

SP2 – Heterogenous multi-source continuous requirements engineering

Krzysztof Wnuk, SP2 leader + the research team

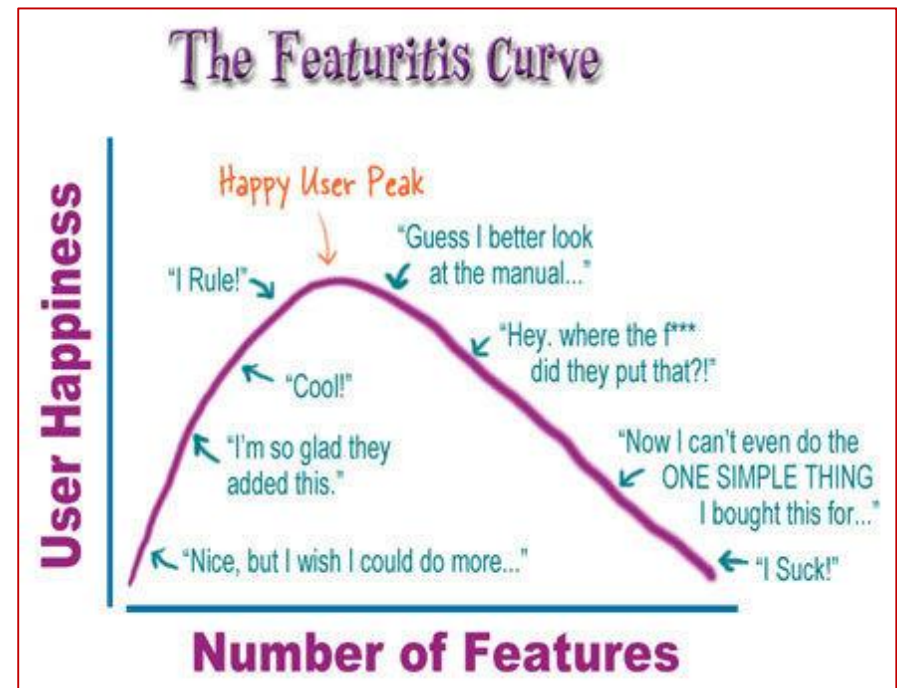


Krzysztof Wnuk (Researcher and practitioner)

- Associate Professor at BTH in Sweden in requirements, product management, software business and innovation (2013-)
- Worked in industry before joining academia and worked with industry the entire academic carrier
- Board member of International Software Product Management Association – www.ispma.org
- 10 years in research
 - PhD from Lund University, in 2012
 - Assistant Professor at BTH since 2013



- We push too much to our products
- We have too many ideas
- Customers have too many requests
- There are many customers



We have many requirements sources

Problem #1

External stakeholders

Customers

- Direct customers

- Operators

- Global customers

- Regional customers

- Other key customers

- Retailers

- Indirect customers

- Consumers

- Market segments

- Service providers

- Content providers

Product providers

- Direct Competitors

- Mobile phone developers

- Indirect Competitors

- Cameras

- Mobile music players

- ... consumer wallet competition

Platform providers

- Operating Systems

- Technical Platforms

Network system providers

Standardization bodies

Legislation and authorities

- National

- International

Manufacturing sub-contractors

Component providers

...

Internal stakeholders

Marketing

- Long term branding

- Customer relations

Product management

- Product planning and portfolio

Product development

- Hardware design

- Electronics

- Analog

- Digital

- Mechanics

- Software design

- User interface

- Service logic

- Network access

- Codecs

Platform development

- Mother, daughters, cluster

- Global functions

Sub-contracting management

- Technical platforms

- Operating systems

- Original Design Manufacturing

Technology forecasting

Market research

Customer Services

- Support

- Repair

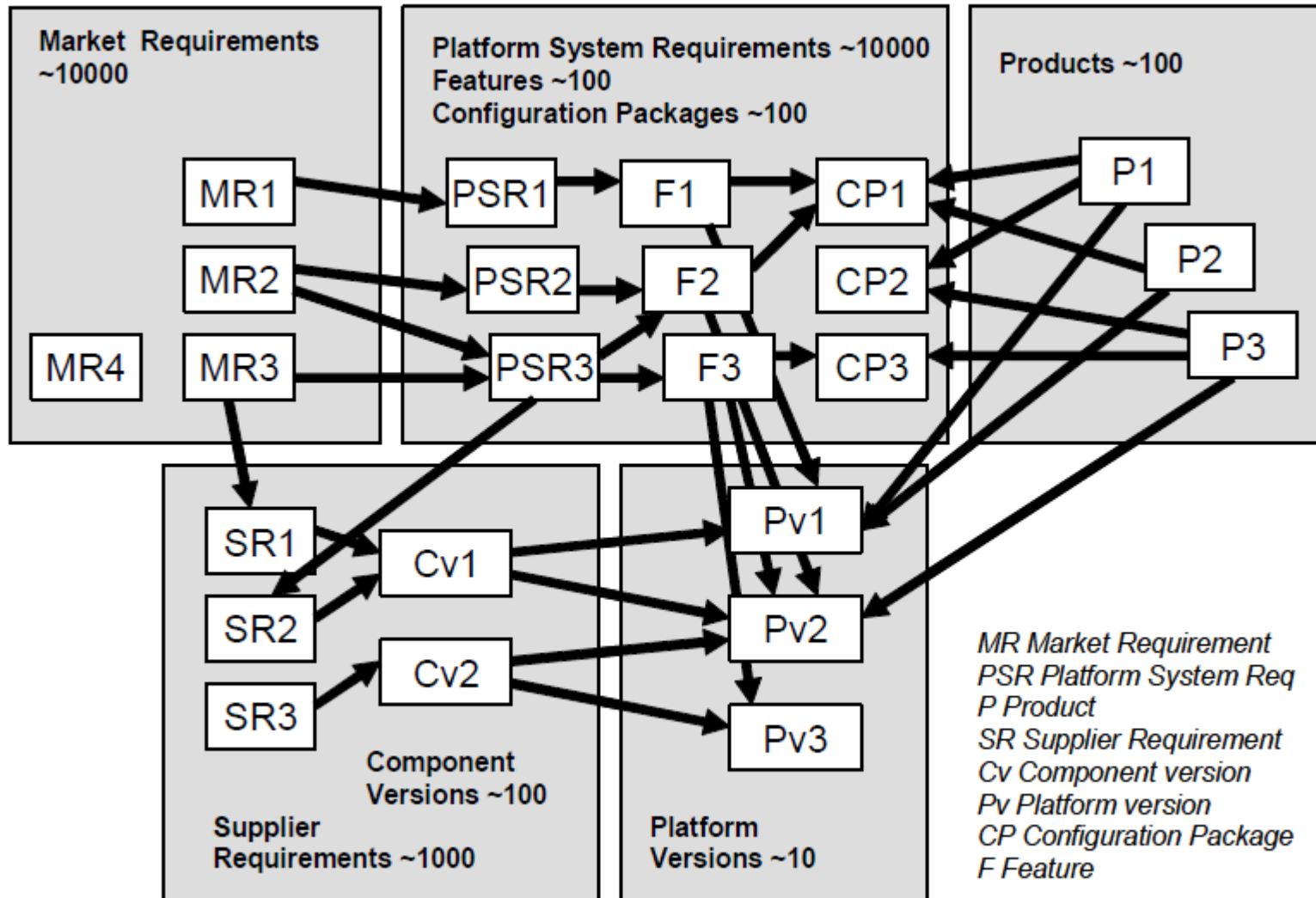
Legal

Sourcing

Accessories



Complexity is increasing



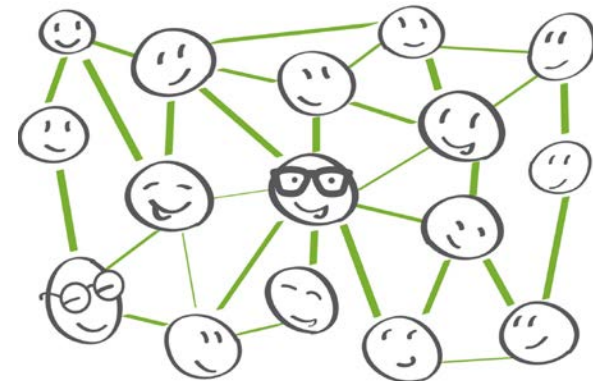
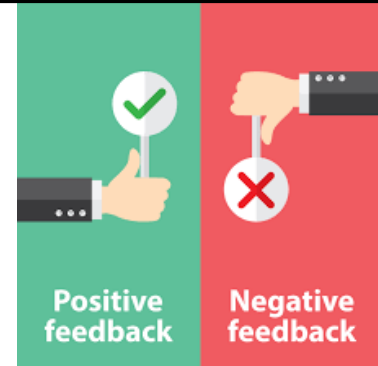
Towards Data-Driven RE

- Products are connected
- They generate and share product-usage data
- Requirements Engineers are rarely data scientists



Massive User Feedback

- Considering user feedback is important for the success of software products
- For instance, apps with more positive reviews get better rankings and sales numbers
- Frustrated users who feel their voices are ignored might even harm the reputation of software by organizing social media campaigns against it
- Users generate a lot of feedback everyday
- Most companies lack effective automation



Product-Usage Data Turns Into Big Data

- Volvo Cars - A test vehicle fleet of 1000 vehicles can be expected to generate around 4.5 terabytes of data per day, or equivalently, around 1.6 peta-bytes per year
- Facebook (2012) reported 500 terabytes of data ingested daily
- Spotify - 38+ Terabytes of incoming data per day ▶70+ Petabytes of permanently stored data about songs, playlists, etc.

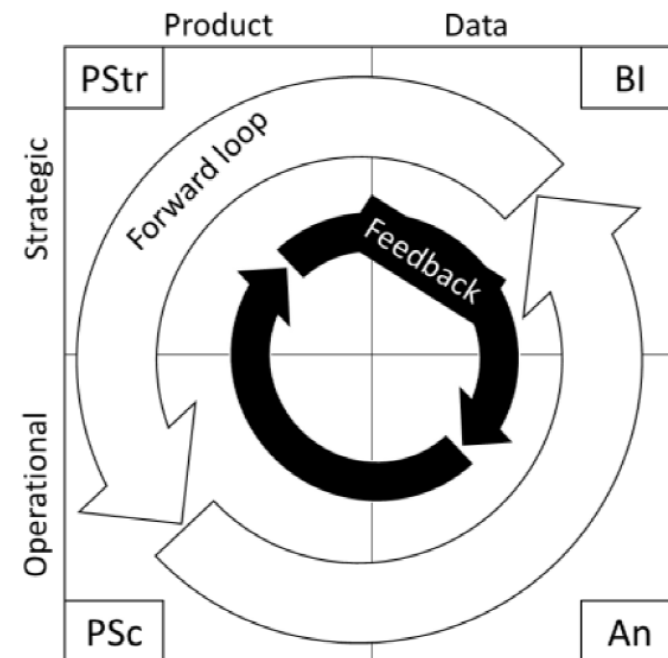
→ Most requirements engineers still work with **manual methods to identify, screen and prioritize requirements**

→ Data-Driven RE is emerging as one of the **surviving factors** for companies



Envisioned Solution – feedback and forward loops

- Huge customer/user data does not give anything unless you can figure out **how to use it (knowledge)**
- Focus must be **value-based** and in turning data into knowledge
- Top-down planning must be **synchronized** with bottom-up data-driven requirements discovery



Multi-Source Data-Driven RE balancing data-driven and plan-driven

“Data-driven approaches may simply lead to the most average HCI design ever created”

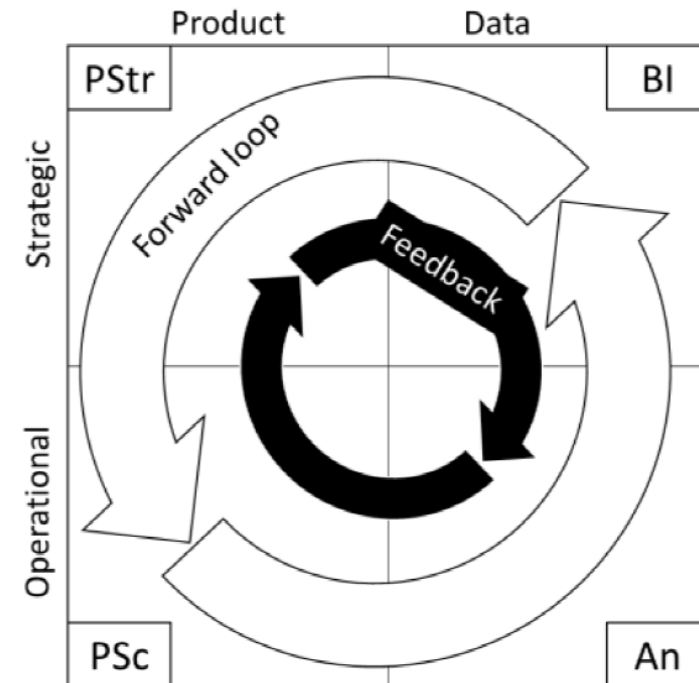
- **G. de Haan:** *HCI Design Methods: Where Next? From User-centered to Creative Design and Beyond.*



“As technology driven innovation’s benefits decrease, companies increasingly prioritize customer-driven innovation”

- **J. Bosch:** *Speed, Data and Ecosystems*

We need to understand when to apply a **data-driven** approach and when to apply a **plan-driven** approach



Step 1 – data filtering

→ **MEANING:** Identifying what data is relevant for **You**

- how you do it today (base)
- ontological approach to data quality and filtering (automate with the help of conceptual modelling and create ontological support that brings meaning to data and relationships between data elements)

and/or

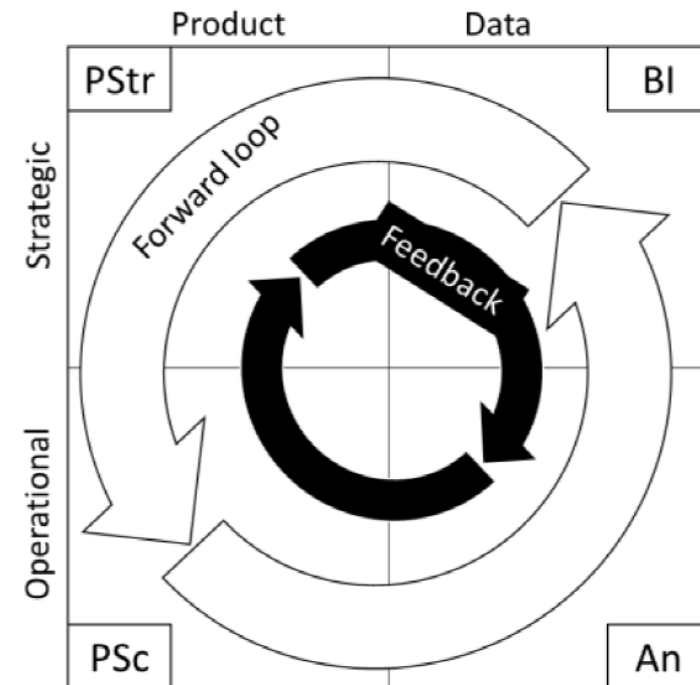
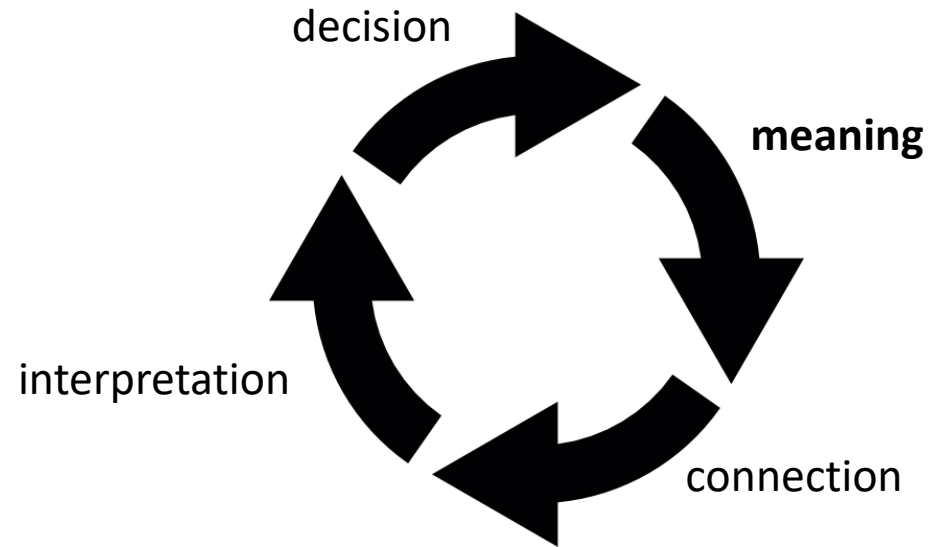
- validated supervised learning

and/or

- validated unsupervised learning

- **data collection and problem formulation** (intelligence, identifying relevant data sources, filtering relevant information from non-relevant)

Envisioned Solution

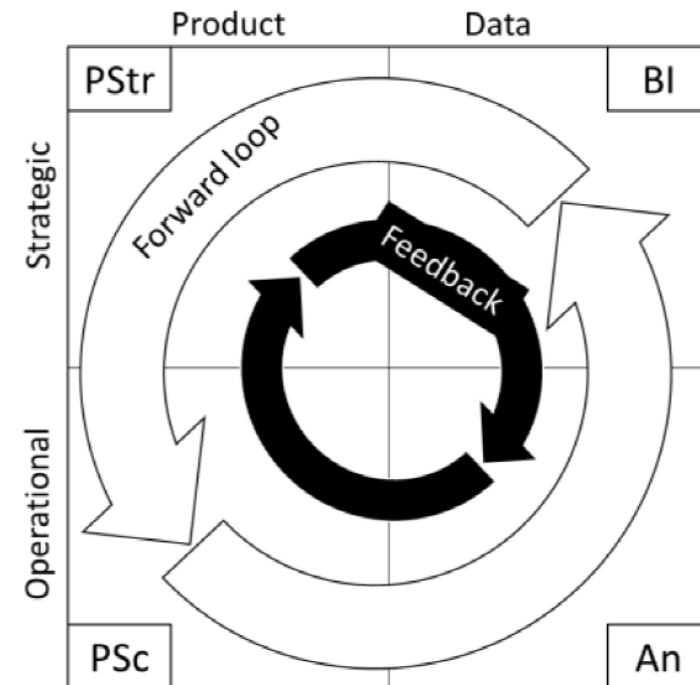
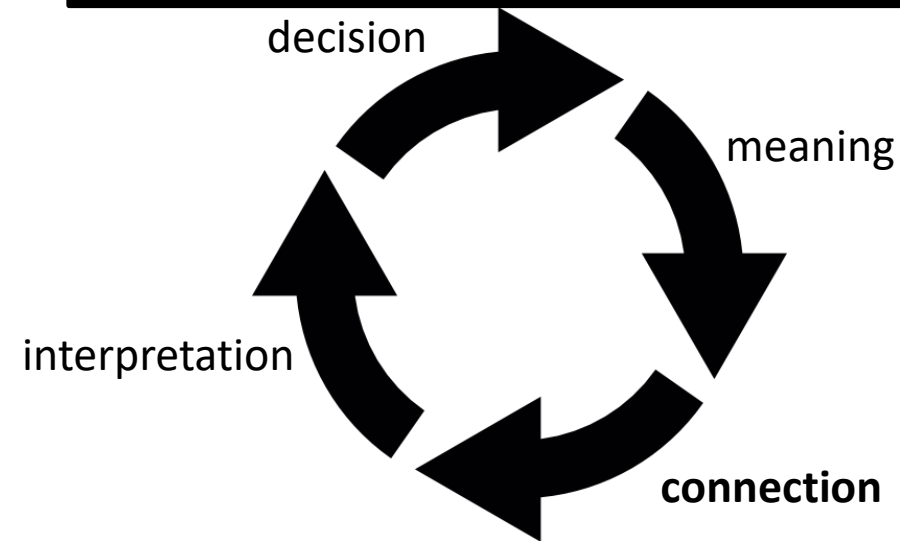


Step 2 – making connections

Envisioned Solution

→ **CONNECTION:** Identifying aspects correspond to what data AND data use patterns

- est. a proper data-driven connection between “features” and “quality” tied to the DATA available (identify data missing too)
- bring in experts in to help w. defining operative parameters for a data-driven definition of features/requirements
- (refine MEANING part) if needed
- not only product features, but also many other items such as services and total experiences...



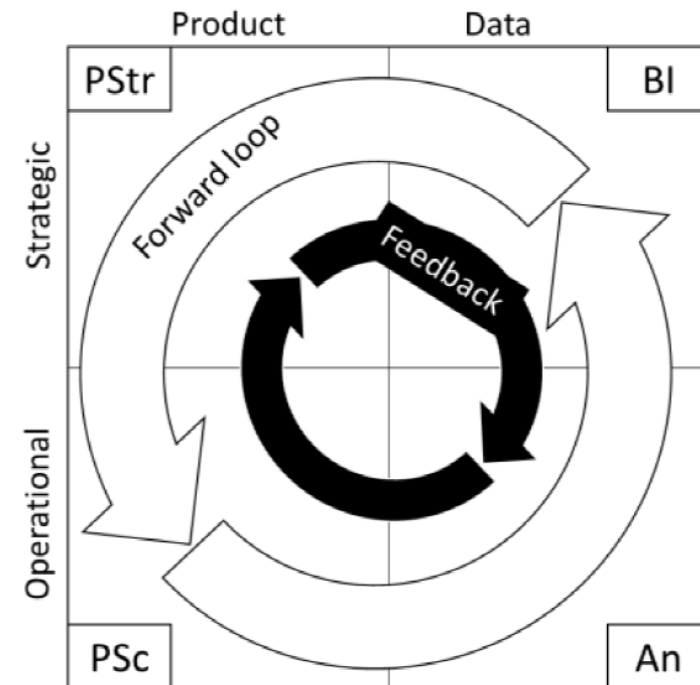
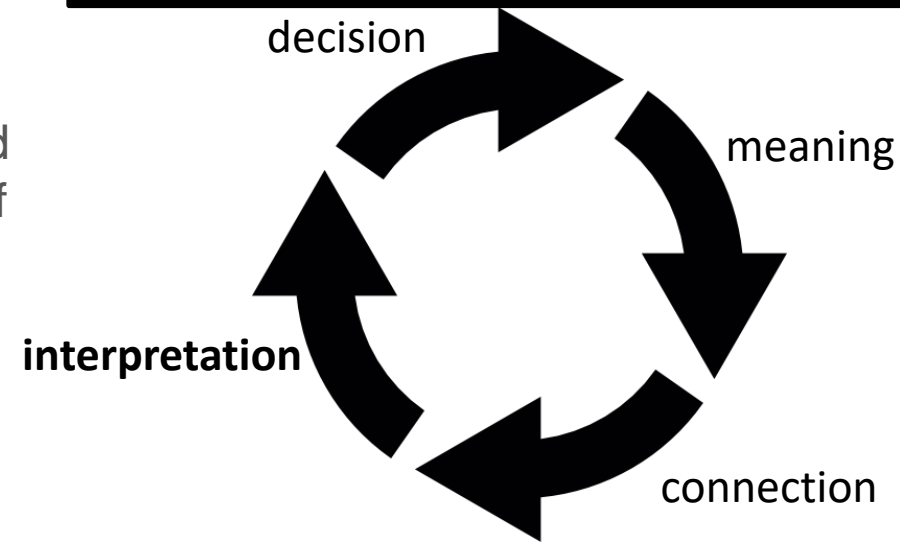
Step 3 – making connections

Envisioned Solution

→ **INTERPRETATION:** Given that we now have connection btw the data (ordered and meaningful) and the features and quality of your product/services...

- how interpret data patterns
- what are the boundary conditions for different features/requirements
- predicting changes in product service (adding or changing features/quality)
- using past data data (we have done it on the last 10 years of decision making at Sony Mobile)

- **development of requirements realization alternatives** (prioritizing these opinions and presenting them for decision-makers)

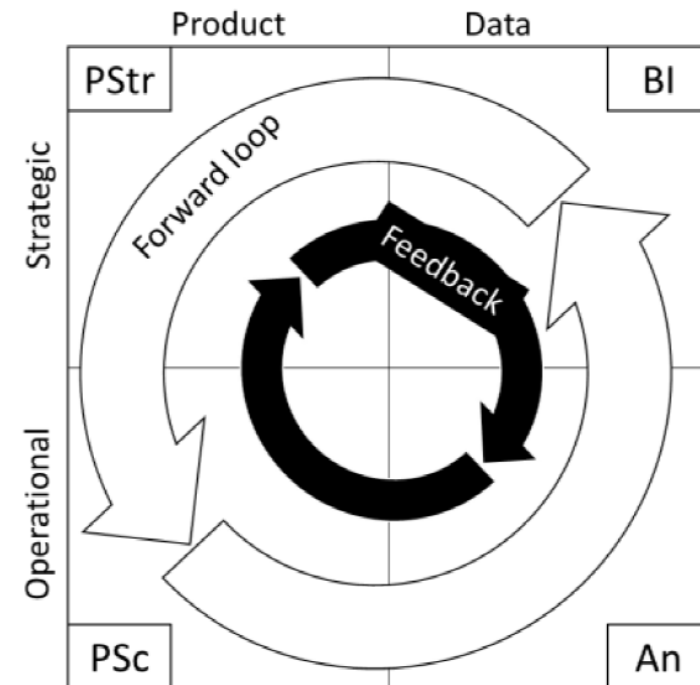
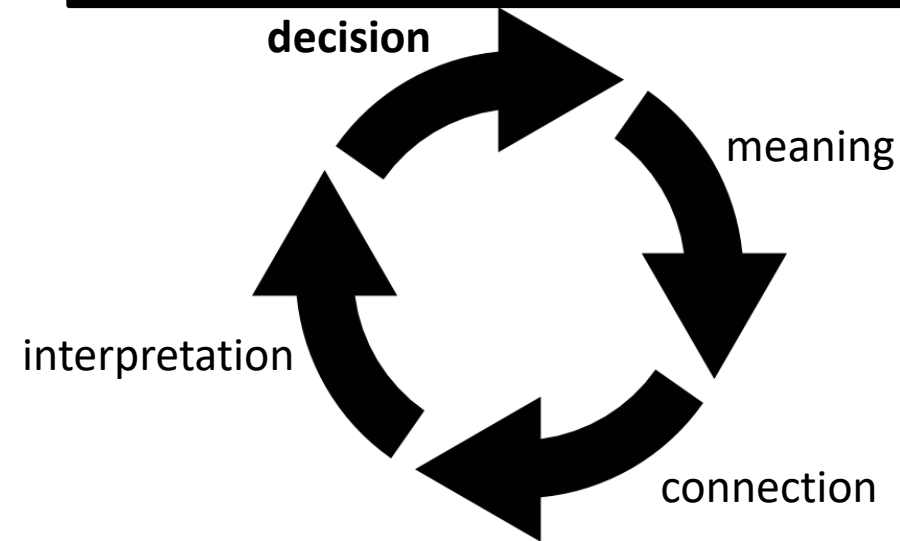


Step 4 – support decision making

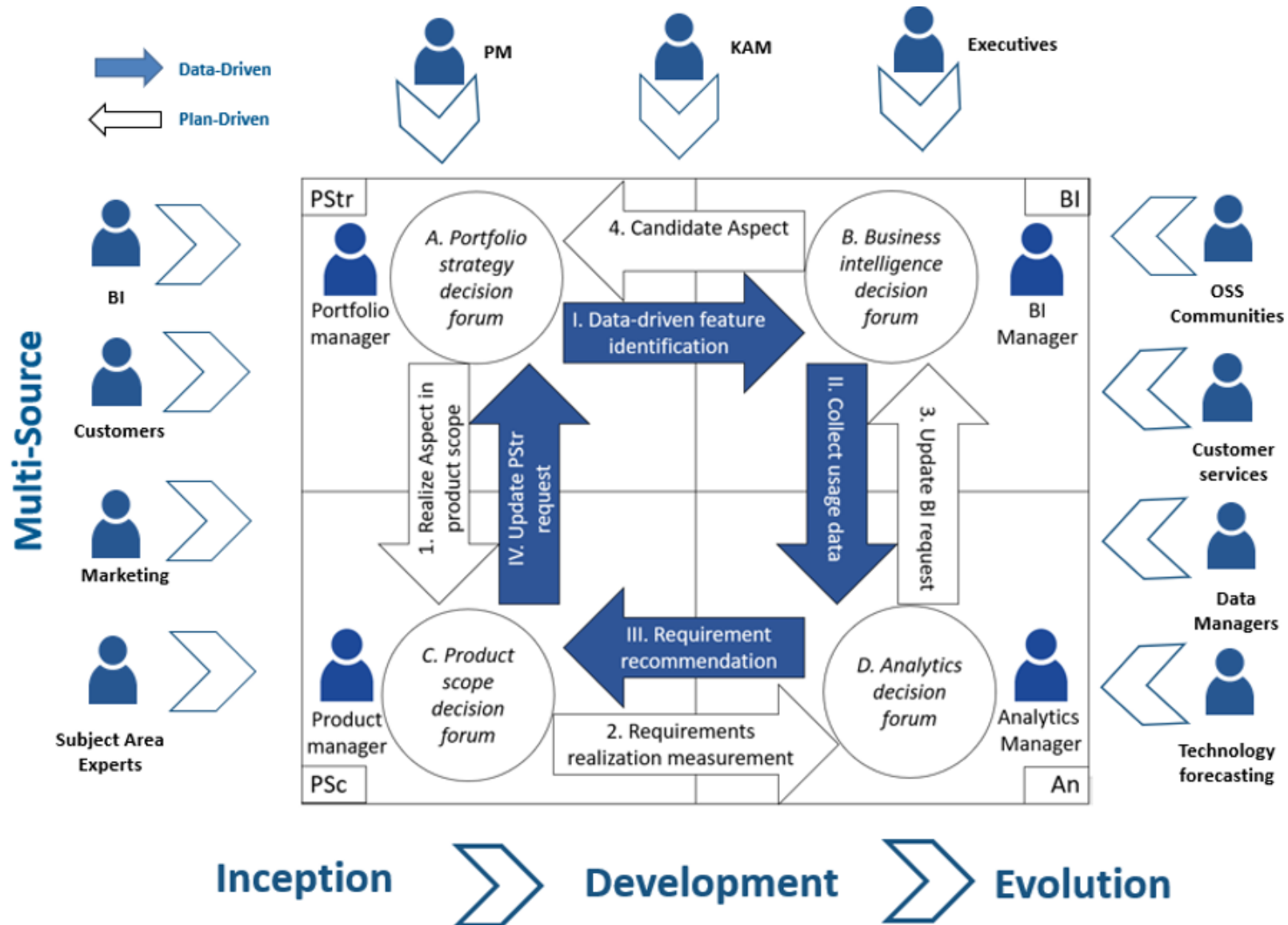
→ **DECISION:** How do we plug-in the "Data" to the decision process of what products/features/services are developed, offered, refined, changed...

- theory meets practice in decision process (integration central)
- the product is a **DECISION SUPPORT SYSTEM... NOT** automated decisions...
- **COLLECT** data from the decision process and incorporate into updating **MEANING** and **CONNECTION**... and away we go...
- **evaluation of these alternatives** (semi-automated analysis of product usage data and user feedback).

Envisioned Solution



Example organization



Questions

- Sounds interesting - please contact
- krw@bth.se

