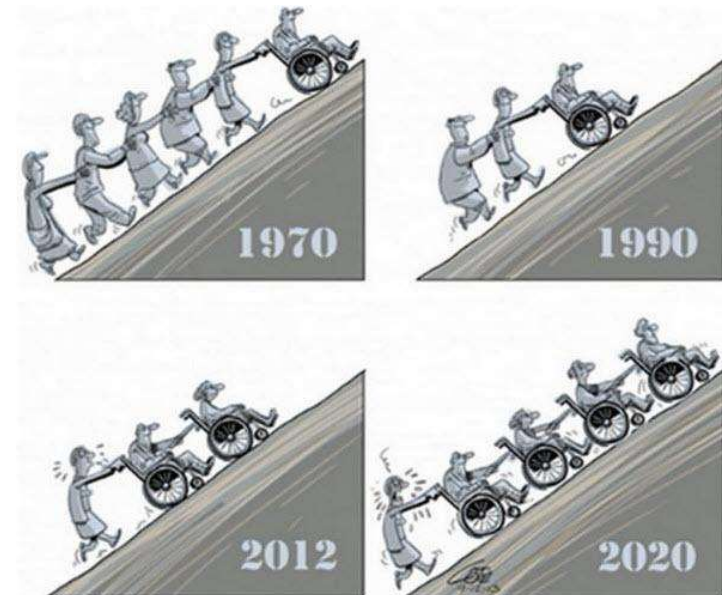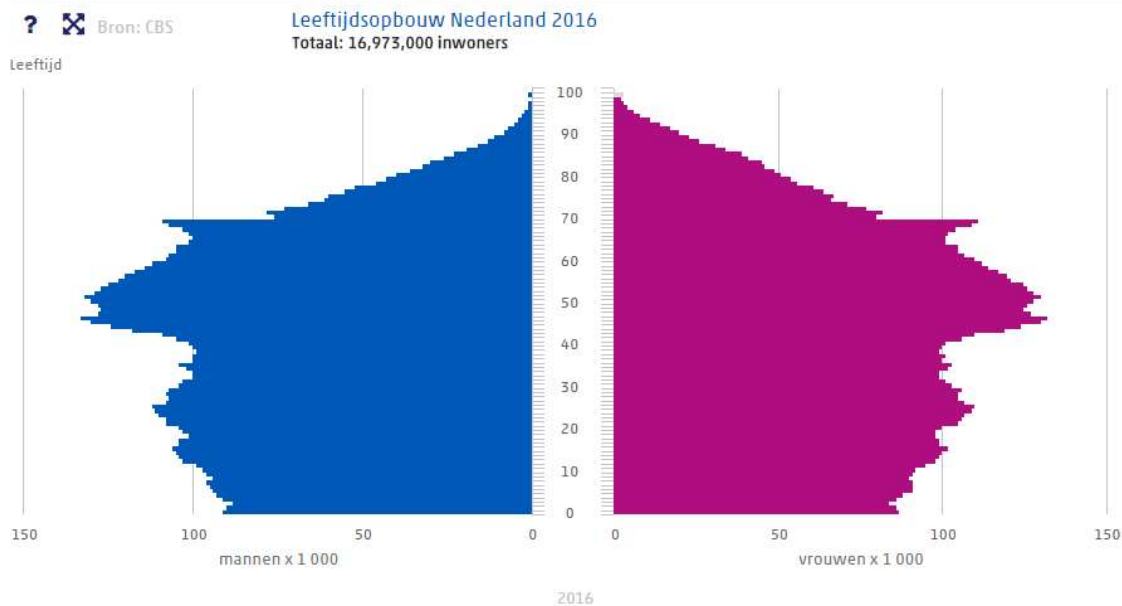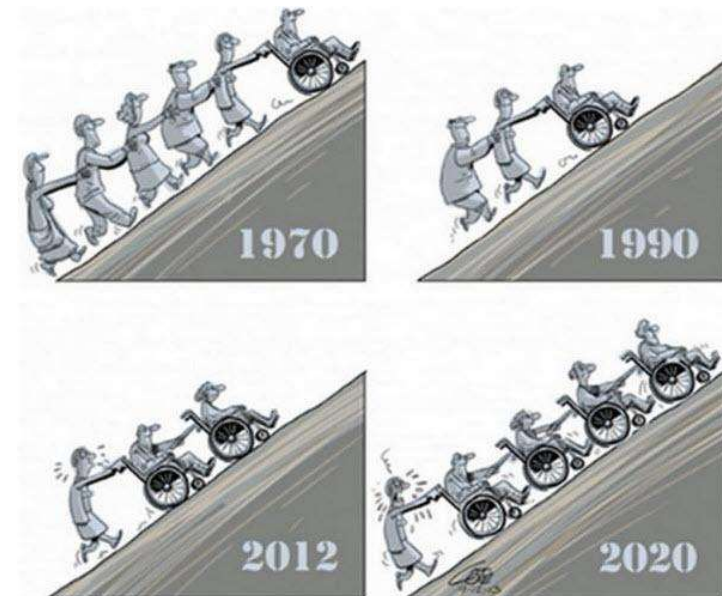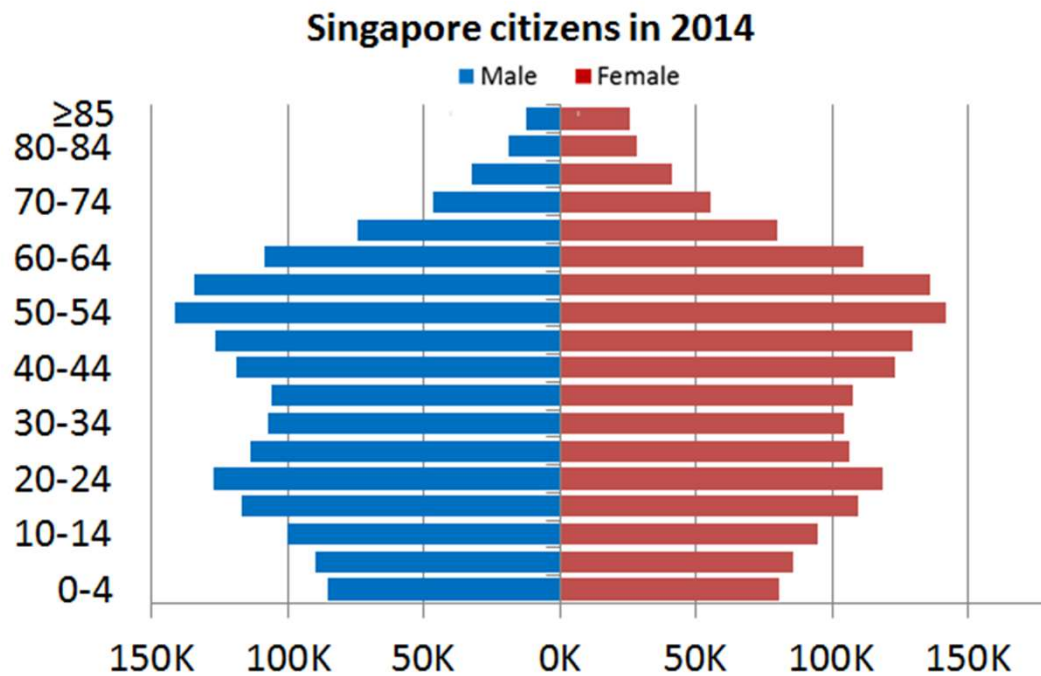HiT

Heemskerk Innovative Technology

A "grey wave" is coming…to the Netherlands

- Amount of pensioners (65+) **increases** → 2.5 M to 4.5 M by 2030
- Available workforce (20-65) **decreases** → 2.7:1 to 2:1 by 2040

The "grey wave" is coming… also to many other places, like Singapore…

(and many other countries)

Singapore citizens in 2014

- Amount of pensioners (65+) **increases** → 0.5M now to 1.5 M by 2030 (!)
- Available workforce (20-65) **decreases** → 4.9:1 now to 2:1 by 2030 (!)

Care robot Rose:
Increasing care productivity and improving care quality!

Meet Rose 🌹
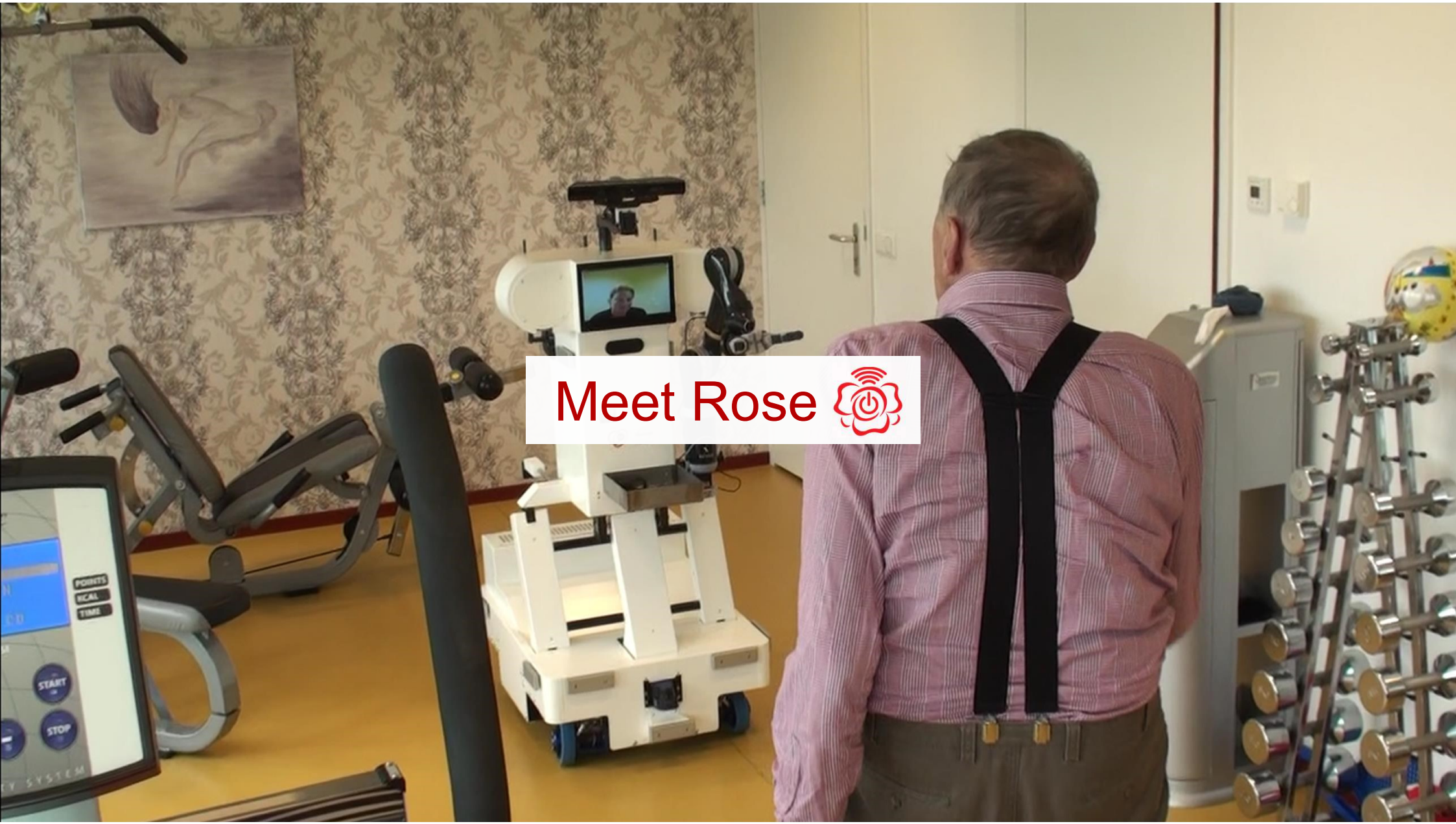
Taking care with robot Rose:
Assisted Living for home care & care homes

Nieuwjaarsbijeenkomst KIVI regio Alkmaar, 17 January 2017

Cock Heemskerk

About HIT

SME:
- 10 employees
- 4 PhDs, ~10 graduate & undergraduates

Location: Delft, The Netherlands

Core business: consultancy in remote handling
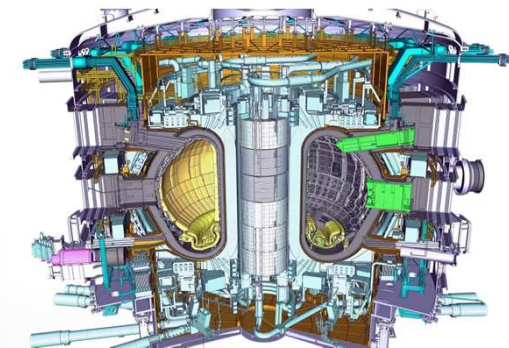
From nuclear fusion into care robots?

Performing critical tasks in uncertain environment

Operator

Tele-operation

Common technology:

Human in the loop
tele-operation

Development emphasis:
Verification and validation

ITER reactors
maintenance robot

Remote robot

Image: Water hydraulic robots developed for the maintenance of ITER reactors - credit: VTT Technical Research Centre of Finland

ROSE: Remotely Operated SErvice Robot

A family of service robots for ADL support in home care & care homes
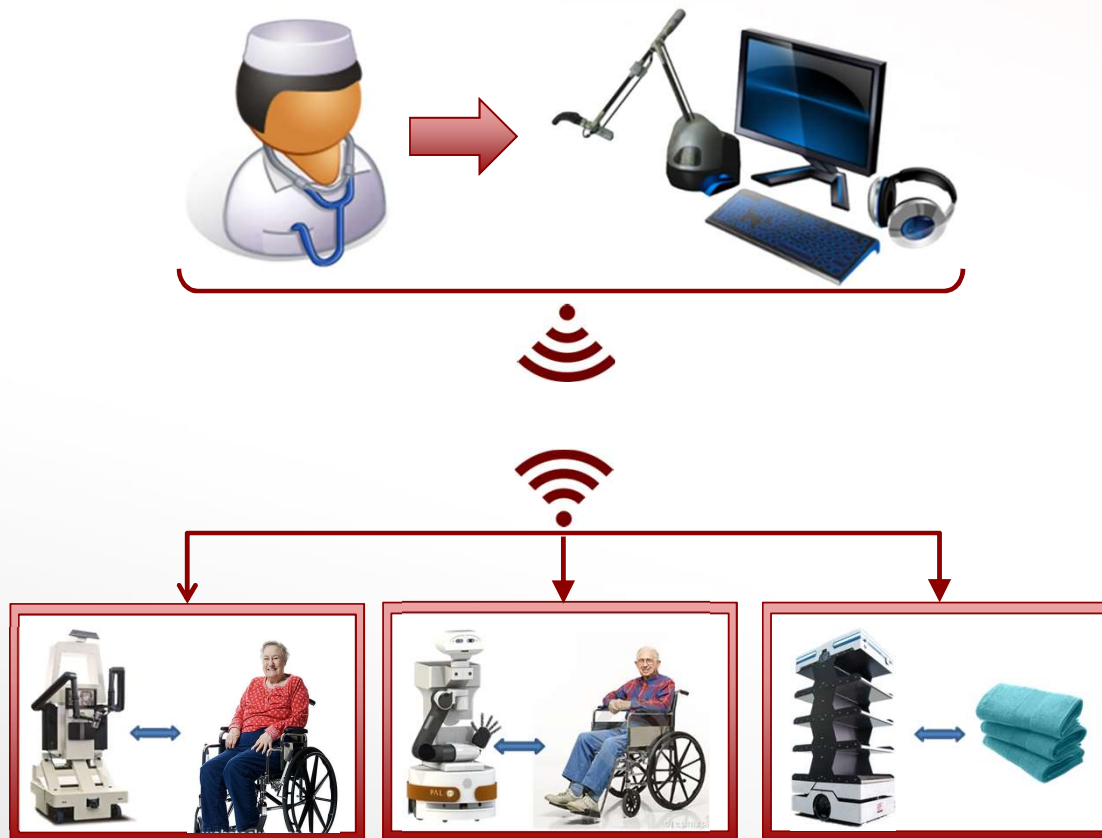
- Efficient care:
  - Increase productivity care professionals (reduce transfer, 1:X)
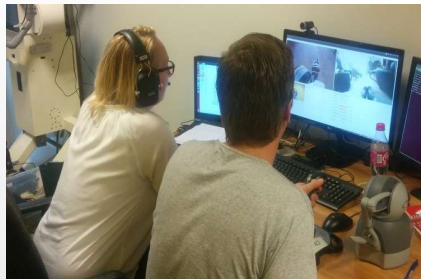 - Increase productivity medical professionals OR decrease stress clients / load informal care takers
- High-quality care
  - More frequent, less waiting
  - More structured contact, less privacy invasive

- Smart & robust robotics:
  - Symbiosis between human intelligence and robot autonomy

- Scalable solution:
  - to increasing demand
  - to international market
  - to technology development (evolving autonomy, h/w costs)

10

Target Market: Medium level care

Tabel 7.1 Aantal cliënten met een geldige indicatie voor AWBZ-zorg op 1 januari 2012, 1 juli 2012 en 1 januari 2013 in Nederland per functiecategorie.

Functiecategorie	1 januari 2012	1 juli 2012	1 januari 2013
PV-sec	152.955	155.255	159.775
VP-sec	21.205	22.185	21.950
PV+VP	33.910	35.985	36.795
BH(+PV/VP)	9.075	9.280	10.045
BGI-sec	78.210	79.995	81.610
BGI+PV/VP/BH	28.165	28.445	28.615
BGG-sec	26.335	26.550	27.015
BGG+PV/VP/BH	24.980	24.585	25.050
BGI+BGG (sec)	21.960	22.700	23.015
BGI+BGG(+PV/VP/BH)	14.755	14.835	15.145
KVB (+PV/VP/BH/BGI/BGG)	17.745	15.455	13.790
Intramuraal GGZ	42.535	44.340	46.040
Intramuraal GZ	107.825	110.275	112.840
Intramuraal VV	198.200	201.840	200.140
Intramuraal Onbekend[3]	65	x	x
Totaal	**778.075**	**791.895**	**802.065**

250.000 potential users in The Netherlands

Clients that **need** support in Activities of Daily Life

- Home care: Assistance (BG) + personal care (PV) + nursing (VP) + treatment (BH)
- Care home clients: Supporting clients with "mild" disabilities

→ Prolonging safe home stay, efficient use of scarce care staff resources

CIZ basisrapportage AWBZ 1 januari 2013

Competition in the care market

Care professional
- + Faster, better
- + More personal
- ▬ Lack of available staff
- ▬ Rotating staff

iPad on wheels "robot"
- + Cheaper
- ● Mobile telepresence
- ▬ No physical tasks

Robot 'Paro'
- + Cheaper
- ▬ No telepresence
- ▬ No physical tasks
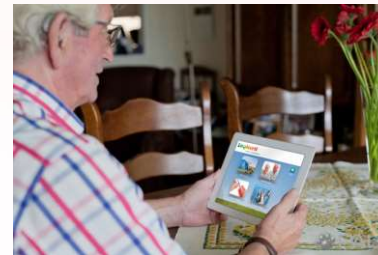
"Facetime" (Beeldzorg)
- + Cheaper
- ● Telepresence
- ▬ No mobility
- ▬ No physical tasks

Home automation (Domotica)
- + Cheaper
- ▬ Bound to specific home
- ▬ Specific functionality

Helping dog
- + Personal companion
- ▬ Specific tasks

State of the art in care robots

Commercial:
- **Paro**
- **Zora**

New:
- **Tinybots**
- **LEA**

State of the art in care robots

Experimental:
- Robear
- Toyota HSR
- Pepper
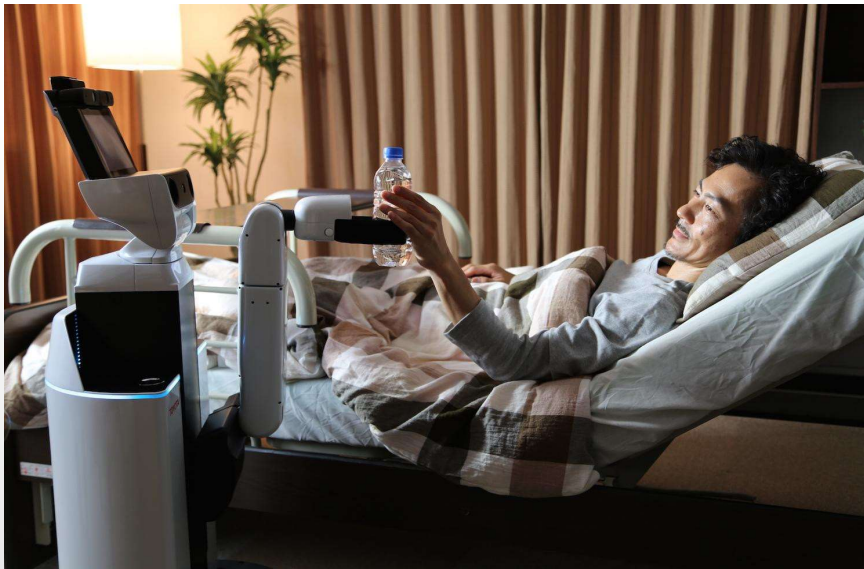
Robots in de zorg

Zorgrobot Alice

Sociale interactie:

"Wat een knappe man..."
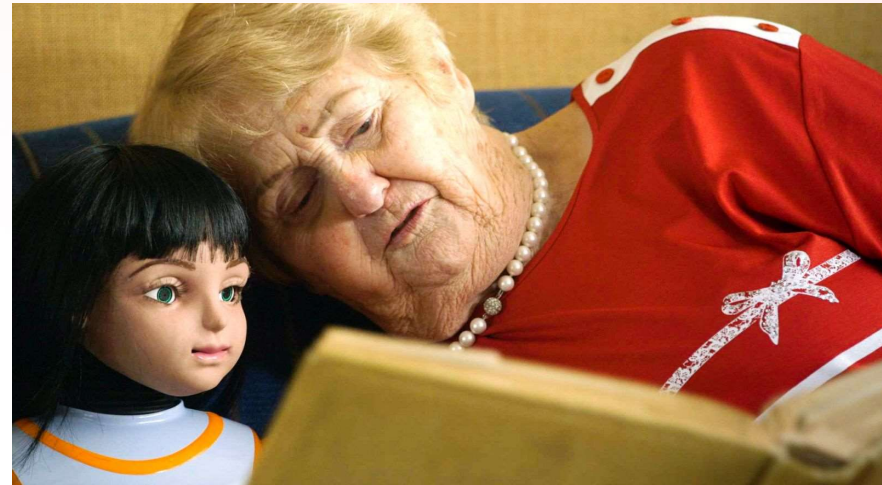
Zorgrobot Rose
ADL ondersteuning:
Helpt mensen

Does Rose work?

Field tests at care institutions
Goal: explore the business case

Elderly (3x)

Disabled living independently (1x)

Method: Participatory action analysis

- semi-structured depth-interviews (clients, caregivers, managers)
- 25+ clients, 5+ employees
- all teleoperated, some automation in navigation
- evaluation
  - Material value (time)
  - Immaterial value (questionnaire: independence, security, social contact, movement)

Trials: Measuring values - three step approach

1) Select ADL activities – at client request (need based)

2) Client ⟶ immaterial value

3) Employee ⟶ time / material value

What do clients need?

Support in Activities of Daily Living

Food & drinks ('rush' hours)

Pick up from floor

Load washer, dryer

Remote supervision
(e.g. toilet visit)

Light out, open/close curtains

Search for glasses,
remote control, phone

Audio/video contact
with family

Logistics

Dispose garbage

Handle laundry

Screencare(Plus)

Ease contact with
medical professionals

19

Results

What do clients need?

Support in Activities of Daily Living

Food & drinks ('rush' hours)

Pick up from floor

Light out, open/close curtains

Load washer, dryer

Remote supervision (e.g. toilet visit)

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Audio/video contact with family

Logistics

Dispose garbage

Handle laundry

Screencare(Plus)

Ease contact with medical professionals

We did all this with success.

HiT
Heemskerk Innovative Technology

Results: case study setting the table

Challenging!

Results
- Opening and closing fridge, drawers
- Grasping and placing placemat, knife, straw
- Grasping and placing eggs (in sack), milk carton, fruit

Challenges
- Limited awareness during navigation (situation awareness, network)
- Limited visual feedback manipulatioin
- Limited reach (high shelves, floor)
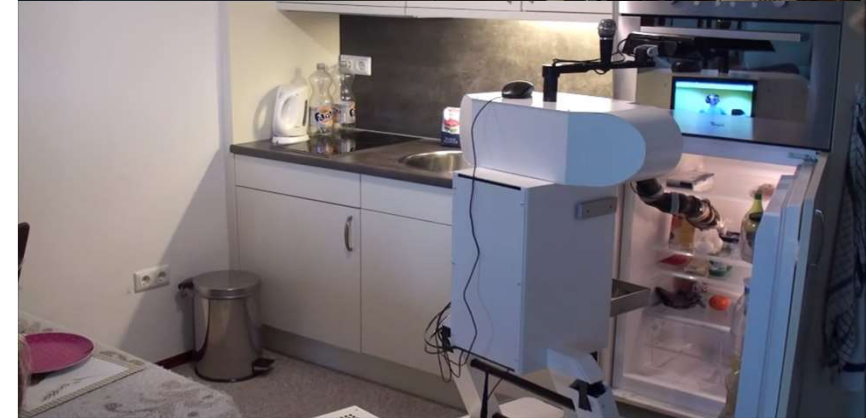
Results: Immaterial Value

Positive reports (5-point Likert scale):
- independence
- security
- social contact
- movement

" [Rose can do things which make me independent] "

" [Why can we go to the moon, but don't we have a robot that puts the garbage outside] "

" [I want Rose just for myself] "

" [Rose gives me hope for the future] "

Results: material value (preliminary)

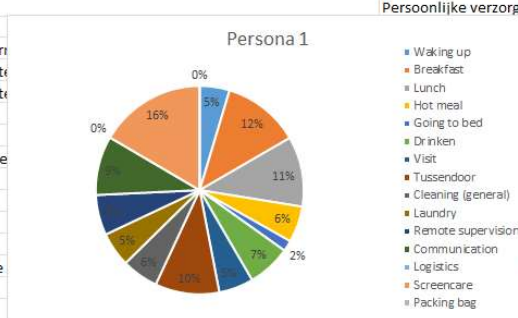|	A	B	C	D	E	F	G	H	I
34		Rapportage warme maaltijd		Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
35	Avond	Going to bed								
36		Steunkousen uittrekken		Persoonlijke verzorging	wlz	Verpleging	€	4,08		
37		Toiletbezoek	Beeldschermcontact	Persoonlijke verzorging	wlz	Oproepbare verzorging	€	2,86	1	5
38		Aan de wastafel gezicht wassen en tanden poetsen	Persoonlijke verzorging- spiegel pakken en voorhouden	Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
39		De cliënt kleedt zich uit	Aankleden - kleding klaarleggen	Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
40		In bed gaan		Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
41		Slaapkamer in de nachtstand zetten		Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
42		Rapportage naar bed gaan		Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
43	Dagbesteding	Drinken								
44		Drinken pakken en neerzetten	Theezetten	Persoonlijke verzorging	wlz	Oproepbare verzorging	€	2,86	3	5
45		Het drinken van de Cliënt	Beeldschermcontact	Persoonlijke verzorging	wlz	Oproepbare verzorging	€	2,86	3	5
46		Opruimen van de lege beker		Huishoudelijke hulp	wmo	HH1	€	1,20	3	5
47		Visit								5
48		Bezoek ontvangen		Begeleiding	wmo	Informele begeleiding	€	1,67	1	5
49		Drankje of een hapje aanbieden		Begeleiding	wmo	Informele begeleiding	€	1,67	1	5
50		Spelletje		Begeleiding	wmo	Informele begeleiding	€	1,67	1	5
51		Bezoek uitlaten		Begeleiding	wmo	Informele begeleiding	€	1,67	1	5
52		Tussendoor								
53		Bestelling Ontvangen	Vuilnis buiten zetten	Begeleiding	wmo	Informele begeleiding	€	1,67	1	5
54		Bestelling Plaatsen		Persoonlijke verzorging	wlz	Persoonlijke verzorging		2,67	1	5
55		Toiletbezoek			wlz	Oproepbare verzorging	€	2,86	3	5
56		TV kijken / Muziek luisteren	Computer...		wmo	HH1	€	1,20	2	5
57		Lezen	Tijdschrifte...		wmo	HH1	€	1,20	2	5
58		Post/krant halen	Tijdschrifte...		wmo	HH1	€	1,20	1	5
59		Telefoneren/skype (contact leggen)			wmo	Informele begeleiding	€	1,67	0	5
60		Afspraken maken			wlz	Persoonlijke verzorging	€	2,67	1	5
61		Voorwerpen zoeken	Object zoe...		wmo	HH1	€	1,20	1	5
62		Huisdier eten geven			wmo	Informele begeleiding	€	1,67	3	5
63		Gordijnen/Zonwering open/dicht			wmo	Informele begeleiding	€	1,67	2	5
64		Licht aan/uit			wmo	Informele begeleiding	€	1,67	5	5
65		Deur openen/sluiten			wlz	Oproepbare verzorging	€	2,86	10	5
66		Medicatie aanreiken	Medicatie		wlz	Persoonlijke verzorging	€	2,67	5	5
67		Betalingen doen			wmo	Informele begeleiding	€	1,67		
68		Begeleiden Lopen			wlz	Persoonlijke verzorging	€	2,67	3	5
69		Rapportage tussendoor		Persoonlijke verzorging	wlz	Persoonlijke verzorging	€	2,67	1	5
70	Schoonmaken	Cleaning (general)								
71		Afval verzamelen en wegbrengen	Vuilnis weggooien/buitenzetten	Huishoudelijke hulp	wmo	HH2	€	1,57	0	5

Persona 1

- Waking up — 5%
- Breakfast — 12%
- Lunch
- Hot meal — 11%
- Going to bed — 6%
- Drinken — 2%
- Visit — 7%
- Tussendoor — 10%
- Cleaning (general)
- Laundry
- Remote supervision
- Communication — 16%
- Logistics — 0%
- Screencare — 0%
- Packing bag

Case / Uitleg indeling

Ready | 80%

Results: material value (preliminary)

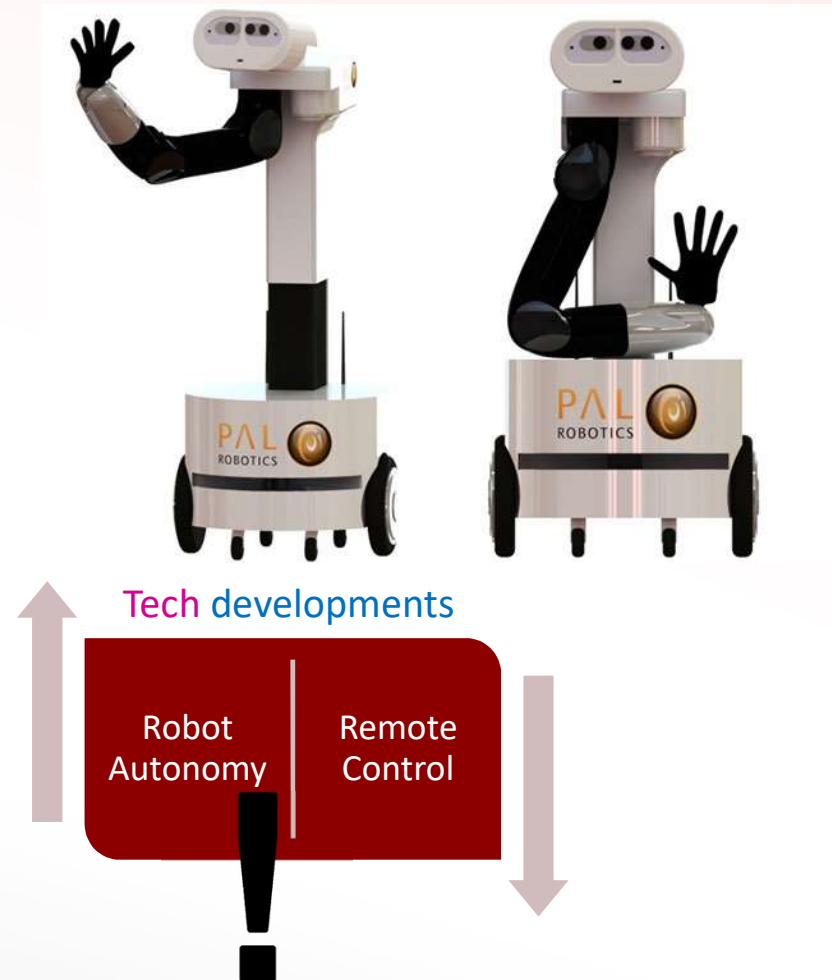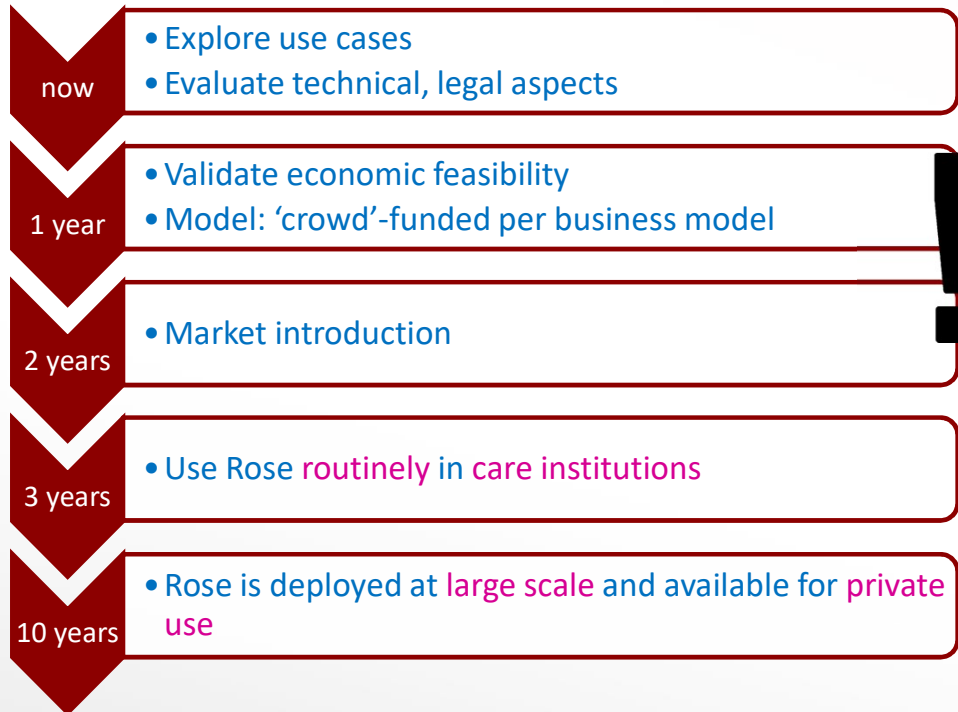Time reduction required for economic feasibility
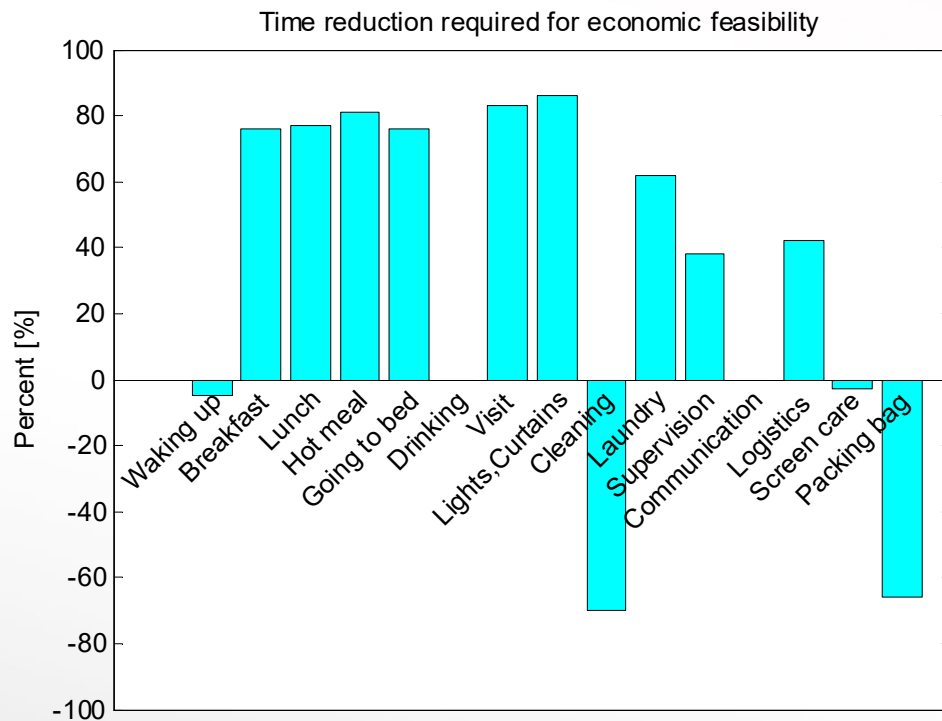
Reducing task execution time:
- 30-40% of time is spent in navigation (except for logistics, here >60% is navigation)
- Optimize telemanipulation
  – Training
  – Operator situation awareness (visual, force)
  – Kinematic optimization
- Faster robot
- Automate navigation

→ Short term focus: logistics and screen care
→ Continuing R&D for ADLs

What's next?

Market introduction 2018?

now
- Explore use cases
- Evaluate technical, legal aspects

1 year
- Validate economic feasibility
- Model: 'crowd'-funded per business model

2 years
- Market introduction

3 years
- Use Rose routinely in care institutions

10 years
- Rose is deployed at large scale and available for private use

Tech developments

Robot Autonomy | Remote Control

Development Challenges

Continue real-life trials to identify Business Cases and essential improvements

- Application
  - Develop and demonstrate additional daily life task capabilities
- Cost
  - Decrease cost
- Hardware
  - Increase HW capabilities
- Software
  - Increase SW functionality
- Autonomy
  - Increase autonomy

Specific NL Challenges

- Financing market validation
- Split between WMO/ WLZ

Conclusion

- Rose is a tele-operated care service robot, performing
  - Activities of Daily Life (ADL): Explicit client requests for "simple" tasks
  - Logistics
  - Screencare(Plus)
- Technologies from nuclear world help to make Rose safe and robust
- Scalable concept
- Evidence based on real life trials
- Immaterial value evident
- First results for material value promising
- Next period: validate economic feasibility in The Netherlands and in Singapore (?)

Thanks for your attention!

Contact

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Partners & Clients