WHITESTEIN
Technologies

Foundations of Contemporary BPM:
Current Trends and Convergence with Agent Technology

Giovanni Rimassa – Whitestein Technologies AG

WOA 2010 – Rimini – September 2010

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Talk Outline

- Patronizing Introduction
  - Research and Innovation from an SME perspective
  - The Great Divide: Architecture vs. Marketecture, Business Units vs. IT, ...
- Unnecessary Background
  - Motivation and History of BPM
  - Current BPM and Links with Software Engineering
- Unsupported Claims
  - A concrete case: engineering a next-generation BPM Suite
  - Which ideas and techniques from MAS/(AO)SE can help? How?
- Dubious Conclusions
  - Significance of BPM domain for agent systems engineering
  - Open issues and foreseeable trends

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Introduction – The Eye of the Beholder

- Where do I come from?
  - Studies in Parma: EE degree (computer-flavored), PhD on MAS (JADE stuff)
  - Started as academic researcher, then moved to industry, staying in research
- What do I do now? Product Manager in a small, hi-tech company
  - It's so critical that nobody agrees on what it is (`http://www.blackblot.com/`)
  - Somehow situated between ***Product Marketing*** and ***Product Specification***
- Who do I work for? Whitestein Technologies
  - A global pioneer of self-adaptive enterprise software
  - Privately held with 80+ staff, Switzerland-based, German office, own near shore center in Slovakia
  - Product Area 1 – Business Process Management
  - Product Area 2 – Freight Transport Optimization
  - Product Area 3 – Mobile Connectivity Optimization & Wi-Fi Offload

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Introduction – The Eye of the Beholder

- How does Whitestein strive for success, with a feasible strategy?
  - Need to be different (if we do the same as the big competitors, we're dead)
  - Need to be fast moving (keep ahead and be there before others)
  - Need to choose where to play (which markets, customers, partners)
- Consequence 1: ***no*** to *compromise on conceptual* innovation
  - Being different (and better) puts us on the map and makes us competitive
  - We are intellectually honest and sincerely believe in agent technology
- Consequence 2: ***yes*** to *compromise on technological* innovation
  - Avoid scaring the customers (we scare them enough as small vendors)
  - Eager to reuse and comply, wherever it does not hit the previous point
- Consequence 3: ***opportunistic compromise*** on buzzword innovation
  - We are no big vendor, or consultant, or academic "leaders of thought"

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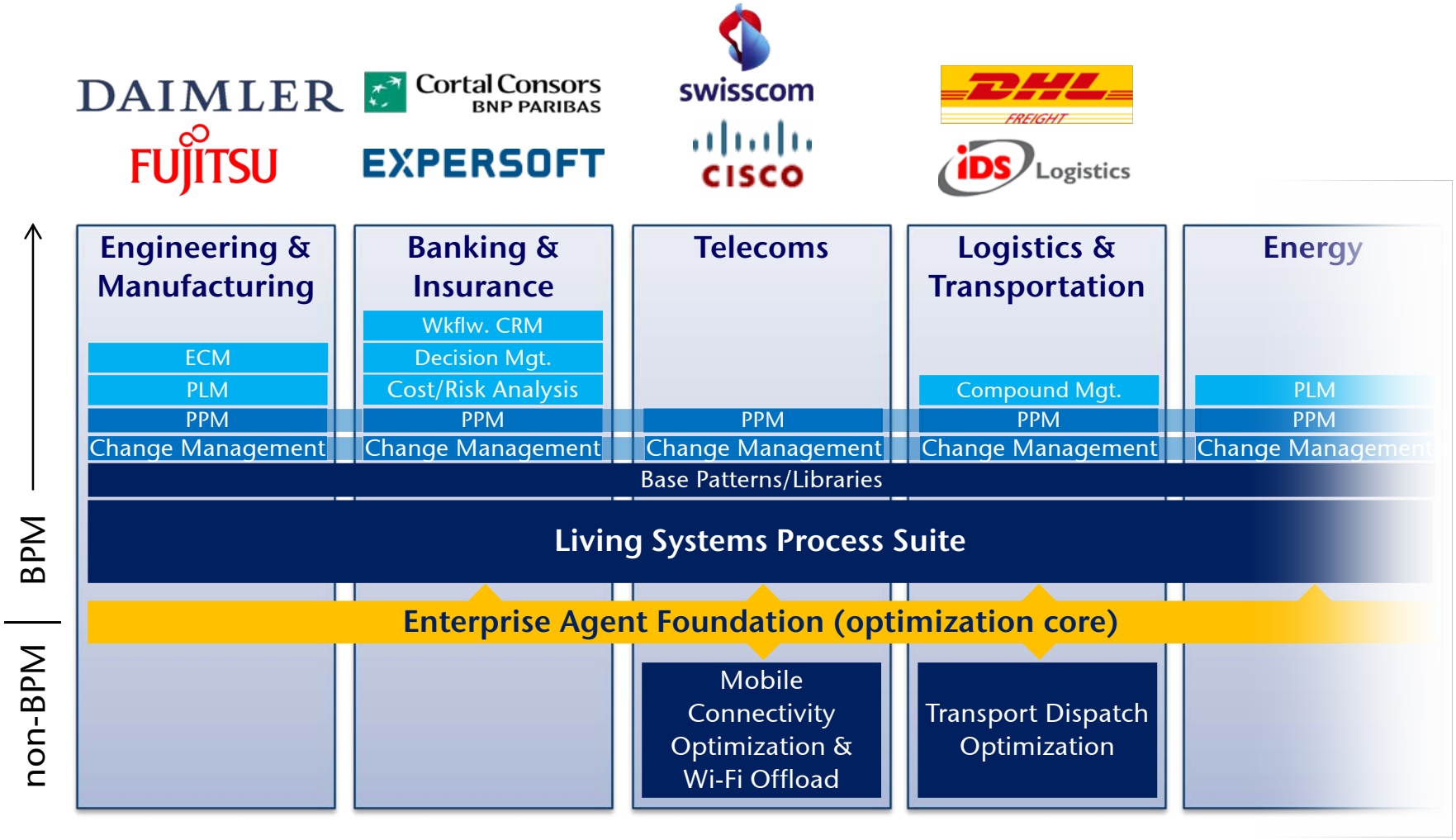
Sample Slide that "Explains" Our BPM to Customers



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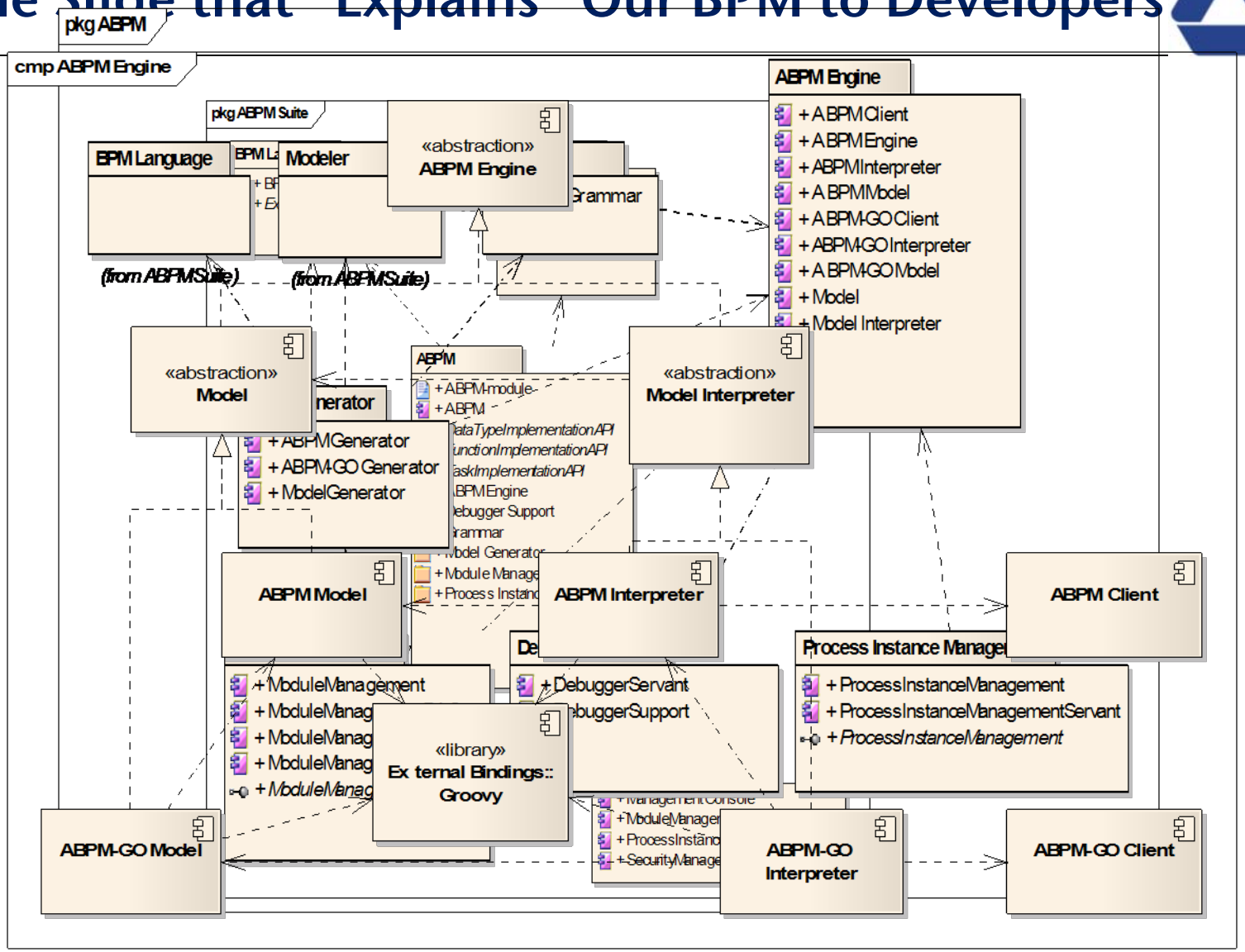
Sample Slide that "Explains" Our BPM to Developers



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The Great Divide: Who‘s Right and Who‘s Wrong?

- Who‘s right and who‘s wrong?
  - Slide 5 is a Marketecture, slide 6 is (part of) a Tarchitecture (see `http://www.informit.com/articles/article.aspx?p=31933`)
  - When one was shown to the „wrong“ group, lessons were learned
  - Mutual distrust, and syndrome of mutual incompetence, can easily arise
- So, is Marketing about bullshitting anything as long as it sells? Is SW Development about hacking anything as long as it works?
  - In both cases, a serious quality professional avoids doing that
  - But sometimes one faces unfair situations and has to resort to that
  - In any case, it will do harm in the long run and need be quickly removed

–

Just for a second look into your heart
As you stand and look across the great divide
Remember well the things that you will leave behind
As you set out to cross the vast and great divide

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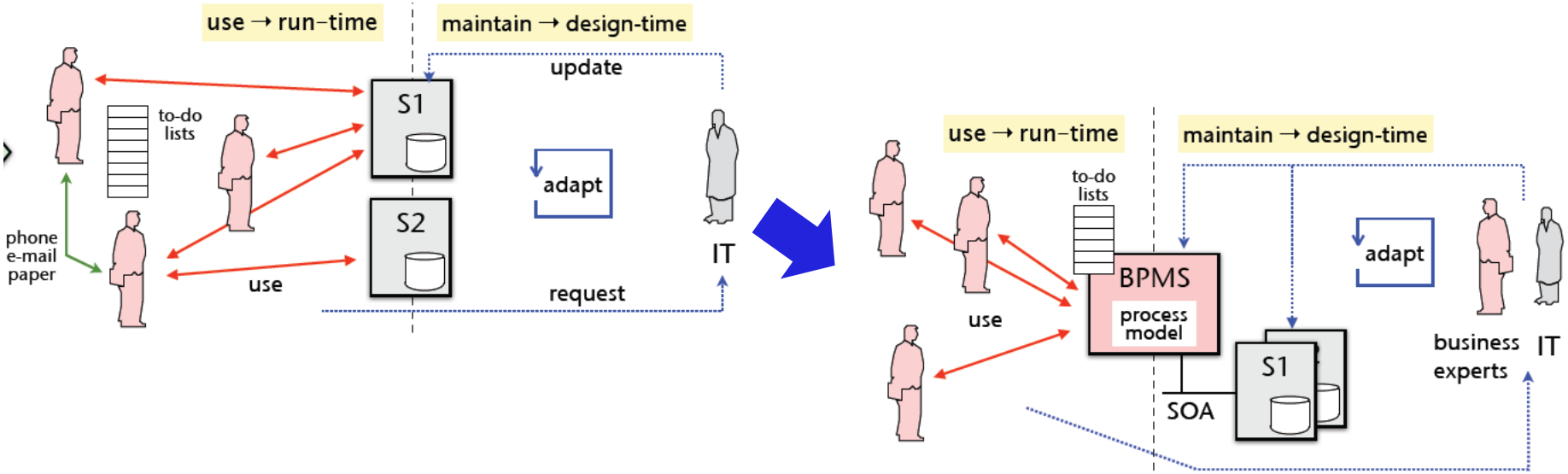
Introduction to BPM

- ***Business Process (BP)*** – a sequence of activities performed by people and software systems to achieve one of an organization's goals or sub-goals
- ***Business Process Management (BPM)*** – a systematic approach to discover, document, and continuously improve an organization's business processes
- ***Business Process Management System (BPMS)*** – a suite of tools, methodologies, and infrastructure to enable business process management



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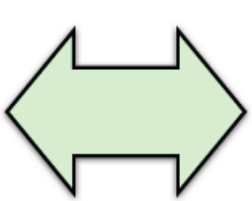
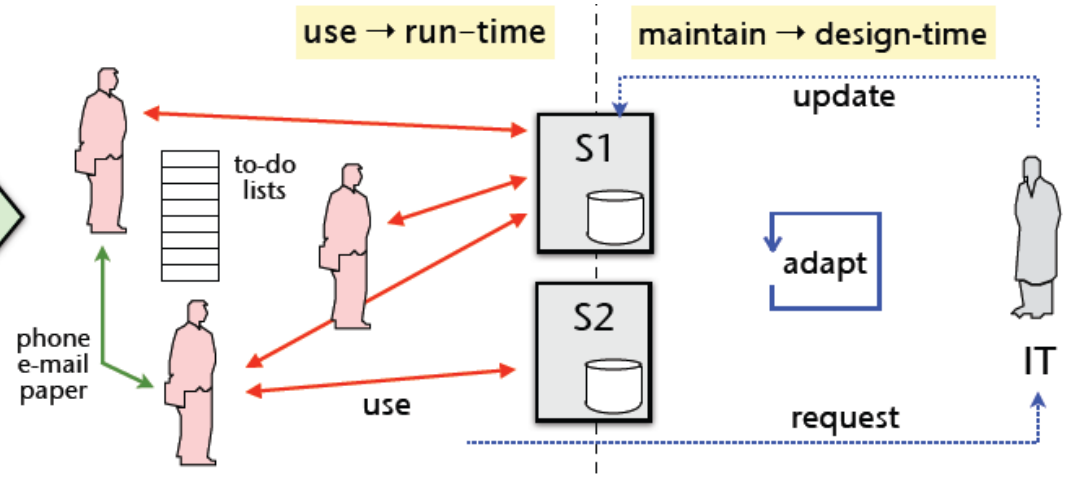
Intro to BPM – Without Process Management





Agile businesses! – that is, process & IT adaptivity...

- ❒ to capture new opportunities
- ❒ respond to new challenges
- ❒ to drive innovation
- ❒ to optimize performance
- ❒ to increase business value
- ❒ ... at lower cost & in shorter time

Increasingly hard with traditional systems & IT!

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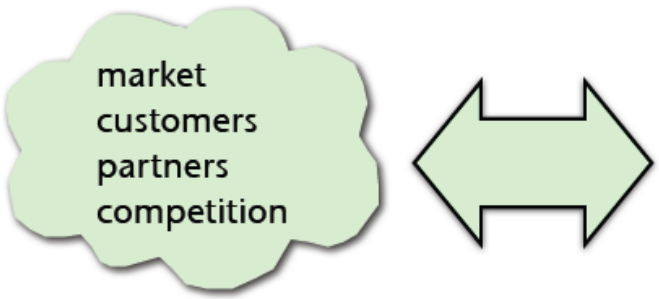
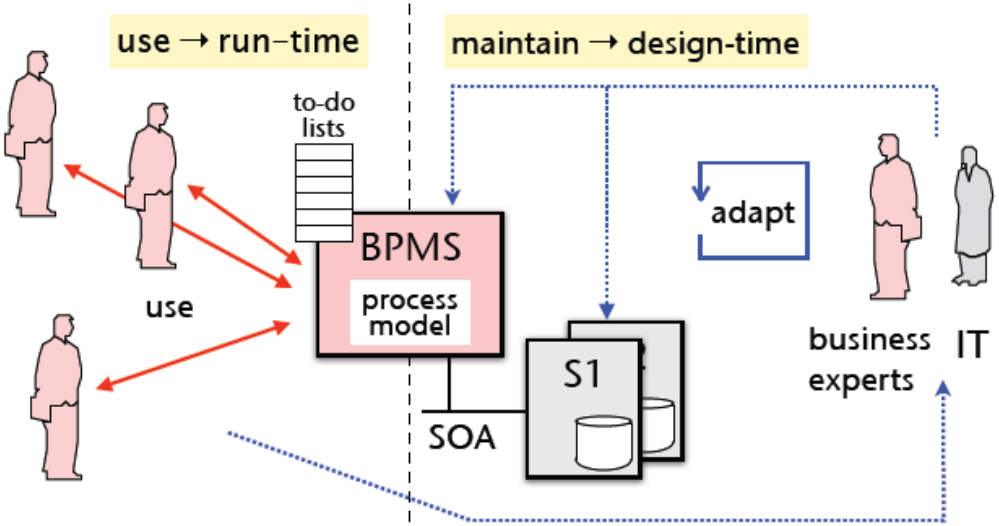
Intro to BPM – With Process Management





Benefits:

- ❒ Process models → explicit processes, easier to adapt than traditional SW
- ❒ Tools, methodologies, & technology for systematic process adaptation
- ❒ Business experts can assume direct responsibility for processes

(Unresolved) Issues:

- ❒ Based on (procedural) programming paradigm, rather technical, goals are "lost"
- ❒ Rigid ("hard-wired"), design-time defined
- ❒ Multiple models/code bases, no round-trip
- ❒ Complex, brittle models over time

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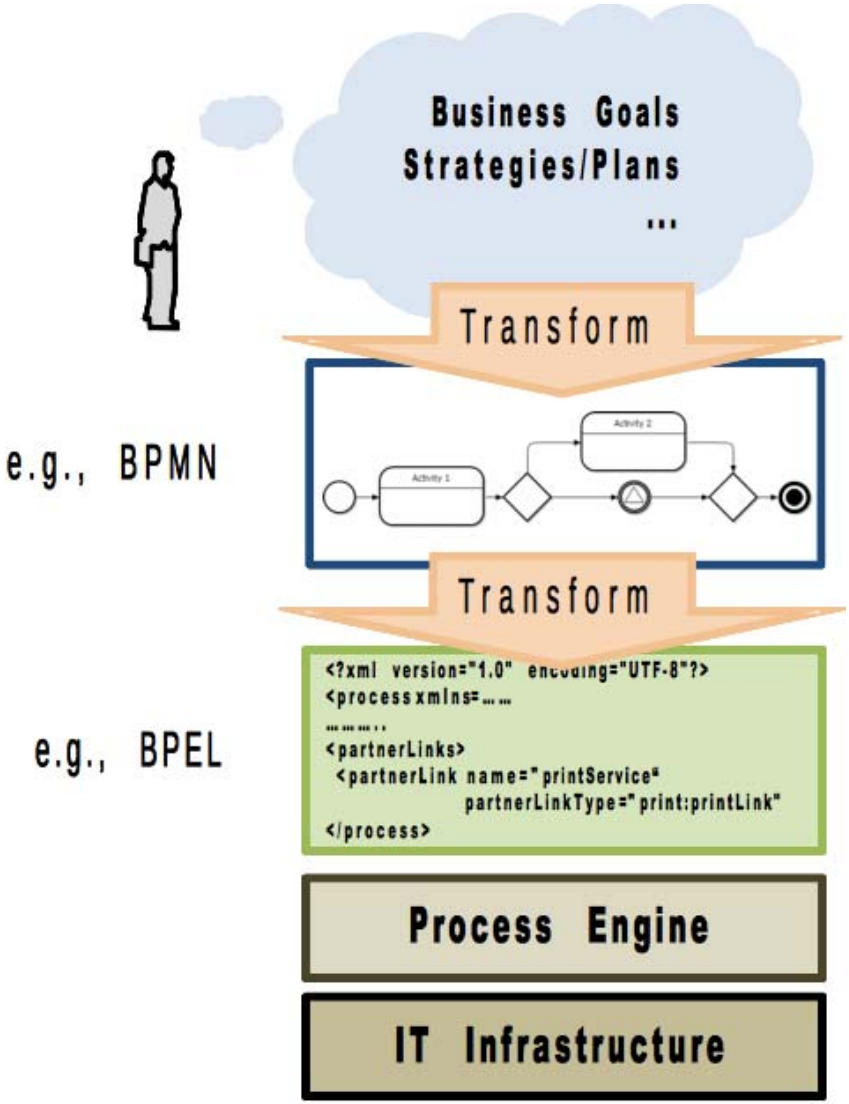
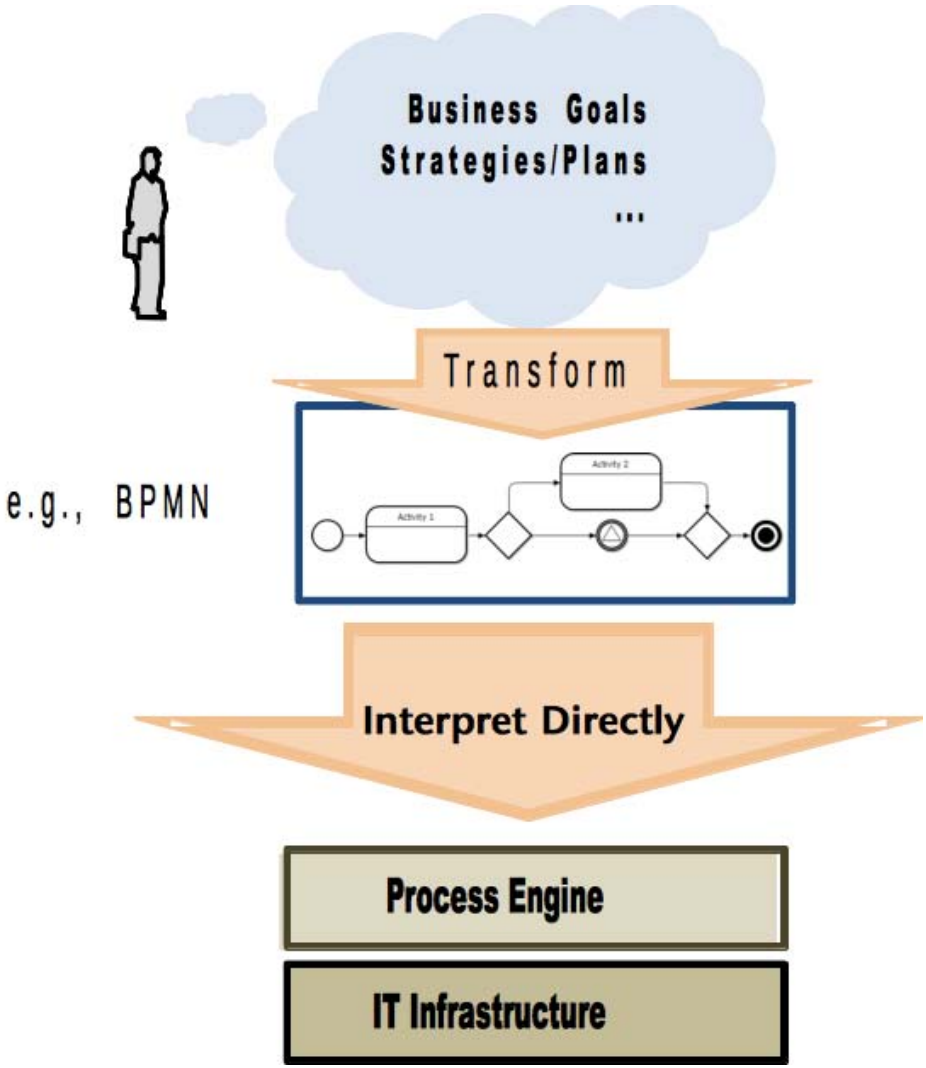
Intro to BPM – Making the BPs Executable





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Intro to BPM – The BPMN Standard

- Business Process Modeling Notation (BPMN)
  - Standard from the Object Management Group
  - Presently version 1.2 (and 2.0 is being finalized)
- Represents a Business Process as a graph of *activities* (nodes) and *flows* (edges), plus some accessory elements (*gateways*, *events*, ...)
  - Wasn't initially designed for executability at all
  - Then it became used to execute translated models (BPEL, Java code, ...)
  - More advanced products execute it directly (completing its semantics)
  - The upcoming version 2.0 should guarantee interoperable execution
- Covers mostly the ***activity view*** of a Business Process
  - Not much data modeling support (*Data Object* element)
  - Not much organizational modeling (*swimlanes to partition activities*)

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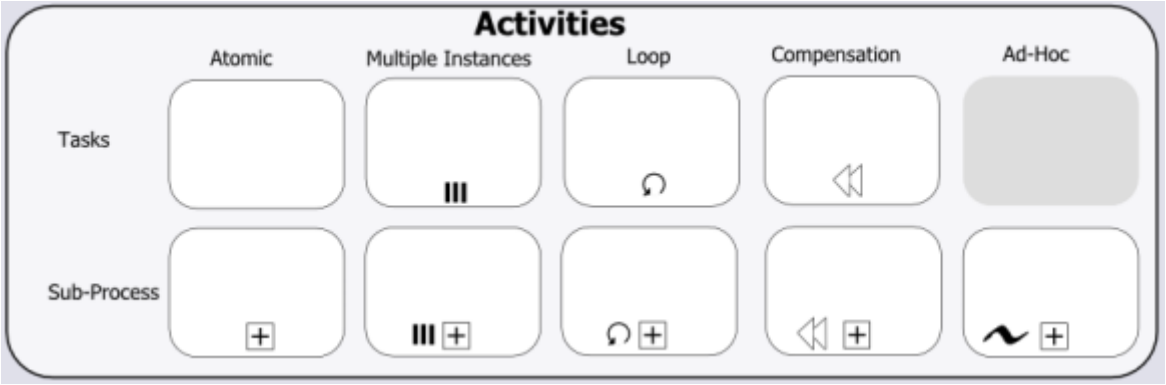
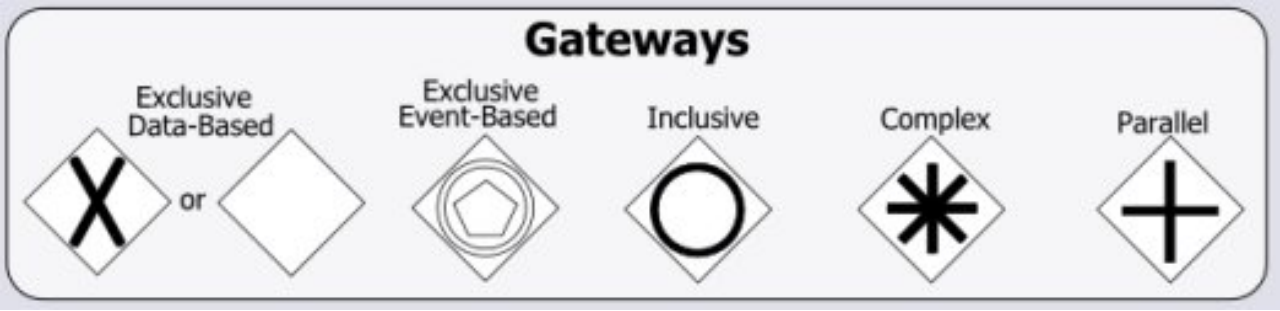
Intro to BPM – The BPMN Standard

- BPMN Activities: the steps in the process flow



- BPMN Gateways: the branching points in the process flow



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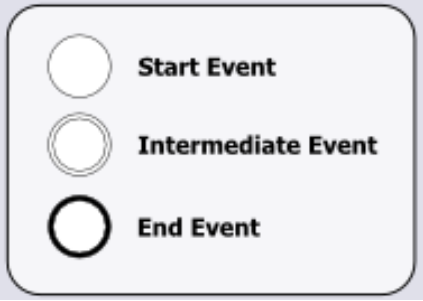
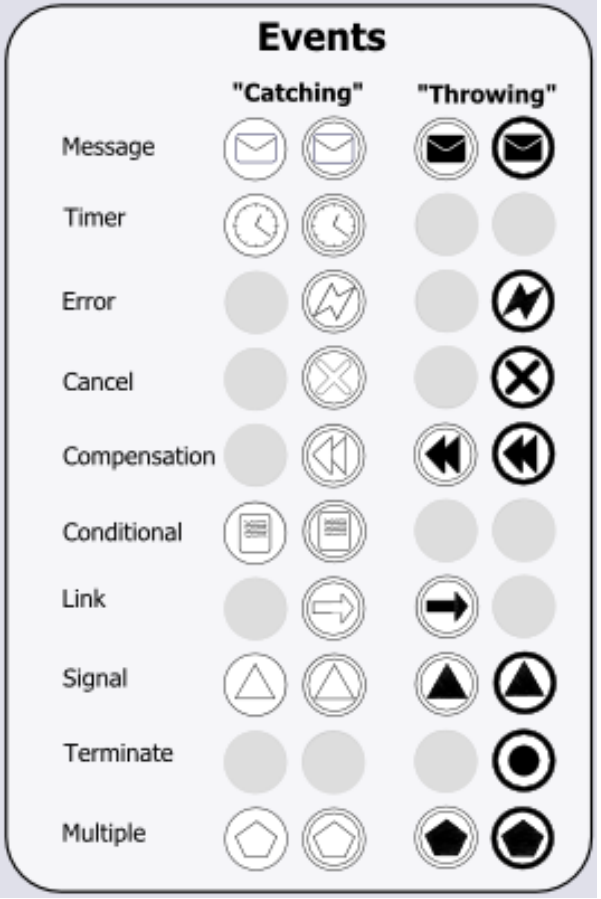
Intro to BPM – The BPMN Standard

- BPMN Events: happenings affecting the process flow.
- Can be of three kinds
  - ***Start*** – they originate a new flow
  - ***Intermediate*** – Appear within flows or activities
  - ***End*** – Terminate a flow
- Have different categories (see figure)





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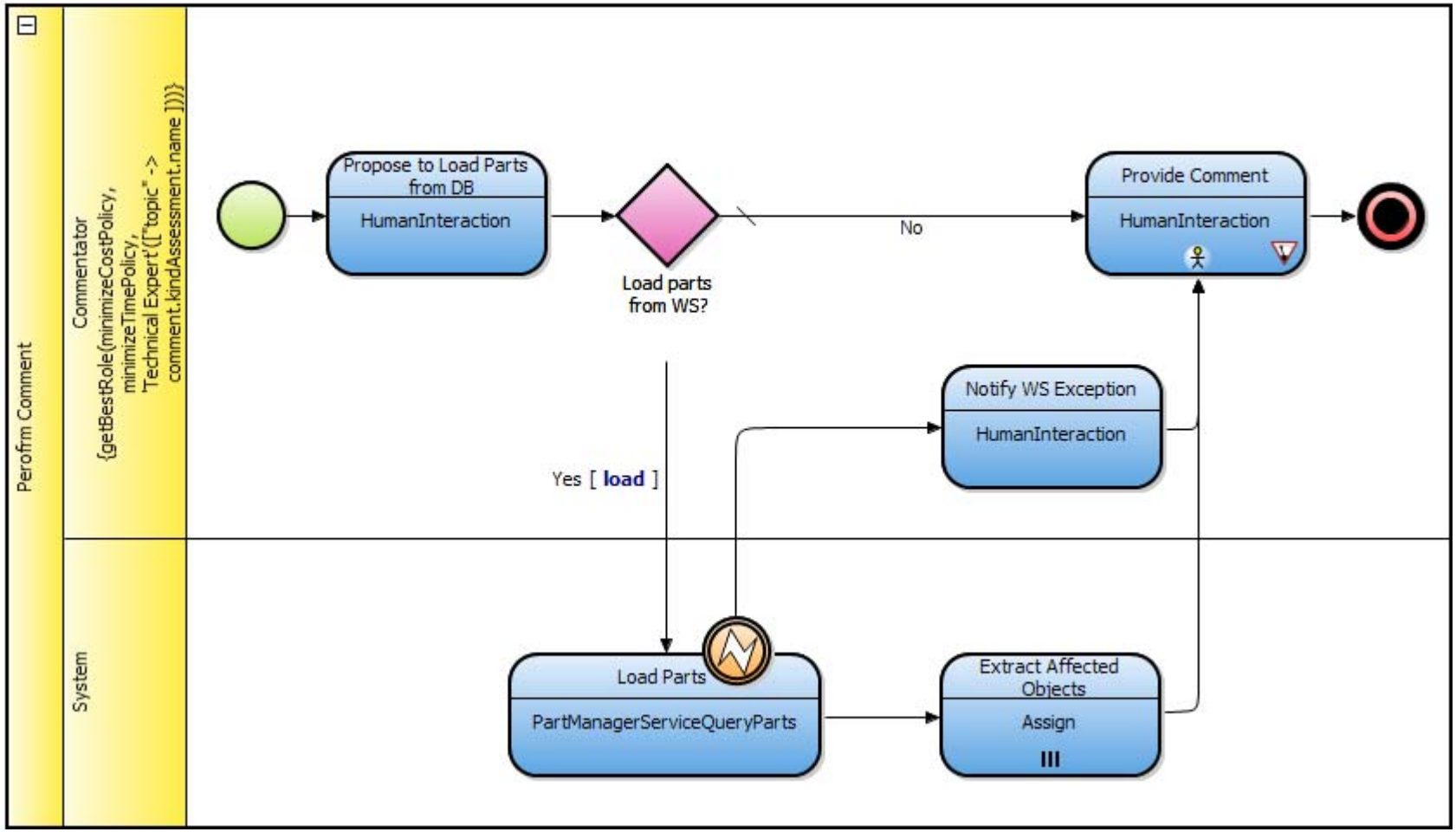
Intro to BPM – The BPMN Standard (Example 1)



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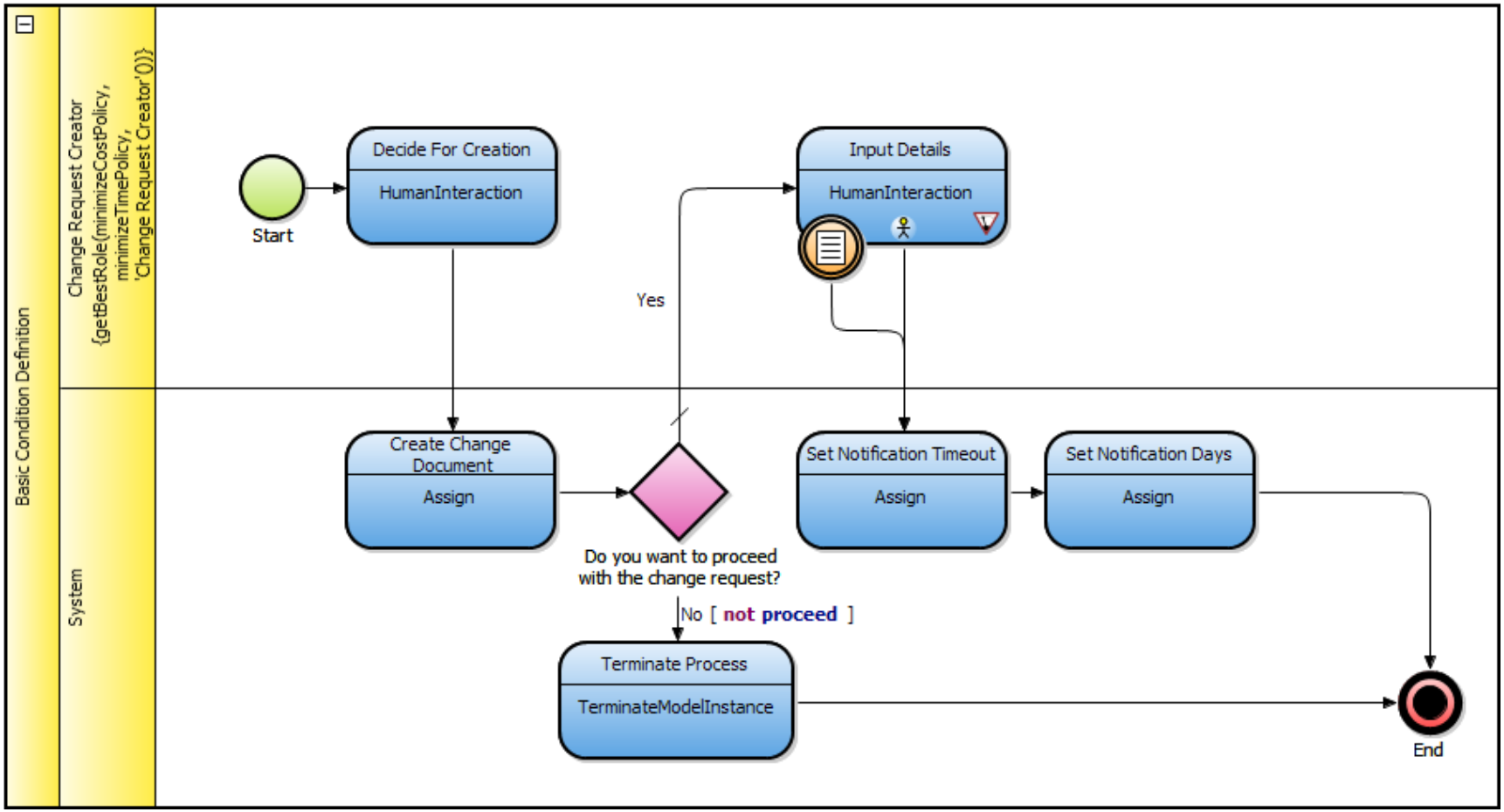
Intro to BPM – The BPMN Standard (Example 2)



Workflow Patterns at http://www.workflowpatterns.com – Animation of BPMN at http://diveintobpm.org/index.jsp

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Intro to BPM – Market Segmentation (BPMS Watch)

- First Segment: ***Human-Centric BPM***
  - "In human-centric BPM, the objective revolves around improving the quality of work."

Clash: People/Business vs. Systems/IT

- Second Segment: ***Integration-Centric BPM***
  - In integration-centric BPM, the objective is improved business integration, coordinating the actions and data of disparate backend systems that run the core business – ERP, supply chain, CRM, billing, etc."

- Further Refinement of Human-Centric BPM
  - ***Production Workflow*** – Maximizing labor productivity by following processes
  - ***Case Management*** – Resolve cases collaboratively with little a priori workflow

Clash: Flow-centric vs. Data-centric

- This was 2006 – Now the times they are-a-changin'

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Intro to BPM – What's Next

- One of the popular definitions of the Holy Grail of BPM is ***„Bringing Business and IT together"***. What does it mean?
  - Methodological integration
  - Technological integration
  - More control to the people that know what's the point (the business)
  - More support to the people that know how not to screw up (the IT)
- The whole BPM is a ***discipline*** for the above
  - The issues and overall ideas are very general and industry independent
  - Designing a BPMS became as *designing a programming language/environment*
- The current big challenges for a BPMS are
  - Creating model-driven applications for ***a less structured way of working***
  - Creating model-driven applications for ***quick and unforeseen change***
  - *Do you know any software technology that helps with that?*

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Whitestein Experience

- To propose a BPM Suite of our own, given the company nature, culture, resources, and knowledge, a few steps were taken:
- Need for a conceptual background that suits ***current*** BPM challenges
  - Agent Technology is an obvious choice (*for who knows and masters it*)
  - Agents are (also) software, BPM is (also) software ⇒ modern SE helps
- Need for a technological infrastructure that is modern and compliant
  - Java Enterprise Edition (JEE 5.0 with EJB 3.0)
  - Web Services and concrete SOA (anyway, ***SOA + EDA ≤ MAS***)
- Need for a clear, recognizable differentiator understood by business
  - ***Goal-oriented BPM*** – Goals: business milestones that bring business value
  - The proposal short motto becomes „*Optimize milestone and performance goal fulfillment across the whole business process life cycle*"

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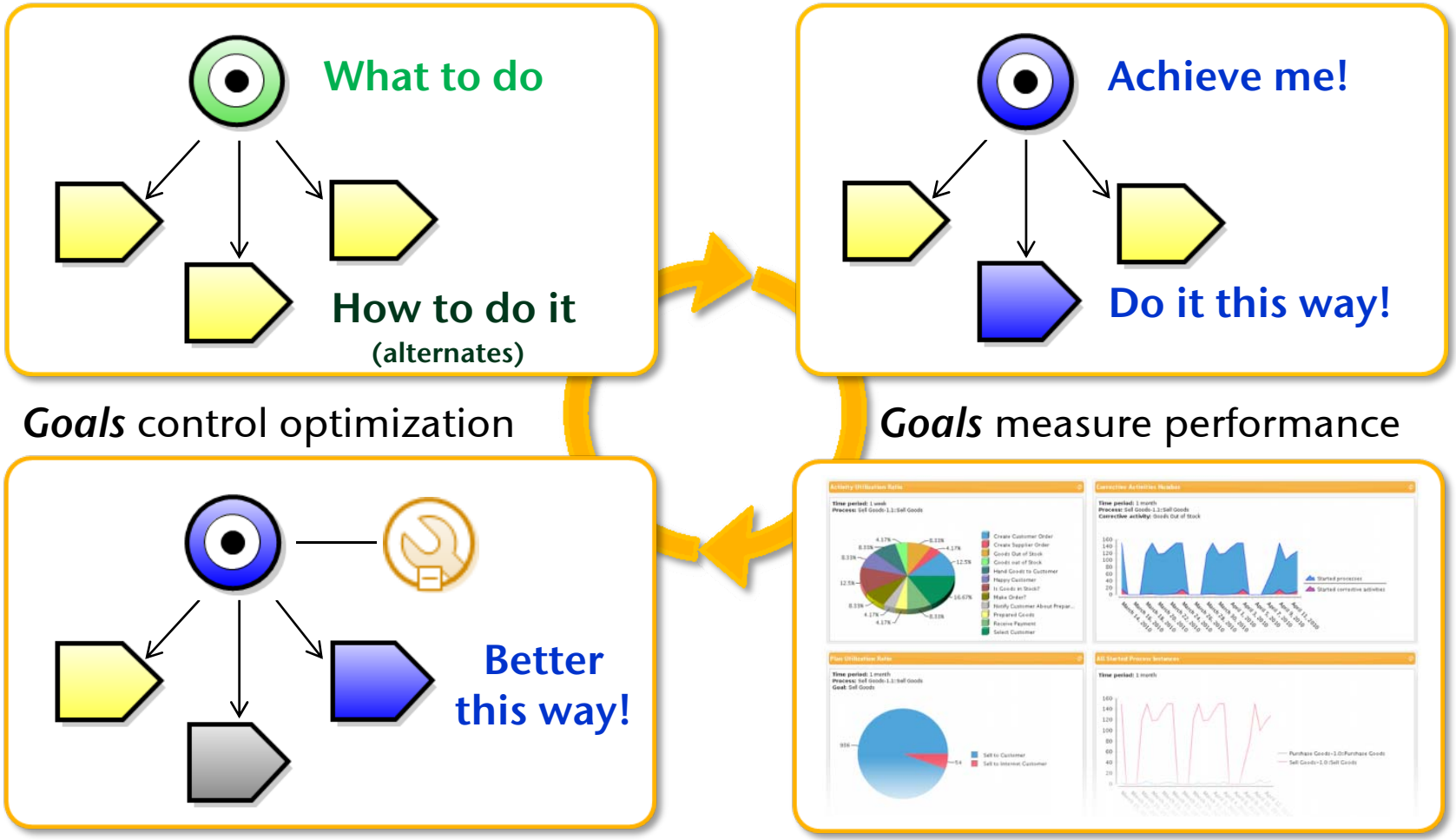
Goals Drive the Entire Process Life Cycle



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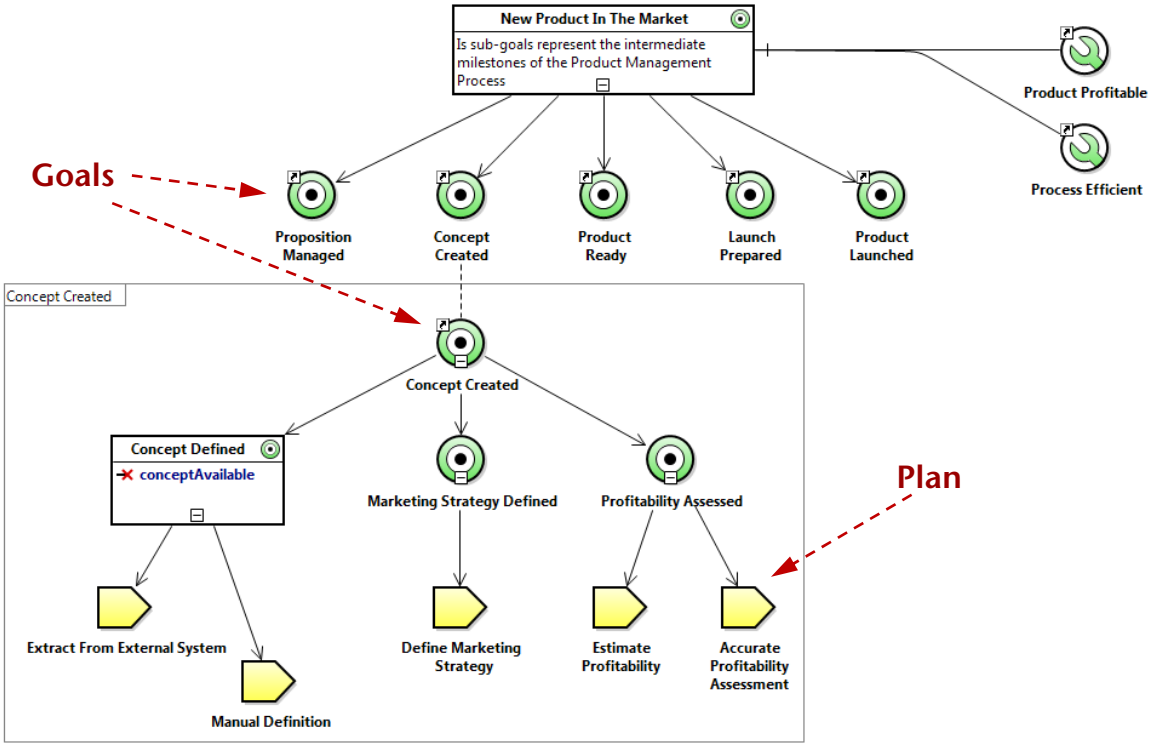
Describe your Process

Process Modeling with GOALS and PLANS

- ***Goals*** : Express business requirements with process milestones
- ***Plans*** : Express alternate ways to attain a goal



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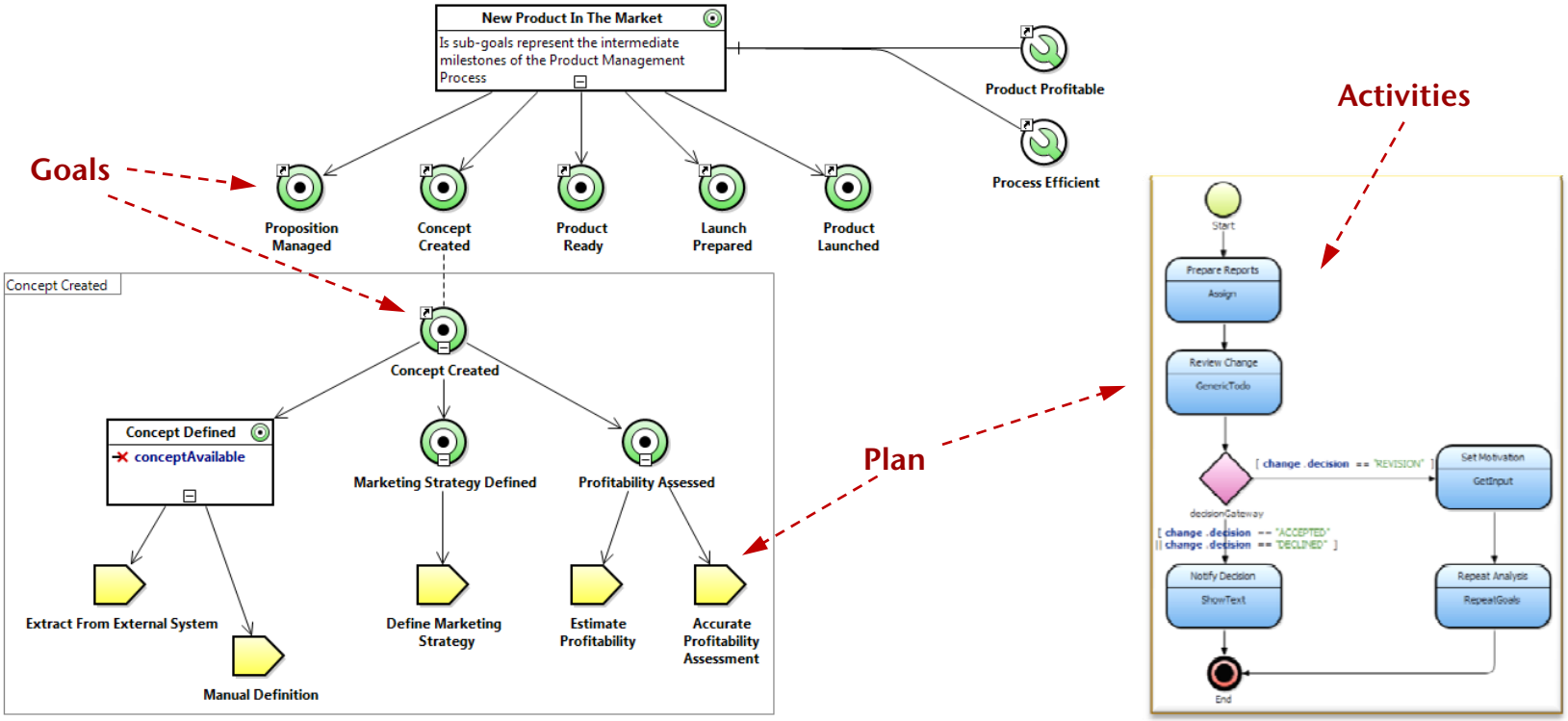
Describe your Process

Process Modeling with GOALS and PLANS

- ***Goals*** : Express business requirements with process milestones
- ***Plans*** : Express alternate ways to attain a goal
- ***Activities*** : Plans contain flows of human and automated activities



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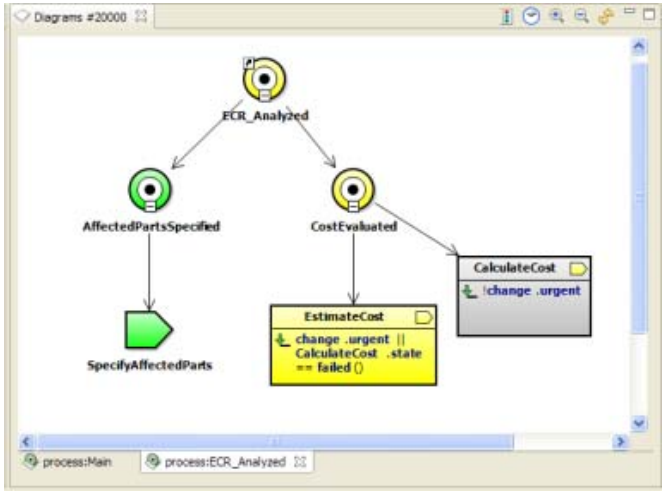
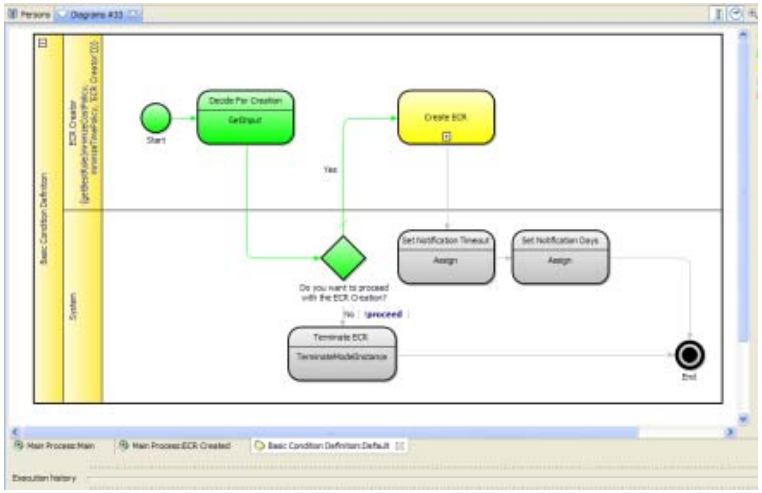
Automate your Process

Process Modeling with GOALS and PLANS

Process Execution – agile automation of your process models

- ***Goals Become Active*** : Engine chooses the most suitable plans
- ***Context Changes*** : Engine reassesses plan selection
- ***Model Change Introduced*** : Engine updates affected process instances in real-time
- ***Organizational Change*** : Engine updates affected process instances in real-time





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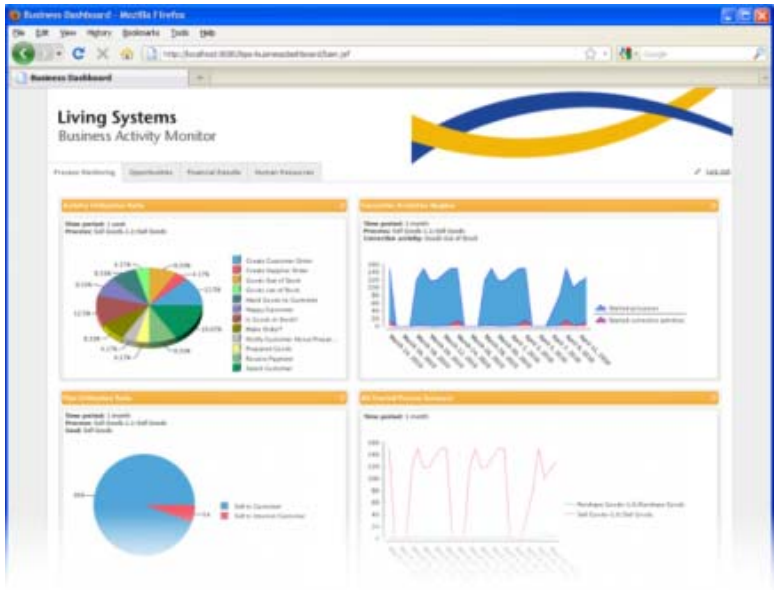
Monitor your Process

Process Modeling with GOALS and PLANS

Process Execution – agile automation of your process models

Process Performance Management – monitoring & reporting

- Monitor and control process execution
  - Define KPIs
  - Track metrics in real-time
  - Trace process inefficiencies
  - Influence process flow in real-time
- Alarming
- BIRT integration for comprehensive report design & generation
  - Standard performance reports
  - Process-specific reports



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Optimize your Process

Process Modeling with GOALS and PLANS

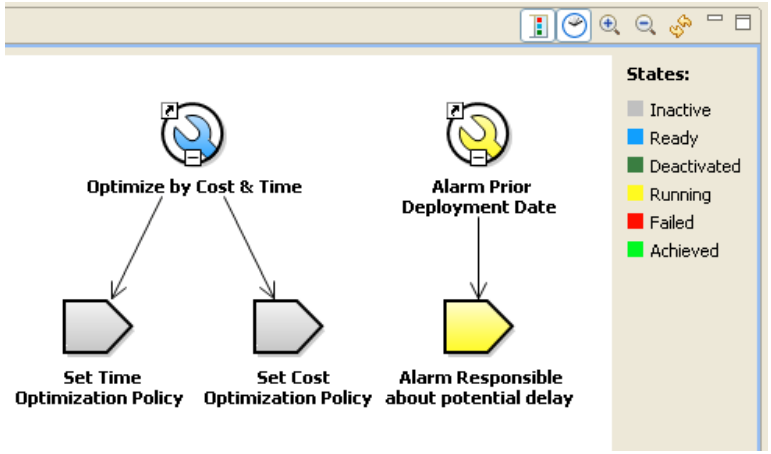
Process Execution – agile automation of your process models

Process Performance Management – monitoring & reporting

Process Optimization – real-time continuous improvement

- Continually measure and optimise process performance to reach KPI, RMIs, CMIs, ...

  Examples:
  - Reduction in time
  - Reduction in cost
  - Reduction in errors
  - Assurance of compliance
  - Increase process efficiency
  - Increase automation to reduce manpower
  - Increase process awareness
  - Increase staff/customer satisfaction



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Yes, Cool, but Where Are My Agents???

- They are easy to find. Once again, follow...
  - The white rabbit?
  - The yellow brick road?
  - ...
- The Business Process Life Cycle!
  - MAS ideas and techniques in Process Modeling
  - MAS ideas and techniques in Process Execution
  - MAS ideas and techniques in Process Monitoring
  - MAS ideas and techniques in Process Optimization
- There is more in software sky than our Philosophy (D) can contain...
  - Ideas and techniques from modern, sound software engineering

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Agents for BPM – Process Modeling

- The activity aspect of the process model is made by goals and plan
  - From: BDI and other models of rational, goal-driven, autonomous agents
  - Goals and Plans have conditions that trigger
  - BPMN process snippets as action/behavior/capability libraries for an agent
  - Organizational model from AML (UML profile for agent systems)
  - Publish/Subscribe inter-process messaging with BPMN signals
- And from non-agent software engineering?
  - Shared Data as a classical E/R + subtying (but, is also a simple ontology...)
  - Reflection everywhere (e.g., on data, human tasks, organization, ...)
  - Expression language (used in goal, plans, and BPMN branch conditions)
    - Purely functional, side-effect free
    - Statically typed with generics, covariance, type inference à la Scala (`http://www.scala-lang.org`)
    - Completely and directly interpreted within the process execution engine

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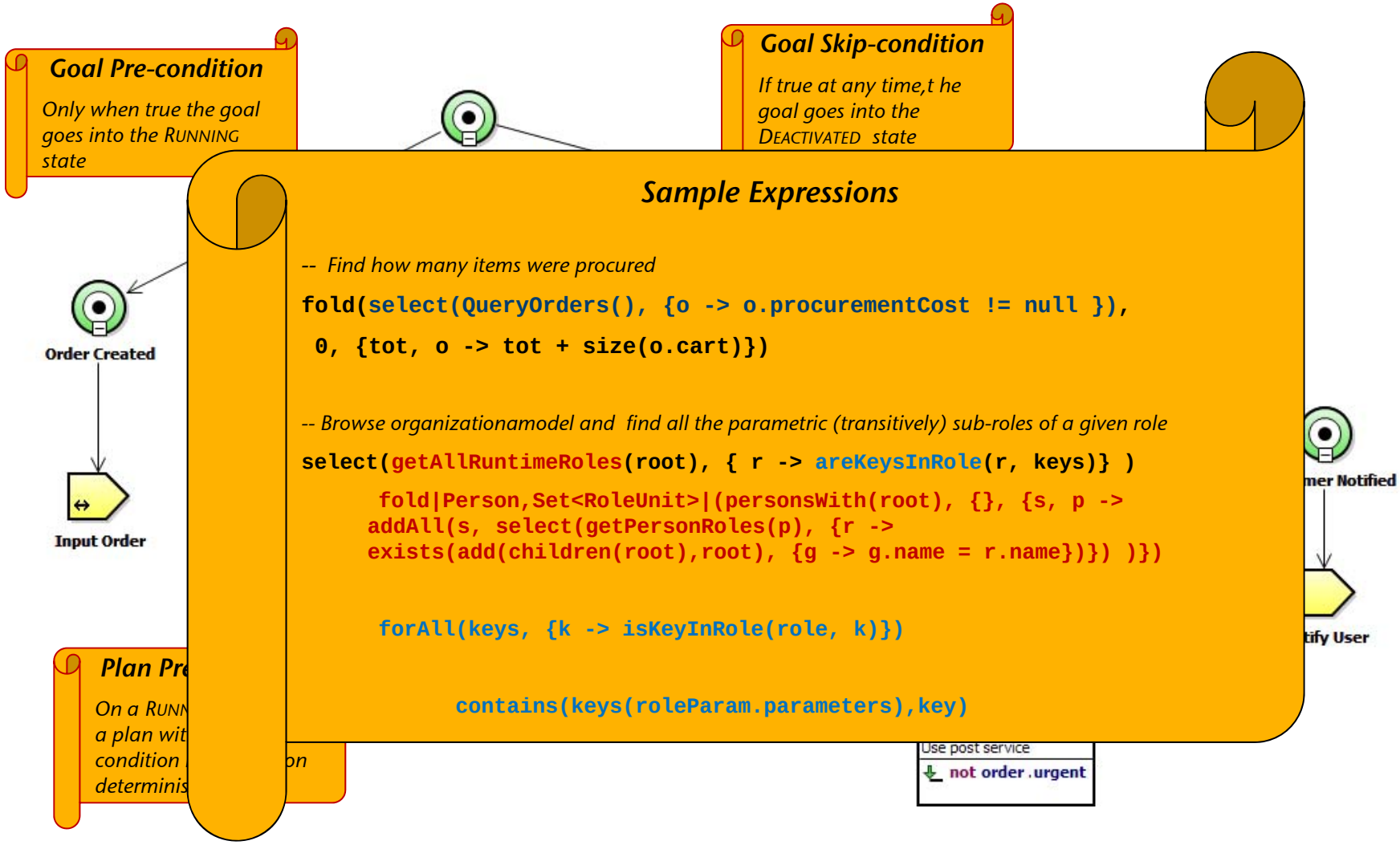
Agents for BPM – Process Modeling



Sample Expressions

```
-- Find how many items were procured
fold(select(QueryOrders(), {o -> o.procurementCost != null }),
 0, {tot, o -> tot + size(o.cart)})

-- Browse organizationamodel and find all the parametric (transitively) sub-roles of a given role
select(getAllRuntimeRoles(root), { r -> areKeysInRole(r, keys)} )
      fold|Person,Set<RoleUnit>|(personsWith(root), {}, {s, p ->
     addAll(s, select(getPersonRoles(p), {r ->
     exists(add(children(root),root), {g -> g.name = r.name})}) )})

      forAll(keys, {k -> isKeyInRole(role, k)})

            contains(keys(roleParam.parameters),key)
```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Agents for BPM – Process Execution

- ***Multi-Agent System BDI-like Engine***
- ***Each process instance is handled by a single agent***, which continuously executes an autonomic "perceive-decide-plan-execute" loop

(model variants)

GO-BPMN model #1 (eg. change mgmt)

GO-BPMN model #2 (eg. procurement)

process agents

model instance

engine

Double-layer Interpreter Architecture

The capability language (e.g., BPMN) is executed on a continuation-based runtime

The conditions and goal-level language is executed by a separate interpreter, and it is independent from the capability and expression language (e.g., UML and OCL)

other system

Other LS Process Suite

other agent system

agent platform

other agents (any type)

for product or solution specific functionality

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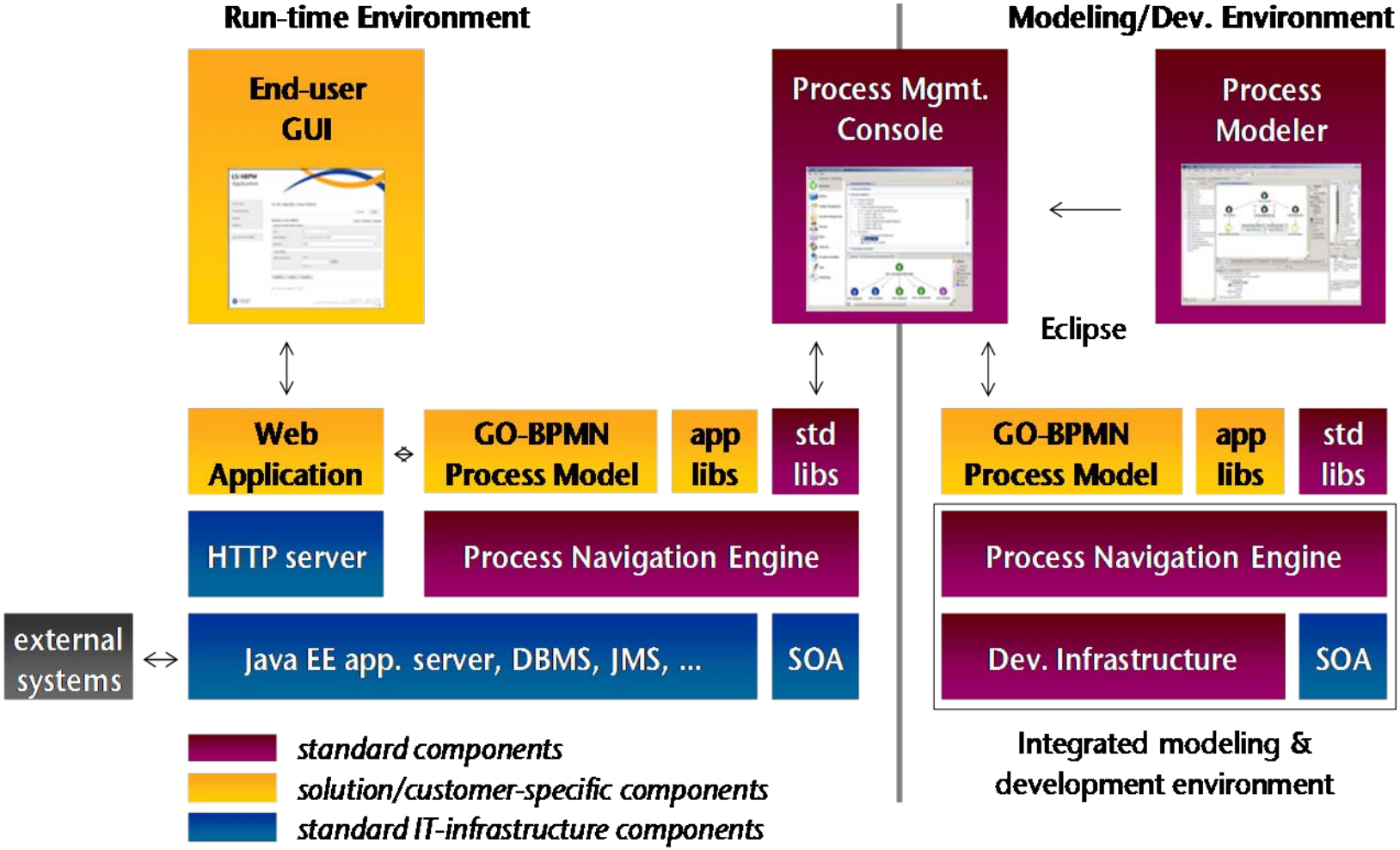
Agents for BPM – Process Execution



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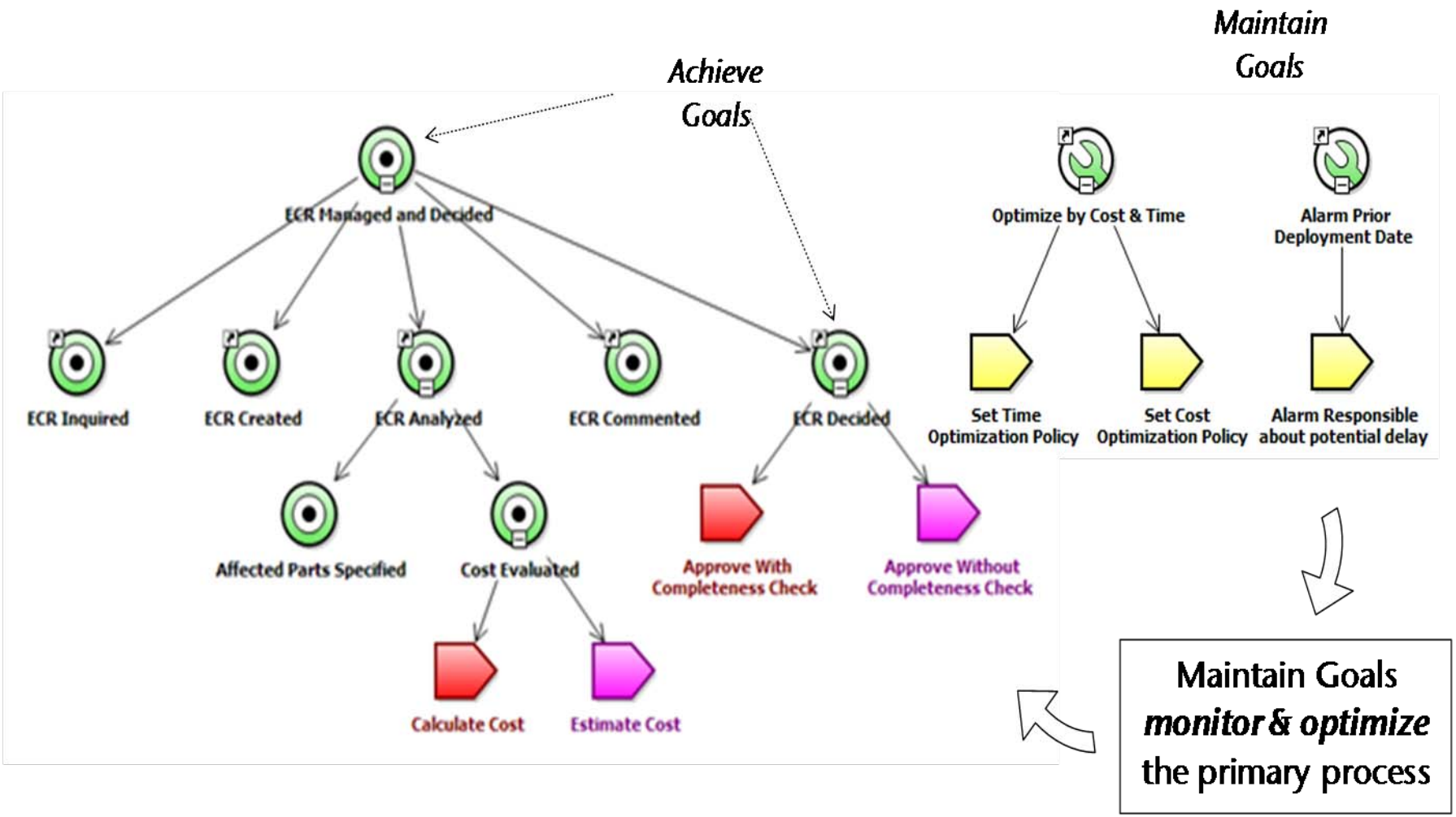
Agents for BPM – Monitoring and Optimizazion



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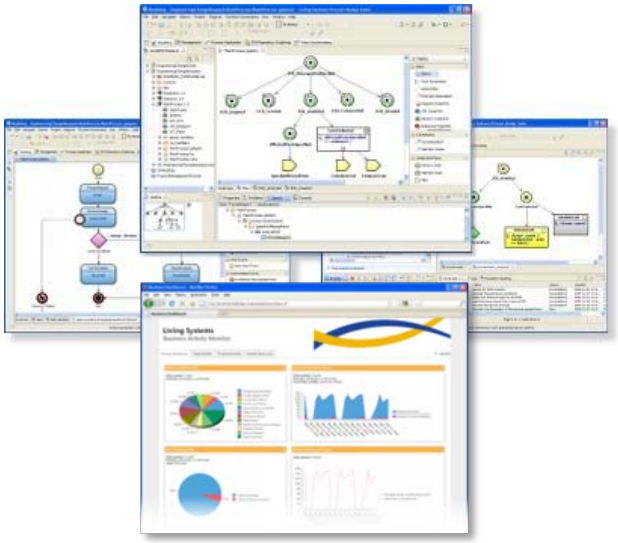
Living Systems® Process Suite 2.0



- Living Systems Process Design Suite
  - Process Modeler
  - Process Navigation Engine
  - Process Management Console
  - Process Business Dashboard
- Enterprise Runtime Suite
  - Comprehensive enterprise integration:

    WebSphere software | ORACLE FUSION MIDDLEWARE WEBLOGIC 11g | JBoss by Red Hat | GlassFish
  - Bi-directional SOA integration
    - Invoke services
    - Expose Process as a Service to other applications
  - SAP integration support
  - Standard task libraries & domain-specific process patterns

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Conclusion

- BPM as a market has clear limits and boundaries, but is actually representative of an extremely larger class of conceptual problems
  - Flexible software life cycle
  - Adjustable autonomy and human-computer cooperation
  - Introduction of pervasive social aspects in software application
- All these themes, along with the general trend towards more complexity in less time, and increased involvement of all stakeholders in the software life cycle, push towards solutions that have the traits of Agent Technology
- Thanks for your attention!
  - Questions?

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