PANEL - CONTENT / PATTERNS 2013

Advances on Information Mining

Samuel Kosolapov, Hans-Werner Sehring, Alfred Zimmermann

Introduction

1. **What are the Advances in Information Mining we have to discuss today?**

1. **Goal of our discussion:**

   We want to discuss about our experiences and our positions, coming from both academia and practice

Panelists

Self-introduction of panelists with short **information** about each **person,** their **work** and **expectations** to our **discussion**

- **Samuel Kosolapov – Israel**
- **Hans-Wener Sehring – Germany**
- **Alfred Zimmermann – Germany**

Definition of Information Mining

1. **Origin**: Data Mining or Knowledge Discovery from Databases
2. **Orientation**: towards high structured data
3. **Analysis of heterogeneous information sources**
4. **Often** combined with **AI technologies,** like fuzzy logic
5. **Classical methods** from **statistics, decision trees, neural networks**
6. **Challenges**: mining of texts, models, patterns, image & sound data, medical data, spacial data, other temporal data
7. **Information Mining**: Extension of Data Mining to identify understandable patterns in heterogeneous information sources

Tasks of Knowledge Discovery

1. **Deviation Filtering** (Anomaly Detection) of unusual instances
2. **Associations**: Dependency modeling based on monitored associations and association rules learning
3. **Clustering**: discovering type and classes of similar instances
4. **Classification**: mapping of instances to clusters of predefined classes
5. **Regression**: find a function which models the data with least error
6. **Summarization**: compact representation for visualizations or reports
7. **Pattern Mining**: Find sets of instances that occur frequently together

Positions from Panelists

1. **Samuel Kosolapov:**

   #### YourContributionTitle

2. **Hans-Wener Sehring:**

   #### YourContributionTitle

3. **Alfred Zimmermann:**

   Extracting and Integrating Metamodel-Information from Capability Maps of IT Enterprise Architectures

Synthesis of Opinions

1. **Questions** from the **audience** and **answers** from **panelists**
2. **What** are our **main conclusions** and **hypotheses** for **future work** in **Information Mining?**
3. **What** are the **big challenges** we have to face**?**

School of Informatics

Business Informatics

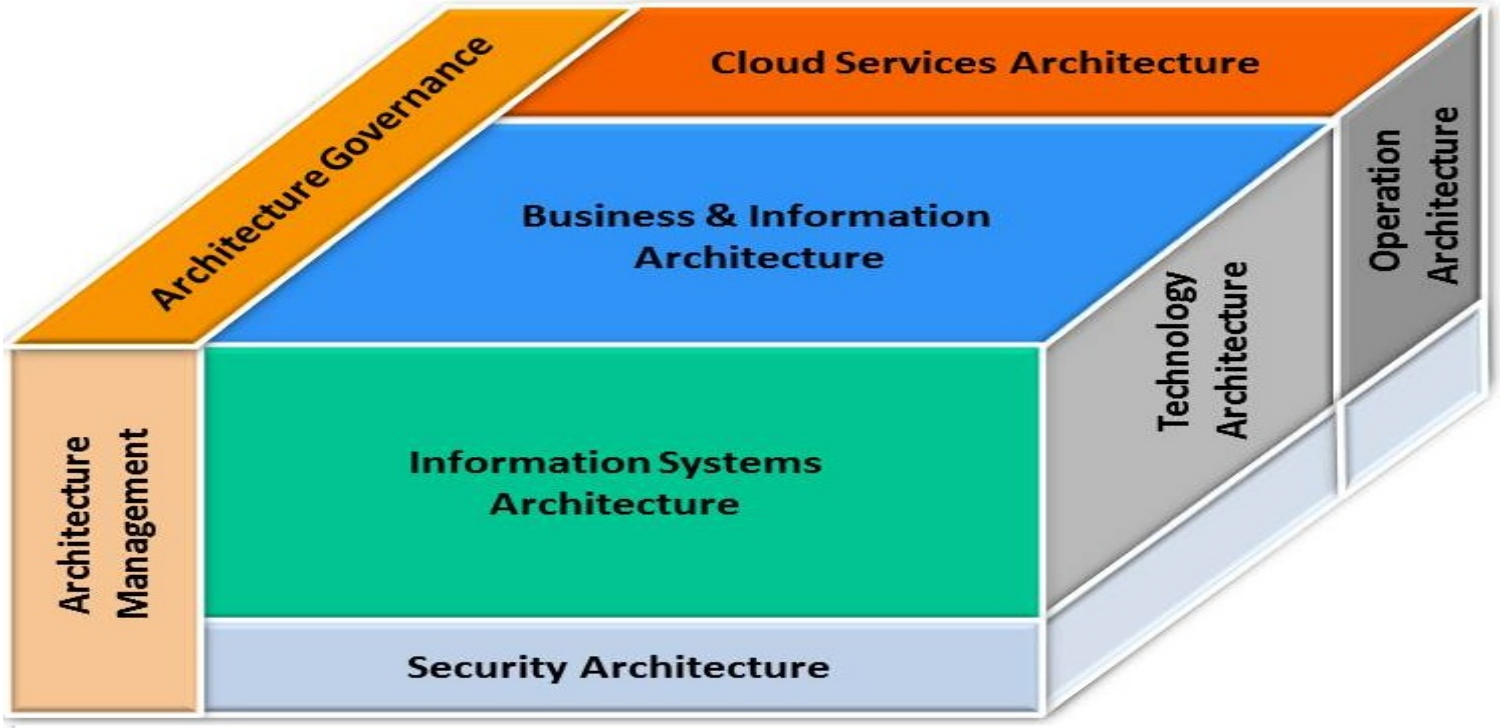
ARL - Architecture Reference Lab

ESAMI – Enterprise Services Architecture Metamodel Integration

Prof. Dr. Alfred Zimmermann

ESARC© - Enterprise Software Architecture Reference Cube Architecture Capability Diagnostics, Monitoring, and Optimization

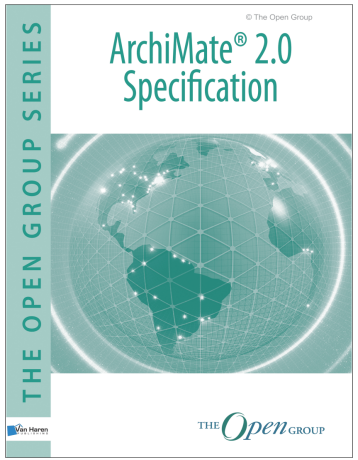
- ESARC defines an original holistic classification scheme for cyclic diagnostics and optimization of eight types (viewpoints) of service-oriented enterprise software architectures
- ESARC substantiates the TOGAF standard with other models to provide a useful mapping foundation of a reference architecture, defining main architecture artifacts and their relationships



ESAMI – Enterprise Services Architecture Metamodel Integration
Integration Process

1. Analyze each **Base Model** with **Concept Maps**
2. Extract the **Base Capability Model** from each model:
   Capability, Model, Element, [Example]
3. Initialize the **Reference Architecture Model** from Base Capability Models:
   Capability, Model, Element
4. Analyze **Correlations** (Concept Mappings) between Base Models and Reference Architecture Model, and optionally conclude **transitive correlations** (Min)
5. Determine **Integration Options** for the resulting **Capability Integration Model**
6. Develop the **Synthesis Metamodel** from **Base Metamodels**
7. Consolidate the **Reference Architecture Model** according to the **Joined Metamodel,** and **finally readjust Correlations** and **Integration Options**
8. Develop **Capability Map** and **Ontology** of the **Reference Architecture Model**
9. Develop **Correspondence Rules** between **Model Elements**
10. Develop **Patterns** for **Architecture Diagnostics** and **Optimization**

Integration Scenario of Business Architectures from ArchiMate® 2.0 and TOGAF 9.1

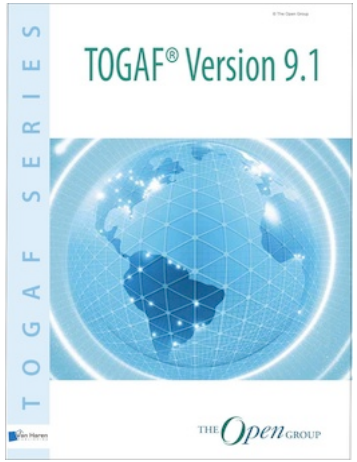


Open Group Standard

ArchiMate® 2.0 Specification.

The Open Group 2009-2012,

ISBN 1-937218-00-3



Open Group Standard

TOGAF 9.1.

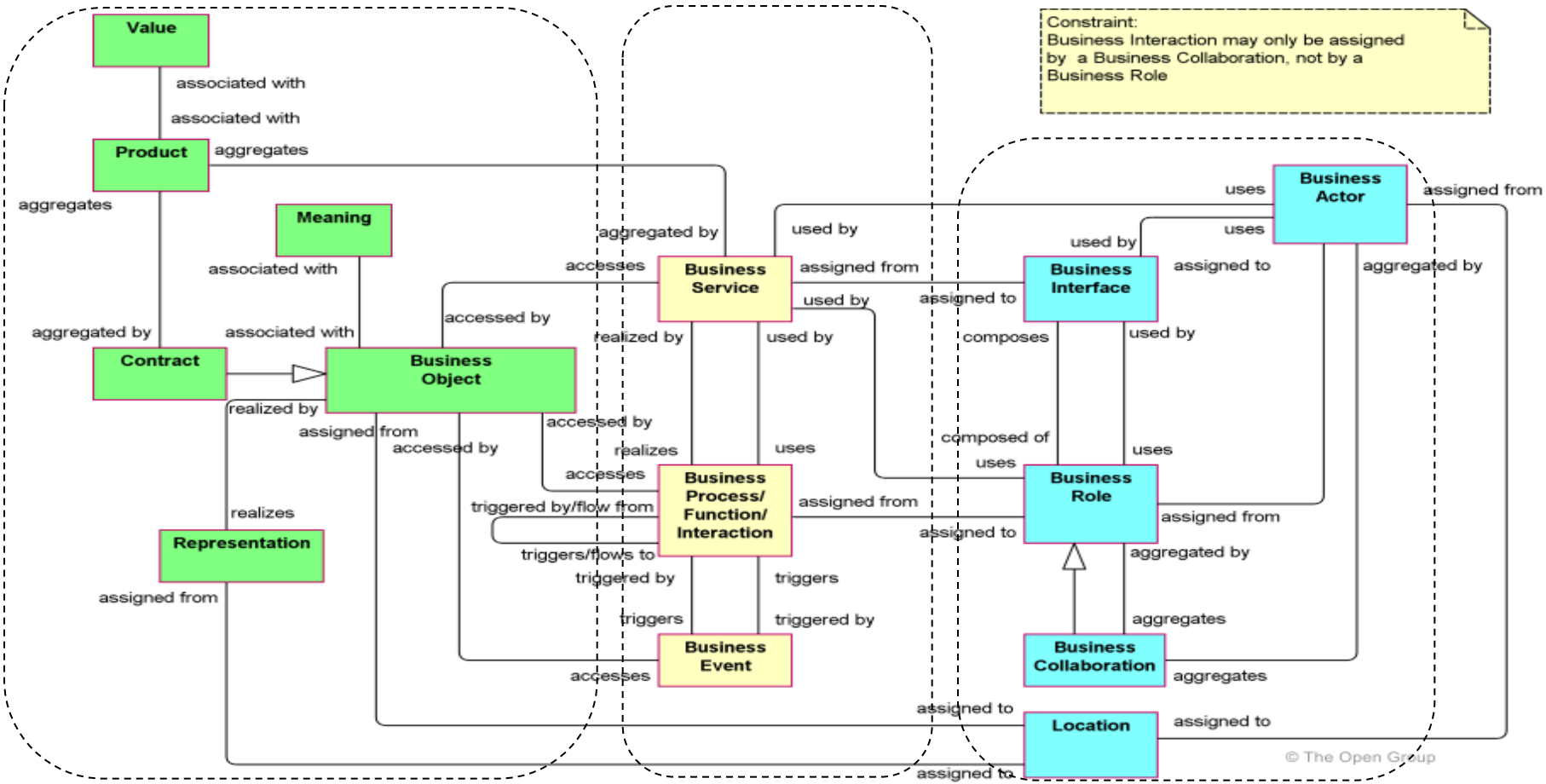
The Open Group 2011,

ISBN 978-9087536794

Capability	Model	Element	Example
BusinessActivator (Viewpoint)	**BusinessActor** BusinessRole Business Collaboration BusinessInterface Location	BusinessActor BusinessRole Process Service	BusinessActor = Language Insurance Department BusinessRole = Travel Insurance Seller Process = tale out travel insurance Service = Offering travel insurance

Capability	Model	Element	Example
Organization (Viewpoint)	**Actor** Role Location	Actor Role OrganizationUnit Function Process BusinessService Event Location	

ArchiMate 2.0
Business Layer Metamodel

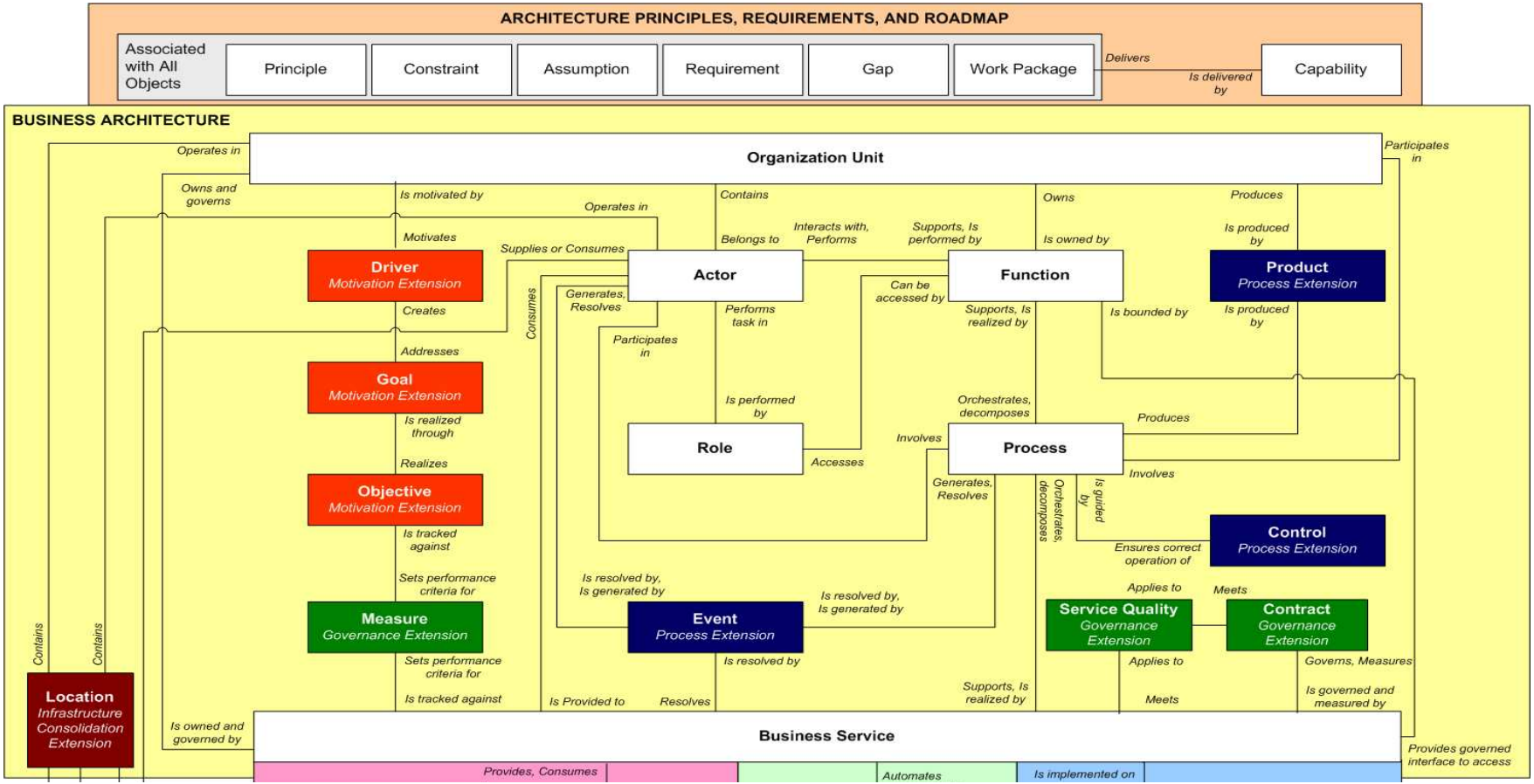


 Source: The Open Group, ArchiMate 2.0 Specification, pp. 14, 2012

ArchiMate 2.0
Base Capability Map for BusinessActivator: BusinessActor

Capability	Model	Element	Example
BusinessActivator	BusinessActor	BusinessActor BusinessRole Process Service	BusinessActor = Luggage Insurance Department BusinessRole = Travel Insurance Seller Process = take out travel insurance Service = Offering travel insurance

TOGAF
Business Architecture Metamodel



 Source: The Open Group, TOGAF 9.1, 2011

TOGAF 9.1
Base Capability Map for Organization: Actor

Capability	Model	Element	Example
Organization	Actor	Actor Role OrganizationUnit Function Process BusinessService Event Location	

ESAMI – Enterprise Services Architecture Metamodel Integration

Consolidated EAM Reference Architecture: Analysis and Integration

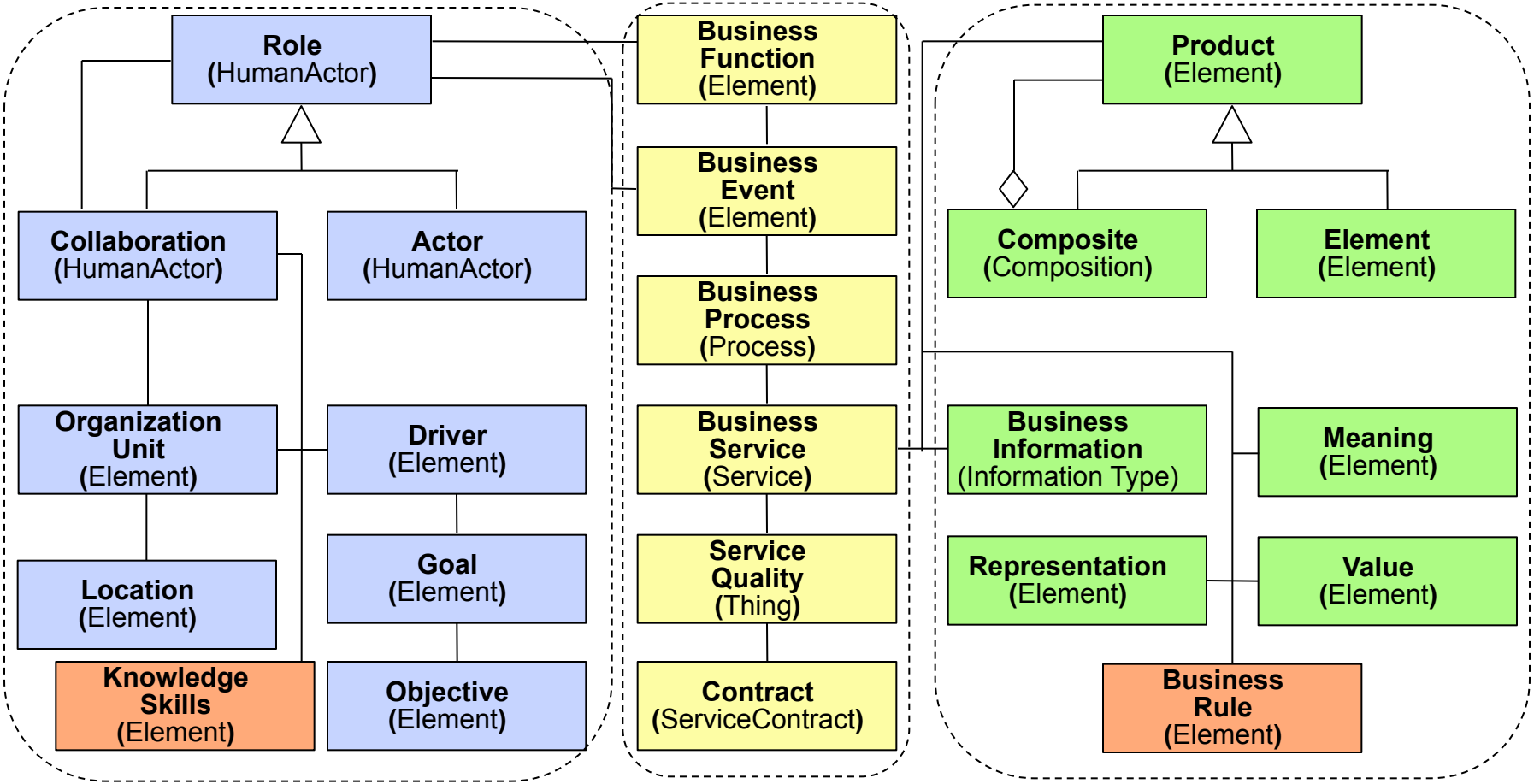
Reference	EAM Reference Architecture			Correlation Index		Integration Options		Documents		
Origin	Capability	Model	Element	ArchiMate	TOGAF	ArchiMate	TOGAF	File	Pages	Authors
ArchiMate Specific. and TOGAF Standard	Business Activator	ActorRole	Actor	2	2	p	m		25-32 87-88	
			Role	3	2	m	m			
			Collabo-ration	3	0	m	r			
			Organiz. Unit	1	3	p	m			
			Business Function		3	p				
			Business Ev...		3	m				
	Organi-zation	Organi-zation Location	C...							
			C...							
			O...							
			Location							

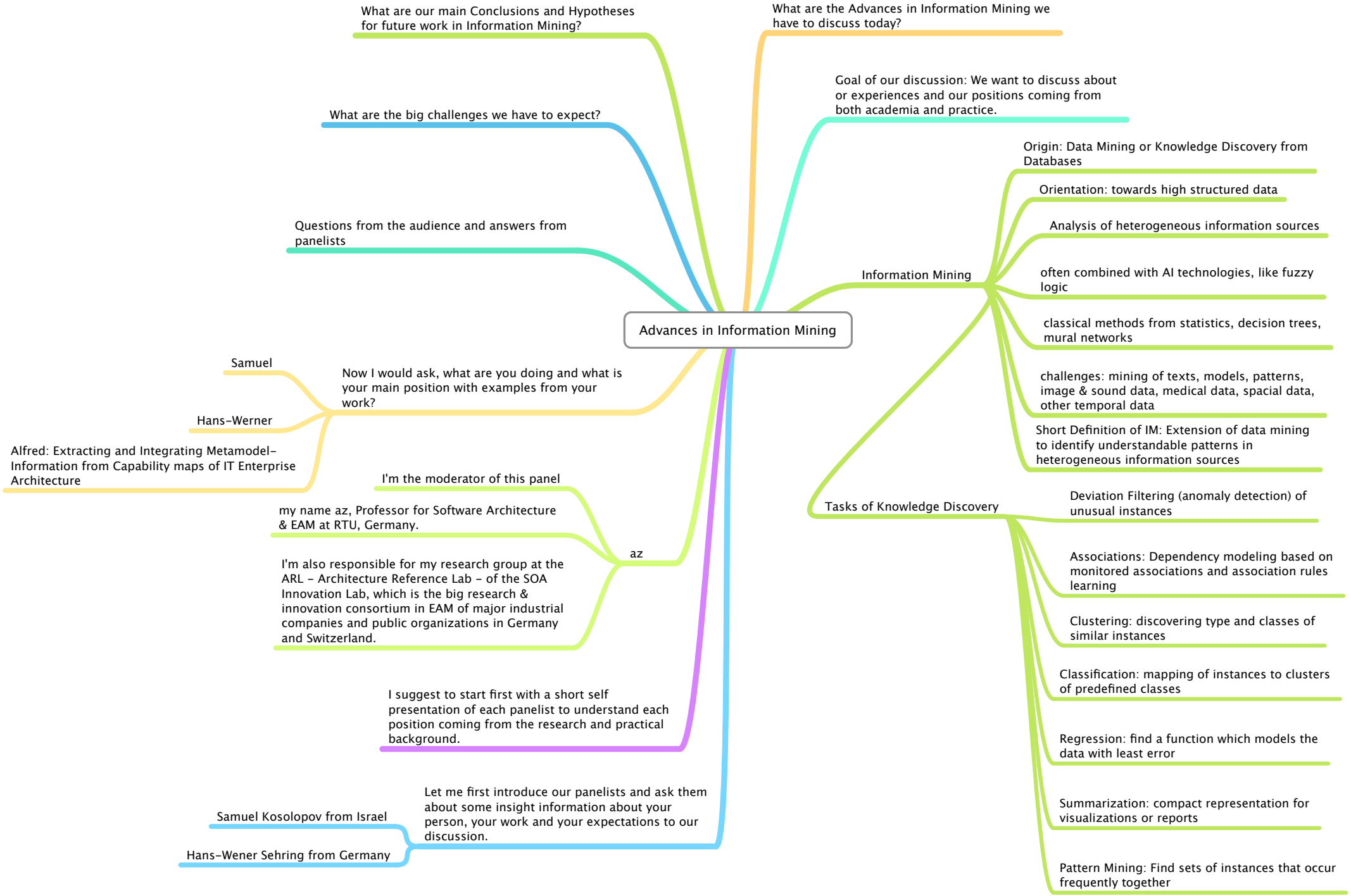
0 no correlation
1 low correlation
2 medium correlation
3 strong correlation

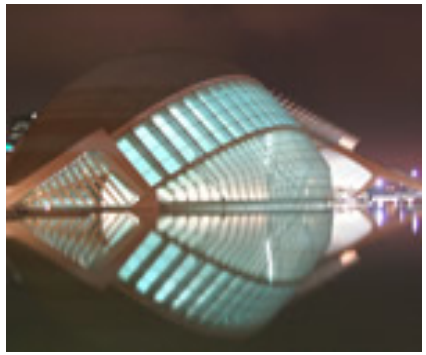
r reject
p partially
m mandatory (leading model)

ESAMI – Enterprise Services Architecture Metamodel Integration

SOA Ontology Typed Metamodel of Business Reference Architecture




Advances in Information Mining
What are our main Conclusions and Hypotheses for future work in Information Mining?
What are the Advances in Information Mining we have to discuss today?
What are the big challenges we have to expect?
Goal of our discussion: We want to discuss about or experiences and our positions coming from both academia and practice.
Questions from the audience and answers from panelists
Information Mining
Origin: Data Mining or Knowledge Discovery from Databases
Orientation: towards high structured data
Analysis of heterogeneous information sources
often combined with AI technologies, like fuzzy logic
classical methods from statistics, decision trees, mural networks
challenges: mining of texts, models, patterns, image & sound data, medical data, spacial data, other temporal data
Short Definition of IM: Extension of data mining to identify understandable patterns in heterogeneous information sources
Tasks of Knowledge Discovery
Deviation Filtering (anomaly detection) of unusual instances
Associations: Dependency modeling based on monitored associations and association rules learning
Clustering: discovering type and classes of similar instances
Classification: mapping of instances to clusters of predefined classes
Regression: find a function which models the data with least error
Summarization: compact representation for visualizations or reports
Pattern Mining: Find sets of instances that occur frequently together
Samuel
Hans-Werner
Alfred: Extracting and Integrating Metamodel-Information from Capability maps of IT Enterprise Architecture
Now I would ask, what are you doing and what is your main position with examples from your work?
I'm the moderator of this panel
my name az, Professor for Software Architecture & EAM at RTU, Germany.
I'm also responsible for my research group at the ARL – Architecture Reference Lab – of the SOA Innovation Lab, which is the big research & innovation consortium in EAM of major industrial companies and public organizations in Germany and Switzerland.
az
I suggest to start first with a short self presentation of each panelist to understand each position coming from the research and practical background.
Samuel Kosolopov from Israel
Hans-Wener Sehring from Germany
Let me first introduce our panelists and ask them about some insight information about your person, your work and your expectations to our discussion.



IARIA
www.iaria.org

The Fifth International Conference on Creative Content Technologies
CONTENT 2013
May 27 - June 1, 2013 - Valencia, Spain
http://www.iaria.org/conferences13/CONTENT13.html

PANEL - CONTENT / PATTERNS 2013

Advances on Information Mining

Samuel Kosolapov, Hans-Werner Sehring, Bijan Raahemi, Alfred Zimmermann

Introduction

1. **What are the Advances in Information Mining we have to discuss today?**

2. **Goal of our discussion:**

   We want to discuss about our experiences and our positions, coming from both academia and practice

Panelists

Self-introduction of panelists with short **information** about each **person,** their **work** and **expectations** to our **discussion**

- **Samuel Kosolapov**
- **Hans-Wener Sehring**
- **Bijan Raahemi**
- **Alfred Zimmermann**

Definition of Information Mining

1. **Origin**: Data Mining or Knowledge Discovery from Databases
2. **Orientation**: towards **high structured data**
3. **Analysis of heterogeneous information sources**
4. **Classical methods** from **Statistics, Decision Trees, Neural Networks**
5. **Often** combined with **AI Technologies,** like Fuzzy Logic, Concept Learning
6. **Challenges**: mining of texts, models, patterns, image & sound data, medical data, spacial data, other temporal data
7. **Information Mining**: Extension of Data Mining to identify **understandable patterns** in **heterogeneous information sources**

Tasks of Knowledge Discovery

1. **Deviation Filtering** (Anomaly Detection) of **unusual instances**
2. **Associations**: **Dependency modeling** based on **monitored associations** and **association rules learning**
3. **Clustering**: discovering **type** and **classes** of similar instances
4. **Classification**: **mapping of instances to clusters** of predefined classes
5. **Regression**: find a **function** which **models data** with least error
6. **Summarization**: **compact representation** for **visualizations** or **reports**
7. **Pattern Mining**: Find **sets of instances** that **occur frequently together**

Positions from Panelists

1. Samuel Kosolapov

   Addition of Rich Data from Smartphone Sensors to Image Metadata

2. Hans-Wener Sehring

   Adapting Content Based on Users' Behavior

3. Bijan Raahemi

   Machine Learning with Applications in Intrusion Detection

4. Alfred Zimmermann

   Extracting and Integrating Metamodel-Information from Capability Maps of IT Enterprise Architectures

Synthesis of Opinions and Discussion

1. **Questions** from the **audience** and **answers** from **panelists**

2. **What** are our **main conclusions** and **hypotheses** for **future work** in **Information Mining?**

3. **What** are the **big challenges** we have to face**?**

Addition of rich environment, location, motion, and orientation data from smartphone sensors to Image Metadata will provide better scene analysis.

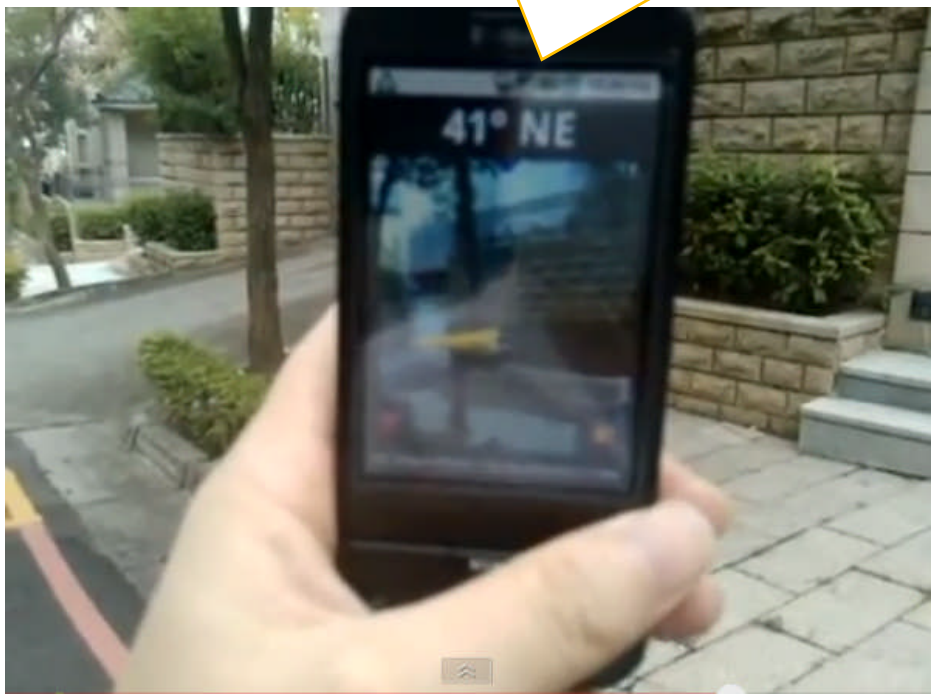
Are current Camera and Image Analyzing applications ready for the change?

Samuel Kosolapov

CONTENT/PATTERNS Panel.

CONTENT 2013. Valencia. 2013-05-29

Google Street View in Compass Mode: Compass that displays your location and direction



~ Standard JPG Image metadata

IMG_2301.JPG

JPEG image

Date taken:	2012-11-25 13:35
Tags:	Add a tag
Rating:	☆☆☆☆☆
Dimensions:	4000 x 3000
Size:	2.33 MB
Title:	Add a title
Authors:	Add an author
Comments:	Add comments
Camera maker:	Canon
Camera model:	Canon IXUS 220HS
Subject:	Specify the subject
F-stop:	f/2.7
Exposure time:	1/30 sec.
ISO speed:	ISO-640
Exposure bias:	0 step
Focal length:	4 mm
Max aperture:	2.875
Metering mode:	Pattern
Flash mode:	No flash, compulsory
Date created:	2013-02-12 17:11
Date modified:	2012-11-25 13:35

I want Sensors Info to be included into the Image Metadata
but in a standardized way.
Yes, everyone can add a TAG,
but in order to provide metadata search some standardization is required

Galaxy Nexus. List of Sensors

- **Camera** (Frons & Back) + Optical proximity sensor: GP2A
- **Microphone**
- **TouchScreen sensor**: *Melfas MMSxxx touchscreen*
- **Triaxial acceleration sensor** *BOSCH BMA250*
  Measurement of accelerations in 3 perpendicular axes
  Used to sense tilt, motion, shock and vibration. (range +-2g… +-16g; 10 bit !)
- **Triple Axis MEMS Gyroscope**: *InvenSense MPU3050*
  3-axis gyroscope with an embedded Digital Motion Processor™
  Digital-output X-, Y-, and Z-Axis angular rate sensors (gyros)
  range of ±250 to ±2000°/sec
  Used to sense: gesture recognition, panning, zooming, scrolling,
  zero-motion detection, tap detection, and shake detection

  \+ Digital-output **temperature sensor**
- **Geomagnetic sensor**: tri-axial *Yamaha YAS530*
  Resolution: 0.15uT (X,Y), 0.3uT (Z)
  Used to sense: Absolute Direction (compass)
- **Barometric pressure sensor**: BOSCH BMP180

  (300...1100 hPa, first of its kind in a smartphone)
  Used to sense: height over the sea level

Why would I want more sensors data inside the image ?

- We have a huge amount of photos and videos in the cloud.
  But search images by content is still very slow and is not always feasible.
- Metadata can provide additional info which can be used to narrow the search.
- Example: Leaning Tower of Pisa
  "Engineers" announced that the Tower had been stabilized
  such that it had stopped moving for the first time in its history.
  They stated it would be stable for at least 200 years

  I want to analyze set of images
  taken from the same camera position, direction and orientation
  in order to check this claim.
- Actually, sensor information may help to reconstruct 3D scene
  from a plurality of 2D Images

Adapting Content Based on Users' Behavior.

Panel on Advances on Information Mining.
Computation World 2013, Valencia, Spain.

Dr. Hans-Werner Sehring, T-Systems Multimedia Solutions GmbH, Germany.

T · · Systems

Scope of Information Mining Used in this Proposition.

- Information/content: purposeful data.
- Mining: Detect implicit relationships in data (similar: find structure in data).
- My field: Content Management.
  - Manually managed content (data).
  - Structure and relationships are well-know/prescribed.
- Observation: Content is perceived in …
  - a context (“Context is King”) …
  - by a user/consumer/use/situation/…

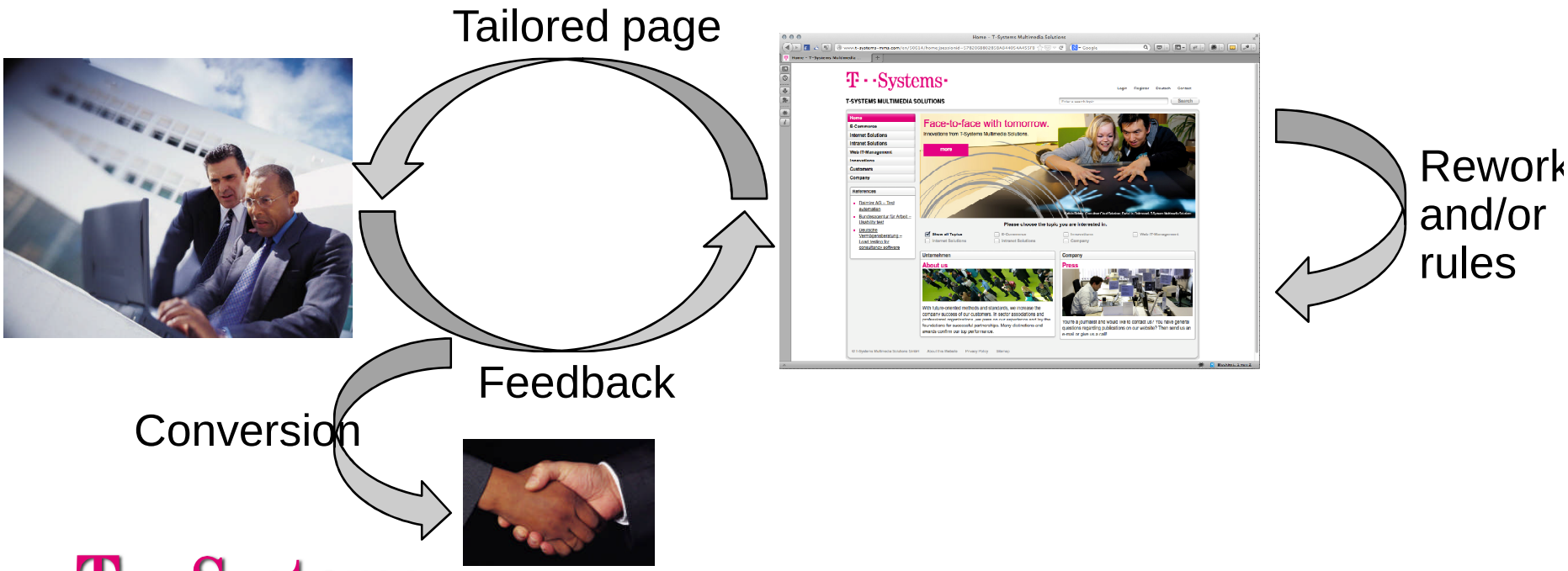
Learning About Users.

- Information = purposeful data, in a context; here: content targeted at a person.
- Information mining here: learning about users and their use of content.
  - Need to describe persons.
  - No explicit data available.
    - Not willing to give information: consumer, …
    - Not possible to give info: diverse interest, subjective (non-explicable) views, …
  - Known, e.g., from personalization based on tracking/profiling.
- Known, e.g., from personalization based on tracking/profiling.
  - Tracking actions.
  - Allowing registered users to give information about themselves.
  - Observing registered users, eventually including anonymous tracking history.

T · · Systems

Information Mining on the Web (I).

- In field of content management: Web Content Management now named
  - Web Experience Management (WCM)
  - Customer Experience Management (CEM, CXM)
- Currently of particular interest: marketing automation.



Information Mining on the Web (II).

- Topics, e.g.:
  - Web tracking (what did the customer do?).
  - Learn about customer journeys (how did the customer come to us?).
  - Segmentation (cluster/classify users).
- With the goals to …
  - Move focus from Point of Sale (PoS) to Point of Contact.
  - Iteratively measure success and improve a site's appearance.
    - Personalization (for groups of users).
    - A/B testing.
  - Compute recommendations (based on segments).
  - Predictive marketing (based on user's history).
- Overall goal of course: increase conversion rate by attracting the customers in the "right" context.

Information Mining on the Web (III).

- Challenges:
  - Getting to know about users.
    - How to identify anonymous users?
    - With different/changing devices?
    - Across different services provided by different service providers?
    - Within legal constraints?
    - How to distinguish different usage scenarios? E.g.,
      - Buy a new washing machine,
      - Having bought a new washing machine,
      - Looking for a washing machine to recommend to the mother in law.
    - How to incentivize users to give information about themselves?
    - …?
  - Drawing conclusions from knowledge about users.