Enterprise COllaboration & INteroperability

- COIN Book -
COIN research results for enterprise innovation
Enterprise Collaboration Services

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Patrick Sitek
BIBA – Bremer Institut für Produktion und Logistik GmbH
Content of the presentation

- COIN A Side: Enterprise Collaboration & Main innovations

- Enterprise Collaboration Baseline technical analysis & business concept perspective

- Enterprise Collaboration Innovative services – exemplified
  - Collaborative Product Development (c-PD)
  - Collaborative Production Planning (c-PP)
  - Collaborative Project Management (c-PM)
  - Collaborative Human Interaction (c-HI)

- COIN A Side: Main innovations

- Back-up by interest
The COIN Project developed services for European SMEs enterprise aggregation, synchronization and co-operation in response to the more and more demanding and complex business opportunities coming from the global market.

- Existing solutions from previous EU FP6 project and other sources are used as starting point (**EC baseline services**).

- On top of a developed common baseline, the project has further developed **EC innovative services** for
  - Collaborative Product Development,
  - Production Planning,
  - Collaborative Project Management,
  - Collaborative Human Interaction.

- Such services are easily configurable to meet different collaboration requirements, from the most static supply chains where optimization and efficiency are of key importance, till to the most dynamic business ecosystems where evolutionary behaviour of the business system, including sudden disappearing and re-appearing of business entities, has to be modelled and supported.
## Technical analysis: Existing EC tools and systems

<table>
<thead>
<tr>
<th>Category</th>
<th>Software</th>
<th>Number of Tools</th>
<th>Tool Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web application</td>
<td>Tomcat</td>
<td>10</td>
<td>Virtual Breeding Environment Management (VMBS), Professional Virtual Community (PVC) Management and Governance, PVC Rewarding Tool, Requirement Identification Service (refQuest), E4 (Extended Enterprise Management in Enlarged Europe) Platform, Supported Indicator Definition (SID), Collaboration Opportunity Characterization (COC) Plan, Virtual Organization (VO) Model Repository, Partner Selection (PS), VO Formation</td>
</tr>
<tr>
<td></td>
<td>Apache Web server</td>
<td>2</td>
<td>Collaboration Opportunity (CO) Finder, Customer Support Service (DISCO)</td>
</tr>
<tr>
<td></td>
<td>Microsoft IIS</td>
<td>4</td>
<td>PVC Management and Governance, Planned, Mediated, and Ad-hoc Collaborations</td>
</tr>
<tr>
<td>Web service</td>
<td>Axis</td>
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<td>Communication Service Set, Activity Management</td>
</tr>
<tr>
<td>Database</td>
<td>MySQL</td>
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<td>PVC Management and Governance, PVC Rewarding Tool, Planned, Mediated, and Ad-hoc Collaborations, Communication Service Set, Activity Management, refQuest, DISCO</td>
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<td></td>
<td>PostgreSQL</td>
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<td>VBMS, E4 Platform, CO Finder, COC-Plan, VO Formation</td>
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<tr>
<td>Programming Language</td>
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<td>VBMS, PVC Rewarding Tool, Communication Service Set, Activity Management, refQuest, SID, COC-Plan, VO Model Repository, PS, VO Formation</td>
</tr>
<tr>
<td></td>
<td>C#</td>
<td>5</td>
<td>PVC Management and Governance, Planned, Mediated, and Ad-hoc Collaborations, E4 Platform</td>
</tr>
<tr>
<td></td>
<td>PHP</td>
<td>2</td>
<td>CO Finder, DISCO</td>
</tr>
</tbody>
</table>
What's new in COIN EC Baselines?

- **Common Data and Models Base**
  with 59 implemented entities

  - Former software has been decoupled in three levels, separating business logic, presentation layer and data

  - Business logic has been encapsulated into reusable web-services

- Data exchanged by applications are now managed by a common database and private data of application stay on legacy databases

- Harmonisation of Networks of individuals (PVCs) and Enterprises
## Enterprise Collaboration Baseline Concept – Business Perspective

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Service for Maintaining Competencies</td>
<td>Service for matching Competencies with Business Opportunity</td>
<td>Service for Tracking Capacities</td>
<td>Service for Maintaining Knowledge and Training</td>
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<tr>
<td>Business Opportunities Management Baseline Services</td>
<td>Service for Identifying Business Opportunities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Services for Human Interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- core set of services and tools
- each ellipse represents a business service that is supported by a group of software tools and services
What’s new in COIN EC Baselines?

- Merging VO Management & Operation Phases
- Addition of Dissolution Phase
- Cross-cutting Competence and Business Opportunity Mgmt Baseline Models
Innovative EC Services Overview

Based on industrial needs and identification of missing services on the market, COIN has further specified, developed and delivered services in the following domains.

- Collaborative Product Development (c-PD)
- Collaborative Production Planning (c-PP)
- Collaborative Project Management (c-PM)
- Collaborative Human Interaction (c-HI)

In the COIN context the developed services to support the above mentioned domains are called

Innovative Enterprise Collaboration Services.
Collaborative Product Development (c-PD) Services

- Semantic Cluster Management Services (SCMS)
- Automatic and Intelligent Construction and Instantiation services (AICIS)
- Collaborative 3D Designer Service (C3DDS)
c-PD services

SCMS (Semantic Cluster Management Services)
Advanced semantic search functionalities for products or services needed in the product development process, finding related suppliers, services or stakeholders.

Horizontal, Software as a Service Utility (SaaS-U), useful for a wide variety of end users

Based on an innovative product structure ontology, based on products, services, documents, companies and competencies

Final improvements to be performed:
- Categorization of searches, to better perform semantic searches.
- Testing of SCMS in different sectors: Healthcare (see figure)
c-PD services

Collaborative 3D Designer Service (C3DDS)

- Online viewing of 3D files, including a wide variety of formats (Jvx, Bd, Byu, Dxf, Fe, Mgs, Mpl, Obj, Off, Stl and Wrl)
- Web service architecture, avoiding the need to install software and contributing to collaborative processes
- Online annotations, to enable “virtual meetings” to comment a 3D design.
- Historic of annotations and author of annotations, to enhance the product development process

Companies would not have to depend on legacy systems with expensive licenses and could connect to collaborative work anytime, anywhere, with the use of web services, without the need to have installed the proprietary software in the computer they are using.

Final improvements to be performed:
- Particularization for Supply chains, Collaborative Networks or Business ecosystems
- Different levels of privacy and security in 3D files depending the type of cluster
- Semantic Management of large number of annotations in Business ecosystems.
Collaborative Production Planning (c-PP) Services

- PnP Collaborative Production Planning Portal (C3P)
- SaaS Production Planning Service (PPS)
- Collaborative Quality Management Service (cQMS)
- Supply Chain Intelligence Service (SCIS)
- Service oriented text enrichment services (SOTES)
Collaborative Production Planning Platform (C3P)

Implementation of the concept **collaborative production planning process** to support the **dynamicity** of the changes in the value chain. Process editable in a collaborative way by value-chain actors.

- Blocks representing the **private production planning** of an actor that has to manufacture something and, if PPS service is used, the user can directly edit its private plan
- Arrows representing the **public collaboration space** among actors; in these virtual rooms the plans are shared and discussed.

**Innovative Concepts**

- Agent negotiation implemented through services coming from COIN WP3.4.
- Possibility to start different negotiation at the same time with different competitors and selects the best one.
- Support to the communication among individuals through the inclusion of the virtual team concept on top of virtual rooms and the integration of human communication services
- Implementation of a collaborative BOM
- Shared changes at public (inter-organisations) or private level (intra-organisation)
What is cQMS about?
An service to identify interdependencies between collaborative network partners in order to define needed communication channels to reduce quality problems.

What is the innovation?
- cQMS suggests an innovative approach beyond state of the art to identify interdependencies by analysing the partners’ competence profiles. Using competence profiles is innovative compared to the State of the Art approach by analysing product structures for interdependencies purposes.
- Competence descriptions are used to identify interdependencies for inter-organisational information exchange.

Who are the main users?
FILAS

Further reading
Invited for IJPD publication
Collaborative Project Management (c-PM) Services

- Project Alignment Booster (PAB)
- Collaborative Project Meeting Process Management (PMPM)
- Collaboration for Project Management (Coll4PM)
Collaboration for Project Management Service
Coll\textsuperscript{4}P\textsubscript{M}

Goal: Provide a **Social Collaboration Space** to support inter-companies collaboration in project management

**Innovation:**
- Inclusion of social aspects in an integrated web environment to support Gantt creation
- Injection of trust based mechanism coming from COIN WP4.5 services in project management
  - A personalized notification system by news feeds of events occurred in different project/discussion rooms
  - A social collaborative management of changes based on web2.0
- Availability of humans/companies profiles and management of social (including trust) relationships among them by assessment of co-workers
Tools for Human Interaction Support

- Collaboration Visualization Tool (CVT)
- Trusted Information Sharing (TIS)
- Trusted Online Help and Support (TOHS)
Collaboration Visualization Tool (CVT)

- Visualization of community structures and evolving social networks
  - Individuals
    - Registered profiles (name, organization, e-mail, Skype, …)
    - Dynamic profile data through interaction mining
  - Context-dependent social relations described by interaction metrics
- Application Scenarios
  - Group formation (emerged structures)
  - Social campaigns (interest clusters)
  - Team evaluation (collab. rewarding)
- Innovative Concepts
  - System-managed profiles and relations through analyzing interaction behavior
    - Keep track of network dynamics
    - Relieve users from managing their social networks manually
  - Evidence-based structures through mining
    - No unfair manual ratings
    - No rating quality variations over time
  - Embedding of baseline human interaction services
COIN A Side: main innovations

• The COIN Collaboration Space

- To allow **Endogenous** generation of Business Opportunities (LivingLabs & Open Innovation)
- To support **Product Design, Production Planning, Project Mgmt**
- To enable **Co-operativity** of Enterprise Applications (groups as users)
- To support **Web 2.0** and participative services (Enterprise 2.0)
- To involve also the Customers in the whole life-cycle of **Enterprise Collaboration**:
  - **EC preparation** (get the enterprises prepared to form VOs)
  - **EC creation** (select partners and competencies)
  - **EC operations & mgmt** (performance indicators definition-governance)
  - **EC dissolution** (inheritance and knowledge transfer)
Back-up
- Management of member information and member performance profiling (processes, VCOR KPIs)
- For both individuals and organizations.
Business Opportunity creation and discovery

- Business Opportunity Discovery Service
- Business Opportunity Creation Tool
- Reward organisations creating new business opportunities for the cluster.
- Score is defined and maintained for each member of the enterprise collaboration.
-Characterization of a Business Opportunity in terms of BOM (Bill Of Material) definition, BOM item information tasks and required competencies to perform them. BO formalization in a structure (WBS).
- Search for relevant partners (from the cluster member pool)

- Web service implementing and executing search algorithms

- The service suggests the most suitable members for an Enterprise Collaboration regarding the requirements of a given business opportunity (BO)
- Mechanisms for storing information on created ECs
- Structuring, storing and providing inheritance information to the EC formation process.
- Creation and management of activities of people within an EC
- Information about responsible and involved users, time constraints, and applicable resources
- Records any changes to activity structures during runtime
- Allows to analyze deviations from planned collaborations

### Activities

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Progress</th>
<th>Start</th>
<th>Status</th>
<th>Details</th>
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<tbody>
<tr>
<td>Adapter__adapter_drilling</td>
<td>BO: Centrifuge Machine, Component: Adapter, Task: adapter-drilling</td>
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<td>15/01/2007</td>
<td>pending</td>
<td>Edit activity properties</td>
</tr>
</tbody>
</table>
- Problem-solving service

- Collecting and evaluating contributions from activity management service

- Compile solution forms, taking into account the experts suggestions, deciding which contributions shall be included in the solution

- Sent information to responsible people
- Share documentation of products and assemblies
- Structure complex products in catalogues, categories and different configurations
- Access information of products and assets resultant from the EC project

- Structured classification in catalogues, categories and different configurations of the complex product
- Members can be rewarded for their skills and technical competencies

- Gained credits as performance indicators for participated activities in the portal can be seen

### Individual rewarding

<table>
<thead>
<tr>
<th>Skills</th>
<th>Technical Knowledge</th>
<th>Language</th>
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<tbody>
<tr>
<td>CIC programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tooling</td>
<td></td>
<td></td>
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<tr>
<td>Machining</td>
<td></td>
<td></td>
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<tr>
<td>Assembling</td>
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<tr>
<td>Cost estimation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product optimization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legal assistance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select one or more technical competencies and a level:

- very low
- low
- medium
- high
- very high

### Individual Trends

<table>
<thead>
<tr>
<th>Subject</th>
<th>Workspace</th>
<th>Amount</th>
<th>Behaviour</th>
<th>Time</th>
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<tbody>
<tr>
<td>Juan Reina</td>
<td>knowledge</td>
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<td>document</td>
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<td>chat</td>
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</tr>
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</table>
Enterprise Collaboration Baseline Services – Prototype Details

- core set of services and tools
- each ellipse represents a business service that is supported by a group of software tools and services

Preparation Phase

Formation Phase
- Business Opportunity creation and discovery
- Business Opportunity characterisation
- Business Opportunity rewarding
- Partner Search & Suggestion
- Partner Selection & VO Formation

Management & Operation Phase
- Collaboration Operation Service
- Activity Management Service
- Product Management Service

Dissolution Phase
- Customer Support Service
- Member Rewarding

Centralised Profiles, Competencies & Business Opportunity Service
Communication Services
- Support of business opportunity information, individual credits, profiling, human interaction information

- Manages the core data model schema which is used by all baseline tools and services.

- All tools and services can save/retrieve required data from different, but common, models without any concern of who inserted these data, what is the data structure of the other modules and who will use the saved data.
Communication Services

- Communication between humans through e-mail, skype, instant messaging and voice chat
- Utilize the communication services directly
- Services can be used by other services/tools to distribute relevant information
- Notify about important events in all collaboration phases
Creating Business Opportunities

The players log into the game using a standard Web Browser.
What's new in COIN EC Baselines?

Human Interaction Communication Services

- Communication Portlet (Part of Mediated Collaboration Support)
- Partner Registration
- Partner Search and Suggestion
- ... (Tools Layer)
- Instant Messaging Service (+Chat) (uses TUV Backend)
- SkypeWeb Service (uses Skype Backend)
- E-Mail Service (uses TUV Backend) (Service Layer)
- Notification Service

1. Notify cluster, VO, team or individuals about an event
2. Lookup contact details (contact persons, e-mail addresses etc.)
3. Send notifications

Competencies Model (Data Layer)
c-PD services

Automatic and Intelligent Construction and Instantiation services (AICIS)

AICIS services provide **Automatic adaptability** to different clusters and collaborative networks systems.

**Automatic building of the ontology**, based on relational databases used in the cluster or on unstructured data.

The innovation in COIN is to implement ontogen services to function automatically i.e, to build up ontology automatically from the given set of documents.

**Automatic instantiation of the ontology**, based on cluster documents. A service to automatically classify the document into an existing ontology has been implemented.
Production Planning Service (PPS)

- **Purpose**
  - SaaS Production Plan system
- **Innovations**
  - Production Plan solution agile and low cost for SMEs
  - Multi-tenant architecture
  - Natively integrated in C3P for collaboration purposes
- **Main users**
  - SMEs
Supply Chain Information Services (SCIS)

SCIS - covers supply chain or material logistic planning (+ alerting and management as an addition to planning) processes in an organisation.

Two main innovative features in SCIS:

- Implementation of innovative features for **prediction**, **trend detection** and **anomaly detection**. Services that are in development are based on various methods that have been developed to handle vast amount of data in real-time.

- Integration of top-down (knowledge driven) methods and bottom-up (data driven methods) for the SCIS domain. Here the main innovation features comprise among others knowledge formalization of SCIS domain, justifying methods with reverse reasoning, and integration with CycKB.

Innovative methods and services that are solely being developed for COIN are:

- **Anomaly detection service for SCIS:**
  - use of sparse vectors techniques
  - methods that are based on active learning methods

- **Trend detection service for SCIS:**
  - to predict long-term trends that can be calculated off-line on a basis of a wide time span

- **Prediction service for SCIS:**
  - to predict events in a complex environment with multimodal data and in real-time
SOTES is set of services that provide the context to any textual information. These services are needed by service in COIN that are dealing with semantics. Service oriented text enrichment services (SOTES) have been developed because they present the basic infrastructure for many planned and future semantically enriched services.

With SOTES the content is being enriched with the large contextual information that then provides far better results in semantic services ranging from machine learning algorithms, data, text and web mining, social software, network modelling tools to semantics and reasoning.

- **We can distinguish two innovation streams:**
  - development of all SOTES basic services: sentence splitting, tokenization, part of speech, entity extraction, entity resolution, co-reference resolution, anaphora resolution, topic classification, triplet extraction, semantic graph and summarisation.
  - first integration of all necessary services in the context enrichment suite
Project Alignment Booster (PAB)

Services for: Social and Collaborative Management of Projects, supporting
• Shared and delegated project management responsibility,
  – self organised and trusted project management activities
  – participative definition of project management and work processes,
• Identification of gaps, pm task fulfilment, learning objectives, risks

The development is based on industrial requirements and
SOA in CNO, PM, Web2.0,

Service Users
• Participants in global complicated project
• Business Ecosystems and Collaborative networks that want to improve operations

Progress beyond State-of-the-Art & Innovations
• The project alignment process, supported by a complete tool.
  – Unified work processes in a distributed environment
  – Shared and delegated project management responsibility
  – Self-evaluation methodology for partners’ capability and engineering competence.
  – Detecting the need for additional capabilities and competencies, project risks, possible timing problem
• The Project Alignment Model (PAM).
  – Configurable framework for describing project alignment tasks
  – Model template content for engineering projects
  – Including non-quantitative levels. E.g. organisational culture elements
Collaborative Project Meeting Process Management (PMPM)

The transition to globally distributed engineering work requires a shift also project collaborative working methods and communication.

The development base on expressed industrial needs:

→ Management of asynchronous and long meeting processes.
  • Participants from different locations, time zones and latitudes
  • Managing the whole process,
  • Usage of best fit existing tools for individual steps

Usage scenario:

• Global project organizations need distributed meetings.
• Asynchronous contribute to project management decisions in advance
Trusted Information Sharing (TIS)

- Document-centric information sharing accounting for:
  - Dynamically changing skills, expertise and interests
  - Dynamically adapting and evolving social and collaborative structures
    - Altering social relations
    - Flexible activity participation

- Application Scenarios
  - Sharing of sensitive data in highly dynamic environments
  - Sharing of information in social campaigns (propagation of invitations)

- Innovative Concepts
  - Dynamically changing access rights
    - Based on previous collaboration outcome
    - Based on emerging social relations
  - Fine-grained sharing model
    - Define sensitivity levels within a document depending on info type (XML)
    - Share more information with closer collaboration partners (system managed)
  - Actively facilitate collaborations
    - Push information to close partners (avoid spamming but stimulate interest)
Trusted Online Help and Support (TOHS)

- Flexible discovery and involvement of trustworthy experts accounting for:
  - Dynamically changing skills, expertise and interests
  - Contextual constraints to find best available expert in community (availability, online state, organizational boundaries, comm. channel …)
  - Personal preferences and social trust relations
- Application Scenarios
  - Ad-Hoc expert discovery in emergency situations
  - Team assembly
  - Interest group formation
- Innovative Concepts
  - Personalized expert discovery
    - Focusing on someone’s surrounding social network
  - Flexible involvement of experts
    - No negotiations and agreements
    - But instant involvement through baseline interaction services
  - Account for contextual constraints, e.g., from higher level process
    - Deadlines and urgency influence interaction channel selection (e.g., e-mail v.s. Skype)