Dirk Draheim

Business Process Technology

A Unified View on Business Processes, Workflows and Enterprise Applications

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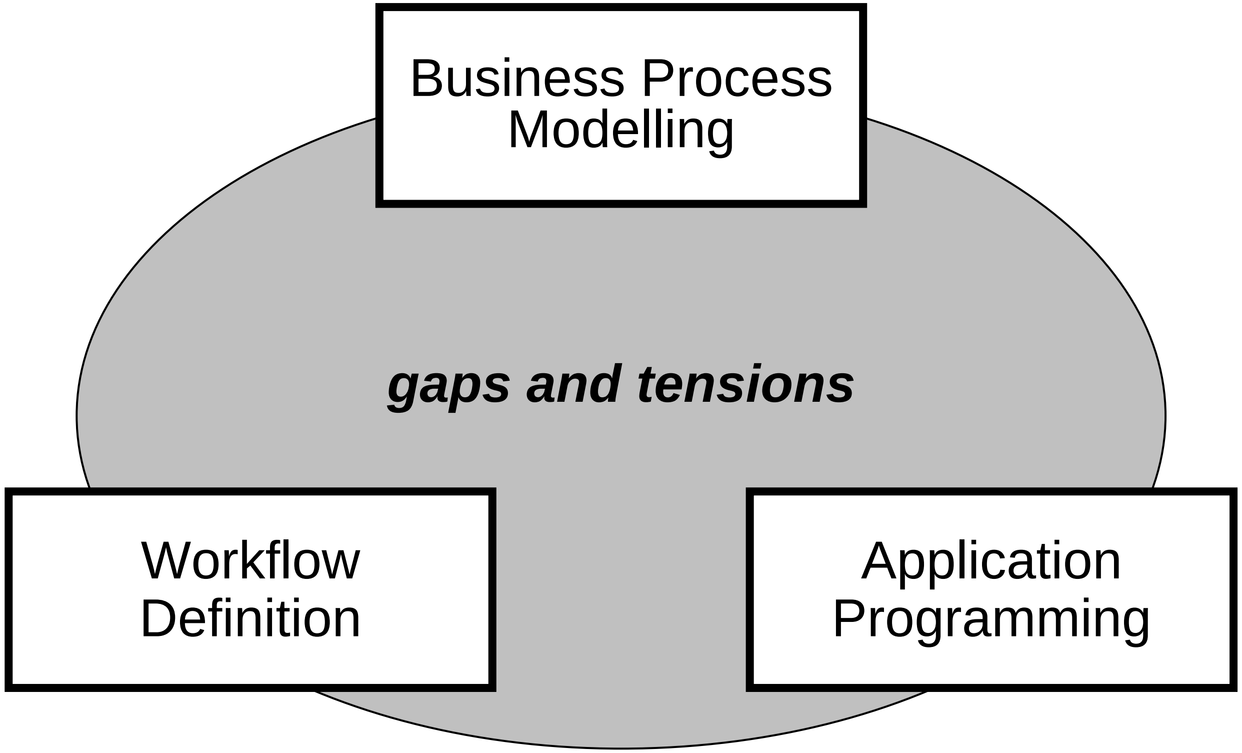

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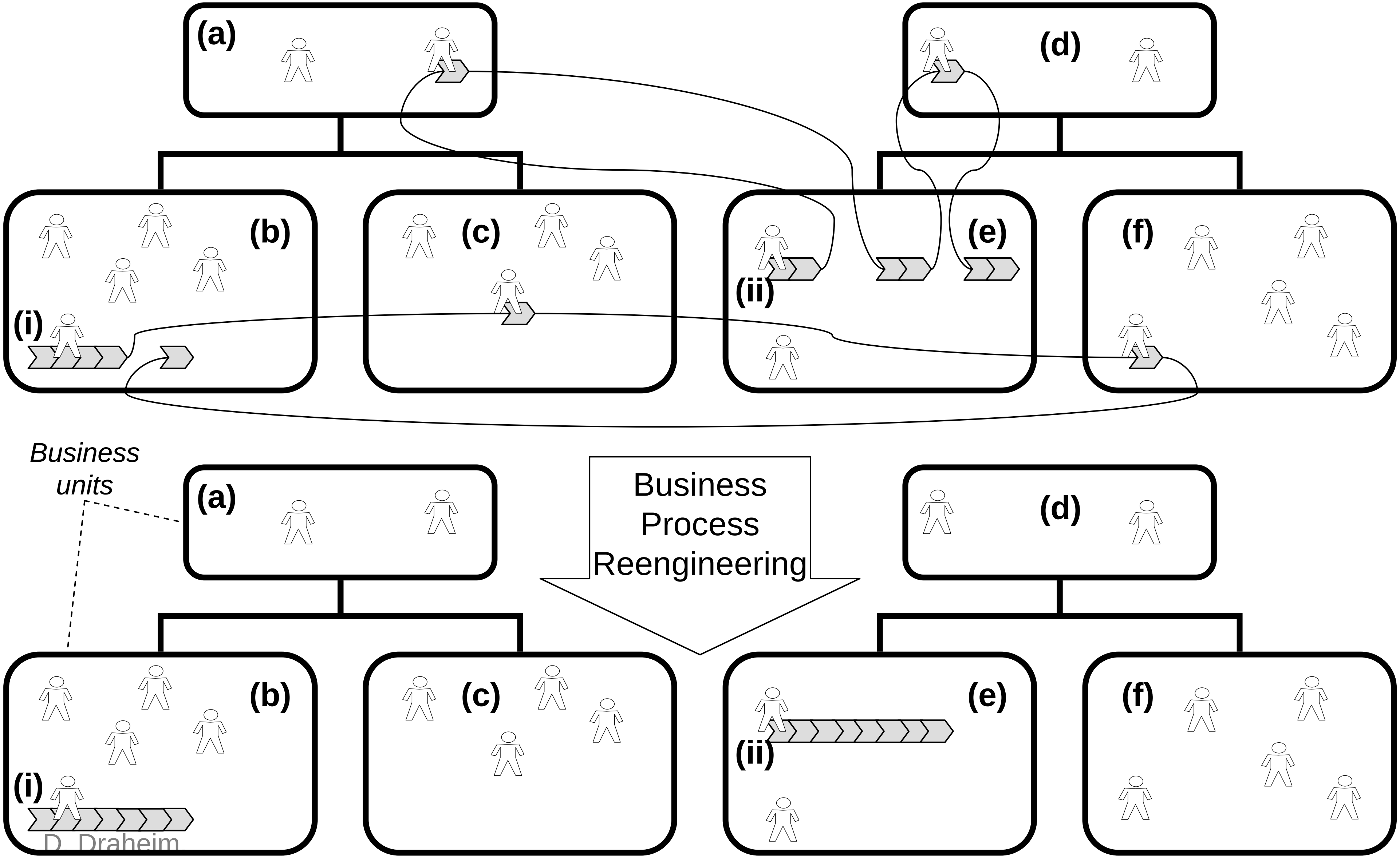

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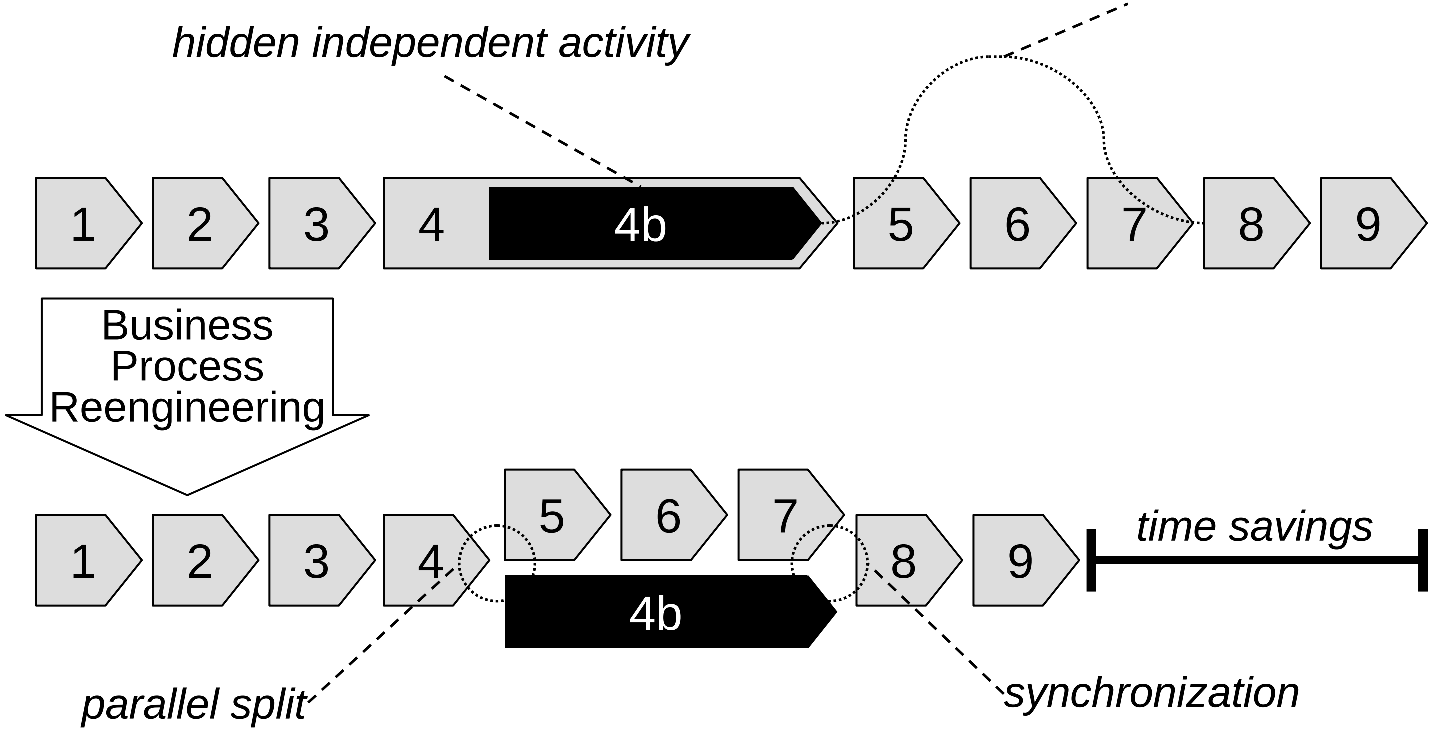

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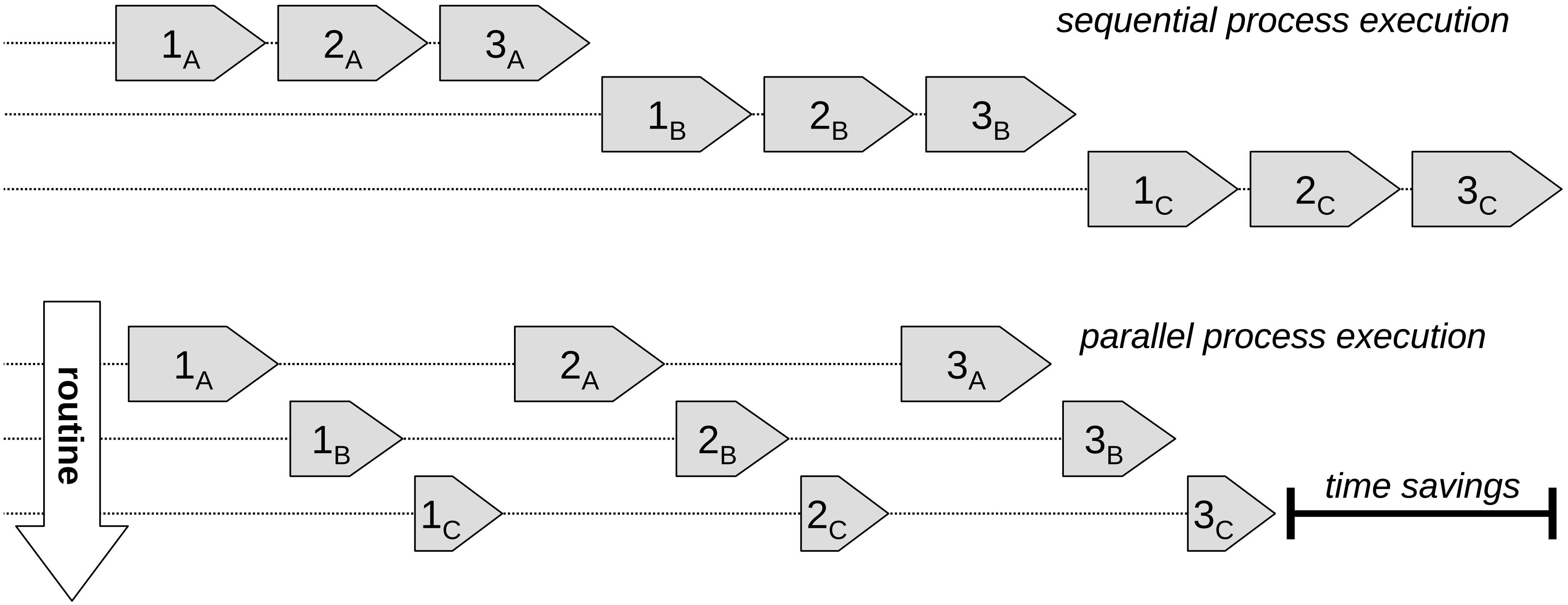

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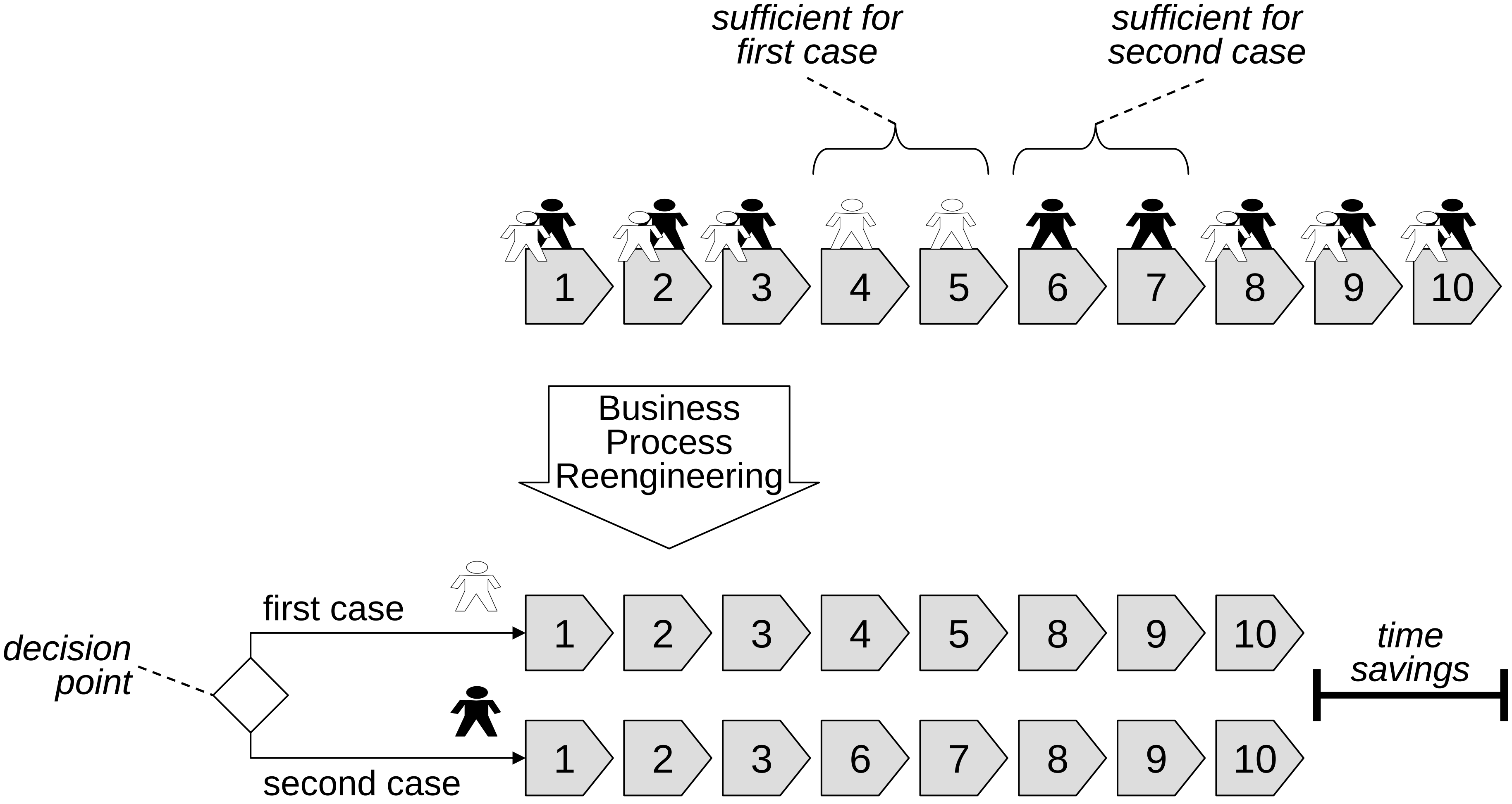

sufficient for first case
sufficient for second case
1
2
3
4
5
6
7
8
9
10
Business Process Reengineering
first case
decision point
second case
1
2
3
4
5
8
9
10
1
2
3
6
7
8
9
10
time savings

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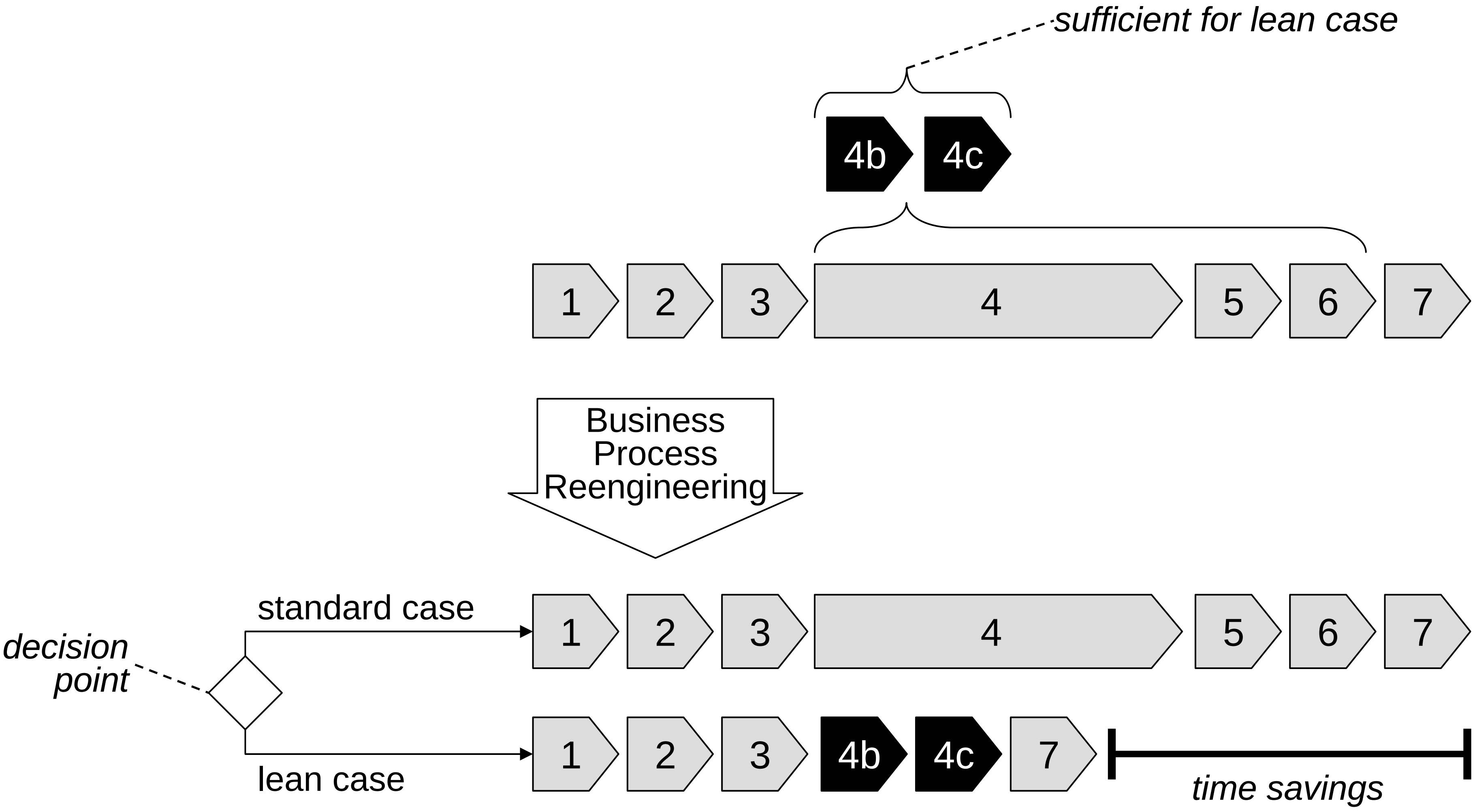

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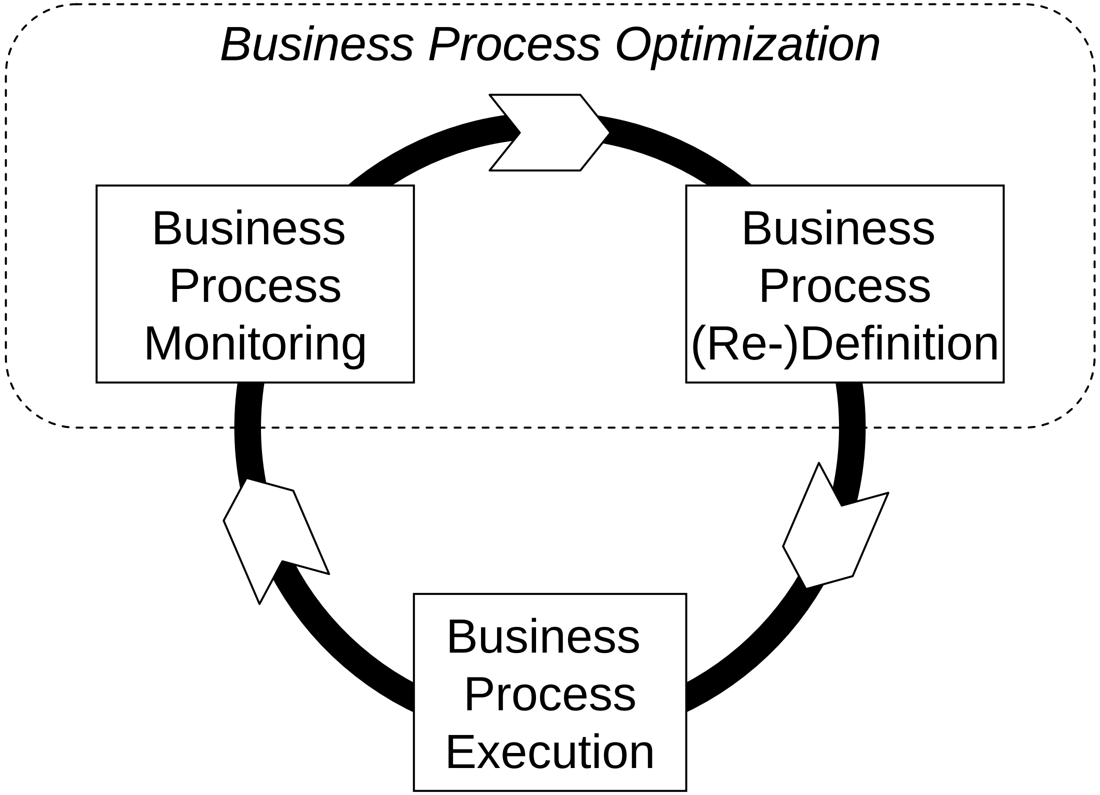
Business Process Optimization
Business Process Monitoring
Business Process (Re-)Definition
Business Process Execution

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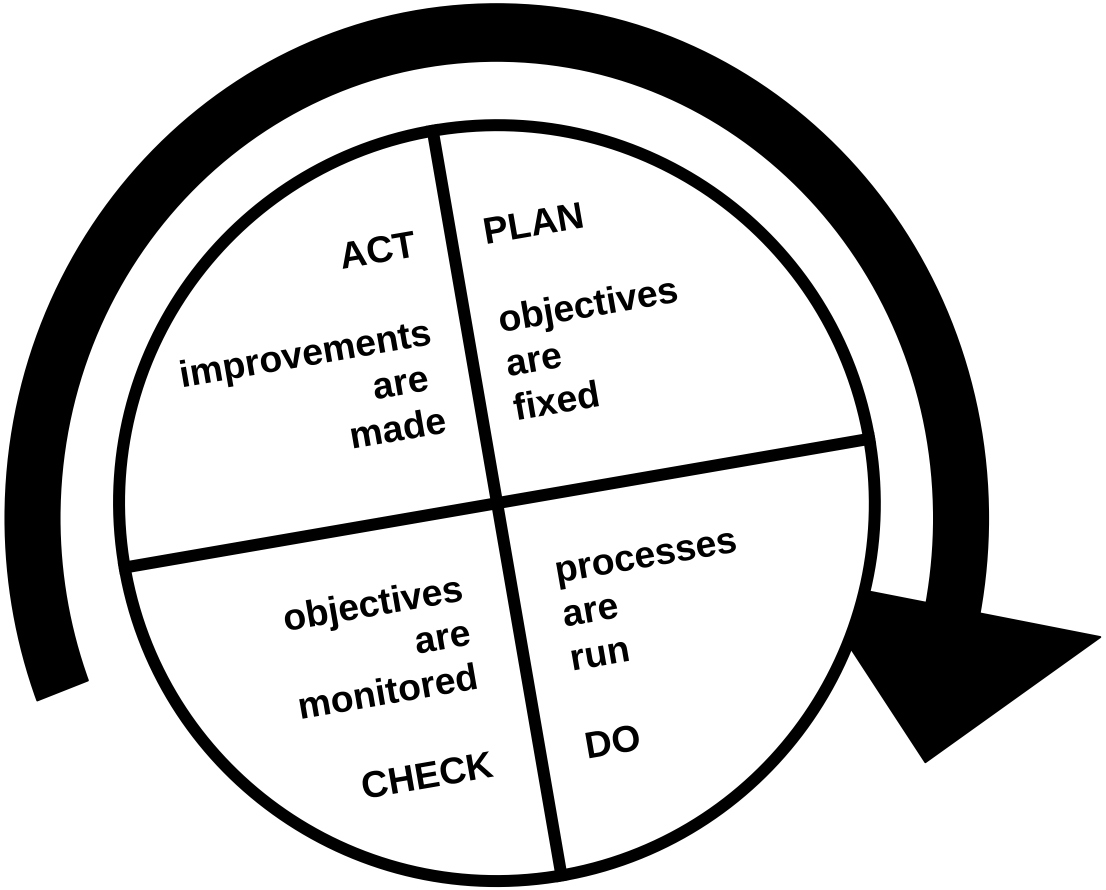

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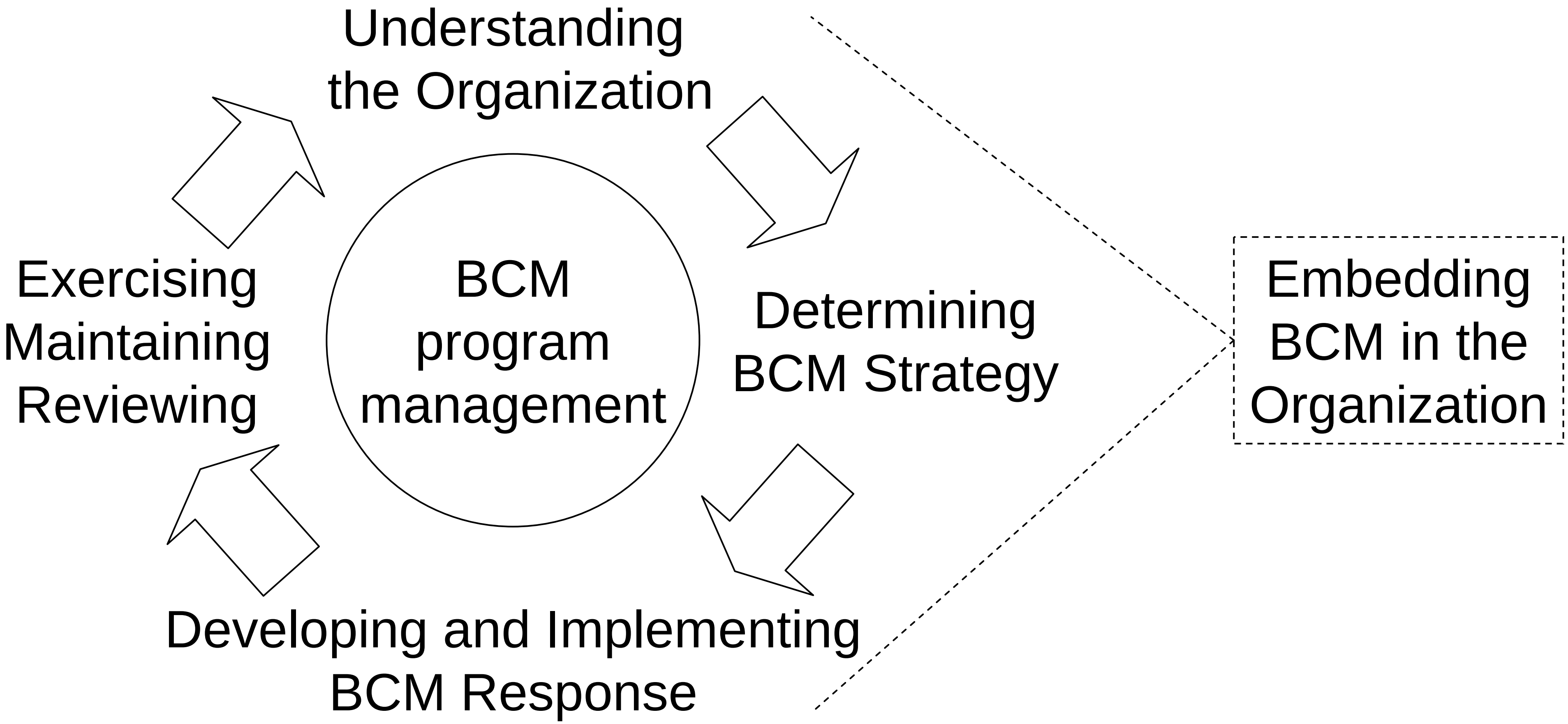

Understanding the Organization

Determining BCM Strategy

Developing and Implementing BCM Response

Exercising Maintaining Reviewing

BCM program management

Embedding BCM in the Organization

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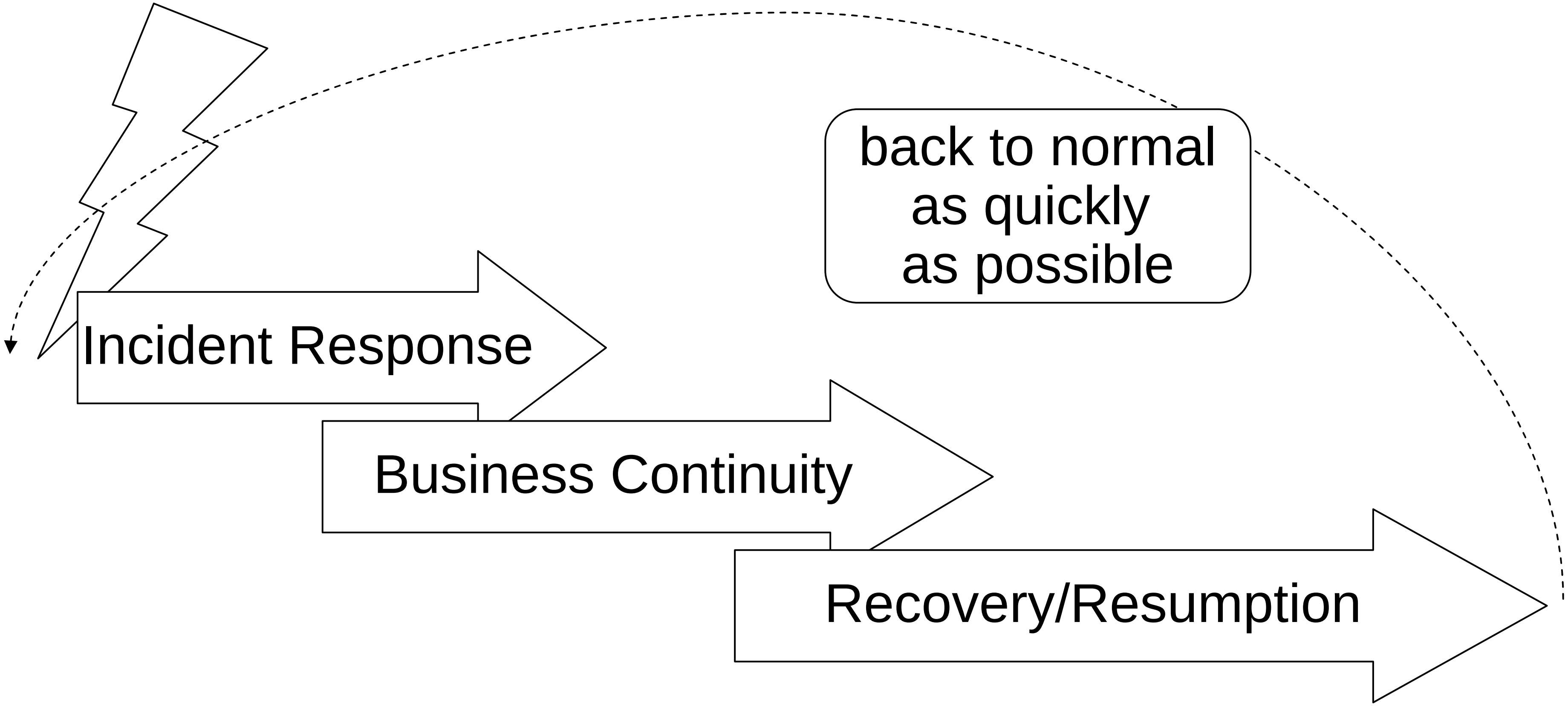

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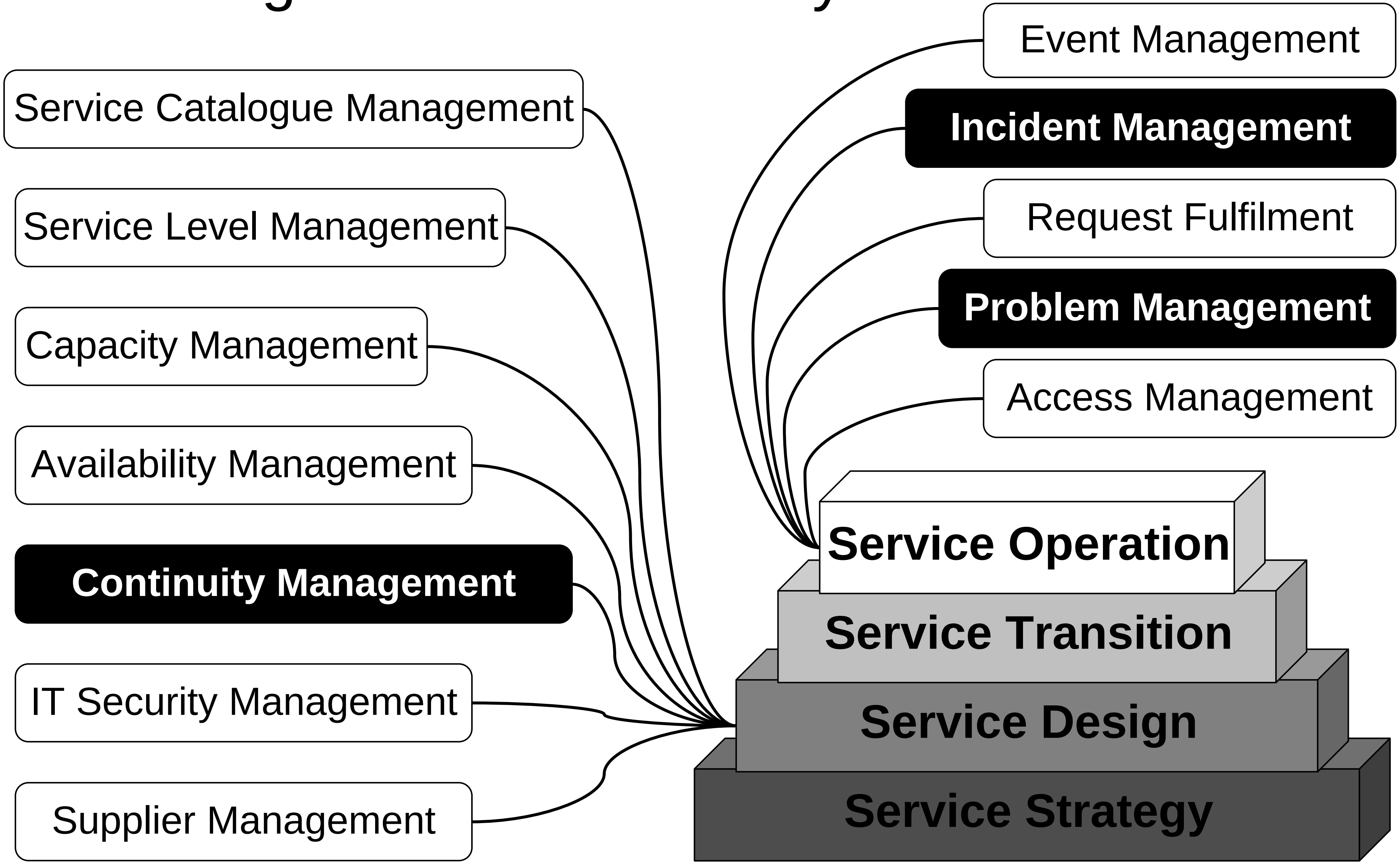

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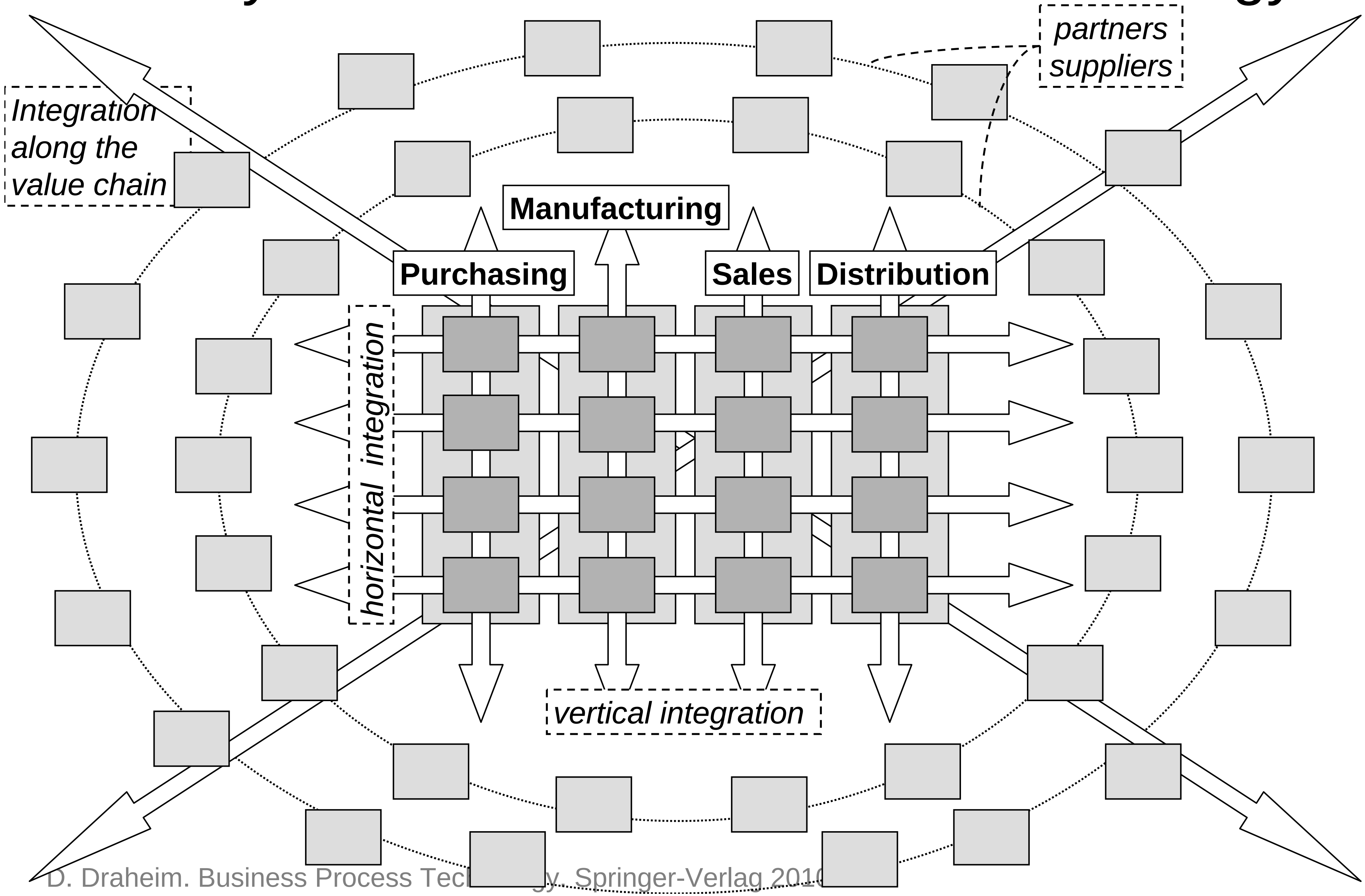

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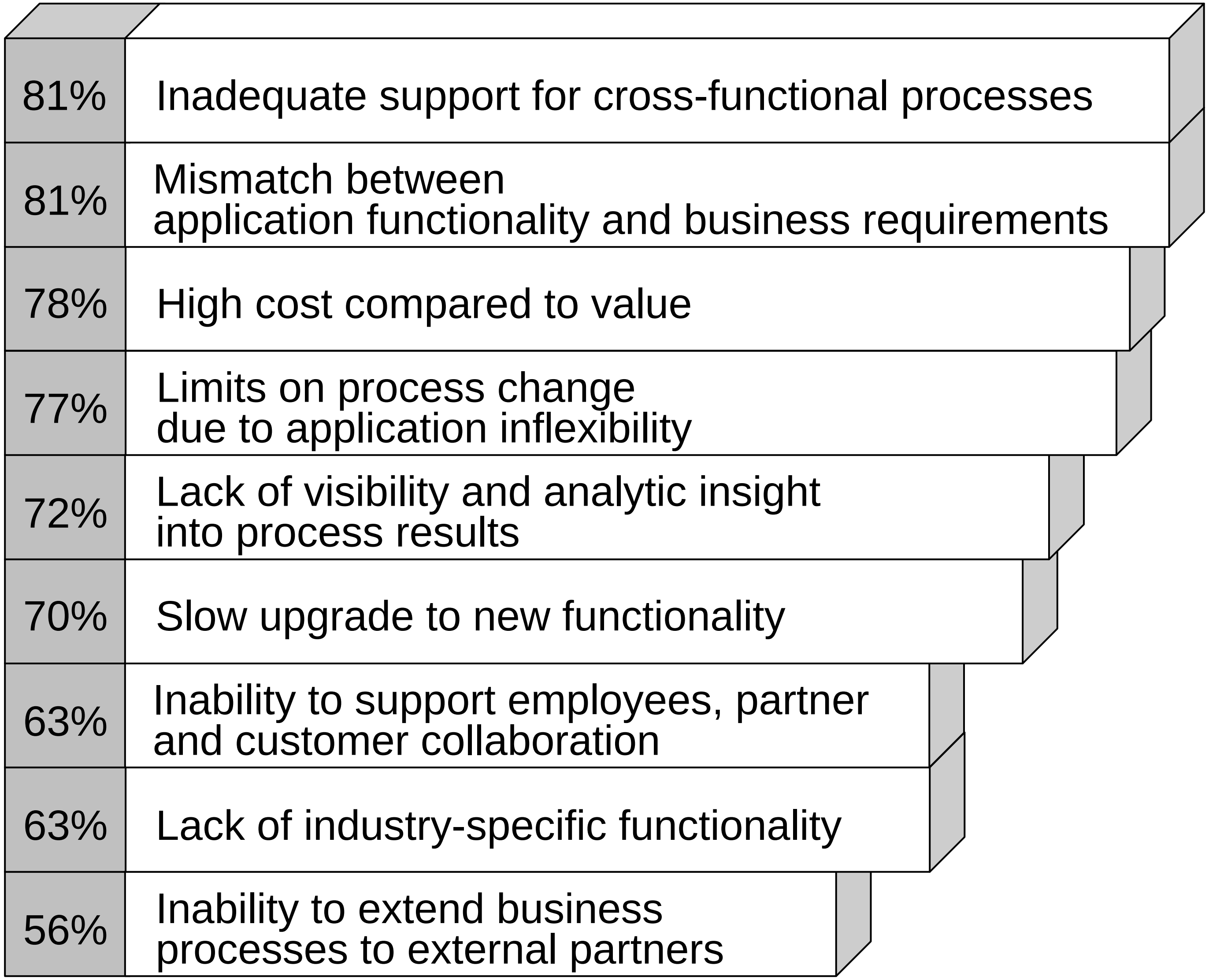

81%	Inadequate support for cross-functional processes
81%	Mismatch between application functionality and business requirements
78%	High cost compared to value
77%	Limits on process change due to application inflexibility
72%	Lack of visibility and analytic insight into process results
70%	Slow upgrade to new functionality
63%	Inability to support employees, partner and customer collaboration
63%	Lack of industry-specific functionality
56%	Inability to extend business processes to external partners

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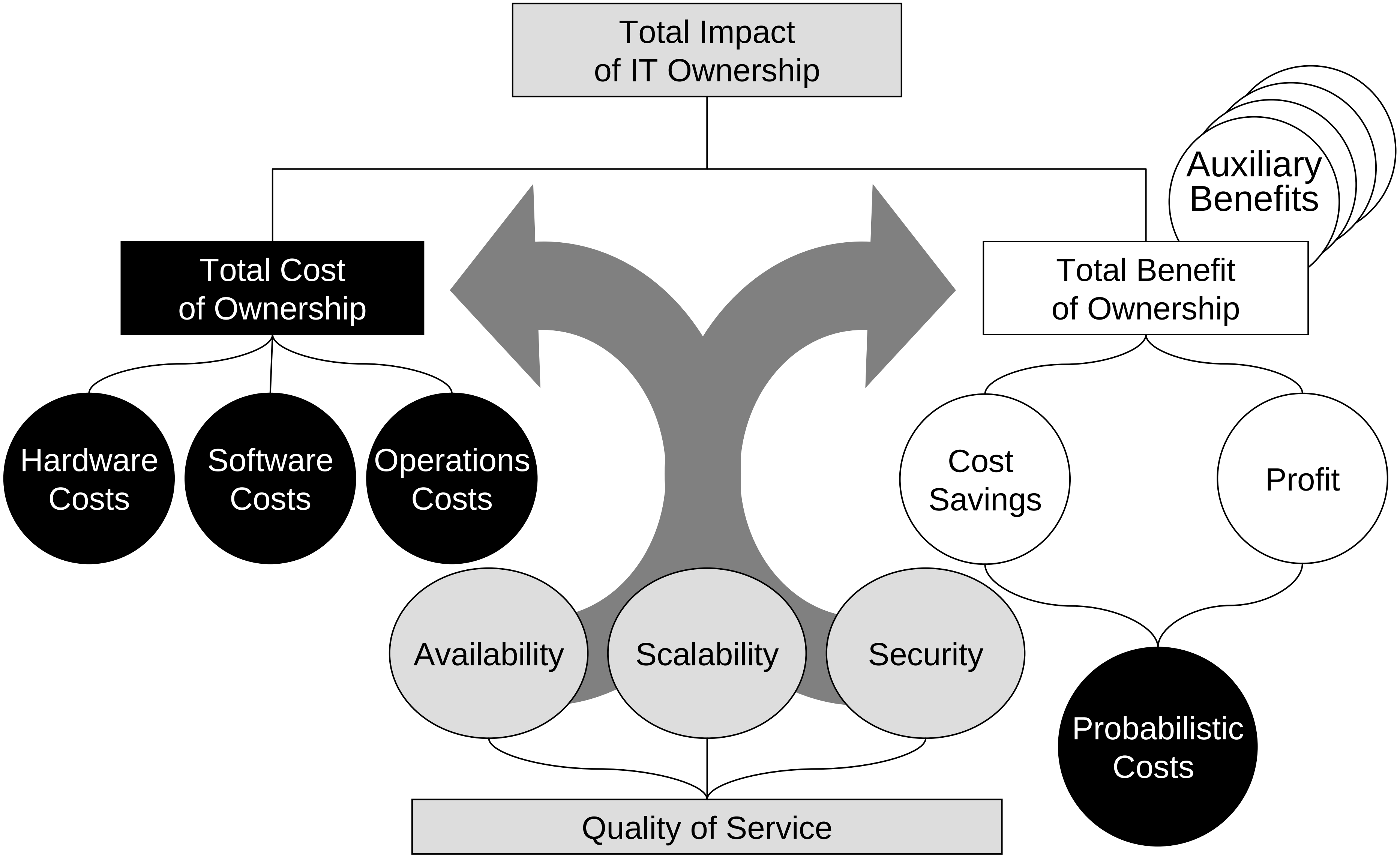

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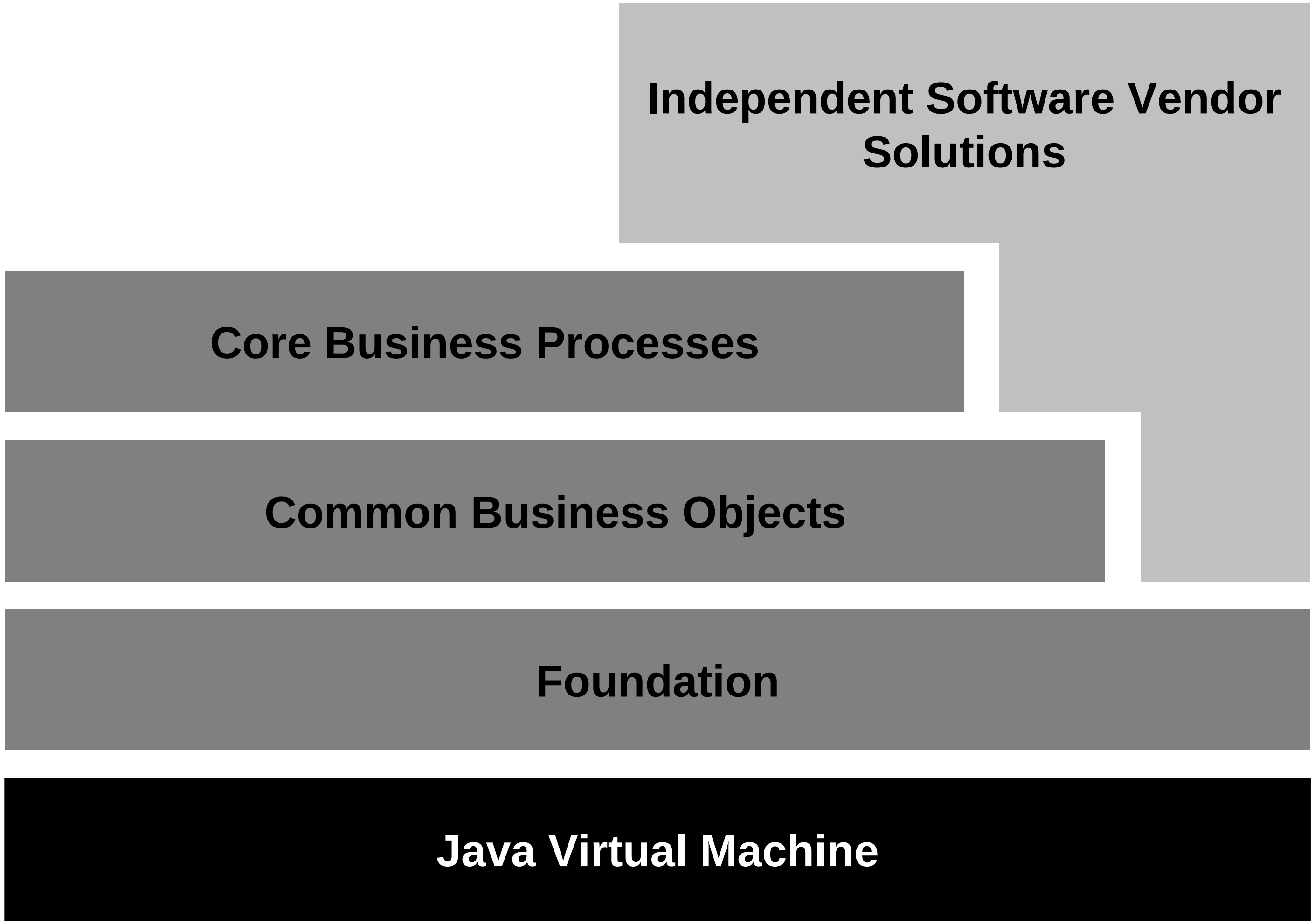

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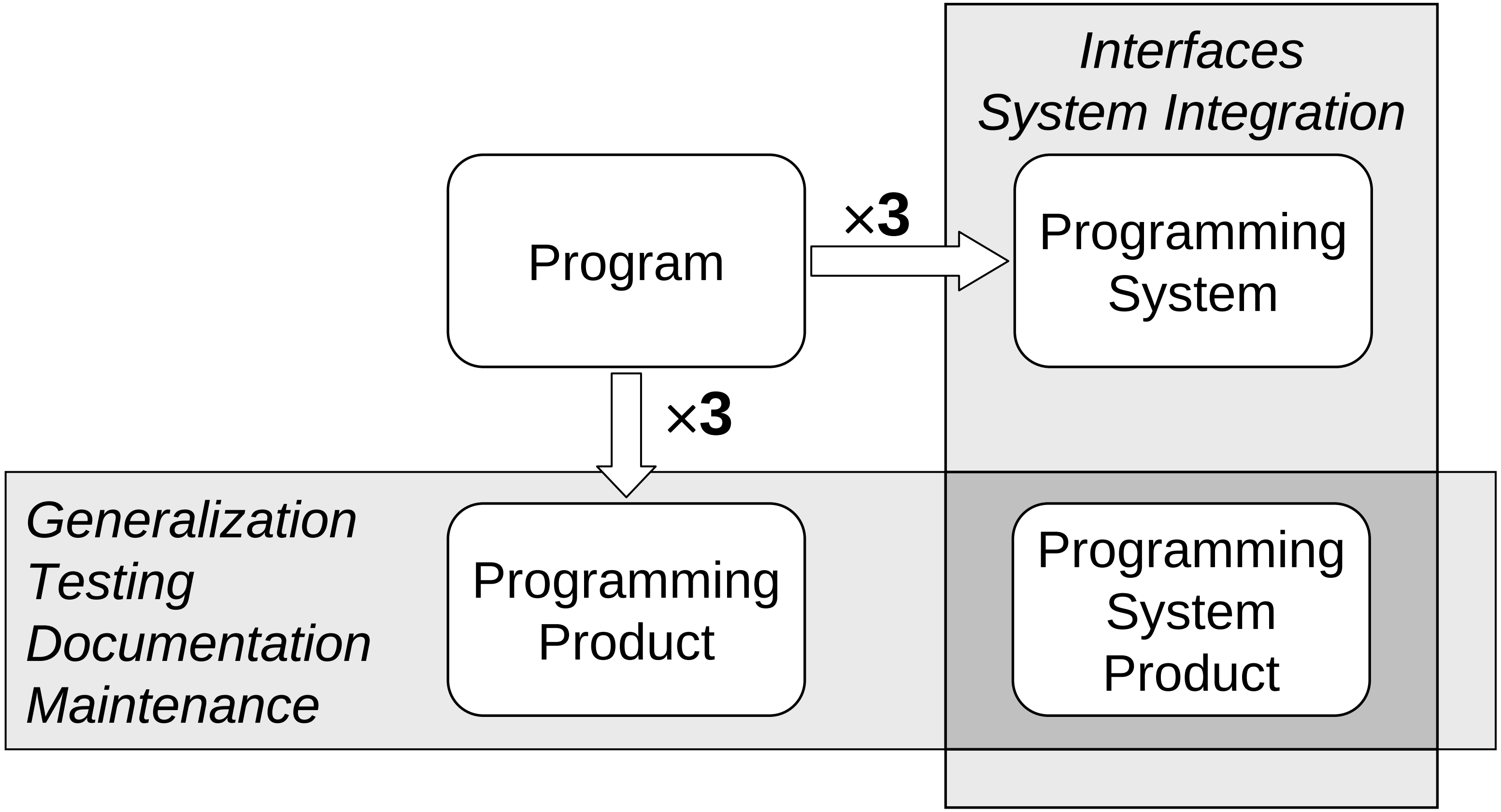

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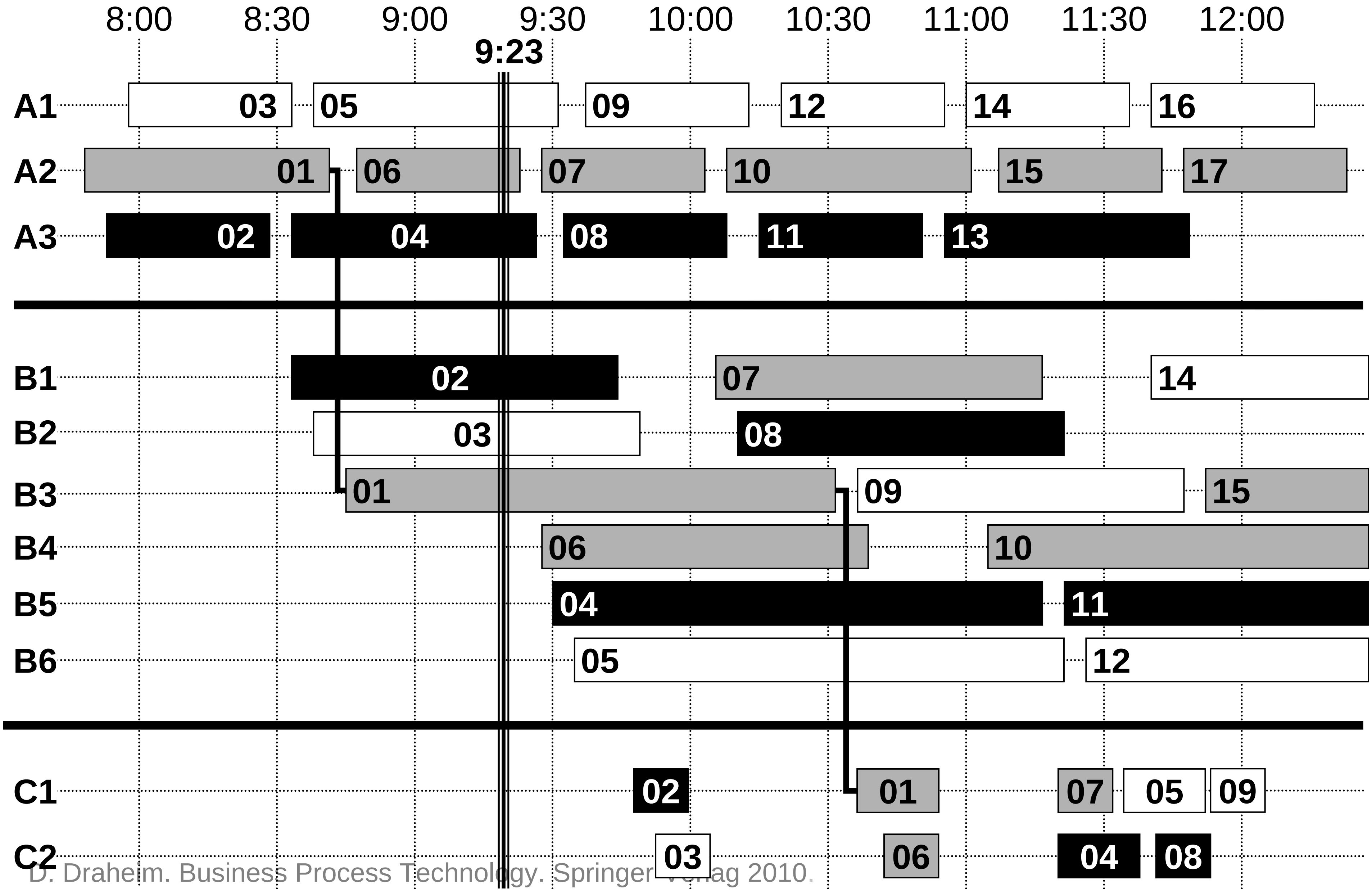

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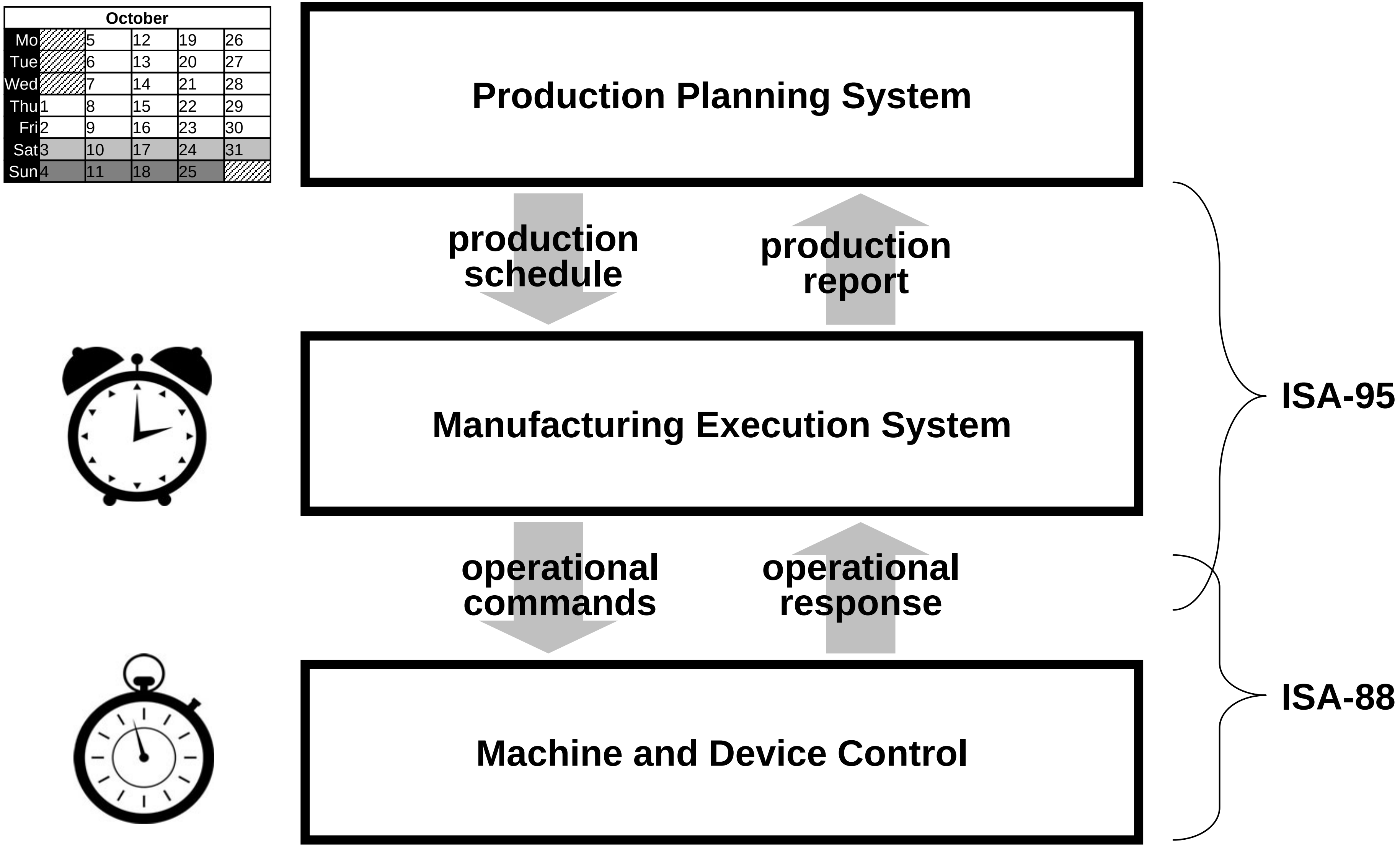

	October				
Mo	▨	5	12	19	26
Tue	▨	6	13	20	27
Wed	▨	7	14	21	28
Thu	1	8	15	22	29
Fri	2	9	16	23	30
Sat	3	10	17	24	31
Sun	4	11	18	25	▨

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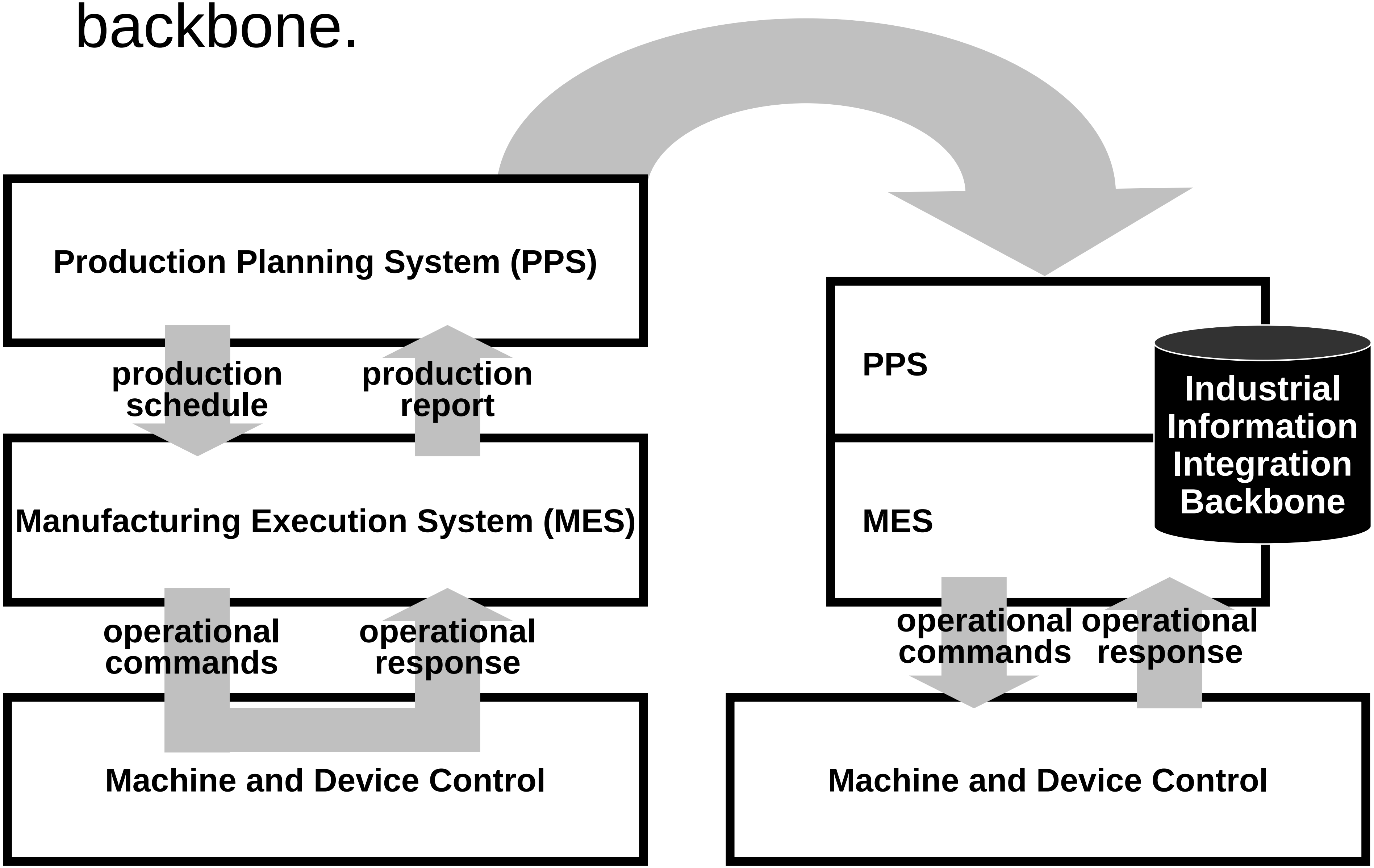
Fig. 3.5. Industrial information integration backbone.


Production Planning System (PPS)
production schedule
production report
Manufacturing Execution System (MES)
operational commands
operational response
Machine and Device Control
PPS
MES
Industrial Information Integration Backbone
operational commands
operational response
Machine and Device Control

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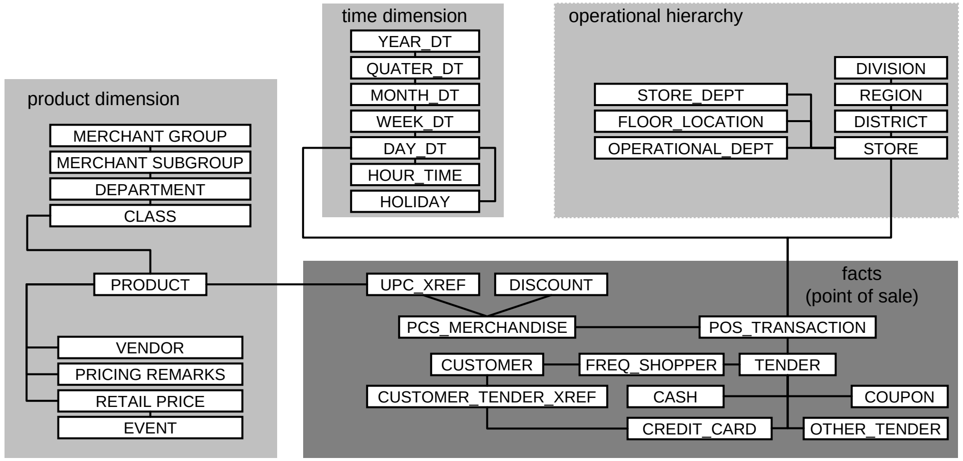

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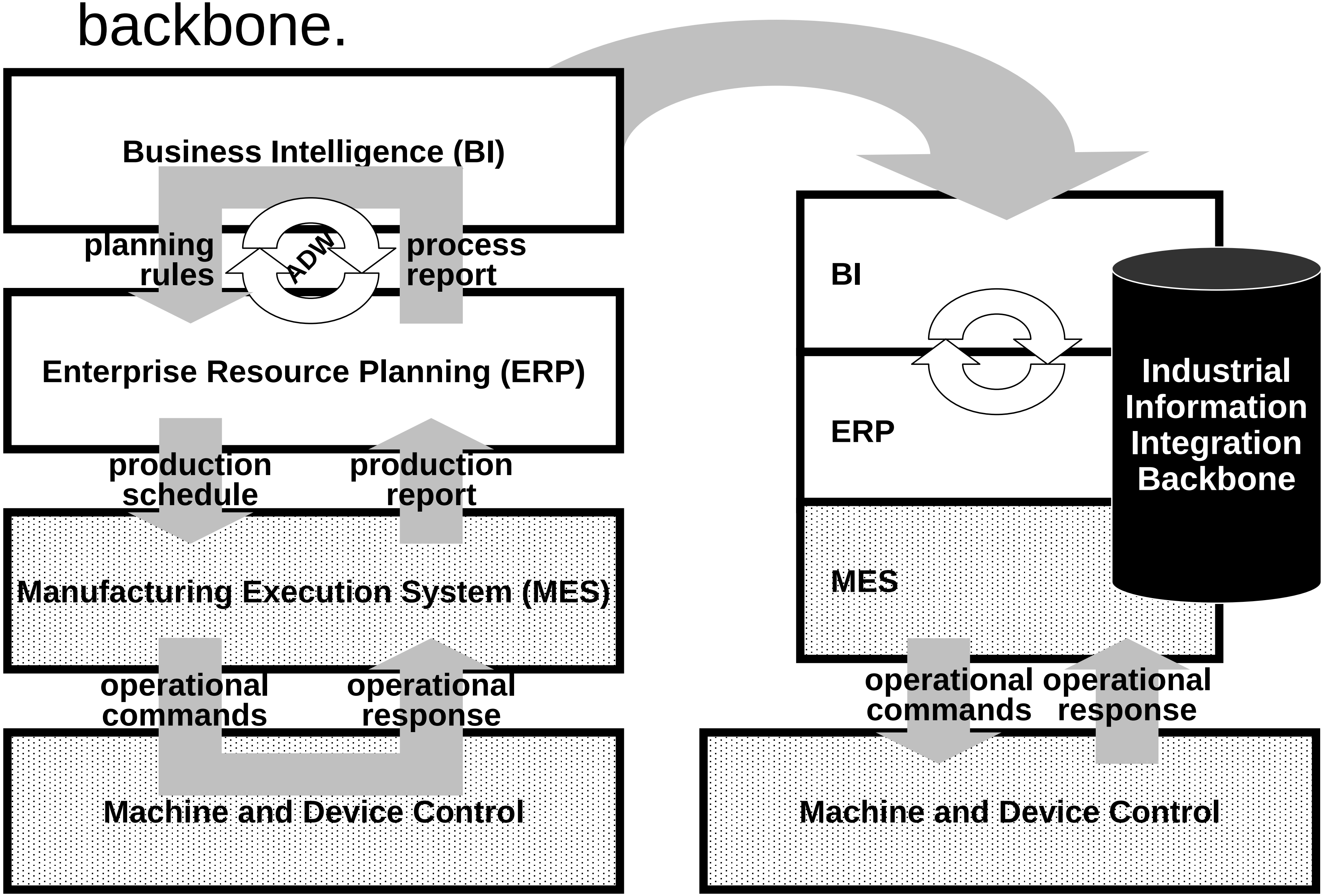
Business Intelligence (BI)
ADW
planning rules
process report
Enterprise Resource Planning (ERP)
production schedule
production report
Manufacturing Execution System (MES)
operational commands
operational response
Machine and Device Control
BI
ERP
MES
Industrial Information Integration Backbone
operational commands
operational response
Machine and Device Control

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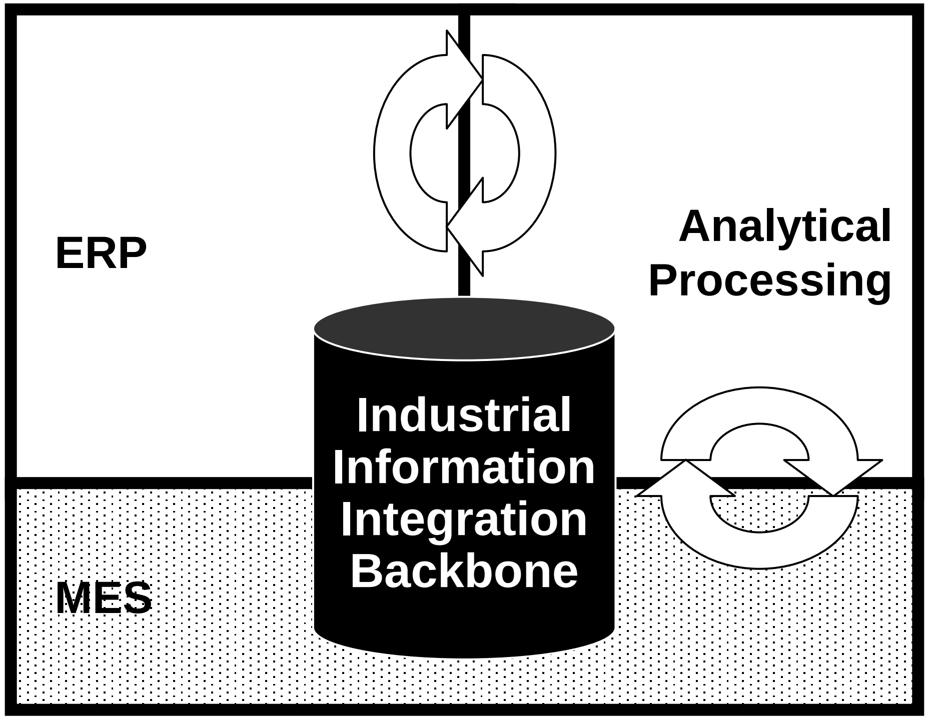

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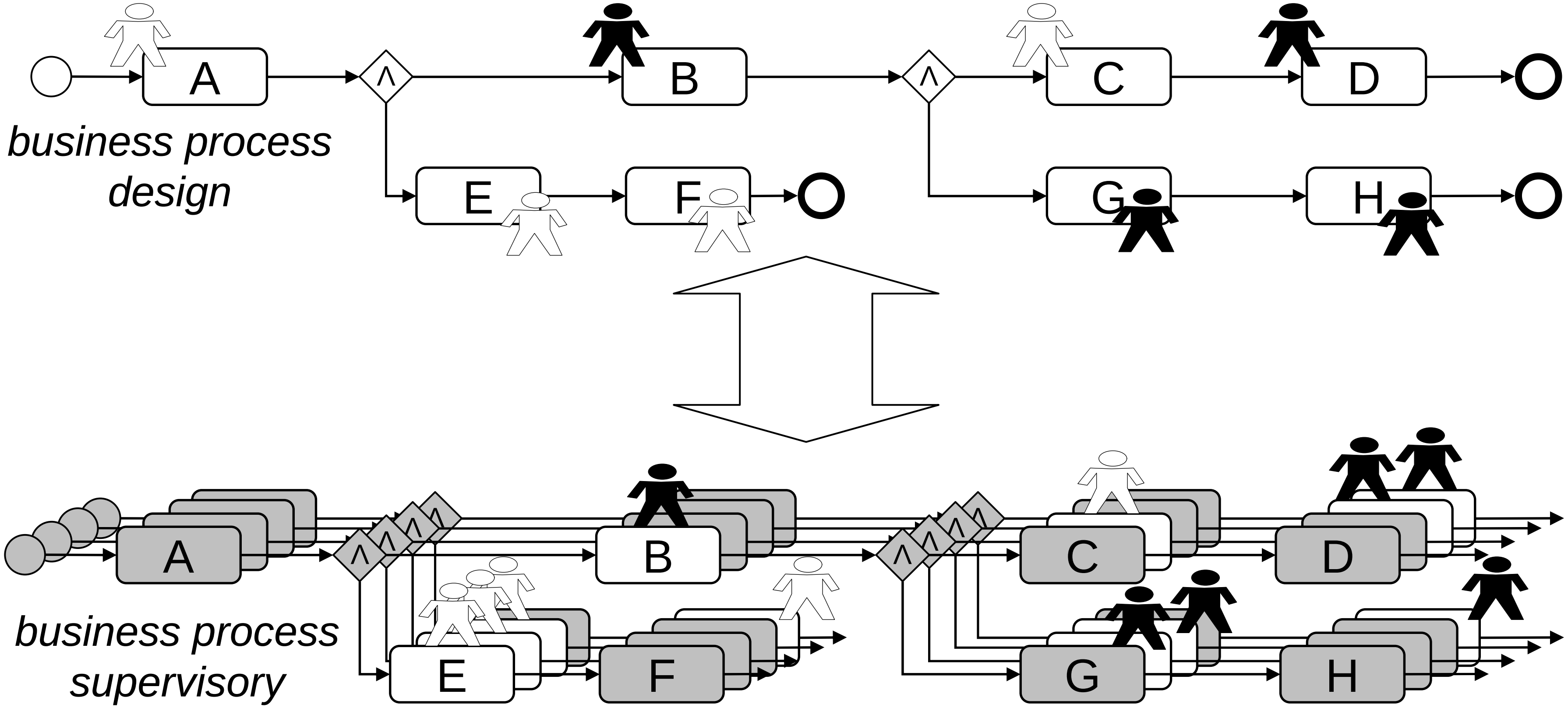
Fi.g 4.1. Business process definition and business process supervisory.



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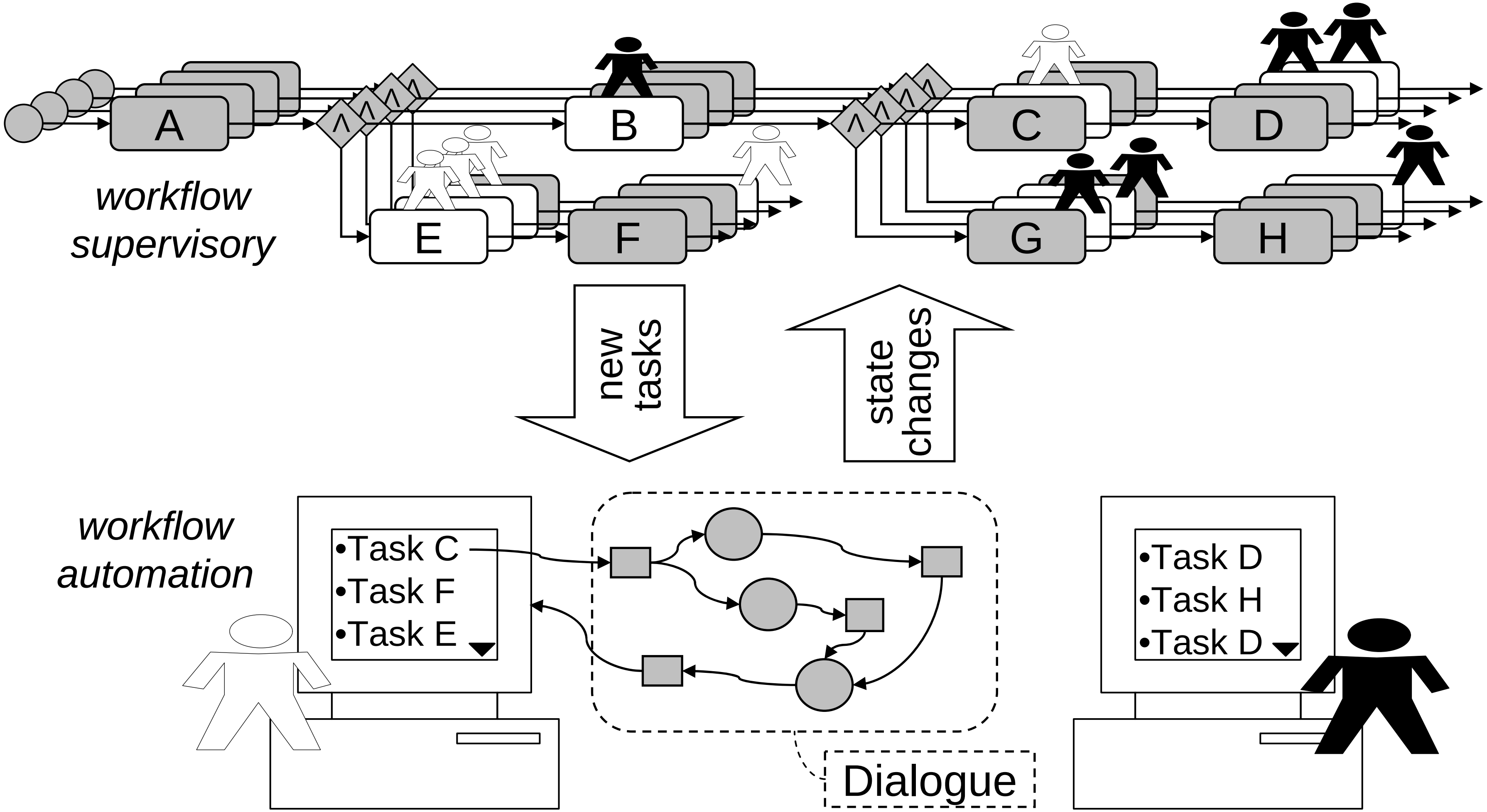

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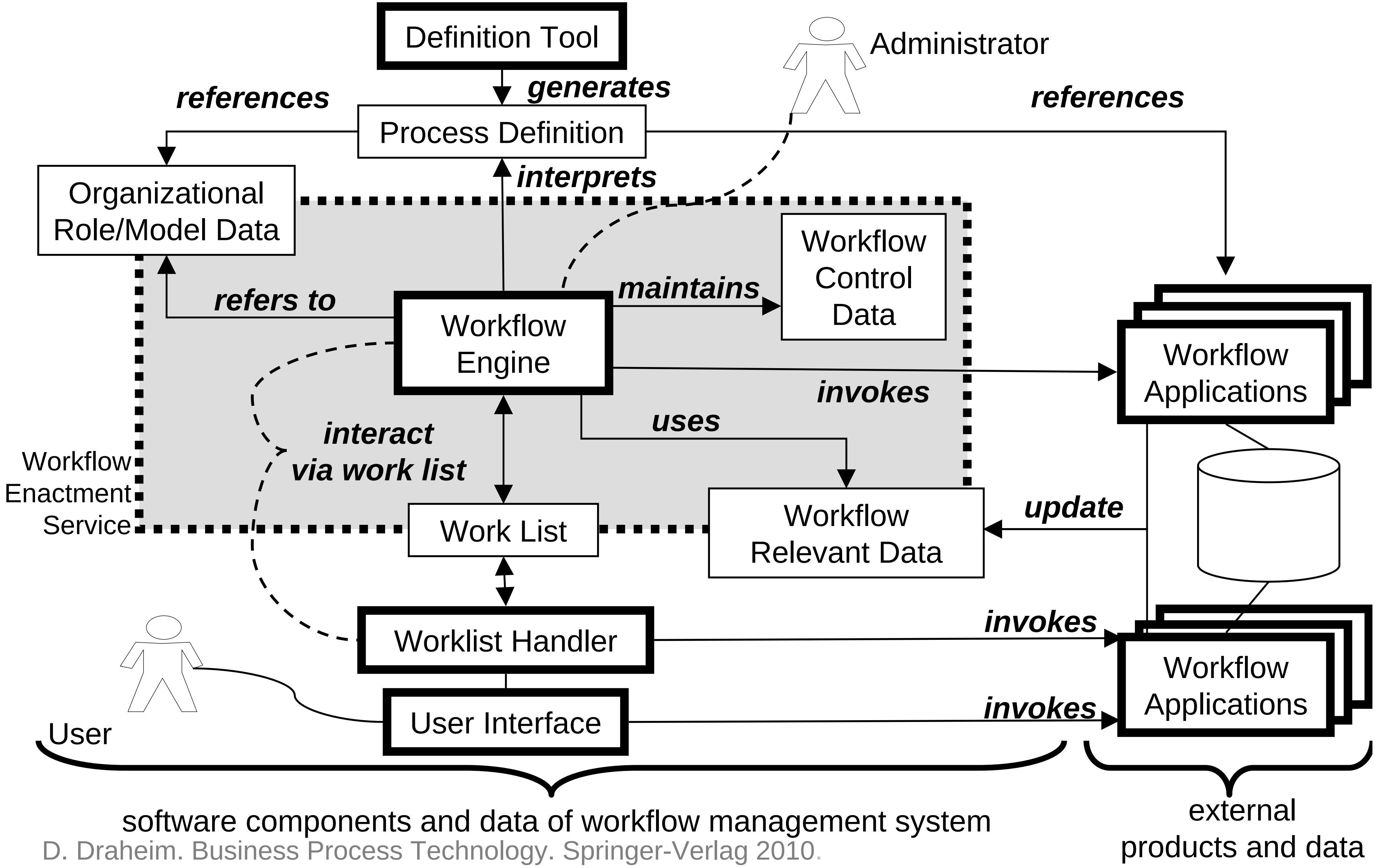

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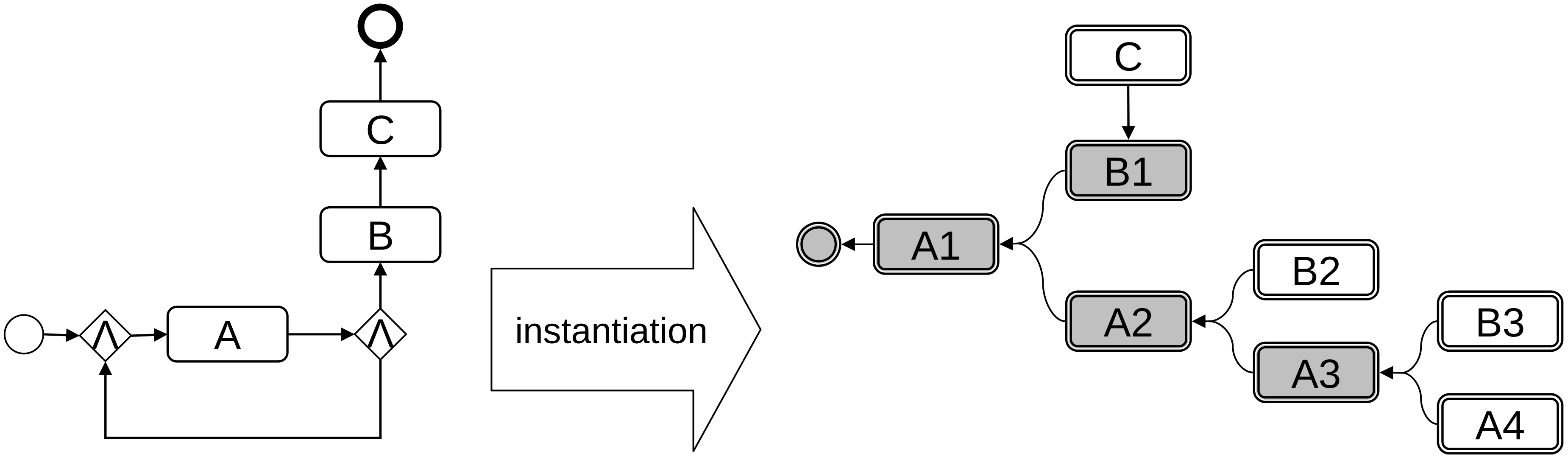

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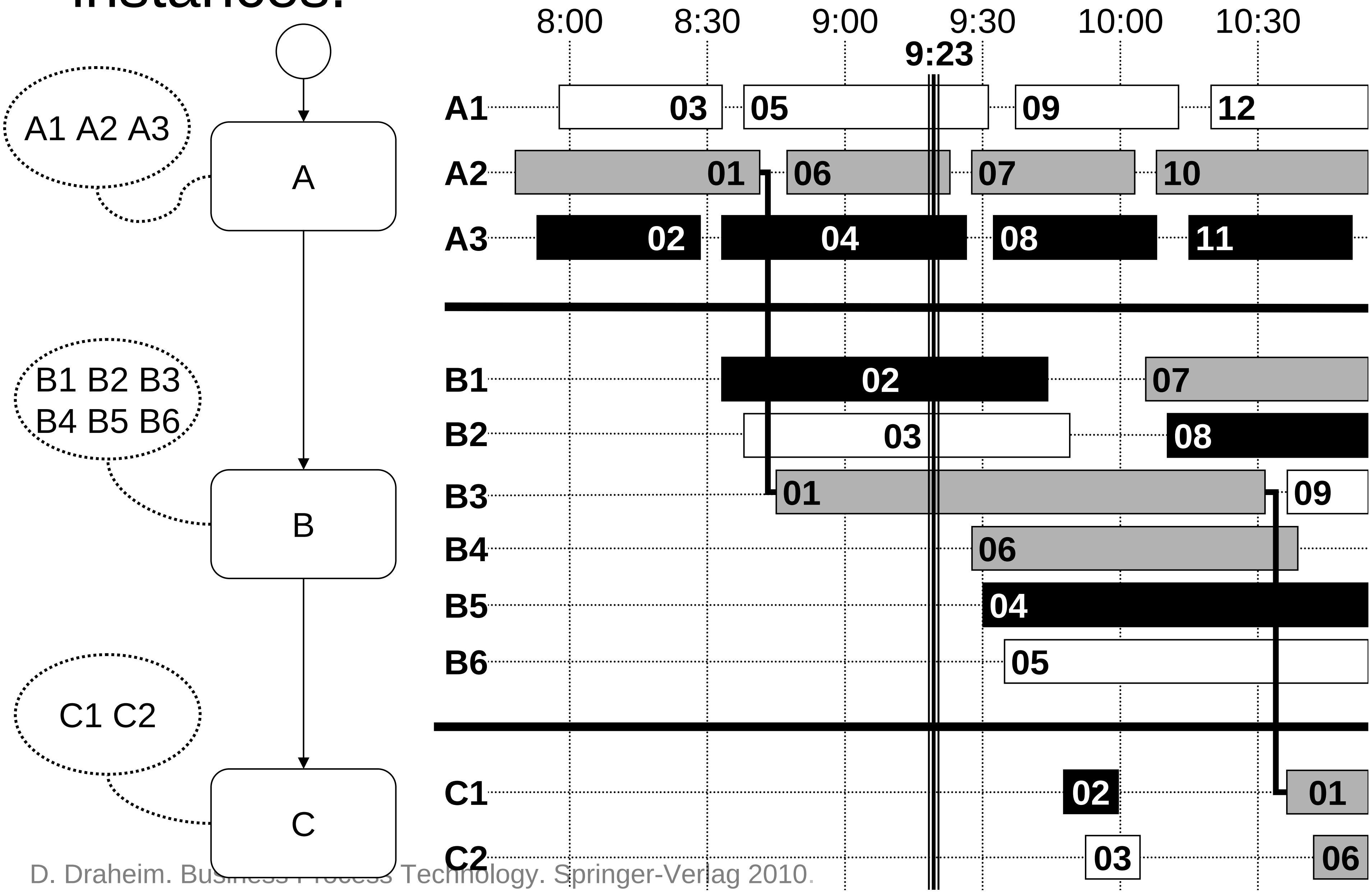

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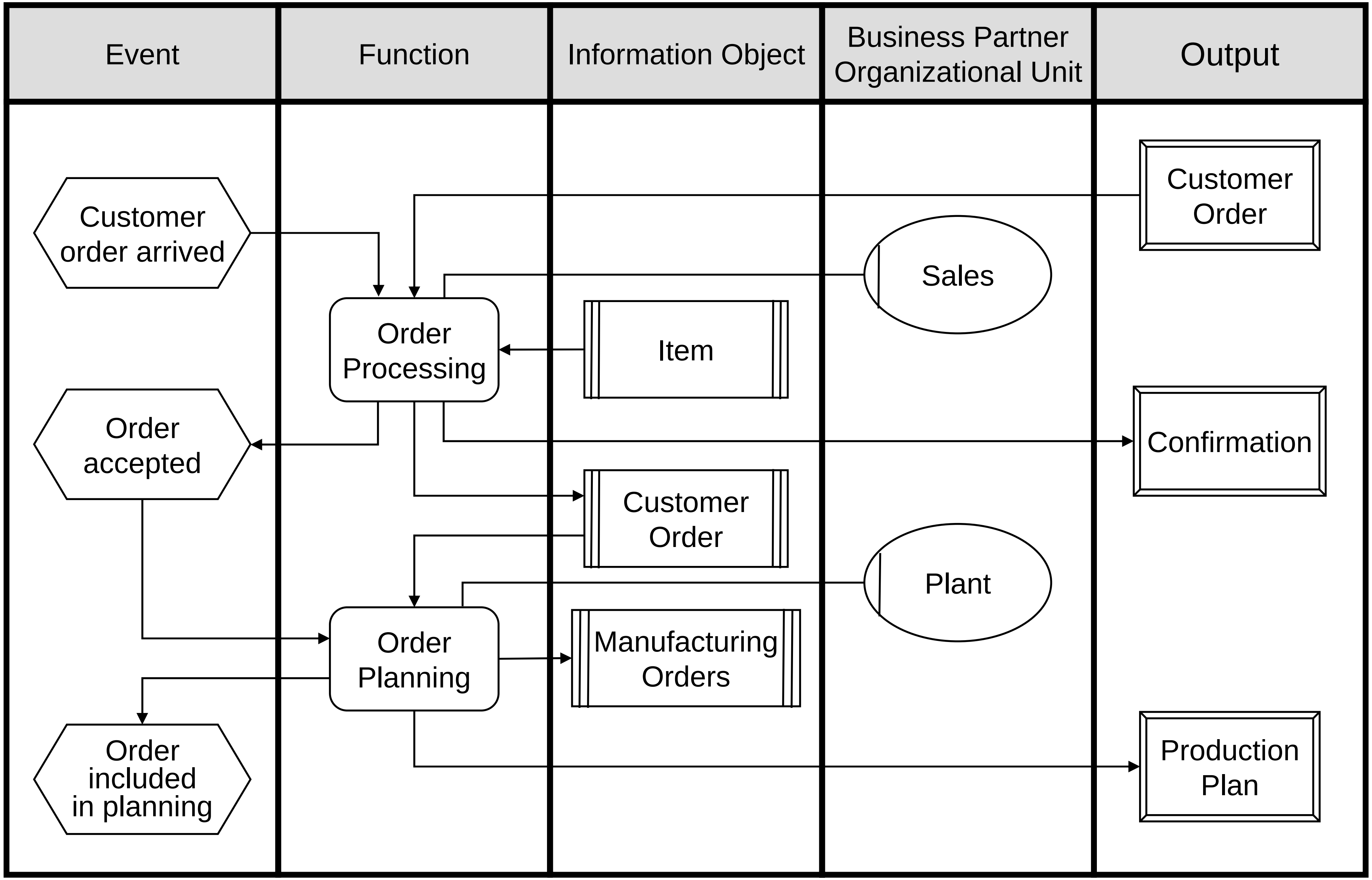

Event

Function

Information Object

Business Partner Organizational Unit

Output

Customer order arrived

Order Processing

Item

Sales

Customer Order

Order accepted

Confirmation

Customer Order

Plant

Order Planning

Manufacturing Orders

Order included in planning

Production Plan

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Fig. 4.7. Events in business process modeling languages and Petri nets.

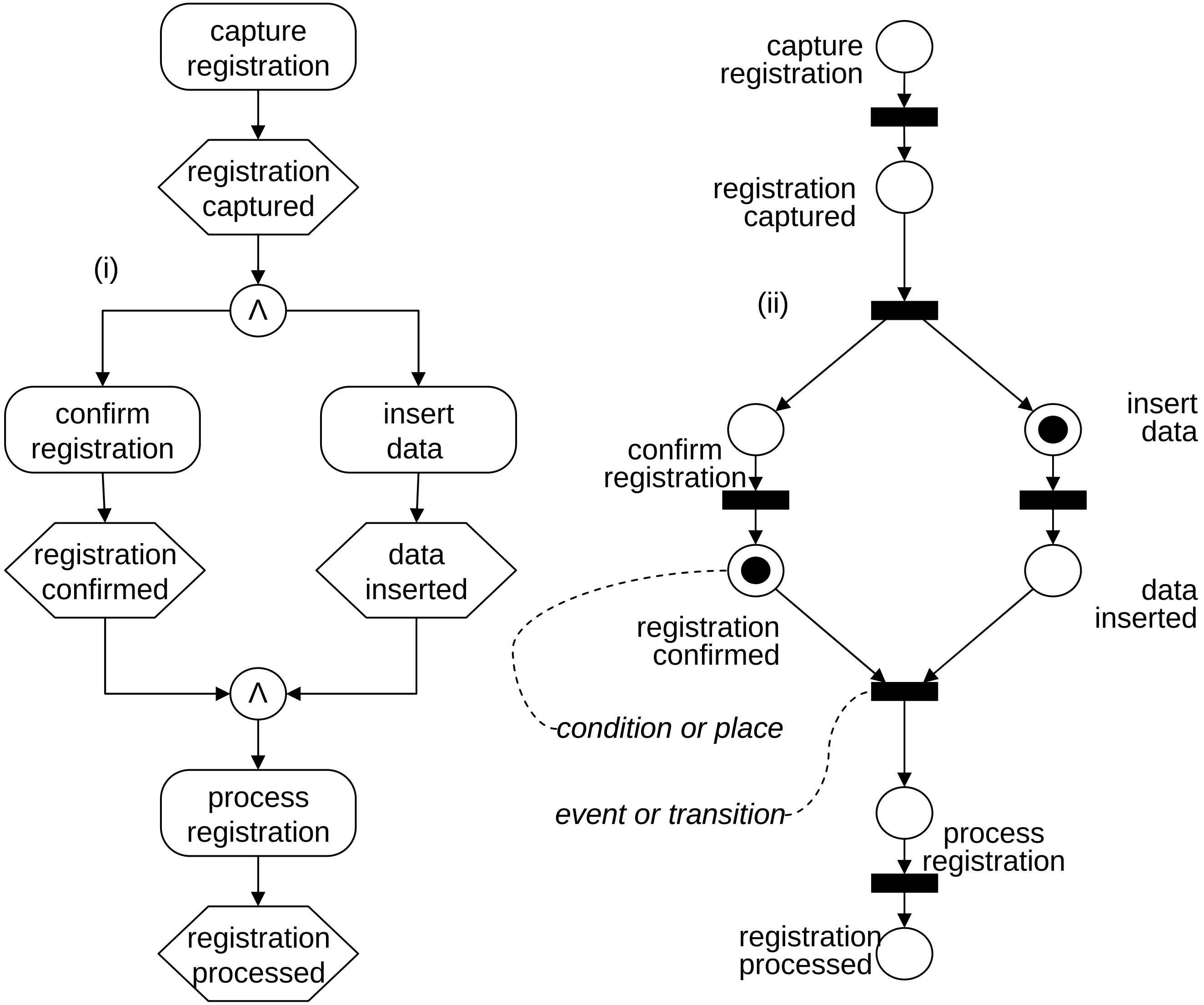

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Fig. 4.8. Alternatives to express decision points in visual process specifications.

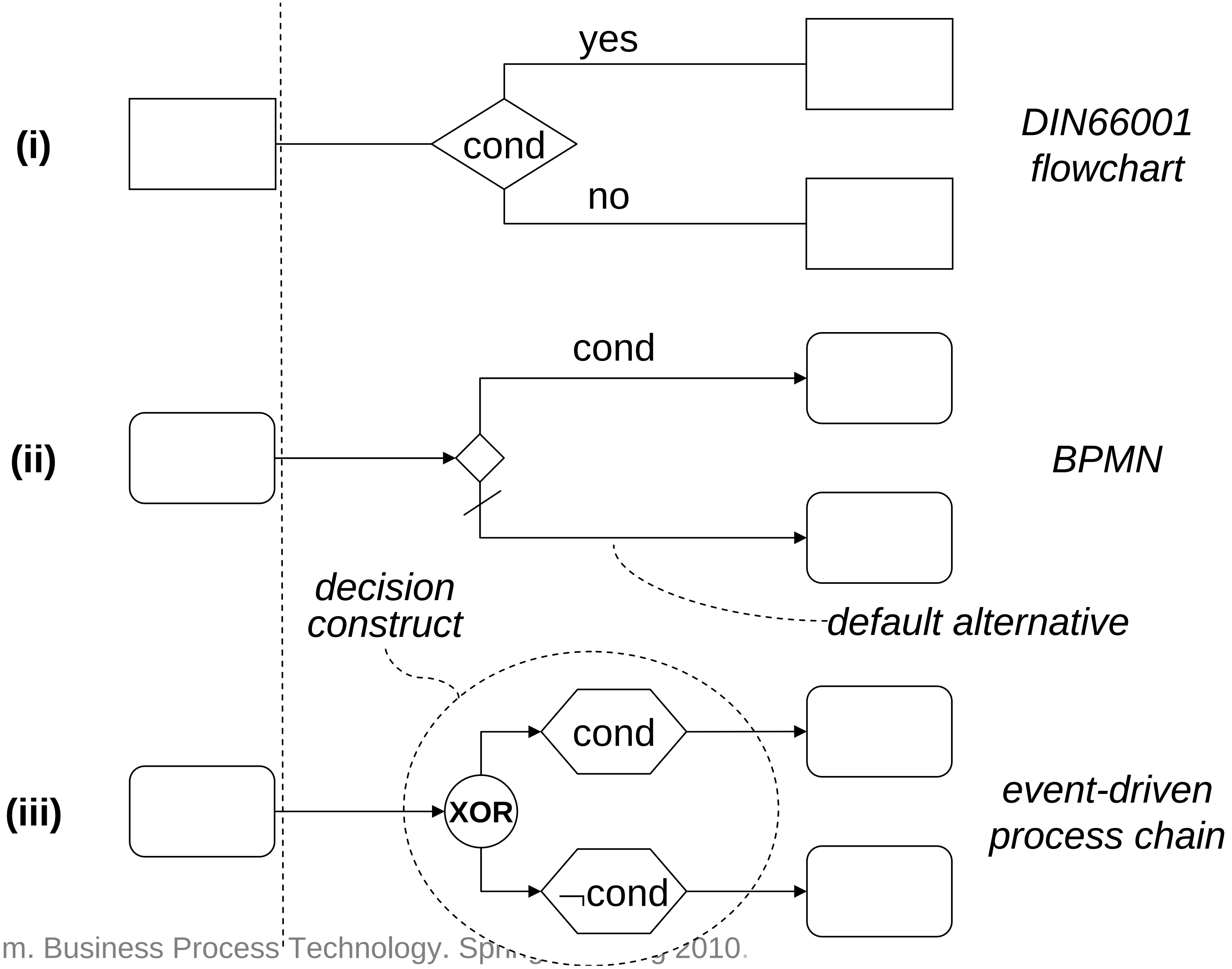

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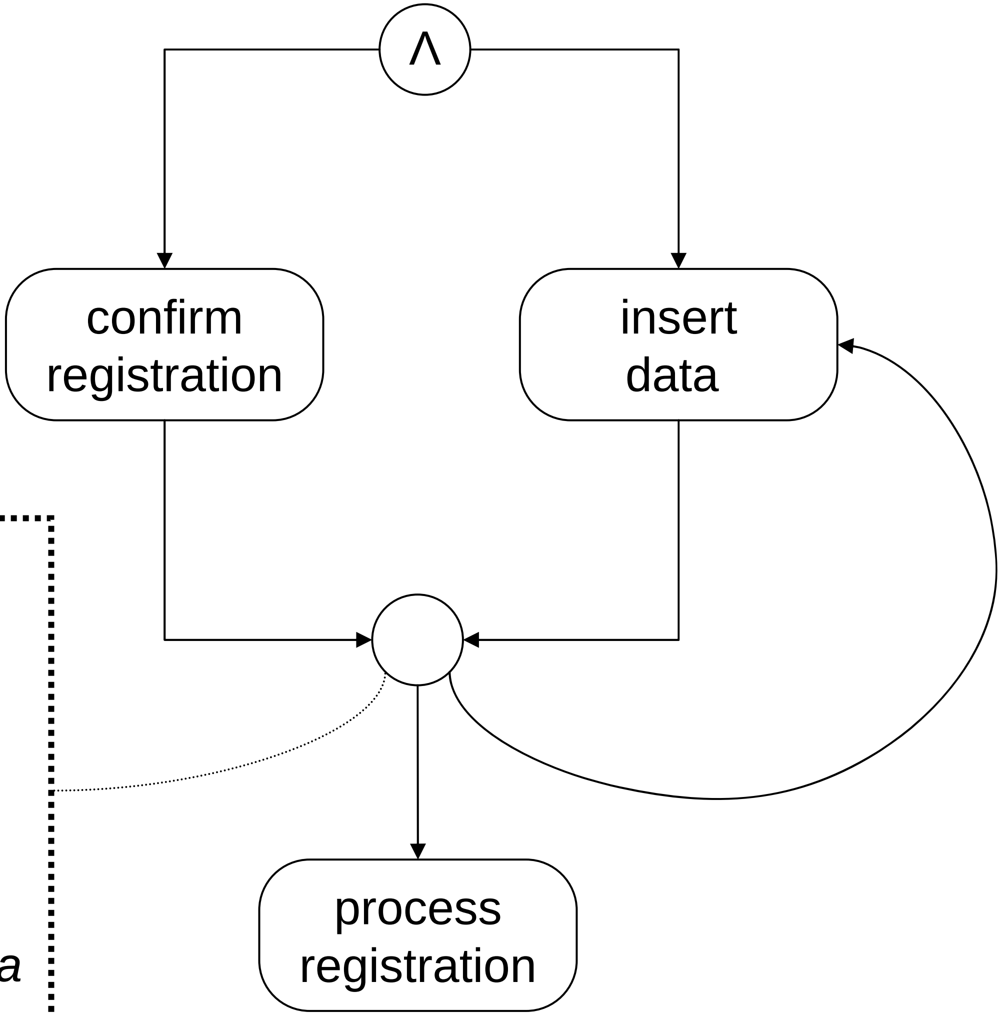
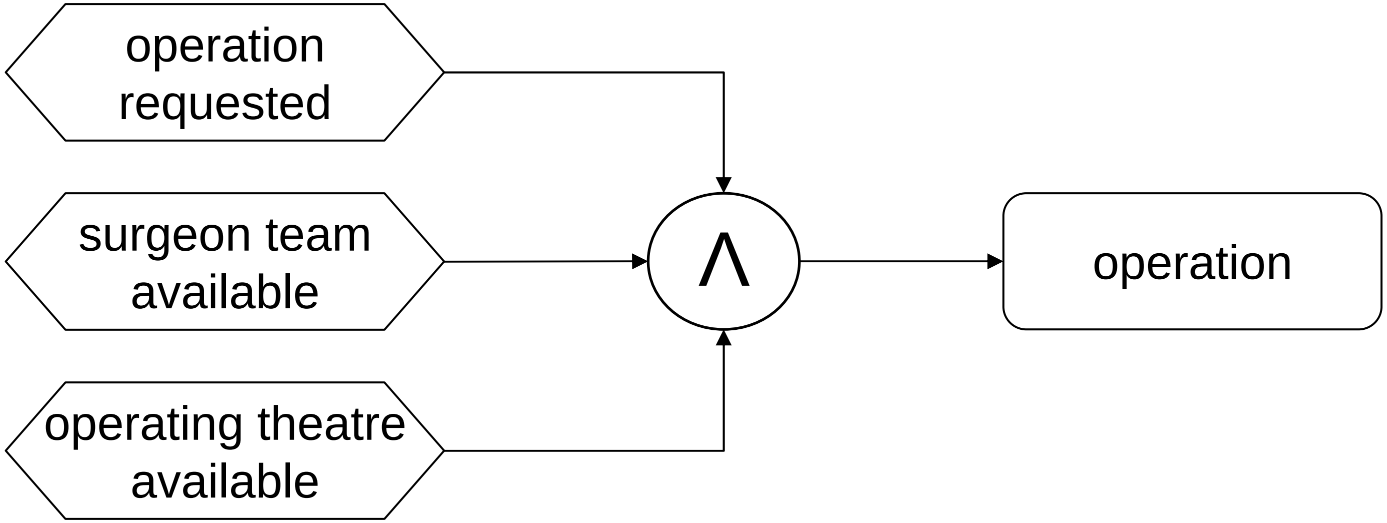
Fig. 4.9. Modeling an expiring condition.



If the registration has been confirmed and the data has been inserted proceed with processing the registration. If the data has been inserted and it takes more than 1 day before the confirmation has been completed, repeat the data insertion step in order to check whether the data is still valid.

Fig. 4.10. Specification of starting an operation process in a hospital.



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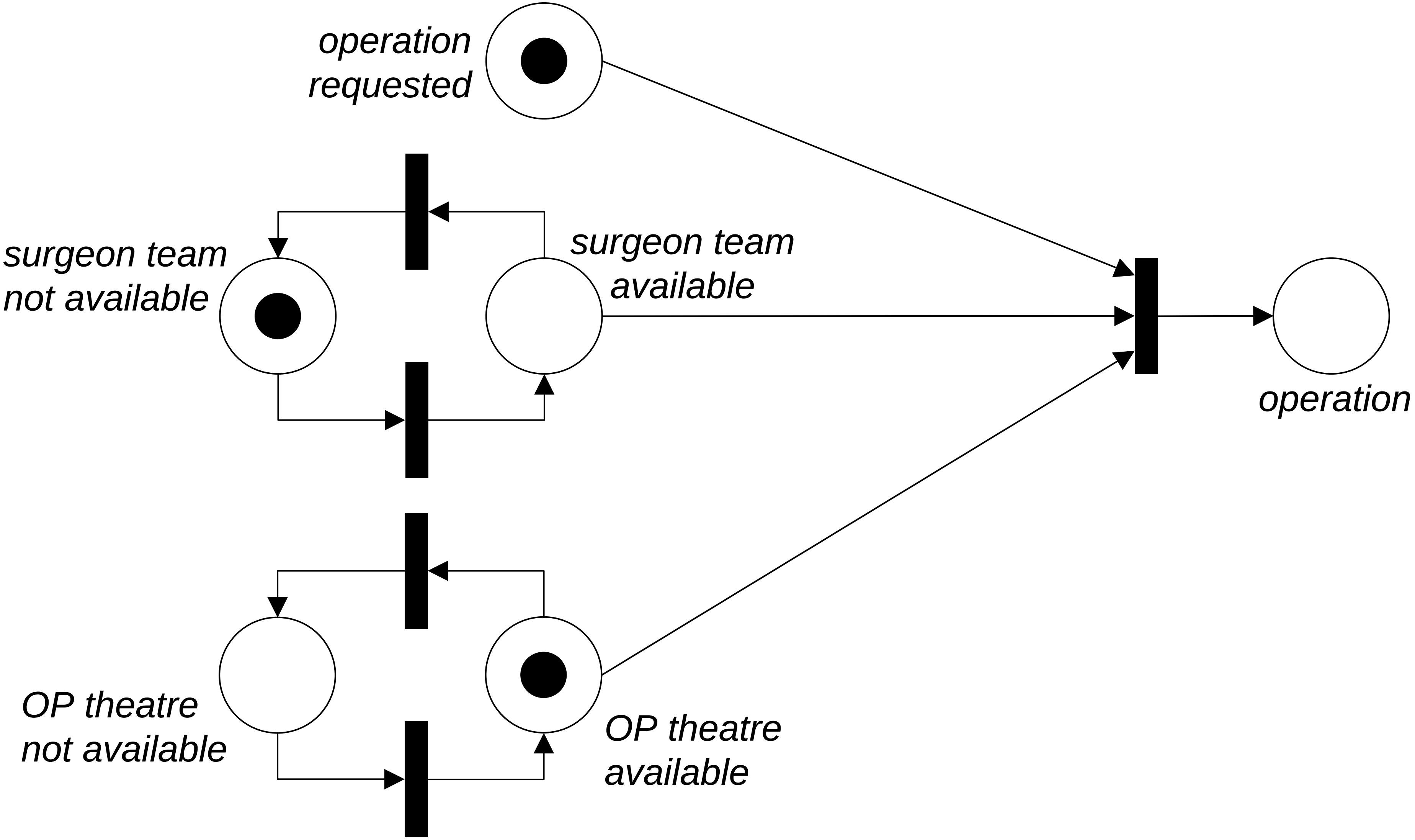

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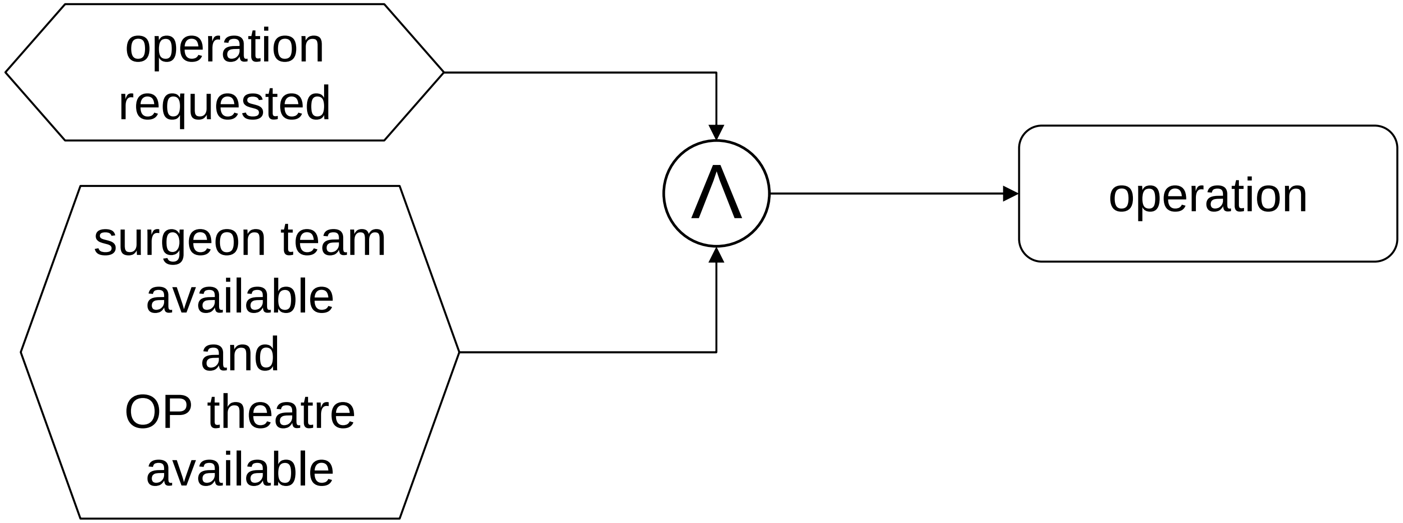


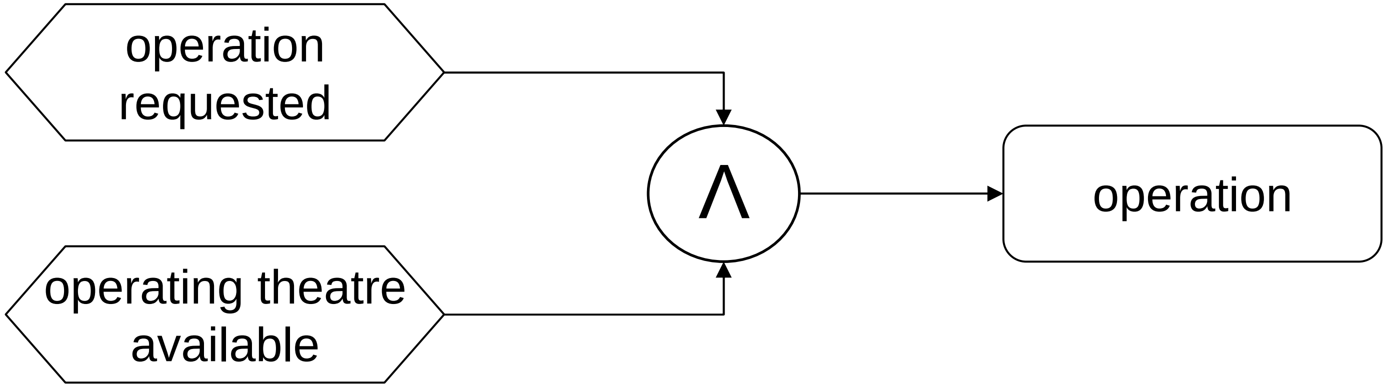
operation requested

surgeon team available and OP theatre available

∧

operation

Fig. 4.13. Specification of an even simpler start of an operation process.



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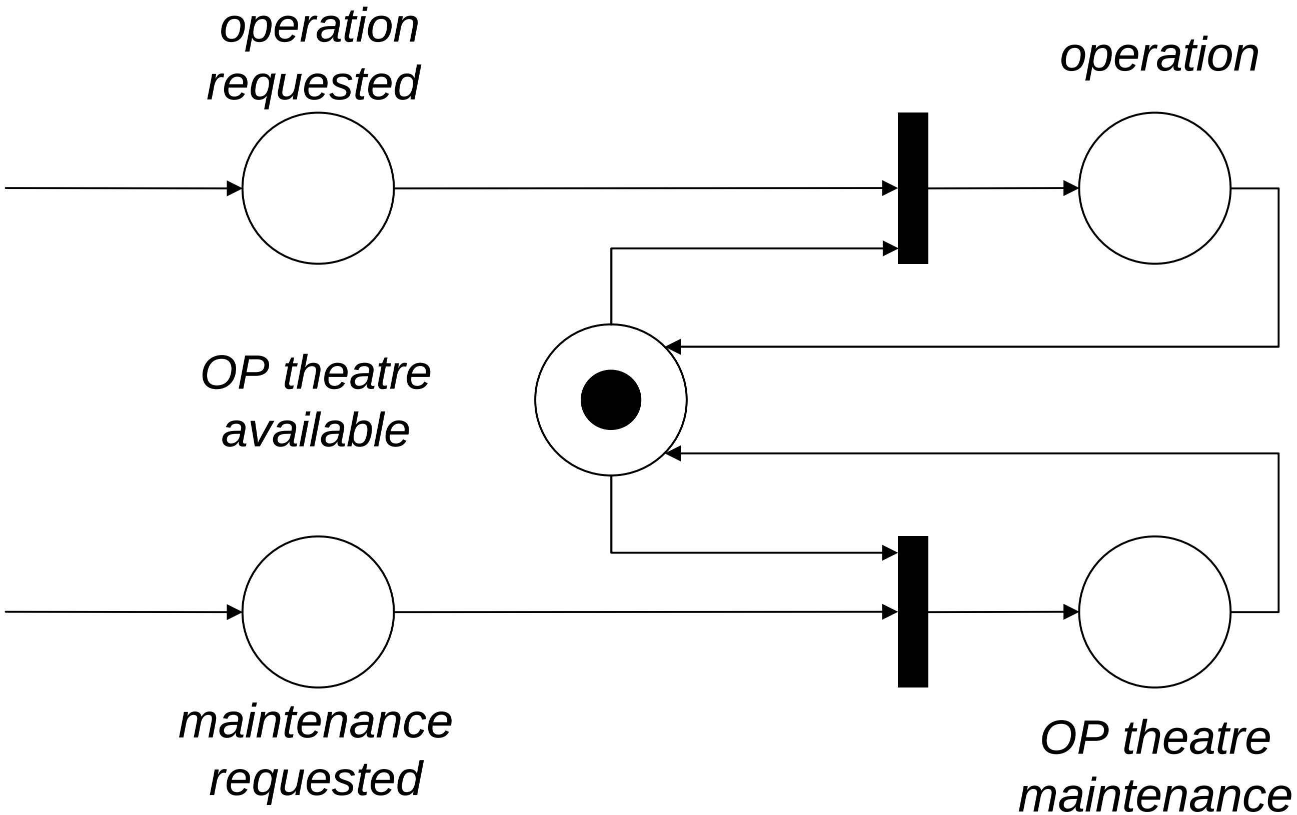

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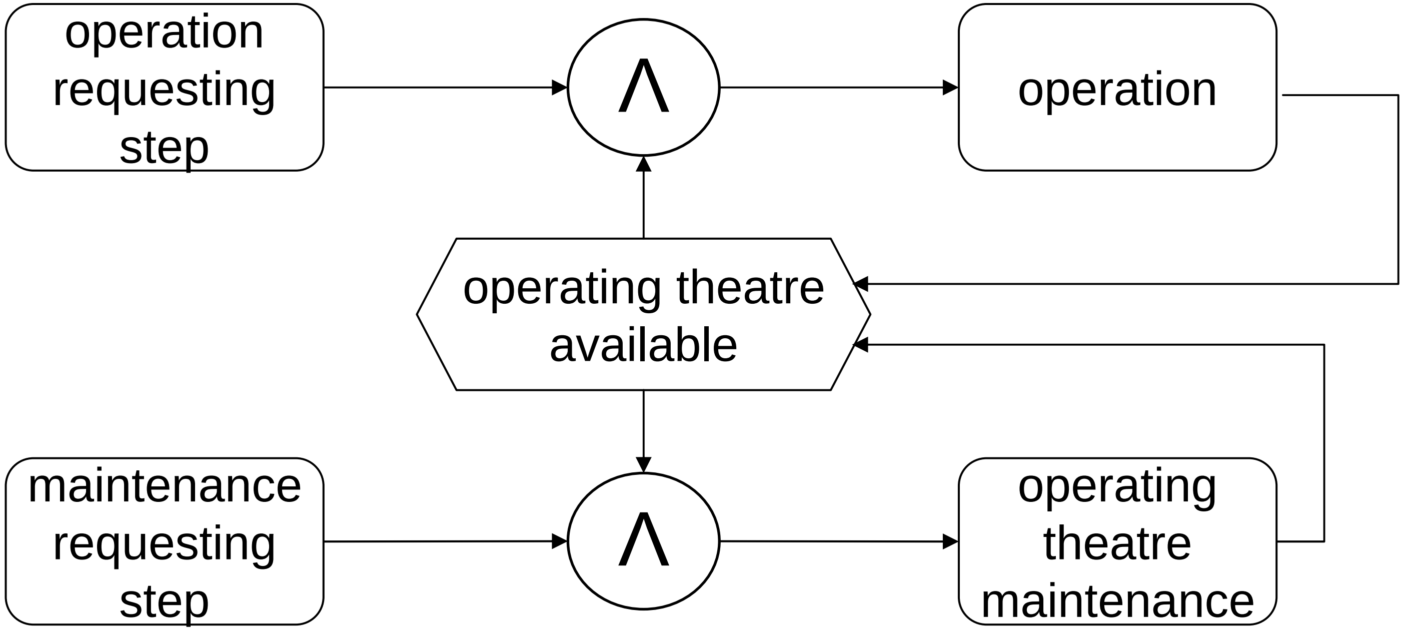
operation requesting step
∧
operation
operating theatre available
maintenance requesting step
∧
operating theatre maintenance

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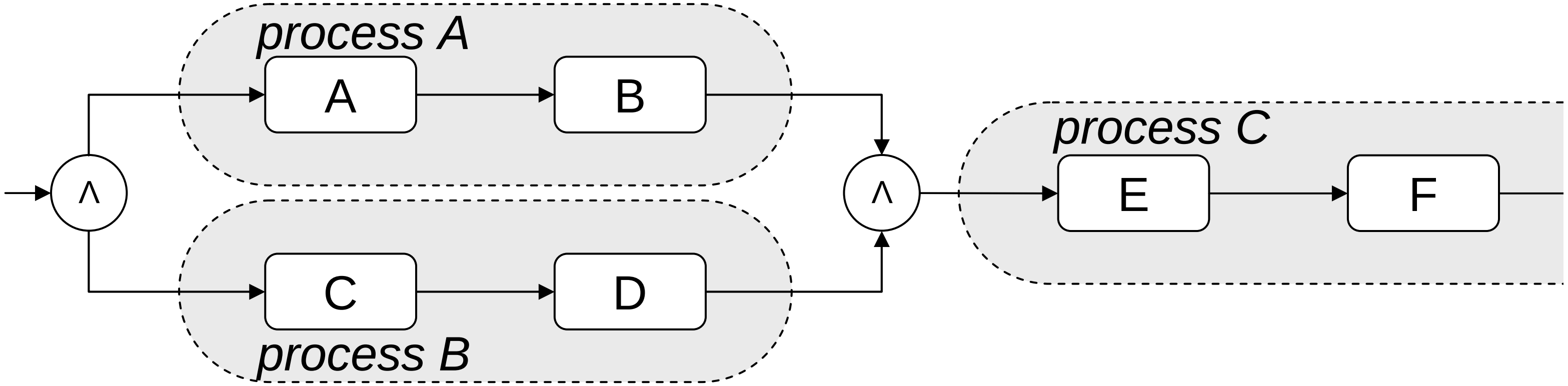

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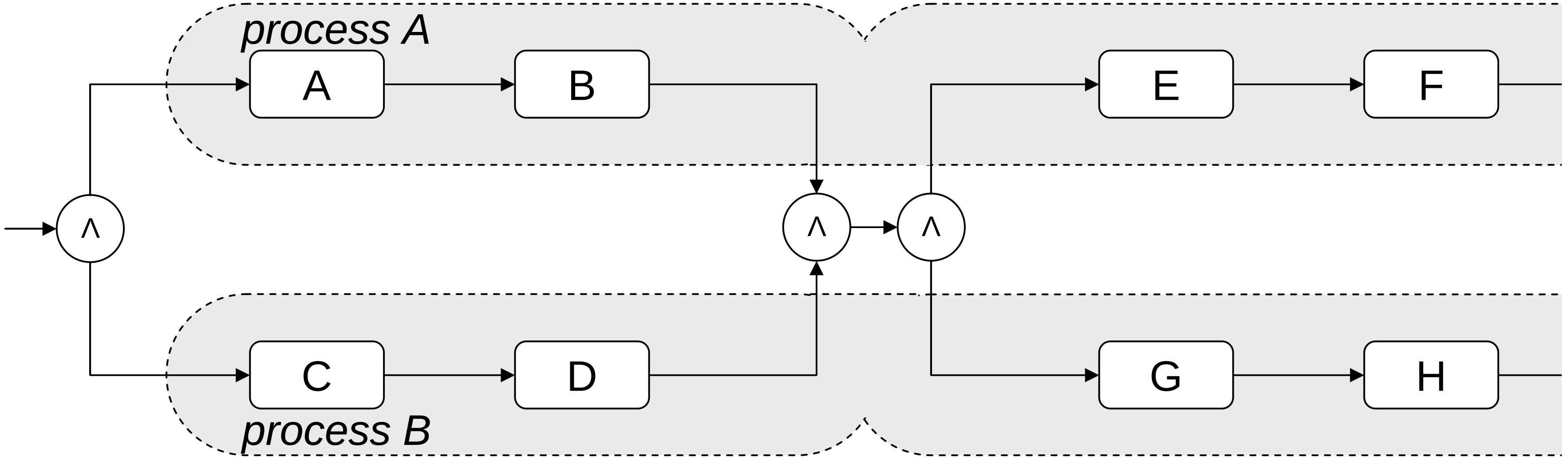

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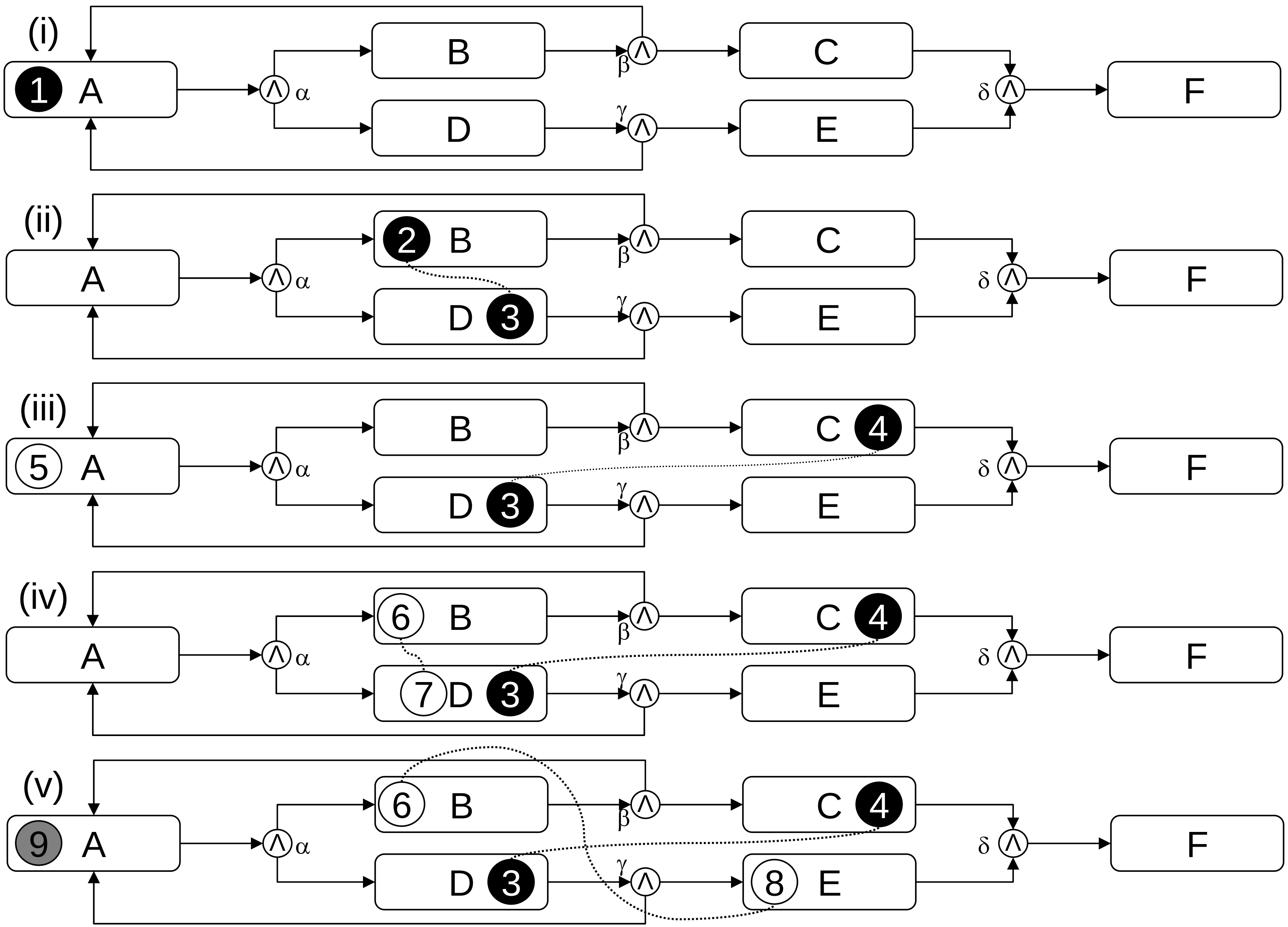

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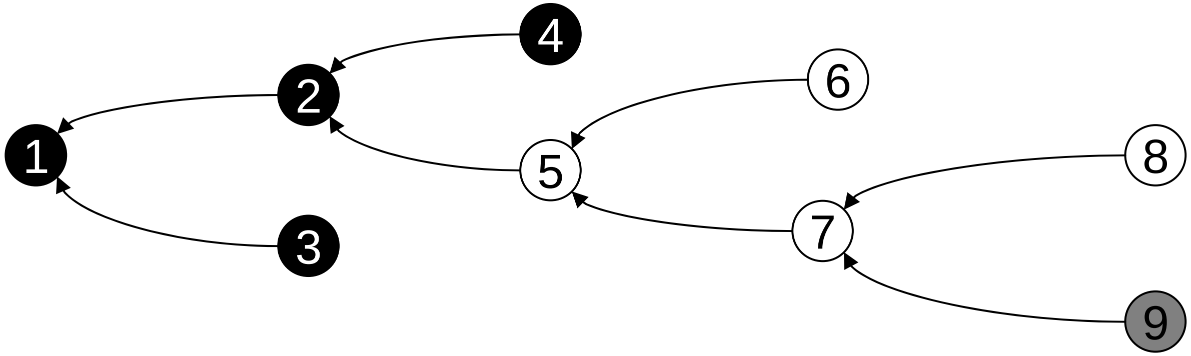

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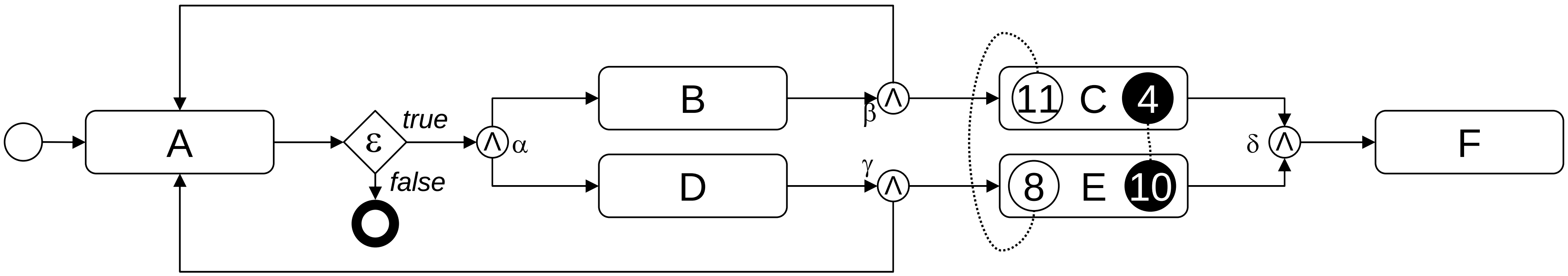

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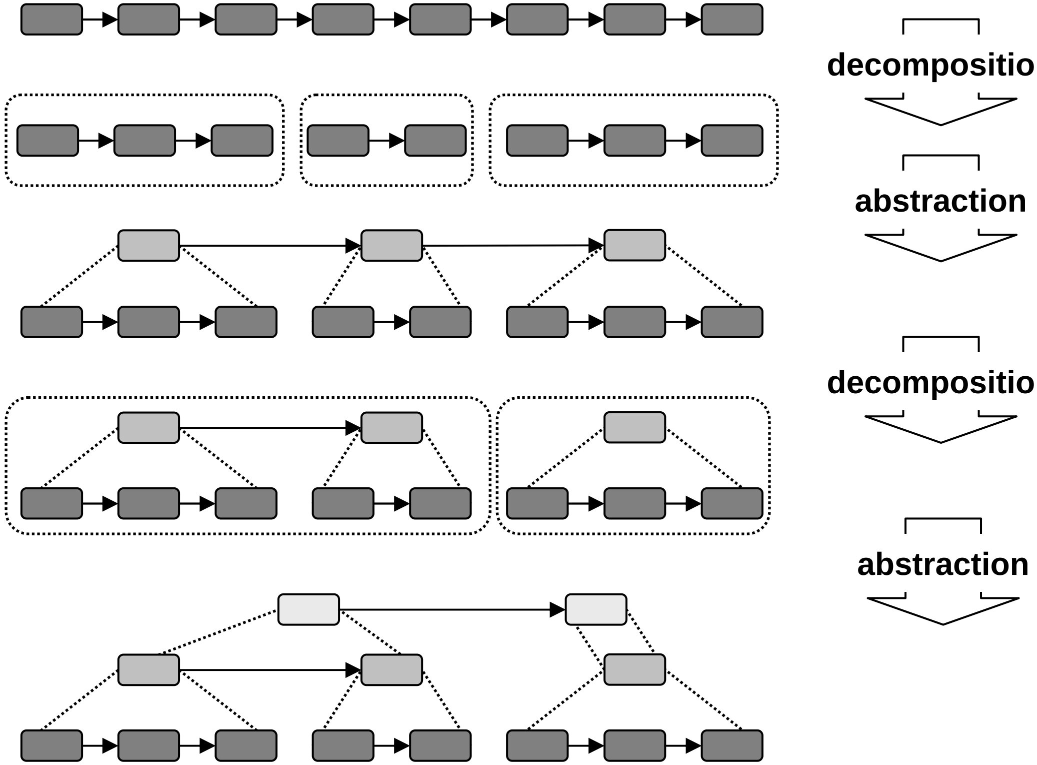

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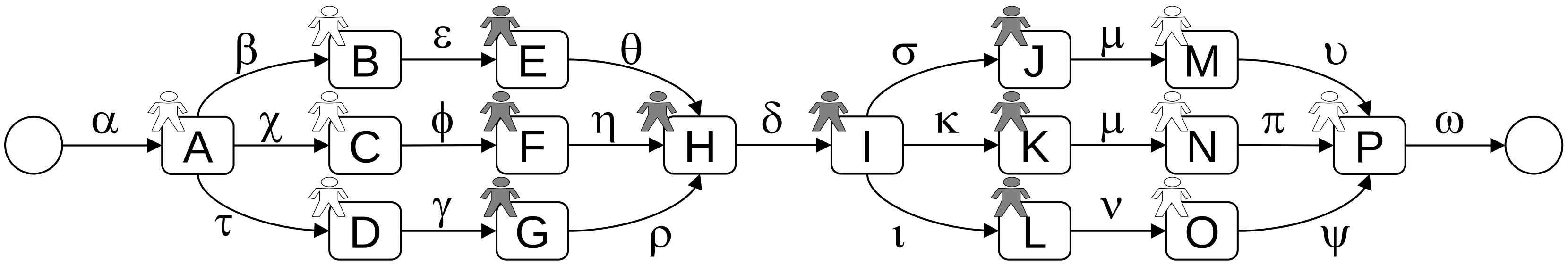

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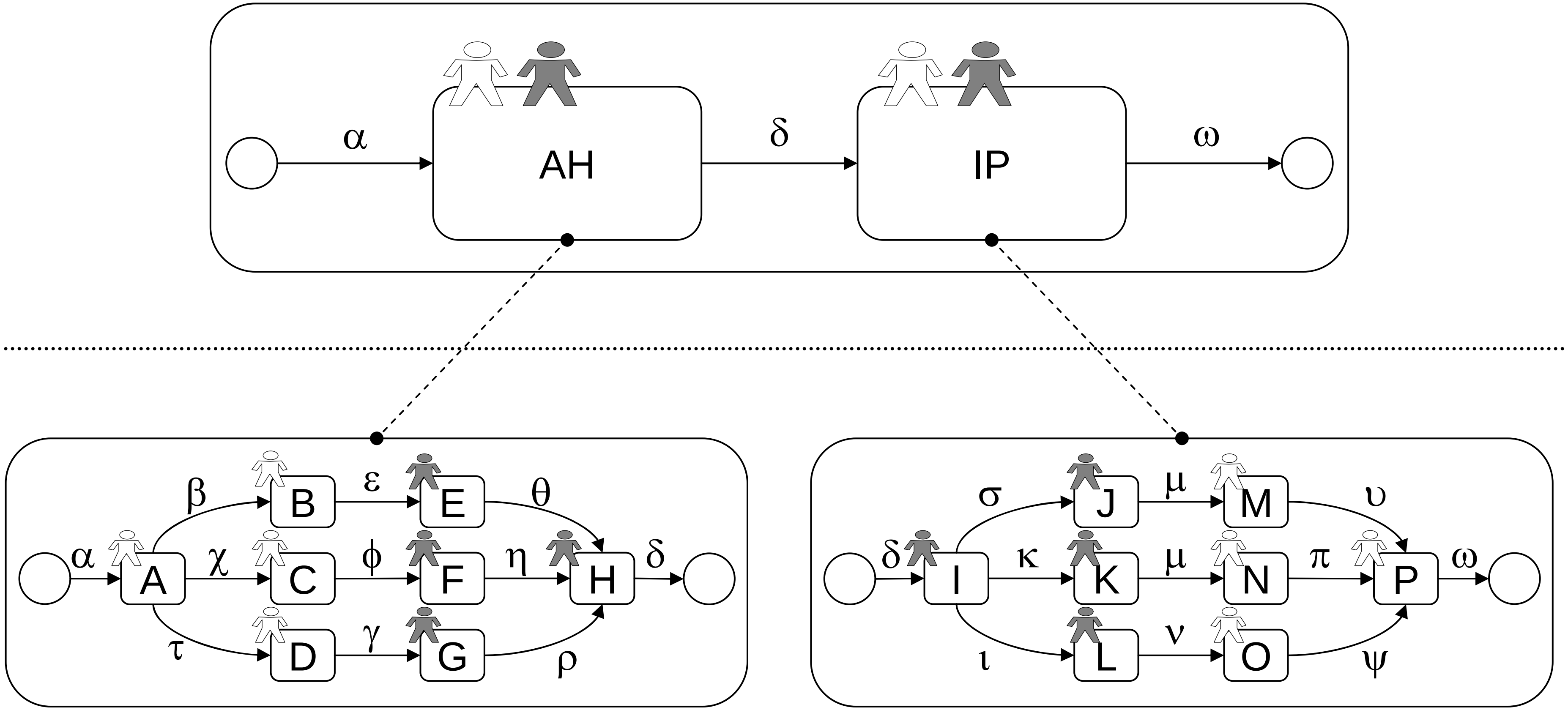

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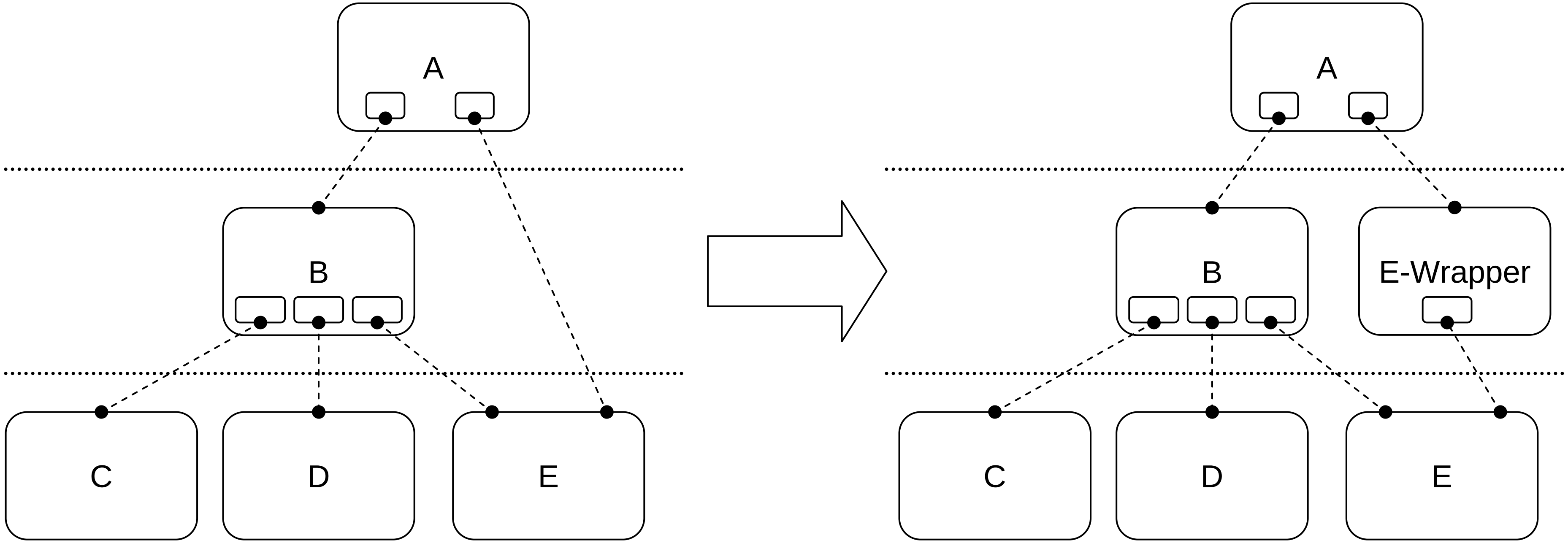

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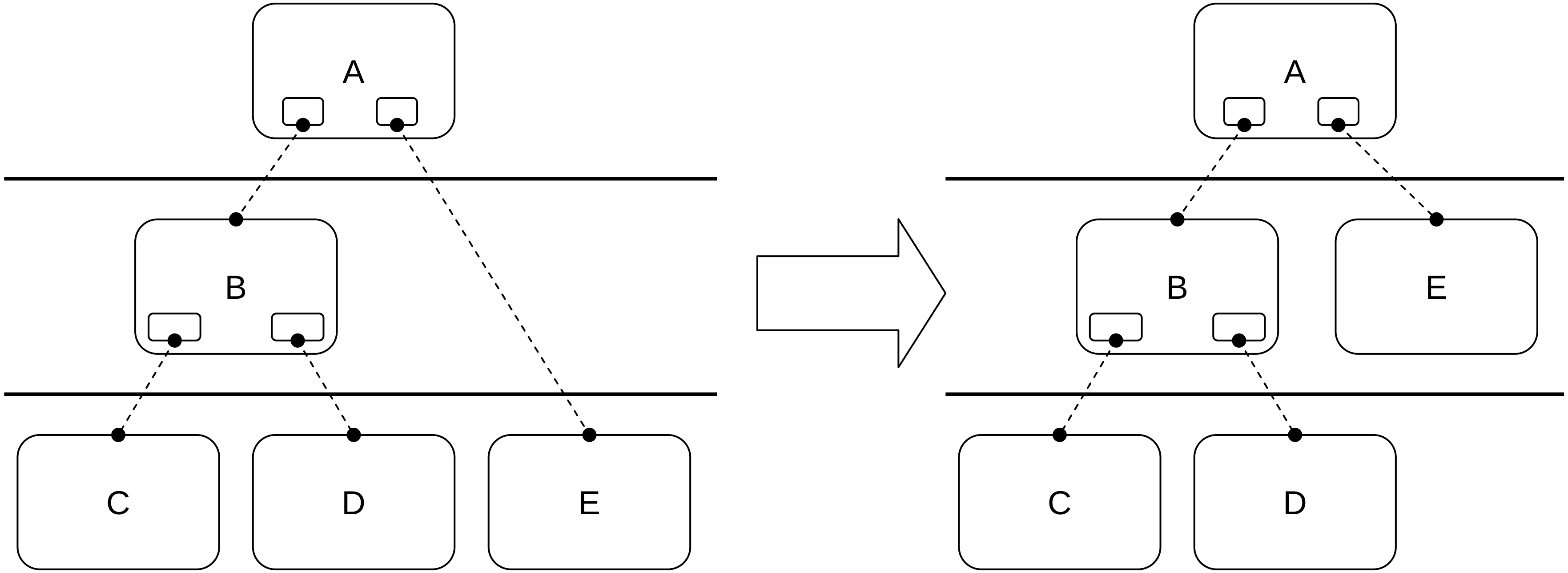

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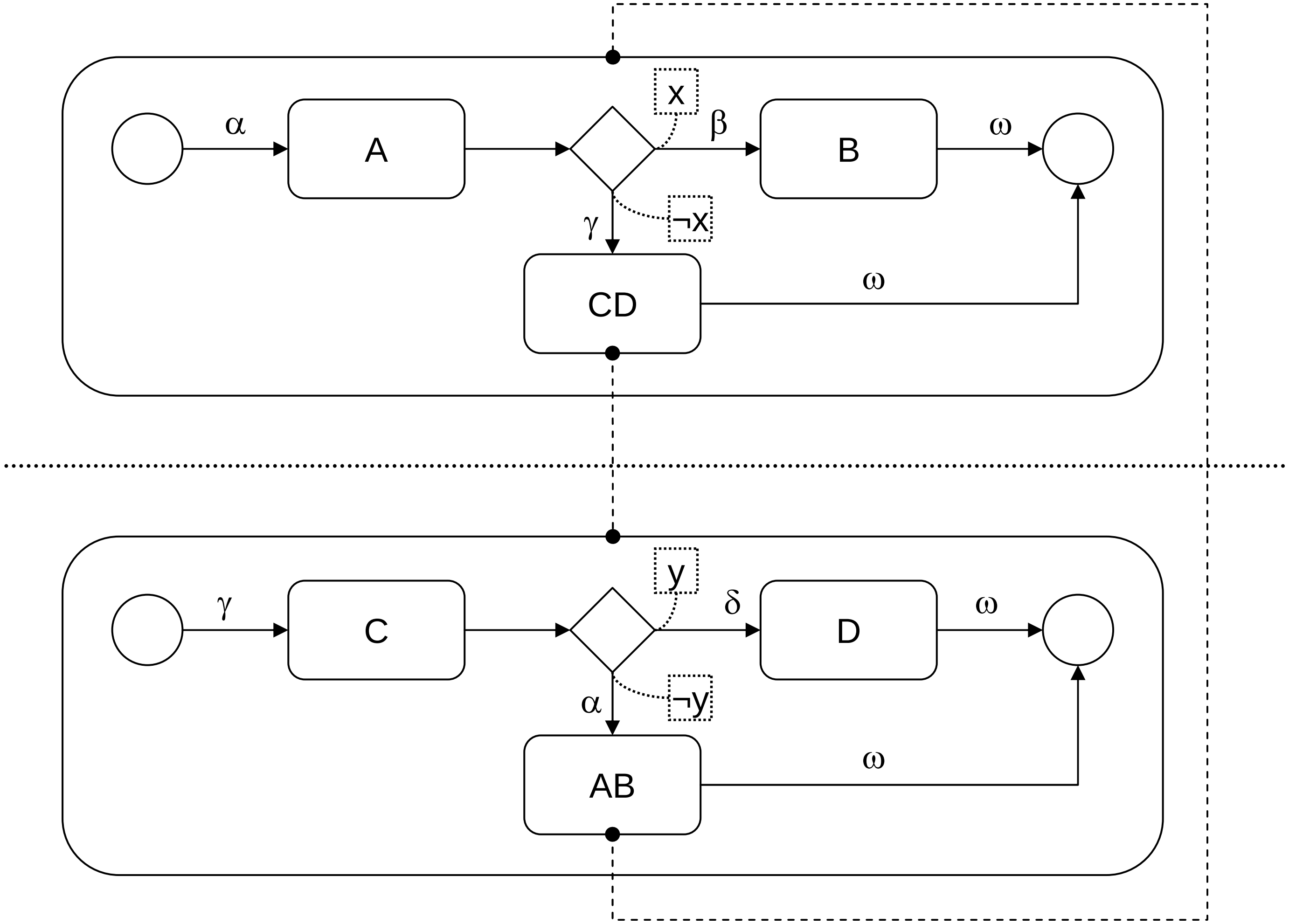

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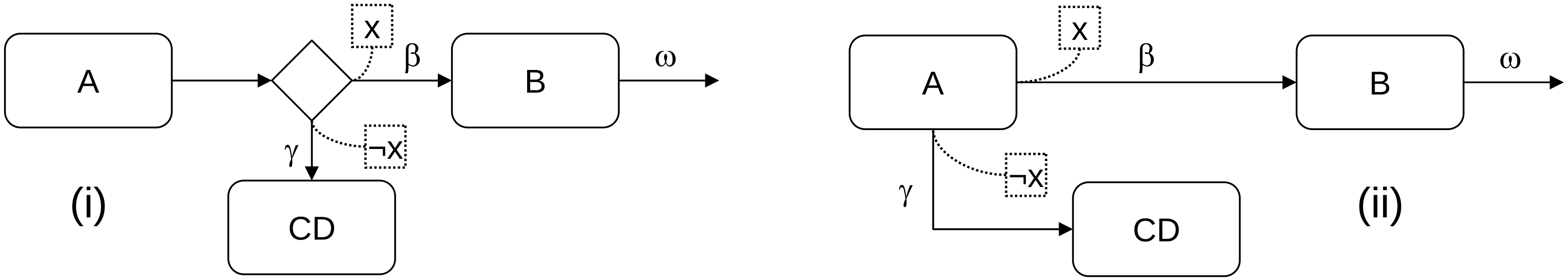

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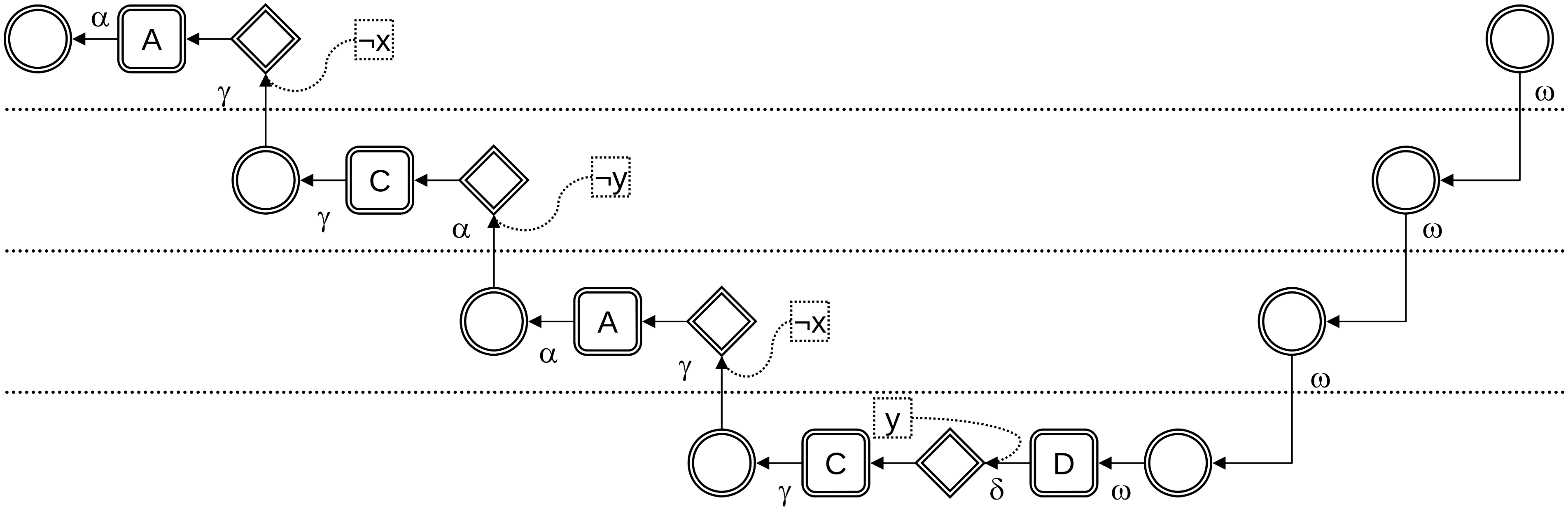

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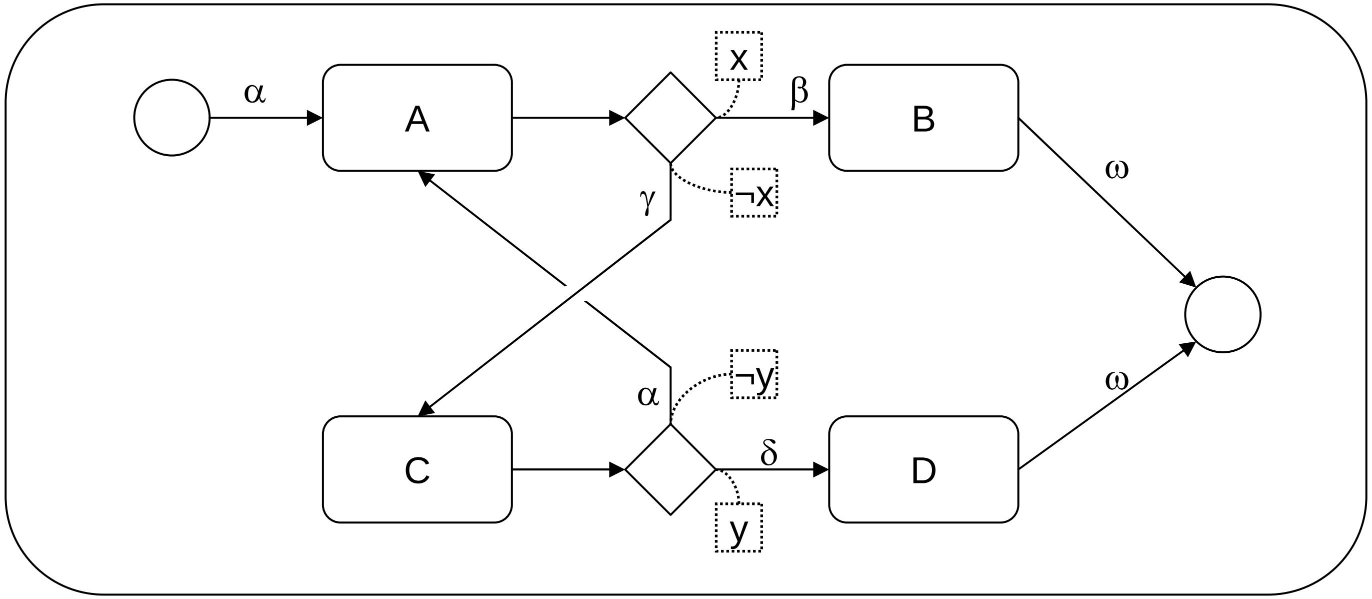

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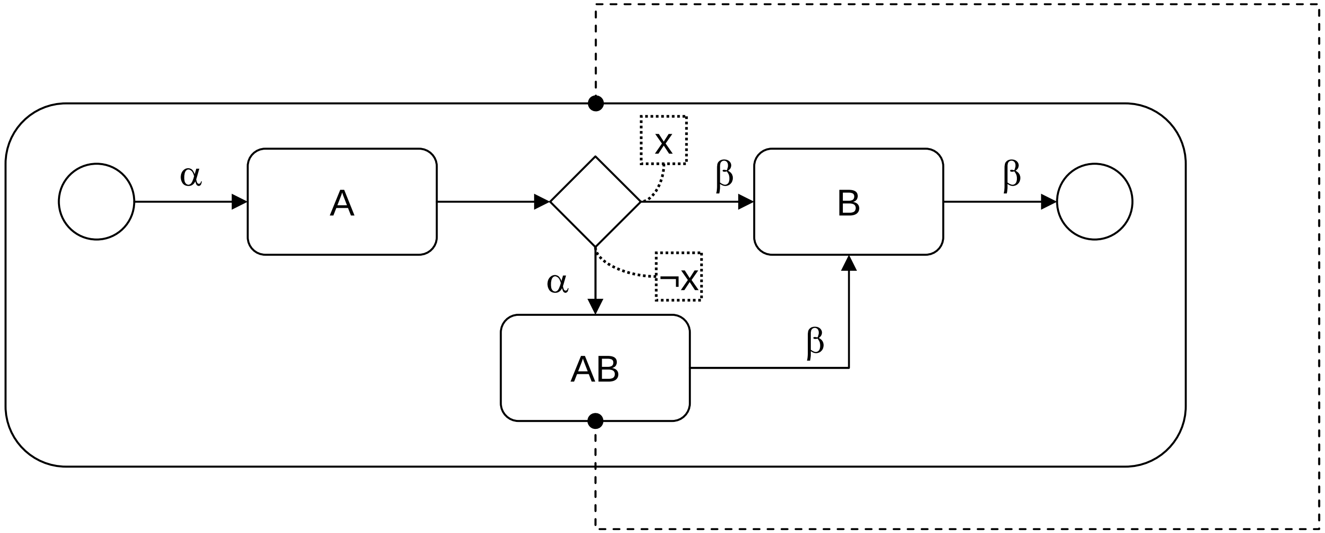

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Fig. 5.11. An instance of the business process model in Fig. 5.10.

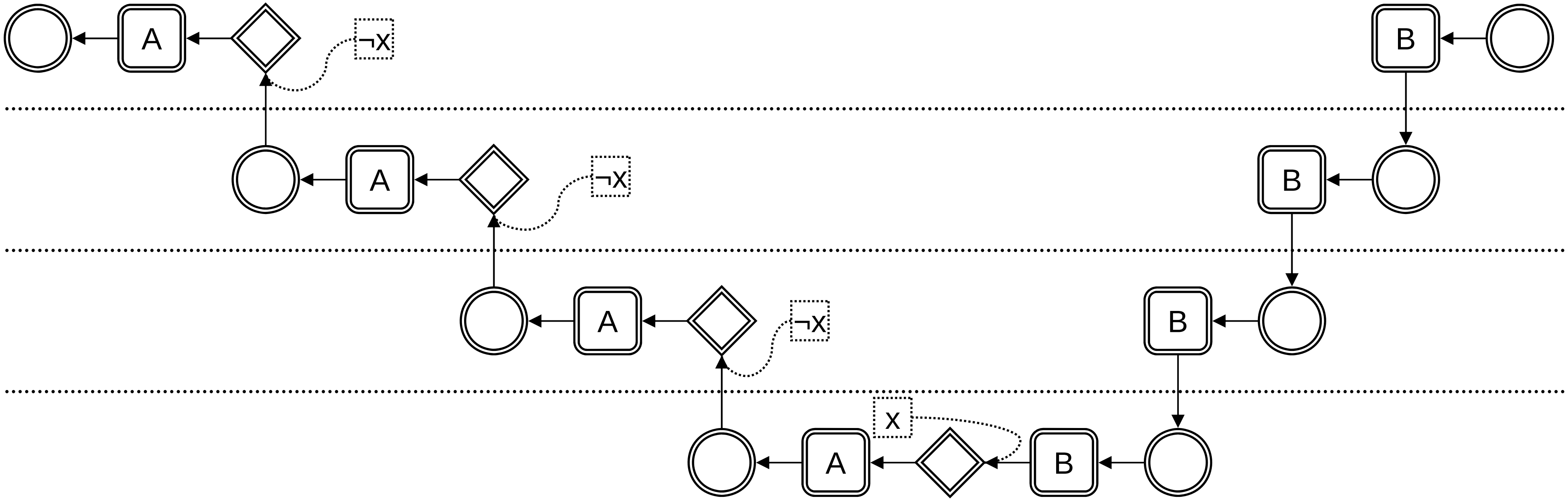

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Fig. 5.12. Flattening the recursive business process specification in Fig. 5.10.

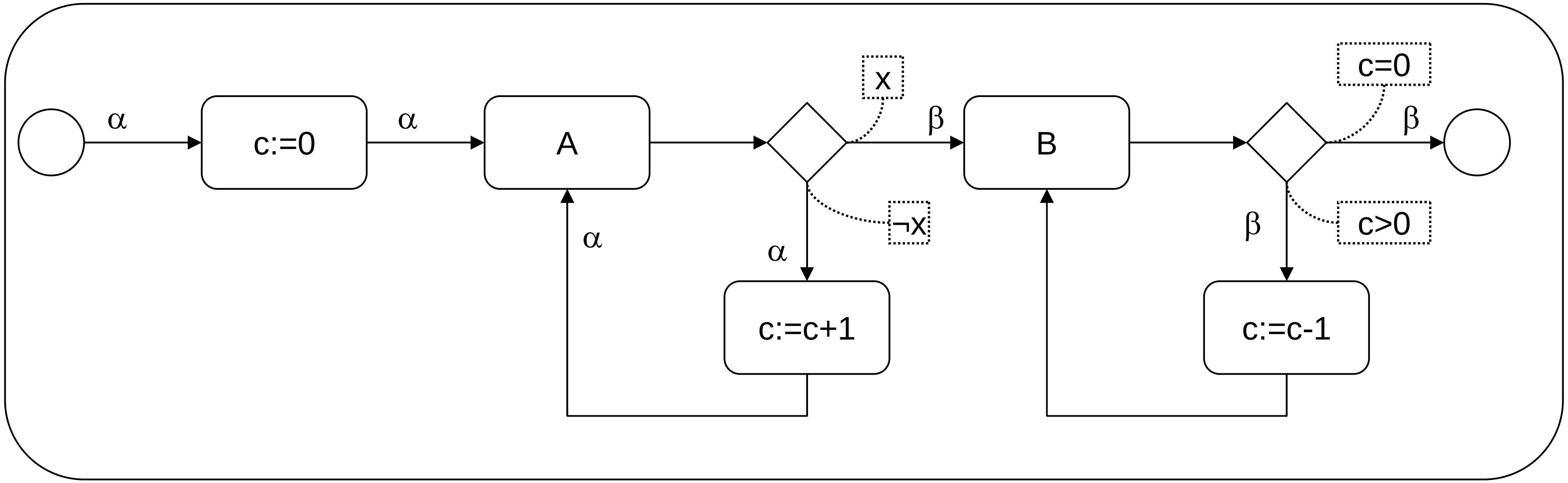

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Fig. 5.13. Example for decomposition with multiple start and exit points.

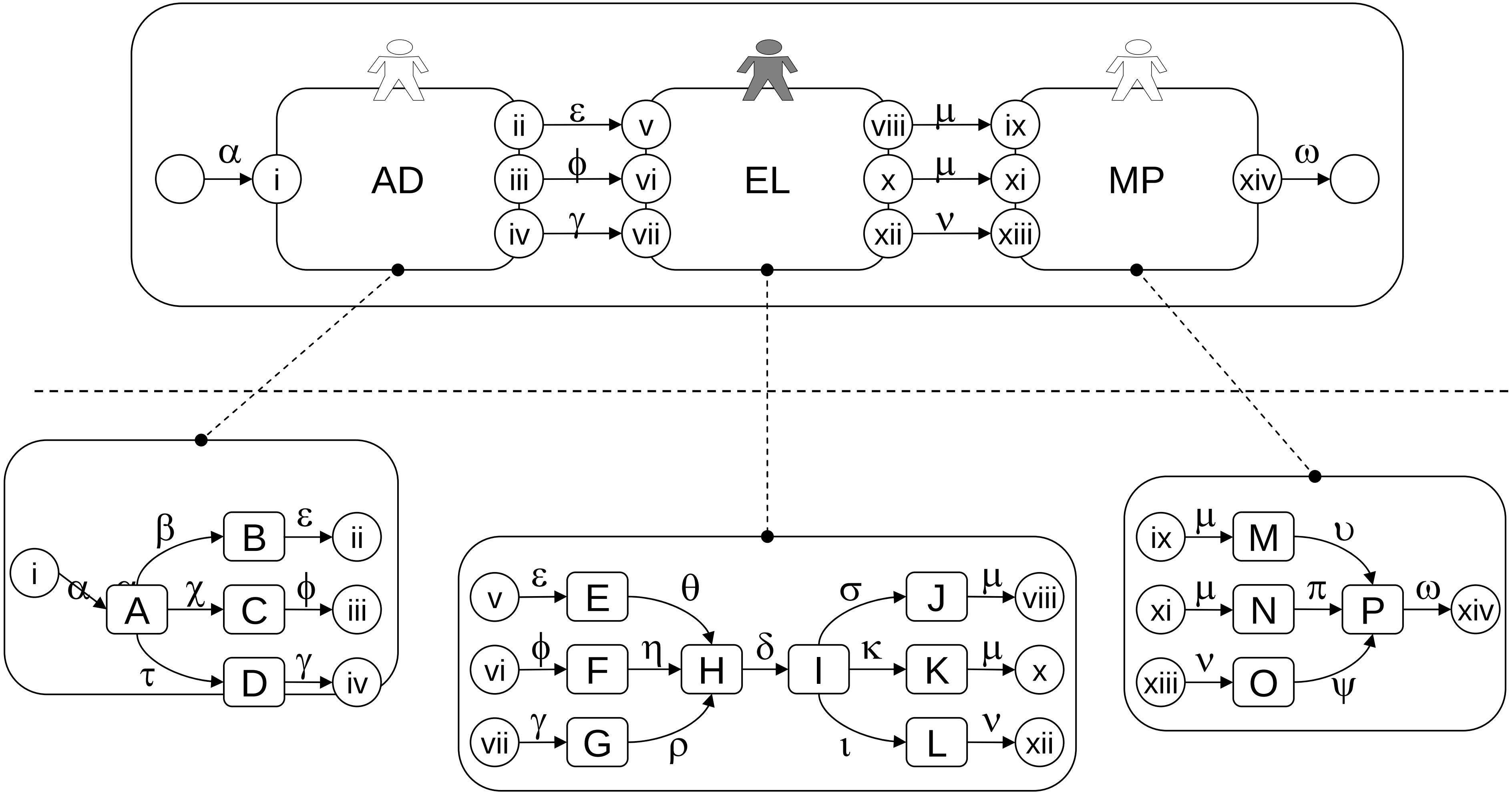

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Fig. 5.14. Alternative control flows for a sub business process from Fig. 5.2.

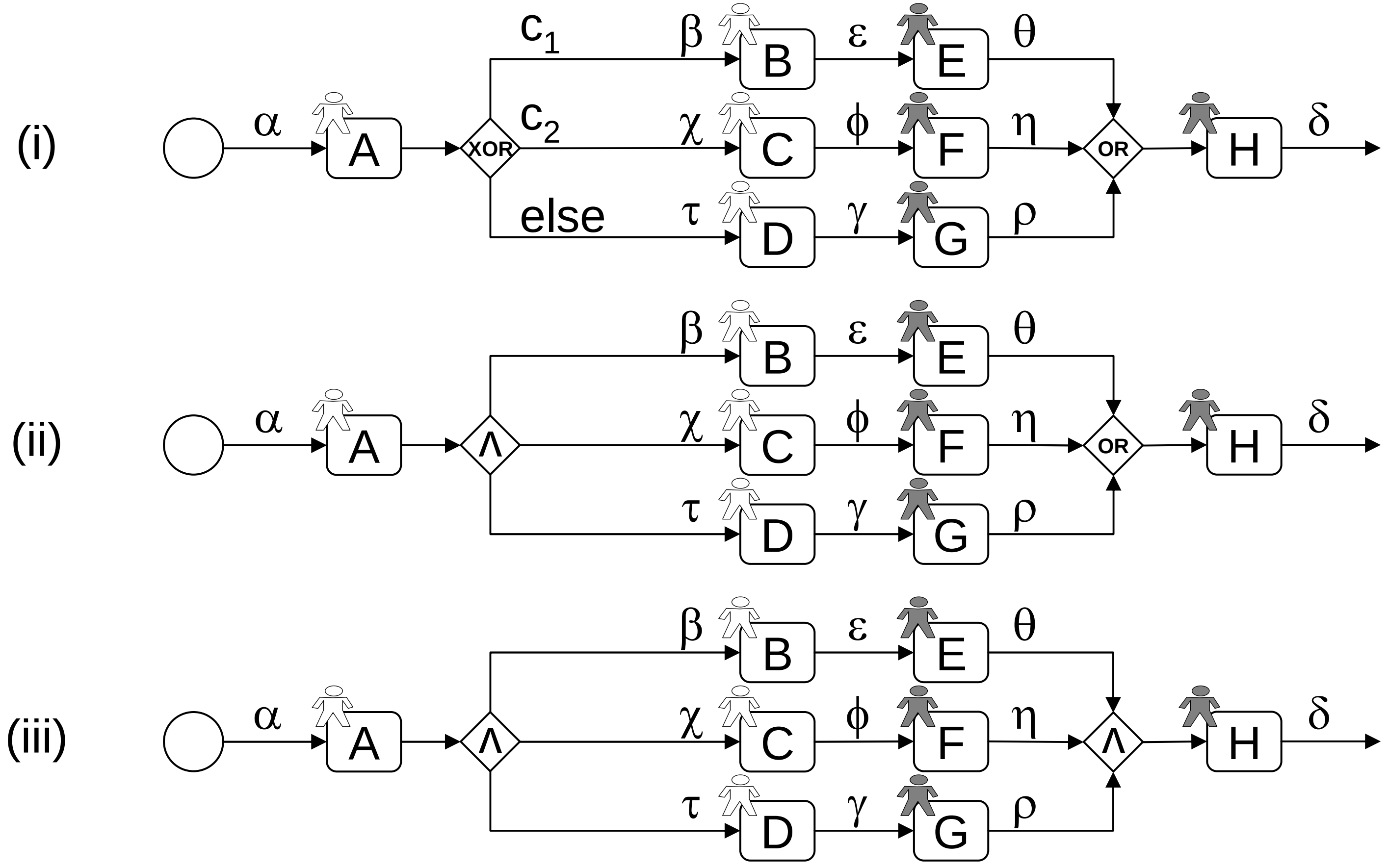

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Fig. 5.15. Decomposing a business process according to business goals.

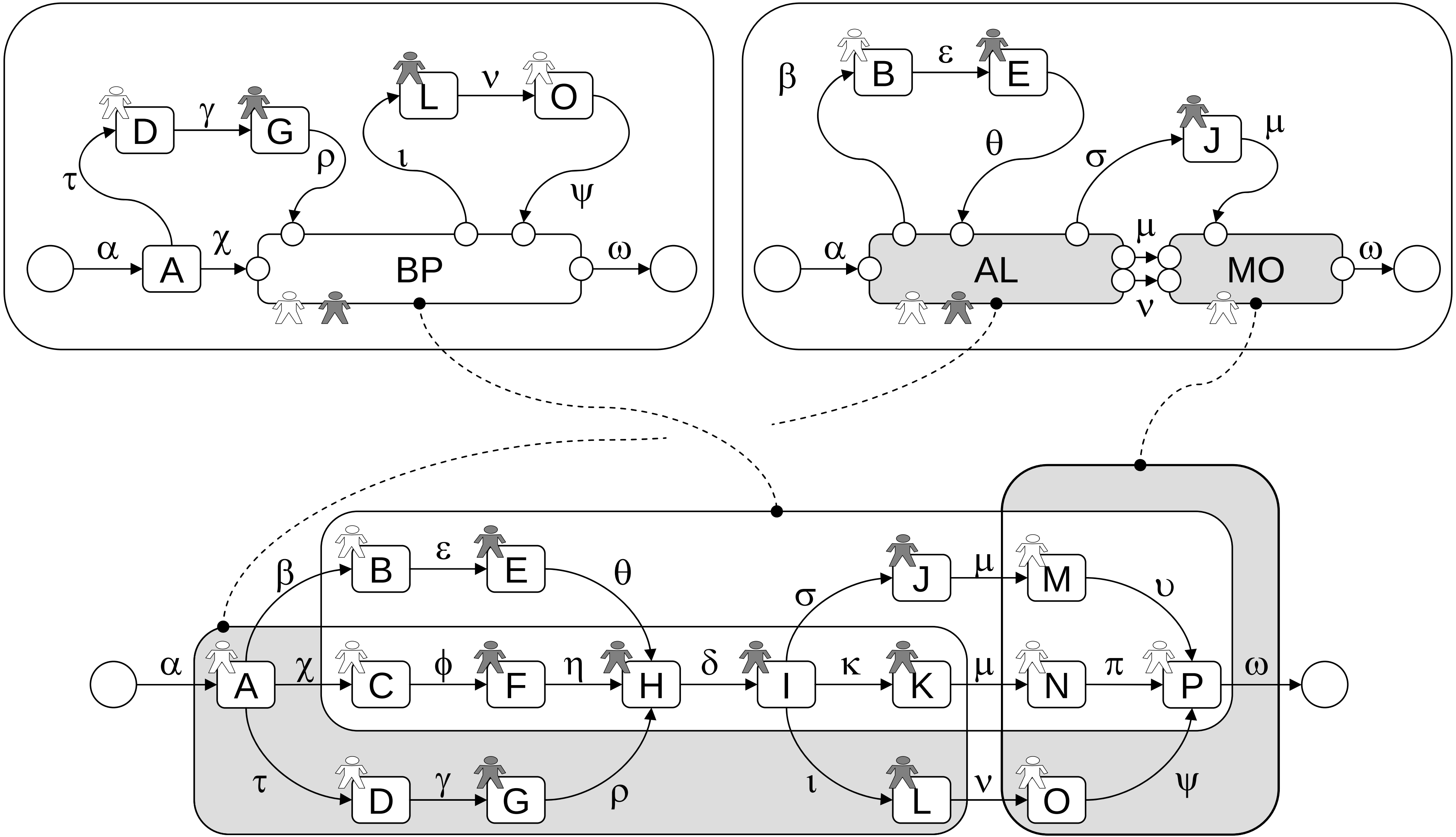

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Fig. 5.16. Overlapping business goals that are compatible in a hierarchy.

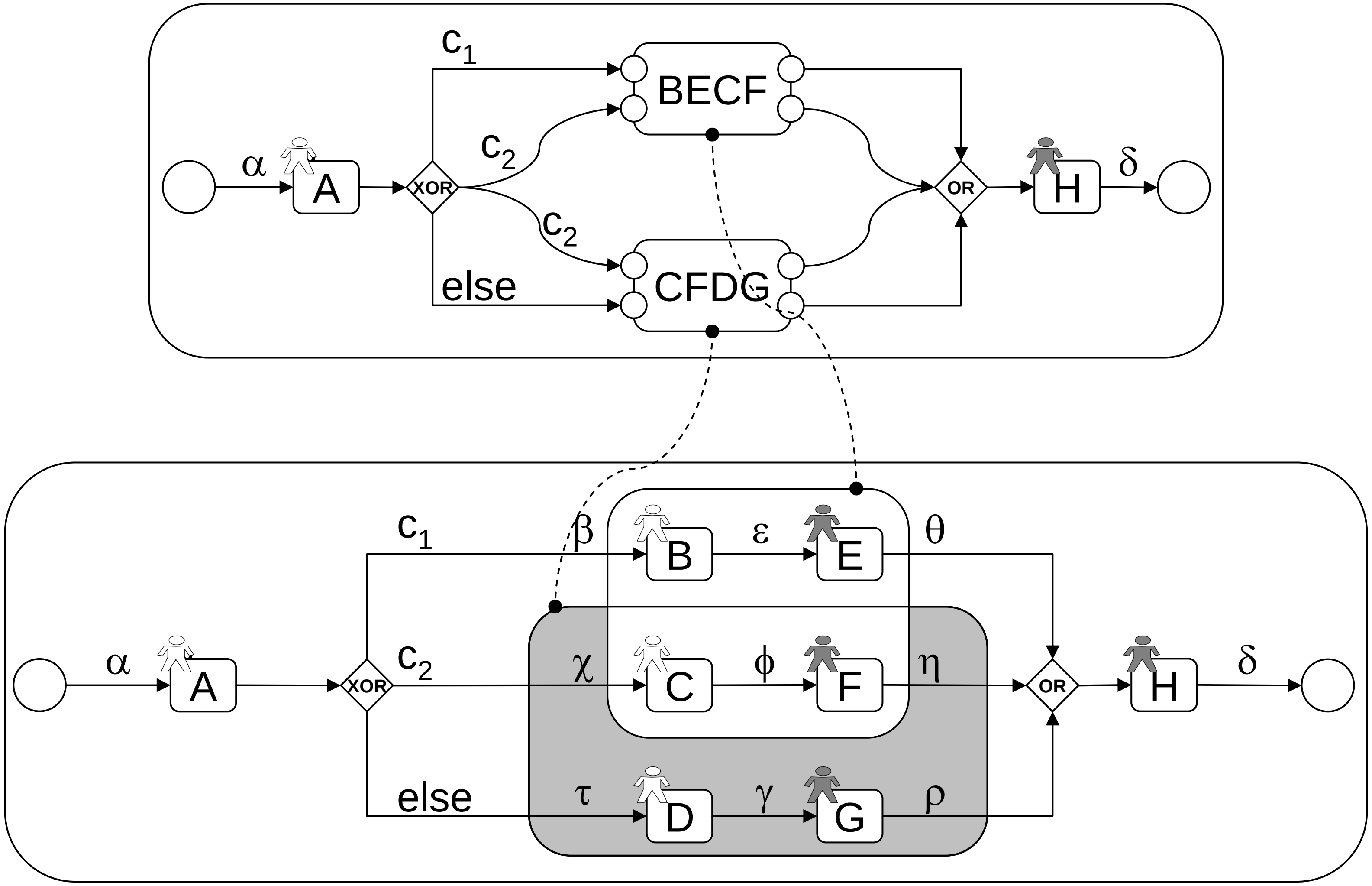

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Fig. 5.17. An alternative business process specification with duplicated activities yielding more options for decomposition.

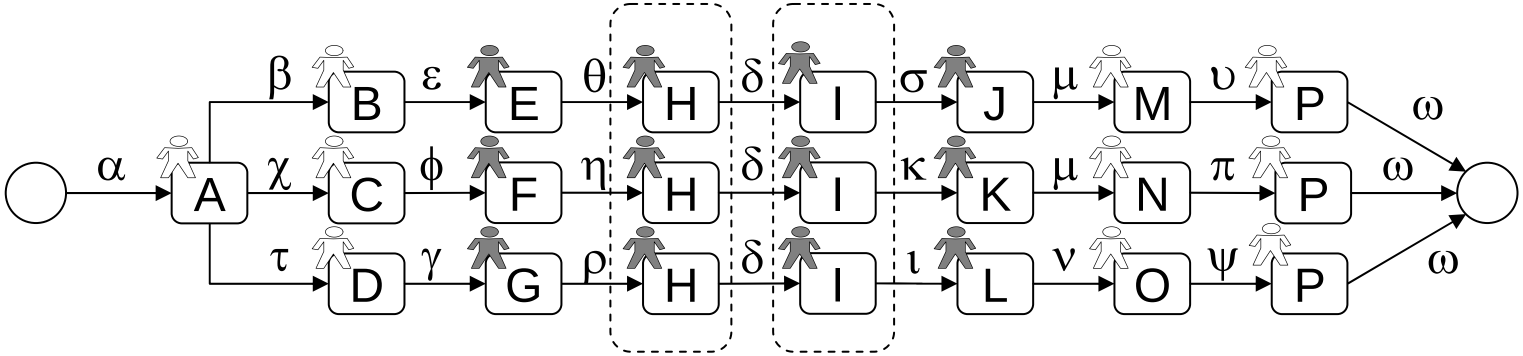

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Fig. 5.18. An example business goal oriented decomposition.

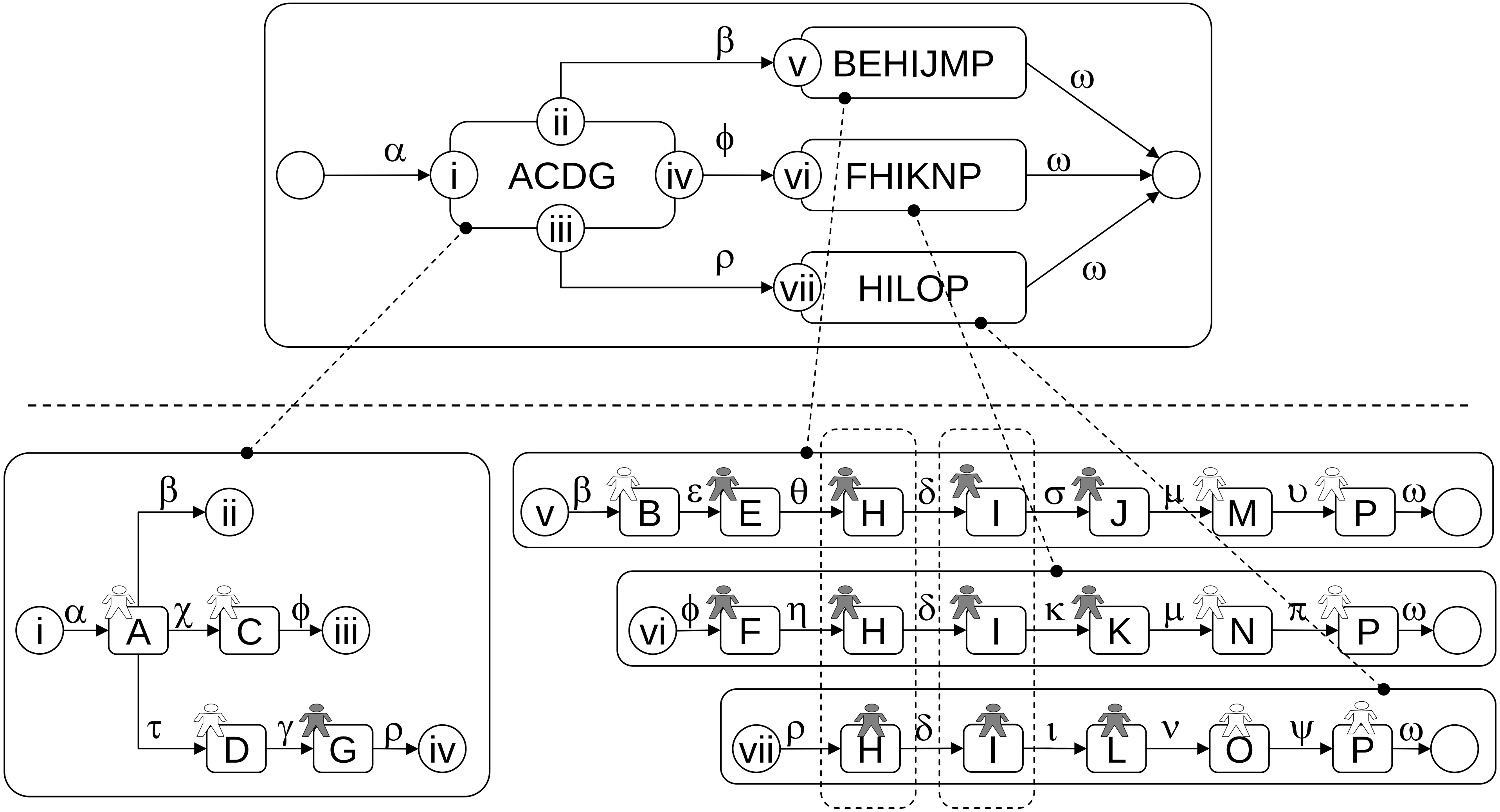

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Fig. 5.19. Parallel decomposition of activities and transitions.

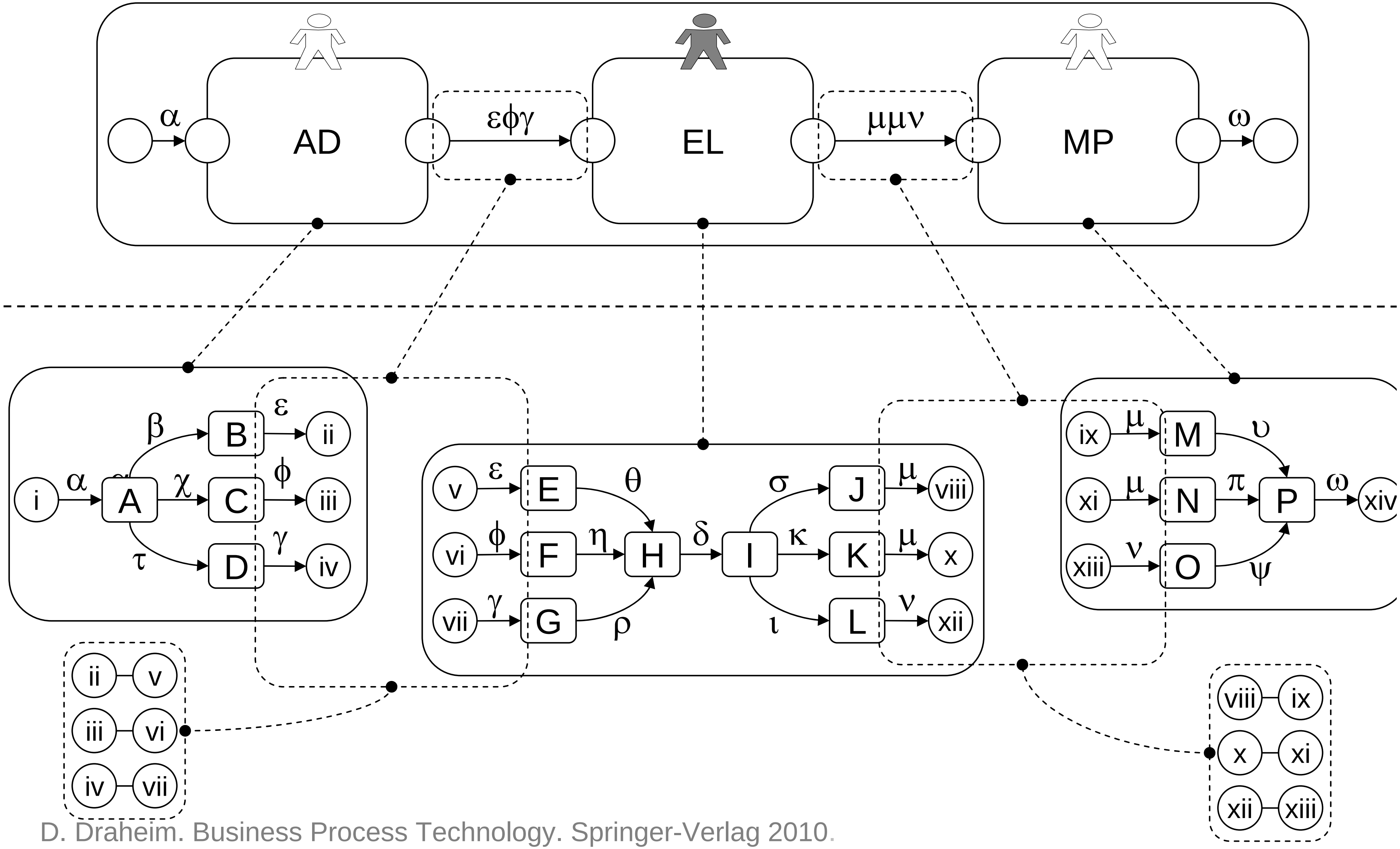

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Fig. 5.20. Completely symmetric decomposition of nodes and edges in a graph.

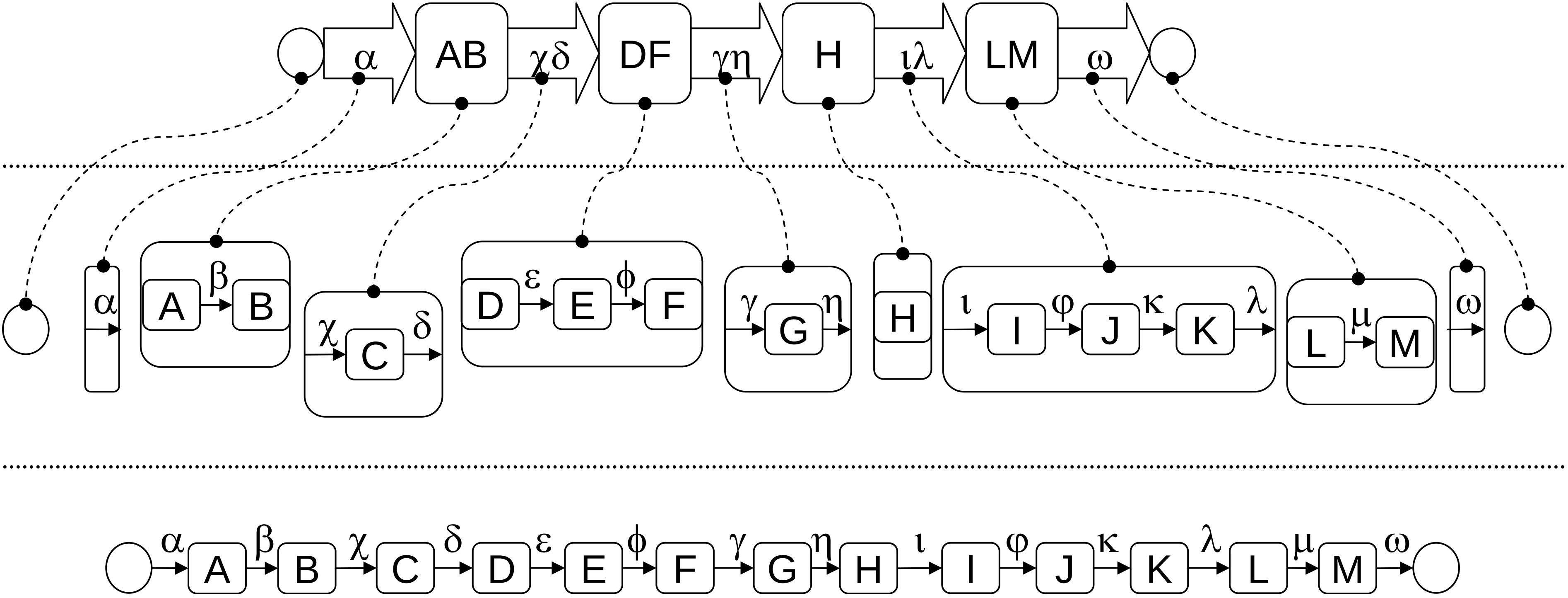

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Fig. 5.21. Simple example for parallel decomposition of activities and transitions.

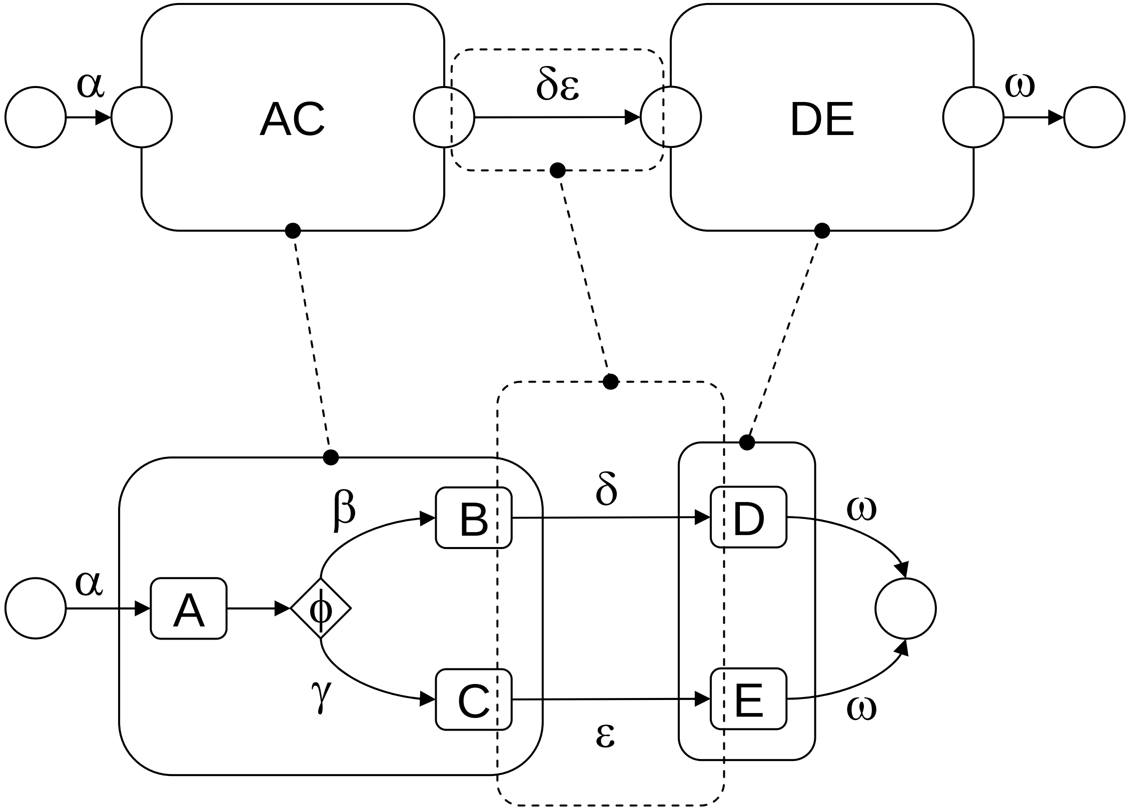

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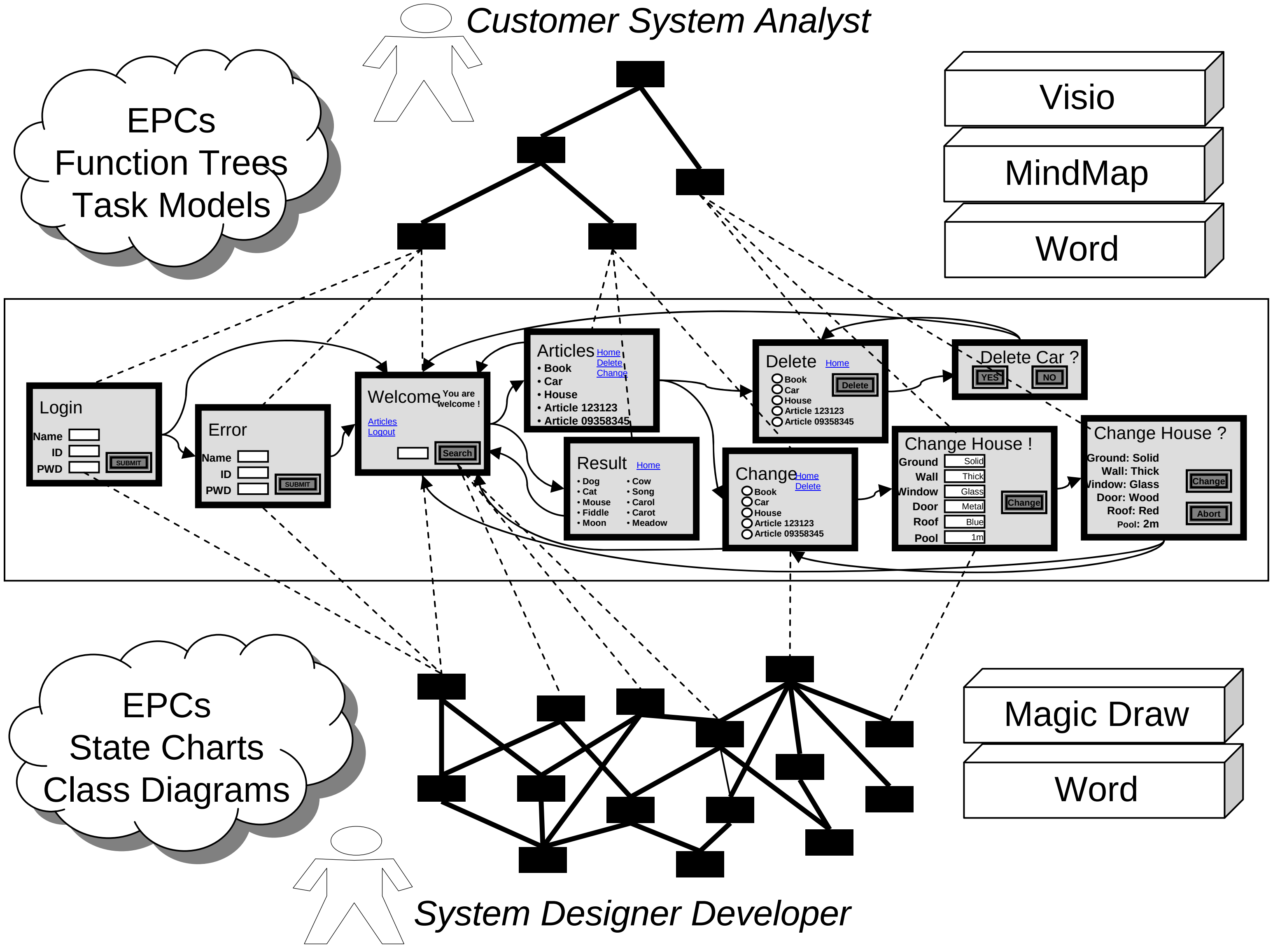
Fig. 5.22. Tyical structural frictions in a combined business process and system model.



Customer System Analyst

EPCs
Function Trees
Task Models

Visio

MindMap

Word

EPCs
State Charts
Class Diagrams

Magic Draw

Word

System Designer Developer

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Fig. 5.23. Mitigating structural frictions in a combined business process and system model.

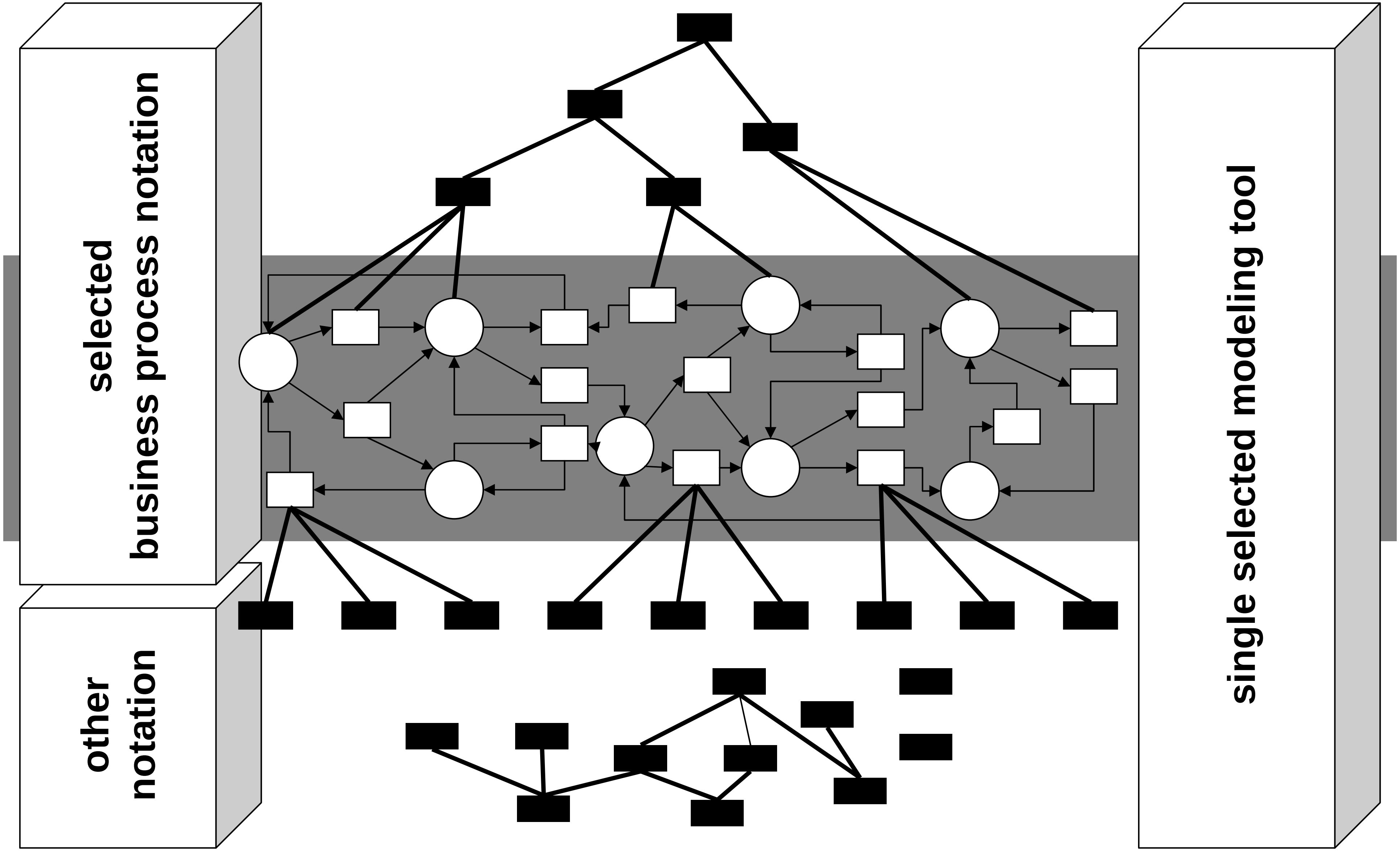

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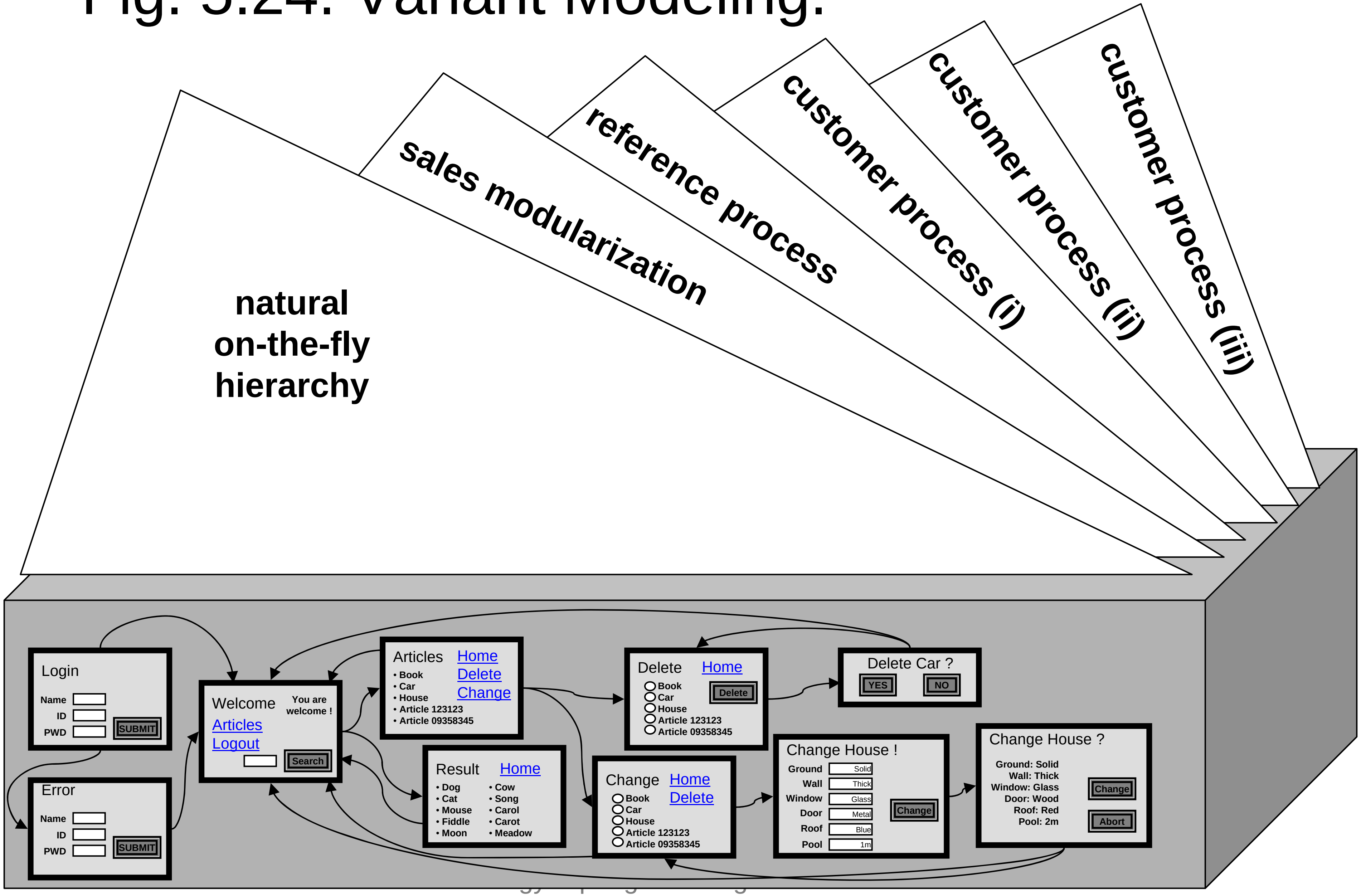
Fig. 5.24. Variant Modeling.



natural
on-the-fly
hierarchy

sales modularization

reference process

customer process (i)

customer process (ii)

customer process (iii)

Login
Name
ID
PWD
SUBMIT

Error
Name
ID
PWD
SUBMIT

Welcome
You are welcome !
Articles
Logout
Search

Articles
Home
Delete
Change
• Book
• Car
• House
• Article 123123
• Article 09358345

Result
Home
• Dog
• Cat
• Mouse
• Fiddle
• Moon
• Cow
• Song
• Carol
• Carot
• Meadow

Delete
Home
○ Book
○ Car
○ House
○ Article 123123
○ Article 09358345
Delete

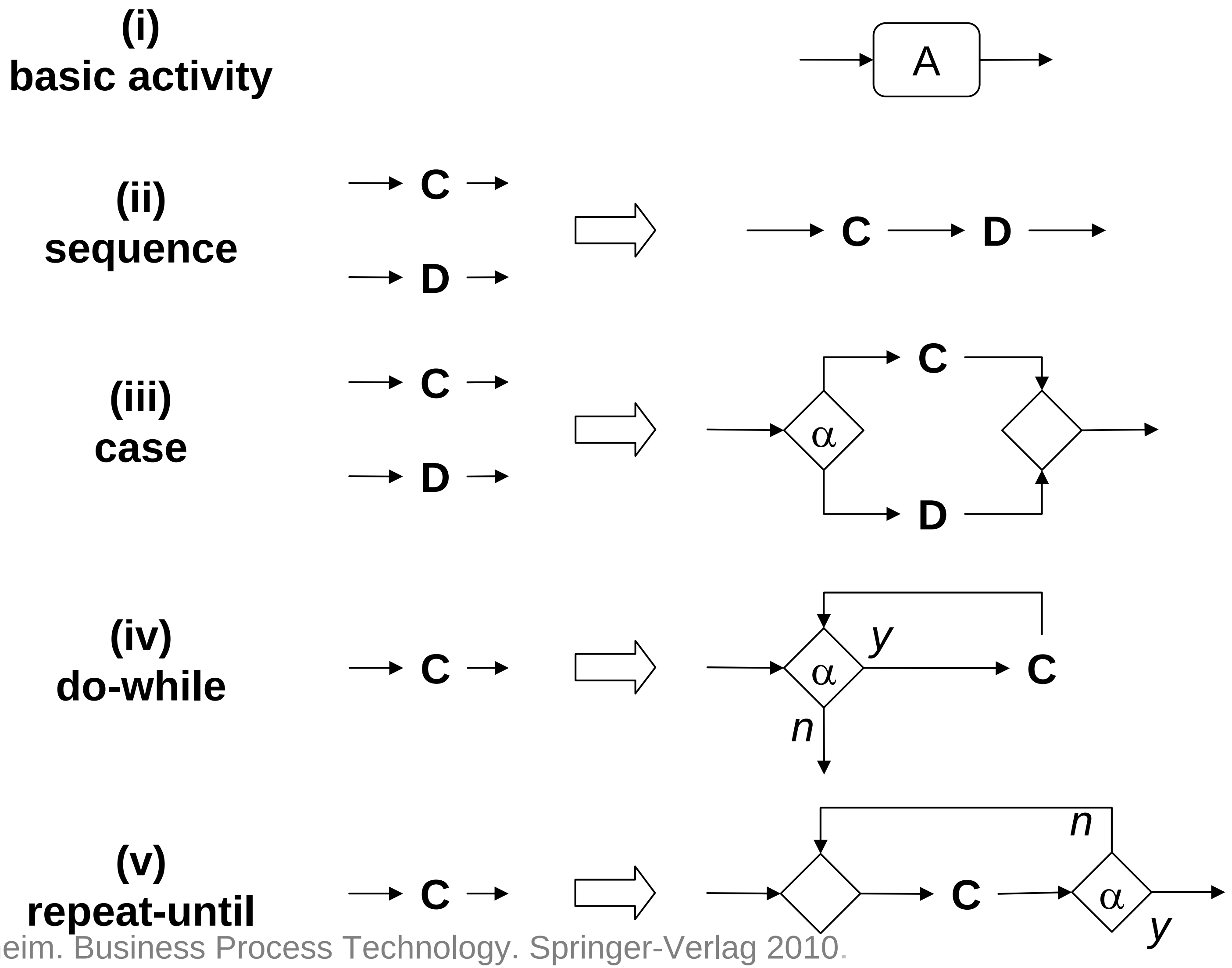
Delete Car ?
YES
NO

Change
Home
Delete
○ Book
○ Car
○ House
○ Article 123123
○ Article 09358345

Change House !
Ground: Solid
Wall: Thick
Window: Glass
Door: Metal
Roof: Blue
Pool: 1m
Change

Change House ?
Ground: Solid
Wall: Thick
Window: Glass
Door: Wood
Roof: Red
Pool: 2m
Change
Abort

Fig. 6.1. Semi-formal formation rules for structured flowcharts.



(i)
basic activity

A

(ii)
sequence

C

D

C D

(iii)
case

C

D

α

C

D

(iv)
do-while

C

α

y

C

n

(v)
repeat-until

C

n

C

α

y

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6.2. Example flowchart that is not a D-flowchart.

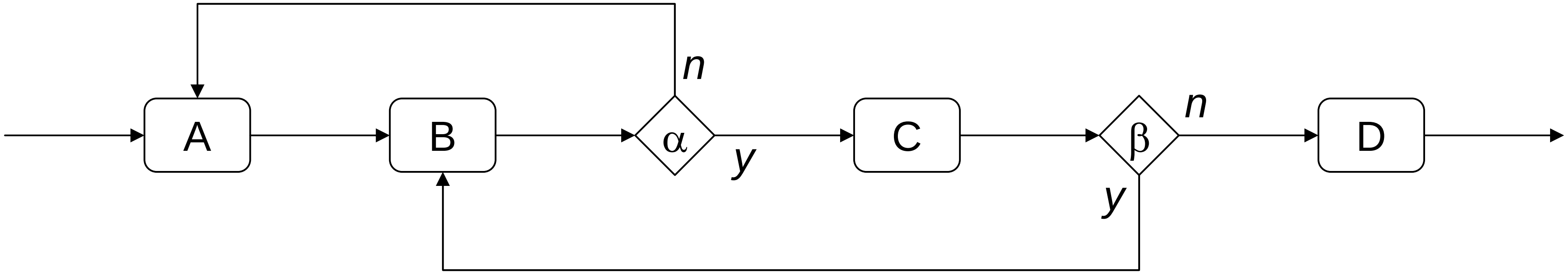

Fig. 6.3. Characterization of bisimilarity for business process models.

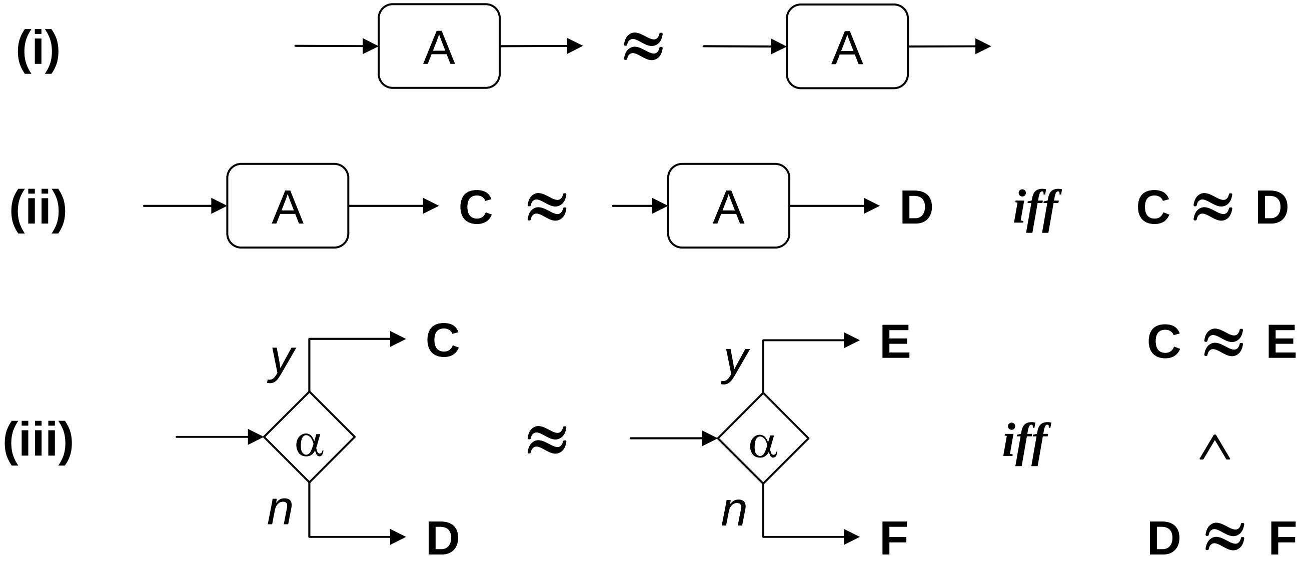

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Fig. 6.4. Example business process model that is not structured.

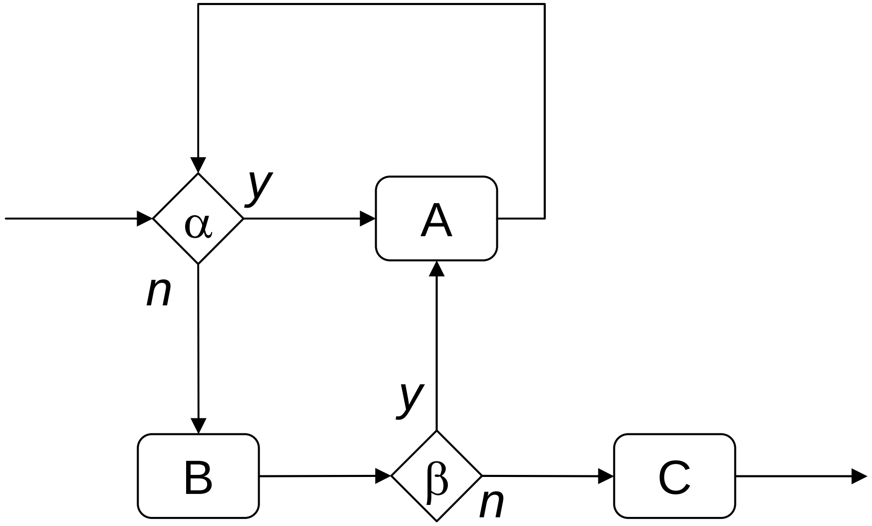

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Fig. 6.5. Structured business process models that replace the non-structured one in Fig. 6.4.

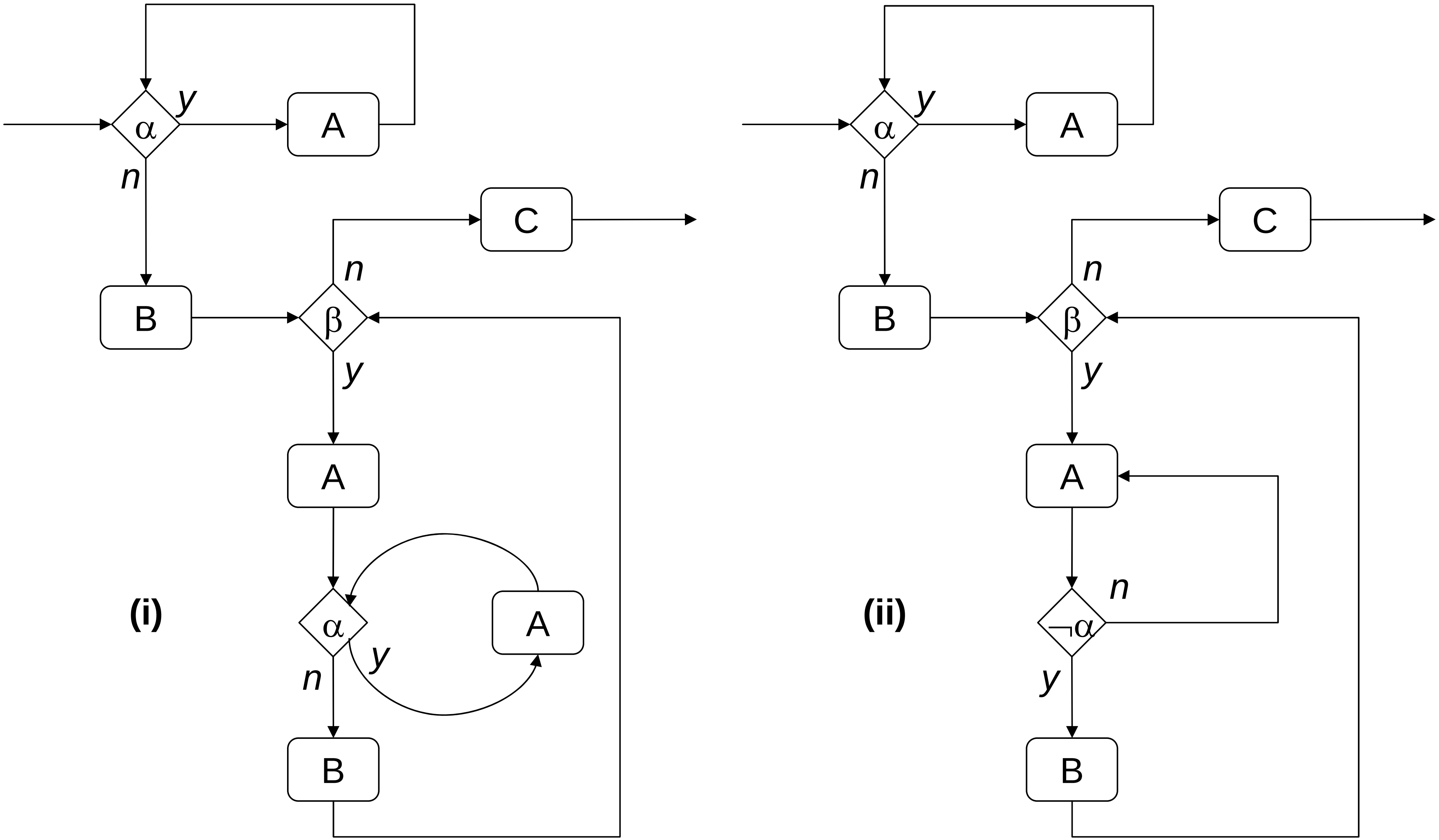

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Fig. 6.6. Block-structured versus arbitrary business process model.

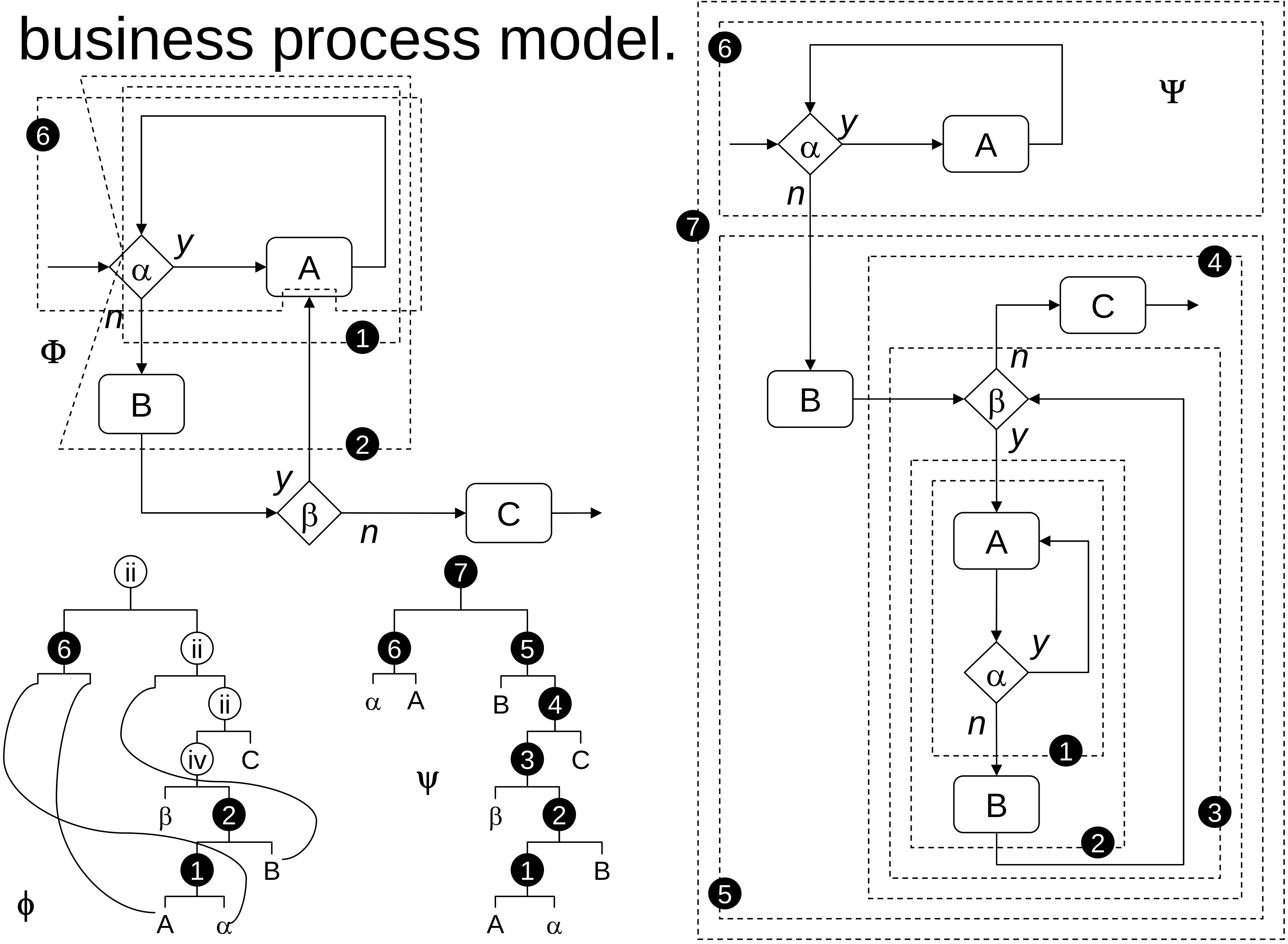
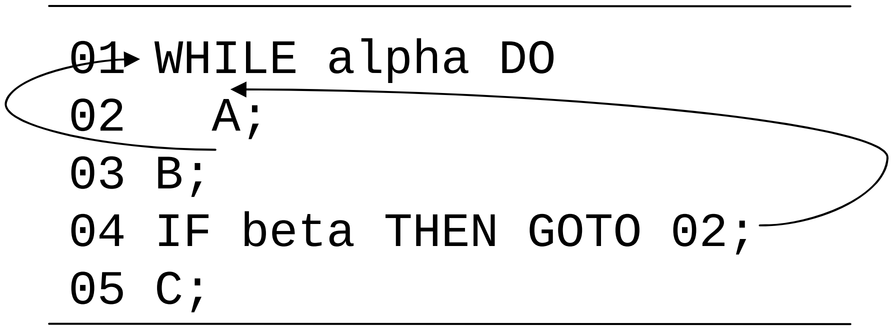


Fig. 6.7. Listing enriched with arrows for making jump structure explicit.



```
01 WHILE alpha DO
02   A;
03 B;
04 IF beta THEN GOTO 02;
05 C;
```

Fig. 6.8. Example business process hierarchy.

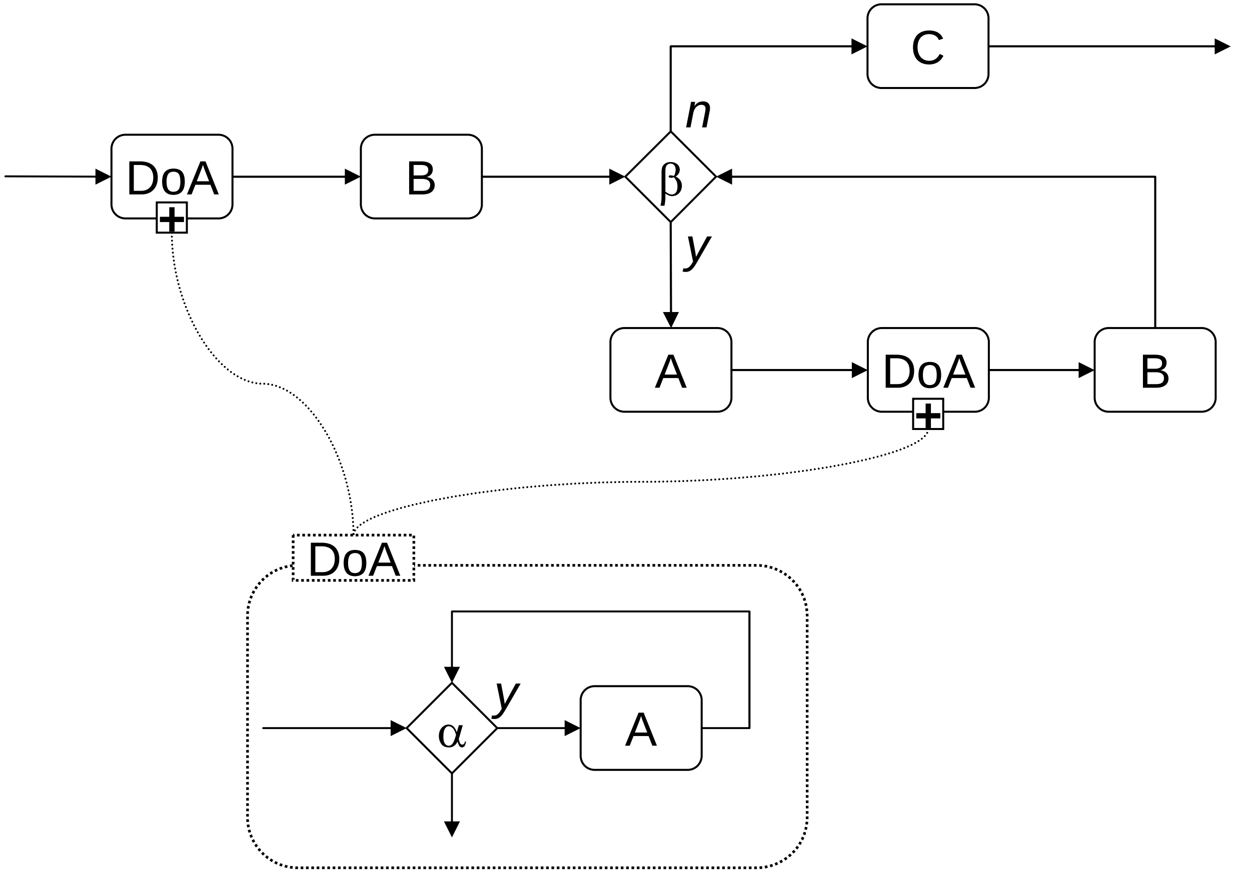


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Fig. 6.9. Example for a deeper business process hierarchy.

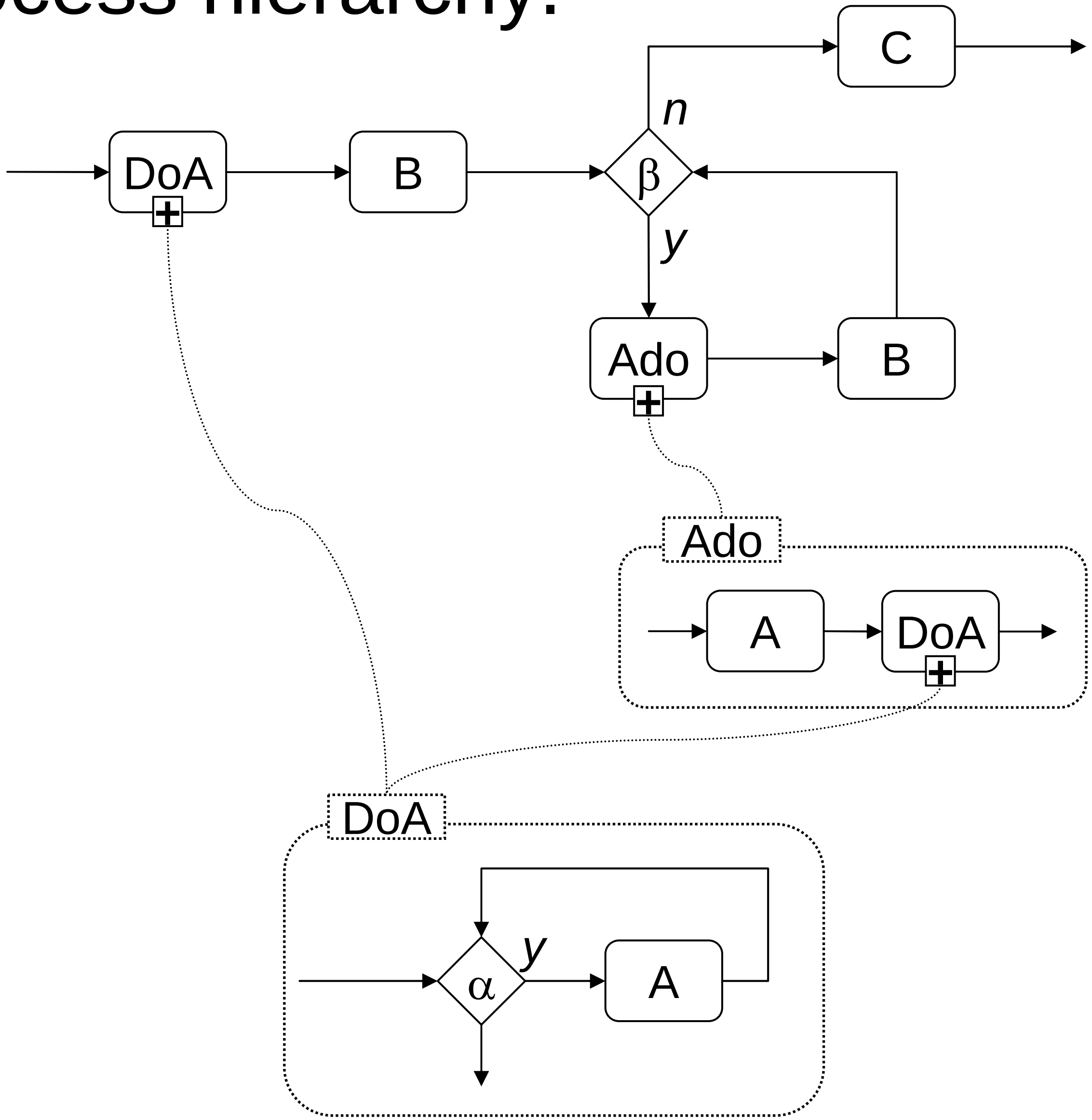

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Fig. 6.10. Structured business process model that replaces the non-structured one in Fig. 6.2.

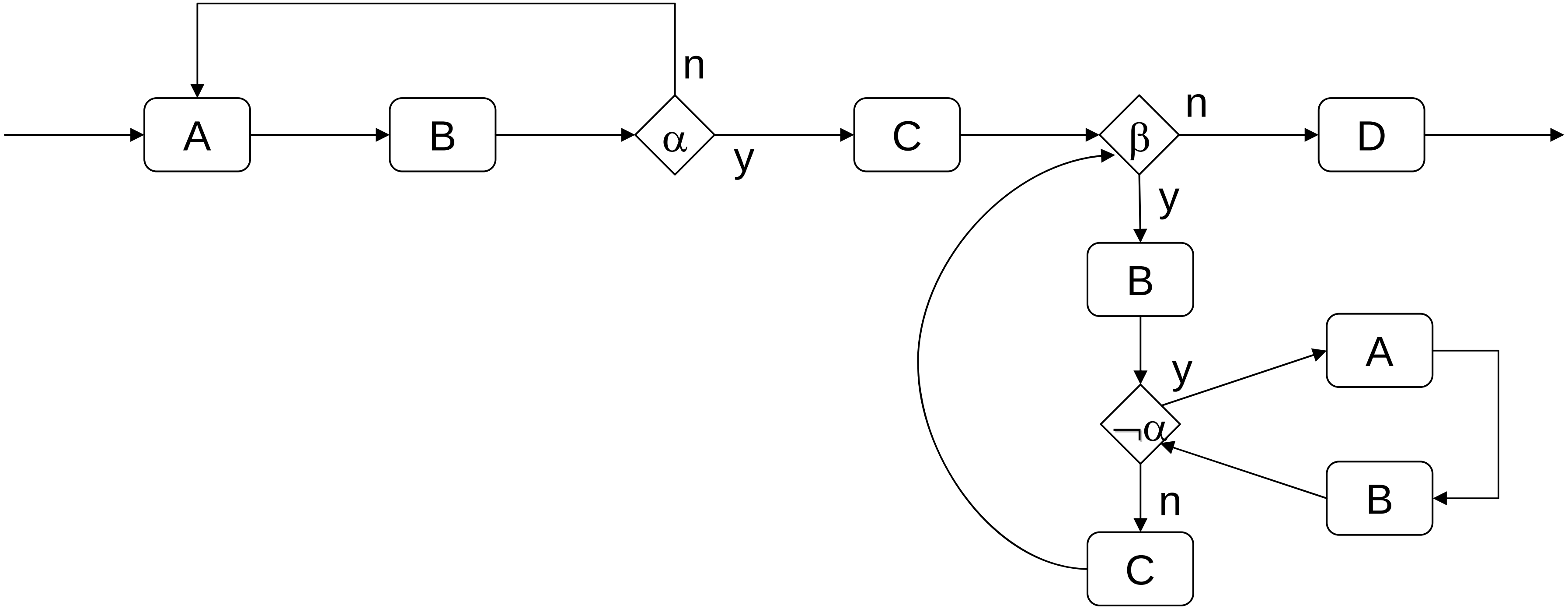

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Fig. 6.11. Two example business processes without structured presentation using no other than their own primitives.

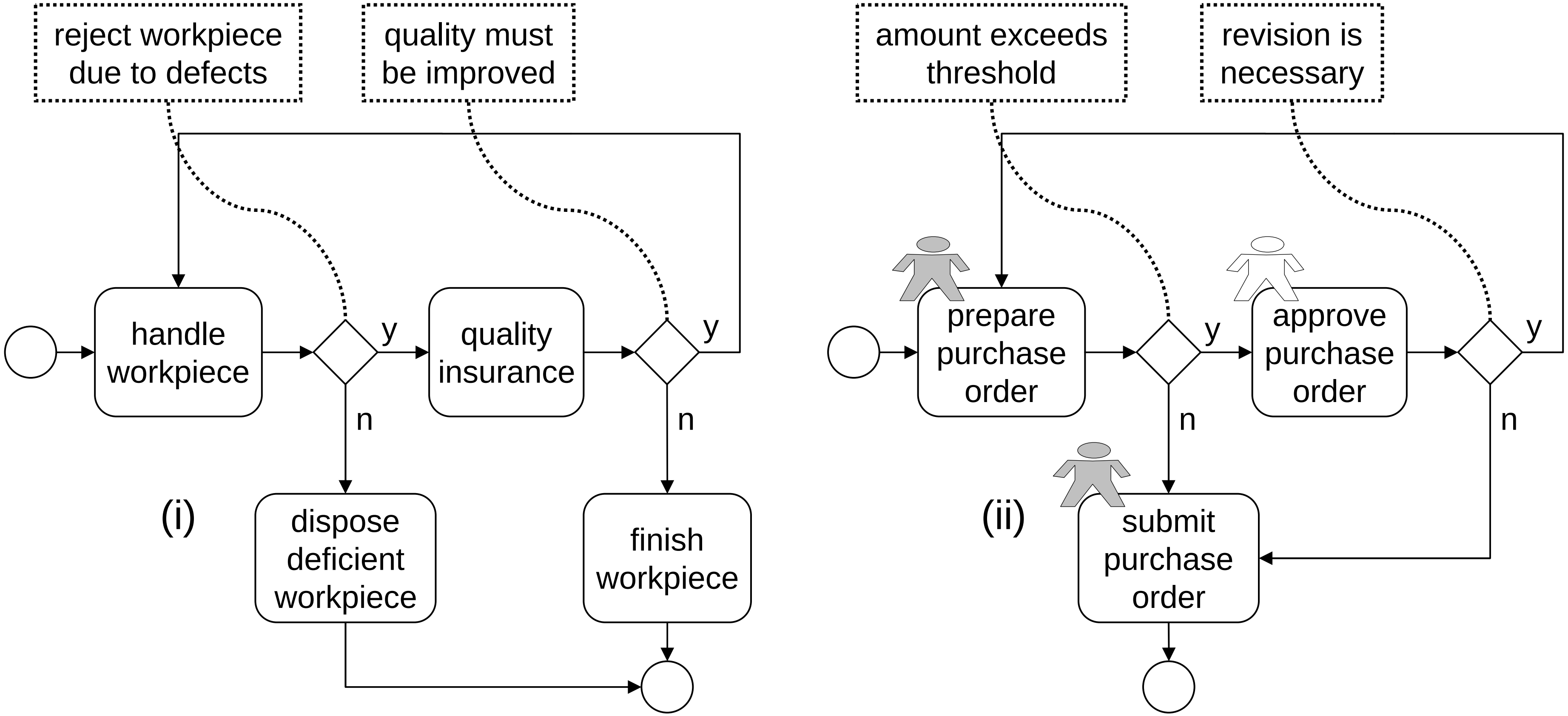

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Fig. 6.12. Business process with cycle that is exited via two distinguishable paths.

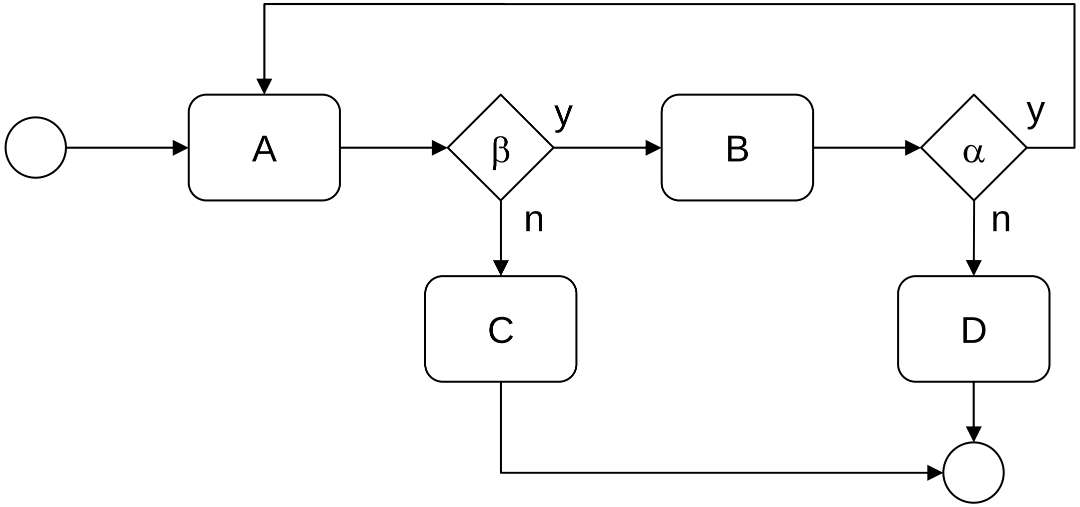

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Fig. 6.13. Resolution of business process cycles with multiple distinguishable exits by the usage of auxiliary logic and state.

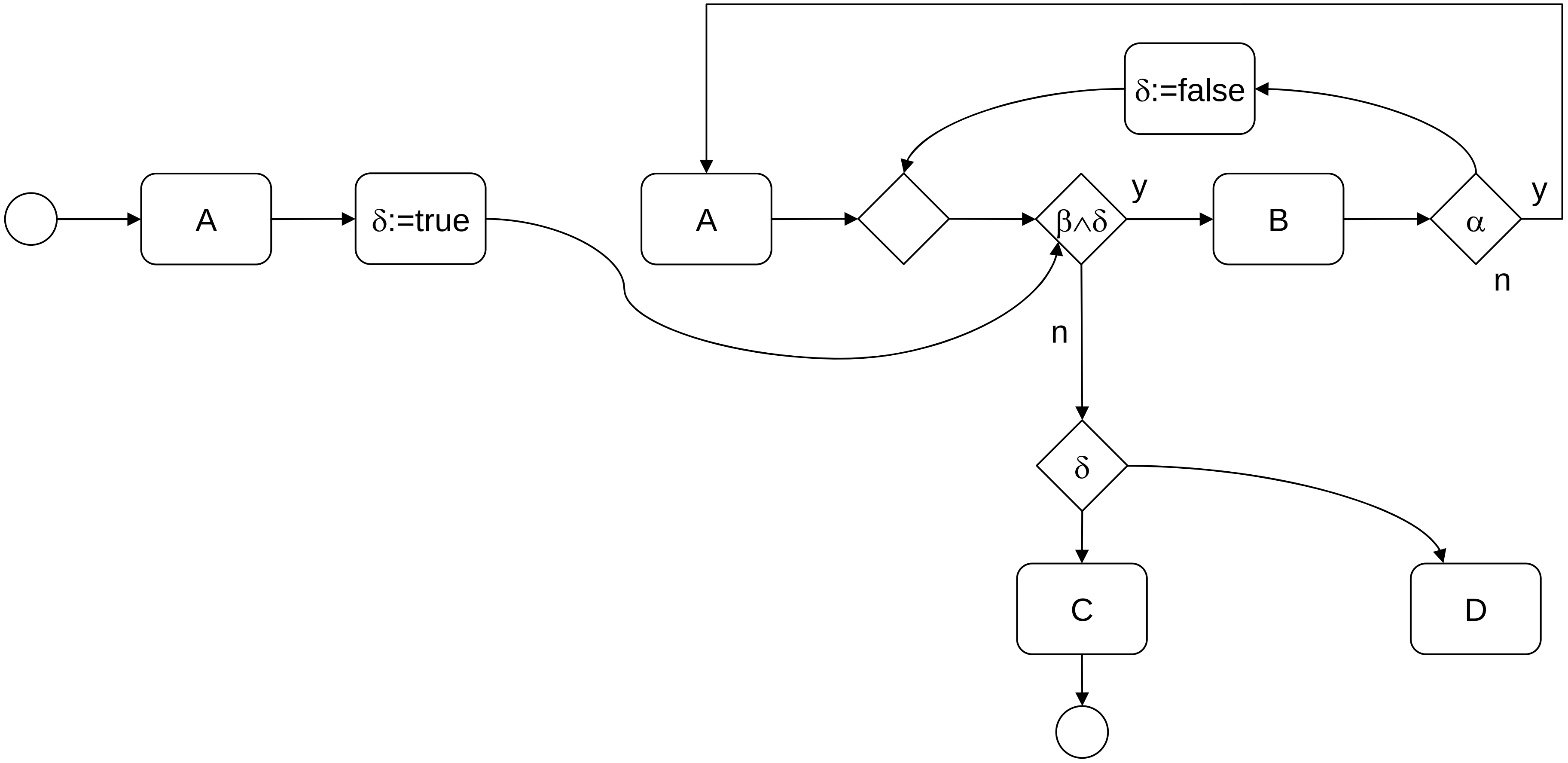

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Fig. 6.14. Two business processes that are not behavioral equivalent.

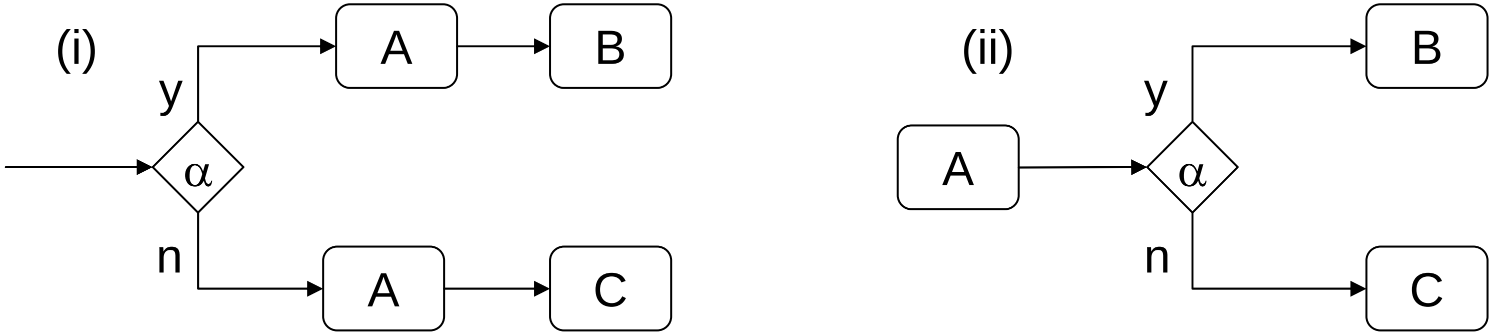

Fig. 7.1. Process definition with one form for each activity as implementing system dialogue.

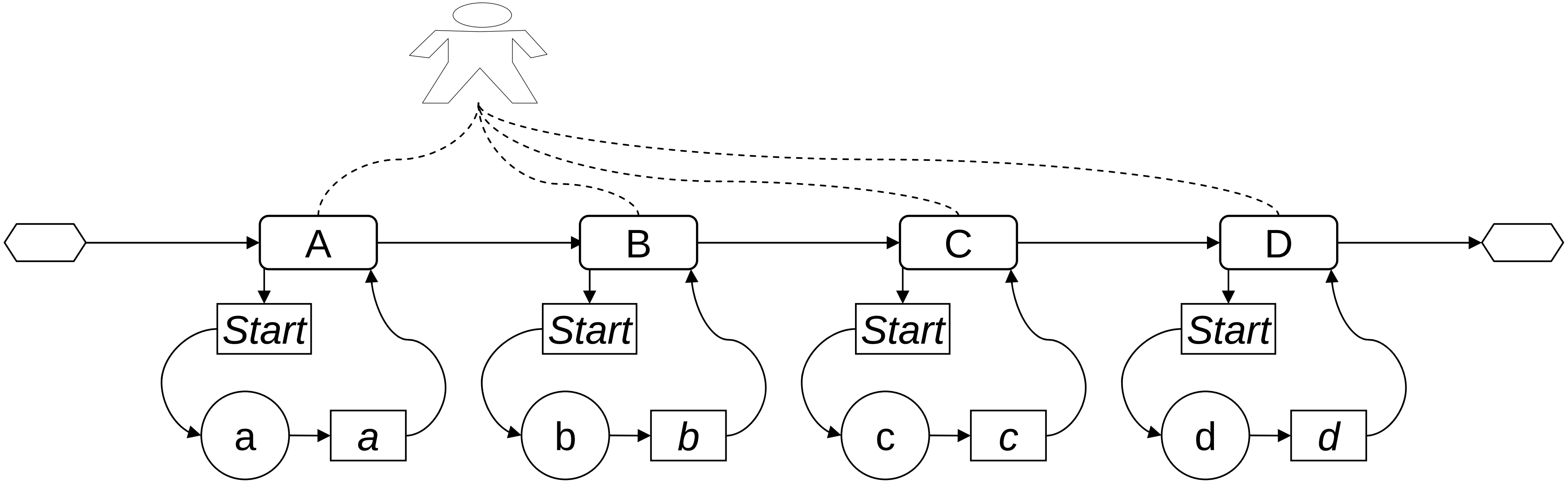

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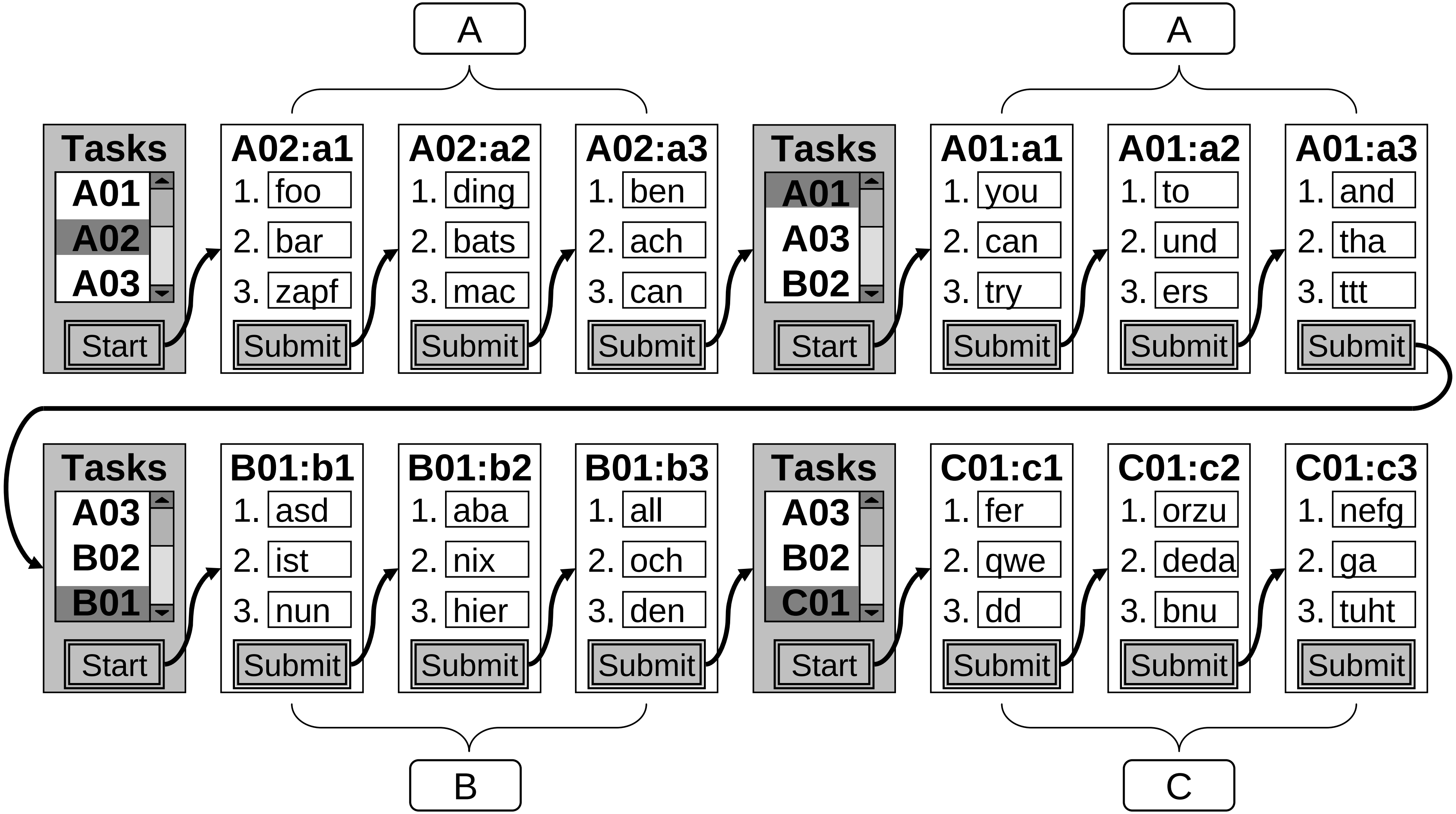
Fig. 7.2. Strictly chained forms of a terminal-server style workflow system.



A

Tasks
A01
A02
A03
Start

A02:a1
1. foo
2. bar
3. zapf
Submit

A02:a2
1. ding
2. bats
3. mac
Submit

A02:a3
1. ben
2. ach
3. can
Submit

Tasks
A01
A03
B02
Start

A

A01:a1
1. you
2. can
3. try
Submit

A01:a2
1. to
2. und
3. ers
Submit

A01:a3
1. and
2. tha
3. ttt
Submit

Tasks
A03
B02
B01
Start

B01:b1
1. asd
2. ist
3. nun
Submit

B01:b2
1. aba
2. nix
3. hier
Submit

B01:b3
1. all
2. och
3. den
Submit

B

Tasks
A03
B02
C01
Start

C01:c1
1. fer
2. qwe
3. dd
Submit

C01:c2
1. orzu
2. deda
3. bnu
Submit

C01:c3
1. nefg
2. ga
3. tuht
Submit

C

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Fig. 7.3. Alternative activity support by a superform-based dialogue.

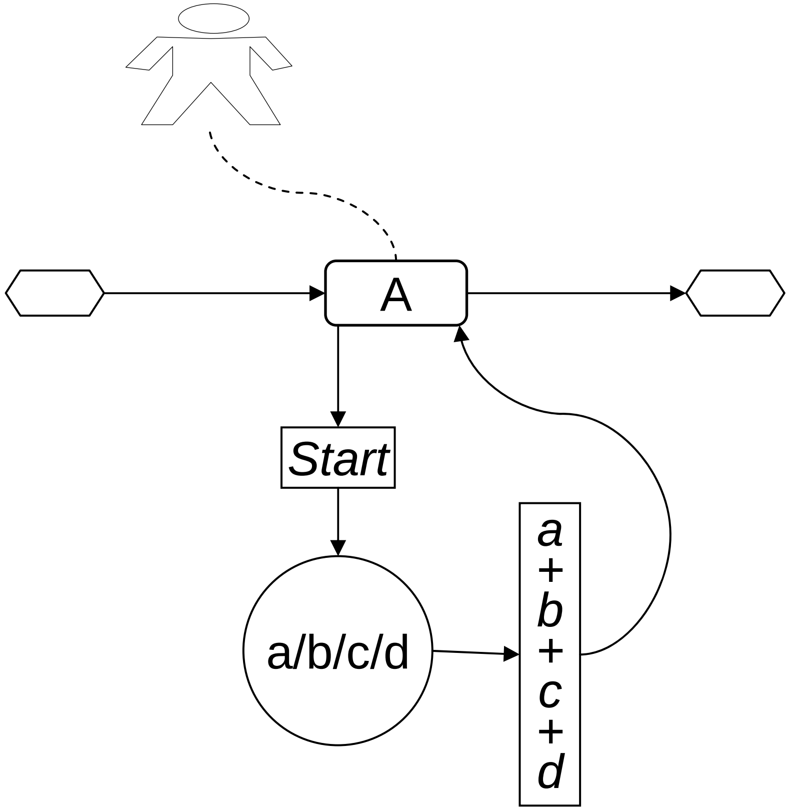

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Fig. 7.4. Workflow system that allows for saving screen states.

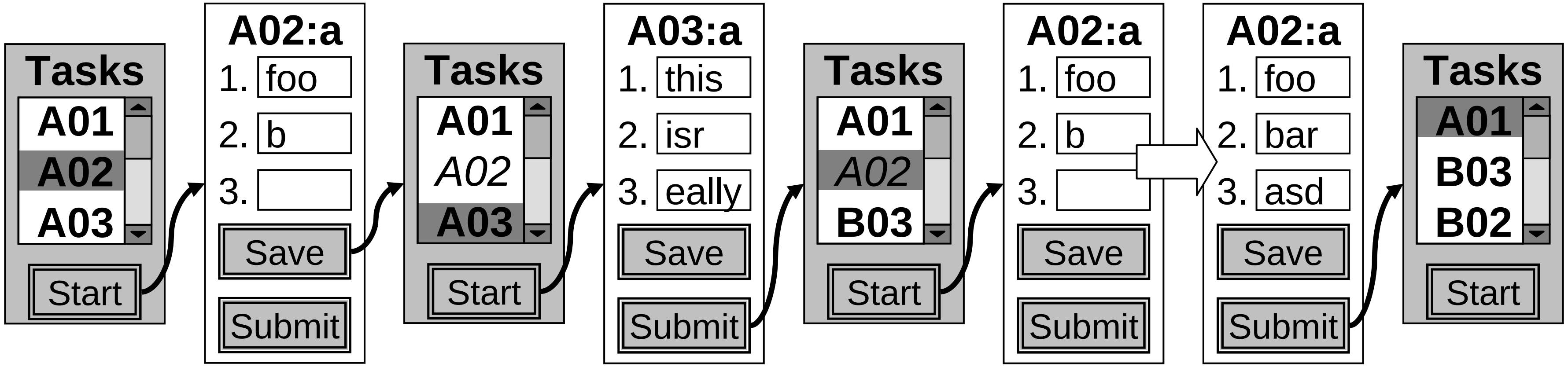

Fig. 7.5. Exploiting windowing for saving screen states of a workflow system.

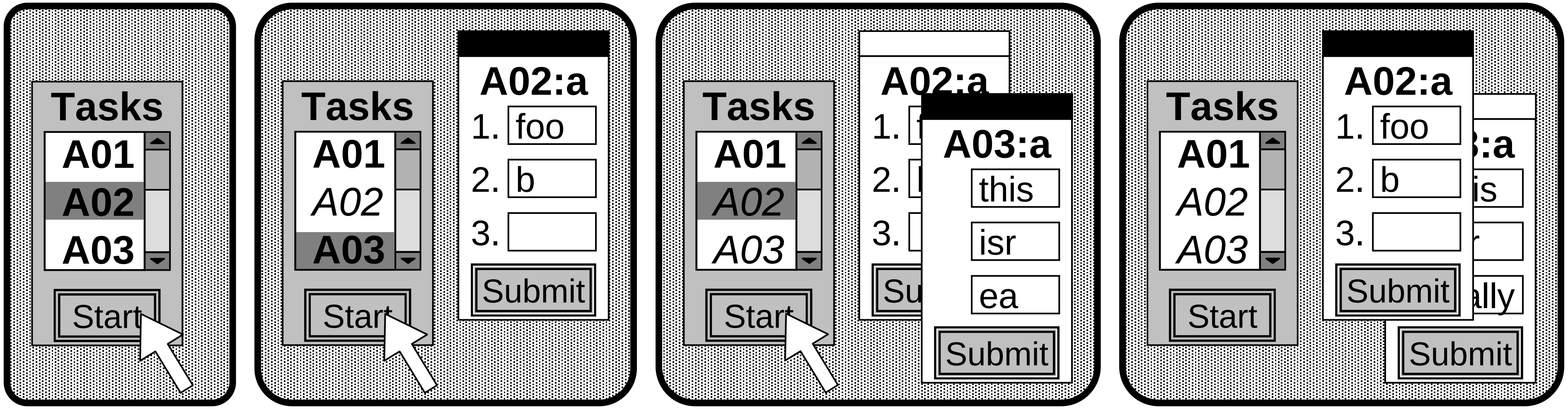

Fig. 7.6. Virtual screens versus viewports versus windows.

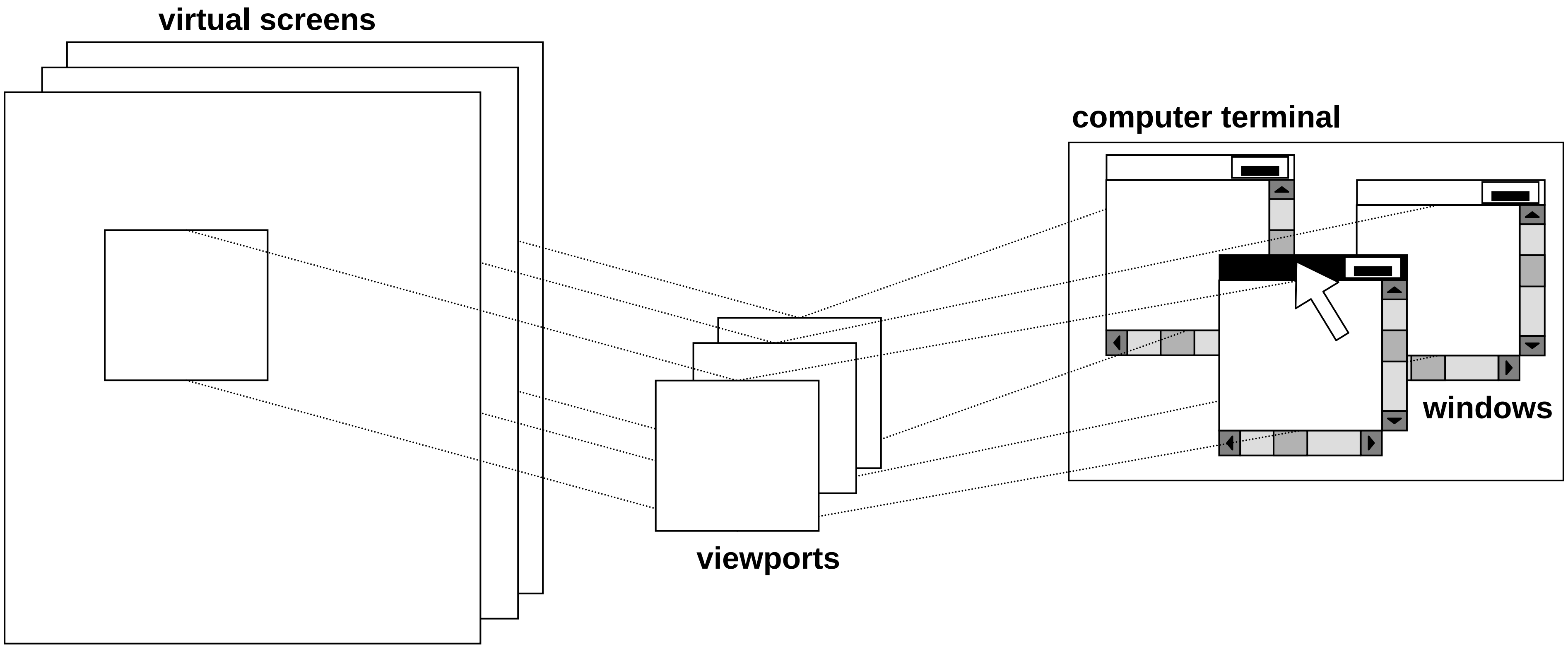

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Fig. 7.7. Exploiting the root pane of a windowing system as worklist.

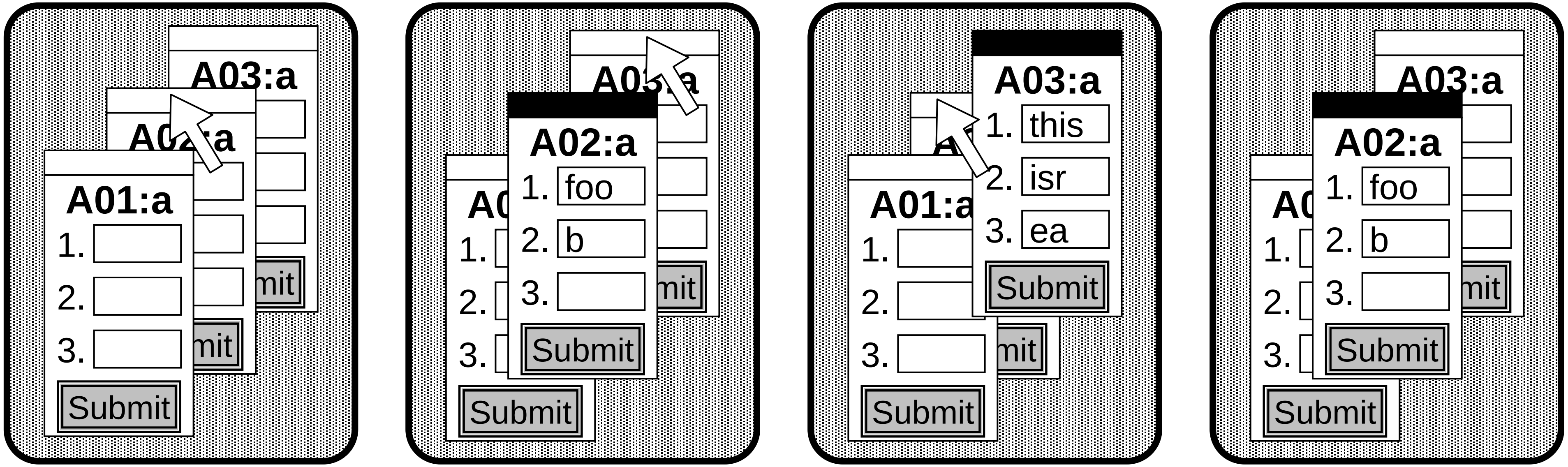
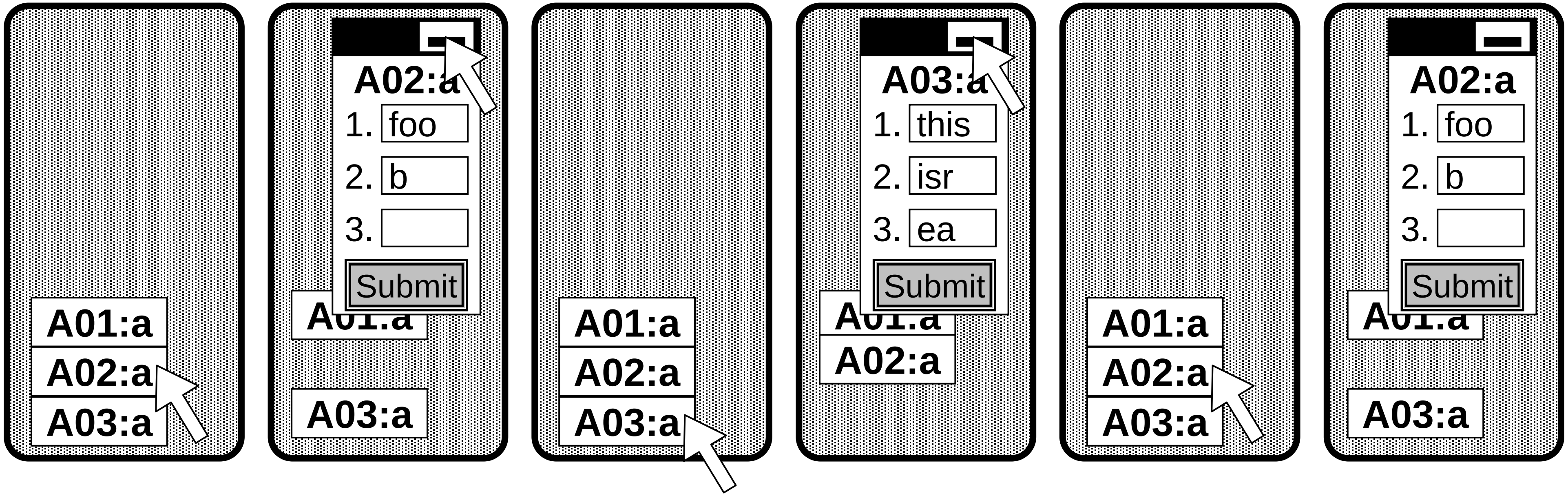


Fig. 7.8. Fully exploiting windowing for saving screen states of a workflow system.



1. foo
2. b
3.

1. this
2. isr
3. ea

1. foo
2. b
3.

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Fig. 7.9. Process definition with complex activity implementing system dialogues.

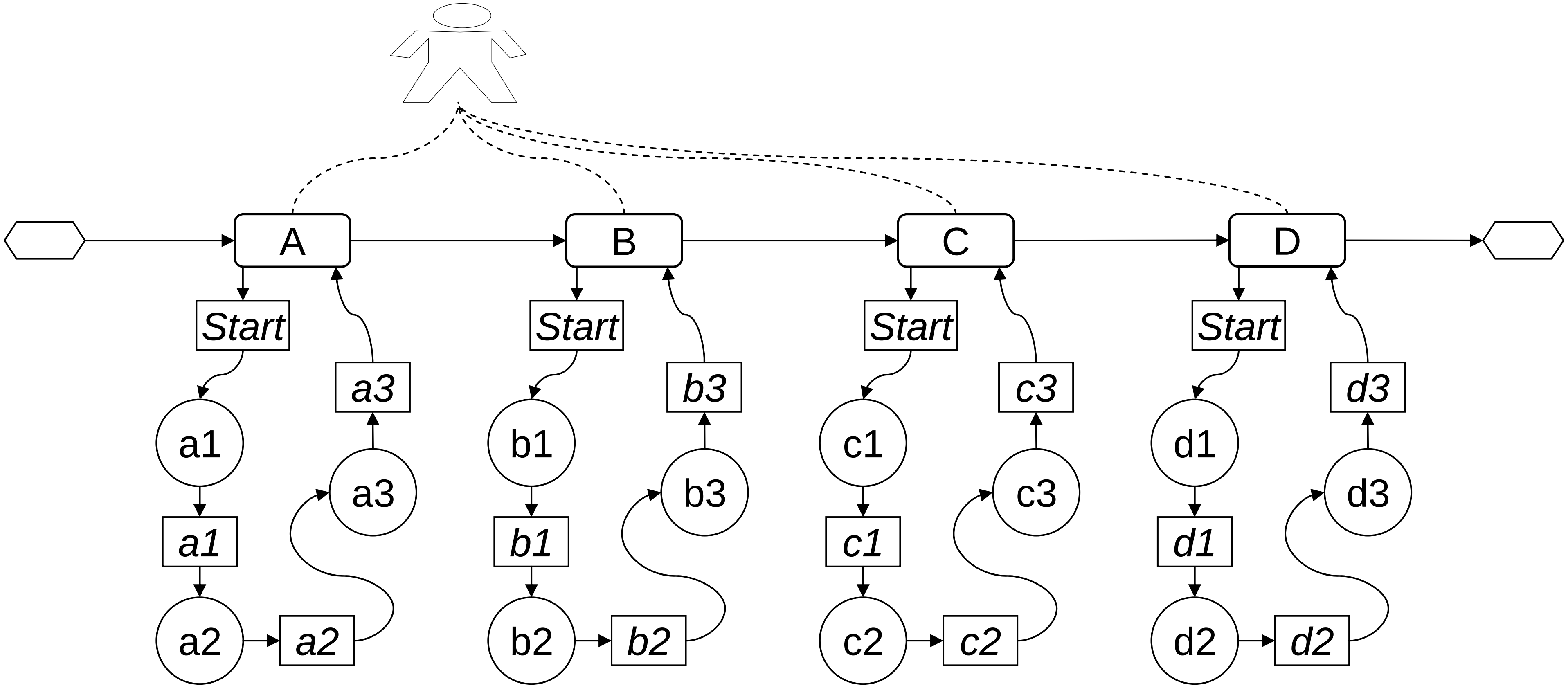

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Fig. 7.10. Strictly chained process execution in a terminal-server style workflow system.

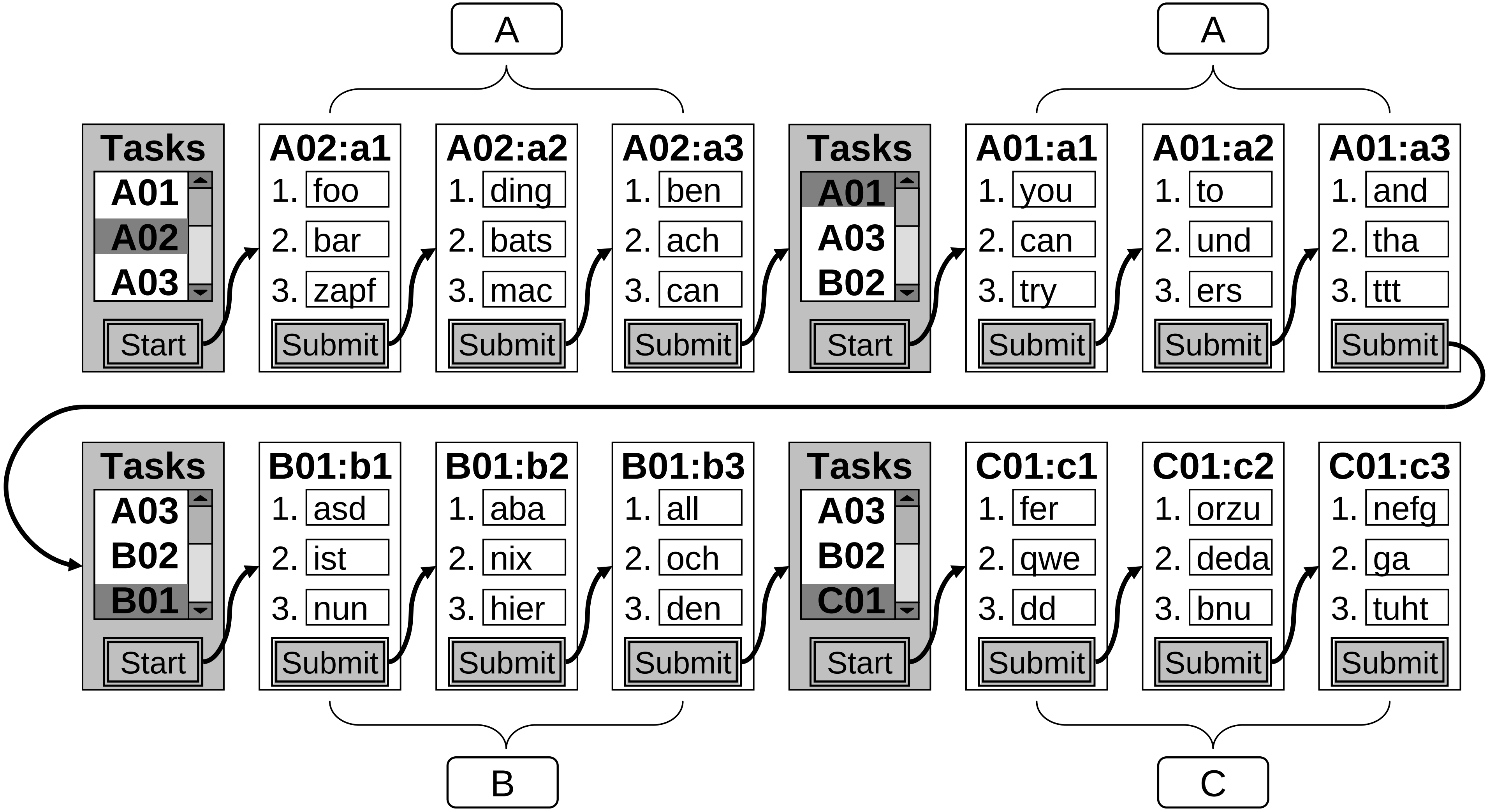
A
A
Tasks A01 A02 A03 Start
A02:a1 1. foo 2. bar 3. zapf Submit
A02:a2 1. ding 2. bats 3. mac Submit
A02:a3 1. ben 2. ach 3. can Submit
Tasks A01 A03 B02 Start
A01:a1 1. you 2. can 3. try Submit
A01:a2 1. to 2. und 3. ers Submit
A01:a3 1. and 2. tha 3. ttt Submit
Tasks A03 B02 B01 Start
B01:b1 1. asd 2. ist 3. nun Submit
B01:b2 1. aba 2. nix 3. hier Submit
B01:b3 1. all 2. och 3. den Submit
Tasks A03 B02 C01 Start
C01:c1 1. fer 2. qwe 3. dd Submit
C01:c2 1. orzu 2. deda 3. bnu Submit
C01:c3 1. nefg 2. ga 3. tuht Submit
B
C

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Fig. 7.11. Roles attached to a workflow definition.

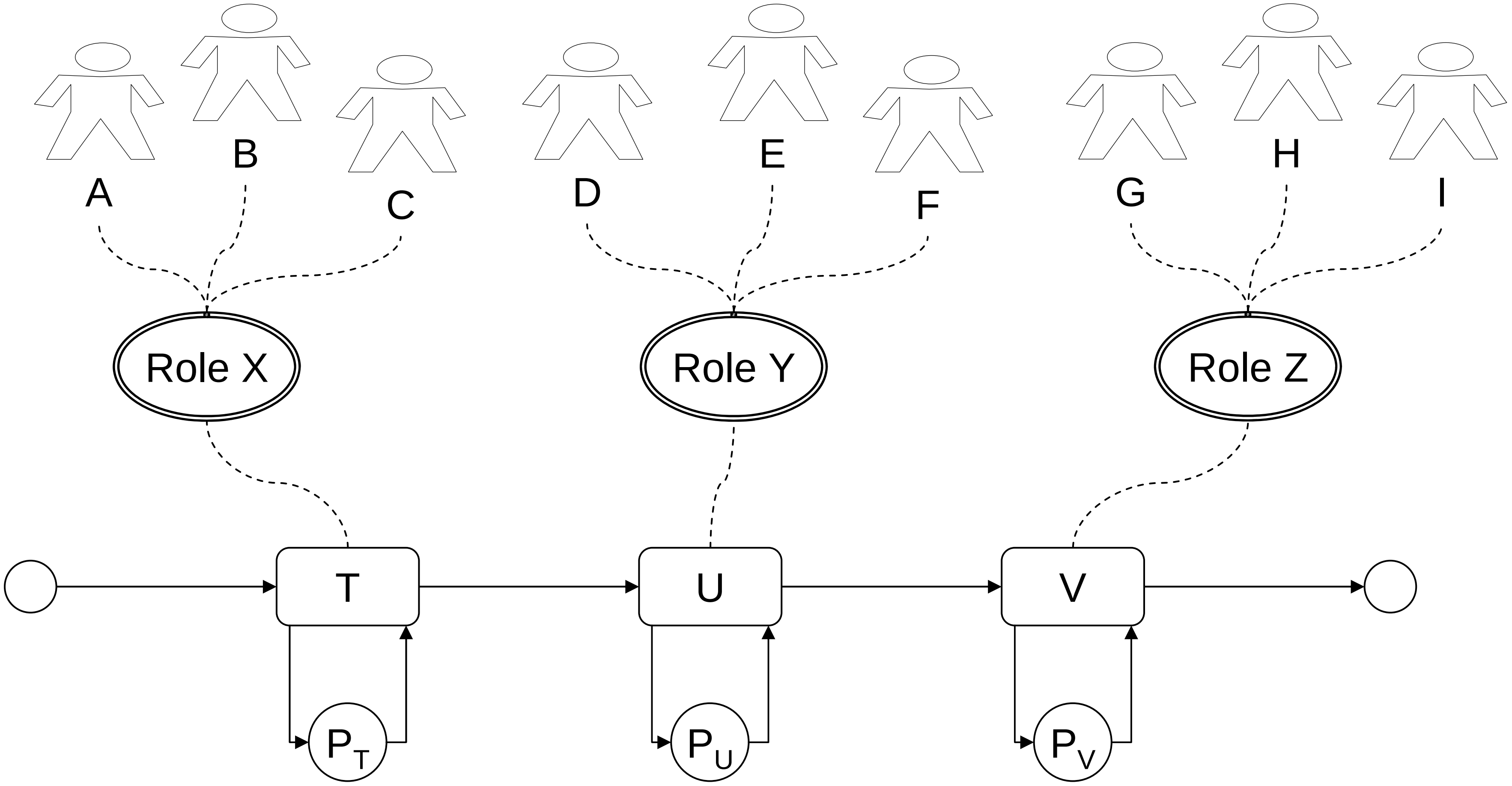

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Fig. 7.12. Repaintings of the workflow definition in Fig. 7.11.

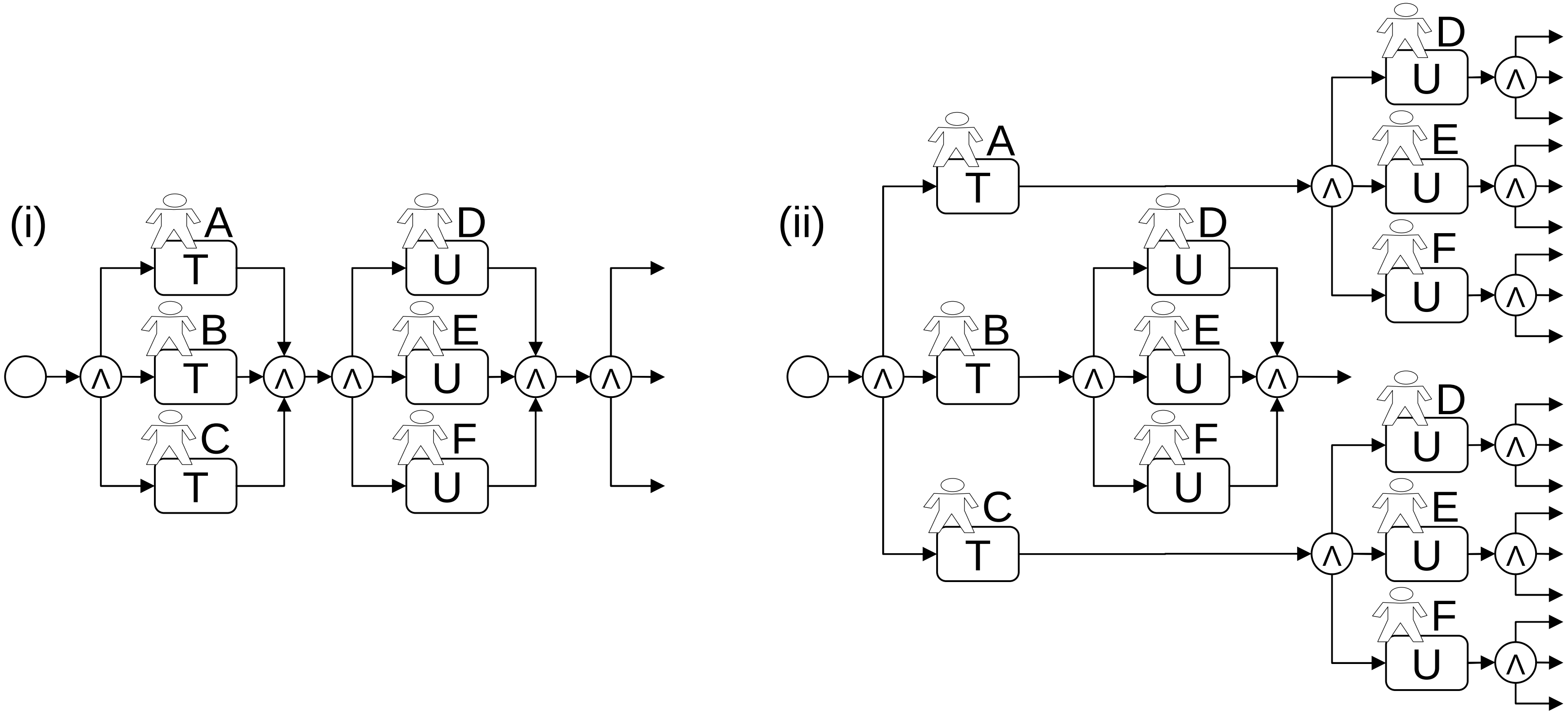

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Fig. 7.13. Business process model with the same role attached to multiple activities.

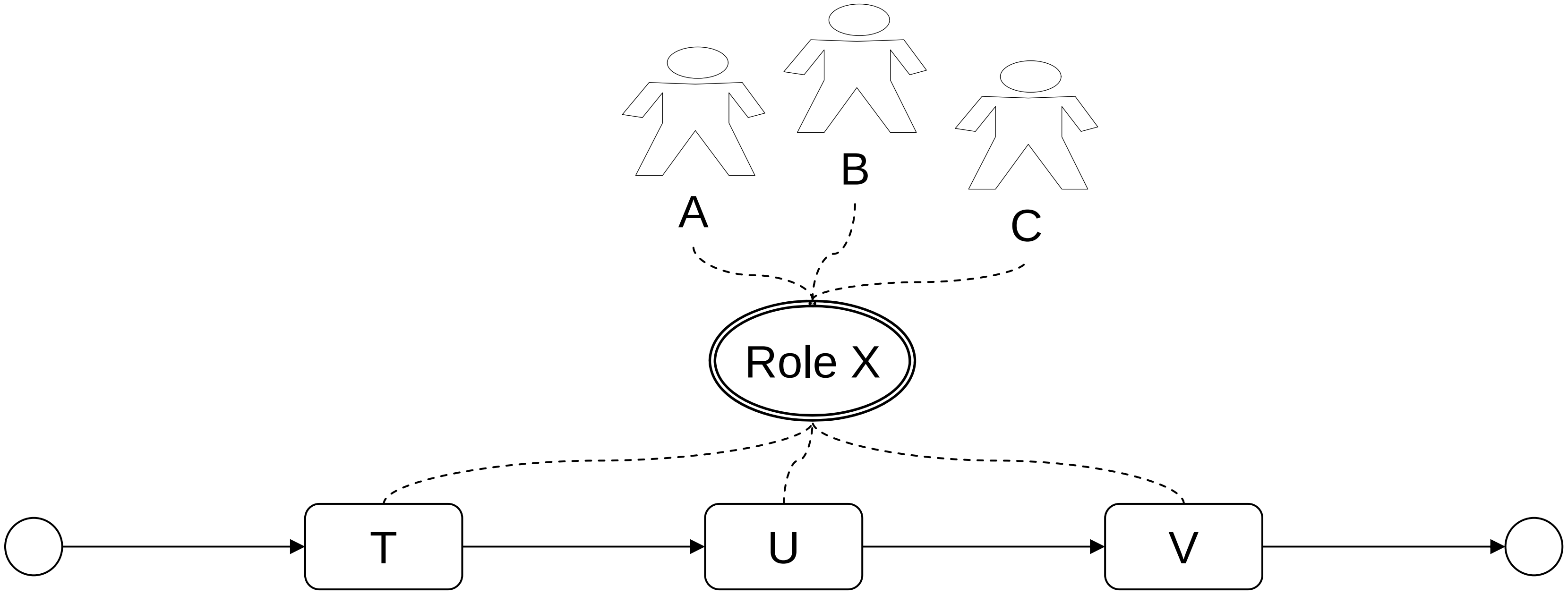

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Fig. 7.14. Attempt to detail the meaning of the process model in Fig. 7.13.

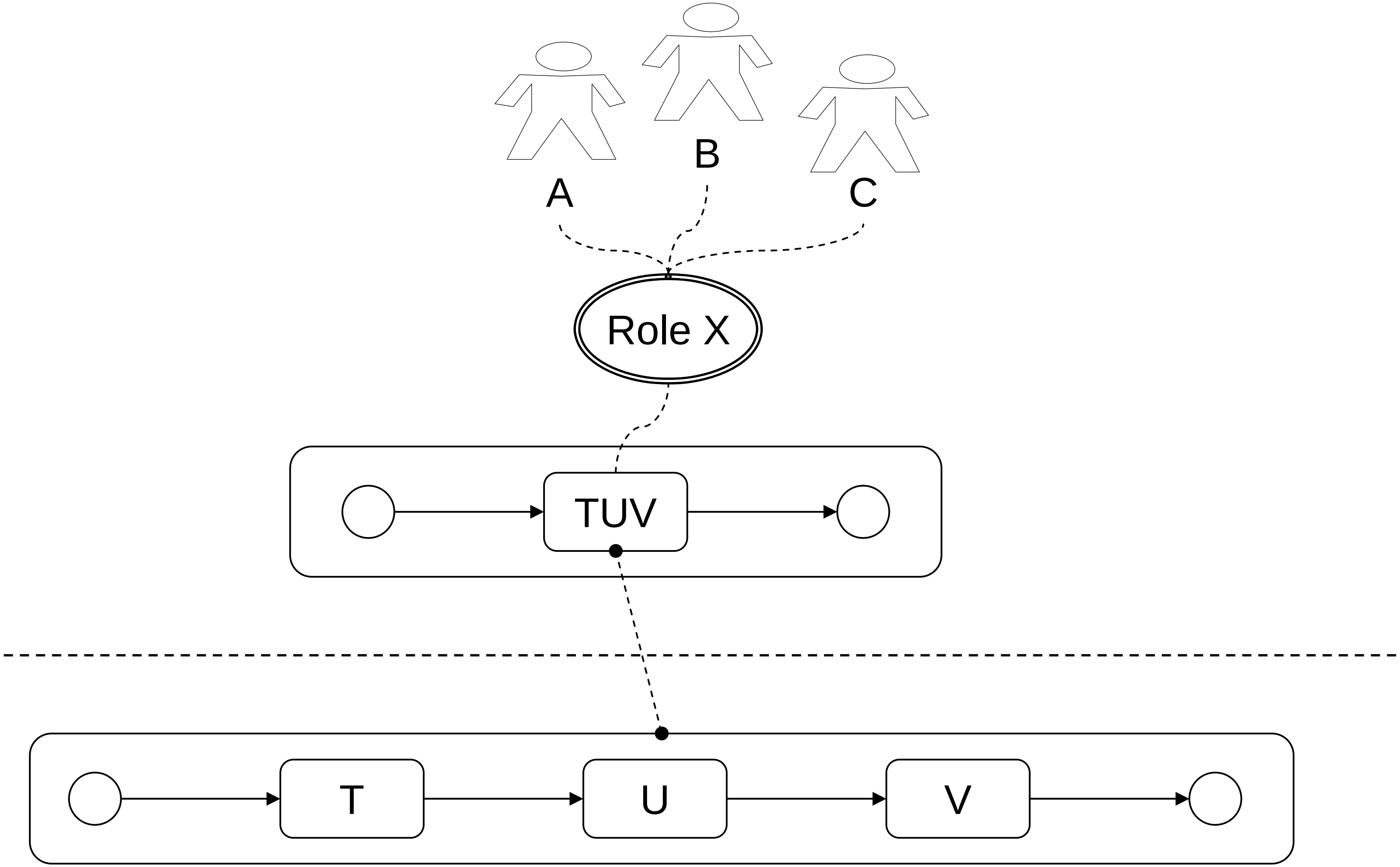

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Fig. 7.15. Business process with complex actor assignment for conducting a business trip.

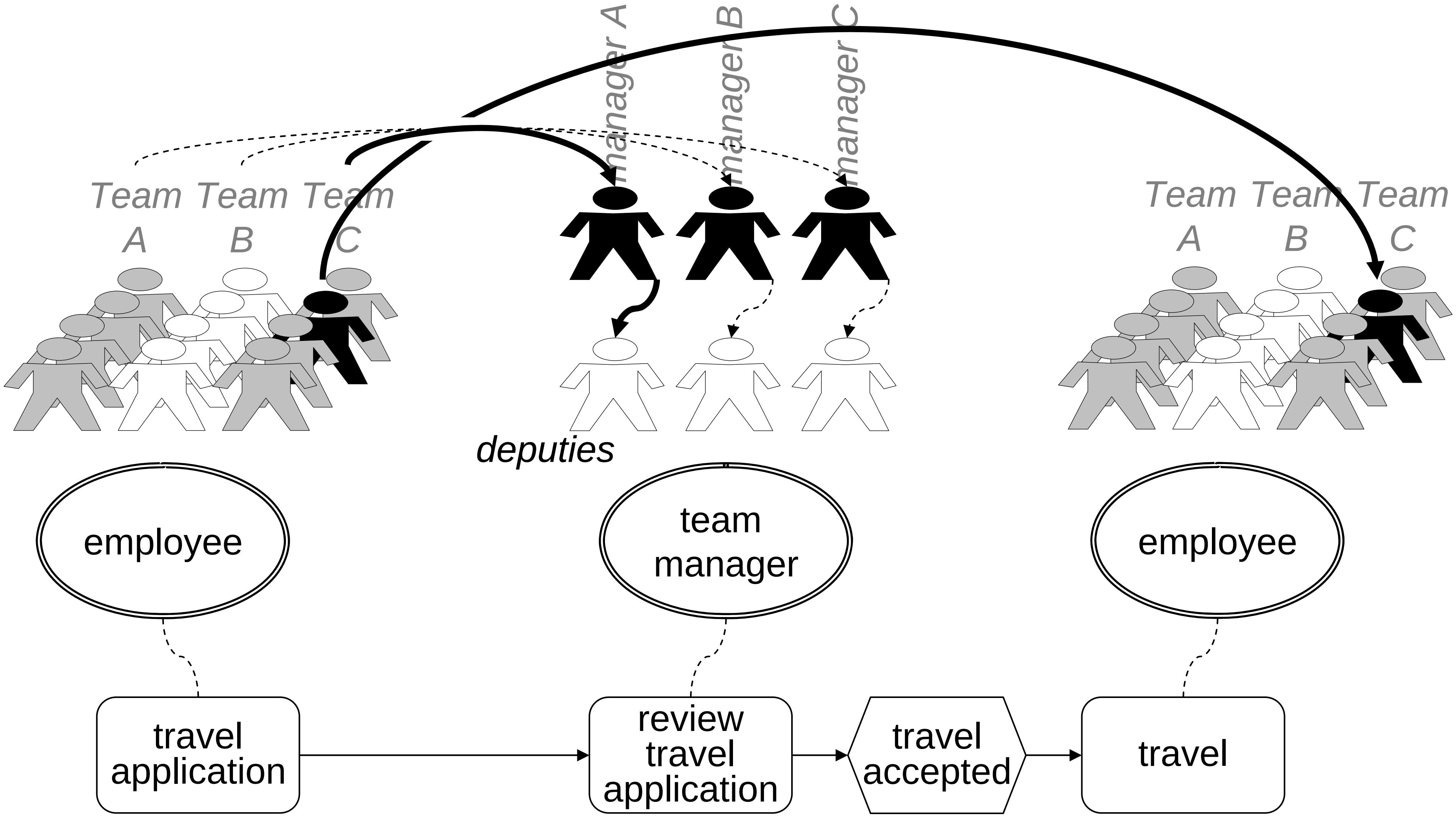

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Fig. 7.16. General dynamic actor scheduling in workflow automation.

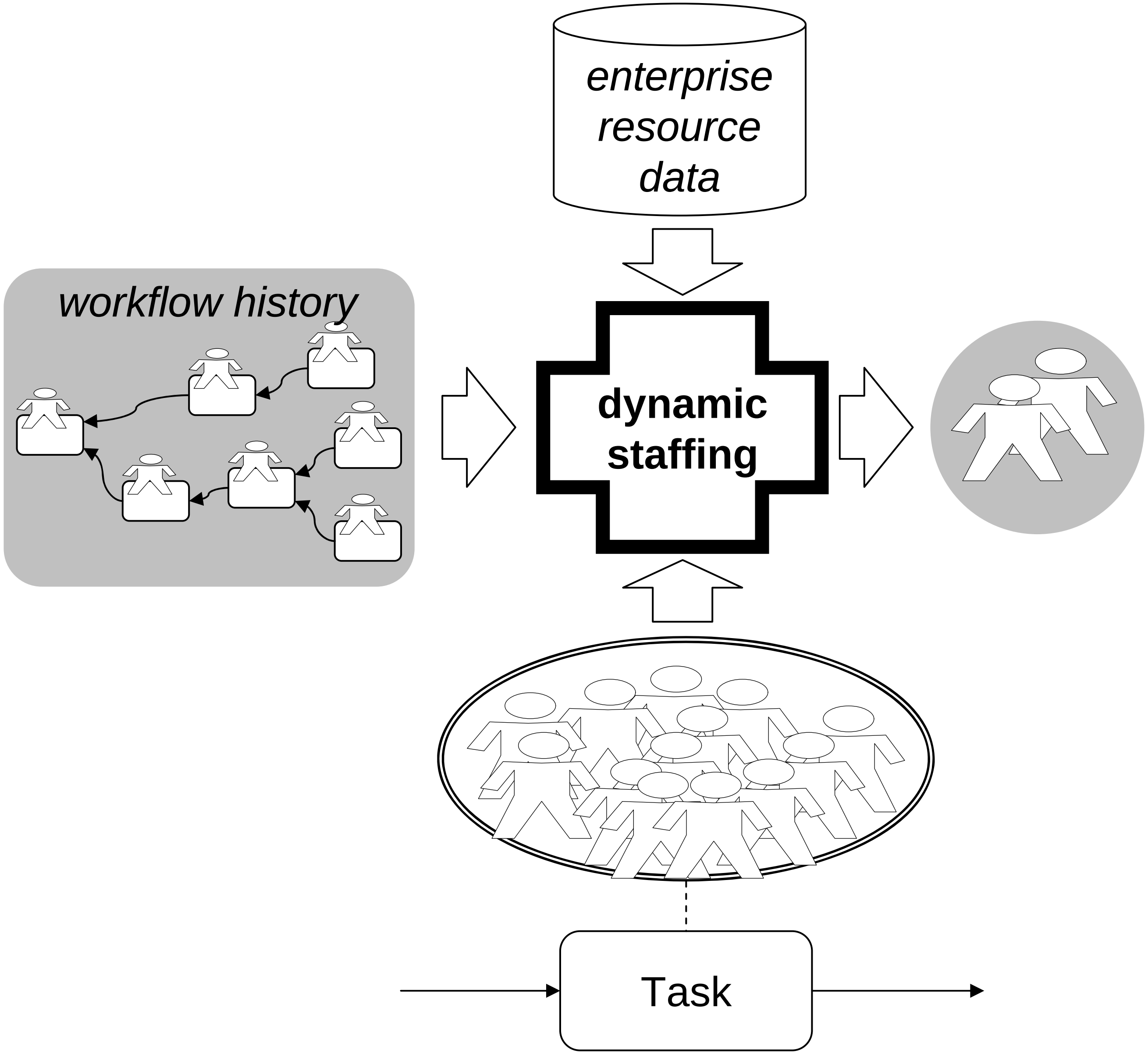

Fig. 8.1. The evolution of SOA paradigms and visions.

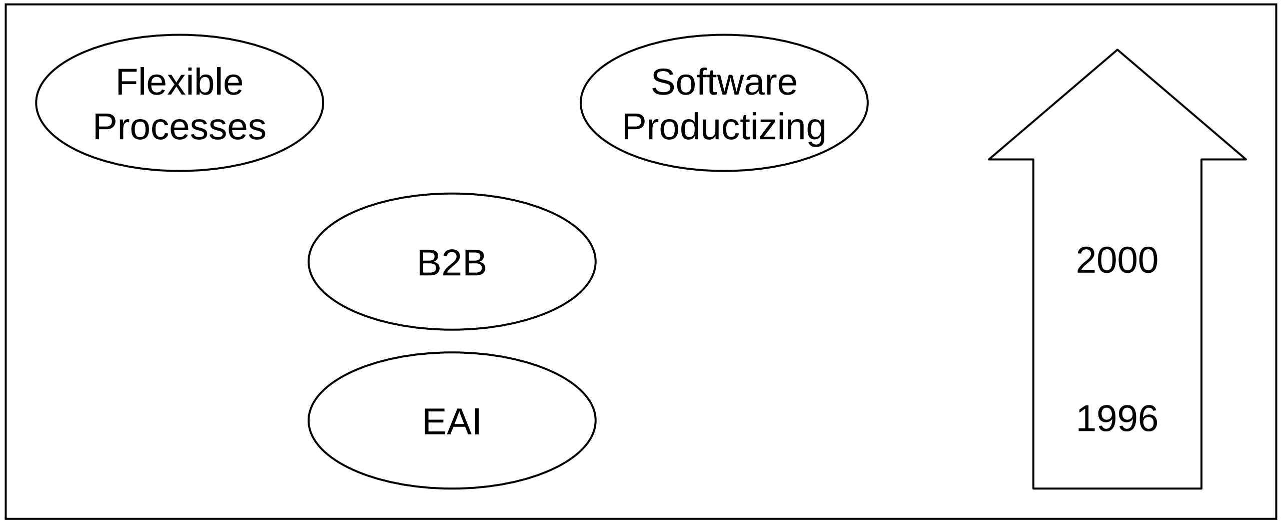

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Fig. 8.2. Gartner Group tier terminology for service-oriented architecture.

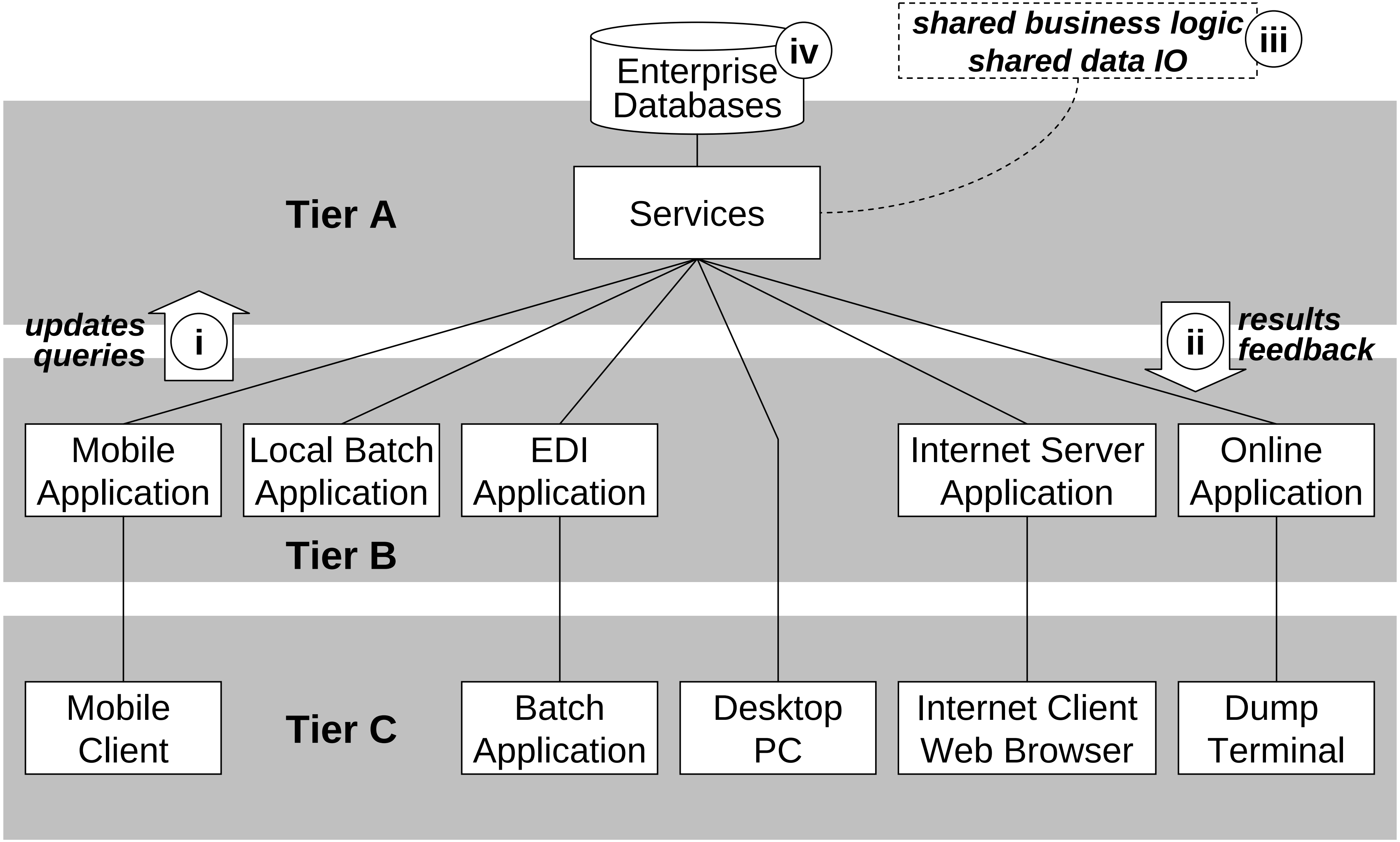

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Fig. 8.3. Example CORBA service bus for banking applications.

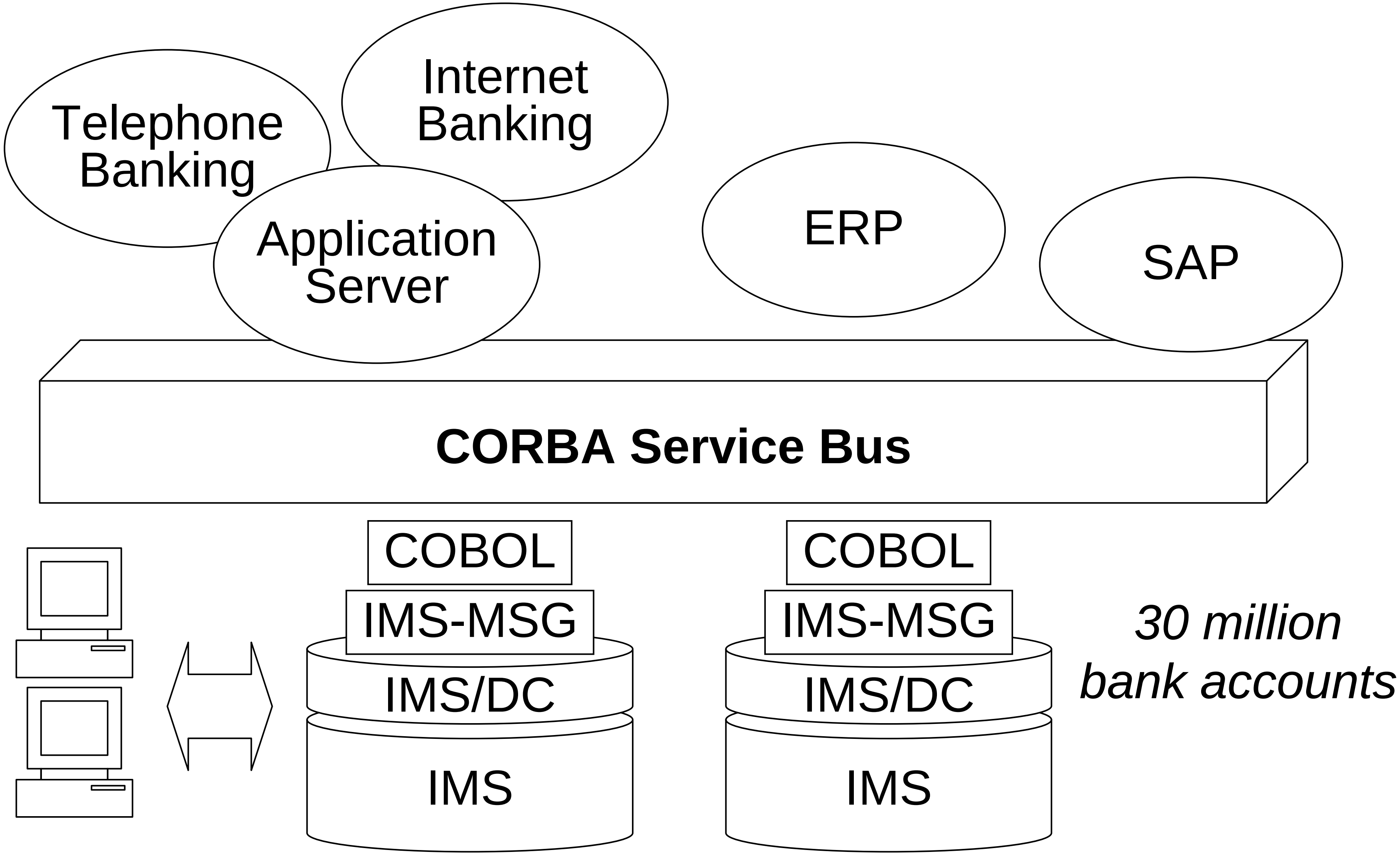

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Fig. 8.4. The web services technology stack then and now.

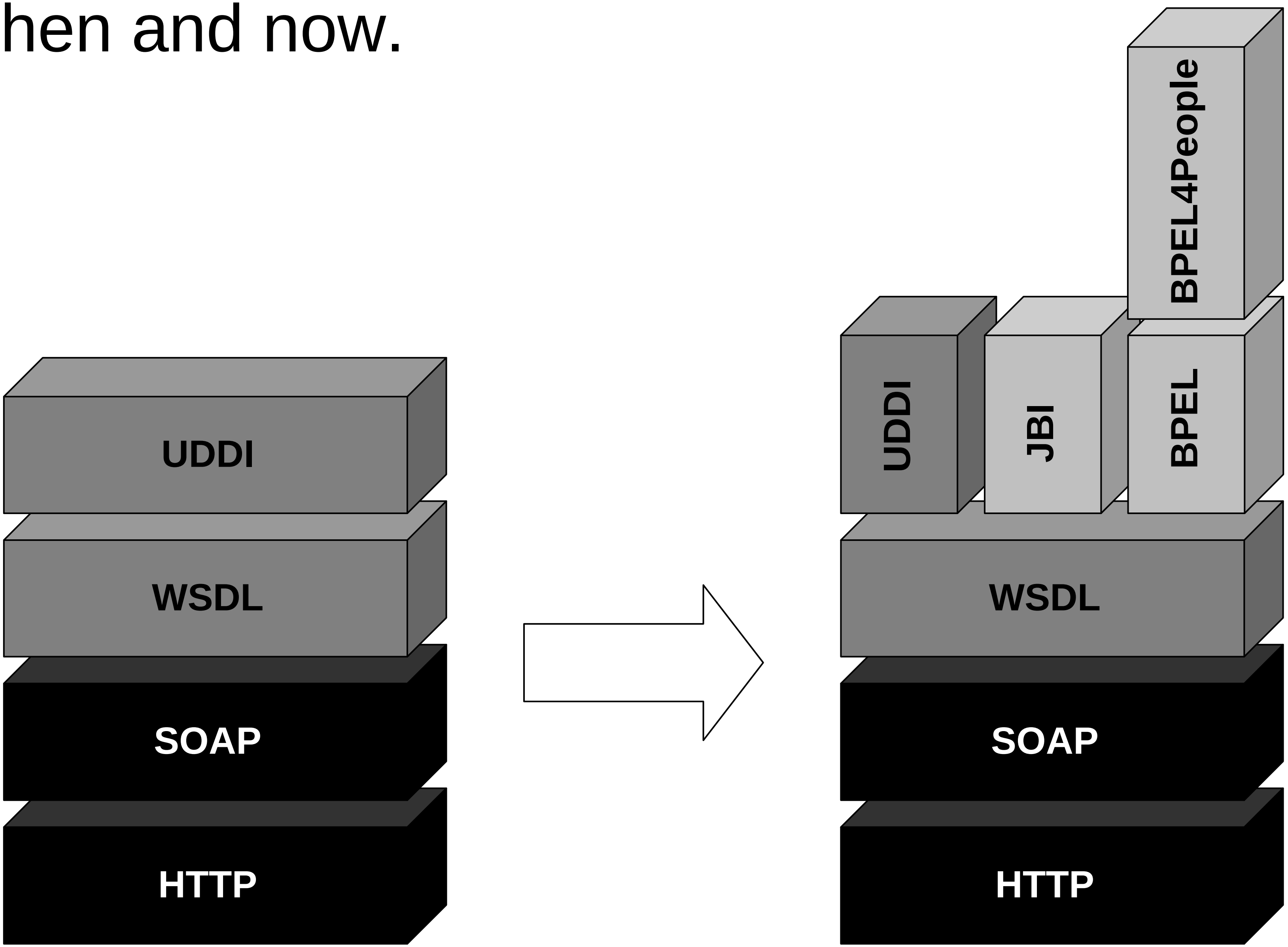

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Fig. 8.5. Exploitation of concrete web services technologies for building business process management systems.

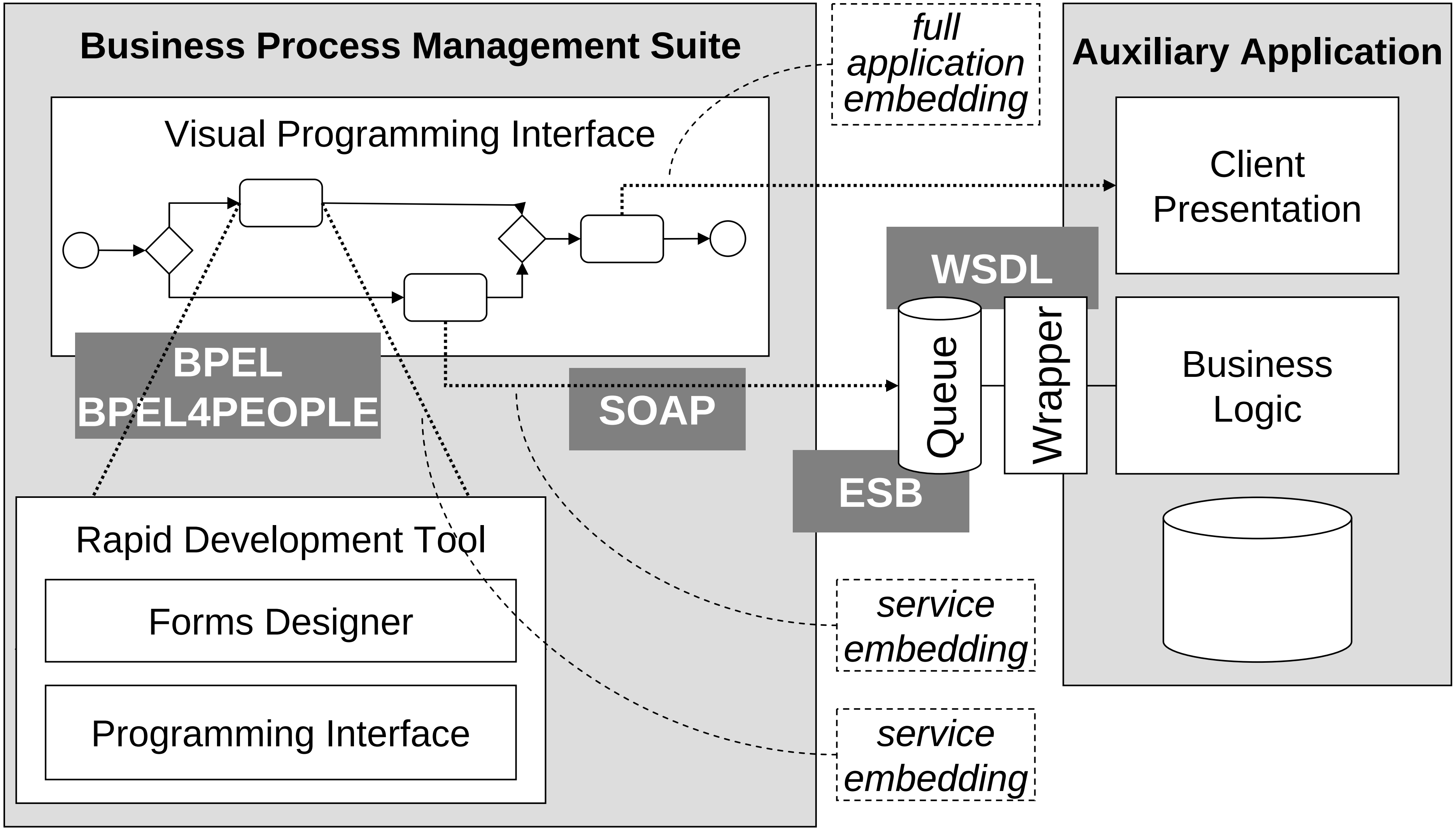

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Fig. 8.6. Stagewise development of silo software systems.

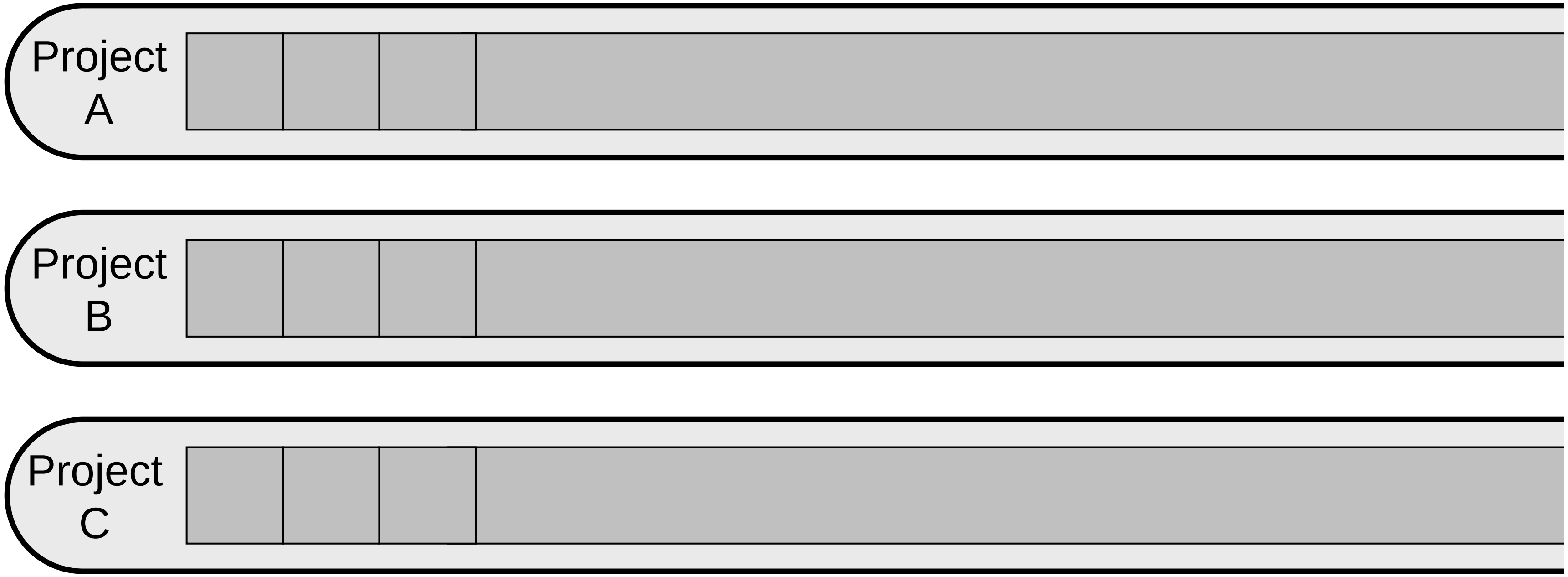

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Fig. 8.7. Iterative development of a silo software system.

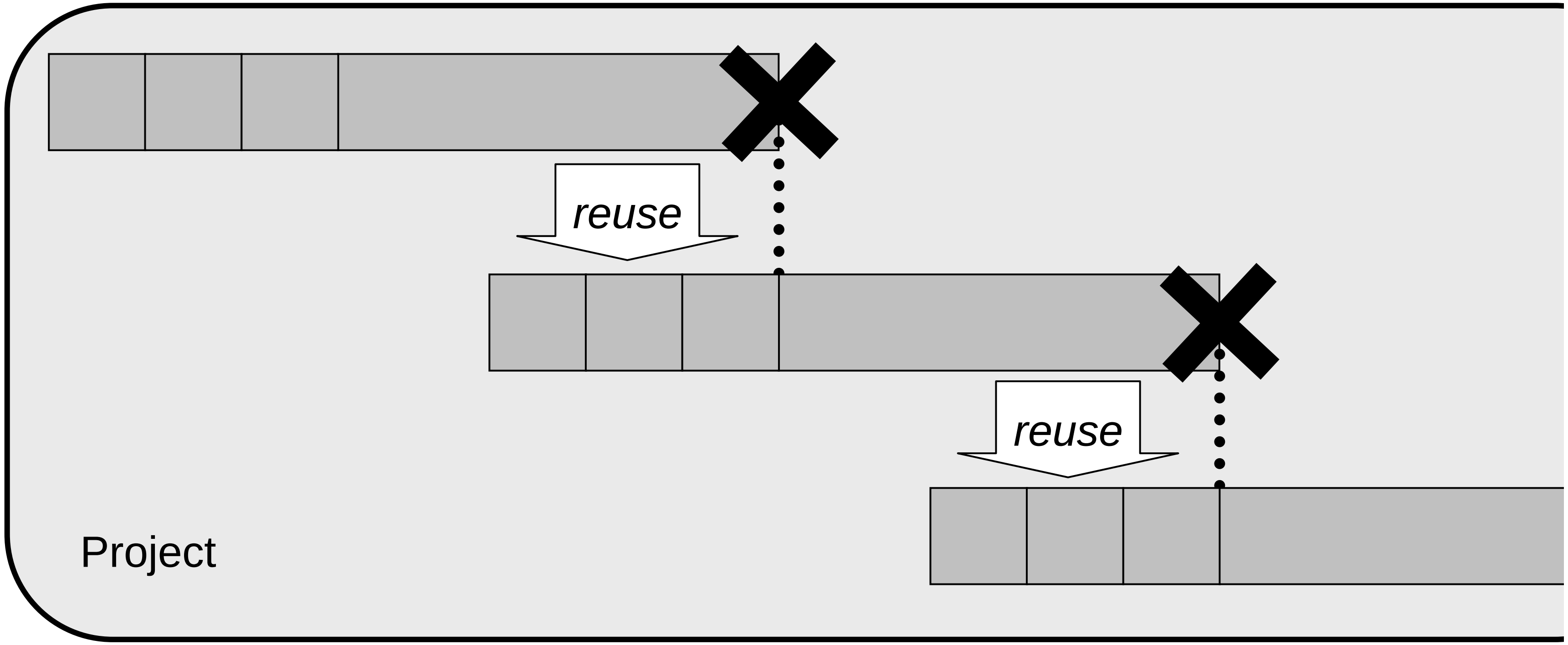

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Fig. 8.8. Division of a project into sub projects.

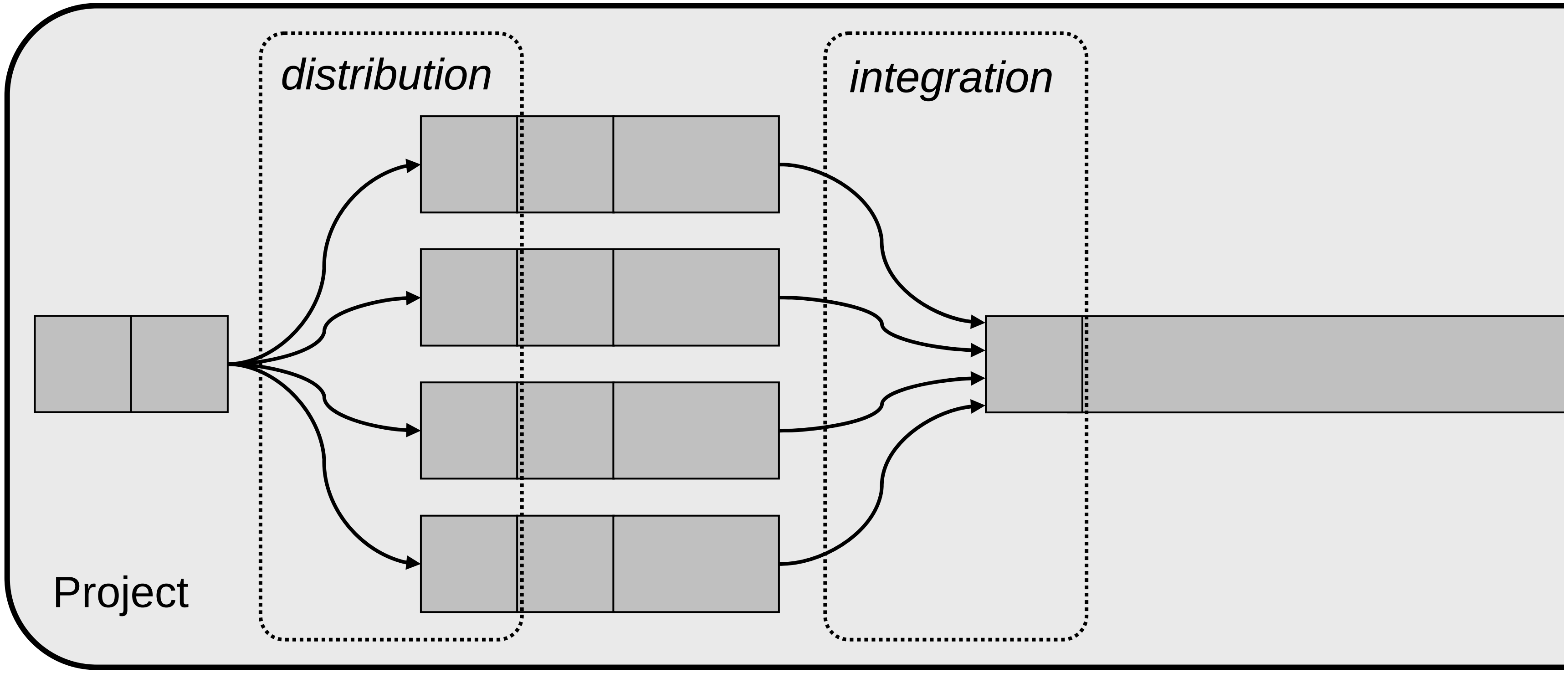

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Fig. 8.9. Software reuse across project boundaries.

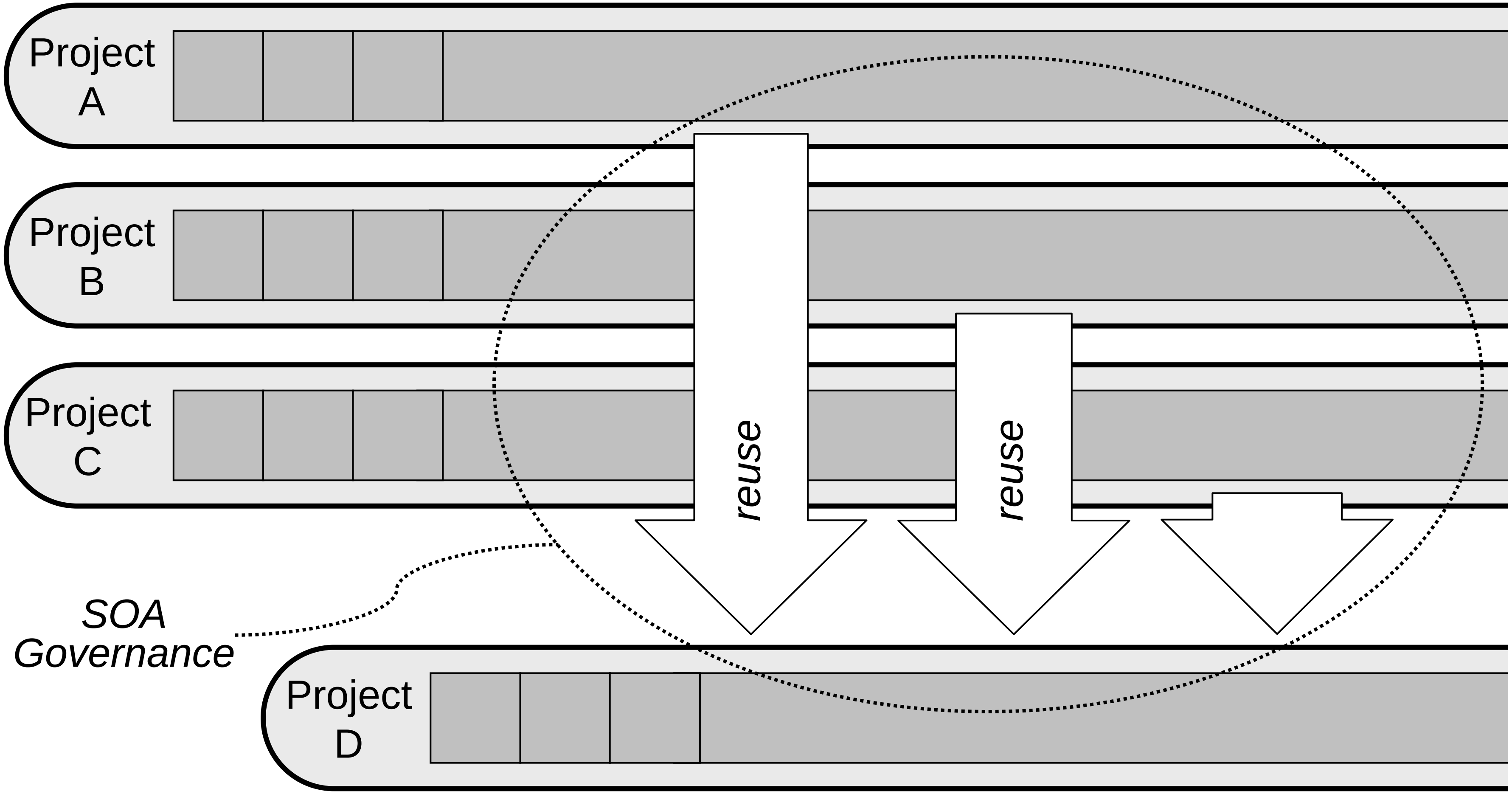

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Fig. 8.10. Software reuse from a maintained software product.

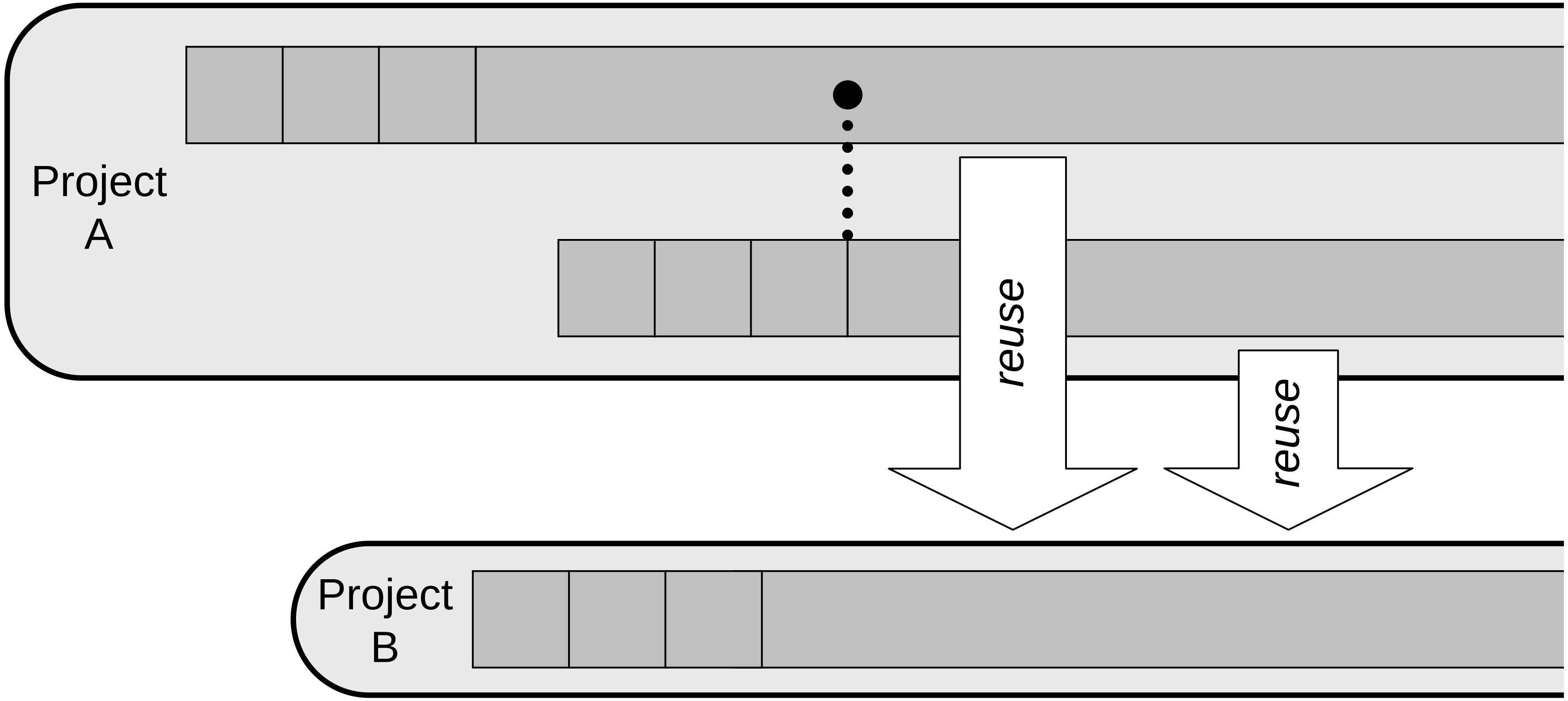

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Fig. 8.11. SOA governance as ubiquitous reuse.

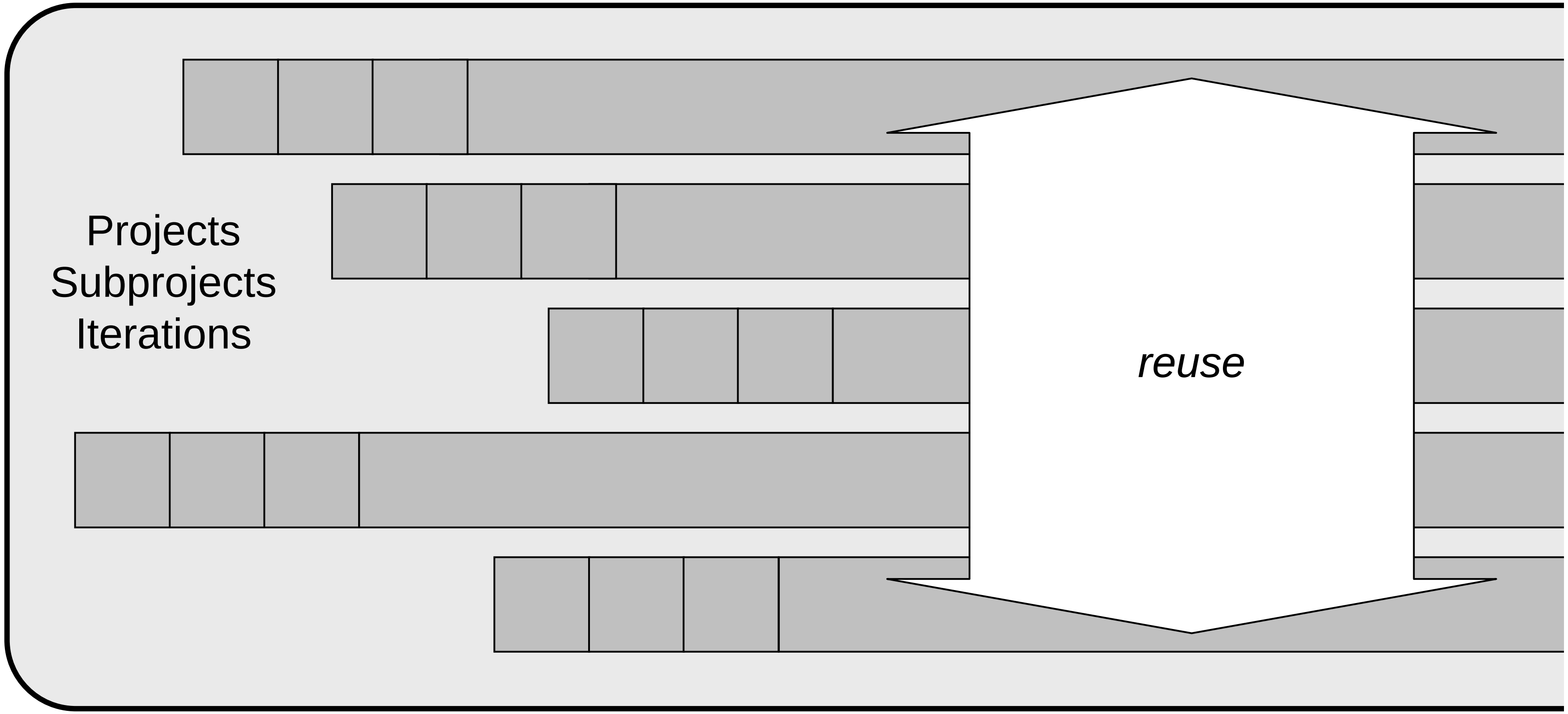

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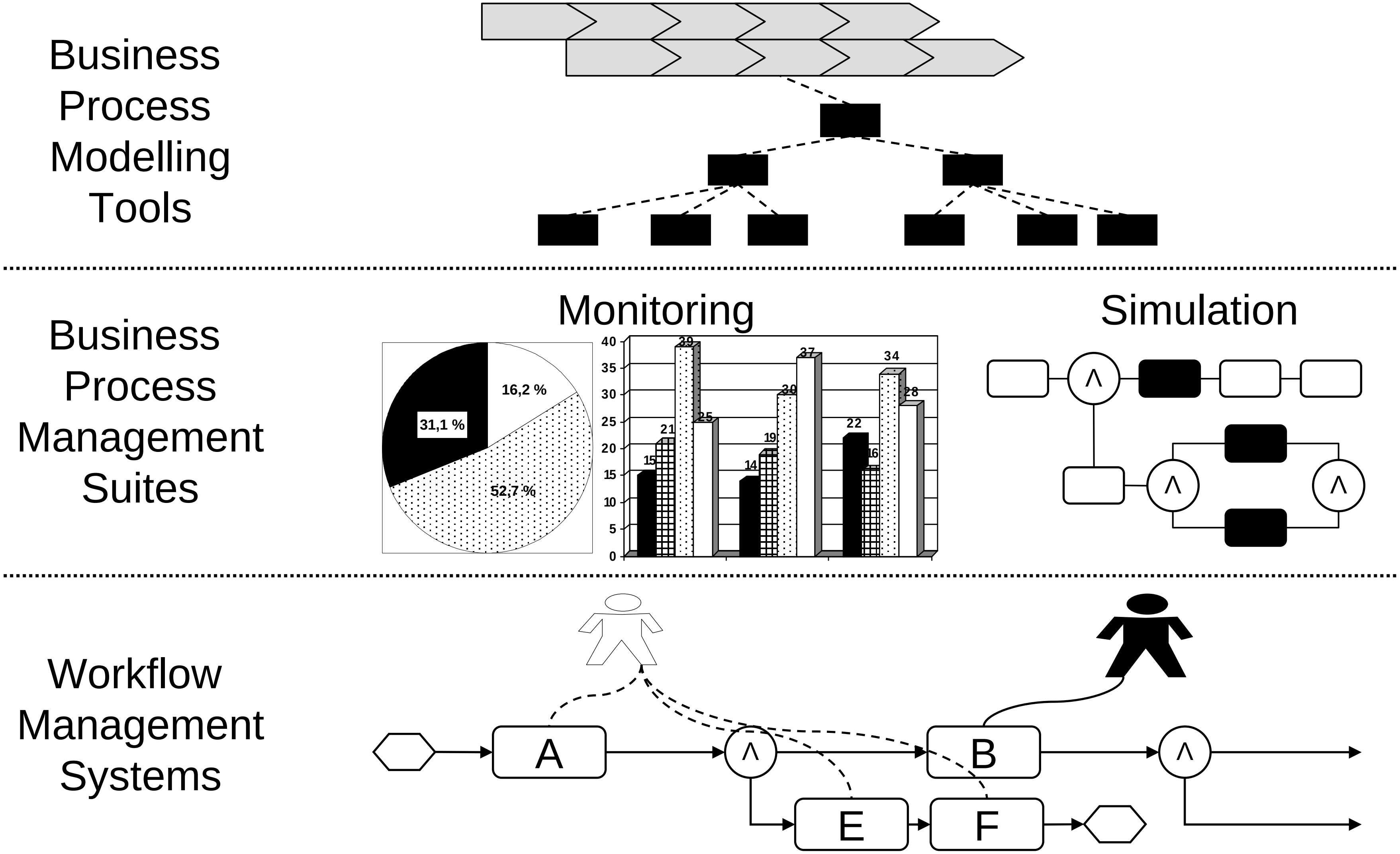
Fig. 9.1. Concrete business process technologies.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Business Process Management Suites

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Fig. 9.2. Business process model for conducting a business trip.

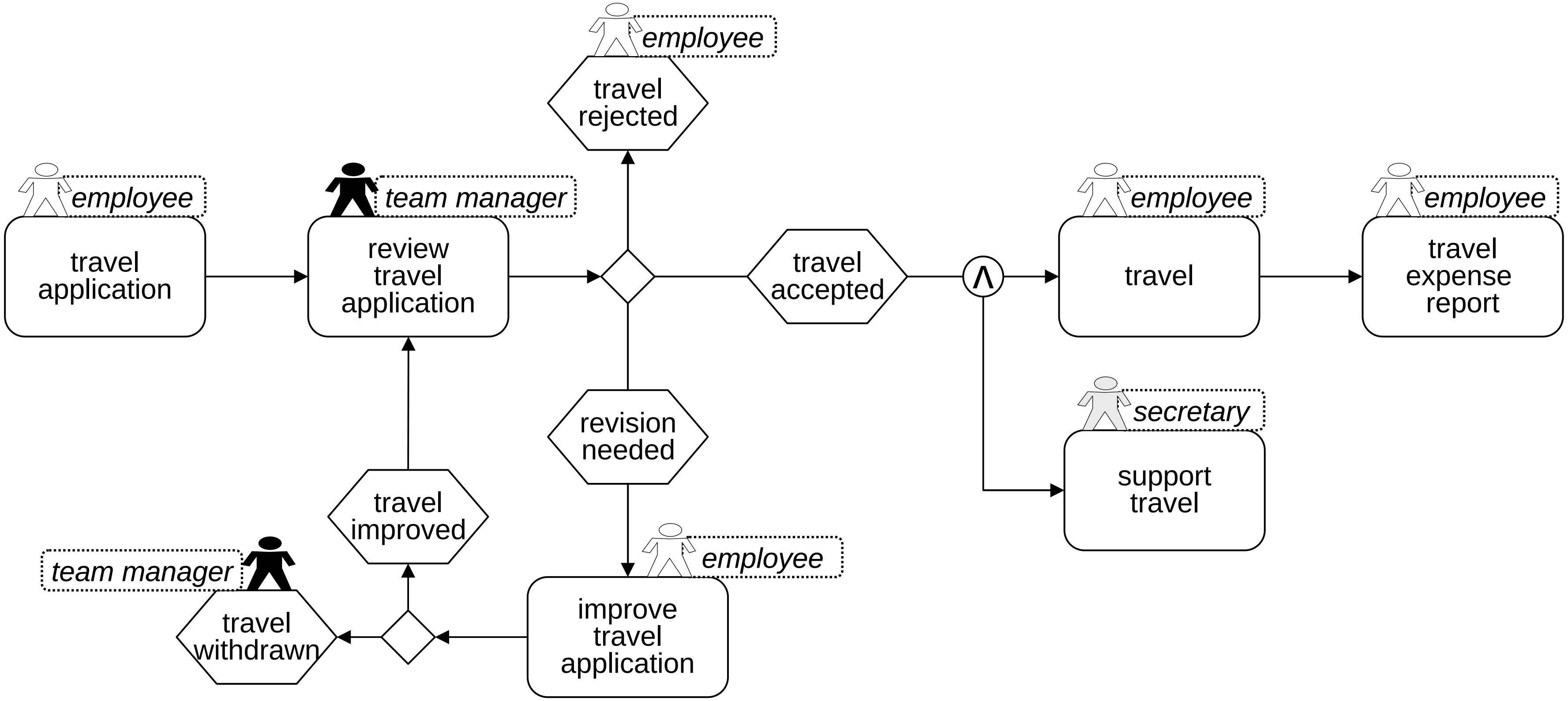

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Fig. 9.3. Workflow chart for conducting a business trip.

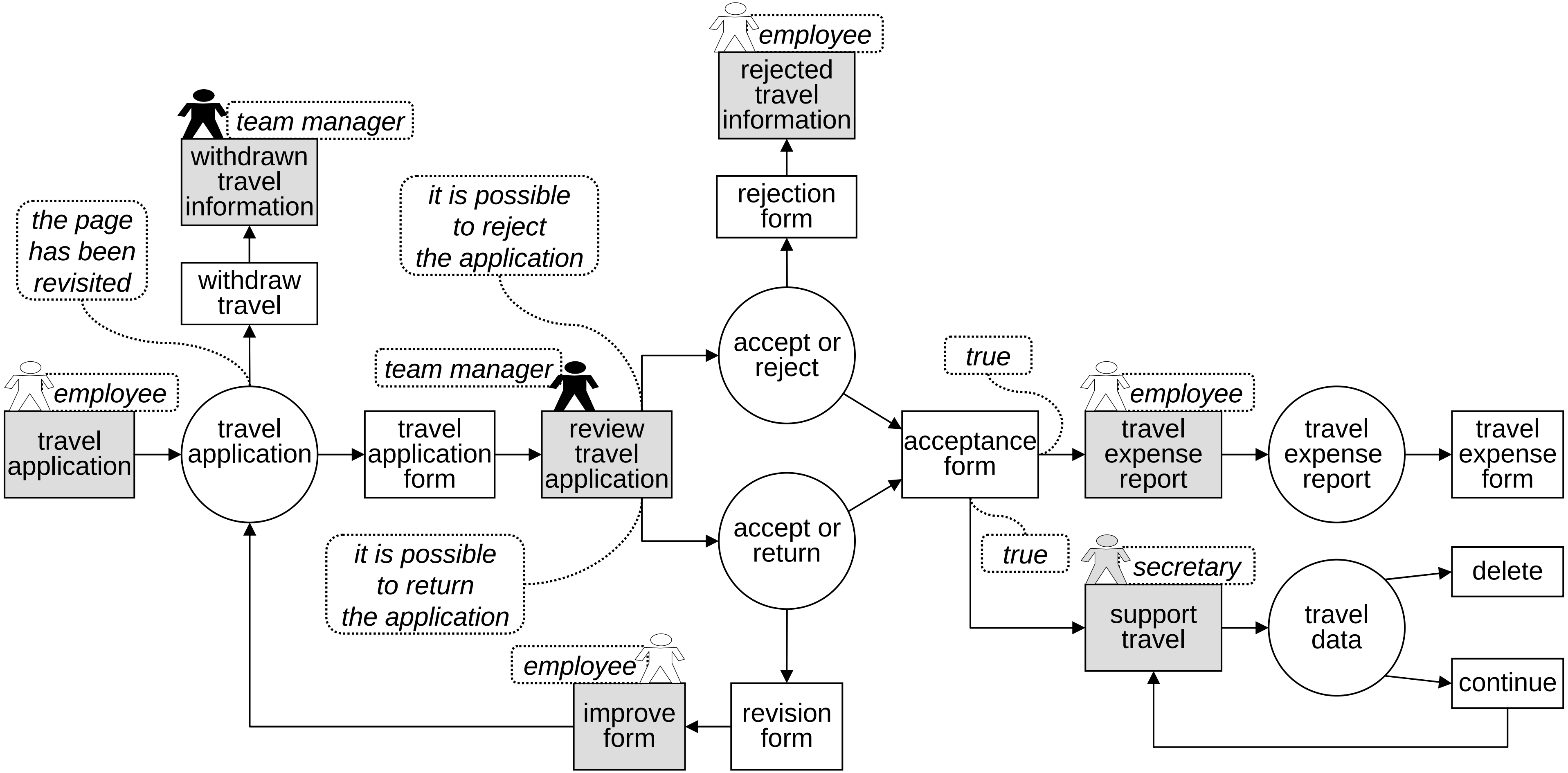

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Fig. 9.4. Basic workflow chart.

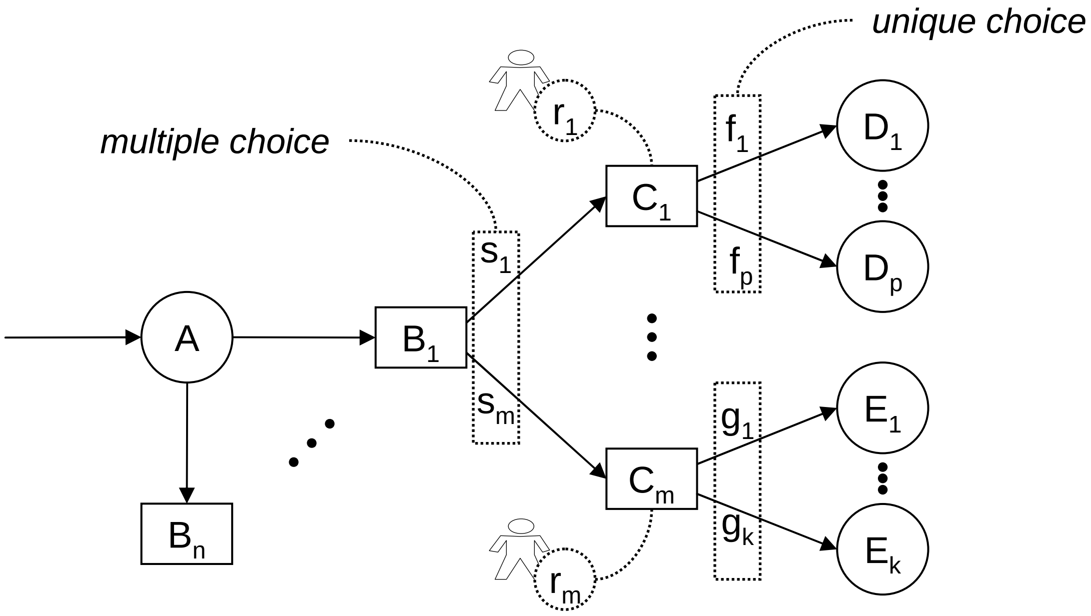

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Fig. 9.5. Implicit versus explicit multiple choice.

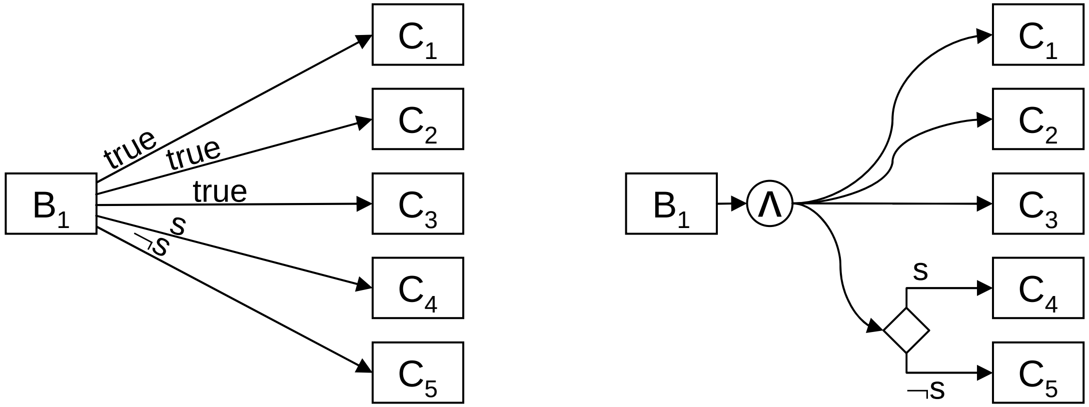

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Fig. 9.6. Deferred server actions as entries to workflows.

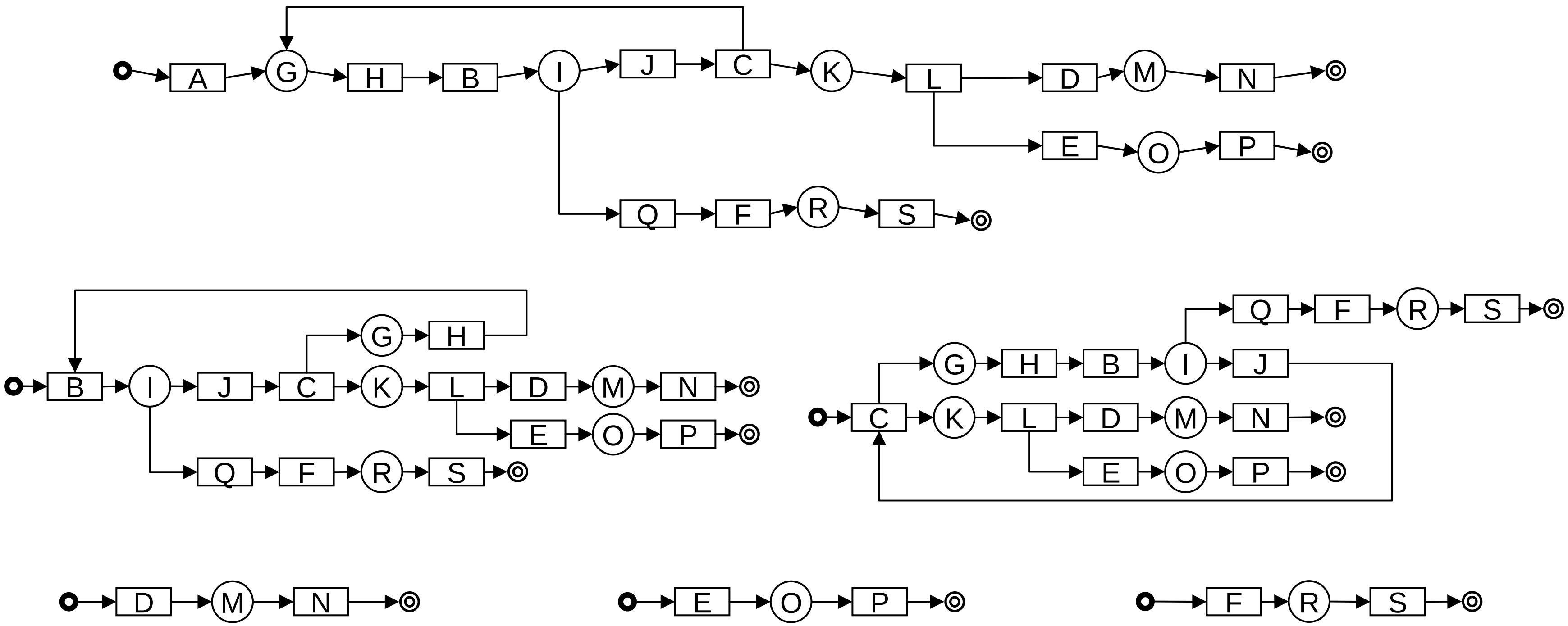

Fig. 9.7. Standard example for synchronization in workflow charts.

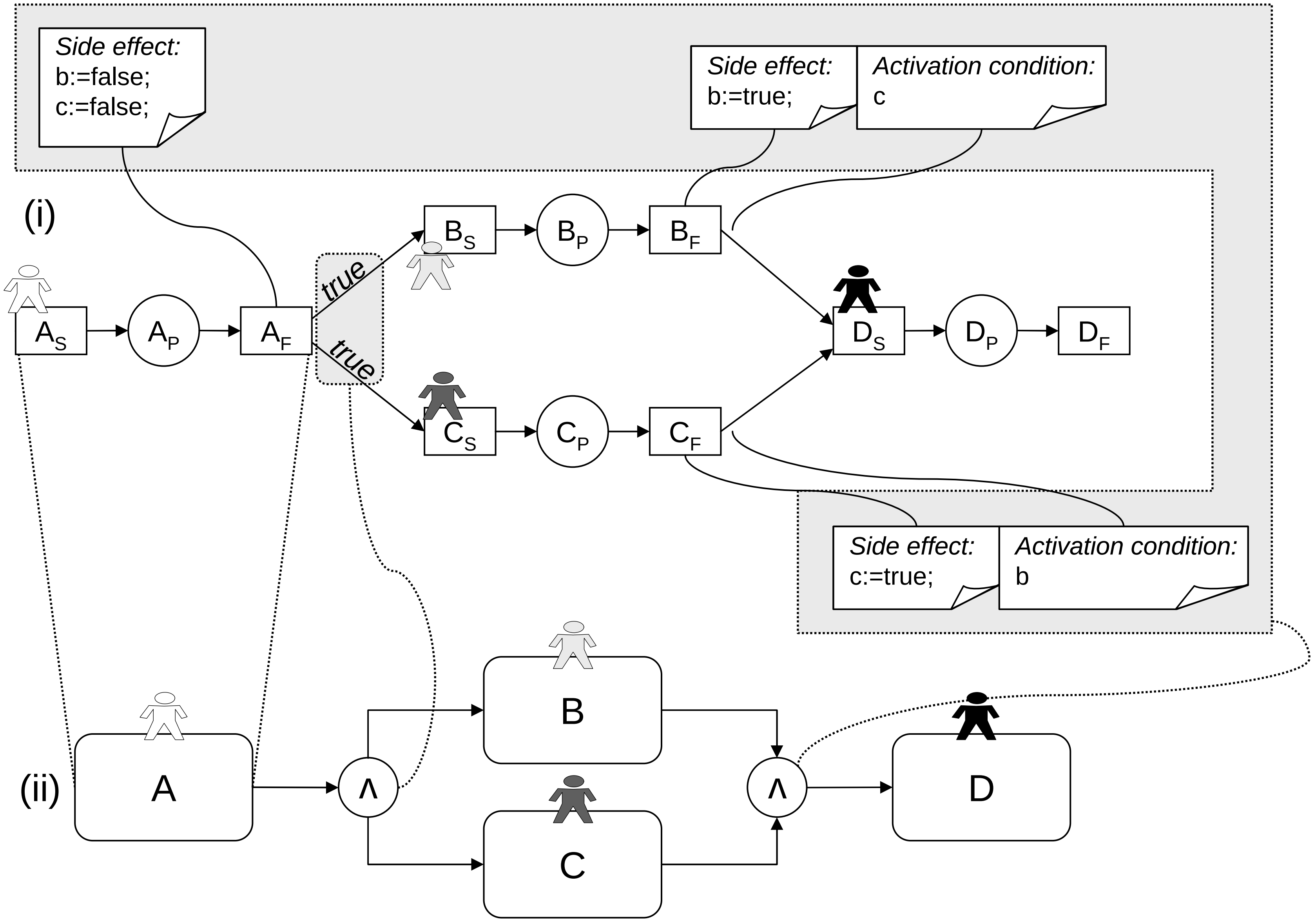

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Fig. 9.8. An enterprise system landscape before integration.

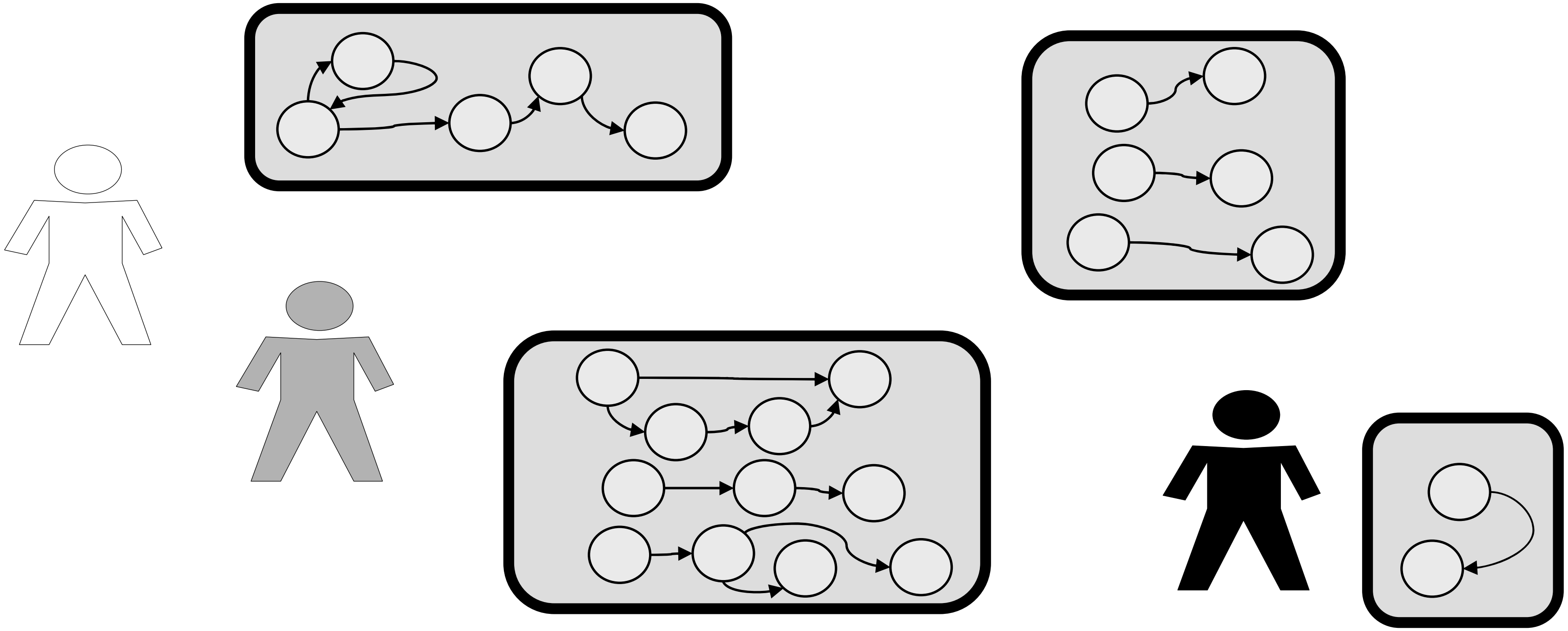

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Fig. 9.9. Enterprise application integration with the help of workflow technology.

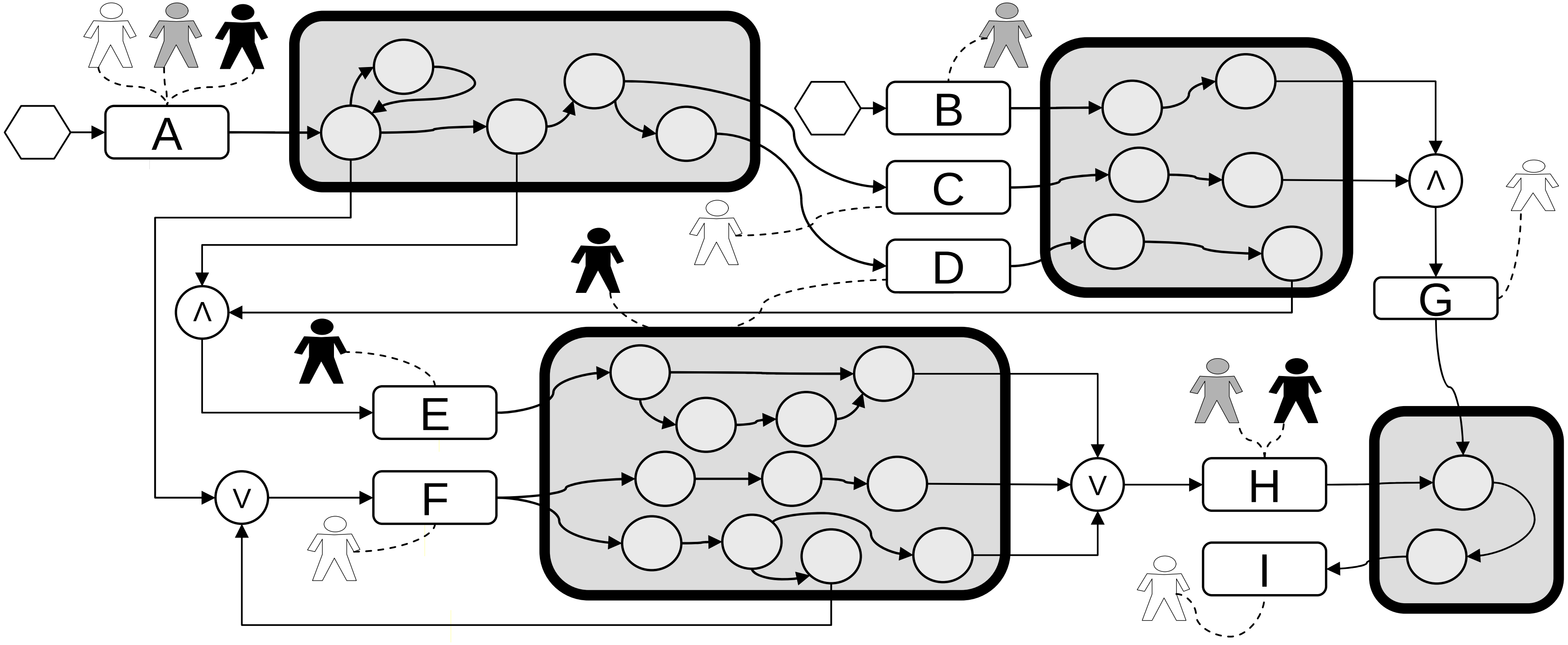

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Fig. 9.10. Inserting auxiliary specification between client pages and immediate server actions.

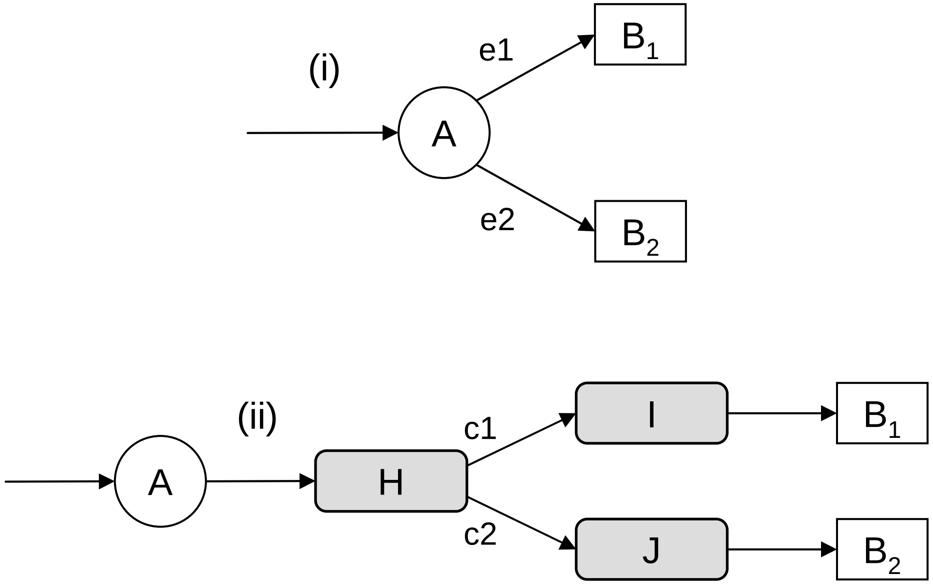

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Fig. 9.11. Synchronizing auxiliary activity against form submission.

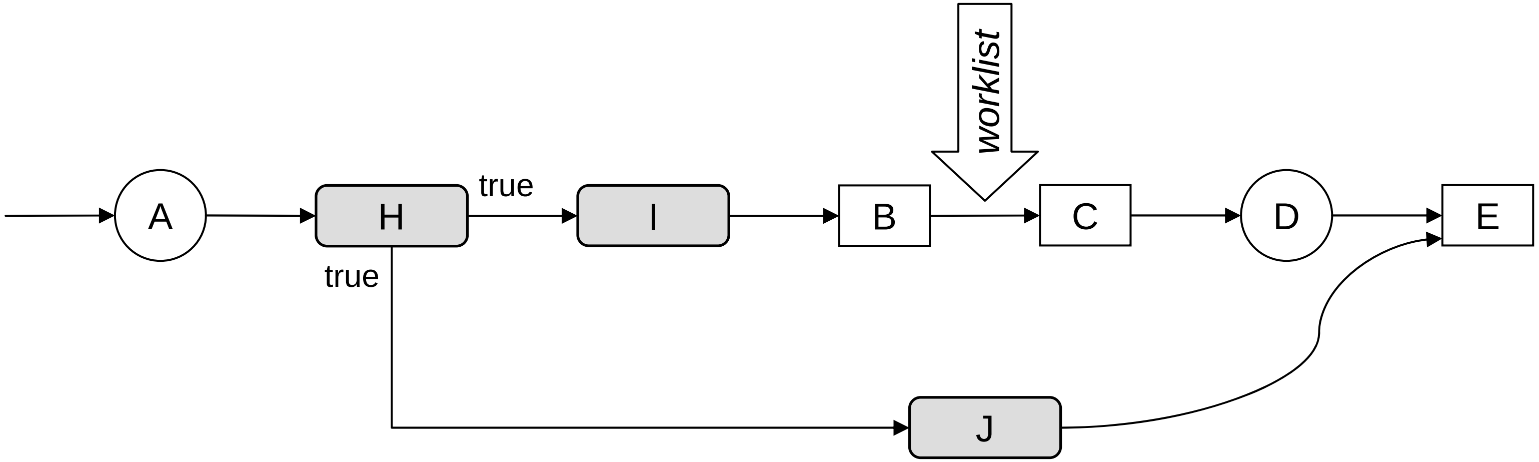

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Fig. 9.12. Alternative insertion of auxiliary specification between client pages and immediate server actions.

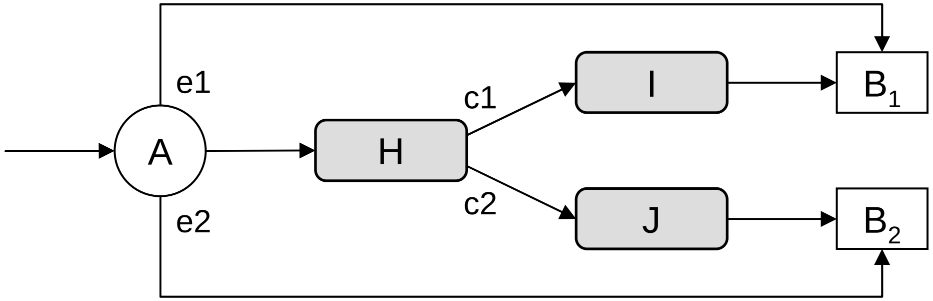

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Fig. 9.13. Synchronizing auxiliary activity against worklist selection.

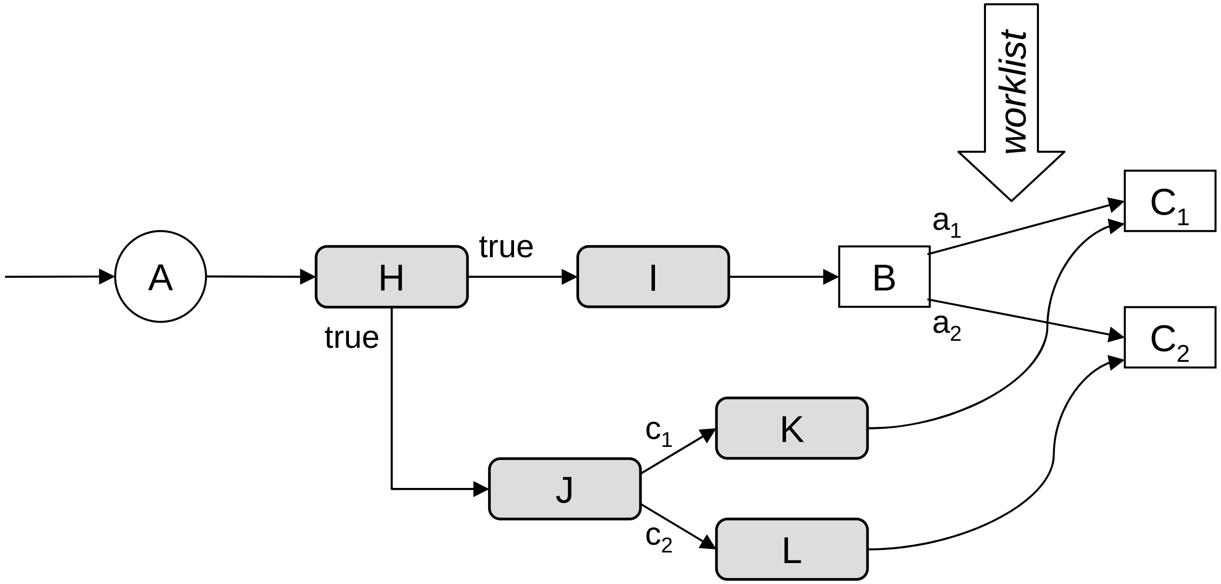

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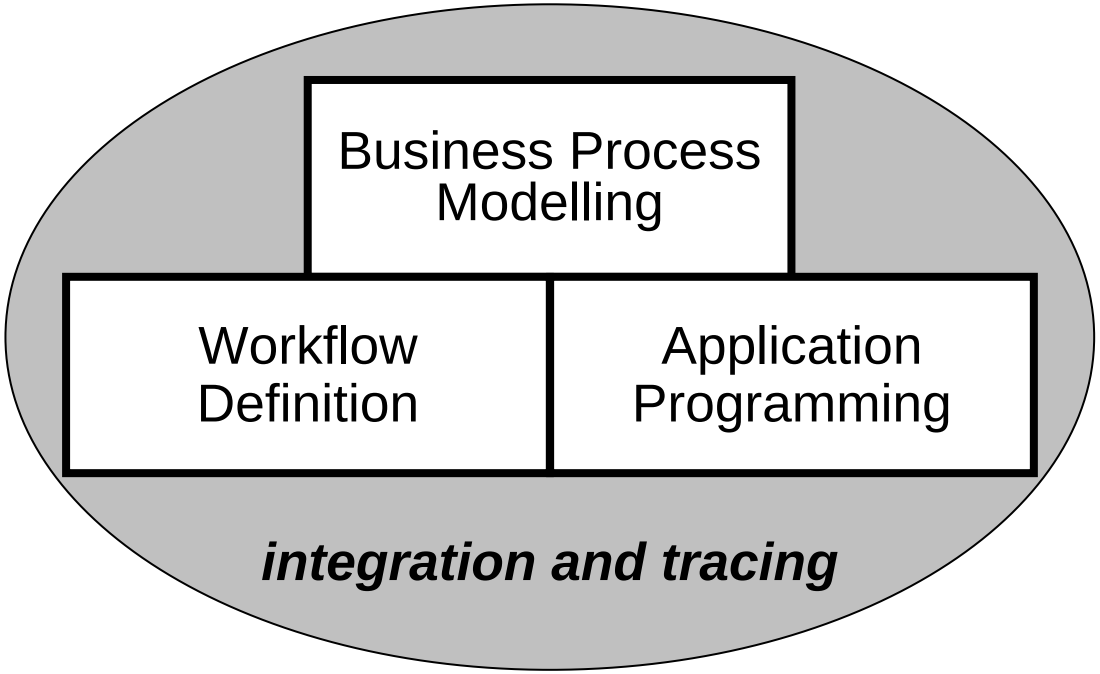
Fig. 9.14. Business process platform mitigating gaps and tensions between business process modeling, workflow control and dialogue control.



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Listings

Listing 6.1. Textual presentation of the business process in Fig. 6.2. with a jump into the loop.

```
01 REPEAT
02   A;
03   B;
04 UNTIL alpha;
05 C;
06 IF beta THEN GOTO 03;
07 D;
```

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Listing 6.2. Alternative textual presentation of the business process in Fig. 6.2. with a jump out of the loop.

```
01 A;
02 REPEAT
03   B;
04   IF NOT alpha THEN
GOTO 01
05   C;
06 UNTIL NOT beta;
07 D;
```

Listing 6.3. Textual presentation of the business process in Fig. 6.4.

```
01 WHILE alpha DO
02   A;
03 B;
04 IF beta THEN GOTO 02;
05 C;
```

Listing 6.4. Textual presentation of business process (i) in Fig. 6.4.

```
WHILE alpha DO
  A;
B;
WHILE beta DO BEGIN
  A;
  WHILE alpha DO
    A;
  B;
END;
C;
```

Listing 6.5. Textual presentation of business process (ii) in Fig. 6.4.

```
WHILE alpha DO
  A;
B;
WHILE beta DO BEGIN
  REPEAT
    A;
  UNTIL NOT alpha;
  B;
END;
C;
```

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Listing 6.6. `go to´-Program for seeking the position of a value in an array according to [204].

```
for i:=1 step 1 until m do
  if A[i]=x then go to found
fi;
not found: i:=m+1; m:=i;
  A[i]:=x;B[i]:=0;
found: B[i]:=B[i]+1;
```

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Listing 6.7. Reformulation of the `go to´-Program in Listing 6.6.

```
01 i:=1;
02 WHILE i<=m DO BEGIN
03   IF A[i]=x THEN GOTO 10
04   i:=i+1;
05 END;
07 m:=i;
08 A[i]:=x;
09 B[i]:=0;
10 B[i]:=B[i]+1;
```

Listing 6.8. Structured Program for seeking the position of a value in an array according to [204].

```
i:=1;
WHILE (i<=m and (NOT (A[i]=x))) DO BEGIN
  i:=i+1;
END;
IF NOT (i<=m) THEN BEGIN
  m:=i;
  A[i]:=x;
  B[i]:=0;
END;
B[i]:=B[i]+1;
```

Listing 6.9. Making unique the finalizing actions that react on the single conditions of a composed loop condition.

```
i:=1;
WHILE i<=m and (NOT (A[i]=x)) DO BEGIN
  i:=i+1;
END;
IF NOT (i<=m) THEN BEGIN
  m:=i;
  A[m]:=x;
  B[m]:=1;
END ELSE BEGIN
   B[i]:=B[i]+1;
END;
```

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Listing 6.10. Moving special actions that react on the single conditions of a composed loop condition into the loop.

```
stop:=false;
i:=0;
WHILE (NOT stop) BEGIN
  i:=i+1;
  IF i>m THEN BEGIN
    m:=m+1;
    A[m]:=x;
    A[m]:=1;
    stop:=TRUE;
  END ELSE BEGIN
    IF A[i]=x THEN BEGIN
      B[i]:=B[i]+1;
      stop:=true;
    END;
  END;
END;
```

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