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for Service Oriented Computing
IE4SOC

ICSOC-ServiceWave 2009 - Industrial Application Workshop

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S-CUBE

European Network of Excellence in Software Services and Systems

ICSOC-ServiceWave 2009 - Industrial Application Workshop

Service-oriented applications are being developed in a variety of application domains. While research focuses on theoretical aspects in themes such as Service Engineering, Service Compositions, Service Management, SOA at runtime, Quality of Service, and Grid Services, solid experiences about the utility of the proposed approaches in industry are still missing. The aim of this workshop is, therefore, to identify the most promising research directions that can have an impact on the service industry for the purpose of aligning academic and industrial research agendas. The evaluation of different proposed approaches and benchmarks and complete case studies is needed to be able to assess which are the most promising research directions that can have an impact on the industrial development of this field.

Goals

Starting from the research work of the EU Network of Excellence S-Cube on analyzing case studies and the gaps in current solutions of current research towards the establishment of adaptive and flexible service-based applications, and with the goal of involving industries in the discussion of experiences in using services in real cases, the workshop has the aim of collecting case studies and perceived gaps in current platforms from industries and from currently running industrial and research projects. The aim of this workshop is to broaden the scope of this gap analysis by collecting industrial scenarios and case studies and by analysing the industrial needs for research in the next 5-10 years. A systematic basis for analyzing the available material can be set and a contribution can be made towards establishing benchmarks for assessing technologies and new research approaches

The industries will be involved with the presentation of their experiences and of their gap analysis with respect to platforms and solutions being adopted and developed.

The goal of the workshop is to establish a discussion forum to analyze and compare the characteristics of presented case studies and solutions.

Workshop organizers

Barbara Pernici, Politecnico di Milano, Italy

Andreas Gehlert, University of Duisburg-Essen, Germany

Marco Pistore, FBK-IRST, Trento, Italy

Pierluigi Plebani, Politecnico di Milano, Italy

George Spanoudakis, City University London, UK

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Workshop Agenda

10.00 – 10.10 Welcome by Workshop organizers (B. Pernici, Politecnico di Milano)

10.10 – 10.30 The S-Cube approach to the modeling of industrial case studies (P. Plebani, Politecnico di Milano)

10.30 – 11.00 Research Challenges for Seamless Service Integration in Extensible Enterprise Systems (Matthias Allgaier, Markus Heller, SAP Research)

11.00 – 11.30 coffee break

11.30 – 12.00 Implementing an SOA for a primary telecommunication operator (Giovanni Laudicina, Ferdinando Campanile, Salvatore Giordano, Sync Lab srl)

12.00 – 12.30 Improving e-service acceptance by involving researchers, providers and users - The efforts of our research institution in the field of e-service acceptance (Gregor Polančič, Boštjan Šumak, Marjan Heričko, University of Maribor)

12.30 – 13.00 On Exploiting Research Solutions to Build Internet of Services at the City Level (Marco Pistore, SayService)

13.00 – 13.30 Panel discussion with presenters and all participants to analyze industry-research cooperation towards the development of industrial case studies

The S-Cube approach to the modeling of industrial case studies

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IE4SOC Workshop @ ServiceWave-ICSOC
Stockholm, 23/11/2009

Agenda

- Modeling case studies
- Current case studies set
- Classifying & comparing case studies

Agenda

- **Modeling case studies**
- **Current case studies set**
- **Classifying & comparing case studies**

Initial approach

- S-Cube proposal
  - An approach to describe case studies derived from NEXOF-RA and enriched with other elements from the RE literature
  - The identification of a set of case studies which the approach is applied on
- Case studies from various application domains
  - From NEXOF partners
  - From a joint effort of 360Fresh and IBM
  - From a wine producer SME

The proposed case study description approach

- Business goals: express the main purposes of some system in the terms of the business domain in which the system will live or currently lives
- Domain assumptions and constraints: report properties of the domain or restrictions on the design of the system architecture
- Domain description: phenomena occurring in the world together with the laws that regulate such a world
- Abstract scenario description: a way to describe world phenomena

Business goals and domain assumptions/ constraints

- Business goals and domain assumption/constraints rely on the same elements:
  - Description
  - Rationale
  - Involved stakeholders
  - Conflicts
  - Supporting material
  - Priority

Example of case study: wine production

- Wine production (Donnafugata)
  - Business goals:
    - Quickly react to critical situations in the vineyard and during harvesting and maturation
    - Keep the produced items under control during transportation and storage
    - Create on the fly contacts with other grapes and wine producers when needed
  - Domain assumptions/constraints
    - The system should be drive by a self-managing business process
    - Vineyard is equipped with a wireless sensor and actuator network
    - Time between harvesting and processing should be limited
    - Logistic is supported through an RFID system

Wine production: Business goal (det.)

Field	Description
Unique ID	WINERY-S-BG2
Short name	Observe vineyard cultivation and react to its evolution
Type	Business goal
Description	The system shall provide a way to infer critical conditions from observing vineyard parameters. It shall provide a way to react in an automatic way to those critical conditions, both from selecting predefined reactions and inferring reactions from a knowledge base. Notifications to the Quality Manager, Oenologist and Agronomist shall be included in such predefined reactions. Other standard reactions are provided in the scenarios and in the domain sections.
Rationale	Maximize sales volume and wine quality.
Involved stakeholders	Quality Manager, Oenologist, Agronomist
Conflicts	None
Supporting materials	See Table..
Priority of accomplishment	Must have

Wine production: Domain assumption (det.)

Field	Description
Unique ID	WINERY-S-DA2
Short name	Vineyard is equipped with a wireless sensor and actuator network.
Type	Domain assumption
Description	The overall business process must be designed such that it shall perform self-management, that is, it shall implement the so-called MAPE cycle, that adheres to the scenario related to this assumption. In the MAPE cycle, the execution of the business process is based on a paradigm that involves resource Monitoring, collected data Analysis, intervention Plan, and action Execution. In the case of the proposed scenario, monitoring comes from the physical infrastructure (see next assumption), and the remaining parts of the paradigm must be implemented by the self-managing business process, which permits to define intervention plans and action executions after a critical condition detection as required by the related scenario. In this approach, detection of market changes and reaction to these changes shall be implemented as a particular instance of the MAPE cycle within the autonomic infrastructure.
Rationale	See Description
Involved stakeholders	Quality Manager
Conflicts	None
Supporting materials	
Priority of accomplishment	Should have

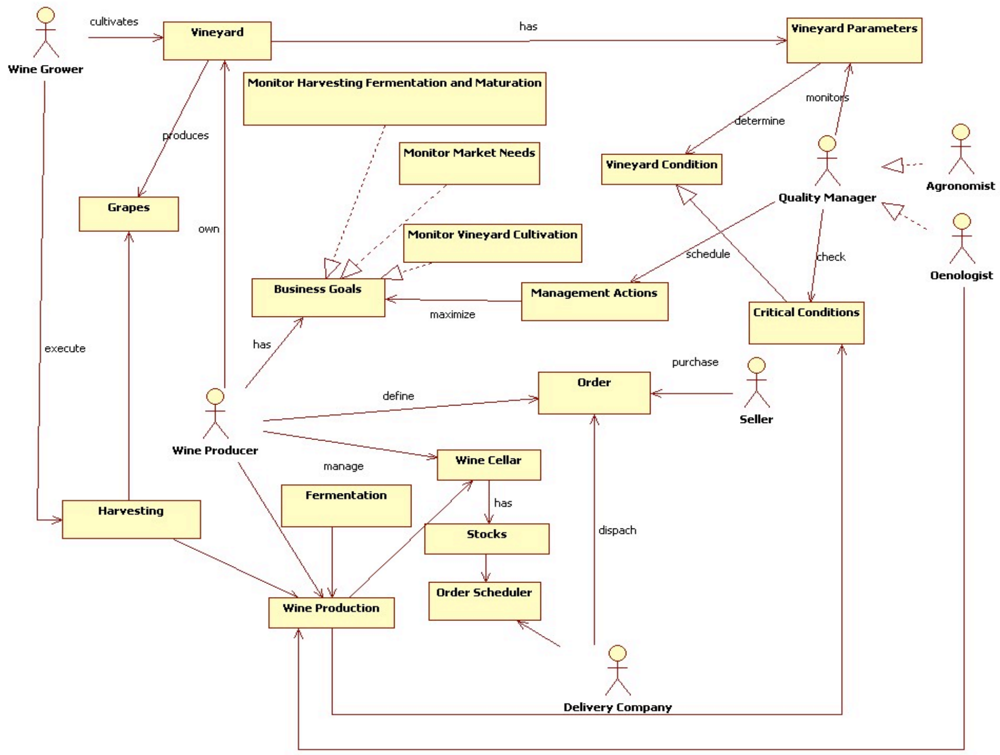
Domain description

- Purpose
  - Study and describe phenomena in the world as well as shared phenomena
- Content
  - Glossary
  - Relationships among the main terms
    - Through class diagrams, semantic networks, E/R diagrams, …
  - Boundaries between the world and the machine
    - Context diagrams

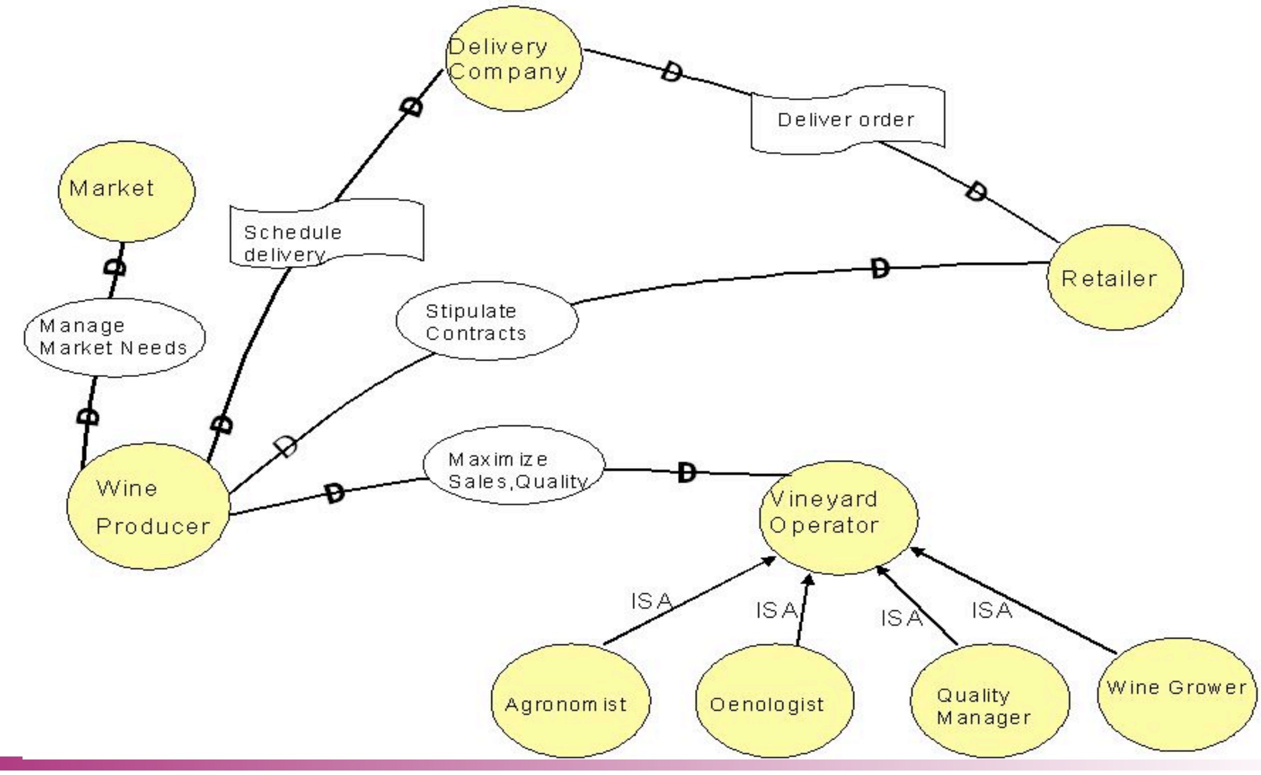
Wine production: domain model

Phase	Description	
Vegetative rest	Interval of repose concerned with growth and development. The plants are leafless.	
Green tips	Green tips are becoming to grow in the cottony tissue.	
Sprouting	The leaves are becoming visible as rosettes	
Expanses leaves	The leaves are broad and the axis of sprout is becoming visible	
…	…	…

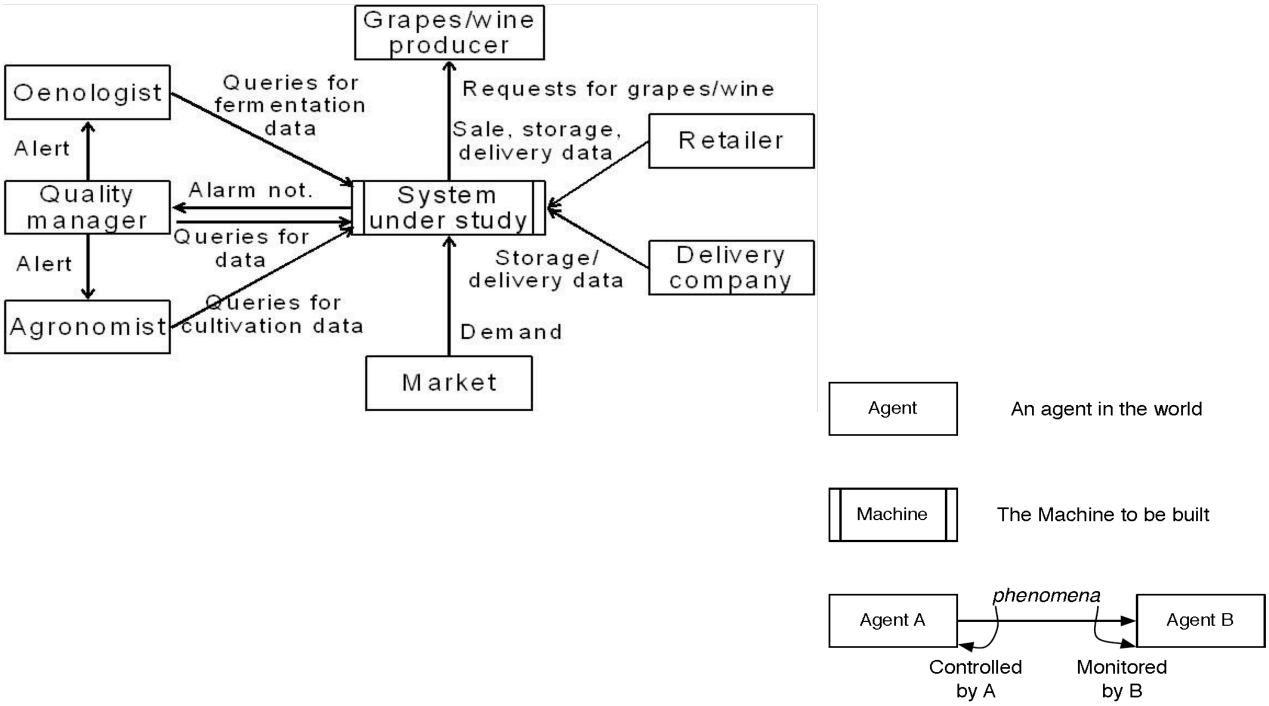
Wine production: domain model



Wine production: strategic dependency model



Wine production: context diagram



Scenarios description

- Purpose: to describe possible situations and interactions between the world and the machine
- Structure of description
  - Involved actors
  - Detailed operational description
  - Problems and challenges
  - Non-functional requirements and constraints
  - Accompanying material
    - sequence and activity diagrams
    - (sub)use case diagrams

Wine production: scenario description

- Some relevant scenarios:
  - Cultivation handling
  - Managing the market needs
  - Harvesting, Fermentation, and Maturation
  - Distribution and sale

Wine production: Scenario description 1/2

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Field	Description
Unique ID	WINERY-S-CH1
Short Name	Cultivation Handling
Related to	WINERY-S-BG1, WINERY-S-BG2, WINERY-S-DA1, WINERY-S-DA2
Involved actors	The agronomist, the oenologist and the quality manager. Moreover, the market has some roles on determining which vineyard should be cultivated.
Detailed operational description	Cultivation handling is mainly performed by the agronomist and the oenologist. For each vineyard, the handling process implies the analysis of functional parameters such as temperature, humidity, light, wind speed, etc. in specific months of the year. The kind of vineyards to be cultivated are determined by information coming from the market, in the sense that using statistical data about sales of previous years, the enterprise infers which vineyards are more likely to be cultivated in order to produce the kind of wines that will maximize sales. The agronomist and oenologist determine the vineyard quality by analyzing gathered information. It may happen that those actors could detect critical conditions on which some recovery actions should be performed in order to react and prevent damages for the wine production. Critical conditions can involve some events on the environment (such as frost destroying the vineyard), or some other events involving the measurement of the quality versus its estimate coming from market information. The identification of the recovery actions is performed by the quality manager together with the oenologist and the agronomist. Actions include notifications and complex processes to be performed by different actors.
Problems and challenges	The main problems arising with the described complex scenario involve: •handling the complex process of vineyard cultivation management; •identification of recovering actions; •automatization of observing vineyard parameters, detection of critical conditions and performing of recovery actions. •provide an automated way to infer an estimate of market needs;

Wine production: Scenario description 2/2

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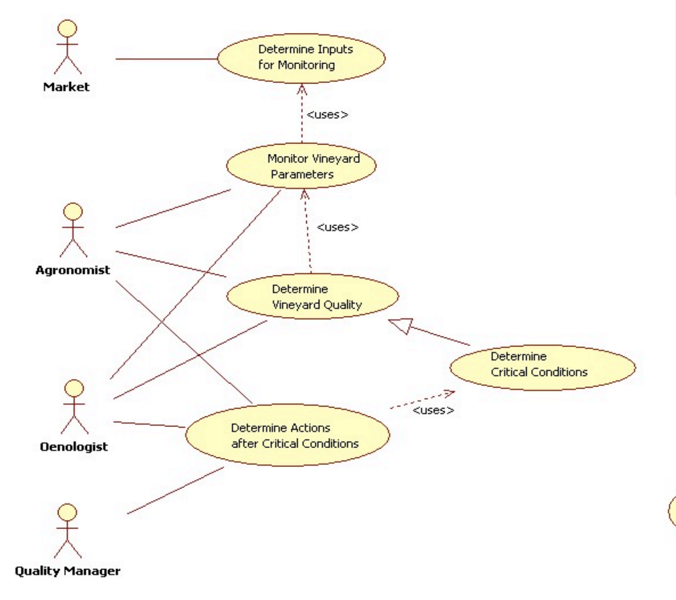
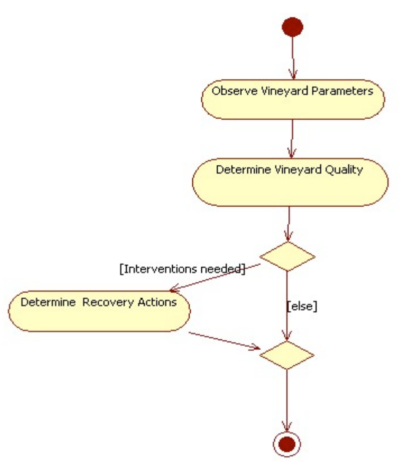
Field	Description
Additional Material	 

Case study description life-cycle

- The four elements NOT necessarily have to be defined sequentially
  - Goals→assumptions→domain→scenario
- They can be defined iteratively
- Some rules:
  - All the terms used in the description have to be put in a glossary
  - All identified actors have to appear in the context diagram (and vice versa)
  - From each scenario there exist at least one related business goal and vice versa
  - Scenarios are not overlapping
  - Goals are not overlapping

Agenda

- Modeling case studies
- **Current case studies set**
- Classifying & comparing case studies

Case studies

- Directly from S-CUBE
  - Wine production (Donnafugata)
  - Automotive supply chain (360Fresh and IBM)
- Derived from NEXOF-RA
  - E-health diagnostic workflow (Siemens/Thales)
  - Traffic management (Siemens)
  - E-government (TIS and Engineering)
- Additional case studies presented in the last WG meeting
  - Service Engineering WG
  - SLA@SOI
- For a complete description of the case studies analyzed in S-Cube, please refer to the deliverable IA-2.2.2 available on the S-Cube portal
  - http://www.s-cube-network.eu/ → Results → Deliverables → WP-IA-2.2

Case studies: automotive supply chain

- Automotive supply chain (IBM)
  - Business goals
    - Just in time production driven by financial and capacity plans
    - Transportation dependent on the highest possible order fulfillment
    - Source material always sufficient for production but stocking duration kept low, also depending on the sensitiveness of materials
    - Ability to change on the fly suppliers and logistic companies

Case studies: ehealth diagnostic workflow

- Ehealth diagnostic workflow (Siemens/Thales through NEXOF)
  - Business goals
    - Improve quality of healthcare through
      - ubiquitous and immediate access to all patients' data
      - facilitated access to expert consultancy
      - easy planning of examinations or other treatments
    - Reduce the costs of managing the complex workflow around a patient's treatment

Case studies: traffic management

- Traffic management (Siemens through NEXOF)
  - Business goals
    - Normal traffic regulation for optimizing noise, throughput, air pollution….
    - Quick reaction to crisis situations
    - Coordination between different traffic management systems
  - Assumptions
    - Heterogeneity and redundancy of devices in traffic management systems

Case studies: e-government

- E-government (TIS and Engineering through NEXOF)
  - Business goals
    - Statewide provision of online services for citizens, companies, government agencies
    - Improve speed and efficacy of processes
    - Provide a 24h per day availability of the services
    - Offer a good user experience and provide continuous feedbacks to users
    - Guarantee confidentiality, integrity, authenticity, non-repudiation
    - Guarantee that provided information is not used for a scope different than the one required by the user

Agenda

- **Modeling case studies**
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- **Classifying & Comparing case studies**

Case study meta-data

- Used to index case studies in the repository for facilitating search mechanisms
- Meta-data:
  - Source
  - Real vs. Realistic
  - Abstract
  - Available solutions
  - Licensing
  - …

Comparison dimensions

- S-CUBE
  - Description of business situations and presence of agile service networks
  - Need for negotiating, establishing, monitoring, enforcing QoS
  - Need for service consumers with various different characteristics
  - Need for distributed infrastructures
  - Need for highly distributed service compositions
  - Highly changing requirements at various levels (from business to infrastructure)
- Others
  - Security
  - Reliability
  - …

Current comparison

	Wine	Automotive	E-health	Traffic	E-gov
Business situations and ASNs	Yes	Yes	No	No	Partially
QoS	No	Partially	Yes	Yes	Partially
Service consumers with various profiles	No	No	Yes	Yes	Yes
Distributed infrastr	Yes (WSN)	Yes (IS)	Yes (WSN, IS, mobile)	Yes (IS, mobile)	Possibly (IS)
Distributed composit	No	Yes	No	No	No
Highly changing requirem	Yes	Partially (changes of regulations)	Yes	Yes	No
Security	No	Yes	Yes	No	Yes
Reliability	Partially	Yes	Yes	Yes	Partially

Ongoing work

- Defining the relevant research challenges. Some examples:
  - Definition of a coherent life cycle for adaptable and evolvable SBA
  - Understand when an adaptation requirement should be selected
  - End-to-End Quality Reference Model
  - Business Transactions in Service Networks
  - QoS Aware Adaptation of Service Compositions
  - Process mining for service discovery
- Linking research challenges to the case studies
- Aligning industrial agenda (NESSI) and academic agenda
- Building a repository for case studies

Research Challenges for Seamless Service Integration in Enterprise Systems

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Abstract. Today, the integration of services into business applications within enterprise systems often requires deep expert knowledge and is typically carried out in manual integration projects on the consumer side. To reduce the total cost of ownership (TCO) for consumers, enterprise system vendors need to allow for efficient integration of services within business applications. Seamless service integration into such environments still constitutes a less explored research area of service-oriented architecture (SOA) research. This paper highlights the industrial need for research in this area and outlines key research challenges regarding integration of services into business applications at a later stage in the software-lifecycle - especially after the shipment of the software.

Keywords: Service Engineering, Service Ecosystems, Enterprise Systems, Extensibility

1 Motivation

In the vision of an *Internet of Services* ([1], [2]) services will become tradable similar to manufactured goods. As services [3] become more widely accessible in service ecosystems (e.g. [4], [5]), the simplified consumption of services becomes a key challenge, especially in enterprise context. Over the last years, a significant number of research projects have studied the provisioning and composition of services. However, this is not equally matched on the service consumption side which can occur in different flavours. Beside consumption in *composite-* or *mash-up applications*, the integration of services into standard *business applications* running within *enterprise systems* (e.g. [6]) is most valuable as these systems typically implement the core business processes of an organization. Basically two different integration scenarios can be distinguished when integrating a service into an enterprise system.

[*] The work presented in this paper is embedded into THESEUS/TEXO project which is funded by means of the German Federal Ministry of Economy and Technology under the promotional reference 01MQ07012. The authors take the responsibility for the contents.

Scenario (1): The enterprise system is extended with a service using a pre-defined service interface that has explicitly been foreseen by the enterprise system provider when the core system was shipped. Examples are standard interfaces for Business-to-Business (B2B) or Application-to-Application (A2A) integration scenarios.

Scenario (2): The enterprise system is extended with a service that has not explicitly been foreseen by the enterprise system provider when the core system was shipped. Examples are services innovated in dynamically evolving service ecosystems.

In both scenarios, mismatches between the service interfaces of the enterprise system and the service provider are handled by service mediation components which have been extensively investigated (e.g. [7]). In contrast, to the best of the author's knowledge, no service engineering approach exists for the integration of unforeseen services as described in scenario (2).

In this paper, we envision an approach of building enterprise systems that allow for seamless and less-complex inclusion of unforeseen services at a later stage in the software-lifecycle - especially after the shipment of the software. We describe an illustrative, industrially relevant scenario and derive research challenges that need to be addressed. Future research on this topic will become particular relevant for service/partner ecosystems in upcoming on-demand enterprise software environments (c.f. *Platform-as-a-Service*, e.g. [8]).

2 Illustrative Scenario

The envisioned integration of services into standard business applications is illustrated with a case study from the automotive sector (see Figure 1). Due to legal changes, a manufacturer of car seats (role *Service Consumer*) has to certify his products under ecological aspects to guarantee environmental sustainability of used materials. The company runs an enterprise system that implements its core business processes (a screenshot of the system's user interface is shown in Figure 2).

A *Service Provider* uses a service development environment to create and publish a service on the service marketplace that allows calculating eco values for products including certification independent of a concrete target environment (Step 1). After deployment, the *Service Host* operates the service (Step 2).

The *Service Consumer* owns a business application for product lifecycle management (PLM) within the enterprise system to design car seats. In the standard version of this business application, the calculation of eco values for a given bill of material is not supported. Therefore, a product designer accesses the service marketplace and searches for services that provide the missing functionality. As a result, a list of services from various service providers is returned that fit to the working context of the service consumer (Step A).

The designer selects a service called "Eco-Calculator" and purchases it on the marketplace. Afterwards, the service is automatically integrated into the core business application without running a manual integration project (Step B).

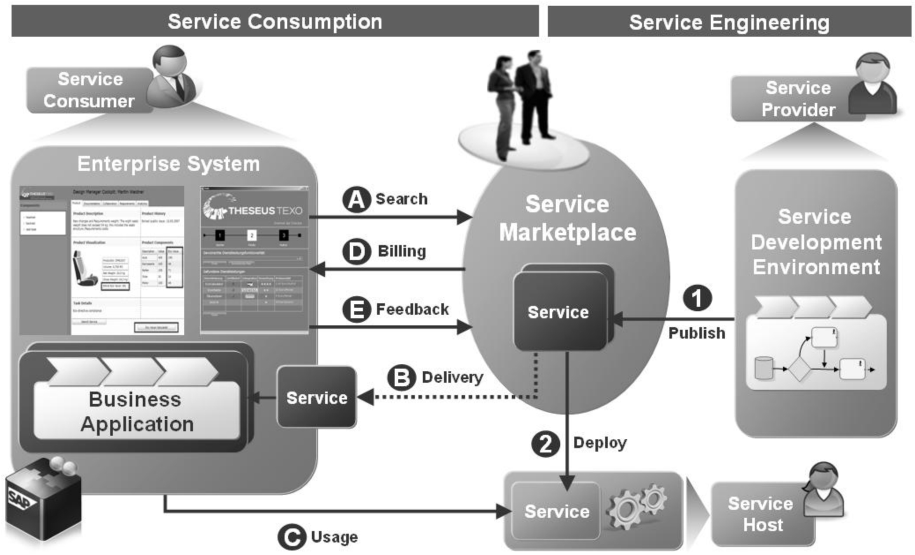

Figure 1. Service integration scenario in a service ecosystem

In detail, the user interface is extended with (1) an additional table column, (2) an additional button, and (3) an additional field indicating the total eco value for the car seat (see Figure 2).

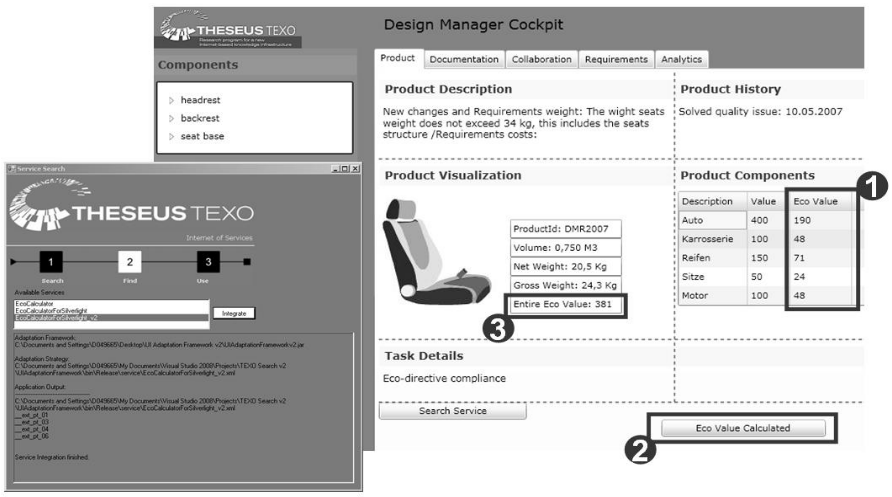

Figure 2. Extended business application with integrated service

Now the service is integrated and ready for usage. If the total eco value fulfils the legal requirements, a certificate is passed to the consumer application (Step C). After usage has ended, the consumer will be charged for the usage of the eco calculator service via the service marketplace (Step D). Finally, some data about the service consumer's feedback on the service usage is collected (e.g. with questionnaires) and sent to the service marketplace (Step E).

3 Research Challenges

Today, the integration of unforeseen services often requires *manual effort* to program needed extensions of the enterprise system. In order to overcome this *deficit*, the following complex research challenges have to be addressed.

(R1) *How to realize a seamless integration of services into business applications?* The consumer of a service needs to be supported insofar as new services need to be discovered and integrated after purchase. The solution needs to be embedded into the larger context of an *Internet of Services* (as described e.g. in [1]).

(R2) *How to define services and business applications to enable service integration?* Both, service and business application need to be carefully designed to enable seamless service integration.

(R3) *How to realize the integration between services and business applications or enterprise systems?* Several technical and non-technical aspects need to be modelled carefully in order to define the necessary integration. For example, security aspects for a service introduce constraints to ensure proper service operation while similar restrictions need to be ensured on the side of the enterprise system. Likewise, billing details for the service usage can be taken into account for the defined integration between service and business application.

(R4) *How to define a service management lifecycle for managing different versions and configurations of services that are integrated into business applications?*
This topic marks a main problem area when dealing with several integrated services of a business application. Several constraints and resource needs of the integrated services in different versions or variants should be taken into account and carefully managed. For this purpose, a comprehensive service management method needs to be developed.

Today, comprehensive methodologies for modeling and realization approaches relating the integration of unforeseen services into enterprise systems in an *Internet of Services a*re missing. Within this paper, the industrial need for research in this area and key research challenges to guide future research have been identified.

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Implementing an SOA for a primary telecommunication operator

by

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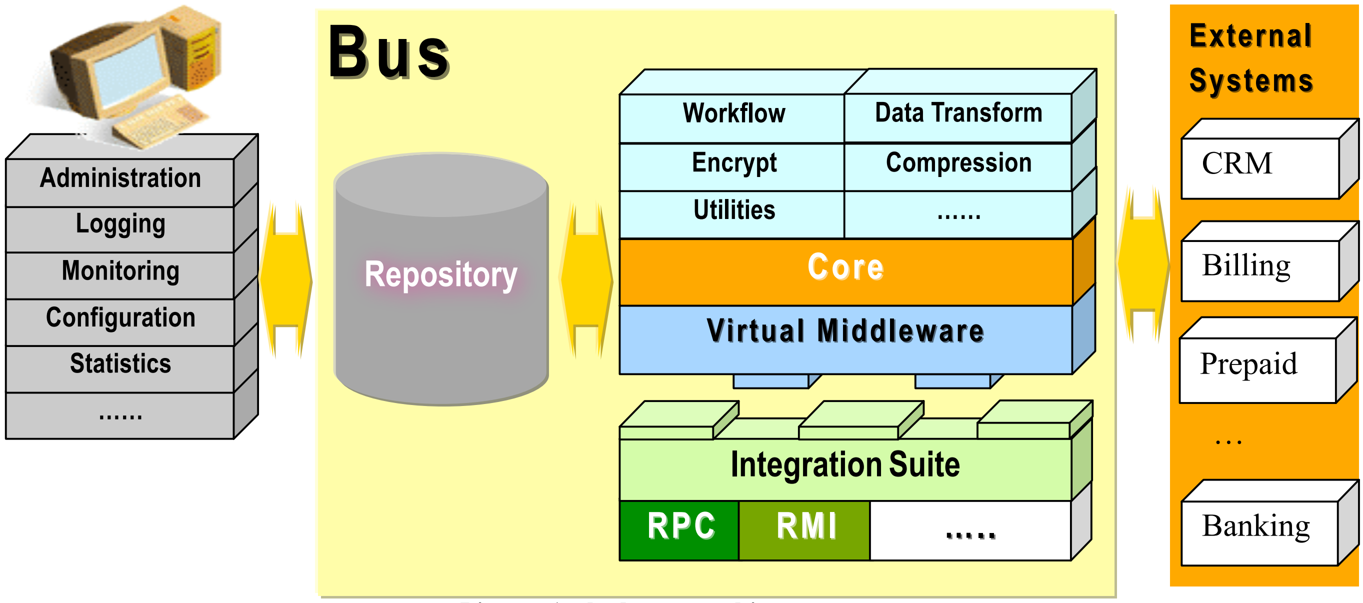
In this paper we describe our experience implementing an SOA for one of the biggest telecommunication operator worldwide, with special attention to the engineering effort enforced.

The starting point was an IT infrastructure based on a legacy bus, that in the years grew up in functionalities, encompassing the roles of a data transformation layer and of BPM. This tightly-coupled architecture no longer accomplished customer's needs, especially in terms of ability to implement new business processes, to maintain a common representation of company's information, and to easily manage the evolution of the systems being involved.



Picture 1: the legacy architecture

The new infrastructure

In SOA intents, web services are an important EIS asset, since they can lead to big savings both in terms of time-to-market and of costs during the implementation of new solutions. To obtain the promised results, however, a strong engineering work is needed on service definition, implementation and cataloguing, to guarantee:

- concrete generality and consequent reusability
- coherence between service definitions
- correctness in change management

In particular, it is important to define for the best both functional requirements and service interfaces.

On the other side, since an SOA should reduce the gap between IT and Business, each service definition should not arise as a technological mean, but it should represent the value it adds to the business. From this perspective, a business process engineering is needed to define and describe the business processes, drilling them down until atomic functionalities are found, and web services appears as a collection of homogeneous business functions.

Finally, there is the SOA backbone, the ESB, that uses the web services to supply business processes

- calling the UDDI to get the correct service
- interacting with a BPM when a service orchestration is needed
- applying data trasformations
- calling external systems, like middleware and wrappers
- performing publishing, service composition and content base routing

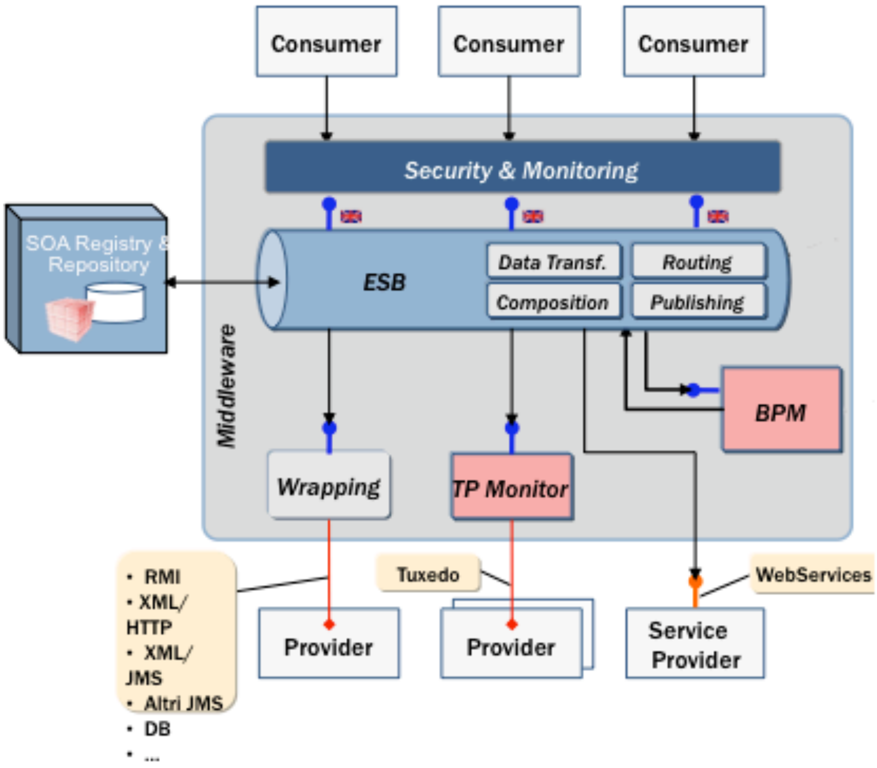
Depending on business requirements, the orchestration may be performed:

- on the ESB itself, for the simplest orchestrations and in case of short-running transactions
- on a BPM, when a complex orchestration of services already exposed on the ESB is needed, or in case of long-time transactions (even 2 months in our case)

All these actions have to be correctly defined and implemented.

Shortly, to implement the SOA at least 3 engineering services are needed:

- Consumer Engineering: responsible of the systems that uses services (the business view)
- ESB Engineering: responsible of the ESB
- Provider Engineering: responsible of the services being exposed



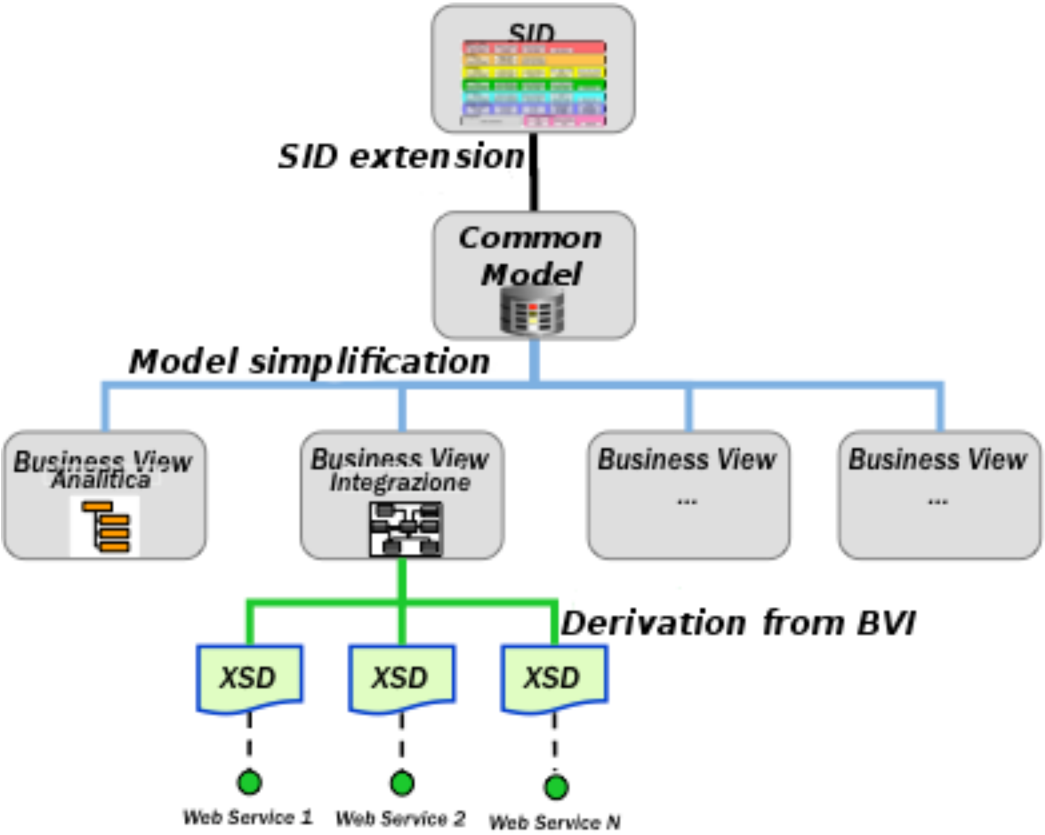
Picture 2: The New Infrastructure

The data integration

In our project, however, we needed a fourth engineering service for data. In fact, it's really important and concurrently challenging to define data structures to be exchanged by different systems. The previous integration architecture provided a XSLT engine to perform all the needed transformations to convert data from one system's format into another's one. This approach is certainly fast and easy to develop, but only when the number of system involved is limited. In fact, since each XSLT sheet represents a single system-to-system mapping, the difficulty to maintain, integrate, develop and test a huge number of XSLT grows much faster (O(n!)) than the number of systems. Moreover, it lacks a comprehensive representation of the data being used by Company's ICT.

To overcome these problems, we adopted the TeleManagement Forum' Shared Information Model (SID). It's a framework, defined by the most important telco operators, that represents a comprehensive view of the data managed by their business processes. This framework has been extended to be more adherent to our particular situation, thus defining a Common Data model (CDM) for all the systems.

From the CDM we generated a set of simplified business views, whose interfaces (BVI) are used to produce the technological artifacts needed to define the web services, such as the XSD that specify the entities used into the WSDLs.



Picture 3: SID applied

By way of example of the impact of these changes, we describe the effort spent for the Open Financial Gateway.

The “Open Financial Gateway” (OFG) is one of the most important service for our customer, as it acts like a “middle man” between our customer' services and the banking systems, offering a single payment tool to perform business transactions with different credit card issuers.

The main problems are related to the technological variety of the issuers, and to the variety of business deal subscribed. In fact, each external system may provide a different communication protocol and method, and the business deals may affect the way the interaction is implemented at a business level. Another feature is the ability to manage black-lists to exclude some specified kinds of credit cards, like prepaid ones, from certain business processes.

OFG has the responsibility to manage all that complexity, hiding it to the service consumers, and offering them an homogeneous interface, independently from the issuer involved in the transaction.

To offer a service in the terms defined by the new architecture, OFG had to be compliant with the common data model described early, so a first effort was to make the entities used by OFG uniform and consistent with its BVI, applying the related guidelines, such as:

- to model logical data in separated XSDs, with different namespaces
- to limit the number of nesting levels, that reduce the readability of the information and have negative impacts on XML processors' performance.
- To include in the targetNamespace URI the information about document version, in a given format, including the support for previous releases
- ...

Subsequently we redefined the way the functionalities were exposed, implementing the related new web services, to guarantee the best performance and interoperability.

Problems solved

The new architecture has introduced many benefits, mainly:
- A clear separation between delivery, orchestration and data
- The definition of standards for inter-systems communications
- The adoption of a model which represents the semantic of our customer's data.

Moreover, we applied a "quick win" approach, gradually introducing the different technologies involved. In fact, a functional analyst or a manager may see an SOA as something too complex and thus risky, and our approach showed to be useful in helping its acceptance by the customer.

But we also faced many problems, part of which is still unresolved
- The Semantic Modeling and transformation of Data is still immature, and the actual implementations don't perform as XSLT
- The SID model is too complex and hard to accept for functional analysts
- Integrating existing services requires a huge effort for standardization, and in many cases we had to validate non-standard solutions.
- There are unresolved technologycal problems, for example:
  - SOAP over JMS is not as reliable as SOAP over http
  - The UDDI implementations have performance issues, especially for runtime discovery.

Improving e-service acceptance by involving researchers, providers and users

The efforts of our research institution[1] in the field of e-service acceptance

Gregor Polančič, Boštjan Šumak Marjan Heričko

Introduction

The provision of high-quality public e-services is one of the keystones of the i2010 program: "A European Information Society for growth and employment". Public e-services are playing an important role in the route to an inclusive European Society. The i2010 Mid-Term Review reports that 60% of basic public services are fully available online and more than half of EU citizens use the Internet regularly. According to the data in (Capgemini 2007) EU is advancing in sophistication and fully availability of e-services, where five EU countries have achieved performance of 90% or above in both. In year 2007 the sophistication of e-services was on average at 76% approaching the level classified as "transactional". A closer look at the evolution of fully-online availability in EU shows that the gap between citizens and businesses is progressively reducing. EU member states are clearly evolving to a higher level of online availability for citizens as well for businesses (Capgemini 2007).

In order to succeed, e-services must have a positive impact on their users and must result in benefits for users, independent of their roles in the society (Man-Sze et al. 2008). From the i2010 Mid-Term Review (European Commission 2008) is evident that there is a gap between the high amount of available e-services and low percentage of those e-services, which are actually used (despite of the fact that the majority of European citizens has the infrastructural predispositions to access and use those e-services). There can be a variety of reasons for not using e-services, ranging from: (1) technical (such as low quality and low user-friendliness of e-services), (2) cultural and social (such as language or preference to doing business with known and trusted partners), (3) uncertainties about the legal and regulatory environment and (4) security of on-line transactions and the electronic systems that support them. So, this is an issue that should be closely measured and analyzed.

According to above statements, we believe that nowadays there are two important issues to investigate in the e-services domain: (1) to increase the accessibility and amount of e-services and (2) to increase the usage of available e-services. In our research efforts, we focus mainly on the second issue, which is related to identifying and managing sociological and technical causes of using or not using e-services.

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Review of relevant literature

In the process of literature review, we identified 309 relevant articles, which investigated the causes of using or not using e-services. Most common independent and dependent factors found in this literature review are presented in Table 1.

Table 1: Most common e-service research related concepts

Variable	Independent	Dependent	Cumulative
Satisfaction	171	332	503
Intention	17	284	301
Loyalty	10	143	273
Trust	130	114	273
Quality	155	92	247
Usefulness	100	130	230
Attitude	64	126	190
Ease of use	111	54	165
Behavior	38	92	130
Service Quality	65	54	119
Value	74	38	112
Ability	75	13	88
Risk	43	37	80
Adoption	7	59	66
Security	45	10	55
Usage	14	41	55
Performance	14	36	50
Enjoyment	31	17	48
Commitment	13	32	45
Access	22	23	45
Privacy	36	8	44
Price	29	15	44
Control	30	14	44
Efficiency	23	14	37
Success	3	30	33
Subjective norm	21	9	30
Disconfirmation	7	18	25
Information Quality	19	5	24
Responsiveness	18	3	21
Capability	20	1	21
Internet Use	0	21	21
Complexity	18	3	21
Internet Access	2	18	20
Accessibility	14	5	19
Benefits	12	6	18
Playfulness	11	7	18
Use	1	17	18
Reliability	17	0	17
System Quality	15	2	17

According to the results of the literature review, we can conclude that a lot of knowledge exists in the e-services domain, which investigates the reasons for e-service acceptance, success or failure. So, we believe that researchers are aware of e-service acceptance problems. However, while there is still a gap between available and used e-services, we believe that the current state of this knowledge has several drawbacks.

If we observe the current state of causal knowledge in the e-service domain from the view of "usefulness/ease of use grid"(UEOU) (Figure 1) we can conclude that the knowledge is rejected by their respective users for following reasons:

- **Low ease of use.** The identified causal knowledge was published in scientific journals in form of research papers. This means that (1) the knowledge is usually accessible only to scientific community and (2) that the "language" in which the knowledge is presented is scientific. We believe that this kind of knowledge has little or no impact to the practitioners who are related to e-services development or provision.
- **Low usefulness.** If we overlook the difficulty of "reading" and using the current causal knowledge, it has still several drawbacks. Each of the researchers usually investigates a specific set of interrelated factors on a specific e-service domain using a specific sample population. Despite of the fact that researcher usually try to relate their research to previously investigated similar researches, they are unable to see the whole causal knowledge in the e-service domain. Therefore, there exist some research contexts, where specific e-service domains or factors are well investigated where on the other side there are context which lack of empirical research. In addition, there are also inconsistent results or even results which contradict. So, we believe that an overview of the causal knowledge in the e-service domain should be established, which would help researchers to search, analyze, add and improve this knowledge.

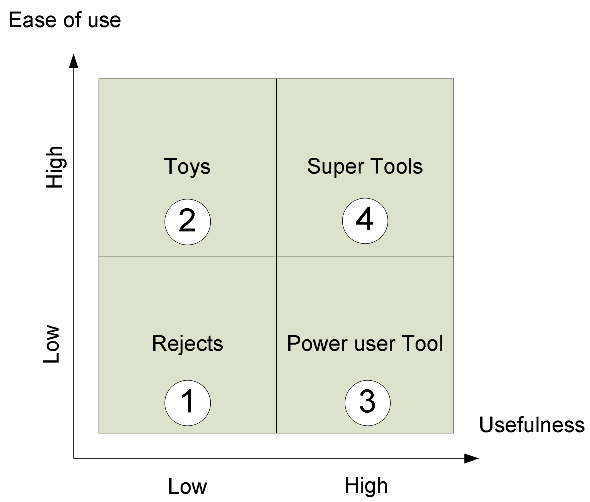

Figure 1: Usefulness / Ease of use grid [8]

Proposed solution

In order to transform the current state of knowledge in the e-service domain from rejected to an acceptable level (see Figure 1) we believe that the usefulness and ease of using the knowledge should be improved. We propose following: (1) establishing an overview of the causal knowledge in the e-service domain, which would help researchers to search, analyze, add, integrate and improve the e-services related causal knowledge; (2) creating a system, capable of transforming the "scientific knowledge" into "practitioner knowledge" and (3) to enable that e-service users could evaluate and feedback the effects of the knowledge.

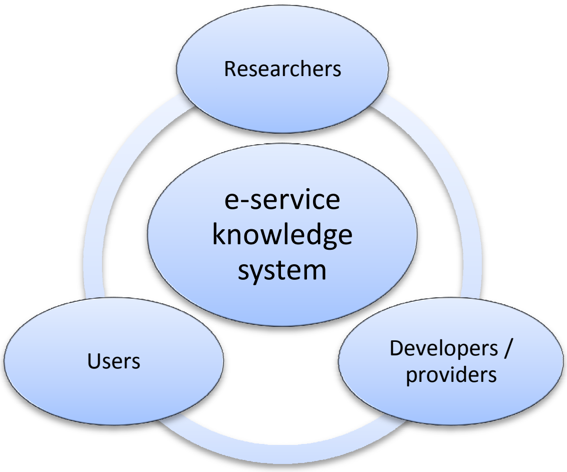

Figure 2: Proposed e-service knowledge system

For these reasons we propose to develop a "web based knowledge system" (Figure 2) capable of increasing the ease of using the causal knowledge in the e-service domain by transforming it from scientific language to language of service providers, where the effects of the knowledge would be observed and feed-backed by e-service users. We believe that a better way of presenting existing e-service knowledge to e-service practitioners would be to transform it into more human-oriented guidelines, composed of structured or plain text. The whole process of exchanging knowledge between e-service researchers and their practitioners is presented on Figure 3 using Business Process Modelling Notation (BPMN).

The process on Figure 3 involves four different sub-processes (three human related processes and a knowledge system). Three of them transform e-service related knowledge from "scientific" view to "practitioners" view. The focal task of researcher is to put the results of their e-service related research into the knowledge system, which inter-relates the information with existing system's knowledge. The practitioner "queries" the system for desired information using a guided process. If available, the system returns information in a form of structured text based guidelines. The practitioner can evaluate and comment the resulting guidelines and, if appropriate, apply the guidelines to specific e-service. In this case the specific guidelines and knowledge are interrelated, which further helps to refine the knowledge base in case if end-users decide to evaluate or comment these e-services.

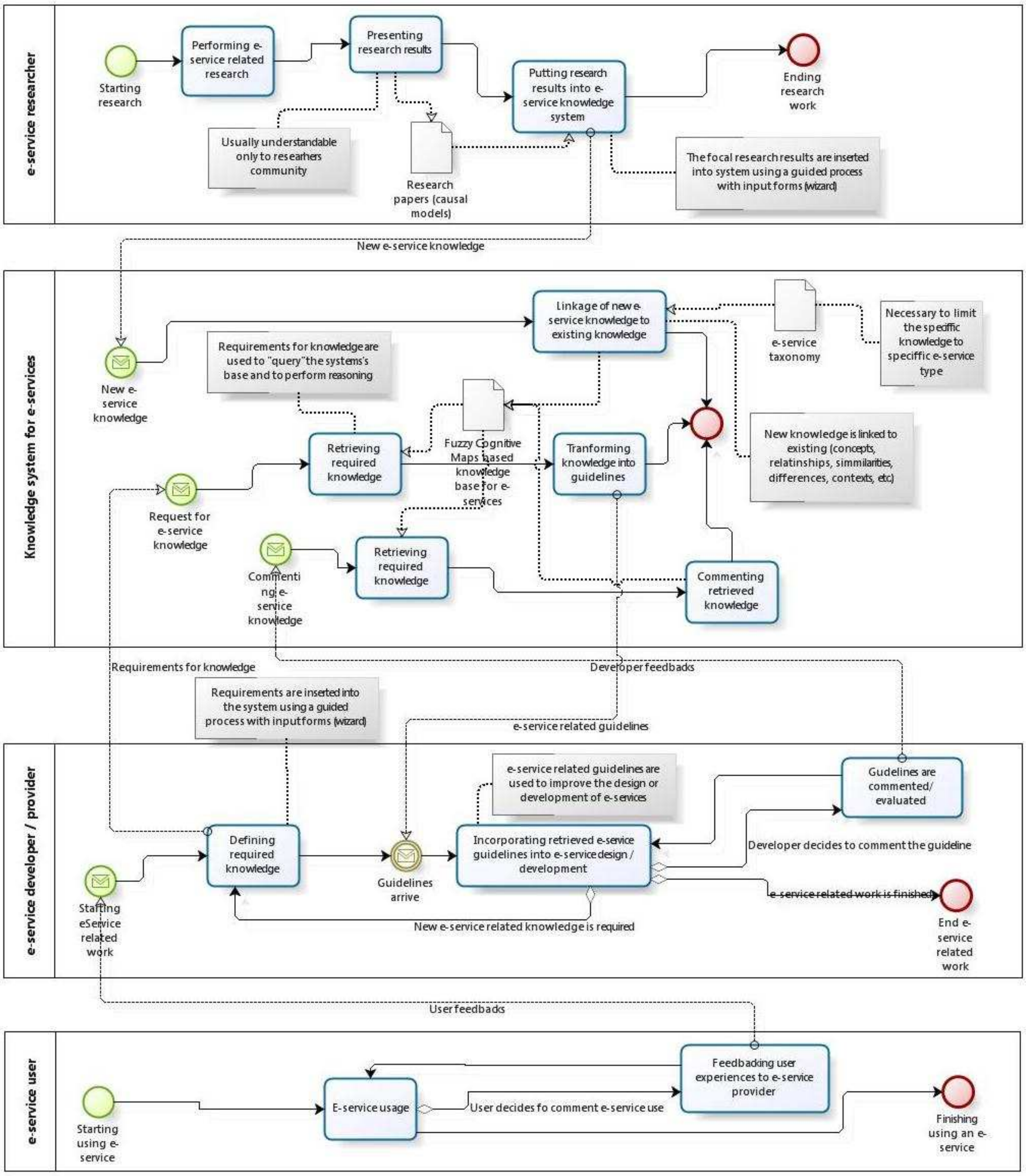

Figure 3: Proposed e-service knowledge system

Conclusion

In this position paper, we presented some ideas on how to increase the adoption and continued use of e-services by involving researchers, providers and end users. We found this research reasonable because we identified a gap between (1) available and used e-services and (2) a gap between available e-service related knowledge and amount of applied knowledge.

While our research is still in its starting phase, we identified following threats and limits of it. First, the analysis of existing research, which was presented in the article, is still in the progress. So, we were able to present only partial results of literature review, which might not be a representative picture of complete literature or knowledge in the area. Second, the solutions to the stated problem were not analyzed and designed in details. So, we were not able to present any limits of proposed solutions. In addition, we did not search for similar solutions, which may exist in other fields of science.

According to this we plan following future activities: (1) we plan to perform a complete meta-analysis of existing (causal) knowledge in the field of e-services; (2) based on meta-analysis we plan to establish e-service cognitive map and (3) perform a case study which would investigate actual benefits of such cognitive map. Based on these results we will decide on how to implement a knowledge system for e-service related knowledge exchange between researchers, providers and practitioners.

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On Exploiting Research Solutions to Build Internet of Services at the City Level

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SayService (http://www.sayservice.it) – a recently established spin-off of the Fondazione Bruno Kessler (FBK – http://www.fbk.eu) research center – has the mission of bringing to the market the research solutions which have been achieved by FBK in the area of Internet of Services (IoS). This role places sayService in a good position for measuring the gap between the research results and the roadmaps of the IoS research community and the needs and requirements that emerge from the adoption of IoS solutions in production contexts.

SayService is engaged in particular in projects aiming at building first instances of the Internet of Services in the Trento region, exploiting the "smart city" concept. The long term goals are to create a critical mass of services that cover all the different aspects of urban life, and to create the infrastructures to allow public bodies, enterprises and citizens to access to, and take advantage from, these services. The shorter term goal is to target specific users (e.g., citizens of a town, or tourists) and provide integrated access to services that may help them in "living" the town, building in particular on these services that are already available in some form (web pages, legacy data sources, etc.) but are hard to access for the user.

During the IE4SOC workshop, we will illustrate the short- and long-term problems that are emerging from the adoption of IoS solutions in these projects, and we will try to relate them to the research challenges addressed by the research community in general, and by the S-Cube project in particular.