

Business Artifacts:

A Data-Centric Approach to Business
Process Modeling & Management

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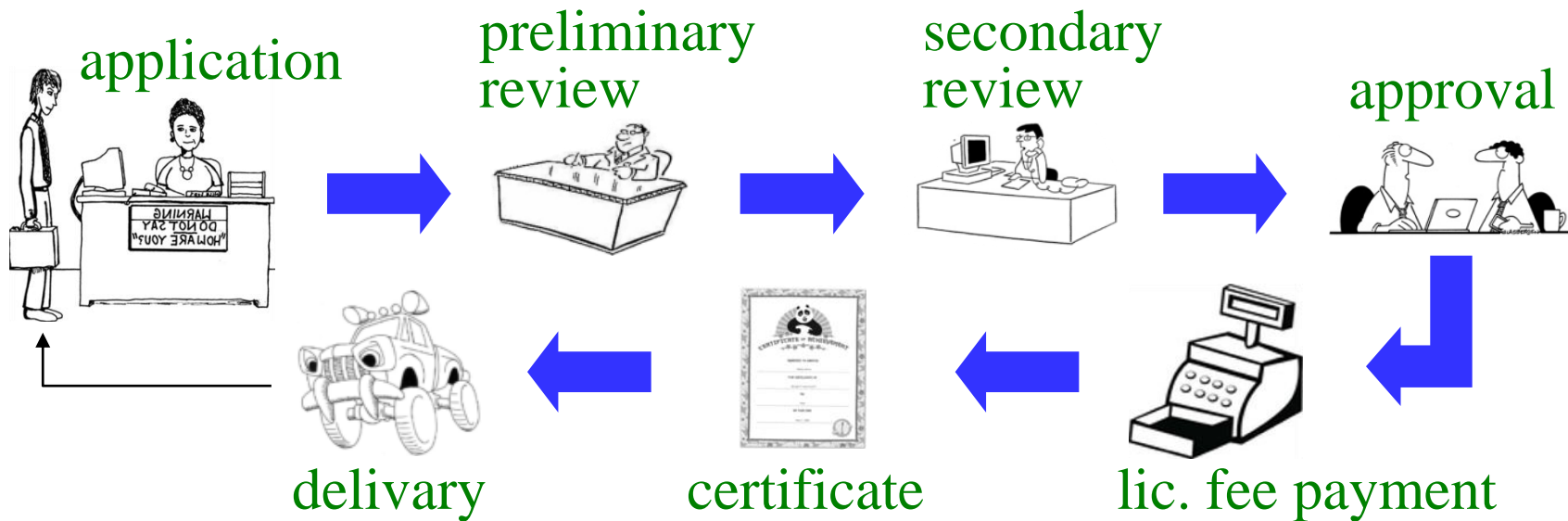
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Outline

- **Data: Critical to Business Processes**
- **Current BP Development & Management Practice**
 - ❖ **Challenges**
 - ❖ **Activity centric (e.g., Visio diagrams), data left to lower level design**
- **Business Artifacts:**
 - ❖ **Blending data with business processes**
 - ❖ **Business processes as lifecycles of business artifacts**
- **Overview of Research Focuses**
- **Conclusions**

Business (Biz) Processes

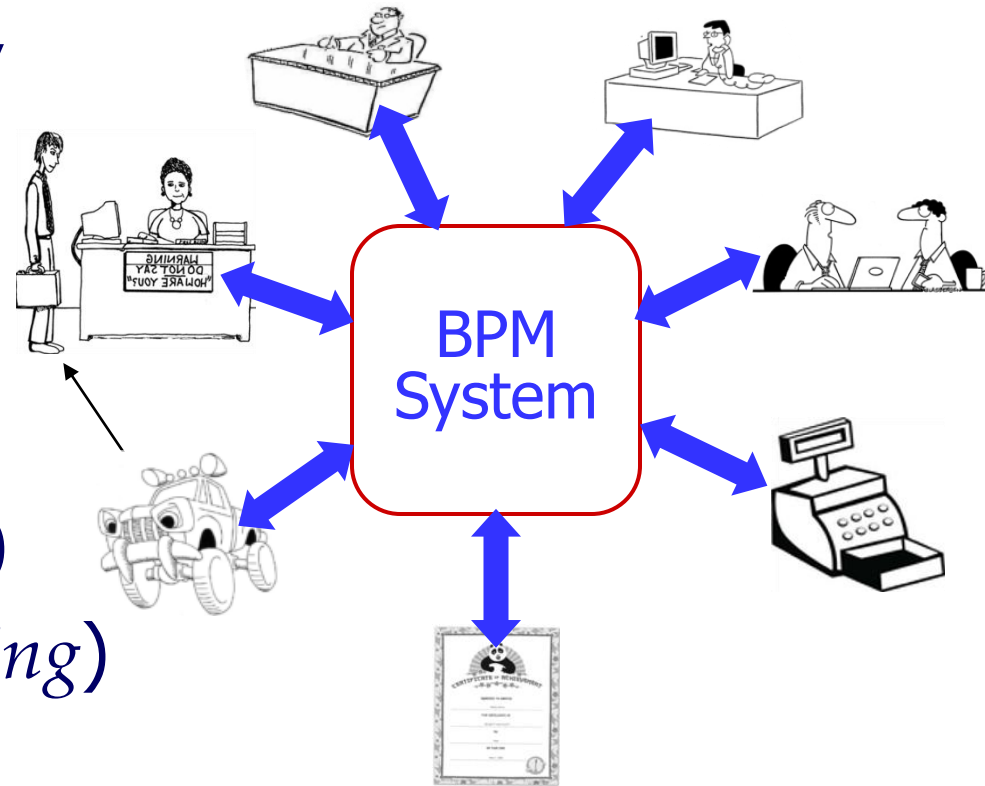
- A **business process** is an **assembly** of one or more related **activities** (**automated** or **manual**) that collectively realizes a **business objective** or **policy goal**, normally within the context of an **organizational structure** defining functional roles and relationships
- **Example: *Obtaining a Permit* (Hangzhou HMB)**



BP Management Systems (BPMs)

Software systems to manage, support, and control:

- biz process models
- **data** (*documents, files, ...*)
- **enactments**
- resources (*including human*)
- others (*e.g. support for auditing*)



BP “=” workflow in the wider sense

Traditional concept of **workflow** in 80’s to early 90’s
restricted to mostly **task sequencing**

Big Data—A Gowing Torrent

\$600 to buy a disk drive that can store all of the world's music

5 billion mobile phones in use in 2010

30 billion pieces of content shared on Facebook every month

40% projected growth in global data generated per year vs. **5%** growth in global IT spending

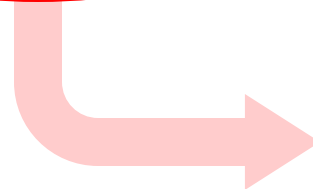
235 terabytes data collected by the US Library of Congress by April 2011

15 out of 17 sectors in the United States have more data stored per company than the US Library of Congress

- Mckinsey Global Institute, June 2011: **Big data: The next frontier for innovation, competition, and productivity**

- Availability of “big data” brings opportunities for improving productivity

15 out of 17 sectors in the United States have more data stored per company than the US Library of Congress



Big Data + Biz Processes → Big Potential



US health care

- \$300 billion value per year
- ~0.7 percent annual productivity growth



Manufacturing

- Up to 50 percent decrease in product development, assembly costs
- Up to 7 percent reduction in working capital



US retail

- 60+% increase in net margin possible
- 0.5–1.0 percent annual productivity growth



Europe public sector administration

- €250 billion value per year
- ~0.5 percent annual productivity growth

Two observations

- A significant portion of big data generated from biz processes
- Productivity growth only obtainable via more efficient/effective biz processes



Global personal location data

- \$100 billion+ revenue for service providers
- Up to \$700 billion value to end users

Source:
MGI Analysis

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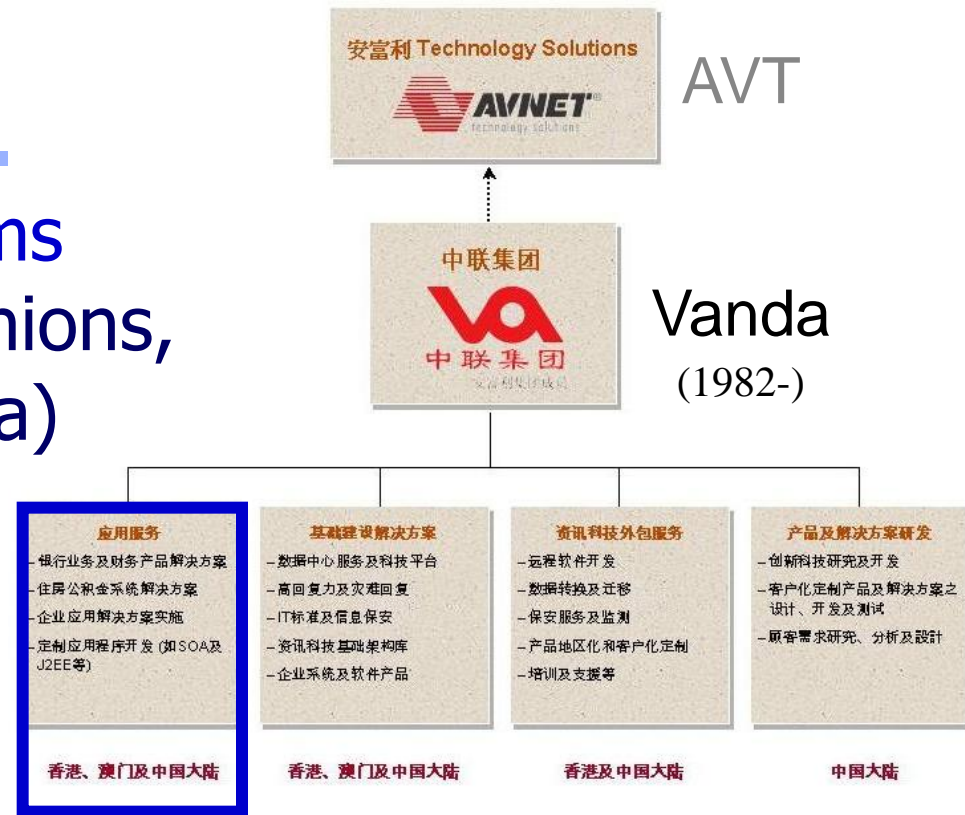
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Vanda Group

- Developing workflow systems for regional banks, credit unions, provident funds, ... (in China)
- Est. 60% of the market excluding national banks

Key obstacles:

- Training (engineer liquidity)
- Repetition of work, labor intensive (could make more \$\$ or ¥¥ and be more competitive)
- High maintenance cost



developed workflow application domains

Hangzhou Housing Management Bureau



杭州市住房保障和房产管理局

www.hzfc.gov.cn

- City population: 8.7 millions
- One division (~400 SMEs) deals with all real estate licenses, permits, titles, etc.
- 300,000 cases each year:
 - ~500 biz process models, 35% 1 day, 30% 7-9 days
- Contractor/in-house development of workflow systems (¥¥ millions for in-house only)

Challenges:

- Manage changes (policy, environment, ...)
- Serious lack of automation for design-development-maintenance

200,000+ for
 中国北车股份有限公司
China CNR Corporation Limited



developing workflow
application domains

Hospitals: RuiJin & SB Cottage

- Health care delivery:
much of the \$300 billion could be gained [MGI'11]
- Treatment workflows can fundamentally improve health care quality

Falling far behind:

new IT divide?

- No workflows, conflicting “workflows”
- “Shaky” IT infrastructures
- RuiJin has the largest IT team (40+ FTEs) among all hospitals in Shanghai

wishful workflow
application domains

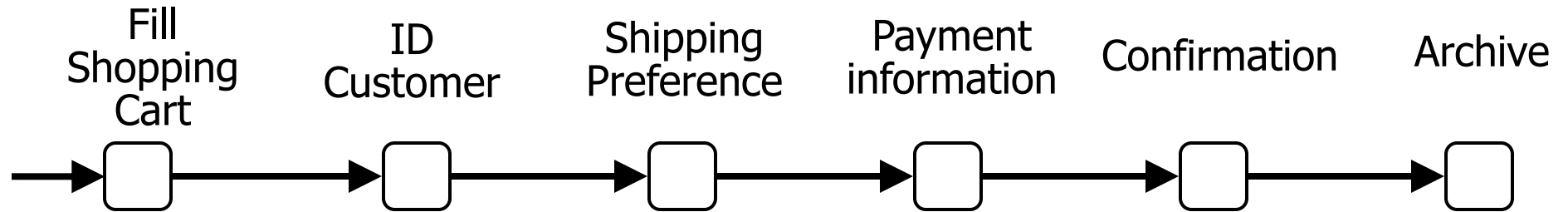
BPM Application Challenges

- Lack of clear ways to combine various factors of biz processes
- Lack of workflow technology to support a variety of essential functions
 - ❖ Analysis, modifications, interoperation, ...
 - ❖ Needs holistic approach to BPM
- Long tail phenomenon is a “holy grail”
- Application domains work in isolation

- Origin of the difficulties:
ill-suited modeling methodology

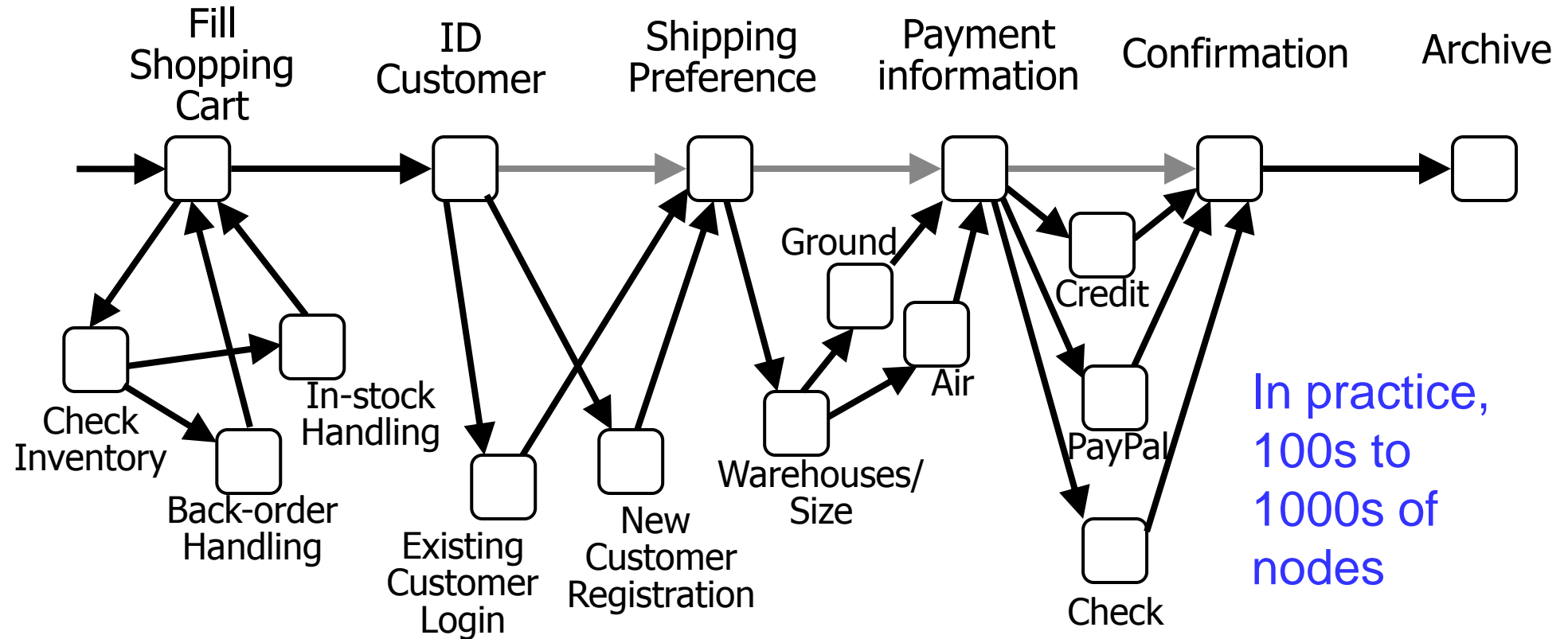
Typical Biz Process Modeling

- A bookseller example: Traditional **control-centric** models



Typical Biz Process Modeling

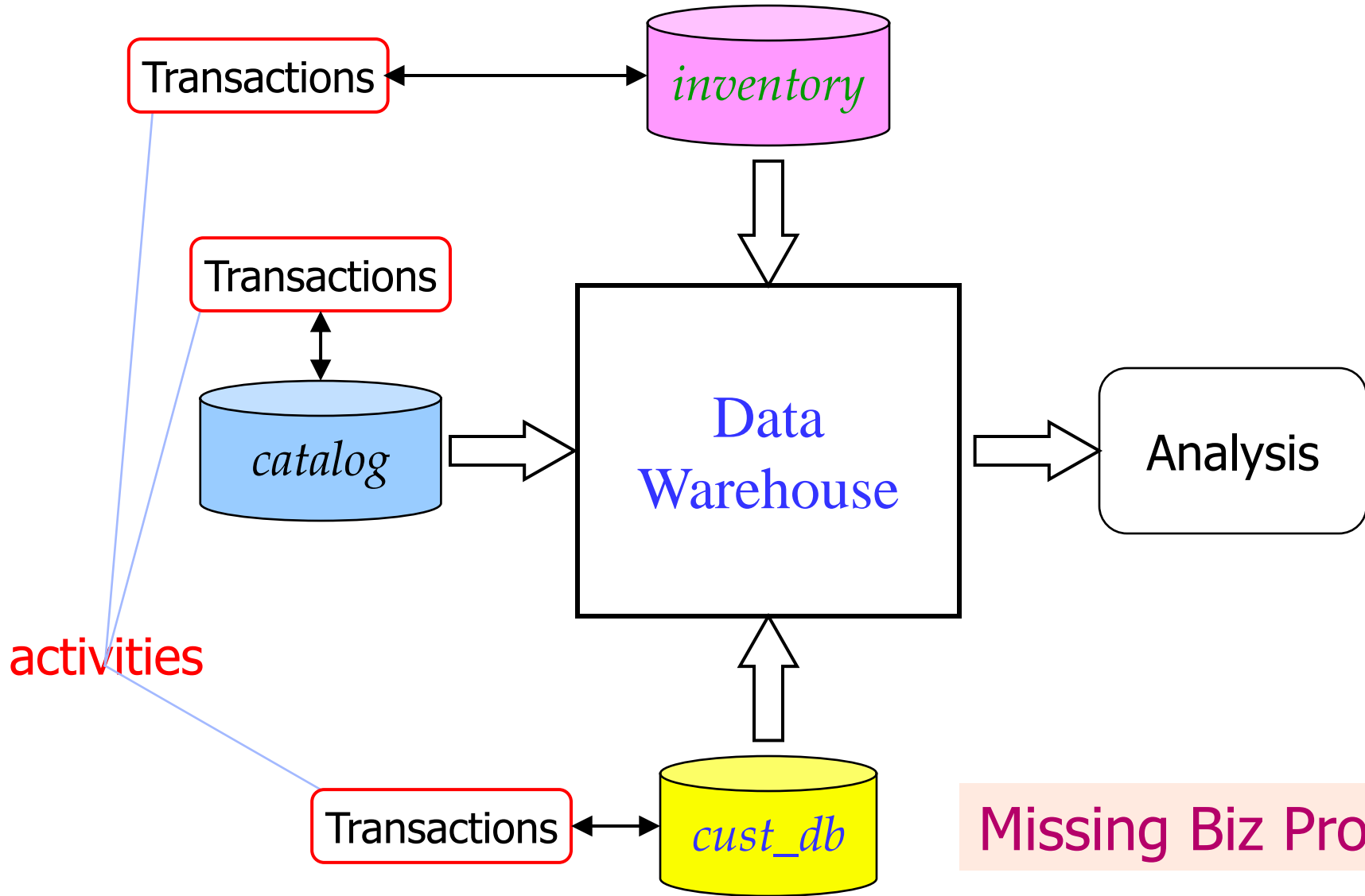
- A bookseller example: Traditional **control-centric** models
- Multiple steps needed for each activity



Hard to reason, find useful views: missing data

Business Analytics (Biz Intelligence)

■ Extract-Transform-Load



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Four Kinds of Data in Biz Processes

- **Business data** essential for business logic
 - Examples: *items, shipping addresses*
- **Enactment status**: the current execution snapshot
 - Examples: *order sent, shipping request made*
- **Resource usage and state** needed for BP execution
 - Examples: *cargo space reserved, truck schedule to be determined*
- **Correlation** between processes instances
 - Example: *3 warehouse fulfillment process instances for Jane's order*
- Traditional biz process models **barely capture** data

Business Artifacts

- A **business artifact** is a key conceptual business entity that is used in guiding the operation of the business
 - ❖ *fedex package delivery, patient visit, application form, insurance claim, order, financial deal, registration, ...*
 - ❖ both “information carrier” and “road-maps”
 - Technically, it includes two parts:
 - ❖ **Information model:**
 - data needed to move through workflow
 - ❖ **Lifecycle:**
 - possible ways to evolve
- ✓ Very natural to business managers and BP modelers

Example: Restaurant Processes

repository

Activity

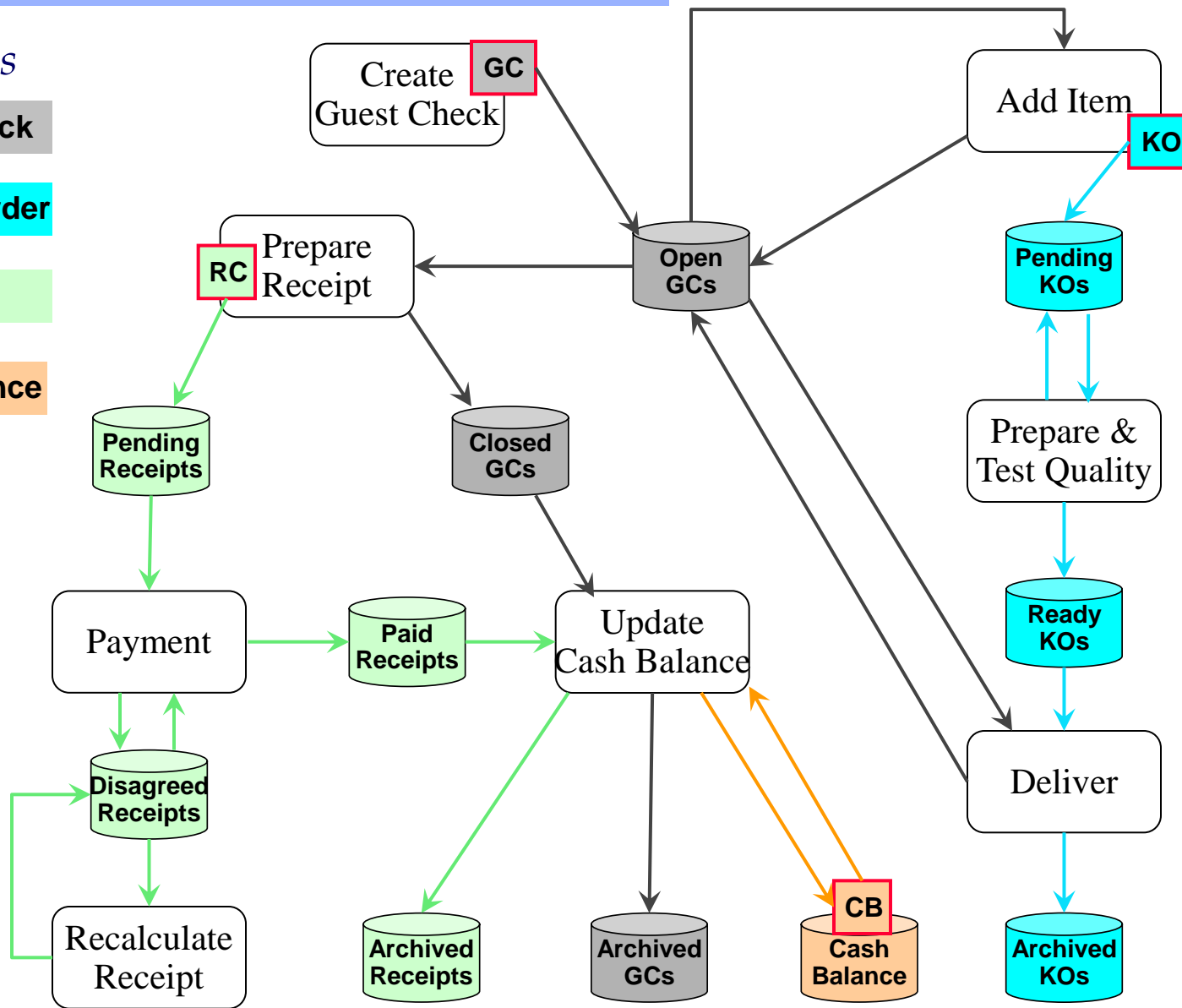
Artifacts

Guest Check

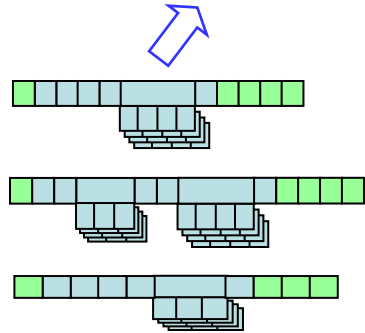
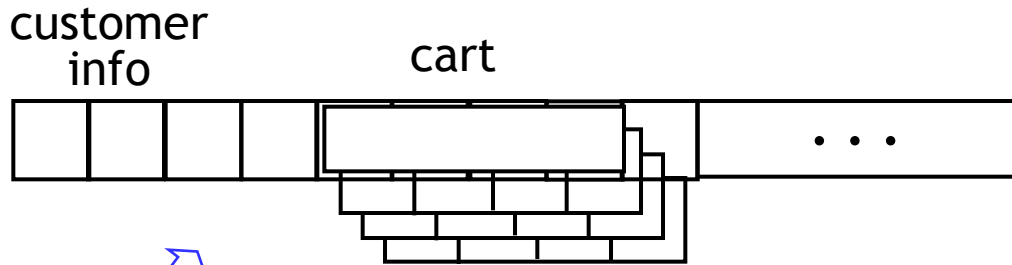
Kitchen Order

Receipt

Cash Balance



Artifact-Centric Biz Process Models



Artifacts (Info models)

+

Specification of
artifact lifecycles

■ Informal model [Nigam-Caswell IBM Sys J 03]

■ Systems: BELA (IBM 2005), Siena (IBM 2007),
EZ-Flow (ArtiFlow) (Fudan-UCSB 2010), Barcelona (IBM 2010)

■ Formal models

❖ State machines [Bhattacharya-Gerede-S. SOCA 07][Gerede-S. ICSSOC 07]

❖ Rules [Bhattacharya-Gerede-Hull-Liu-S. BPM 07][Hull et al WSFM 2010]

BP Models: Data Abstraction to Artifacts

Four classes of Biz process models:

- **Data abstraction** models: data mostly absent
 - WF (Petri) nets, BPMN, UML Activity Diagrams, ...
- **Data-aware** models: data present (as variables), but storage and management hidden
 - BPEL, YAWL, ...
- **Storage-aware** models: schemas for persistent stores, mappings to/from data in BPs defined and managed manually
 - jBPM, ...
- **Artifact-centric** models: logical modeling for biz data, automated modeling other 3 types, data-storage mapping
 - GSM, EZ-Flow

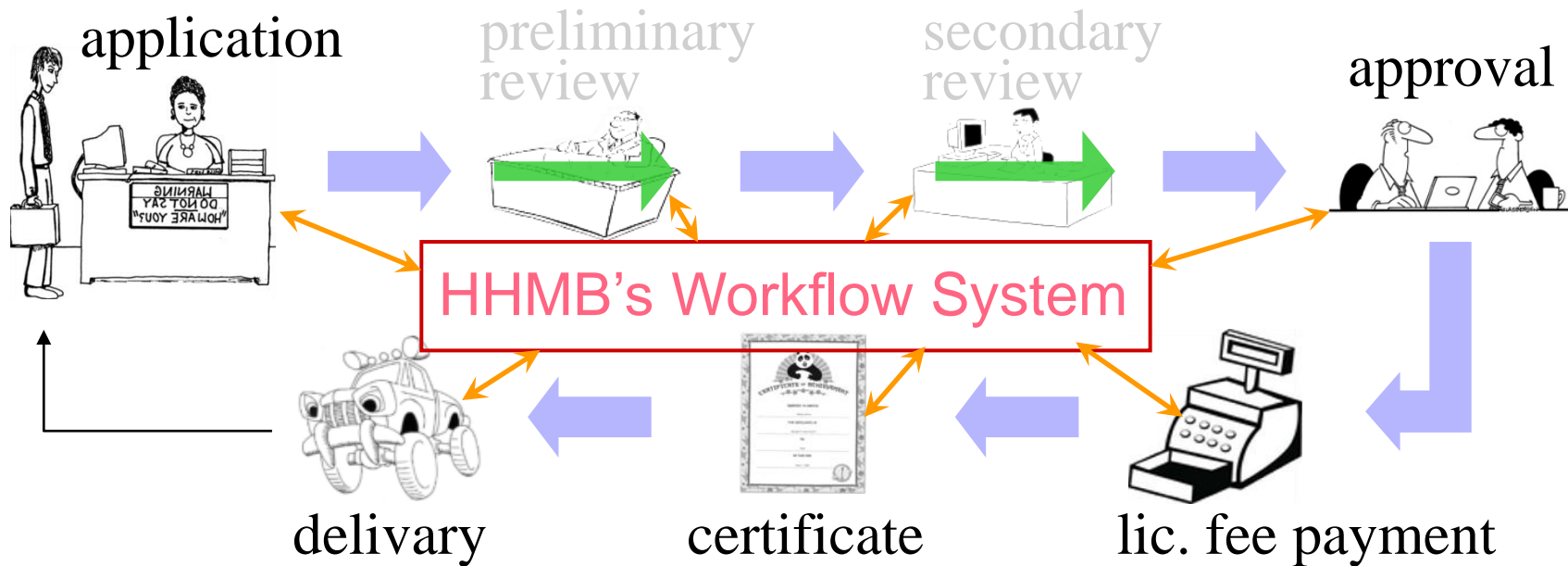
Case Study: IBM Global Financing

[Chao et al
BPM 2009]

- Finance HW, SW & services for global clients
 - ❖ \$38B asset base, financing >\$40B/year, 125K clients
- Business challenges
 - ❖ Country “silos” inhibited integration & annoyed clients
 - ❖ Failed to produce end-to-end “tangible model”
 - ❖ Efficiency/cost control need global performance metrics
 - ❖ Need a globally standard process w/ local variations
- No results after 2 year efforts with traditional approach
- A preliminary artifact design after a 3-day workshop with 15 business SMEs from IGF
- 6 weeks of design refinements lead to final design
 - ❖ Also, a blueprint for transformation of IGF operations

Case: Hangzhou Housing Management

- Problem: **Cannot handle ad hoc changes effectively**
 - ❖ Regulation and policy changes (some temporary)
 - ❖ Temporary changes in response to, e.g., disaster
- Example: A **green** channel for projects of flood victim resettlement omits reviewing tasks



Artifact-Centric BPs are Easier to Change

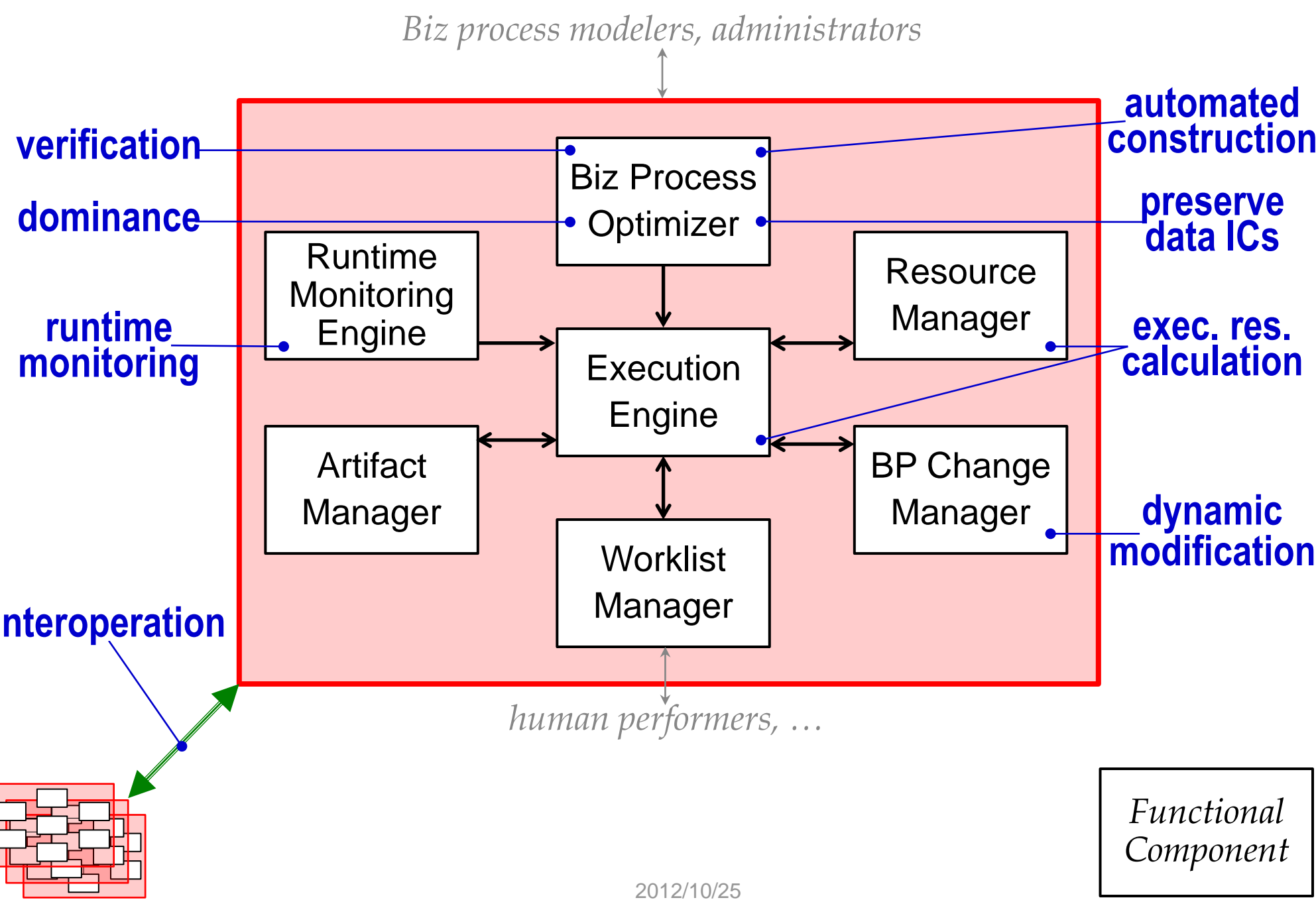
- Biz process = biz artifacts = state machine lifecycle + **BP change rules**
- **BP change rules** conservatively extend workflow
 - ❖ Could be temporary, non-schematic
- Rules allow biz processes to respond to situations with many more options
- **Estimated labor savings:**
 - ❖ 9% for Hangzhou HMB (preliminary study) or 38 out of 400 FTEs

[Xu-S.-Yan-Yang-Zhang CoopIS 2011]

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Artifact-Centric BPMS & Current Research

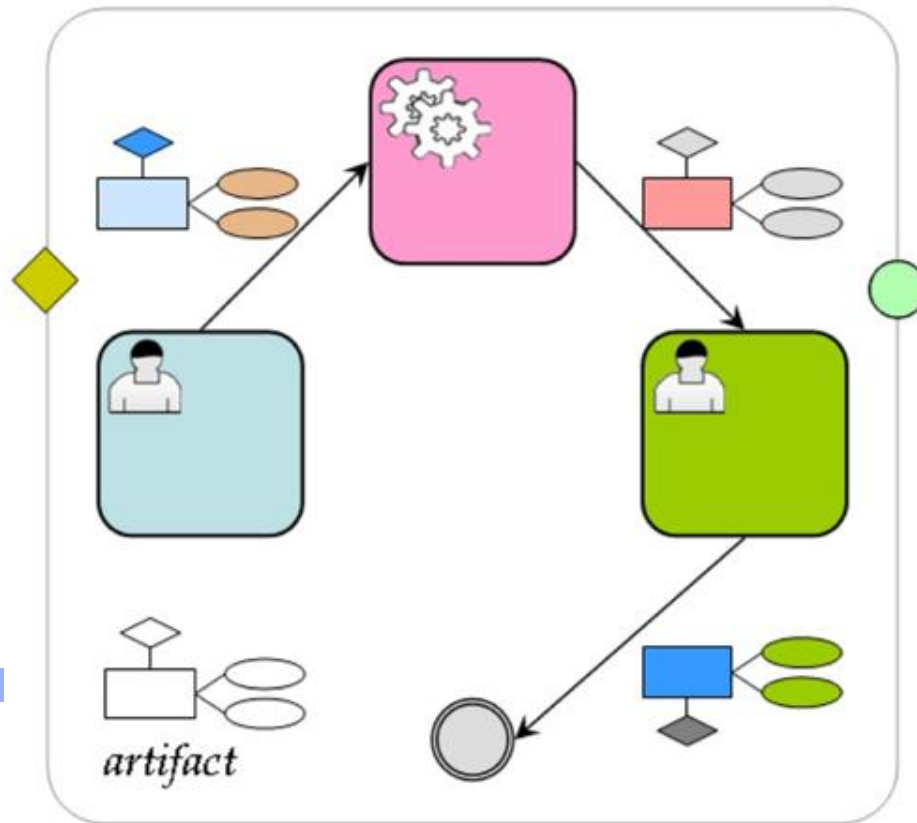


Research Challenges

- Unifying holistic conceptual models
- Design tools (analysis, verification, optimization)
- Runtime support, manage changes
- Reasoning, business analytics (informatics), process mining
- Interoperation

Conclusions

- Biz process modeling: a foundation for BP management
 - ❖ Many challenges: old and new
 - ❖ **Data** are essential and play prominent roles for BPs
- Biz artifact centric approach promising
- **Two alternatives:**
 - ❖ As a BPM design methodology/tool, e.g., accompanying jBPM
 - ❖ Full-fledged BPMS, one possible aim:
install and use as easy as MySQL
- Biz artifacts: a very active research topic



A business process

Thank you!