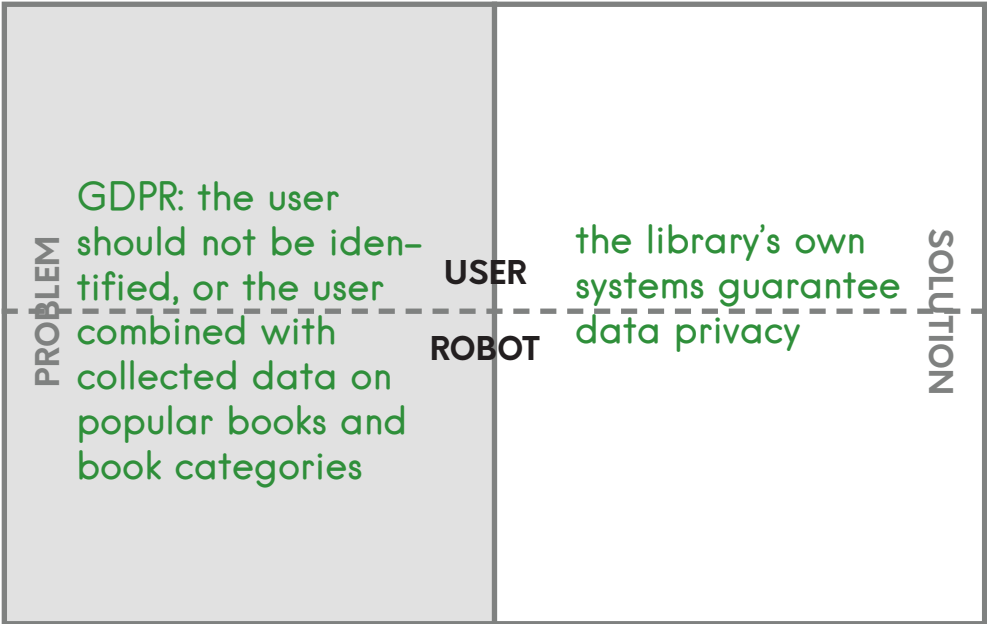
Physical safety

Machines can pinch or crush the user. How is this mitigated?



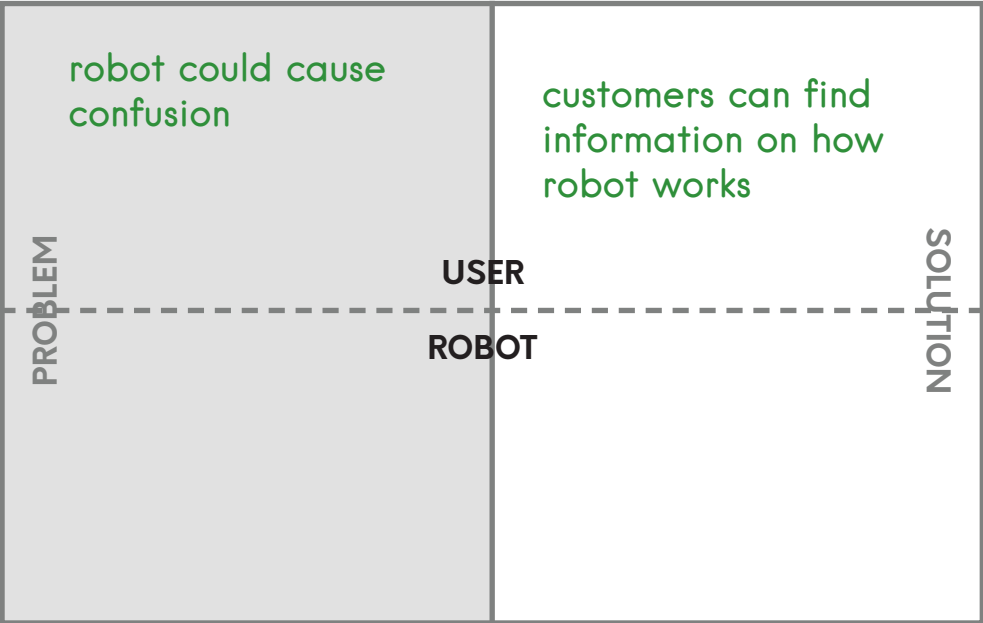
Data security

Is the robot in a unique data collection position? How is the user’s data protected?



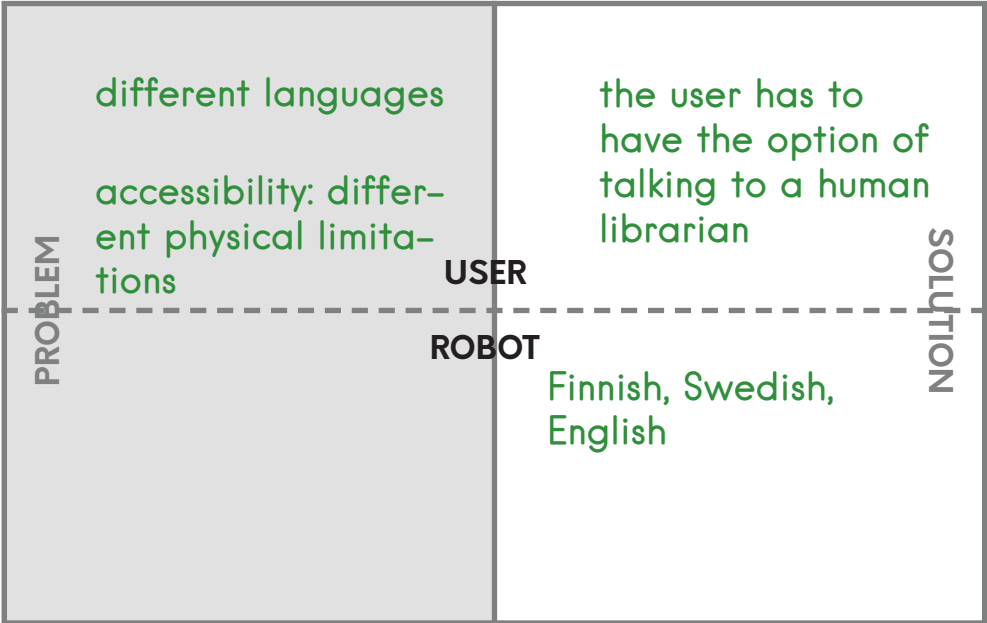
Transparency

How does the robot share an accurate perception of its abilities, intentions and constraints, so the user can evaluate their trust in it?



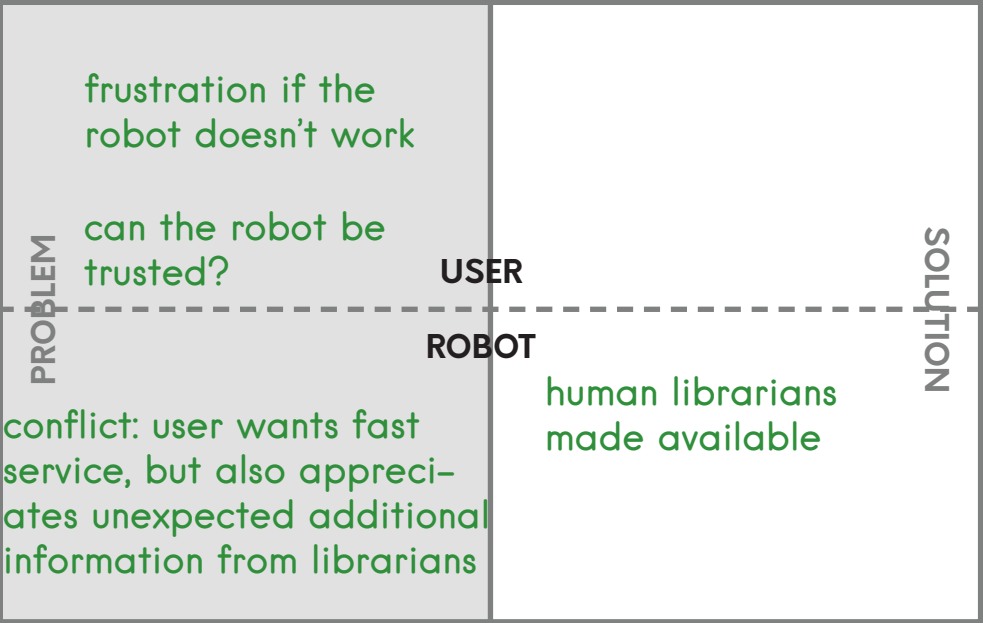
Equality across users

Robots’ algorithms can be biased. A robot’s appearance could reinforce harmful stereotypes. What are potential issues?



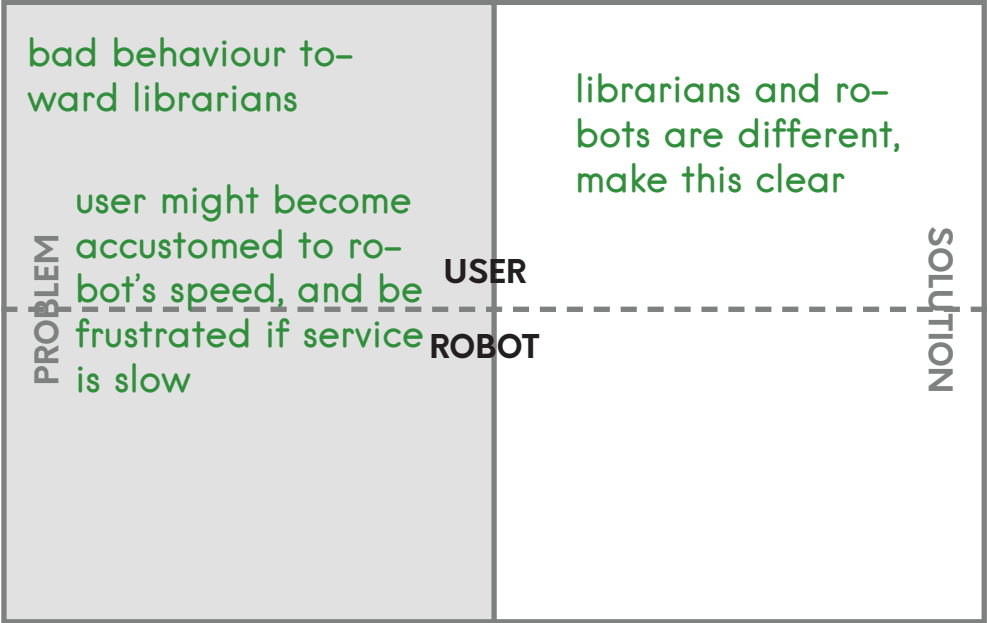
Emotional consideration

People have been shown to form emotional attachments to robots, as if they were alive. Is this a potential problem?



Behaviour enforcement

People could transfer their inappropriate behaviour, such as rudeness, from robots to humans. How is this mitigated?



DESIGN GUIDELINES

SOCIAL ROBOT CO-DESIGN CANVASES

What things are important to consider in the robot’s design?

Advantage guidelines

What advantages can the robotic solution have?
Think back to what you defined in the solution space canvas.

librarians save time, library
saves money

Ethical guidelines

What ethical considerations does the robot have?
Think back to what you defined in the ethics canvas.

equality and accessibility

use of the robot should not
be restricted based on the
user’s technical knowledge

ROBOT DIMENSIONS

Environment guidelines

What should the robot’s context be like?
For example:
• If users are especially vulnerable, should it optimize for support?
• If the robot is part of a strict process, should it optimize for efficiency and security?

background noise

accessibility (can’t be
in the way)

changing library
layout and furniture

avoiding collisions
with people

Form guidelines

What guides the design of the robot’s outward qualities?
For example:
• Should the robot be designed to appear especially approachable, or more industrial?
• Should it be simple, or detailed?

touch screen
--> activation
--> choices

mobility, guiding to
books

RFID-reader to find
books

Interaction guidelines

What guides the design of interaction?
For example:
• Is the interaction multimodal, or is one modality optimized for efficiency?
• Should the user feel empowered and lead the interaction, or does the robot provide safety via leadership?
• Is the goal of the interaction to complete a task, or explore?

touch screen

robot can make
noises, the user uses
the touch pad and
doesn’t talk to the
robot

Behaviour guidelines

What guides the design of the robot’s behaviour?
For example:
• Should behaviour be simple, or sensitive to context?
• Does the robot have internal drivers, or does it react to external stimuli?
• Does the robot have social skills?

treats users equally



ROBOT DESIGN MVP

SOCIAL ROBOT CO-DESIGN CANVASES

It's time to design your robot MVP (Minimum Viable Product)! Remember the guidelines you defined.

Where and when

What place?
What time of day?
Does the place or time change?

Oodi library
3rd floor

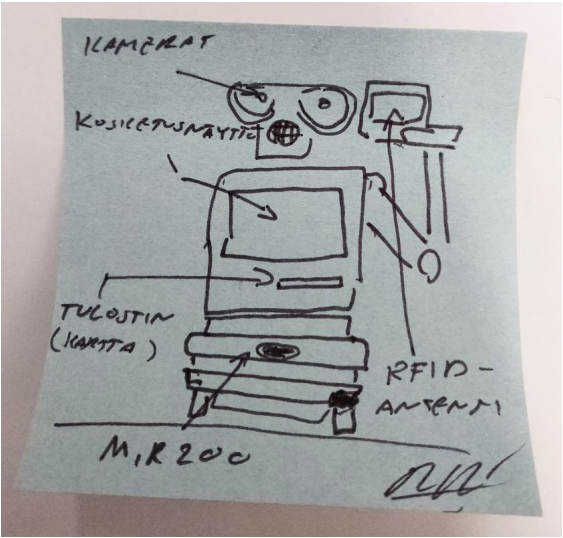
Robot's role

Is the robot a friend? Teacher? Helper?
Something else?

helper

Draw a picture

What does the robot look like?
Is it attached to something?
Does it move around?
Can its appearance be modified?



Personality

Does the robot have specific characteristics?
Does it have emotional states, or needs?

sincerely a machine – beeps expressively

Context-based behaviour

What external and environmental factors affect behaviour?
What data is used to adapt to context?

reacts to book location, mission success

Connection to systems

Is the robot connected to external systems, such as software, databases, or other robots?
How does it use these systems?

library Sierra database, MiR200 robot

Interaction modalities

What modalities are inputs to the robot? What modalities does the robot output?

INPUT

☐

voice

☐

sounds

☐

gestures

☒

movement

☐

touch

☐

smell

☐

facial expressions

☒

screens

☐

lights

☐

other

OUTPUT

☐

voice

☒

sounds

☐

gestures

☒

movement

☐

touch

☐

smell

☐

facial expressions

☒

screens

☒

lights

☐

other

googly eyes

Interaction flow

Describe the most important interaction of the robot.

Note: only fill the bottom row if your robot is teleoperated.

ROBOT OPERATOR (optional)	ROBOT	USER	BEFORE	DURING		AFTER
			at 3rd floor, beeping (attracting user)	instructs user with text on screen	searches library data-base	returns to starting point
			user activates robot	user searches for book	presses button	takes book, loans from machine



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The Social Robot Co-Design Canvases can be found at <https://osf.io/jg2t8/>

Cite as: Minja Axelsson. 2020. Social Robot Co-Design Canvases. <https://doi.org/10.17605/OSF.IO/JG2T8>

ENVIRONMENT

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What is the robot’s context of operation?
You can use the “Ecosystem” canvas to dive deeper into this topic.

Where

What place?
Does it change?

at 3rd floor,
goes between
bookshelves at
non-fiction books

User(s)

Who is using the robot?

library customers,
who are looking
for non-fiction
books

When

What time of day?
Does it change?

during the day

test for one week,
make fixes based
on this

Secondary user(s)

Are there secondary users?
E.g. teachers that help students use a robot.

librarians, don’t use
robot themselves but
may inform library
customers about it

Data collection

Does the robot collect data from its environment?
How is it stored?

mission success, number of
missions

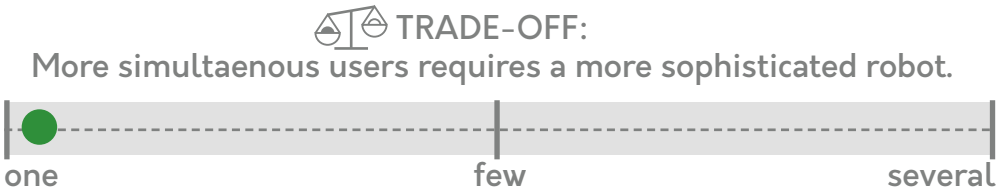
no customer data

popular books and book
categories

 **TRADE-OFF:**
More data collection requires more attention to data security.

Simultaneous users

How many users should be able to use the robot
simultaneously?



External sensors and actuators

Does the robot use external sensors?
Does it have external actuators, such as lights or limbs?

MiR200 robot has Lidar
sensors and wheels

Connection to systems

Is the robot connected to external systems, such as software,
databases, or other robots?
How does it use these systems?

MiR200 navigation system,
library database Sierra



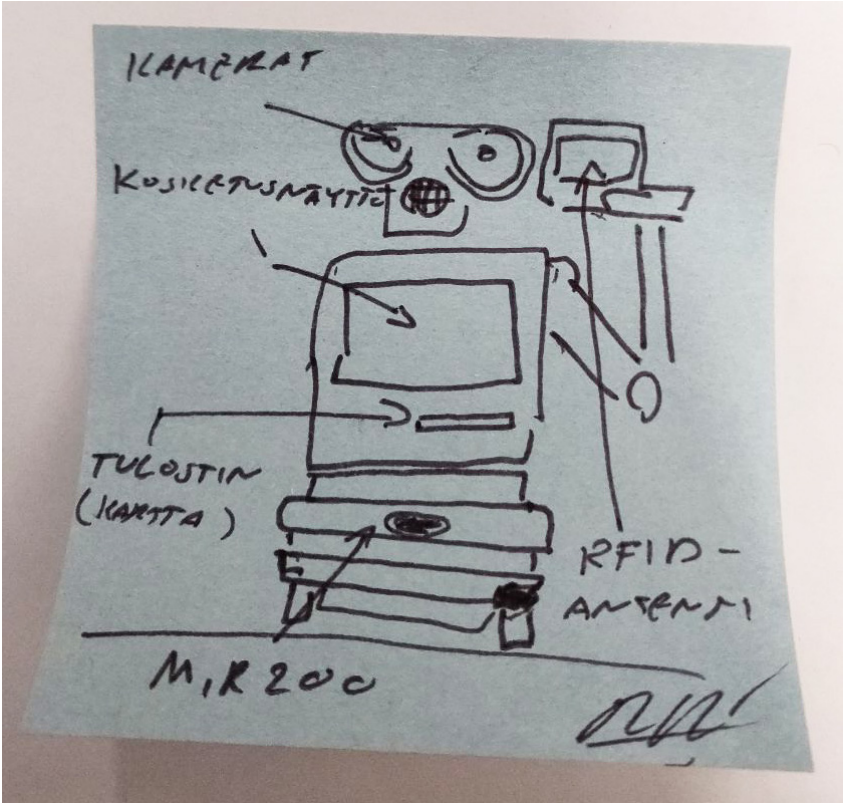
FORM

SOCIAL ROBOT CO-DESIGN CANVASES

What are the robot’s outward qualities? If an existing robot is used, are its qualities modified?

Draw a picture

What does the robot look like?
Is it attached to something?
Does it move around?
Can its appearance be modified?

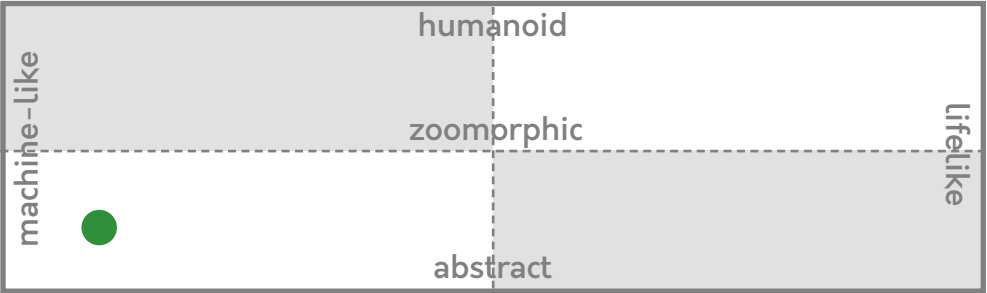


Appearance

Is the robot more machine or lifelike? Is it human-shaped, animal-shaped, or abstract?



Robots that appear more human and lifelike are expected to be more sophisticated in features.



Size

How big is the robot?



Character of movement

What is the robot’s movement like?



Voice & sounds

Does the voice have a gender or an age? What are pitch, speed and prosody like? Is the voice always the same?
Does the robot make sounds: music, “beep”s, animal noises?
When are these sounds heard?

MiR200 navigation system,
library database Sierra

Mobility

Does the robot move across space? Does it move in place?

moves on wheels in library

Visual cues

Does the robot have expressions, lights, a screen or other visual elements?

lights, moving expressively,
googly eyes to indicate
direction of movement

Touch & smell sensations

Is the robot soft or rough, warm or cold?
How does the robot smell?
Touch and smell are especially important in close interactions.

wood material gives warmer
feel, references Oodi’s
architecture



How does the robot interact with the user?
You can use the “Experience Flow” canvas to dive deeper into this topic.

What modalities are inputs to the robot? What modalities does the robot output?

INPUT

- ☒ movement
- ☒ screens
- ☐ voice
- ☐ touch
- ☐ lights
- ☐ sounds
- ☐ smell
- ☐ other _____
- ☐ gestures
- ☐ facial expressions _____

OUTPUT

- ☒ movement
- ☒ screens
- ☐ voice
- ☐ touch
- ☒ lights
- ☒ sounds
- ☐ smell
- ☐ other googly eyes
- ☐ gestures
- ☐ facial expressions _____

Describe the most important interaction of the robot.
Note: only fill the bottom row if your robot is teleoperated.

	BEFORE	DURING				AFTER
USER		user activates robot	user searches for book	presses button	follows robot	takes book, loans from machine
ROBOT	at 3rd floor, beeping (attracting user)	instructs user with text on screen	searches library database	guide to book OR if book not available: suggest reserving		returns to starting point
ROBOT OPERATOR (optional)		NOT APPLICABLE				

How defined is the situation where the interaction takes place?
Does the user always enter and exit at the same point?

A horizontal scale with three labels: 'predefined', 'flexible', and 'freestyle'. A green dot is positioned at the 'predefined' end of the scale.

Who initiates the interaction? Who determines what happens next?

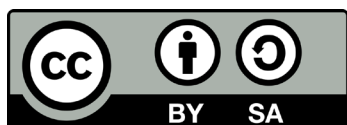
What is the user's goal in the interaction? What describes the interaction?

task completion / informative both explorative

Does the robot have a name which is used during interaction?

 **TRADE-OFF:**
A robot with a name, creates more emotional bond.

Veera



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BEHAVIOUR

SOCIAL ROBOT CO-DESIGN CANVASES

What factors guide the robot's behaviour?

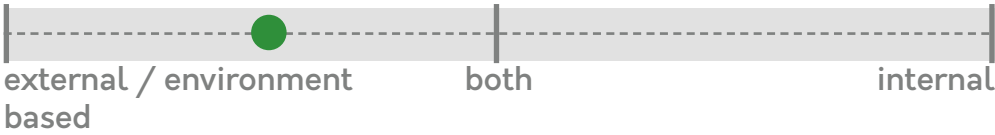
Robot's role

Is the robot a friend? Teacher? Helper?
Something else?

helper

Motivation

How is the robot's behaviour motivated? Is it based on external data, internal models such as personality, or both?



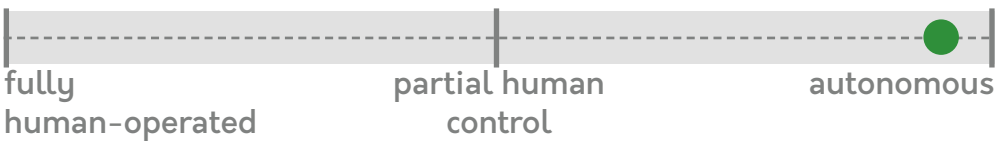
Mode of operation

Is the robot operating by itself, or is a human affecting behaviour? Is a human in full control?



TRADE-OFF:

A human-operated robot requires a good user interface, an autonomous robot requires a good control logic.



Personality

Does the robot have specific characteristics?
Does it have emotional states, or needs?

sincerely a machine – beeps expressively



TRADE-OFF:

More personality creates more emotional bond.

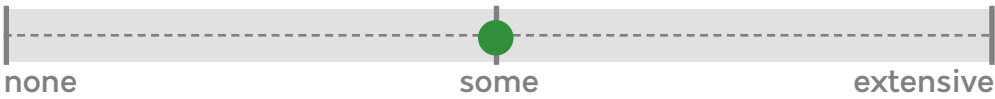
Social skills

How good are the robot's social skills: does it greet a new person and ask their name? Does it follow people with its gaze?



TRADE-OFF:

Extensive social skills require a more sophisticated robot.



Social behaviours

What social behaviours does the robot exhibit?

looks in direction it is moving in,
looks around to attract attention,
can express hesitation with movement

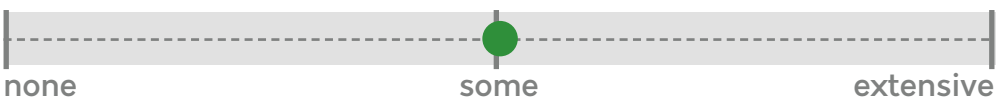
Contextual adaptation

Does the robot's behaviour vary according to context, e.g. by weather or time of day?



TRADE-OFF:

More contextual adaptation requires a more sophisticated robot.



Context-based behaviour

What external and environmental factors affect behaviour?
What data is used to adapt to context?

attracts customers if no missions,
expresses frustration if fails missions often

Personalization

Does the robot behave differently toward different people?
Does it need to remember people, and store their data?

no personalization



TRADE-OFF:

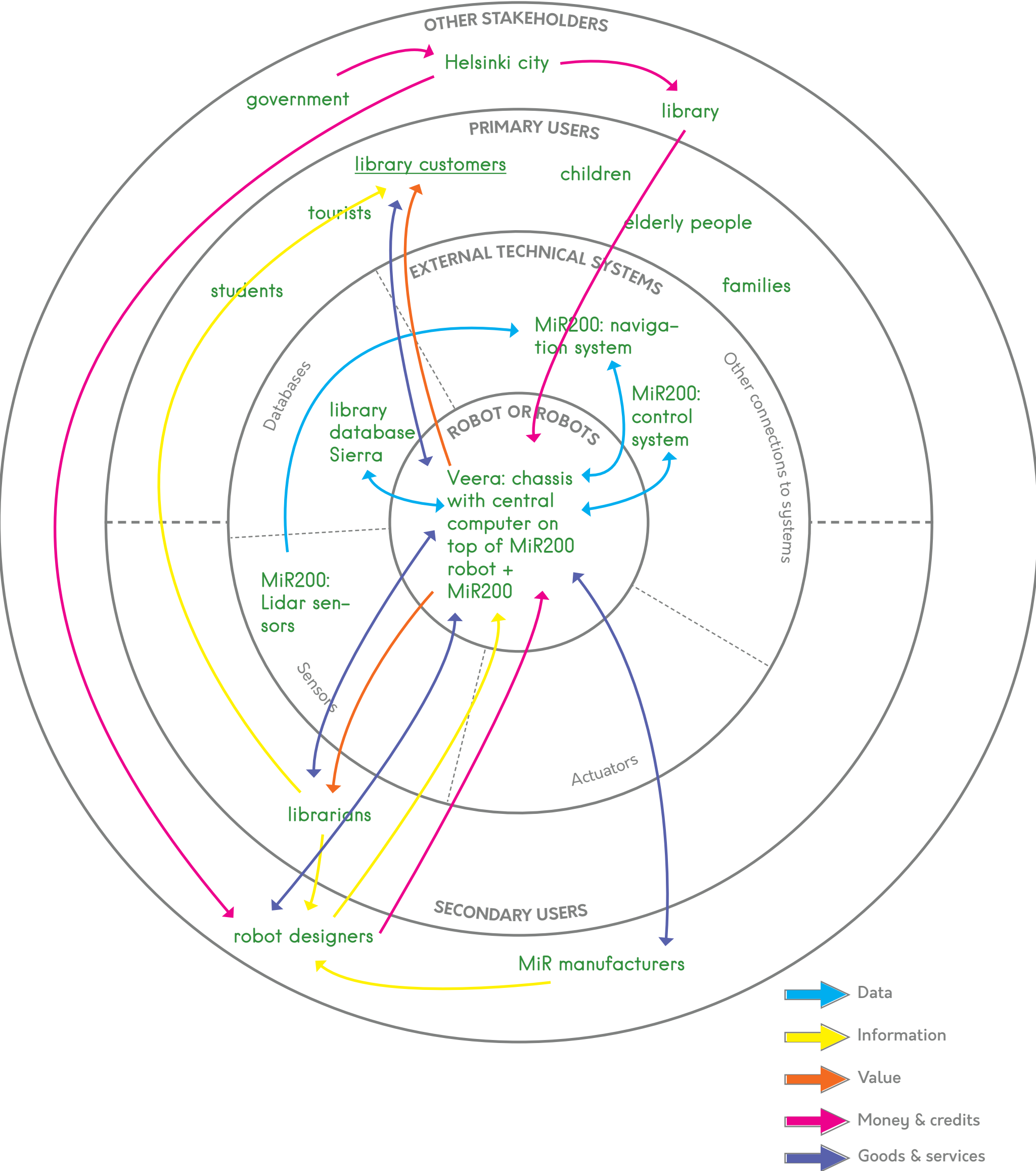
More personalization requires more personal data from the user.



SERVICE ECOSYSTEM

SOCIAL ROBOT CO-DESIGN CANVASES

What stakeholders does the robot's operation involve?
Draw sectors for different stakeholders.
Select a color for each of the resources, and draw arrows to show their flow from stakeholder to stakeholder.



EXPERIENCE FLOW

SOCIAL ROBOT CO-DESIGN CANVASES

Describe the most important interaction of the robot.
Note: only fill the bottom row if your robot is teleoperated.

USER		ROBOT		ROBOT OPERATOR (optional)
FEELING e.g. confused confusion ∴ —	interest ∴ —	curiosity	pleasant surprise ∴ —	satisfaction, excitement ∴ —
THINKING e.g. “I need help.” “I want to find this book, but I don’t know the library well.”	“I wonder if I can use this robot to find what I want, and if it works.”		“It seems to be guiding me in the right direction!”	
DOING e.g. pushes button user sees robot	user activates robot	user searches for book	presses button	starts following robot
DOING e.g. says “Hello!” at 3rd floor, beeping (attracting user)	instructs user with text on screen		searches library database	guide to book OR if book not available: suggest reserving
SENSOR INPUT e.g. sees user’s face	screen registers button press OR registers search term		Lidar used to avoid customers walking in library	
CONNECTION TO SYSTEMS e.g. records data in database	IF search term, searches library data—base Sierra		returns info if book is available	MiR system returns “Done” when robot in correct position
DOING e.g. controls robot’s arm	NOT APPLICABLE			
BEFORE	DURING		AFTER	

