Using Oracle Workflow
A Case Study
13 March 2003
Agenda

• Why we need workflow
• Case Study: The NPD Group, Inc.
  • Project Formulation
  • Oracle workflow
  • Results
Drivers for workflow systems

Corporate Objectives

• More Productive Workforce

• Competitive Advantage - making operations more dynamic and responsive across organizations with emphasis on process driven integration and process-based improvement
Current Market Facts

• $2.26B Market in 2001 of which $1.48B represents professional services
• Compound annual growth rate of 29.3% till 2005
• Vendor revenue 34.9% growth
• 36 BPM suppliers – 21 public 15 Private
• 24 of them market share less than 2%

Aberdeen Research Oct 2002
WFMC Definitions

Workflow
The automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules.

Workflow Management System
A system that defines, creates and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke the use of IT tools and applications.
Workflow technology provides a new set of tools to build, manage and monitor the way data gets routed through an organization.

Workflow bridges the gap between people, technology and business processes.
Traditional Applications

1. Business Rules and Business Process is embedded in Code

2. Business Process traverse several systems and interact with people
Integrating Business Process

Adding and Removing business objects and applications as business process improve

Business Process

SYSTEM A  SYSTEM B  SYSTEM C
Application 1
Application 2
Application 3
Workflow Systems help execute and optimize cross-functional business processes.

Workflow integrates applications and it involves people for exception handling and decision-making.
Steps to Improving BP

1. Understand and Analyze existing processes
2. Rationalize, modify and introduce the new process
Business Process Management Lifecycle

- Strategy
- Process Design and Simulation
- Process Execution
- New Objectives
- Analysis
- Results
The NPD Group Inc.

A Case Study in Deploying Oracle Workflow
Market Research Company

- Gathers POS Data in a weekly and monthly basis from retailers (2.6B Transactions/month)
- Sends out surveys in a weekly basis requesting purchasing information and Demographic Data
- Statistically combine POS data with survey demographic data in legacy flat file system
- Store data in ODS
- Transfer data to industry specific datamarts – Fashion, Toy, Household goods, Food, Computers & Electronics,
- Provide the reports and analysis through an internet portal
The NPD Group Challenges

- Changing business process to load datamarts – new business requirements new processes
- Many interactions among various departments to load, QA and publish data
- Many Interactions among multiple systems and applications
- Needed to publish market data faster
- Reduce operational expenses
- Find low investment solution
- Needed better documentation of process for change management
Achievable with Workflow?

- **Modeling of Business Process**
  - Documentation of Process
  - Analyze and improve process
- **Automation of Business Process**
  - Reduce Errors
  - Improve Efficiency
- **Automatic Auditing of Process**
  - Capturing metrics real time
  - Maintaining History of activities
  - Finding true deficiencies in process
- **Flexibility in changing Business Process**
  - Improving process incrementally
  - Little modification to existing code
### Some Workflow Players

<table>
<thead>
<tr>
<th>Player</th>
<th>Complexity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM MQ Series Workflow</td>
<td>HIGH</td>
<td>170k/cpu</td>
</tr>
<tr>
<td>BEA Workflow</td>
<td>HIGH</td>
<td>62k/cpu</td>
</tr>
<tr>
<td>Staffware Workflow</td>
<td>MEDIUM</td>
<td>122k#</td>
</tr>
<tr>
<td>Ultimus</td>
<td>LOW</td>
<td>31k*</td>
</tr>
<tr>
<td>Oracle Workflow</td>
<td>LOW</td>
<td>20k/cpu</td>
</tr>
</tbody>
</table>

# 50 Users
* 15 Users 10k steps per day
Oracle Workflow

- Part of the core of Oracle E-Business Suite Applications: ERM, ERP, HR
- Over 12,000 installations of the suites
- Integral part of Oracle DB
- Requires application server
- High powered workflow engine that is scalable and robust with messaging capabilities
Oracle Workflow Architecture

- **Web Notification Worklist**
- **Web Monitor**
- **Web Analysis Tools**
- **Mail Applications**
- **Workflow Builder**
- **Workflow Loader**
- **Workflow Definition Files**

**Oracle Workflow Enabled Application**

- **Directory Services**
  - Users
  - Roles

- **Business Event System**
  - Send
  - Receive
  - Raise
  - Listen
  - Query

- **Notification Services**
  - Send
  - Respond
  - Forward
  - Cancel
  - Query

- **Workflow Engine**
  - Execution
  - Definition
  - Administration
  - Monitoring
  - Query

**Oracle server**

**Application Server**

**Browser Client**

**Workflow Development Client**
Creating the Workflow Project

• Upper Management on workflow:
  “Great concept” but skeptical on delivery
• Structured project as a proof of concept tackling key technological and organizational issues
• Created pilot project for POS data loads after POC
• Captured metrics of current BP
• Modeled the AS-IS business process
• Presented operational improvements
• Created recommendations for TO-BE process and best practices
Components of Workflow

Development Environment - Workflow Builder

- Draw the business Process
- Create tasks for
  - E-mail Notifications
  - Shell Scripts
  - PL/SQL
  - Automated Business Rules checks
WORKFLOW BUILDER INTERFACE
PL/SQL wrappers for activities

- Item Type - Internal name of the item type as defined in Oracle Workflow
- Item Key - a string that represents a primary key generated by workflow engine
- Actid - Id number of the activity from which this procedure is called
- Funcmode - :RUN, CANCEL, RESPOND, FORWARD, TRANSFER, TIMEOUT
- Resultout - COMPLETE, WAITING, DEFERRED, NOTIFIED, ERROR
PL/SQL wrappers for activities

1 ⇔ procedure <procedure name> (itemtype in varchar2,
itemkey in varchar2,
actid in number,
funcmode in varchar2,
resultout out varchar2) is

2 ⇔ <local declarations>
3 ⇔ begin
   if ( funcmode = 'RUN' ) then
      <your RUN executable statements>
      resultout := 'COMPLETE:<result>’;
      return;
   end if;
4 ⇔ if ( funcmode = 'CANCEL' ) then
   <your CANCEL executable statements>
   resultout := 'COMPLETE’;
   return;
end if;
5 ⇔ if ( funcmode = 'RESPOND' ) then
   <your RESPOND executable statements>
   resultout := 'COMPLETE’;return;
end if;
PL/SQL wrappers for activities

6 ⇔ if (funcmode = 'FORWARD') then
<your FORWARD executable statements>
resultout := 'COMPLETE';
return;
end if;

7 ⇔ if (funcmode = 'TRANSFER') then
<your TRANSFER executable statements>
resultout := 'COMPLETE';
return;
end if;

8 ⇔ if (funcmode = 'TIMEOUT') then
<your TIMEOUT executable statements>
if (<condition_ok_to_proceed>) then
resultout := 'COMPLETE';
else
resultout := wf_engine.eng_timedout;
end if;
return;
end if;

9 ⇔ if (funcmode = '<other funcmode>') then
resultout := ' ';
return;
end if;

10 ⇔ exception
when others then
WF_CORE.CONTEXT ('<package name>', '<procedure name>', <itemtype>, <itemkey>, to_char(<actid>), <funcmode>);
raise;
11 ⇔ end <procedure name>;}
ATTACHING A PL/SQL PROGRAM TO WORKFLOW
POC and Pilot For POS Data Load

- Interviewed ETL group, DBAs, Operations group and Business to map out existing process
- Reviewed Process Model with Business Process owners and verified with technical team
- Wrapped existing code and applications (1 week)
- Wrote code to automated many manual steps
First Version of Main Process
Incremental Process Delivery
Managing Business Process

• Managing Complex Processes by creating sub-processes

• Example: Informatica datamart load Task is composed of various steps which are defined in its own process
Main Business Process
Sub Processes

Manual Steps
Evolving Model

Automated Error Detection
Starting the workflow Process

• Launching a workflow process
  • EVENT DRIVEN
    • An Internal or External system or application can start a workflow process
  • MANUAL START
    • Item Key
    • Process Name
Monitoring a Workflow Process

- Monitoring the Business Process
  - Web Based Activity Monitor
  - Web Based Workflow Monitor
## Activity Status Options
- Active
- Complete
- Error
- Suspended

## Activity Type
- Response Notifications
- FYI Notifications
- Functions
- Standard Workflow Items
- Event

### Notification List

<table>
<thead>
<tr>
<th>Status</th>
<th>Who</th>
<th>Parent Activity</th>
<th>Activity</th>
<th>Started*</th>
<th>Duration</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td></td>
<td>FUN POS LOAD</td>
<td>21-FEB-2003 10:02:16</td>
<td>6 Hours 50 Minutes</td>
<td></td>
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<tr>
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<td>Workflow Engine</td>
<td>FUN POS LOAD</td>
<td>Start</td>
<td>21-FEB-2003 10:02:16</td>
<td>0 Seconds</td>
<td></td>
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<tr>
<td>Complete</td>
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<td>FUN POS LOAD</td>
<td>RUN POS PREPARE PROCESS</td>
<td>21-FEB-2003 10:02:16</td>
<td>50 Minutes 38 Seconds</td>
<td>Approve</td>
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<td>Start</td>
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<td>0 Seconds</td>
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<tr>
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<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>Defer Thread</td>
<td>21-FEB-2003 10:02:17</td>
<td>0 Seconds</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>IN FILE COUNT</td>
<td>21-FEB-2003 10:02:18</td>
<td>1 Minutes 33 Seconds</td>
<td>The tot_rows in file4236064</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------</td>
<td>-------------------------</td>
<td>--------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>POS TABLE PRE CNT</td>
<td>21-FEB-2003 10:03:51</td>
<td>11 Seconds</td>
<td>The tot_rows is 6398132</td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>RUN POS PREPARE</td>
<td>21-FEB-2003 10:04:02</td>
<td>48 Minutes 34 Seconds</td>
<td>remsh usnord1 -l informa5 . p</td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>POS TABLE POST CNT</td>
<td>21-FEB-2003 10:52:36</td>
<td>0 Seconds</td>
<td>The tot_rows is 932597</td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>RUN POS PREPARE PROCESS</td>
<td>POST PREPARE CNT</td>
<td>21-FEB-2003 10:52:57</td>
<td>16 Seconds</td>
<td>After Prepare Query result = 0</td>
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<tr>
<td>Complete</td>
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<td>RUN POS PREPARE PROCESS</td>
<td>PREPARE PRECESS CHECK</td>
<td>21-FEB-2003 10:52:54</td>
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<tr>
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<td>PRELOAD CLEANUP VERIFY COMPLETED</td>
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<td>RUN POS PREPARE PROCESS</td>
<td>End</td>
<td>21-FEB-2003 10:52:55</td>
<td>0 Seconds</td>
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<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>REFRESH MVIEWS &amp; CLEAR CACHE</td>
<td>Defer Thread</td>
<td>21-FEB-2003 16:20:31</td>
<td>0 Seconds</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------</td>
<td>-----------------------------</td>
<td>--------------</td>
<td>----------------------</td>
<td>-----------</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>REFRESH MVIEWS &amp; CLEAR CACHE</td>
<td>REFRESH MV</td>
<td>21-FEB-2003 16:20:51</td>
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<tr>
<td>Complete</td>
<td>KEVIN FELICE</td>
<td>REFRESH MVIEWS &amp; CLEAR CACHE</td>
<td>MVS HAVE BEEN REFRESHED</td>
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<td></td>
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<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>REFRESH MVIEWS &amp; CLEAR CACHE</td>
<td>CLEAR CACHE</td>
<td>21-FEB-2003 16:51:50</td>
<td>2 Seconds</td>
<td></td>
</tr>
<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>REFRESH MVIEWS &amp; CLEAR CACHE</td>
<td>End</td>
<td>21-FEB-2003 16:51:52</td>
<td>0 Seconds</td>
<td></td>
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<tr>
<td>Complete</td>
<td>KEVIN FELICE</td>
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<td>FUN POS LOAD COMPLETE</td>
<td>21-FEB-2003 16:51:52</td>
<td>0 Seconds</td>
<td></td>
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<tr>
<td>Complete</td>
<td>Workflow Engine</td>
<td>FUN POS LOAD</td>
<td>End</td>
<td>21-FEB-2003 16:51:52</td>
<td>0 Seconds</td>
<td></td>
</tr>
</tbody>
</table>
Results of Pilot
Reasons for Implementing Workflow

• **Modeling of Business Process**
  • Documentation of Process
  • Analyze and improve process

• **Automation of Business Process**
  • Reduce Errors
  • Improve Efficiency

• **Automatic Auditing of Process**
  • Capturing metrics real time
  • Maintaining History of activities
  • Finding true deficiencies in process

• **Flexibility in changing Business Process**
  • Improving process incrementally
  • Little modification to existing code
Results Of Pilot

• Document and Model BP
  • Documentation was the primary result of using workflow
  • Process diagrams improved communication between Operations and IS
    • Identified tasks and their dependencies
    • Identified tasks that had to be added or changed
  • The process evolved from a rigid design to one that reflected the realities of the loading process
  • The process was improved and deployed incrementally
  • Identified various QA tasks that were manual and not part of any automation or existing programs
  • Traceability and versioning of Business Process
  • Version History used to analyze how and why the process has changed
Improved Communication and Traceability

Most edit file etl-env in /repository/current/information/Scripts/full
if the source files from the BU has been FTP’d to a different place.

Script location: /repository/current/information/Scripts/full
ods load script: funPosLoad.csh <filename> + for test
log file location: /repository/current/1zout
log file name: funPosDataLoad.pl <pid>.etl.log

---

PEARL TEST RUN VALIDATION / FX
- PRELOAD CLEANUP / VERIFICATION
- REFRESH M VIEWS & CLEAR CACHE & RESTART WEB LOGIC
- RUN INFORMARICA TO LOAD DATAMART
- RUN INFORMARICA TO LOAD DATAMART ATTRIBUTE
- RUN INFORMARICA TO LOAD DATAMART DATA AVAILABILITY
- RUN INFORMARICA TO LOAD DATAMART DIMENSIONS
- RUN INFORMARICA TO LOAD DATAMART FACT
- RUN INFORMARICA TO LOAD DATAMART INFO
- RUN SUPPRESSION VALIDATION / FX

Notifications
Functions
CLEAR CACHE
Better Communication

• Having a graphical representation of workflow made it very clear which activity in the process was at issue

• Identified processes that were unnecessary, superfluous or repetitive

• Found many undocumented processes that were performed by individuals

• Visual information helped breakdown complex processes

• The visual diagram became the contract for the business process

  Design Document is Deployment Program
Help breakdown complex BP
Results Of Pilot

Automation of Business Process

• Reduce Errors
  • Errors were reduced since the process was systematized
  • Many manual QA and error reporting processes were incorporated into workflow

• Improve Efficiency
  • E-mail notification at various steps slowed process - wait for user’s response
  • Efficiency improved when business rules for routing were introduced
  • Additional information was placed in the e-mail notifications such as attaching URL’s to log files so that the users did not have to search various system for them
  • Users intervened less and monitoring time was reduced

• Many tasks were identified and automated
<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLEANUP_COMPLETE_APPROVAL_REQ</td>
<td>Perl Test Run Begins</td>
</tr>
<tr>
<td>CLEANUP_VERIFY__COMPLETE</td>
<td>POS Load</td>
</tr>
<tr>
<td>CLEAR_CACHE</td>
<td>POS Pre Table Cnt</td>
</tr>
<tr>
<td>CONFIRM_SPACE_FOR_TEMP_TABLES</td>
<td>POS Table Cnt</td>
</tr>
<tr>
<td>DOS_F_POSTEMDATA_TABLE_FULCNT</td>
<td>Preload Cleanup Begins</td>
</tr>
<tr>
<td>DOS_F_POSTEMDATA_TABLE_TRNCNT</td>
<td>Preload Cleanup Verification NW</td>
</tr>
<tr>
<td>DELETE_TOYS_IN_FACT</td>
<td>PrepareProcesschk</td>
</tr>
<tr>
<td>DELETE_VG_IN_FACT</td>
<td>Prepare Process Manual_chk</td>
</tr>
<tr>
<td>DMLOADCHK</td>
<td>Prepare Process Manual_Run</td>
</tr>
<tr>
<td>DMLOADERRCODECHK</td>
<td>Pre Load Approval</td>
</tr>
<tr>
<td>DMLOAD_COMPLETE</td>
<td>Pre Load Approval_Reminder</td>
</tr>
<tr>
<td>DMLOAD_ERROR</td>
<td>Pre Pos Table Cnt</td>
</tr>
<tr>
<td>EXECUTE_PEARL_PROD</td>
<td>Pre Session</td>
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<tr>
<td>EXECUTE_PEARL_TEST</td>
<td>Refreshmv</td>
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<tr>
<td>FUNPOSLOAD_COMPLETE</td>
<td>Run Informatica</td>
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<tr>
<td>FUN_ATTR_COUNT_VERIFICATION</td>
<td>Run InformaticaAttr</td>
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<tr>
<td>FUN_ATTR_LOADED_CONFIRMATION</td>
<td>Run Informatica Data Available</td>
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<td>INFILE_COUNT</td>
<td>Run Informatica_Dim</td>
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<td>INFORMATICA_DBSETUP</td>
<td>Run Informatica Fact</td>
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<tr>
<td>MANUF_TABLE_COUNT</td>
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<td>MV_REFRESHED</td>
<td>Suppression Complete1</td>
</tr>
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<td>NEW_CODE_ADDTN</td>
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<td>NEW_CODE_ENTRY_STATUS</td>
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<tr>
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<tr>
<td>NOTI_PEARL_TEST_RUN</td>
<td>ToyScountchk</td>
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<td>PBTECDM_OR_PBTECDM</td>
<td>Toys_Count</td>
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<tr>
<td>PEARL_PRODUCTION_RUN_COMPLETE</td>
<td>Toys_Count Verification</td>
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<td>PEARL_PRODUCTION_RUN_VAL_FIX</td>
<td>Toys_S or VG</td>
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<td>PERL_LOADED_CNT</td>
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<tr>
<td>PERL_TESTRUN_COMPLETE</td>
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</tbody>
</table>
Results Of Pilot

• Automatic Auditing of Process
  • Metrics of the process was captured real-time
  • History of activities was maintained
  • Helped in focusing on process that needs improvement
  • Automatic version control of tasks or processes
## VERSION CONTROL OF TASKS

<table>
<thead>
<tr>
<th>ITEM_TYPE</th>
<th>NAME</th>
<th>VERSION</th>
<th>TYPE</th>
<th>BEGIN_DATE</th>
<th>END_DATE</th>
<th>FUNCTION</th>
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</thead>
<tbody>
<tr>
<td>FUNPOS</td>
<td>EXECUTE_PEARL_PROD</td>
<td>4</td>
<td>FUNCTION</td>
<td>8/21/02 11:13</td>
<td>9/20/02 16:48</td>
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<td>9/30/02 14:57</td>
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## REPORT ON MAJOR PROCESSES

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## REPORT ON SUB-PROCESS TIMING

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### Sub Process Timing

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</table>

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Timing Trends for each task

Run Suppression Validation

Minutes

0 10 20 30 40 50 60

1 2 3 4 5
Removing Latencies

Comparison of Workflow vs Current Process

- 5.0 10.0 15.0 20.0 25.0 30.0
- 27-Aug
- 23-Oct

Workflow
Results Of Pilot

• Programming complexity for Workflow
  • Creating wrappers to existing code was easy after understanding the wrapper structure
  • Most existing code could be incorporated into workflow within 30 minutes
  • Out of the box wrappers for SQL were used
  • Special simple wrappers were created for non-SQL tasks such as the Informatica sessions
  • New code and wrappers for QA tasks had to be written and incorporated into workflow
  • When improved wrappers were created, it was easy to introduce them to existing processes
Organizational Structure

- Roles
  - Business Process Owner
  - Business Process Designer
  - Operations
  - Process and Application/Code integrator
  - Application Wrapper Programmer
  - Application/Code Programmer
Organizational Distribution of Work

ROLES

Business Process Owner

Business Process Designer

Application Integrator

Application Wrapper Programmer

Application/Code Programmer
Results Of Pilot

Flexibility in changing Business Process

• Changing process was not very complicated
• Sub-processes could be created and tested separately outside the main process
• These sub-processes can later be added to the main process
• Sub-processes were used individually for production
• Incremental improvement and deployment of the business process was achieved
Did workflow improve Process?

- Modeling of BP helped identify various manual steps
- Workflow allowed users to suspend or if necessary bypass execution of specific processes to fix systems or application issues
- One could incrementally add tasks or sub-processes to improve BP
- Workflow can consolidate the results of QA and attach pertinent information and e-mail it to make informed decisions
- Workflow eliminated latencies between processes
- History of BP and its activities was useful for analysis and reviewing purpose of processes
- Documented BP design helped identify inefficiencies of the overall process
Can Workflow Achieve the following?

YES • Document and Model the BP
YES • Automate various tasks
YES • Audit the tasks
YES • Adapt to changes in business process
YES • Add little overhead to existing application code
YES • Improve existing BP
Other tangible benefits

- Reduce headcount
- Reduce lifecycle time
- Reduce operating costs
- Automate routine and repetitive tasks
- Faster processing times – parallel tasks
- Improve change management
- Improve Quality
- Decision Support information
- Improve inter-organization communications
Using Oracle Workflow

A Case Study

13 March 2003
Phases Of Implementation

- Environment Setup
- Establish Process modeling methodology
- Create the As-Is business process
- Create the To-Be business process
- Define business measures
- Simulate Business Process
- Communicate and Verify Business Process model
- Build the object model wrappers
- Build the object models
- Test
- Deploy
Functional Architecture

Administration Console

- Process Definition
- Process Execution
- Process Analysis and Reporting
- Repository

Connection Layer

- User Interaction front-ends
- EAI Software
- B2B Integration Middleware

Business Process Management System

Source: Yphise BPM Assessment Report
## Workflow Architecture

<table>
<thead>
<tr>
<th>Designer</th>
<th>Administration</th>
<th>End User GUI</th>
<th>Custom GUI</th>
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<tr>
<td>Thick Client</td>
<td>WEB INTERFACE</td>
<td></td>
<td>VB / JAVA</td>
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</tbody>
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### Workflow Engine

- **PL/SQL**
- **JAVA**
- **Shell Scripts**
  - `RSHD`
  - `*.exe`
  - **Perl**
  - **Informatica**

### DB Systems

- **Oracle DB**
- **SQL2000 DB**

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