

Nordic Welfare Center – delegation visit

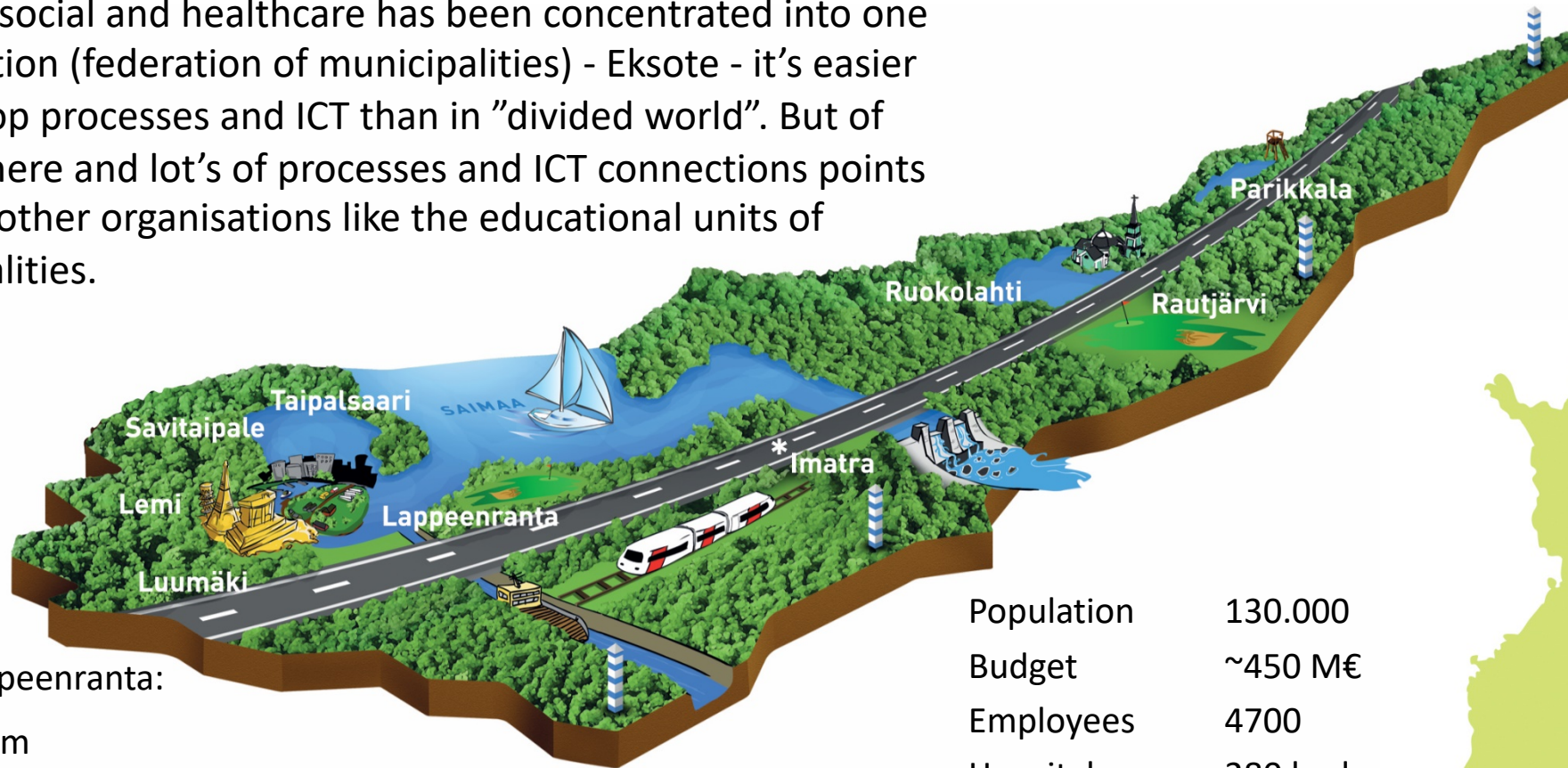
Digitalization and CRM



Eksote
10.9.2019 (15.10-15.50)
Toni Suihko, Chief Information Officer

THE ANATOMY OF THE EKSOTE

Because social and healthcare has been concentrated into one organization (federation of municipalities) - Eksote - it's easier to develop processes and ICT than in "divided world". But of course there are a lot of processes and ICT connections points towards other organisations like the educational units of municipalities.



Distances from Lappeenranta:

- to Helsinki 230 km
- to St. Petersburg 230 km
- to Russian borders 35 km

Population	130.000
Budget	~450 M€
Employees	4700
Hospital	280 beds
Nine wellbeing centers in our regions	

“Renewal is under process but it appears that there will be no new Midas stone to be found. It about the integration also in the future”

Strategy 2014–2018

Making it easier to cope at home

- Our customers look after their functional ability and wellbeing independently.
- Our care and service models are light, rehabilitative, and home-oriented.
- Our electronic and low-threshold services are easy to use.
- We guide our customers to the right place at the right time.
- Urgent care and help in crisis situations are easily available.



Mega trends

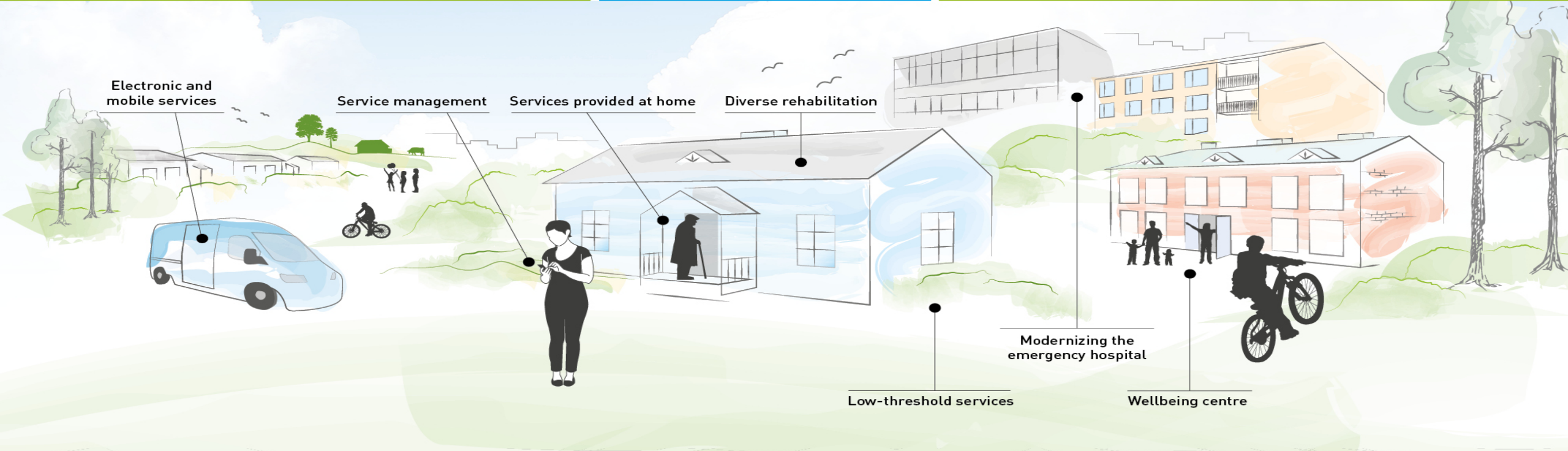
- Ageing of the population
- Increasing individuality and customer-orientation
- Increased emphasis on social and psychological needs
- Use of smart technology and increasing prevalence of virtual environments in everyday life

Our vision

Making it easier to cope at home

Our goals

- Supporting the independence of the customers
- Improving the availability of services
- Increased social participation
- A motivating and attractive workplace
- Balanced economy



Our values

Working together with customers

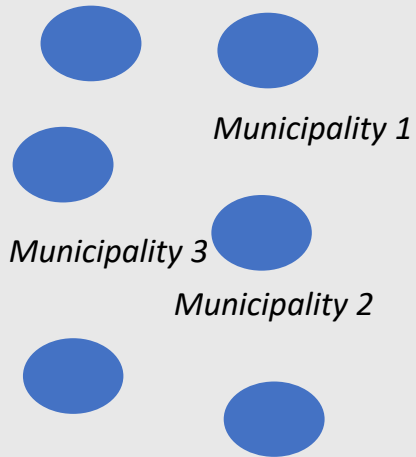
Willingness to take responsibility

Smooth interaction

Courage to renew

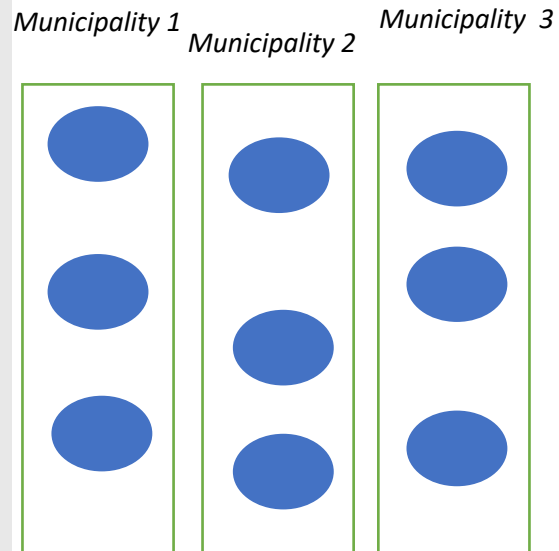
PHASES IN SERVICE DEVELOPMENT

DIFFERENT UNITS IN HIERARCHY



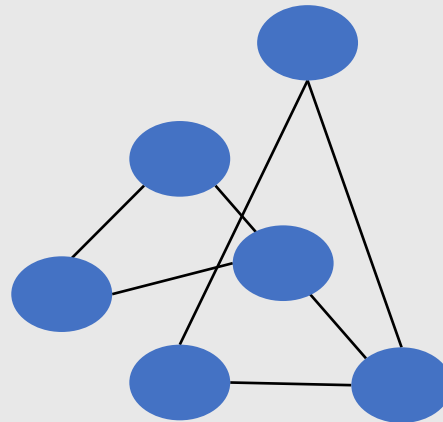
- Added value comes from hierarchies
- Municipal-based structure
- Main focus is on professionals and organization

ADMINISTRATIVE INTEGRATION



- Added value comes from economics of scale
- Contract based operation structure
- Main focus is on professionals and organization

FUNCTIONAL INTEGRATION



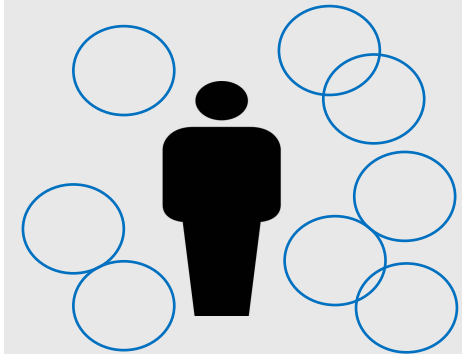
- Added value comes from data
- Functionally integrated structure
- Utilization of digitalization is beginning

ECOSYSTEM OF ACTORS



- Added value comes from data analyzing and artificial intelligence
- Orchestrate the whole ecosystem by AI with person level data - main focus on the citizen

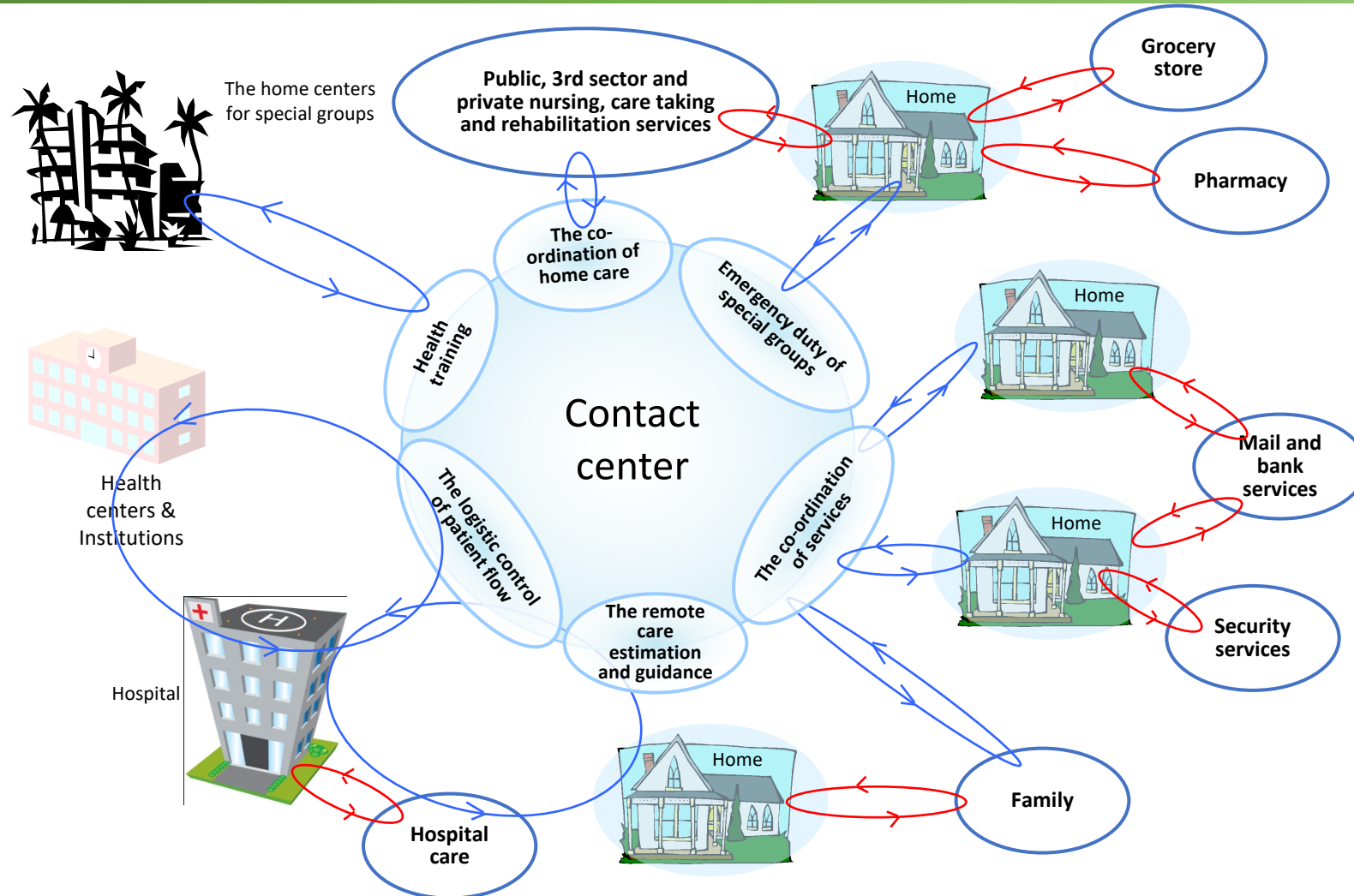
ECOSYSTEM OF THE CUSTOMER



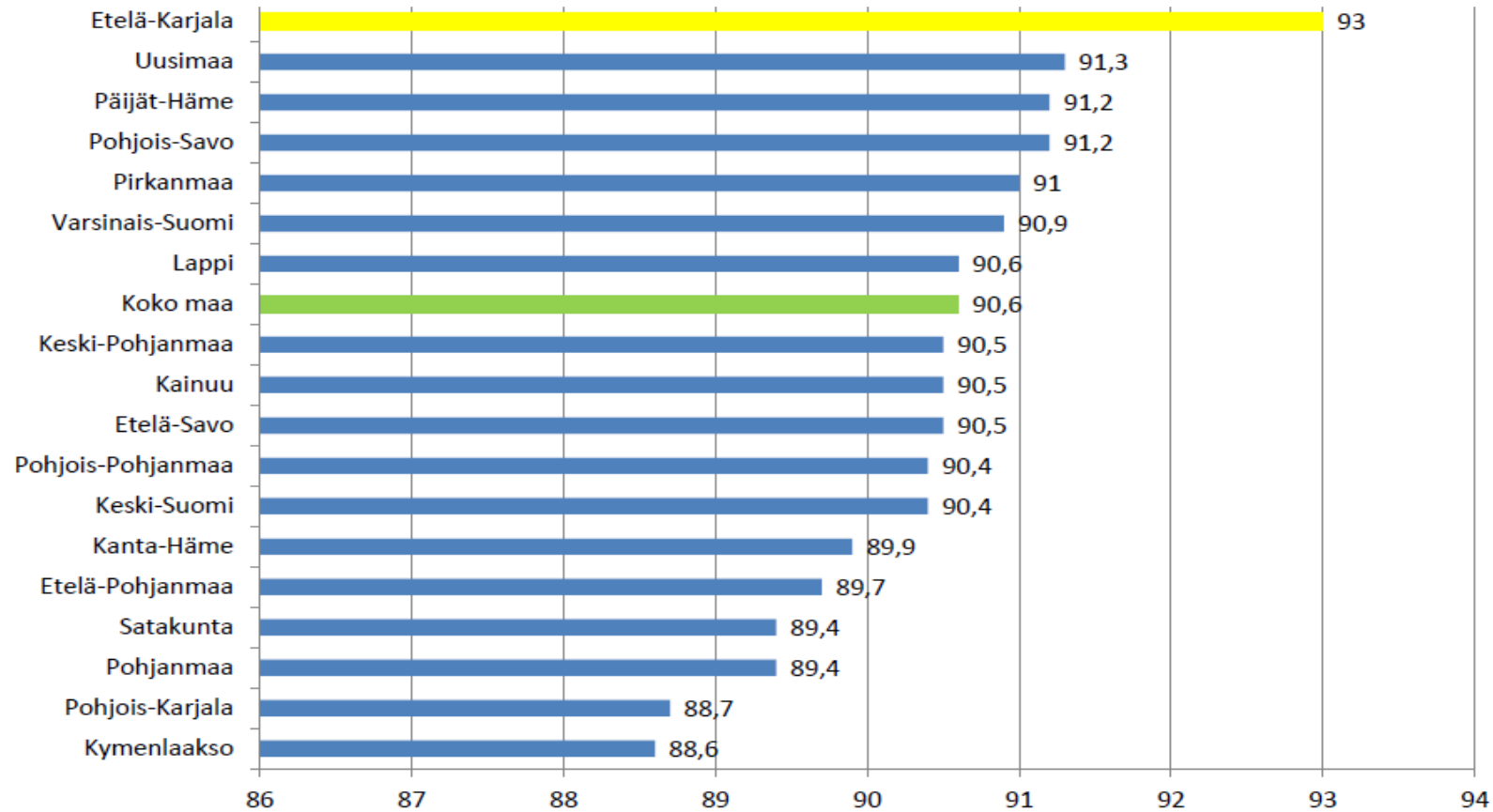
- Added value comes from personalized data analytics and AI
- Emphasizes customer's own responsibility, activity and customer experience. Customer owns data
- Network of networks where organizations' interfaces have to be open according to customer's needs

STRATEGICAL TRANSFER - AUTONOMY OF PROFESSIONS

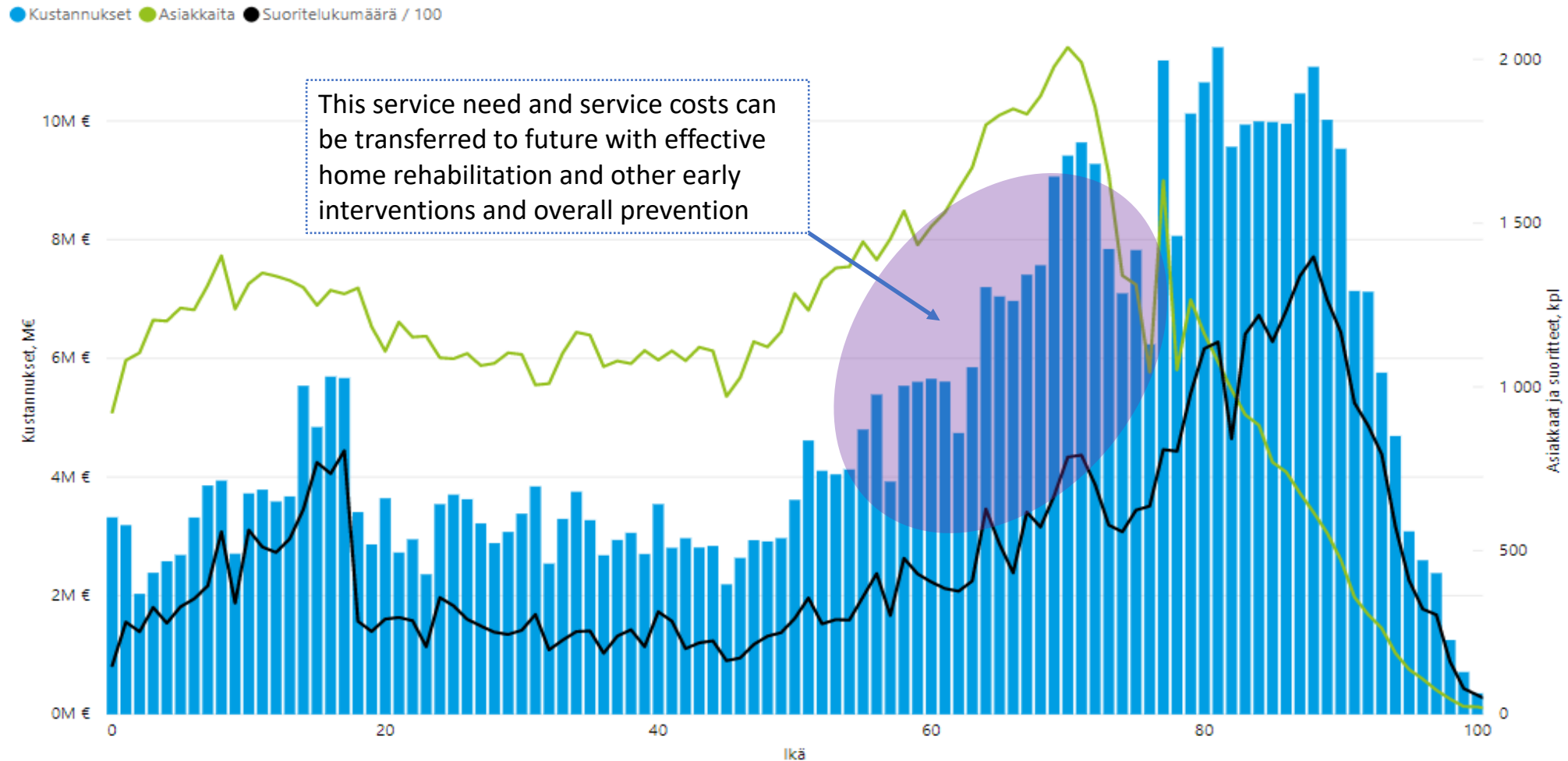
SUPPORTING THE COPING AT HOME IS NOT EASY TASK - IT'S ABOUT MANAGING THE WHOLE ECOSYSTEM



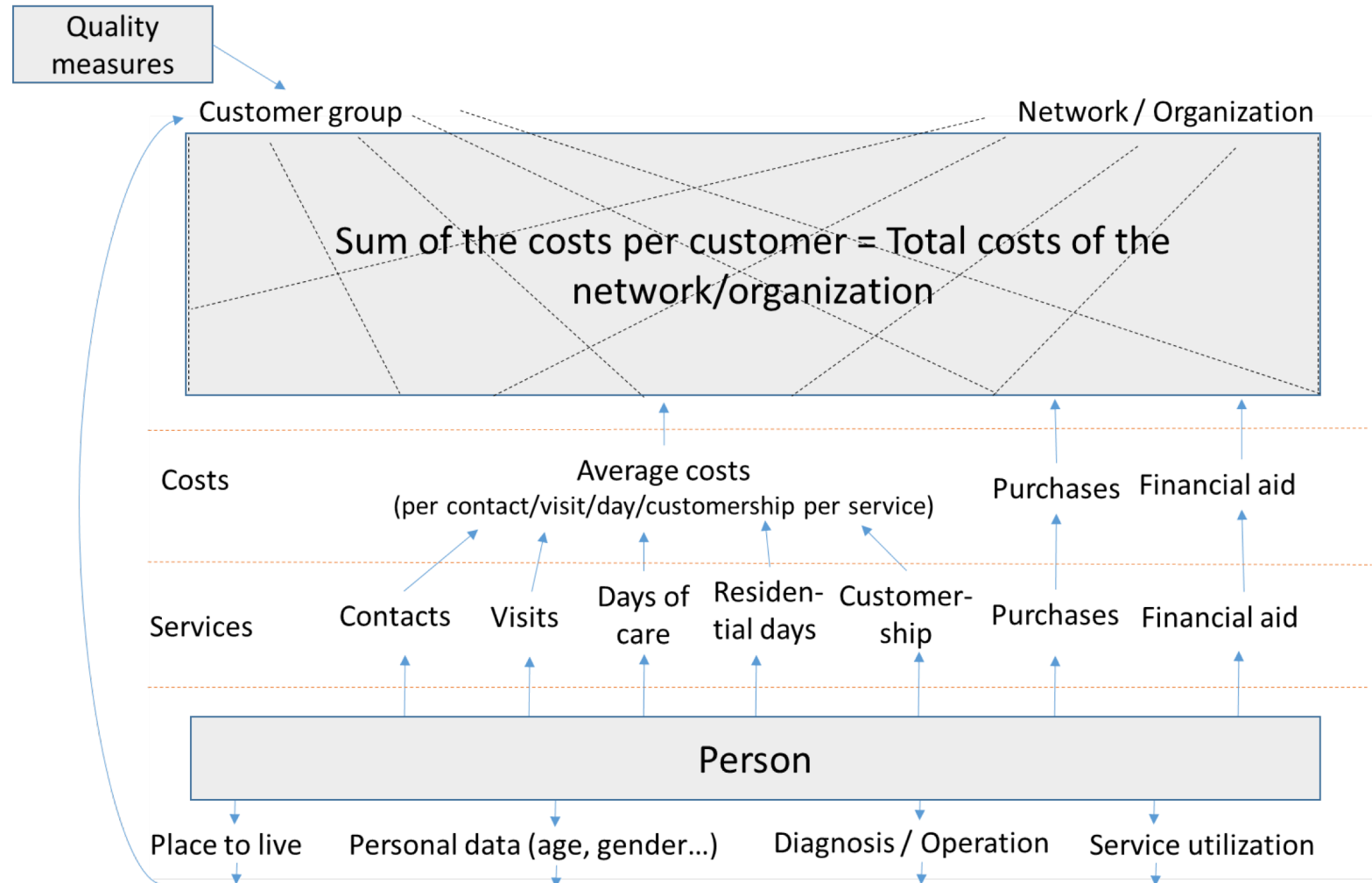
OVER 75 YEAR OLDS LIVING AT HOME (% OF AGE GROUP)



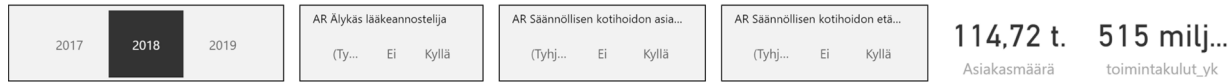
COST BY AGE - WE MUST PUSH THE AGE BASED COST FURTHER IN THE YEARS OF OUR CUSTOMERS LIFE



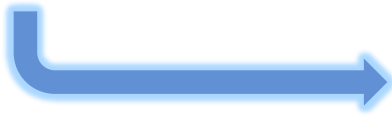
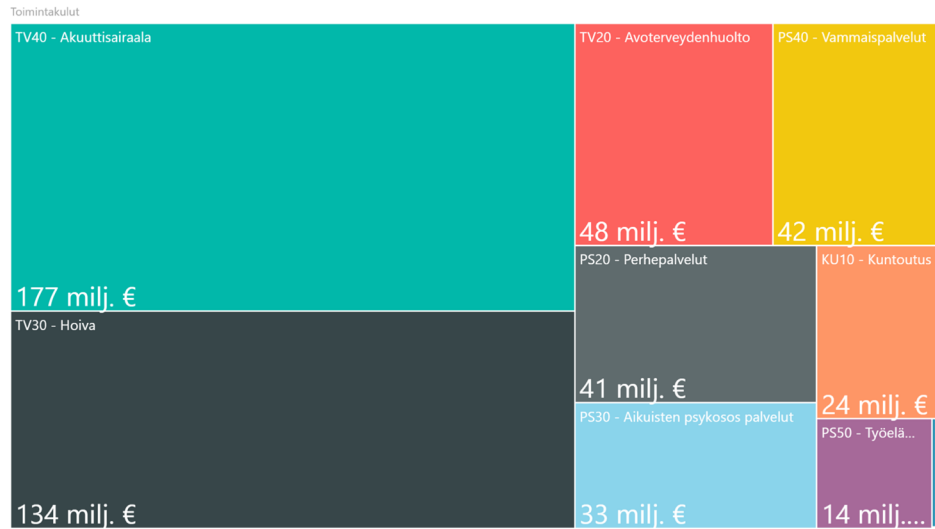
INTEGRATED DATA MODEL OF EKSOTE



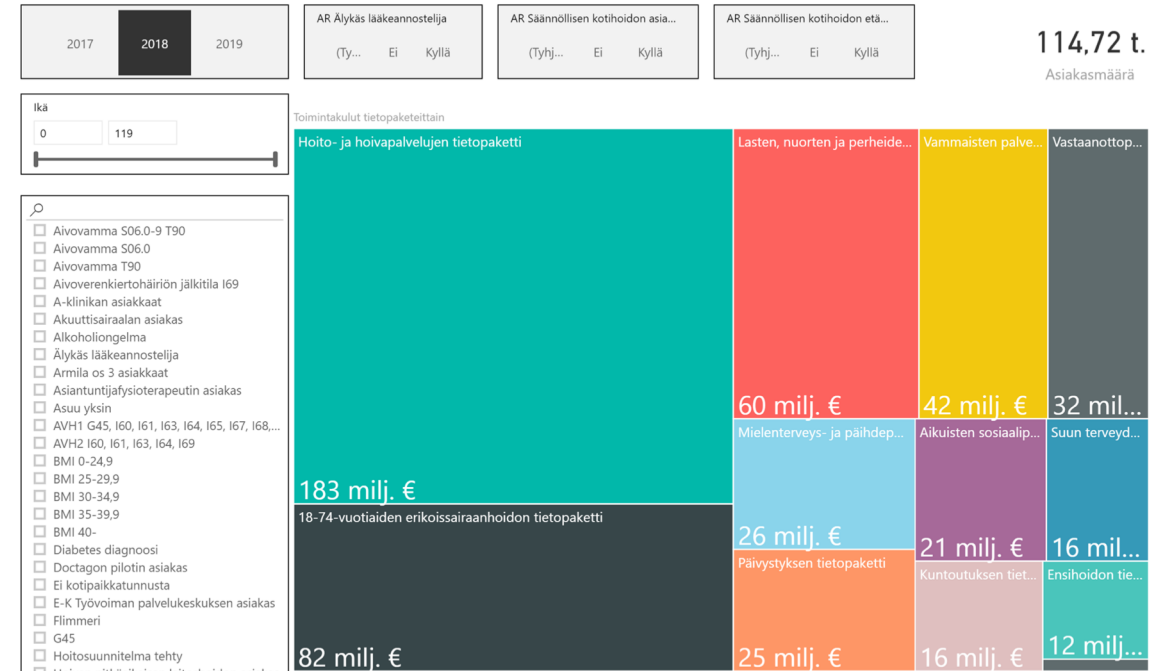
FROM ORGANISATION TO CUSTOMER SEGMENTS (sote-tietopakettit)...



- Aiovamma S06.0-9 T90
- Aiovamma S06.0
- Aiovamma T90
- Aivoverenkiertohäiriön jälkitila I69
- A-klinikan asiakkaat
- Akuuttisairaalan asiakas
- Alkoholiongelma
- Älykäs lääkeannostelija
- Armila os 3 asiakkaat
- Asiantuntijafysioterapeutin asiakas
- Asuu yksin
- AVH1 G45, I60, I61, I63, I64, I65, I67, I68,...
- AVH2 I60, I61, I63, I64, I69
- BMI 0-24,9
- BMI 25-29,9
- BMI 30-34,9
- BMI 35-39,9
- BMI 40-
- Diabetes diagnoosi
- Doctagon pilotin asiakas
- Ei kotipaikkatunnusta
- E-K Työvoiman palvelukeskuksen asiakas
- Flimmeri
- G45
- Hoitosuunnitelma tehty



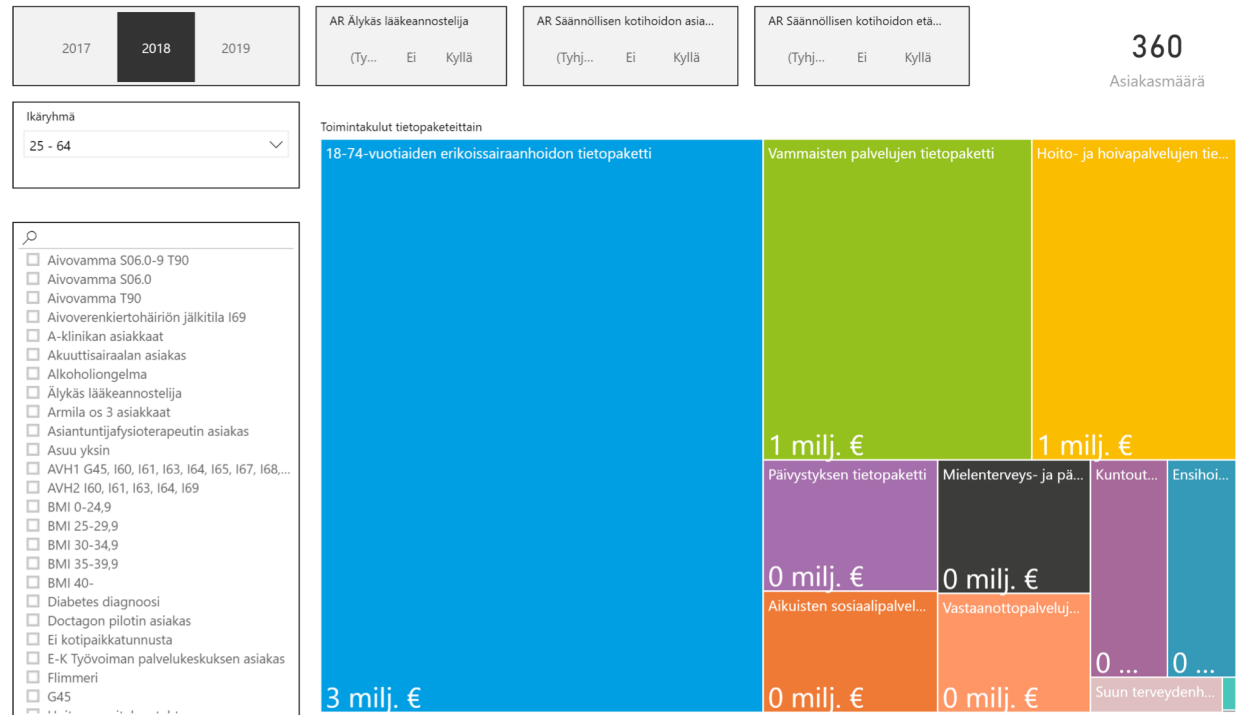
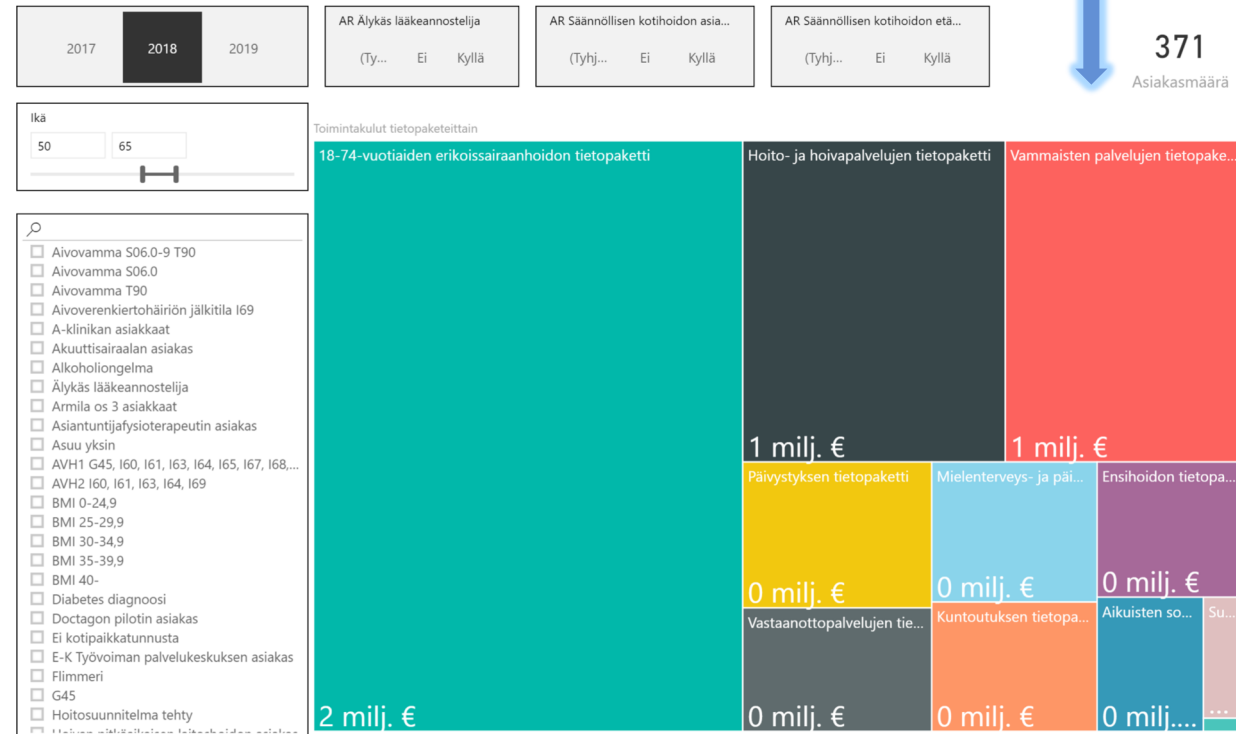
EksoTE's annual overall costs from organization or customer segment point of view



...OR INTO SPECIFIC CUSTOMER GROUPS.

Overall cost of heart failure patients of age group 50-65
(these patient might have other conditions too)

371
Asiakasmäärä



The amount of used services in different “sote-tietopaketti” groups of heart failure patients.

FROM CENTRALIZATION OF SERVICES TO DECENTRALIZED MODELS



ACUTE HOSPITAL MODELS

- Centralized and digitalized consultation models, hospitals supports other units
- Co-ordination - out of hospital services
- Enhanced and centralized discharging 24/7



MOBILE EMERGENCY MODELS

- Mobile urgent assessment and treatment unit
- Home hospital services
- Enhanced home nursing
- Care pathways across sector borders - multiprofessional co-operation



SUPPORTING LIVING AT HOME

- Home rehabilitation
- Early interventions
- Clinic van, mobile lab van
- Palliative and end of life care
- Flexible usage of beds within the whole region

Temporary services provided at home

Enhanced home care and palliative care

Continuous home care services

Foreseeing and preventive home care

JOINT COORDINATION

THE AVERAGE COST OF DIFFERENT MODELS OF SERVICE PRODUCTION PER DAY



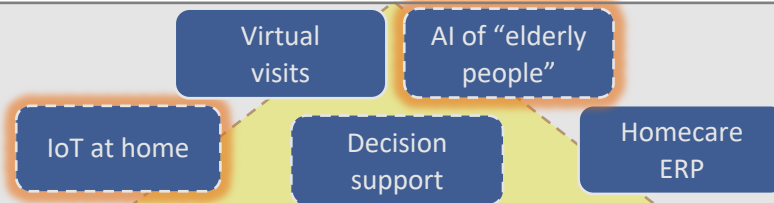
AUTONOMY OF CITIZENS/CUSTOMER

EKSOTE'S AUTONOMY SUPPORTING ICT

AUTONOMY OF PROFESSIONS

ELDERLY CARE

More independent customers at home with connectivity to service ecosystem and to family and friends.
Customers with a feeling of security supported by IoT devices in the area of personal health and security

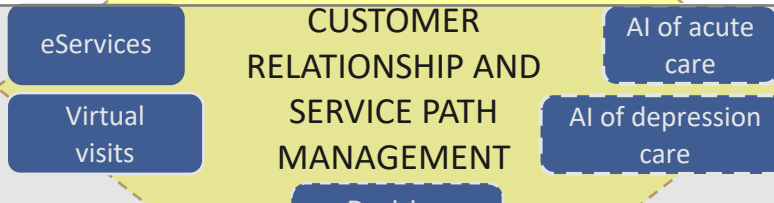


Self guided home care teams / individuals connected to healthcare acute services and social care long term services through shared customer service path management. Technology is providing the connectivity and decision support by IoT alarms and AI

ELDERLY CARE

HEALTH CARE

Connections to service ecosystem through eServices. National level eServices to show electronical healthcare records. National level eServices with decision support capabilities



Healthcare professionals are connected to homecare and social care through customer relationship and service path management with capabilities to directly order services from other units by individuals. Overall view of customer situation through CRM.

HEALTH CARE

SOCIAL CARE

Connections to service ecosystem through eServices. National level eServices to show electronical social care records. Integrated social and healthcare service in the area of mental health. Low level enter point through video connections.

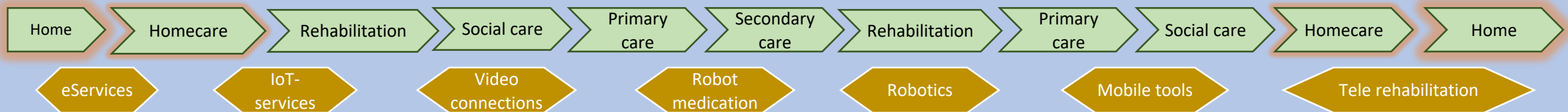


Integrated data base with healthcare. Overall view of customer situation through customer relationship management. Possibilities for professionals to start processes of different service areas through service path management.

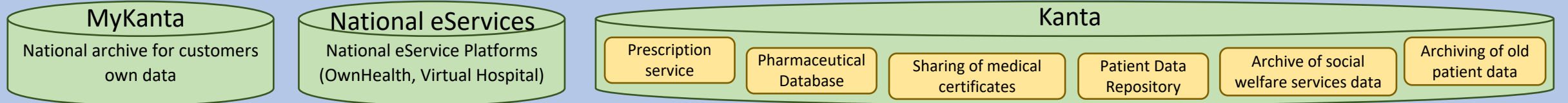
SOCIAL CARE

International Human Account Network (IHAN)

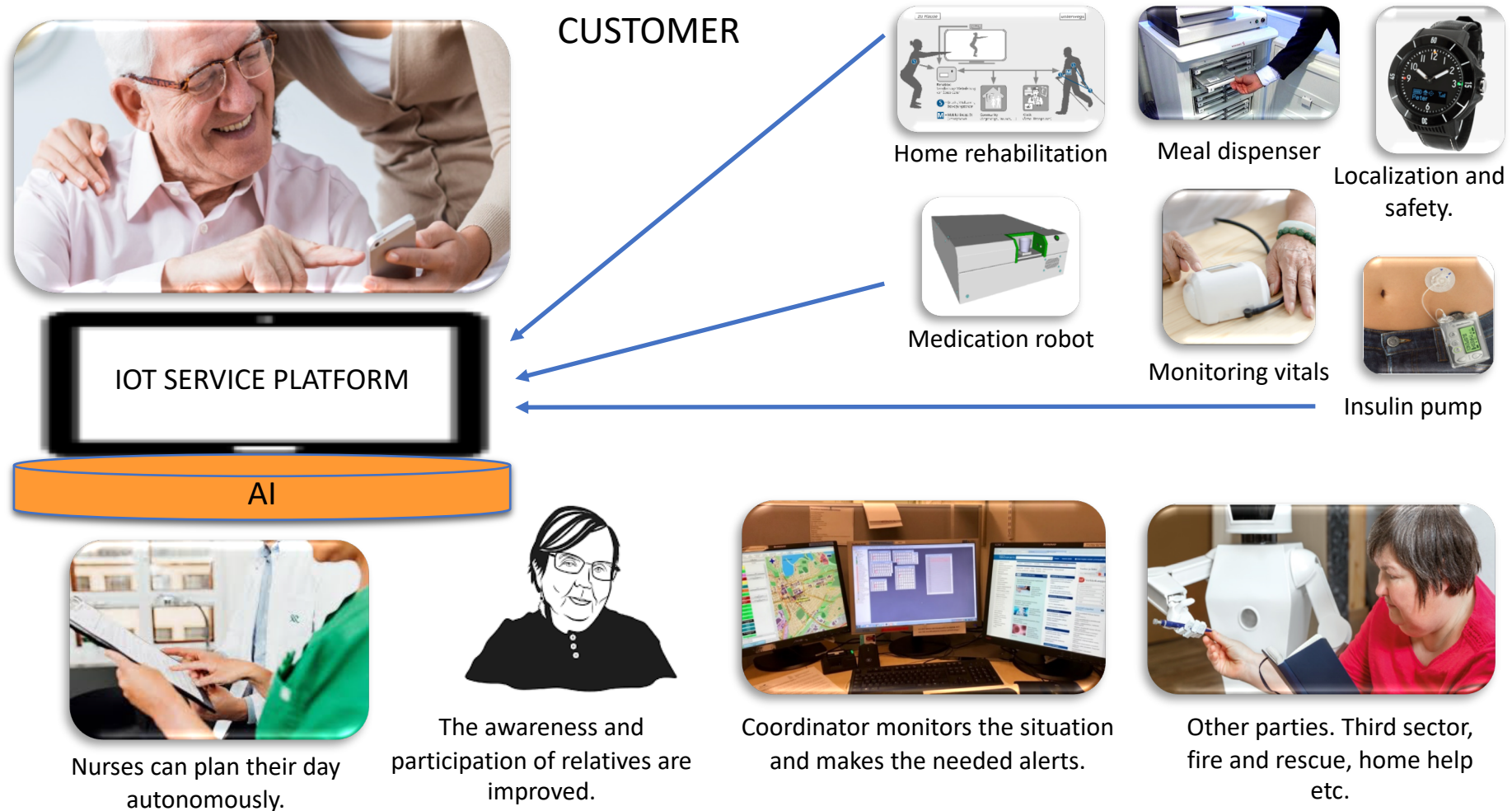
EKSOTE'S INFORMATION POOL BASED TO INTEGRATED "FROM-END-TO-END" PROCESSES



FINLAND'S NATIONAL DATA "OCEANS"



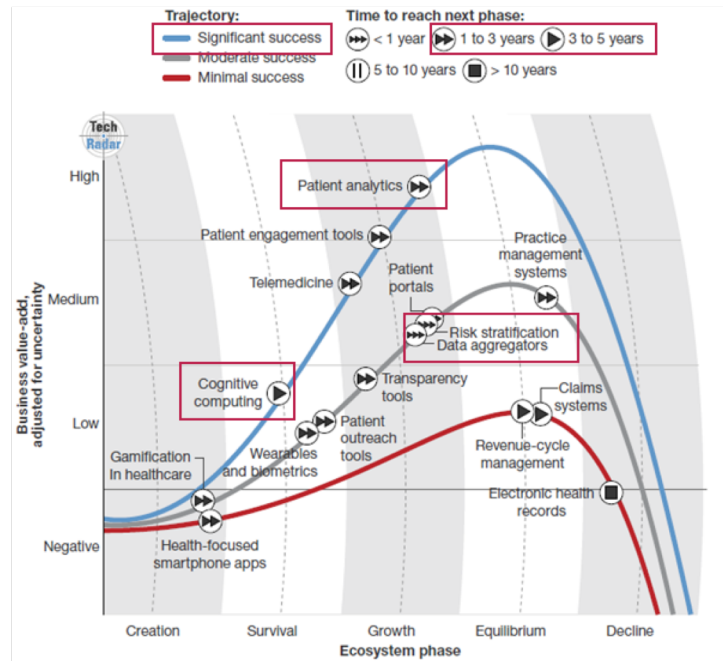
IoT IN HOME-LIKE ENVIRONMENTS TOMORROW



TIME HAS PASSED THE PURE SUPINE DEVELOPMENT OF EHR OR ESR (electronic social care record) - THE FUTURE IS TOTALLY ELSEWHERE

The business value-add and ecosystem phase of healthcare technologies

TechRadar Patient Engagement Technologies (Forrester, Q3/2016)

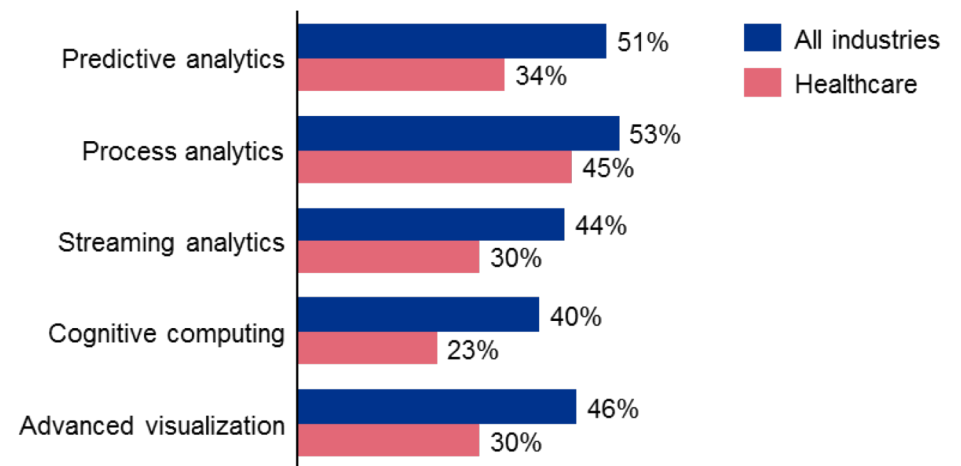


Cognitive computing and risk stratification solutions are entering the healthcare arena from other industries

Healthcare organizations have been slow to adopt advanced analytics

Global Business Technographics Data and Analytics Survey (Forrester, 2016)

“What are your firm’s plans for using the following analytics technologies?”



Base: 47 to 2,094 business and technology decision-makers working in healthcare organizations

Healthcare lags behind other industries in adoption of advanced analytics, but shows strong interest, especially in predictive and process analytics

THE WORLD OVERFLOWS ABOUT EXISTING DATA

Other publicly available data

(weather, purchases, social media)

Remote monitoring

(EKG, pulse, blood pressure, blood sugar and oxygen)

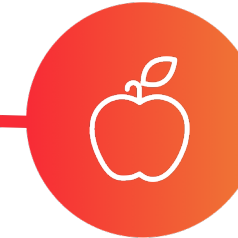
Genom data



Activity

(sleep, exercise, mobility)

Employment



Nutrition

(Diet, weight)

Social support decisions







Safety data

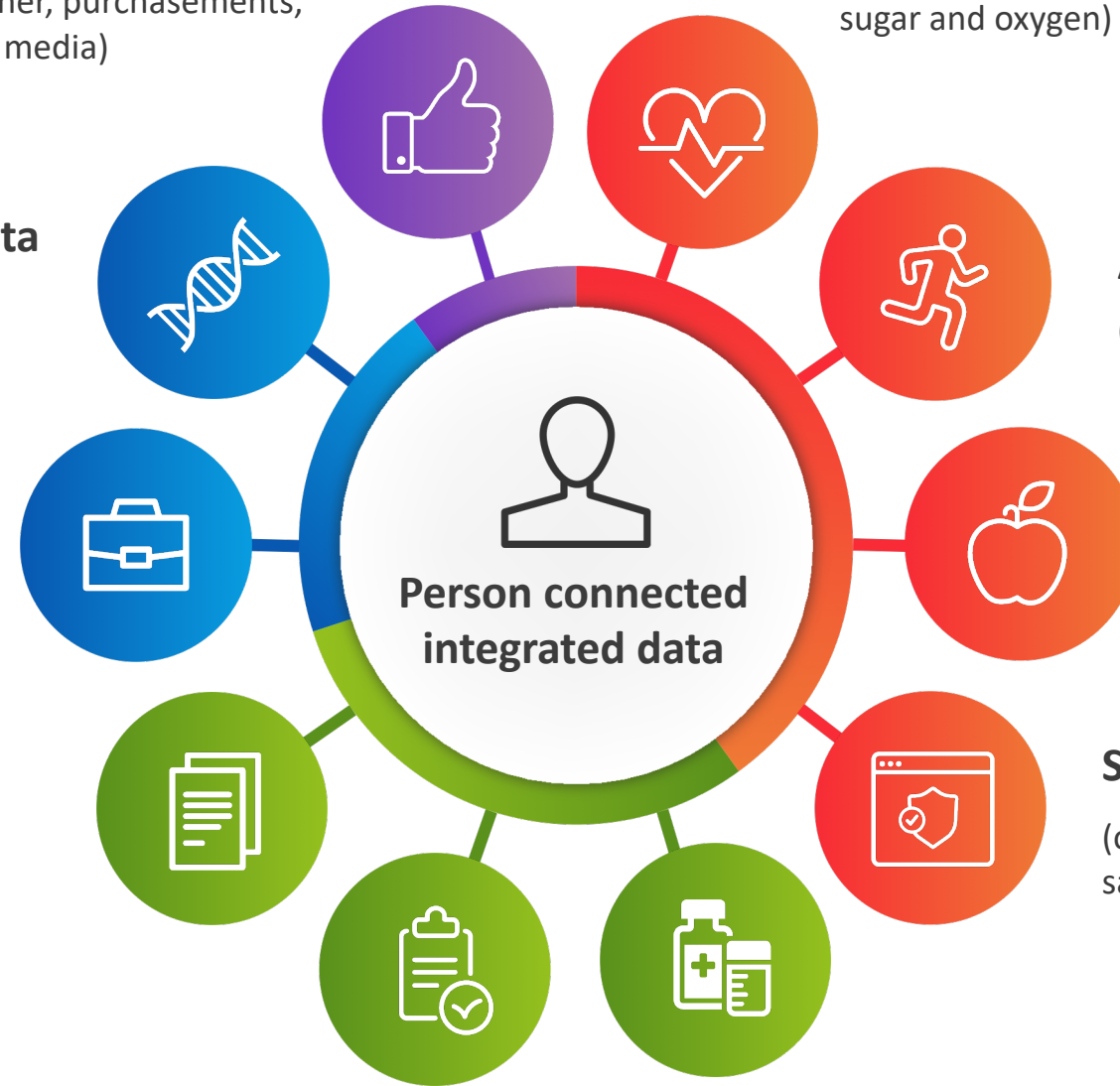
(oven guard, door guard, safety phone)

Electronical social care and medical records

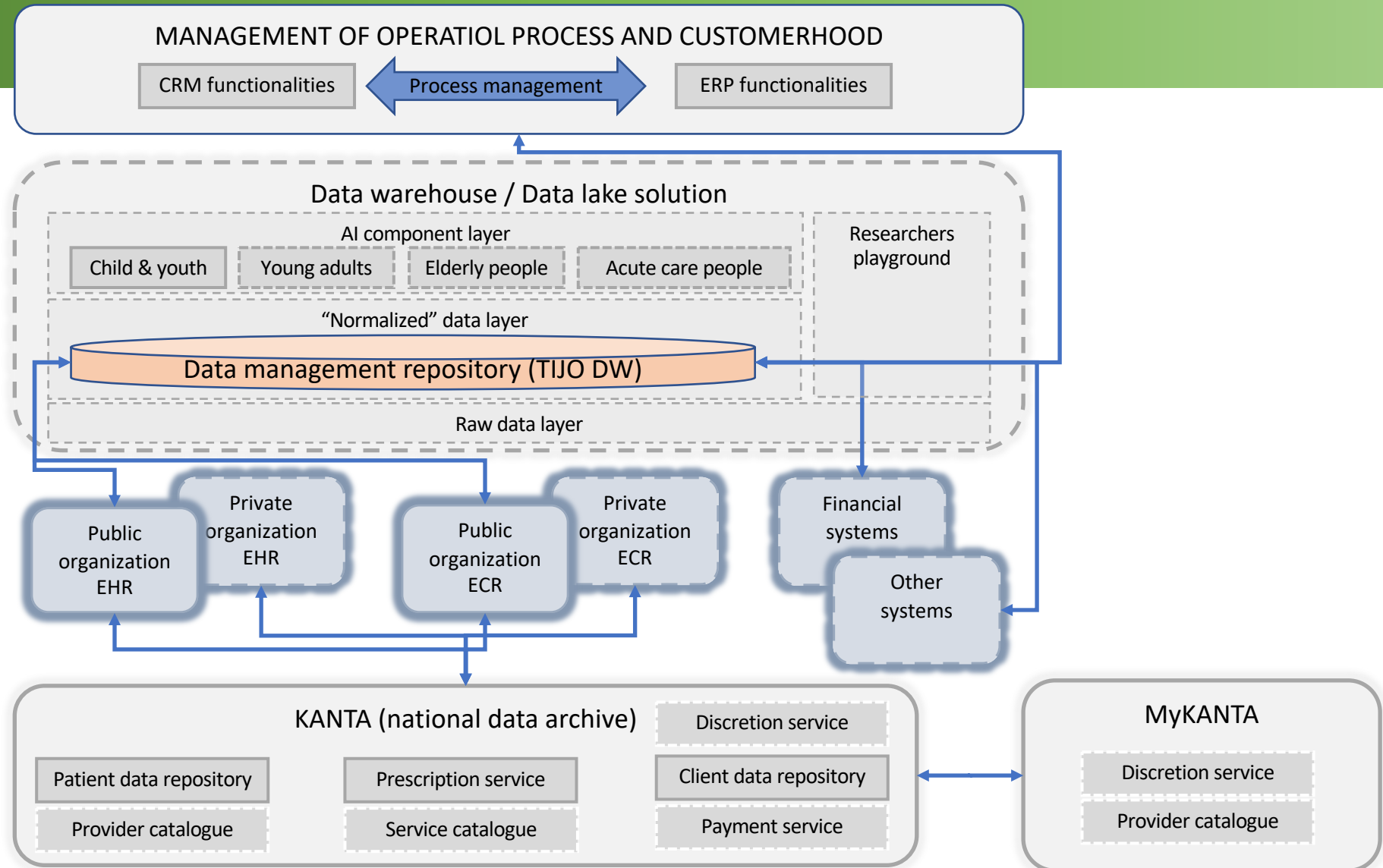


Medication

-  Organization wide
-  Organization & nation wide
-  Nation wide
-  Other publicly available data



EXISTING LAYERS OF DATA MANAGEMENT IN EKSOTE



THE ARTIFICIAL INTELLIGENCE NEEDS TO BE CONNECTED TO EVERYDAY PROCESSES AND CUSTOMERS → CRM & ERP

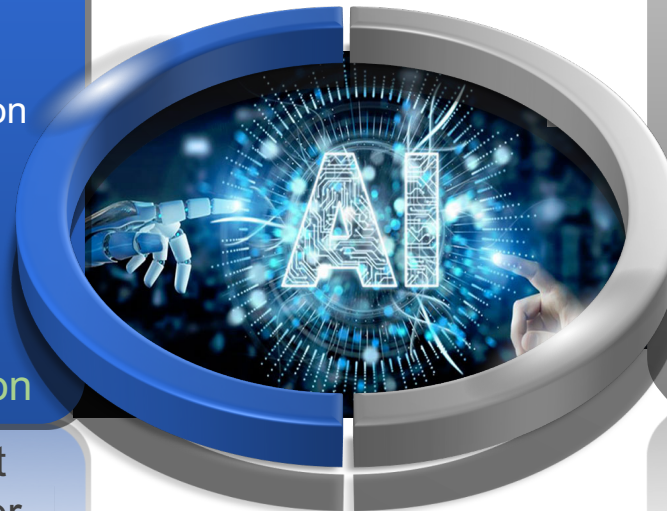
Social and healthcare Customer Relationship Management (CRM)

- Gathering and displaying customer data on role based
- Illustrating the customer's overall situation



Holistic overview of customers situation

Customer Relationship Management
(In Eksote Solution Business Manager platform)



IOT SERVICE
PLATFORM

The process management (ERP) of customer service paths

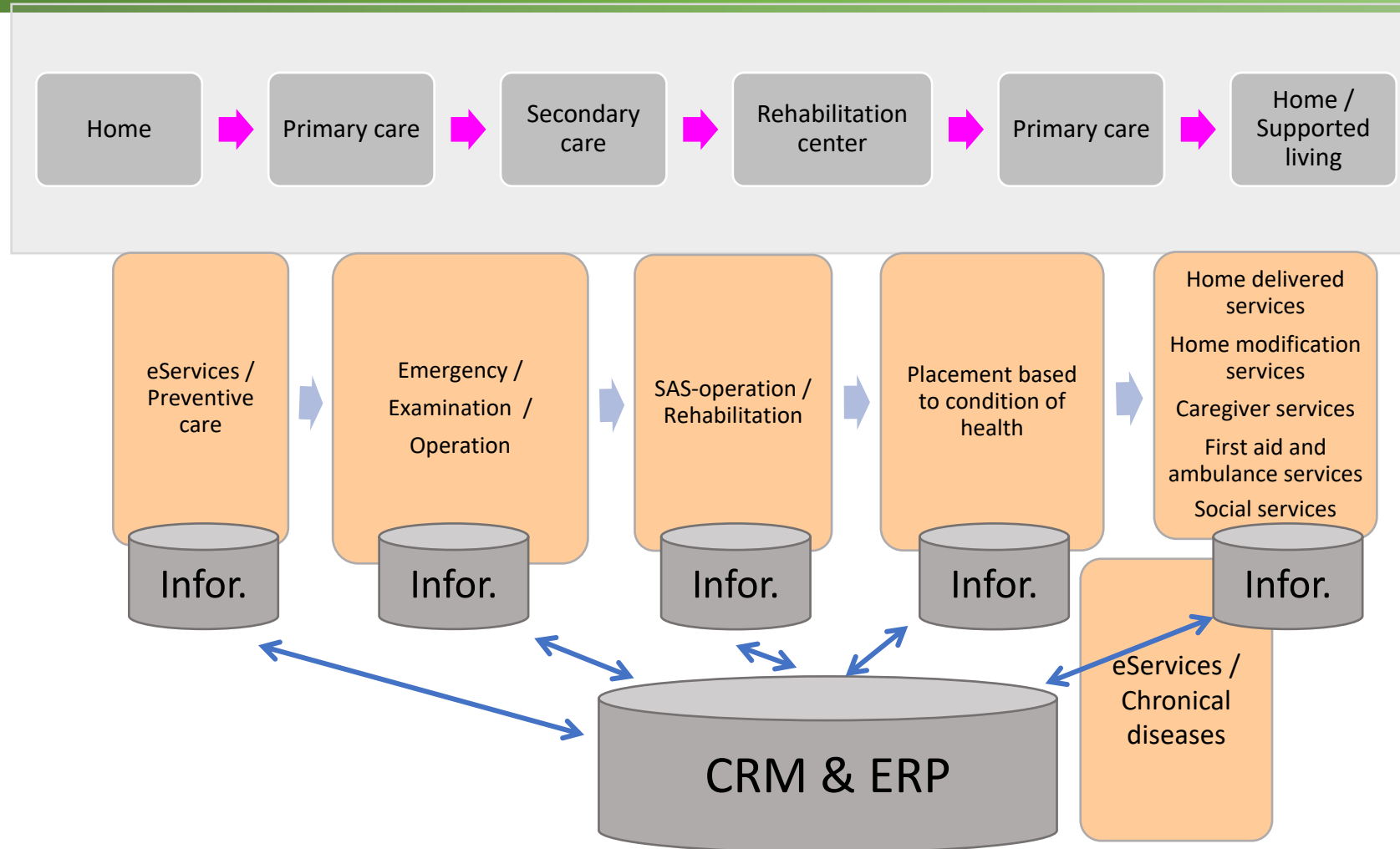
- Managing service chains to enable the customer to stay at home for as long as possible based on cost-effective and sufficient support services



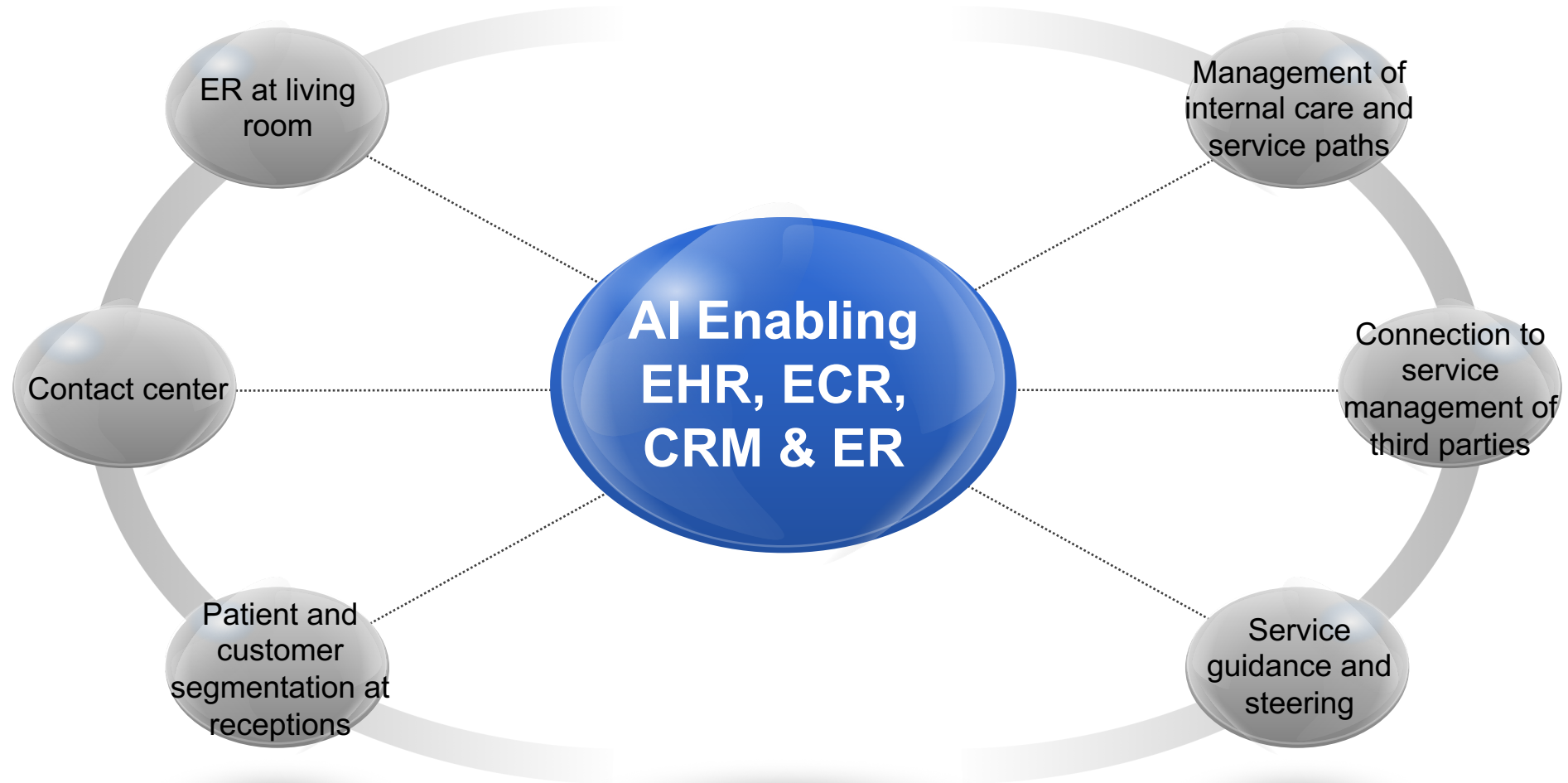
Management of customer processes

Enterprise resource management of customers service paths (In Eksote Solution Business Manager platform)

OVERALL MANAGEMENT OF CUSTOMER SERVICE PATHS IS THE “KEY”



TECHNOLOGY IS ENABLER BUT THERE ALWAYS NEEDS TO BE FUNTIONAL REASON TO RAISE UP TECHNOLOGY



TREE EXAMPLE CASES OF EKSOTE'S AI APPROACH

- The prediction model for children and youth
- The prediction model for "young adults"
- The prediction model for service heavy users

CASE CHILDREN AND YOUTH: THE AIM FOR THE PREDICTIVE ANALYTICS AND THE BIG DATA IN THE CASE OF CHILDREN AND YOUTH

The aim was

to build an app, with which

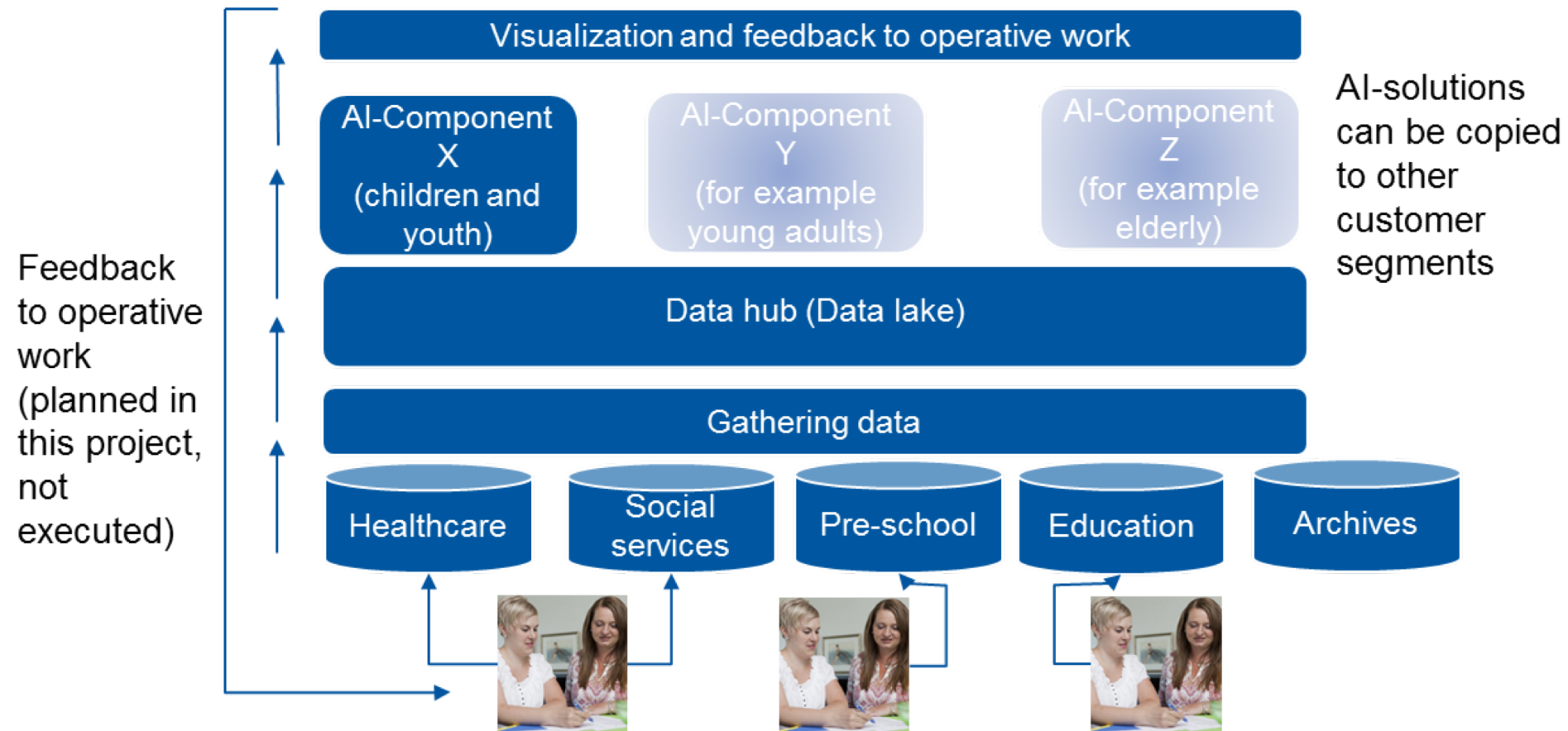
- We can go through large amount of data and find common factors for different endpoints
- Test how meaningful those factors are (how strongly they predict an endpoint)
- Make the concerns visible to people working with children and youth (doctors, nurses, teachers...)

The aim **was NOT**

- To define and select in advance the factors that might predict an endpoint
- To do statistical analysis to those chosen factors

The way is from big data to specifics, NOT from specifics to bigger picture

CASE CHILDREN AND YOUTH: SIMPLIFIED OVERALL PICTURE



CASE CHILDREN AND YOUTH: AI-COMPONENT - ENDPOINTS FOR CHILDREN AND YOUTH

In this project the developed tool was tested with following endpoints (target group children and youth):

- Average of school grades below 6,5 (scale 4-10), this can indicate
 - Child doesn't get graduation diploma from primary school
 - Child doesn't get to secondary studies after primary school
- Disciplinary actions at school
 - More than 3-5/year
 - Written warning or denying from the teaching
- More than 20 absence from school / year without permission
- Taken into custody (urgent or non-urgent)
- Psychiatric care (inpatient or outpatient)
- Drug problems

⇒ With the app developed, the analysis can be made to any other endpoint concerning children and youth

CASE CHILDREN AND YOUTH: AI-COMPONENT - QUANTITATIVE ANALYSIS

EXAMPLE OF THE RESULTS: SOCIAL AND HEALTHCARE ENDPOINTS

Social- and healthcare endpoints

- Taken into custody, urgent or non-urgent (n=500)
- Psychiatric care, outpatient (n=5897)
- Psychiatric care, inpatient (n=657)
- Drug problems (n=146)

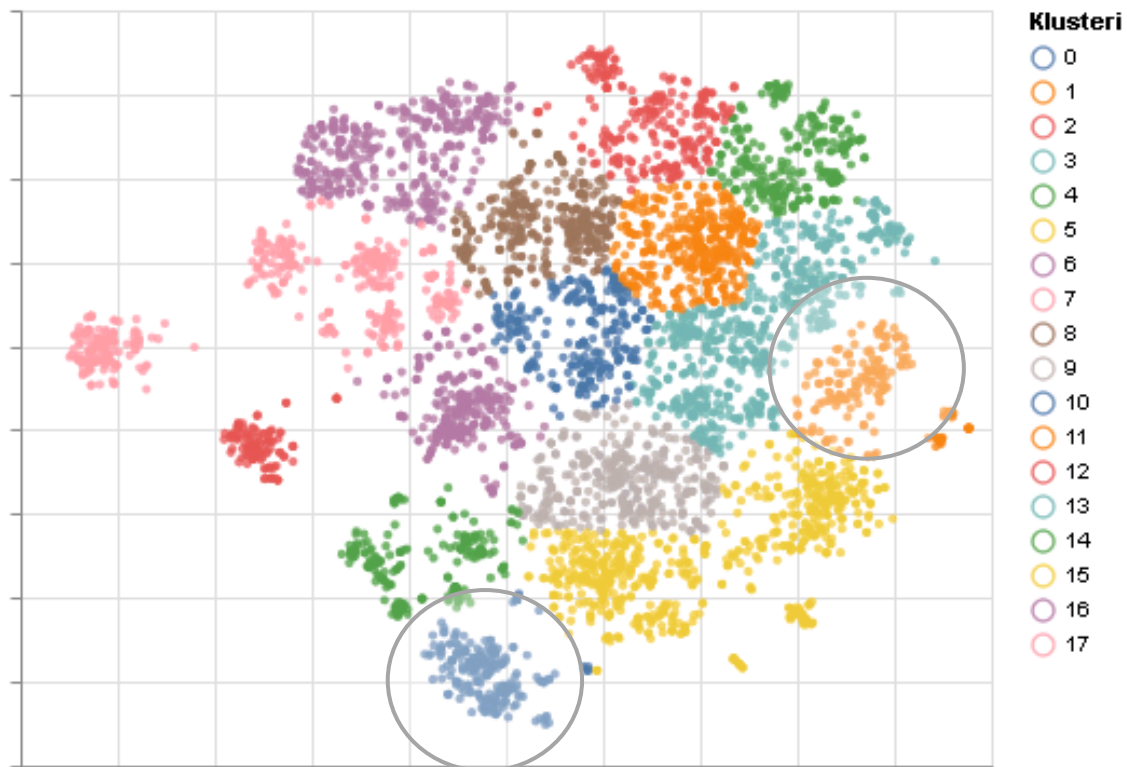
There were 1338 statistically significant predictive variables

- 429 related to child itself, 358 related to adults and 551 related to siblings
- 212 (out of 1338) variables were common for all social- and healthcare endpoints
- 628 (out of 1338) variables occurred only in one social- and healthcare endpoint

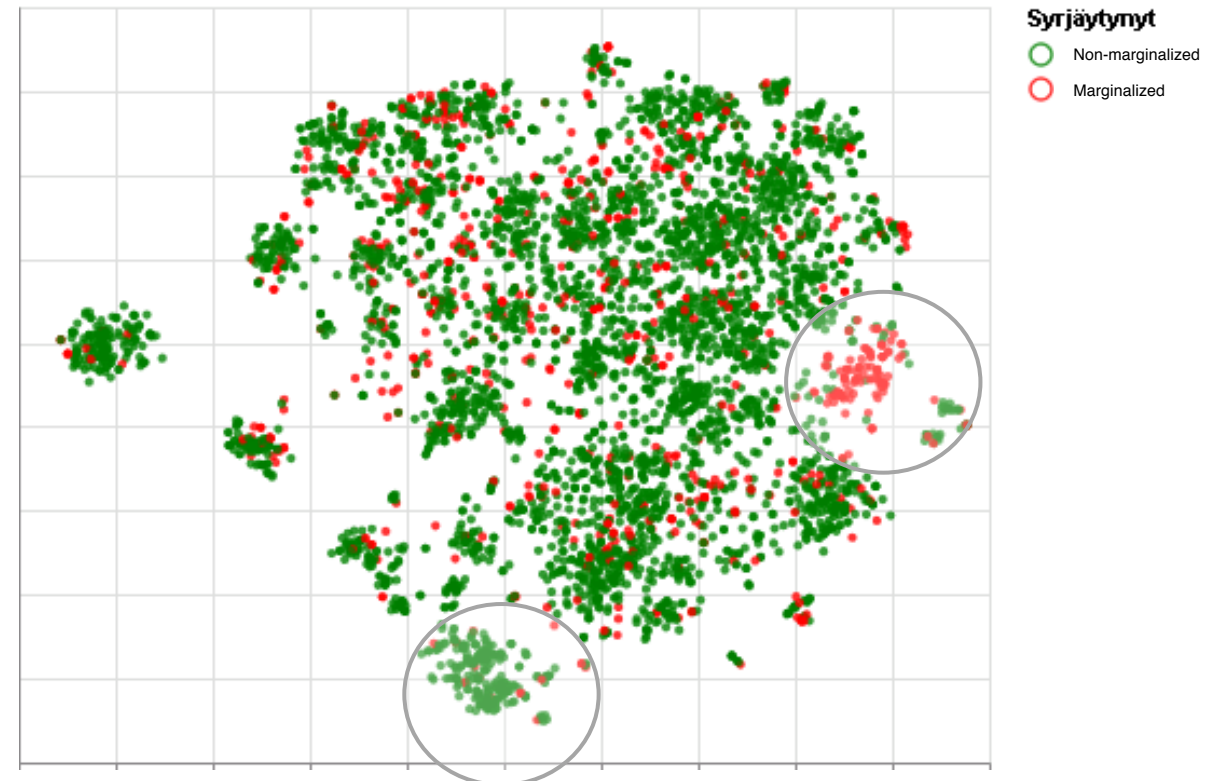
Example results needed for testing the app are limited to pre-events, whole dataset, incidence differences more than 5%, only binary variables, one variable from the texts

CASE: YOUNG ADULTS - CLUSTER ANALYSIS

Customer clusters (segmented by elbow-method) based to varying data between different clusters

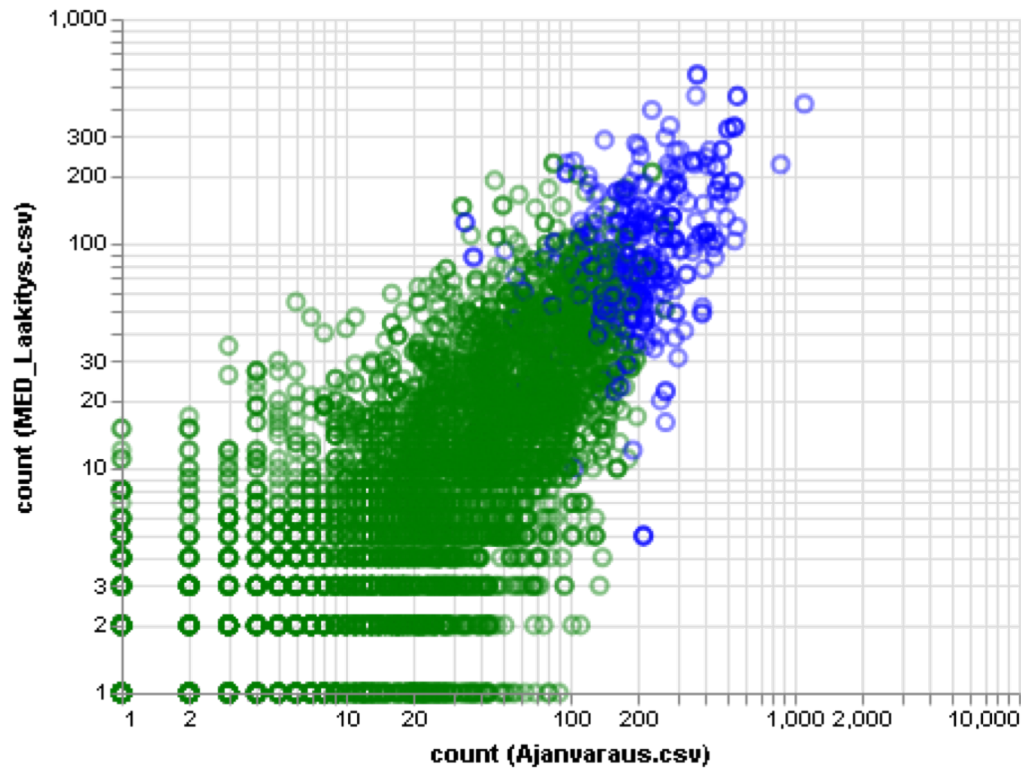


Marginalized individuals are focusing mostly to one clusters based to data



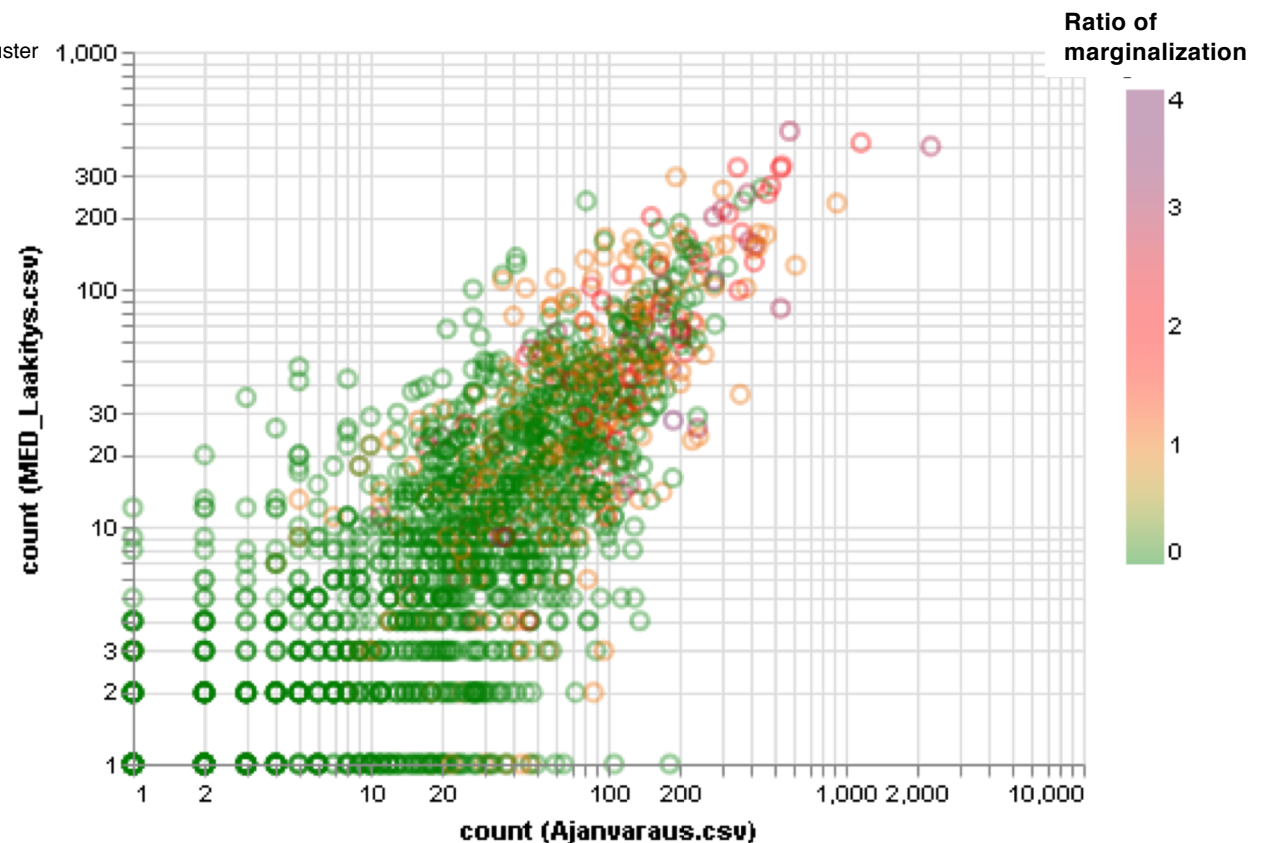
CASE: YOUNG ADULTS - CLUSTER ANALYSIS

Cluster 4 consists mostly marginalized people. The main reasons to belong to cluster related to medication and the amount of healthcare bookings. The ratio of marginalization increases with the amount of medication and contacts



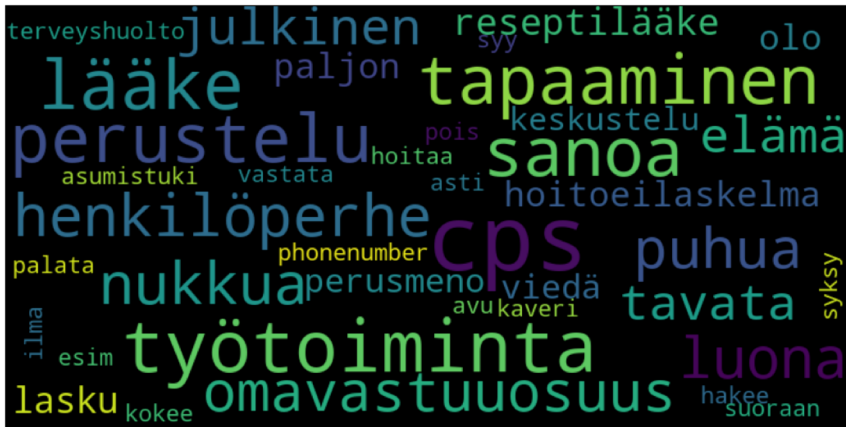
Klusteri 4
○ Out of cluster
○ In cluster

contacts



WORLD CLOUD & THE RESULT OF ML MODEL

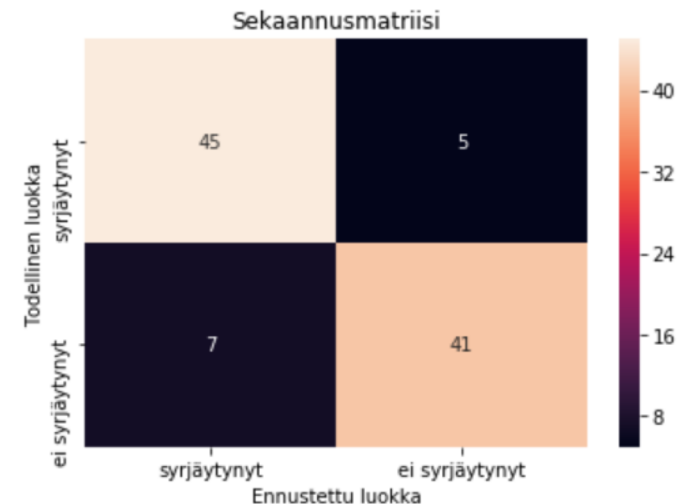
Marginalized



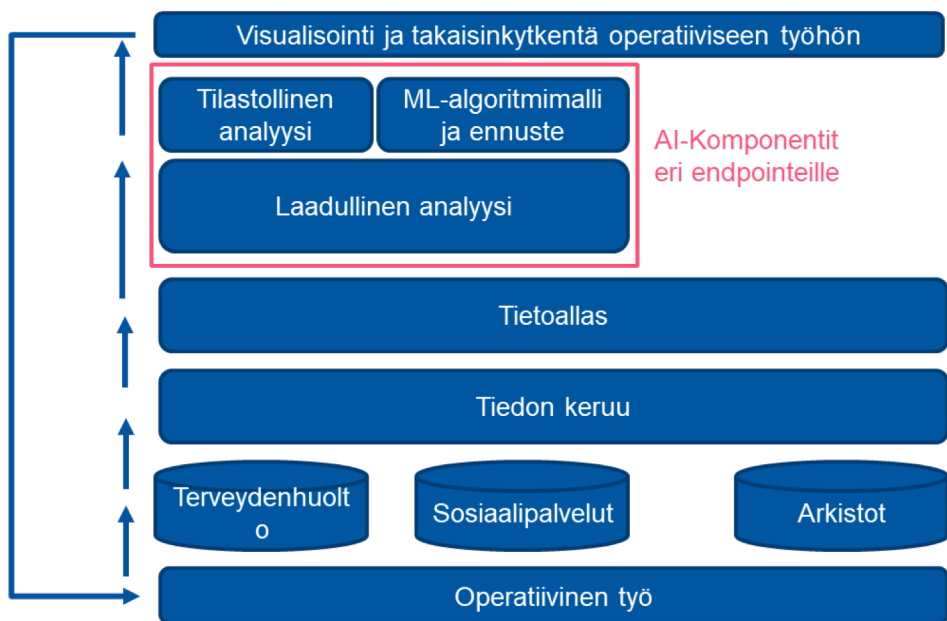
Non-marginalized



- Decision tree based model that connects structural and textual data
- Total accuracy 88%, if decision line is not modified
- 90% migrated and 85% non-migrated are catch



CASE: SERVICE HEAVY USERS



- Before transfer and load, data was pseudonymized

- ID's and name information was replaced
- Free written text was searched and data that could identify you (also address etc.) where replaced

- Approximately 20 different endpoints were defined as a unwanted outcome
- At the moment we have find preliminary outcome for the following endpoints:
 - Emergency unit contact over 3 times (in different days) during 6 months
 - Discharged patients from wards and returners to ER during 1 month
 - Urgent placement or taking into custody
 - Drinking problems under 18th year olds
 - Over 3 contacts per year because of mental or drinking problem
- Structural data
 - 37 tabled, 103 columns + the hierarchized of some variables
 - The values of columns can have values between 2-14000
 - The age based segmentation for endpoints considering all age groups are:
 - 0-17y,18-40y,41-64y and 65y-
 - The age based segments for children and youth are:
 - 0-1y, 2-6y, 7-12y, 13-15y, 16-17y ja 0-17y
 - Analysis contains also the inner circle of persons
 - Family data of social care, people living in the same address, indicated close ones by customers in healthcare, biological parents, custodian information in educational and early childhood educational services

CASE: SERVICE HEAVY USERS

STATISTICAL ANALYSIS

- Analysis contains approximately 490 000 id's
- With present endpoint rules different endpoints were reached by different id's following:
 - Emergency unit contact over 3 times (in different days) / 6 months (n = 5592)
 - Discharged patients from wards and returners to ER during 1 month (n = 16139)
 - Urgent placement or taking into custody (n = 523)
 - Drinking problems under 18th year olds (n = 664)
 - Over 3 contacts per year because of mental or drinking problem (n = 5578)
- Statistical significant variables in different endpoint groups were found
 - Emergency unit contact over 3 times (in different days) / 6 months : 278 – 737 variables
 - Discharged patients from wards and returners to ER during 1 month: 265 – 781 variables
 - Urgent placement or taking into custody: 131 – 257 variables
 - Drinking problems under 18th year old: 77 – 267 variables
 - Over 3 contacts per year because of mental or drinking problem: 304 – 509 variables

EXAMPLE OF STATISTICAL SIGNIFICANT VARIABLES

- Emergency unit contact over 3 times (in different days) / 6 months
 - Removal of plastic bandage or bone traction patient procedure done
- Discharged patients from wards and returners to ER during 1 month
 - Cost center: Institutional care of drug usage
- Urgent placement or taking into custody
 - Customer work, labeled into other actions in social care
- Drinking problems under 18th year old
 - Visit reason: depression
- Over 3 contacts per year because of mental or drinking problem
 - Patient diagnosis: addiction syndrome/other substance

AI MODEL EVALUATION EXAMPLE FROM THE SUBSTANCE ABUSER FOR AGE GROUP 16-18

	Predicted class 0 (non-target)	Predicted class 1 (target)	
Actual class 0 (non-target)	9890	426	#total non-targets=10316 #correctly predicted=9890 #incorrectly predicted=426
Actual class 1 (target)	12	48	#total targets=60 #correctly predicted=48 #incorrectly predicted=12

Accuracy = 95%
Recall = 80%
Precision = 10%

And remember, technology might give you a ride forward but you can still screw it up!



THANKS 😊



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