Towards an Open and Scientific Approach to Innovation Processes

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   • Scientific mindset
   • Innovation meta-process

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   • Main modules
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IV. Conclusions
Introduction

Highly dynamic environments require adaptation capabilities. **Innovation** is a way to react efficiently and effectively to changes.

The process by which an invention (product/process/model) is implemented to satisfy a specific need:

- for the customer (cost-cutting side)
- for the client (value-side)
- for the society (environmental/social-side)

Macro-activities:
- invention
- implementation
- adaptation & diffusion
Main issues in innovation management

Innovation...

- risky process
- unpredictable outcomes
- non-observable and non-controllable variables
- complex dependencies and huge amounts of information
Role of collaboration

Innovation requires many resources: the capability to **cooperate** with other partners is a means to reduce risks and increase competencies.

Collaboration in distributed organizations:

- research consortium to face scientific challenges
- Virtual Enterprises: connection of SMEs into peer networks, to face commercial challenges
Main issues in innovation management

Innovation...

• risky process
• unpredictable outcomes
• non-observable and non-controllable variables
• complex dependencies and huge amounts of information

...in a distributed and collaborative environment (VE)

• localization of and access to resources
• heterogeneity
• lack of control (need of coordination)

Available approaches in the Literature:
- lack of methodologies (suggestions, heuristics, “best-rules” lists)
- lack of solutions (not-comprehensive tools)
Research question

How to provide **support** to business users in the management of an innovation process in a **collaborative**, **distributed** and **heterogeneous** environment?

1. Which general **principles** should a framework for BI be based on?
2. Which **requirements**? Which support **functionalities** should the framework offer?
Approach

Open innovation:
- collaboration of distributed partners in the VE
- internal skills are not enough: sharing of (some) resources in the VE
- sharing of (proportional) risks and revenues
- new collaborative business models and strategies

Scientific mindset:
- innovation process as a “process of discovery”
- more rigorous/rational approach
- closely tied to empirical data
- better control of the process
- control of information flow/dependencies
**Scientific** process:
- aims to discover how a phenomenon works
- rigorous methodology, protocols for evaluation
- relies on standards, practices, units of measurement

**Innovation** Process:
- much less structured, more exceptions
- more hardly controllable variables
- lack of methodologies, standards, and background knowledge
Similarities

• **starting point**: an open problem, a draft of an idea or a hypothesis
• **dynamic/risky** nature (output not known in advance)
• **high complexity** (many dependencies have to be taken into account)
• **highly iterative/interactive** (not completely automatable)
• **output**: knowledge useful for successive iterations
• **constructive refinement** of hypotheses/ideas
**Approach > Innovation meta-process**

Prior internal knowledge, data trails about previous IPs, BPs, external data from client/customers/partners in the VE

To recognize problems/opportunities: variables to tune, flaws, weaknesses, previously unknown relations among data

To experiment different solutions, to track such experiments and evaluate the feasibility of their implementation
Research question

How to provide **support** to business users in the management of an innovation process in a **collaborative, distributed and heterogeneous** environment?

1. Which general *principles* should a framework for BI be based on?

2. Which **requirements**? Which support *functionalities* should the framework offer?
**BI Framework > Functional requirements**

To keep track of information, to collect & store data from multiple sources

Data manipulation, summarization, retrieval of hidden relations in data, model generation, ex-post analysis of previous innovation processes

Collaborative discussion, knowledge sharing

To design implementation processes, design experimental workflows, highlight dependencies among documents, control relevant KPIs during the process, log the process, test customer satisfaction, simulation
• **Interoperability** of available distributed and heterogeneous data, formats, business processes: to identify and describe resources within the VE in a shared way

• **Usability** in process innovation design and management: to codify dependencies among process activities, provide suggestions about next tasks, support in the choice of KPIs

• **Coordination** in cooperative work

• **Flexibility**

• **Modularity**
BI Framework > Main modules

External resources -> Data acquisition

Data Analysis

Service-Oriented Infrastructure

Knowledge Layer

Virtual Enterprise

Ent.1

Ent.2

Ent.N

Statistics, Data Mining, OLAP, visualization

XML descriptors, semantic technologies

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BI Framework > Main modules

Process log

KPI evaluation
IP versioning
Process analysis

Process design

Data acquisition
Data analysis
VE Resource retrieval

Service-Oriented Infrastructure

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Process Clustering techniques (to extract common subprocesses, i.e. common practice)

E.g., Taverna, Kepler, Next, KDDVM

Preconditions/postconditions/dependencies check

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BI Framework > Main modules

- Process log
  - KPI evaluation
  - IP versioning
  - Process analysis

- Process design
  - Data acquisition
  - Data Analysis
  - VE Resource retrieval

- Collaborative Functions
  - Resource annotation, Communication, Team building, Task assignment, Collaborative design, Collaborative idea generation

Service-Oriented Infrastructure

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Conclusion

Open and scientific approach to innovation process management:

• Open approach:
  • sharing of (some) resources, risks and revenues
  • definition of shared meaning for shared resources
  • reuse of collaborative technologies

• Scientific approach:
  • rigorous, rational, tied to empirical data
  • adaptation of available solutions for e-Science workflow management

Towards (custom) methodologies for business innovation in VEs:

• extraction of common practices in past innovation processes
• ex-post analysis to recognize best practices and improve the way the VE manages innovation