GBS Standardised Process Modelling and Analysis with WebSphere Business Modeler

Technique Paper (TP)

Version 1.1 - June 2006

Control page

Update history

Version	Date	By	Reason for update
1.0	17 March 2006	A/NZ Operations Strategy Team	Initial Release for Version 6.0
1.1	10 June 2006	A/NZ Operations Strategy Team	Updates for Version 6.0.1 & Added Case Aggregation Analysis

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Golden rules for Modelling & Analysis

About this guide

Who should read this guide

This guide is for IBM GBS practitioners engaged in process modelling and analysis activities using WebSphere Business Modeler (WBM) Version 6.0, irrespective of their industry sector or service line, and independent of any engagement methodology. It is assumed that readers have experience in the application of process mapping with WBM in accordance with the GBS Standards documented in 🕮 GBS Standardised Process Mapping with WBM Technique Paper.

Other potential users of this guide include project managers who need to appreciate the rigours of process modelling and effort and outcomes of process analysis.

Why this guide is important to you, your client and IBM

This guide provides standards for completing process analysis activities within a GBS engagement using WBM. It gives detailed explanations of the different types of analysis and guidance on where these can be used effectively within engagements. It will help to ensure that you are more productive and your team can easily produce standardised and accurate analysis results.

For your client, this will mean greater access to the value provided by process analysis activities. The client will appreciate the speed and accuracy in which complex process analysis can be performed. They will appreciate how this can provide objective and quantifiable support to your recommendations and business cases. It will allow them to more fully understand process related issues and make fact based decisions regarding future investments and initiatives. It will also mean that the impact of any proposed process change can be tested and quantified prior to implementation. This information can support recommendations and conclusions offered in an engagement.

For IBM, this guide will instil practices, standards and approaches that will give us a more flexible workforce, improved client deliverables and improved confidence in recommendations made to clients. It will ensure modelling and analysis activities occur within a structured framework reducing the risk of error and inaccuracies in results. It also provides a common language to facilitate cohesive teaming between consultants on modelling and analytic engagements.

What you need to know to understand this guide

It is assumed that you have a solid understanding of the principles and GBS standards for mapping processes in WBM. All processes which are being modelled and analysed in accordance with this technique paper must comply with the GBS standards for process mapping as specified in the 🕮 GBS Standardised Process Mapping with WBM Technique Paper.

It is also assumed that you have a solid understanding in the use of WebSphere Business Modeler version 6.0 including familiarity with process constructs and process simulation[1].

Where appropriate, the rationale for recommendations has been included as endnotes. (See Appendix H: Rationales & Explanation)

What is not covered in this guide

This guide is not intended to be:

- A "How to use…" manual for WBM – this is provided by WBM Help. (See Appendix A: Useful references and links)
- A guide to process mapping – this is covered by the  GBS Standardised Process Mapping with WBM (See Appendix A: Useful references and links)
- A guide to workflow / application integration guide – this is covered by a separate Technique Paper
- A guide describing a methodology for use in process re-engineering engagements
- Substitute for business process mapping or business case development training
- A comprehensive guide to all forms of process, resource, data and organisation analysis facilitated by WBM. For a detailed description of out of scope topics please see Section 7 Advanced Process Analytics.

Suggested Use Templates

This guide is accompanied by a series of MS Excel and PowerPoint templates described in Appendix E: Templates.

These templates substantially automate the creation of standard graphs and analysis deliverables. They utilise the standard format of WBM reports and convert these into data which can be represented in graphs. Their other purpose is to ensure deliverables maintain a consistent look and feel and so represent a good starting point for teams performing analysis activities in parallel.

These templates do not represent all possible uses or representations of analysis results. Each template will need to be customised using standard MS Excel functionality to meet the specific requirements of each engagement. Use of other graphs and techniques to support specific engagement requirements is encouraged. Any useful graphs or templates should be submitted for consideration for inclusion in later versions of this Technique Paper.

The templates are valuable IBM intellectual property. When utilising these templates on client engagements they must be treated as **IBM Confidential** and **not provided** to client team members. If a client would like to utilise these templates, they can be licensed for a fee through the Asset Commercialisation initiative. Contact L&K Methods for further information.

Obtaining assistance

It is recommended that Bid Managers engage a practitioner experienced in modelling and analysing processes using WBM to support bid approach and estimate development including workplan and effort planning and sizing.

Engagement Managers should ensure that their resourcing plan includes at least one practitioner experienced in developing process models and performing analysis in WBM to mentor the team in execution of the project and provide quality assurance of deliverables.

Where the outcome of the process modelling and analysis activity is to be used to support client recommendations or business cases, it is critical that appropriately skilled resources be assigned to the project to ensure the appropriate degree of accuracy and confidence in the results. Use of inexperienced resources in these critical activities may adversely impact the accuracy and timeliness of the results achieved and potentially exposes IBM to liability.

The Operations Strategy group of IBM GBS has a number of consultants with deep modelling and analysis experience to assist with modelling, planning, and mentoring. It is recommended that Engagement Managers contact the Operations Strategy group or L&K Methods if assistance is required.

Contacts:

Debbie van Pelt	***Leo Roomets***
Operations Strategy	L&K Methods
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Troubleshooting

If you experience any technical difficulties or issues with WBM or have any questions when leveraging WBM on an engagement, contact the Practitioner Support Network and request technical assistance.

Practitioner Support Network

Intranet: http://w3-03.ibm.com/services/GBS/psn/

Email: psn@custhelp.com

Further support information is provided in the GBS Tools pages:
http://w3-03.ibm.com/services/GBS/competency/client/methodtools/tools/wbi/support.html

If you have any questions about the templates used to support this Technique Paper, please contact Kylie Skeahan (skeahan@au1.ibm.com) or Tomomi Yoshioka (ytomomi@au1.ibm.com).

Feedback and suggestions

If you have any feedback or suggestions for inclusion in this document, please send them to Kylie Skeahan (skeahan@au1.ibm.com). It is intended that revisions of this guide will be regularly published in *KnowledgeView*.

Abbreviations

MS	Microsoft ®
WBM	WebSphere Business Modeler
WWW	World Wide Web

Conventions

Italics	Reference to a document or document section, software item, etc, eg See *Appendix C: Glossary*
Bold	Reference to a WBM screen field, eg At **User Name**, type your name.
Bold	Target of action on a screen, eg Click **Next**
	Reference to other documents or existing documentation:  GBS Standardised Process Mapping with WBM Technique Paper

1. Process Modelling and Analysis

1.1 What is Process Modelling?

The terms process mapping and process modelling are often used interchangeably. It is important to understand that there are differences, and additional information is required to build a process model.

Table 1: Characteristics of process mapping and process modelling

Process mapping	*Process modelling*
Business process mapping (or flowcharting) provides a graphical representation of the flow of a business process. It depicts a set of activities that represent the alternative routes that the flow of execution can take.	Business process modelling refers to the addition of operational data into the flow of activities. It includes data such as the resources required to perform a task and their timetables to work, the task duration and associated direct and indirect costs.
The primary purpose of process mapping is to document the process. This can be for current state in order to satisfy audit requirements or to help educate future operations after major changes have taken place such as after the implementation of software.	The primary purpose of process modelling is to conduct objective analysis in order to understand the costs, bottlenecks and resource constraints Of a process. The analysis conducted in turn is used to justify a *To-Be* future state of processes.
Process mapping can be done using tools such as WBM, MS Visio, or MS PowerPoint.	Modelling can only be performed in more advanced software such as WBM.

While process modelling is an extension of process mapping it may be included in the initial scope of an engagement or undertaken as a follow-on engagement that leverages process maps created previously.

1.2 Value of Process Modelling

Process modelling provides additional significant value to process mapping. It enables:

- Understanding potential areas for increased value;
- Assessing the impact of new solutions and quantifying the expected improvement and ROI;
- Improved logic, robustness of quantification, and unambiguous process maps;
- Improved compliance with regulatory requirements;
- Improved communication through increased level of detail;
- Understanding of current business measures or KPIs; and
- Use of real-time monitoring products to capture business performance.

1.3 WBM as a Process Modelling Tool

WBM is the IBM GBS standard process modelling tool that should be used on all engagements unless otherwise directed by the client. It facilitates:

- Development of graphical representation of the process;
- Maintenance of process data within a single repository;
- Ability to view the process in different levels of detail;
- Rapid production of quantitative reports; and
- Simulation of the operation of the process based on configurable variables.

1.4 Why do Analysis

Analysis involves collecting, representing and interpreting process measures and simulation results.

Process mapping allows a process to be understood and communicated, and modelling provides a quantitative perspective. It is only through analysis of process models that the performance of a process can be fully assessed.

Analysis enables:

- The process model to be understood and compared with other processes and best practices;
- Hypothesis to be tested;
- Recommendations to be supported with facts and quantitative data;
- Identification of issues in the process, its resourcing and operation within its business context; and
- Investment to be directed into process improvement and system support in the areas which provide the greatest return on investment or alignment with other business priorities (service, compliance, etc.).

1.5 Realising Value from Process Modelling & Analysis

Process modelling and analysis can provide a broad range of business benefits along a continuum of investment. For example:

Table 2: Analysis Activity and Value

Activity	*Business Value*
Process Mapping	Understand the activities involved in the end to end process and who is responsible for performing these
Process Modelling	Enhance process description with quantification measures and unambiguous business logic
Process Metrics	Obtain high level quantifiable measures of the overall process and case level measures of time and cost involved in a process

Activity	Business Value
Process Analysis	Improve understanding of the process Provide a detailed breakdown of the time and cost components within the process
Process Operation Analysis	Observe operation of process within the business environment and constraints (resources, time, etc.) in which the process executes. Identify process limits, bottlenecks and resource implications

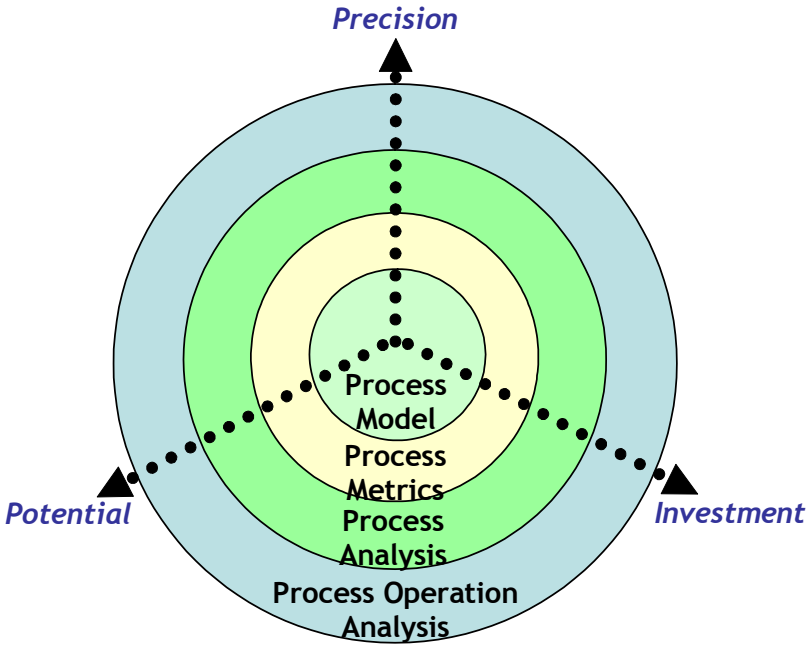
The increase in business value for each level of analysis incurs an incremental cost. It is important to balance investment in the precision of the model and the level of detail in the analysis activities against the potential benefits and value which can be realised from the process improvements.

There are three factors which should be considered when the determining the appropriate level of modelling & analysis to be performed:

Table 3: Analysis Factors

Factor	Description
Investment	The level of investment in time, skill and cost associated with building a model and analysing an area of the process
Precision	The level of accuracy of the model and the extent to which it represents the real world operation of the process
Potential	The scope for realisation of improvement in the process (eg. cost reduction, client satisfaction, cycle time) The magnitude of the cost of the potential solution requires additional due diligence

Figure 1: Factors in determining value point for analysis



Adopt a Phased Approach

One of the key purposes of the process analysis is to provide a perspective of the size of the process improvement opportunity.

To ensure the investment in analysis is balanced with the business benefit, it is recommended that a phased approach is adopted.

Process mapping and modelling is a relatively rapid and inexpensive way to determine high potential areas within a larger process scope eg. Complex processes, significant client interaction or critical business dependencies.

Based on these high potential areas identified in client interviews, undertaking process analysis[2] activities can identify process issues that can be used to identify opportunities for improvement eg resource dependencies, quality, waste, organisation structure and high cost.

When the improvement opportunity associated with these process issues is significant, the investment in developing a simulation model for the process may be justified[3].

1.6 Compliance with Standards

Given the computational demands that are placed on process models, drawing them to set standards and conventions is of paramount importance. It is essential that the process be mapped to comply with the mapping standards defined in the  GBS Standardised Process Mapping with WBM Technique Paper, and any other modelling standards defined in this guide.

These standards are defined to ensure models:

- can be easily interpreted by others and reused
- are accurate and predictable results are achieved
- are consistent within an engagement

The subsequent sections of this guide use the standards to direct analysis activities. Each section builds on the previous concepts and assumes models have been developed in accordance with the standards in both the mapping guide and earlier modelling guidance.

1.7 Comparative Modelling

It is possible to assess the impact of changes being made to a process by comparing a current process with its proposed future states. This guide and its templates support a current state of the process and two incremental future states. These are known as As-Is, To-Be and What-If but could be used to represent any other state of a model by simply changing labels in templates[4].

Table 4: Analysis Factors

Future State Name	*Example of Use*[5]
As-Is Model	This model represents the current state of the process.
To-Be Model	This model represents the first future state process. It may be used to model proposed process changes including: • Simple and easy process changes ("low hanging fruit"); • Process changes made within defined constraints; • Non system related process changes; or • First phase of implementation of a new system.
What-If Model	This model represents the further changed future state. It may be used to model proposed process changes including: • Unconstrained changes to process to investigate scope of possibility; • Full system implementation; • Future changes of volume or staff levels.

2. Modelling and Analysis Technique

Modelling and analysis activities support a broad range of methodologies and engagement approaches. It is a technical and precise activity which must be utilised carefully to obtain accurate results[6].

The steps described below were developed as a result of experience from a large number of modelling and analysis engagements. Following a standard approach as recommended in this Technique Paper will yield accurate and time efficient results.

2.1 Understand Goals and Issues

The issues, goals and expected outcomes of the engagement must be identified and well understood prior to any modelling and analysis activities being planned. For example:

- The organisation must increase its profit on the delivery of its products;
- Customer satisfaction is low due to delivery delays;
- Customer call handling times are too high;
- Client wants to understand the level of resources required to support introduction of new products; or
- Parts of the organisation are overloaded at peak times of the month and client is seeking to improve resource assignment to process to better meet deadlines or SLAs.

2.2 Determine Purpose for Modelling & Analysis

Once the client issues and engagement outcomes are understood, define how modelling and analysis will support these outcomes.

A simple approach is to define the questions to which modelling and analysis activities will provide answers. For example:

- What is the cost of answering a customer query?
- How long does it take to ship goods once an order is received?
- What percentage of process time is consumed with risk management activities?
- How many orders can be processed in a day?
- Where are the bottlenecks in my process?

2.3 Data Gathering

It is critical that data gathering activities occur in a structured and consistent manner in order to support an accurate model. The templates provided with the  GBS Standardised Process Mapping with WBM Technique Paper provide assistance in identifying the data required, and in maintaining consistent definitions for all measurements.

Data gathering may be performed through workshops, interviews with subject matter experts, by direct observation, by surveys or from system extracts.

Objective evidence (system extracts, direct observation etc) provides the greatest accuracy when building a model. However, it is important to ensure that the effort of obtaining objective evidence is warranted by the size of the benefit to the client or of the criticality of the incremental accuracy.

Models are often based on anecdotal information obtained directly from subject matter experts. It is essential that subject matter experts are sourced from personnel who perform the operational tasks of the process. Utilise management and supervisors when designing the future state of the process to articulate the future state vision. The subject matter experts can then validate the operational feasibility of the future state process.

It is usual to encounter differing views of the time required to complete a single activity or task. As WBM requires duration metrics to be input as a single figure, the options for quantifying duration in order of increased effort are:

- Determine an average or median value eg. if a small order takes 10 hours and a large order takes 30 hours, and there are roughly equal numbers of small and large orders the weighted average order would take 20 hours[7].

- Build a decision in the map and use multiple copies of tasks or subprocesses to record the different values eg. use a decision to distinguish between small and large orders. Assign the small order processing time 10 hours and the large order process time 30 hours. Use the decision choice percentages to determine the proportion of small and large orders.

Any particular areas of uncertainty or specific assumptions should be documented using an annotation.

2.4 Develop the Process Model

Building the process model involves creating a process map and adding operational data to the activities, resources and logic. The subsequent sections of this document provide guidance on how to augment the process map or model for each type of analysis.

2.5 Validate Model

When the model is finalised, ensure the data has been recorded consistently for all elements in the model, and that the logic of the model produces accurate and consistent results.

The results should be validated against real life observations where possible. For example, if the average call time within a call centre is 15 mins, the average process duration for a call in the model should also be approximately 15 mins.

In each of the subsequent sections, assistance is provided on how to ensure the model is providing valid results.

2.6 Measure the Process

To be able to analyse the process it is necessary to calculate the metrics from the model. In WBM this is achieved through a comprehensive suite of standard reports. Different reports provide data to support the different types of analysis outlined in this guide.

Each of the reports requires a number of different settings to be configured. Guidance on how to configure these settings is provided in the subsequent sections of this document.

The results produced by WBM need to be exported into a format that allows manipulation and analysis. Excel is one format that the results can be exported to.

Guidance on how to extract these reports is provided in the subsequent sections of this document.

2.7 Analyse & Interpret Results

The results obtained from the WBM model will provide the quantitative data to answer the questions identified earlier. Where questions involve comparison between different process states, (eg. As-Is, To-Be), it will be necessary to analyse the results from each of the versions of the process.

These analysis results must be interpreted within the context of the entire engagement. This will include issues and opportunities identified from interviews, workshops and other data gathering activities. It is important to fully understand and explain the implications of the results of the analysis to the goals of the engagement.

Each section of this document provides guidance on how results may be interpreted and suggestions for the implications of different analysis results.

2.8 Report Analysis Results

The results from analysis should be documented in a consistent and meaningful way. Templates in MS Excel and PowerPoint accompany this guide to assist in building reports.

Use the data and analysis as the basis for conclusions and recommendations for addressing the client business issues.

3. Process Metrics Taxonomy

It is critical to use a consistent taxonomy when describing process measures and metrics. These terms are conceptual and can be applied at a process, case or instance level using weighted averages.

3.1 Time Based Metrics

There are two key measures which form the building blocks of all time measurements:

Table 5: Time Measures

Measure	*Definition*
Time Required for Role (Resources Tab)	Time the role is working on the activity. This may include preparation and recovery time in addition to working time.
Processing Time (Duration Tab)	Time required for the activity to complete. That is, from the time the input is received to the time the output leaves. This measure includes the preparation time associated with the resource before work can begin, the time the resource is actively working and any additional time such as recovery time for the output. Recovery time for the resource should NOT be included. Any waiting time due to resource constraints should NOT be included.[8]

Based on the time measures for each activity in the process map, the following time metrics can be calculated:

Table 6: Time Metrics

Metric	*Definition*	*Activities Included*		*Time Measure*		*Non-Working Time*
		All Activities	*Critical Path*	*Time Required for Role*	*Processing Time*	
Cycle Time	The time between when a process commences and when it finishes. It includes non working time such as lunch breaks, nights and holidays.	✗	✓	✗	✓	✓
Minimum Critical Path Time	The sum of the durations for all activities on the critical path. This measures the shortest possible time to complete the process if all resources were available. It does not include non-working time or time spent waiting for a resource to become available to start the task.	✗	✓	✗	✓	✗

Metric	Definition	Activities Included		Time Measure		Non-Working Time
		All Activities	Critical Path	Time Required for Role	Processing Time	
Activity Time	Sum of durations for all activities. It measures the total amount of time expended by people, systems and machines within the process.	✓	✗	✗	✓	✗
Critical Path Resource Time	Sum of Time Required for Role for activities on the critical path.	✗	✓	✓	✗	✗
Resource Time	Sum of Time Required for Role for all activities	✓	✗	✓	✗	✗
Queue Time	Time an activity waits for a resource to be allocated.	✓	✗	✗	✗	✓

Note: Minimum Critical Path Time and Critical Path Resource Time will be different if Processing Time and Time Required for Role are different for an activity.

Refer to Appendix C: Example Time Metrics Calculation for an explanation of how these time measures would be calculated for a process.

3.2 Cost and Revenue Based Metrics

Key building blocks for the cost measurements within a process are:

Table 7: Cost Measures

Measure	Definition
Processing Cost (Cost and Revenue Tab)	The cost incurred every time an activity is run. This is a unit cost (ie. expense)
Startup Cost (Cost and Revenue Tab)	The cost incurred the first time the activity is executed. (Simulation only)
Wait Time Cost (Cost and Revenue Tab)	The cost of the activity while waiting for a resource to be applied. This cost measure can only be applied within a simulation profile.
Revenue (Cost and Revenue Tab)	The income earned when a task is completed.
Resource Costs – Cost per Time Unit (Costs Tab on Role, Resource or human Bulk Resource)	The cost of resource for a particular time. Eg. Hourly cost rate
Resource Costs – Cost per Unit (Costs Tab on Role, Resource or Bulk Resource)	The cost of the resource performing a task eg. cost per report.
Resource Costs – One Time Cost (Costs Tab on Role, Resource or Bulk Resource)	The costs associated with the first use of a resource in a process.

Based on these cost measures entered in a model, the following cost metrics are calculated:

Table 8: Cost Metrics

Metric	*Definition*	*Processing Cost*	*Startup Cost*	*Wait Time Cost*	*Revenue*	*Cost per Time or Unit (Resources)*	*One Time Cost (Resources)*
Process Cost	The total of all costs in a process.	✓	✓	✓	✗	✓	✓
Static Process Cost	The processing and resource costs for the process not including costs of startup, one-time costs or delays.	✓	✗	✗	✗	✓	✗
Resource Cost	The total cost of allocated roles or resources including systems in a process based on the time contribution of each Resource.	✗	✗	✗	✗	✓	✓
Queue Cost	The costs incurred by the process while waiting for resources.	✗	✗	✓	✗	✗	✗
Process Revenue	The total of all revenue in a process.	✗	✗	✗	✓	✗	✗
Profit	The overall profit or loss from a process.	✓	✓	✓	✓	✓	✓

3.3 Resources

Confusion may result from the use of Resource and Roles within WBM. Resource is used as a generic term to encompass any human, system, tool or machine which expends effort on the process. Within this generic definition, it includes **Roles**, **Individual Resources** and **Bulk Resources**.

4. Calculate Process Metrics

4.1 Purpose and Value of Process Metrics

4.1(a) What are Process Metrics

Process metrics are simple quantifiable measures of the process as a whole. These measures provide a baseline for process cost and effort for current processes and measure the difference between proposed future states of the process.

4.1(b) Common Business Scenarios

Common business scenarios in which process metrics can provide support for engagement findings, recommendations and conclusions are:

- A client wants to know the cost of providing a service to its customer;
- Potential process savings are required to support a business case;
- Client deliveries are being delayed; or
- A client wants to build a business case to support introduction of a new application.

4.1(c) How can Process Metrics add value to your engagement?

Quantitative measurements of the process can provide factual support to findings and recommendations which provide a more compelling business case than anecdotal evidence alone.

Process metrics can also be used to:

- Measure the level of complexity of a process;
- Identify areas for greatest return from process improvement initiatives;
- Measure impact of proposed process changes;
- Assess potential impact of competing process improvement initiatives; and
- Support business case for change.

4.2 Scope of Process Metrics

Process Metrics are the measurements of the process that can be derived without simulating the process. These measurements are calculated by reference only to the process and not its operation in the organisational environment ie. the analysis is not concerned with the number of resources working on the process, the volume of work, or the businesses hours of operation.

Table 9: Metric Definitions

Metric[9]	*Definition*
Resource Time / Process	Weighted average total resource time for all activities for the process.
Resource Time / Case	Sum of resource time for all activities for a particular case
Static Process Cost / Process	Weighted average cost of process execution.
Static Process Cost / Case	The cost of the execution of a particular case through a process
Minimum Critical Path Time / Case	Average of Minimum Critical Path Time over all instances following a Case.
Minimum Critical Path Time / Process	Average over all instances of the sum of Processing Time for all activities on critical path.
Activity Time / Case	Sum of Processing Time for all activities for a particular case
Activity Time / Process	Weighted average of total Processing Time for all activities for the process.
Critical Path Resource Time / Case	Average over instances following a Case of Critical Path Resource Time
Critical Path Resource Time / Process	Average over all instances of the sum of Time Required for Role for activities on the critical path.
Process Cases	The number of alternative ways in which the process may be executed
Case Probability	The likelihood of any particular case occurring when the process is executed

4.3 Data Gathering

To obtain metrics, it is necessary to augment the process map with quantitative data. The templates in  GBS Process Data Gathering for WebSphere Business Modeler Templates will provide assistance for the data gathering activities.

It is essential to maintain a consistent definition of each of these measures. The following table describes the measures which need to be collected for each process element and the WBM Attributes Field in which that data should be stored.

Table 10: Process Metrics Data Gathering Requirements

Element	*Measure*	*Definition*	*WBM Attributes Field (Tab → Field Name)*
Task	Processing Time	Time required for the activity to complete.	**Duration → Processing Time**
	Time Required for Role	Time the role is actively working on the Task. **NOTE:** For **automated tasks, transfer tasks and wait tasks** this value should **not** be populated[10]	**Resources → Role Requirements → Time Required**
	Processing Cost	Cost which is incurred every time task is executed. This is a unit cost (ie. expense)	**Cost and Revenue → Processing Cost**
Service	Processing Time	Time for Service to provide response.	**Duration → Processing Time**
	Processing Cost	Cost of obtaining the service	**Cost and Revenue → Processing Cost**
Role	Cost	Average cost rate for people performing this Role. This is entered as either a Cost per Time Unit or a Cost per Unit	**Costs → Costs**
Bulk Resource (system or machine only)	Cost	Cost of each use of the system / machine resource expressed as a Cost per Unit. (Do not record a cost by time usage[11])	**Costs → Costs**
Decision Choice	Probability	The likelihood the decision choice will occur when the process executes	**Output Branches → Probability**

In addition, gather information about the business environment described in Table 11. These can be captured in the **Attributes → Description** or in **Annotations** on the Process Model.

Table 11: Process Environment Information

Environment Information	*Definition*
Process Volume	The number of business items received as input to the process over a certain time frame (average, peak, seasonal variations etc.).
Process Issues	Any known issues or problems with the process in its current state
Process Opportunities	Any suggestions for improving the processes
Process Assumptions	Any assumptions made regarding the process

4.4 Developing Process Models

A process model should represent the business logic of the process. This may require revision and revalidation of a process map to ensure precision in the representation of the sequence of activities. The analysis activities to be performed will also impact how the model must be structured.

4.4(a) Augment model with data

Update model by adding quantitative data outlined in section 4.3 to appropriate WBM Attributes field.

4.4(b) Confirm process logic is correct

Review the process model to ensure all logic is correct. Some key points to confirm:

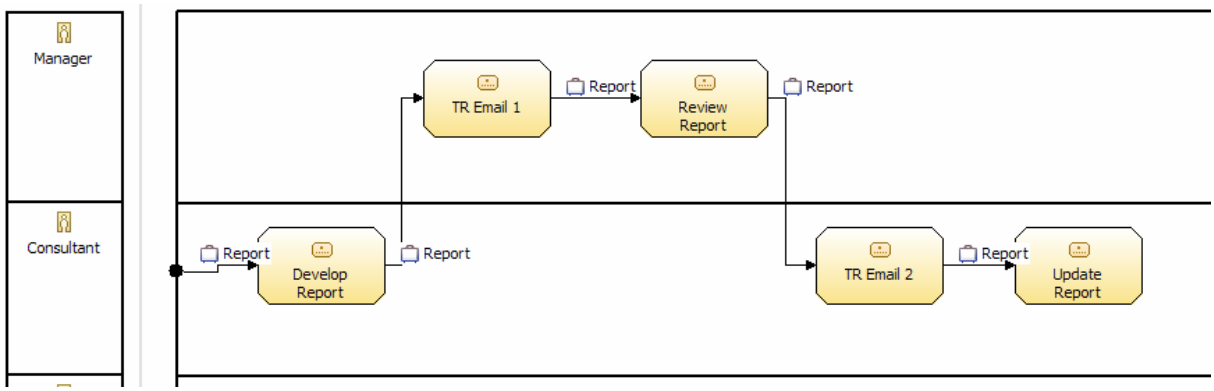
- All alternative paths ending with a Stop Node are replaced by a Merge to a single Stop Node[12];
- Each path ending with an End Node is replaced with a link to a Join and a Stop Node[13];
- The percentages on all decision choices total 100%;
- Business items do not transform through a decision, merge, fork or join;
- Each path split by a Fork reconnects with a Join if the outputs are the same business item;
- Each path split by a Decision reconnects with a Merge;
- The activity immediately after a join has a minimum number of inputs[14] equal to the number of business items being joined;
- Tasks do not occur in parallel if they are being performed by the same individual[15]; and
- Tasks which have two or more different business items as inputs have correctly defined input logic to specify if one or all business items are required for the task to commence.

4.4(c) Modelling Transfer Time

When the purpose of analysis is to measure the transfer times of information between activities, explicitly model each transfer as a separate task[16]. This should also be done where transfer time is material within the overall process[17] as it may affect the critical path times. Including transfers will add to the size, complexity, and effort required to producing the model.

Transfer tasks should be set up as local tasks or services. The naming standard for these tasks are: *TR {medium} #*. For example: TR email 1, TR courier 5. These Tasks must be used in the process map every time a transfer occurs.

Figure 2: Transfer Tasks



Assign the Transfer Task to the Role of the receiving activity.

Use the **Processing Time** field to record the transfer time[18]. Do not record any time in the **Time Required for Role**.

4.4(d) Modelling Waiting Time

When a process must wait for a specified period of time before proceeding, this delay should be modelled using a separate task[19]. These tasks should be set up as local tasks or services. Assign the task to the Role of the receiving activity.

Use **Processing Time** to record the delay or wait time. Do not record any time in the **Time Required for Role**.

4.4(e) Modelling Individual instance or Batch processes

Always model a process using a consistent unit of work iterator[20]. The purpose of the model should be considered to determine whether to use a batch or individual unit of work iterator.

Generally, reduce all activities to a single iterator. However, where a process contains significant portions of batch processing, it is recommended that the entire process be mapped at a batch level. For example, where:

- batch level measurements are required[21]; or
- cycle time or critical path time is required[22].

To convert batch times to individual times divide batch time by average number of items in a batch[23].

To convert individual times to batch times either multiply individual time by average number of items in a batch or gather data on the average duration for completing a batch.

4.4(f) Decisions & Cases

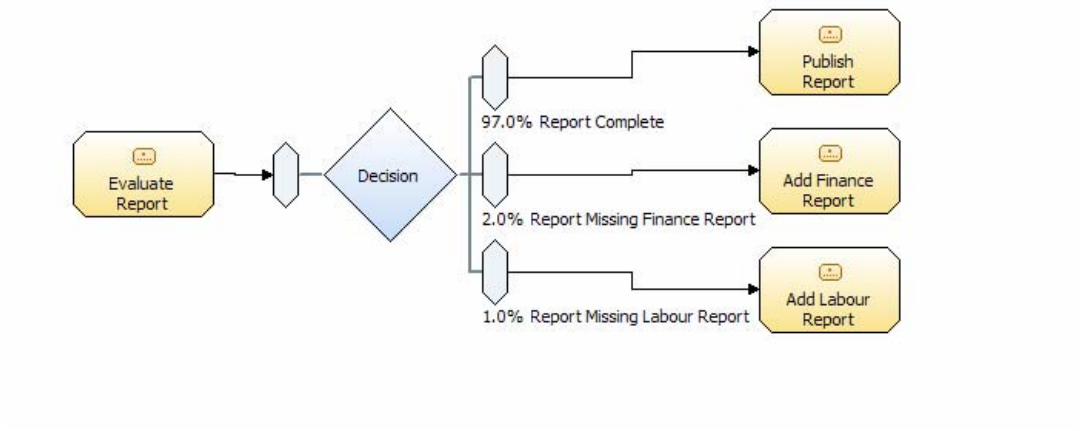
Each decision increases the number of process cases. A case is a particular path through the process. An excessively large number of cases may be challenging to understand and interpret.

Consider whether the low probability of some decision choices occurring would be better modelled at a summary level.

This approach is recommended when a decision creates alternate paths with minimal differences in the processing, roles or timing of two or more possible paths. Use annotations to document the fine grained differences within the process.

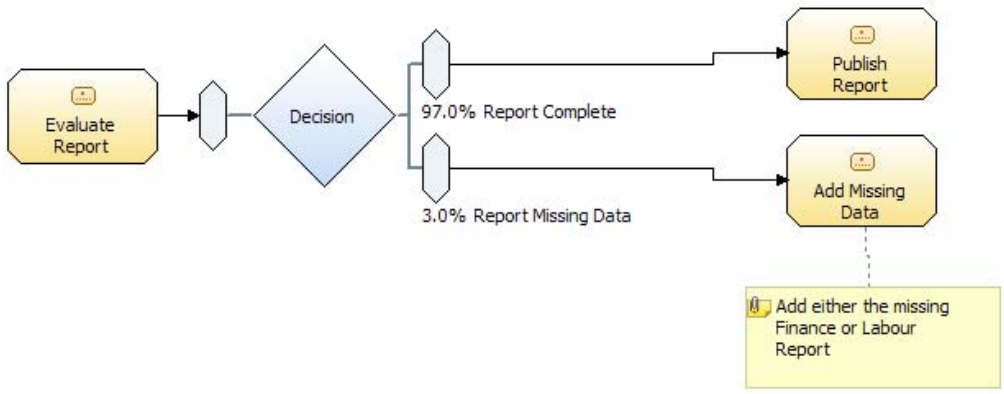
For example, in the following process, the decision creates three cases. Two cases have relatively low probabilities with similar subsequent tasks.

Figure 3: Example of model with multiple cases with low probabilities



This could be modelled in the following manner which would reduce the overall number of cases without losing the required level of detail in the process.

Figure 4: Example of model with reduced cases



4.4(g) Errors

Correct all errors in the maps listed in the Error View. Using analysis reports generated while there are errors in the Error View may result in inaccurate report content.

4.4(h) Modelling for Comparative Analysis

When performing comparative analysis ensure consistency is maintained between the models.

Use a copy of the current process and make the changes to the copied model that represent the future state[24].

4.5 Validating the Model

Validate every process and subprocess individually before extracting analysis results from WBM[25]. Only validate higher level processes after each of their subprocess have been validated.

4.5(a) Ensure all data is complete and correct

Summary reports will enable a quick check of the data recorded for each process element. The following table explains which report to use to validate the information stored for each process element.

Table 12: Process Data Validation

Process Element	*Validation*	*Report Name & Navigation*
Roles	Ensure appropriate costs are assigned to all Roles	Static Analysis → Roles Cost Summary Analysis Report
Bulk Resources	Ensure appropriate costs are assigned to all system/machine Bulk Resources	Static Analysis → Resource Cost Summary Analysis Report
Tasks	Validate Time Required for Role to perform task is associated with Role[26] Time is NOT allocated to Bulk Resource[27] Time is not allocated to "System" roles[28] Time is not allocated to Transfer tasks (prefaced by TR). Validate correct Processing Time Ensure consistent times have been applied for the same transfer medium across the process.	Profile Analysis → Profile Specification
Services	Validate correct Processing Time Time is NOT allocated to Role or Bulk Resource[29]	Profile Analysis → Profile Specification
Decisions	Validate percentages for each decision choice is complete and correct and total 100%	Profile Analysis → Profile Specification

4.5(b) Validate the process flow

Validate the list of activities contained in each case[30]. Run **Profile Analysis → Static Cases Summary Analysis Report** and review the list of activities contained within the case.

Where there are a large number of cases, review the activities for at least the 10 most probable cases and review other cases with significant deviations in cost or time.

4.5(c) Validate linkages between subprocesses

Within the simulation snapshot, select **Expand All** on the process editor to view an expanded view of the process. Ensure the process logic flow is correct across all subprocesses.

4.5(d) Validate the appropriateness of results

Results of process metrics should always be checked to make sure that the model is giving correct results that are consistent with actual observations or records in the business.

Run **Profile Analysis → Static Cases Summary Analysis** and review the case level and weighted average results to ensure a sensible and explicable result is being achieved.

Where there are a large number of cases, review the values of at least the 10 most probable cases and other cases with significant deviations in cost or time.

4.6 Troubleshooting

Use the following troubleshooting suggestions to resolve any remaining issues with your process model:

Table 13: Process Metrics Troubleshooting

Issue	*Suggested Resolution*
The process model has been updated but the results obtained from the Static Process Cases Summary Analysis have not changed	The report is based on the simulation snapshot of the process. After updating the process model, select Simulate to create a new snapshot.
The Static Process Cases Summary Report does not contain any results	Ensure the process does not begin with a Start Node Ensure the process contains a Stop Node Ensure that Merges, Forks and Joins do not contain additional inputs or outputs.
There are inexplicable changes in time or cost between current and future states of the process	Run a **Profile Specification report** on both processes to ensure only the data which should be changed has been changed.
Process flow is not accurate	Ensure logic linking subprocesses is valid Ensure business items linking subprocesses match
Model is producing unexpected results	Revalidate model using checklists in Section 4.4(b) and 4.5(a).
Other issue or unable to resolve problems above	Refer issue to GBS Practitioner Support Network.

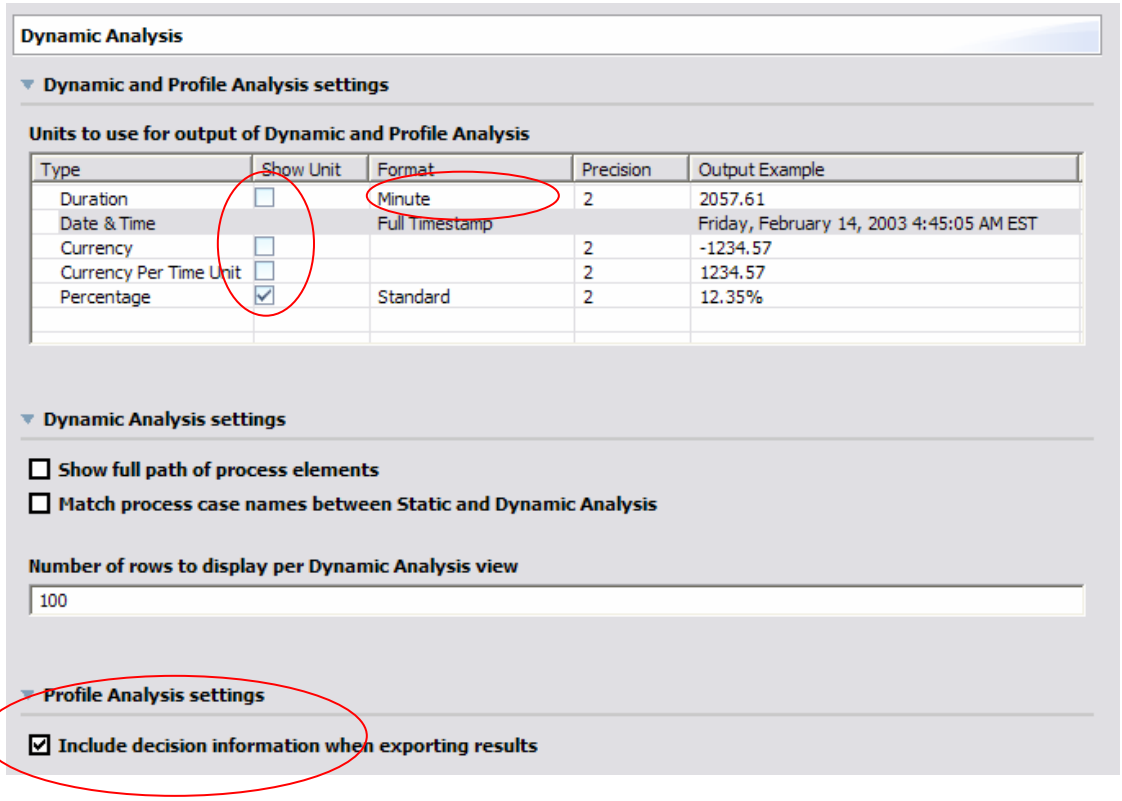
4.7 Measuring the Process

This section will provide guidance in how to configure WBM settings and the recommended reports to be used to generate results for analysis.

4.7(a) Configuring WBM

- Update **Windows → Preferences → Business Modelling → Dynamic Analysis Preferences** :
  - Ensure **Show Units** box is unchecked for all options except Percentage.
  - When using Cases Aggregation Template, check **Profile Analysis Settings** -> **Include decision information when exporting results**
  - When running reports for other templates, ensure **Profile Analysis Settings** -> **Include decision information when exporting results** is NOT checked.
  - Ensure **Duration** format is NOT set to **Expanded.**

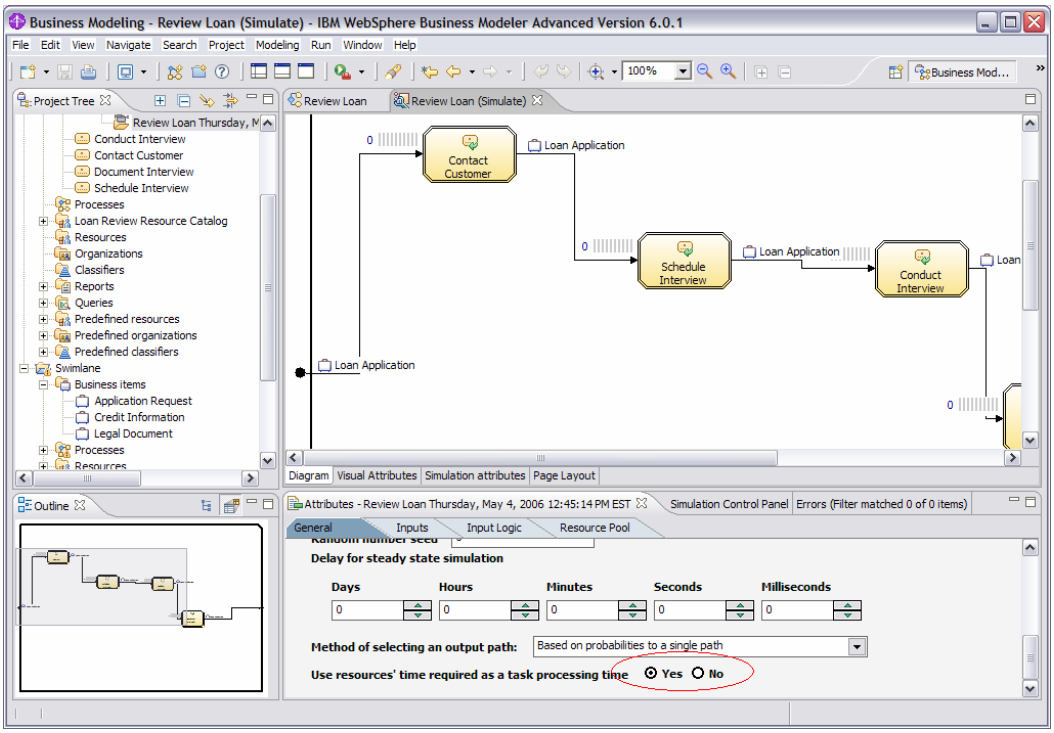
Figure 5: Show Units & Profile Analysis settings



- Create a simulation snapshot of the Process

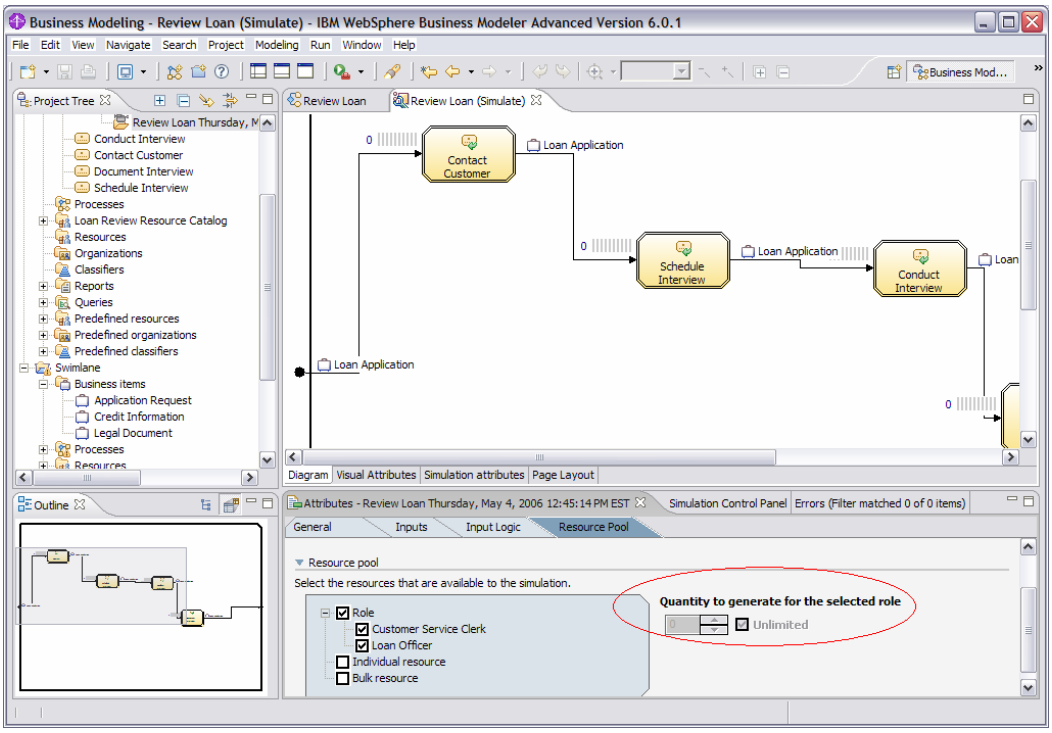
- **Use resource's time required as the task processing time** should be set based on the analysis that is to be performed. See Table 14 for details.

Figure 6: Set Use resource's time required as task processing time



- Set **Roles** to be available in the simulation and **unlimited** in number.

Figure 7: Ensure Unlimited Roles available



4.7(b) Running Reports

- Run the **Profile Analysis → Static Process Cases Summary Analysis** to extract the process metrics from WBM.

Table 14: Settings for Process Metrics Reports

Setting	*Analysis Type*				
	Resource Time	*Minimum Critical Path Analysis*	*Static Process Cost Analysis*	*Process Complexity Analysis*	*Additional Analysis*
Simulation Setting – Use resources time required as task processing time	Yes	No	Either	Either	Either

4.7(c) Extracting Reports

The following templates will support the analysis covered in this section:

- WBM Process Metrics Template
- WBM Process Metrics Opportunity Minimum Critical Path Template
- WBM Process Metrics Opportunity Resource Time Template
- WBM Cases Aggregation Template

See **instruction** tab of each template for instructions on how to extract data from WBM so that it can be loaded into the template.

4.8 Analysis & Interpretation

4.8(a) Case Aggregation Analysis

Decisions illustrate the different activities which can be performed in a process based on the application of business rules. A case within a process is one path through the process and is described by the decision choices it follows.

Where there are a significant number of cases within a process, aggregate cases using common characteristics or key decision choices to improve focus on the business rules which drive the processing differences.

Cases are aggregated by decision choice. Cases which share a common decision choice are grouped and the weighted average time and cost measures are calculated for the group. This provides visibility of the impact of the underlying business rules on the process time and cost. It is also possible to aggregate cases across a number of decisions using AND or OR logic. This facilitates more complex groupings of cases eg. successful or unsuccessful cases.

It is not necessary for notable case groups to be exclusive. Each notable case group tests the impact of specific business rules associated with the decision choices around which the cases are grouped.

Utilise the Cases Aggregation Template to identify notable case groups within the process information. Depending on the engagement objective, a case may be notable if :

- It has a high probability of occurrence;
- It has one or more time or cost measures that deviate significantly from the process average. The higher the probability of occurrence the lower the difference must be to be significant.
- It represents the focus of the engagement eg. successfully completed loans, rejected applications.

Each notable case group should be assigned a meaningful name eg. High Value Customers, Overseas Applicants.

The Cases Aggregation Template enables the development of Static Process Cases Summary Analysis Reports using these notable case groups which can be used in Resource Time and Minimum Critical Path Analysis to more clearly understand the impact of the business rules on the process.

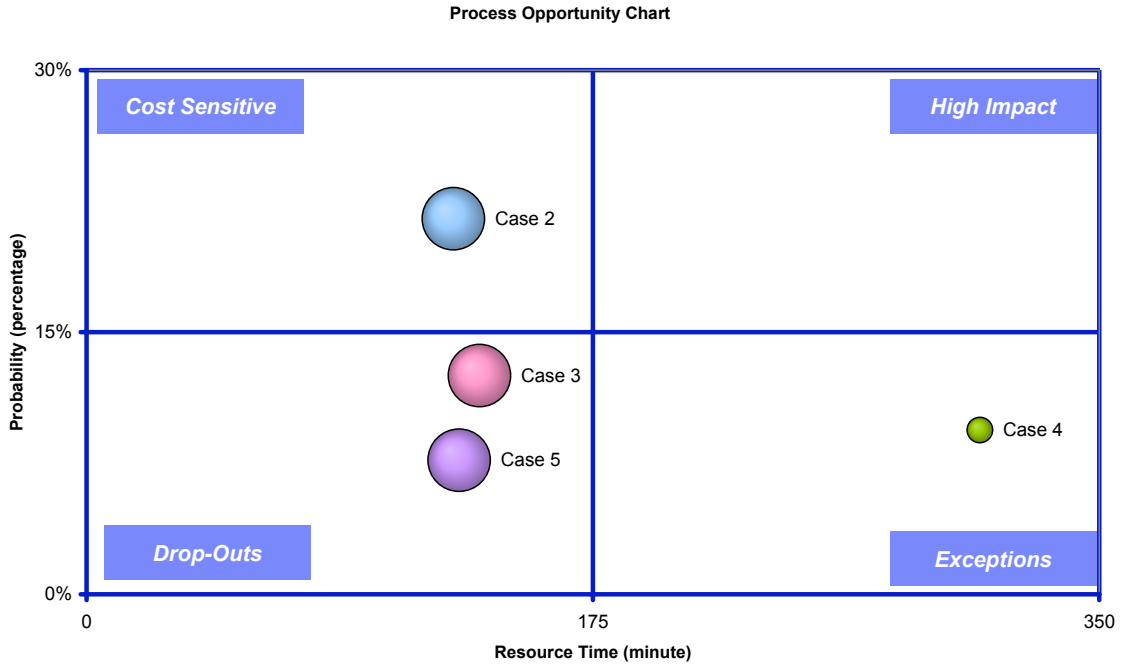
4.8(b) Resource Time Analysis

Analysis

Table 15: Resource Time Analysis

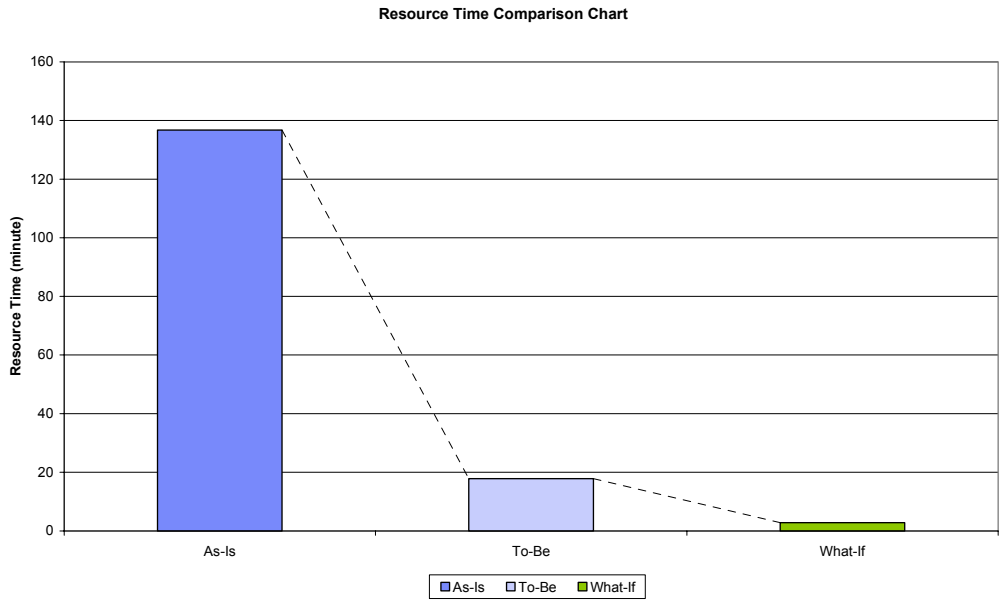
Graph Name	Description	Template
Process Opportunity Chart (Resource Time)	Shows cases (or grouped cases) with highest opportunity for value add to the whole process	WBM Process Metrics Opportunity Resource Time

Figure 8: Resource Time Process Opportunity Chart



Graph Name	Description	Template
Resource Time Comparison Chart	Shows the change in resource time between As-Is and To-Be processes	Process Metrics

Figure 9: Resource Time Comparison Chart



Interpretation

Table 16: Resource Time Interpretation

Analysis	Possible Cause	Opportunity
Large bubbles in high impact quadrant Figure 8	• Most common cases have resource driven costs	• Process redesign • Reduce waste or rework • Implement system support or automation • Assign tasks to lower cost resources • Outsource non-core activities
Small bubbles in high impact quadrant Figure 8	• Efficient process	• Focus on reduction of time • Analyse potential to improve overall minimum critical path time
Large number of bubbles in high impact quadrant Figure 8	• Complex process	• Consolidate business rules and process flow logic

Analysis	*Possible Cause*	*Opportunity*
Large bubbles in cost sensitive quadrant Figure 8	• High cost resources • Significant external or non-labour costs	• Cost reduction improvements • Identify alternative suppliers for key services • Assign tasks to lower cost resources • Outsource non-core activities • Analyse to assess impact of the minimum critical path time of the process
Large number of bubbles in cost sensitive quadrant Figure 8	• Relatively complex process	• Consolidate business rules and process flow logic
Large number of bubbles in exception quadrant Figure 8	• Complex or immature process which is driven by exceptions	• Standardise processing • Reduce exception occurrence
Large bubbles in exception quadrant Figure 8	• High cost exceptions due to additional labour requirements	• Modify business rules to reduce exceptions occurring • Reduce defects which require rework or rectification • Assess product or services provided in this case to determine profitability • Ensure resources are appropriately skilled to handle this situations more efficiently
Large bubbles in drop-out quadrant Figure 8	• Large non-resource driven cost	• Similar to cost sensitive quadrant but low percentage of occurrence may reduce overall ROI from these initiatives
Large number of bubbles in drop-out quadrant Figure 8	• Process drop-outs or situations where it is impossible to complete entire process	• Reduce the number of cases by identifying incomplete or inappropriate triggers early

Analysis	*Possible Cause*	*Opportunity*
Decrease in resource time Figure 9	• Reduction in number of tasks • Automation of tasks • Decrease in task duration and therefore lower resource requirement • Increase in efficiency of resources through better training • Improvement of machines/systems used	• Reduce resources. Total decrease can be quantified by multiplication of resource reduction (by role) by the volume of the process. NOTE: Care must be exercised when basing personnel reduction recommendations on this analysis if this process does not reflect the complete scope of the personnel's responsibilities.
Increase in resource time Figure 9	• Improved customer service • Work allocated to less skilled resources • Increased effort to reduce rework or errors • Additional effort to decrease overall end-to-end time (critical path) of process	• Complete Process Analysis to determine if critical path has been reduced • Use cheaper resources to reduce overall cost of the process • Look at full end-to-end process to determine if reduction in errors results in cost savings or total time

4.8(c) Minimum Critical Path Analysis

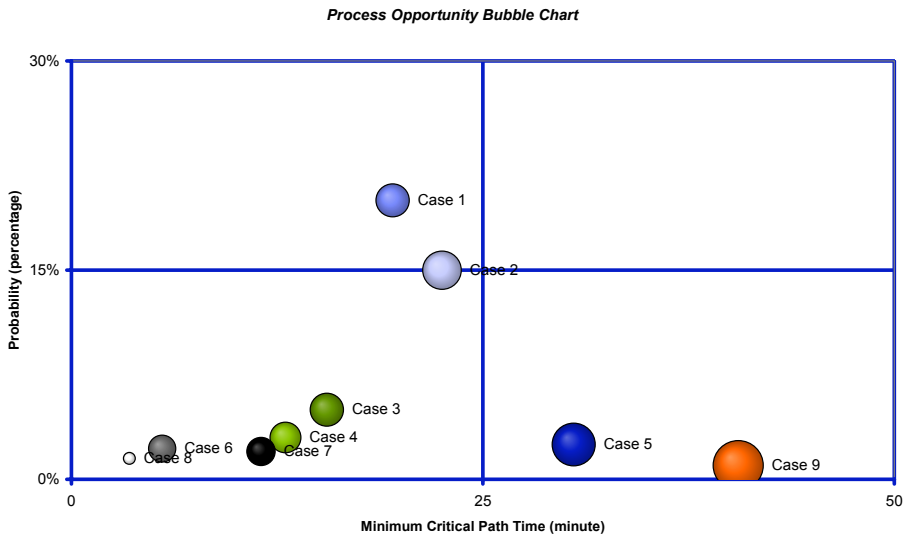
The Minimum Critical path analysis is concerned with the time required to complete the process. It does not factor in non-working time or resource constraints that result in delays.

Analysis

Table 17: Minimum Critical Path Analysis

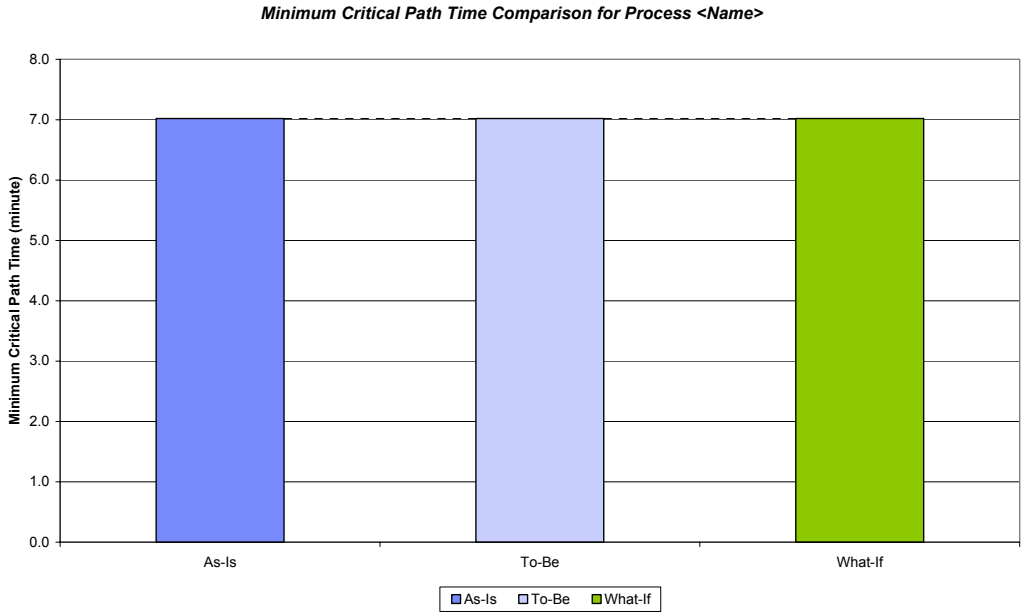
Graph Name	*Description*	*Template*
Process Opportunity Chart (Minimum Critical Path)	Shows cases (or grouped cases) with highest opportunity for value add to the whole process	WBM Process Metrics Opportunity Minimum Critical Path

Figure 10: Minimum Critical Path Opportunity Chart



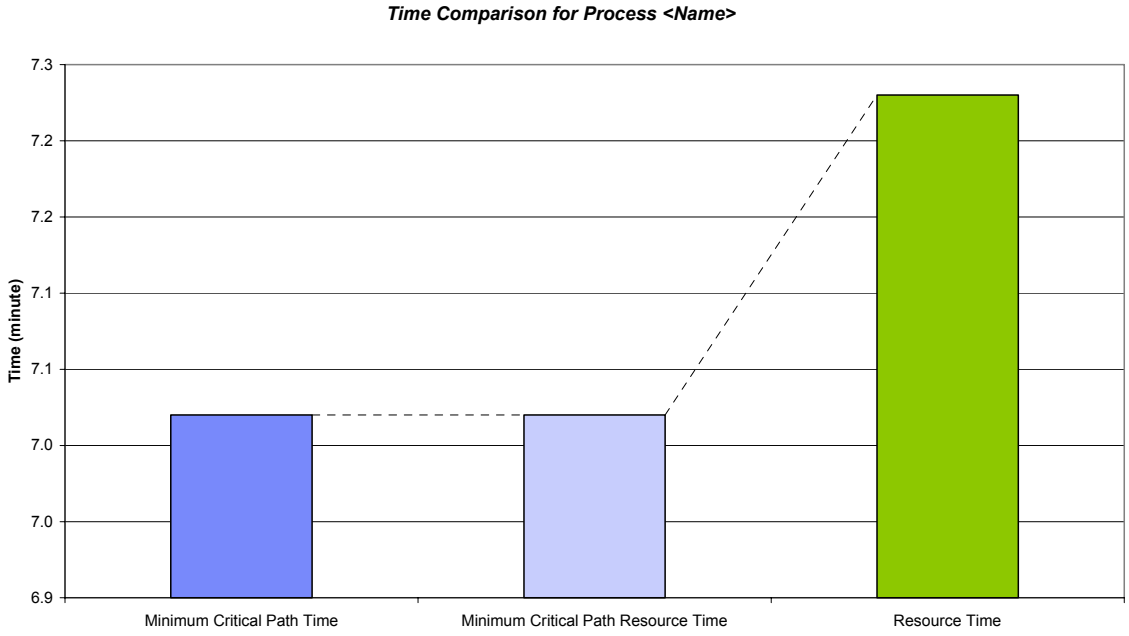
Graph Name	Description	Template
Minimum Critical Path Time Comparison Chart	Shows the change in Critical Path Time between As-Is and To-Be processes	Process Metrics

Figure 11: Example Minimum Critical Path Time Comparison Chart



Time Comparison Chart	Shows the difference between Minimum Critical Path Time, Minimum Critical Path Resource Time and Resource Time	Process Metrics

Figure 12: Example Time Comparison Chart



Interpretation

This interpretation will also apply to analysis performed on Minimum Critical Path using Dynamic Analysis reports in Section 5.8(c).

Table 18: Minimum Critical Path Interpretation

Analysis	*Possible Cause*	*Opportunity*
Minimum Critical Path Time is high compared to Critical Path Resource Time Figure 12 Figure 21	• High dependence on systems or physical resources • Regulatory limitations • High transfer time • High external time	• Reorganise tasks to expedite delivery to customer and perform other tasks afterwards • Improve response time of tools or equipment • Perform classification analysis to confirm transfer time and/or external time is an issue • Set SLA for external suppliers
Minimum Critical Path Time is close to Critical Path Resource Time Figure 12 Figure 21	• Limited transfer or external time	
Minimum Critical Path Time is close to Resource Total Time Figure 12 Figure 21	• Sequential processing	• Identify activities which may be able to be completed in parallel to reduce overall critical path time.
Decrease in Minimum critical path time Figure 11 Figure 22	• Increase in activities being performed in parallel	• Identify the overall process cost or implications from decreasing the Minimum Critical Path Time
Increase in Minimum critical path time Figure 11 Figure 22	• Cheaper, less skilled resources have been used • An increase in successful products or services completing the entire process	
Critical path resource time similar compared to resource total time Figure 12 Figure 21	• Sequential process	• Identify activities that can be completed in parallel to reduce overall critical path time.
Large bubbles in high impact quadrant Figure 10 **Error! Reference source not found.**	• High cost resources • Complex process • Large amounts of rework	• High potential for improvement due to large cost • Process redesign • Reduce waste or rework • Implement system support or automation • Assign tasks to lower cost resources • Outsource non-core activities

Analysis	*Possible Cause*	*Opportunity*
Small bubbles in high impact quadrant	• Sequential process with low cost resources	• Reduce time through process redesign and parallelism
Large number of bubbles in high impact quadrant Figure 10 **Error! Reference source not found.**	• Complex process	• Consolidate business rules and process flow logic
Large bubbles in cost sensitive quadrant Figure 10 **Error! Reference source not found.**	• High cost resources • Large number of resources • High costs from external providers	• Use of lower cost resources • Use fewer resources with the drawback of increasing critical path time • Use alternate suppliers
Large number of bubbles in cost sensitive quadrant Figure 10 **Error! Reference source not found.**	• Complex process • High cost resources • Significant parallel processing	• Consolidate business rules and process flow logic • Re-assign tasks to lower cost resources where possible • Outsourcing
Large number of bubbles in exception quadrant Figure 10 **Error! Reference source not found.**	• Complex or immature process driven by exceptions	• Reduce the number of different handling processes for exceptional situations • Reduce likelihood of occurrence of exceptional situations through improved quality • Assess profitability of product or service provided by these exceptions to determine if required
Large bubbles in exception quadrant Figure 10 **Error! Reference source not found.**	• Requires large amount of rework • Inappropriate resources to handle exceptions	• Implement earlier quality checking to reduce amount of rework or wastage • Staff training or assignment of appropriately skilled staff
Large bubbles in drop-out quadrant Figure 10 **Error! Reference source not found.**	• Non-resource costs • Large amount of simultaneous work completed before dropping out • High cost resources	• Use lower cost resources • Reduce amount of unnecessary work before dropout identified • Implement earlier quality checking

4.8(d) Process Complexity Analysis

Analysis

Table 19: Process Complexity Analysis

Graph Name	Data	Suggested Representation	Supporting Data
Process Complexity	Total Number of Cases	Number in Table	Static Process Cases Summary Report

Figure 13: Process Complexity Chart

	As-Is	To-Be	What-If
Number of Cases	20,000	1,000	50
Highest Probability Case	3%	10%	45%
Frequency	3 times per week	10 times per week	45 times per week
Cases comprising 95% of volume	10,000	200	8

Interpretation

Table 20: Process Complexity Interpretation

Large number of cases Figure 13 Figure 8	• Immature or ad-hoc process • Complex business rules which may impact customer service levels or affect quality; • Requirement to use a large number of systems • An exception driven process which focuses on differences instead of common activities.	• Consolidate business rules and process flow logic • Reduce rework and errors • Streamline systems • Focus on common activities rather than exceptions
Cases with low probability Figure 13 Figure 8	• Exceptions • Significant number of business rules	• Simplify business rules to reduce exception cases • Assess true impact of case on business as improvements are likely to have minimal impact

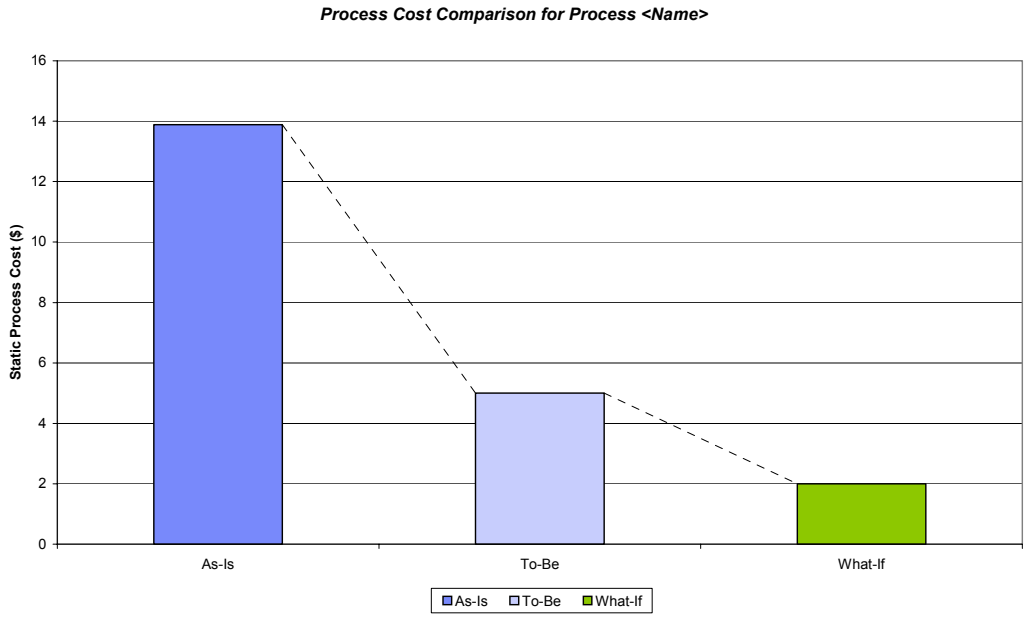
4.8(e) Static Process Cost Comparative Analysis

Analysis

Table 21: Static Process Cost Analysis

Graph Name	*Description*	*Template*
Process Cost Comparison Chart	Shows the change in process cost between As-Is and To-Be processes	Process Metrics

Figure 14: Cost Comparison Chart



Interpretation

Table 22: Static Process Cost Interpretation

Analysis	*Possible Cause*	*Opportunity*
Decrease in cost Figure 14	• Automation • Lower resource requirements • Cheaper resources	• Business case support
Increase in cost Figure 14	• Extra work for improved customer service • Extra work to reduce number of errors	• Further analysis to determine if profitability has increased • Identify qualitative benefits that could support this change

4.8(f) Additional Analysis

Table 23: Additional Analysis

Analysis	*Description*	*Data*	*Suggested representation*
Number of systems	A large number of systems Shows an opportunity for consolidation resulting in an improvement in technical support.	Number of bulk resources from Profile specification report	Number in table
Activity	Comparison of the costs at an activity level can identify key tasks which have the greatest potential for cost reduction initiatives through automation, simplification, outsourcing or assignment to lower cost resources.	Activity names, times and costs for each case from Static Process Cases Summary	Stacked bar graph

4.9 Reporting Analysis Results

Use the Process Metrics analysis results, as appropriate, throughout the engagement report as described below.

4.9(a) Process Model

A printed or PDF version of the process model should be delivered as an appendix to the engagement deliverable.

4.9(b) Process Description, Issues, Opportunities and Assumptions

The process description, issues, opportunities and assumptions should be clearly documented and delivered as an appendix to the engagement deliverable.

Clearly record a summary of any assumptions within the engagement report.

Where different future states of the process exist, a clear list of opportunities or changes being incorporated in each of the future states should be provided.

4.9(c) Process Analysis Results

The process analysis results should be captured for each process and delivered as an appendix to the final report. A template page is provided in the GBS Process Analysis and Modelling PowerPoint Template.

Impacts on cost may be incorporated directly into a business case.

The results from any modelling or analysis activity are only as accurate as the data recorded in the model.

4.9(d) Conclusions and Recommendations

Use summaries of relevant analysis results or graphs to support the conclusions and recommendations in the engagement deliverable. Any assumptions that were made in developing the model, collecting or analysis data and calculating metrics that lead to conclusions or recommendations also need to be included in the engagement deliverable.

5. Generate Process Analysis

5.1 Purpose and Value of Process Analysis

5.1(a) What is Process Analysis

Process Analysis continues to examine the process in isolation from the environment in which it operates. It provides a more focused analysis of time and cost of group of elements within the process.

Process Analysis does not consider the effects of resource limitation or process volume on the overall operation of the process.

5.1(b) Common Business Scenarios

Common business scenarios in which process analysis provides support for engagements findings, recommendations and conclusions are:

- Significant dependence on external organisations to deliver process outcomes;
- Perception of too much internal bureaucracy in process;
- Significant errors or rework required to complete a process;
- Evaluation of a workflow solution; and
- Concerns about high process cost.

5.1(c) How can process analysis add value to your engagement?

Process analysis results provide a detailed breakdown of the time and cost components within the process. This allows further insight into how the process operates and areas with the greatest potential for change. For example:

Categorisation of the time components of a process illustrates:

- Relative contribution of specific roles to the overall process;
- Proportion of process time spent on groups of activities eg. Internal activities, value add activities, quality control activities.

Categorisation of cost components of a process illustrates:

- Relative costs of specific roles to overall cost of process;
- Contribution of labour and non-labour costs to overall cost of process;
- Proportion of process cost expended on groups of activities.

5.2 Scope of Process Analysis

Process Analysis covers measurements of the process obtained with unlimited resources and a fixed number of inputs received. The measurements are calculated by reference only to the process and not its operation within the actual organisational environment.

Table 24:Process Analysis Metrics

Metric	*Definition*
Critical Path Resource Time / Process	Average over all instances of the sum of Time Required for Role for activities on the critical path.
Minimum Critical Path Time / Process	Average over all instances of the sum of Processing Time for all activities on critical path.
Resource Time / Process	Average over all Cases of total Time Required for Role for all activities
Resource Cost / Process	Average over all Cases of total of resource related costs of process
Process Cost / Process	Average over all instances of total cost of process
Resource Time / Role	Average over all instances of total of Time Required for Role for all activities performed by each Role.
Resource Cost / Role	Average over all instances of Resource Cost of all activities performed by each Role.
Critical Path Resource Time / Case	Average over instances following a Case of Critical Path Resource Time
Minimum Critical Path Time / Case	Average of Minimum Critical Path Time over all instances following a Case.
Resource Cost / Case	Average of Resource Cost over all instances following a Case
Process Cost / Case	Average of Process Cost for all instances following a Case
Activity Time / Classifier	Average over all instances of Activity Time for all Sum of all activities within a classifier.
Resource Time / Classifier	Average over all instances of Resource Time for all activities within a classifier.
Process Cost / Classifier	Average over all instances of total cost of all activities within a classifier.
Process Cost / Classifier / Case	Average of total cost of all activities within a classifier over all instances following a Case.
Resource Time / Classifier / Case	Average of Time Required for Role for all activities within a classifier over all instances following a Case.
Activity Time / Classifier / Case	Average of Processing Time for all activities within a classifier over all instances following a Case.

5.3 Data Gathering

To perform Process Analysis, update the process model with the additional information outlined below.

The templates in  GBS Process Data Gathering for WebSphere Business Modeler Templates will provide assistance with these data gathering activities. The following table describes the measures which need to be collected for each process element and the WBM Attributes Field in which they should be captured.

Table 25:Process Analysis Data Gathering Requirements

Element	*Measure*	*Definition*	*WBM Attributes Field (Tab → Field Name)*
Task	Classifier Value	The appropriate Classifier Value for the task.	**Classifier → Classifier Value**
	Startup Cost	The cost incurred the first time the activity is executed.	**Cost and Revenue Tab → Startup Cost**
	Wait Time Cost	The cost of the activity while waiting for a resource to be applied.	**Cost and Revenue Tab → Wait Time Cost**
	Revenue	The revenue which is earned when this task is completed.	**Cost and Revenue Tab → Revenue**
Service	Classifier Value	The appropriate Classifier Value for the service.	**Classifier → Classifier Value**

5.4 Developing the Process Model

Update the process model to add the additional information outlined in Table 25.

Utilise classifiers to group activities within a process and determine whether to explicitly measure the time business items are in transit between activities.

5.4(a) Grouping Activities by Classifications

WBM provides a mechanism to group process elements using Classifiers. This enables analysis of the proportion of time and cost of the process being spent on certain groups of activities.

Assign a **Classifier Value** for each **Classifier** to be used in analysis to each process element.

Pre-defined Classifiers are available to assist in analysis of issues concerning quality control, automation and business value.

For a particular engagement, analysis may be better supported by customised **Classifiers**. It will be necessary to define a consistent meaning within an engagement for the customised **Classifier Values** applied to an element to ensure consistent application across the process model.

Two recommended Classifiers are:

Table 26:Recommended Classifiers

Classifier	*Classifier Value*
Activity Type	Internal
	External
	System
	Transfer
Rework	Rework
	Non-Rework

Additional Classifier suggestions are provided in Appendix F: Recommended Classifiers.

5.5 Validating the model

5.5(a) Ensure Classifier Values have been assigned to each element

Render the model into **Swimlanes by Classifier** to ensure that all elements have been assigned a Classifier Value. Drag and drop any activities in the **Unassigned swimlane** to the correct **Classifier Value** swimlane[31].

Activities can also be rendered by colours to cross check **Classifiers** with **Roles** or other **Classifiers** if required.

5.5(b) Timetables

Ensure no timetables are assigned to Roles involved in the process[32]. To do this go into each **Role** and check the **Availability Tab** does not contain any timetables[33].

5.6 Troubleshooting

This section describes possible reasons that data may not be generated or the results are not as expected and provides guidance on correction:

Table 27:Process Analysis Troubleshooting

Problem	*Suggested Resolution*
Not all cases are reported	Increase the number of tokens being used as Inputs
Nothing in the model has been changed and results are different between runs of the simulation	Ensure **random number seed** is not set to zero and is maintain as a constant number for all simulations. The results will be different if they are run on different computers.
Simulation results are not visible in Simulation Control Panel	Resize Simulation Control panel to reveal results hidden in the middle of the page.
Simulation producing extended time measures.	Ensure no timetables have been assigned to any Roles assigned to activities within the process. If assigned, all time measures will be inflated by non-working time.
Model is producing unexpected results	Revalidate the model using suggestions in 5.5 above.
Probability values of cases are different to Process Metrics	Due to probability, results may not be exactly the same as theoretical values obtained in Section 4. Running a simulation with more tokens may result in the values moving closer to the theoretical probability.
Values for same process different between computers	Due to probability and random number generation of WBM, results may not be exactly the same. Using more tokens will move the results closer.

Problem	*Suggested Resolution*
Other issue or unable to resolve problems above	Refer issue to GBS Practitioner Support Network

5.7 Measuring the Process

This section will provide guidance in how to configure WBM settings and the recommended reports to be used to generate results for analysis.

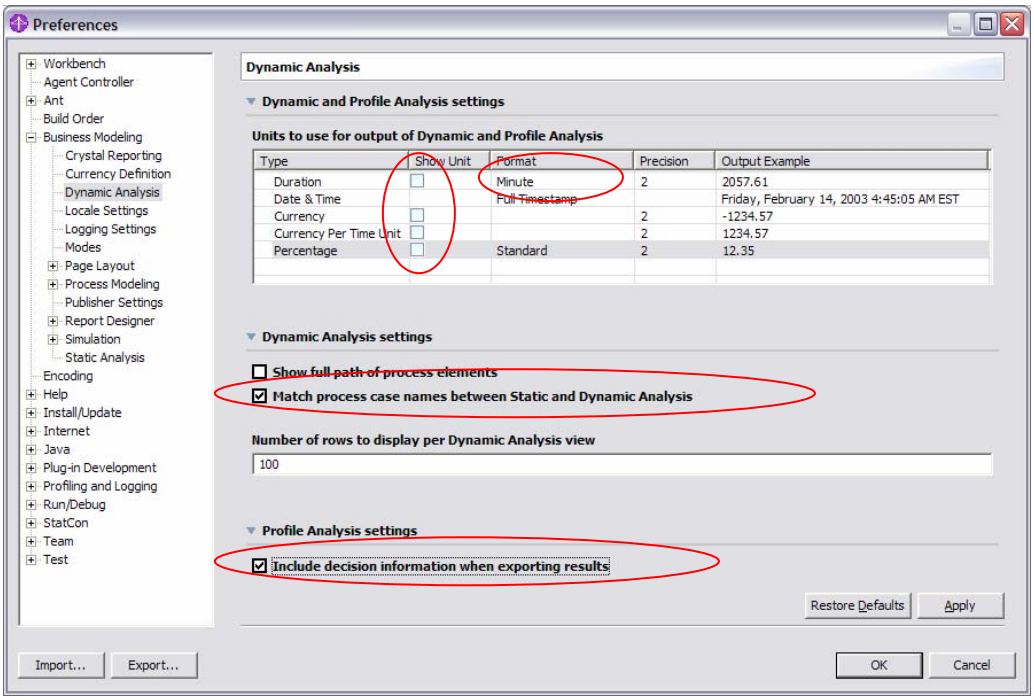
5.7(a) Using DB2 for Simulation Database

To improve simulation performance, it is recommended that DB2 be installed as the Simulation Database when utilising more than a minimal number of tokens in a Simulation. Instructions for installation of DB2 are included in Appendix G: DB2 Installation Guidance

5.7(b) Configuring WBM

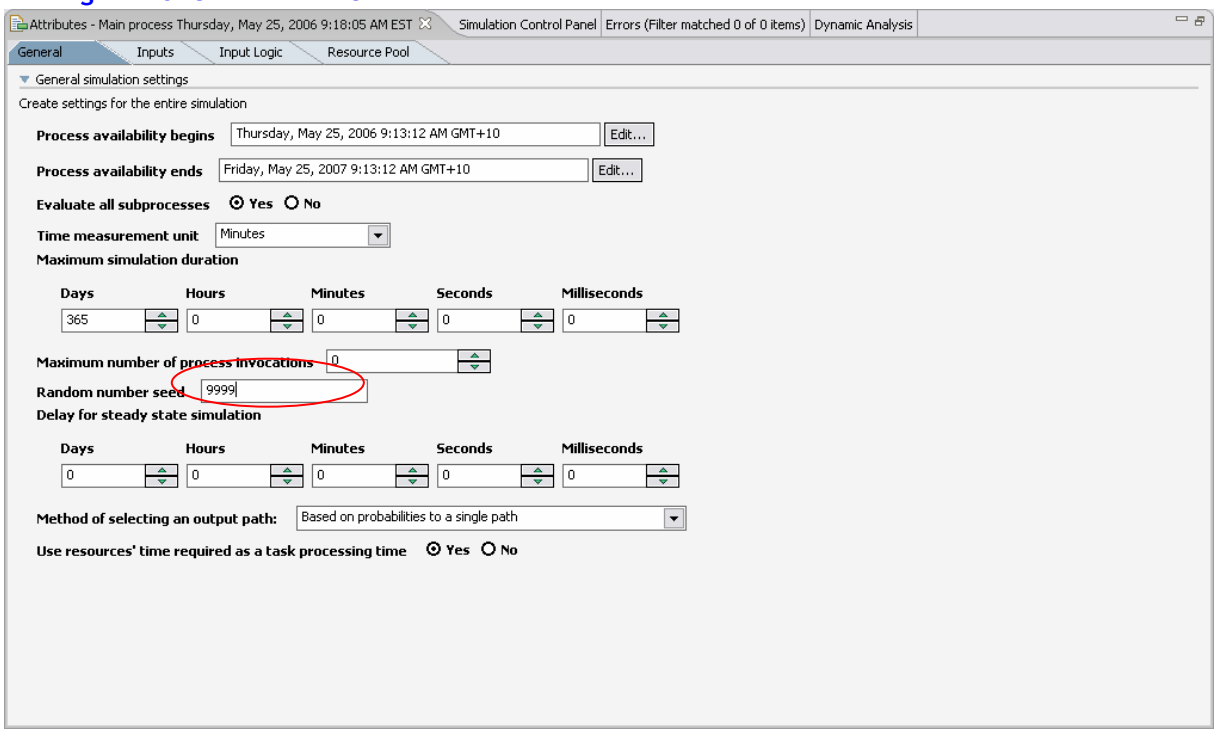
- Update **Windows → Preferences → Business Modelling → Dynamic Analysis Preferences** :
  - Match process case names between static and dynamic analysis should be selected
  - Ensure **Show Units** box is unchecked for all options except Percentage.
  - When using Cases Aggregation Template, check Profile Analysis Settings -> Include decision information when exporting results
  - When running reports for other templates, ensure Profile Analysis Settings -> Include decision information when exporting results is NOT checked.
  - Ensure **Duration** format is NOT set to **Expanded.**

Figure 15: Dynamic Analysis Preference Settings



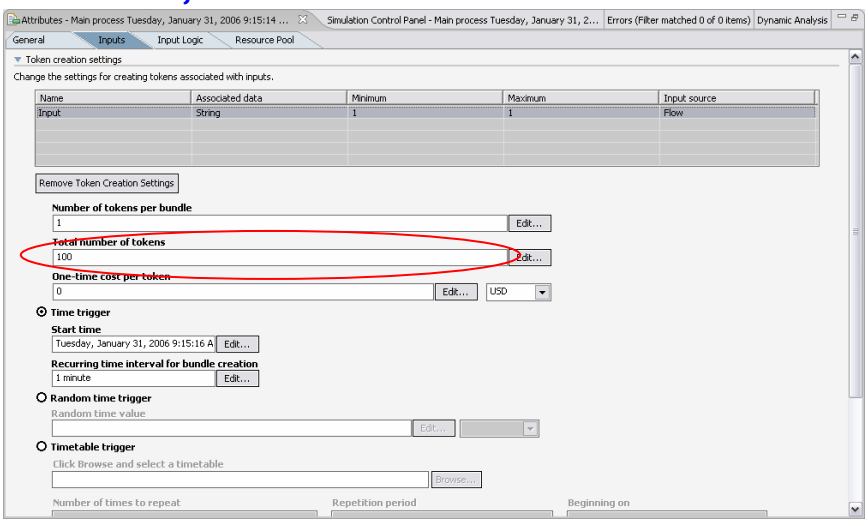
- **Random number seed** must be set and maintained at a number other than zero in order for results between simulations using **Resource Time as Task Processing Time** and not using **Resource Time as Task Processing Time** to be the consistent.

Figure 16: Set Random Seed to a number other than zero



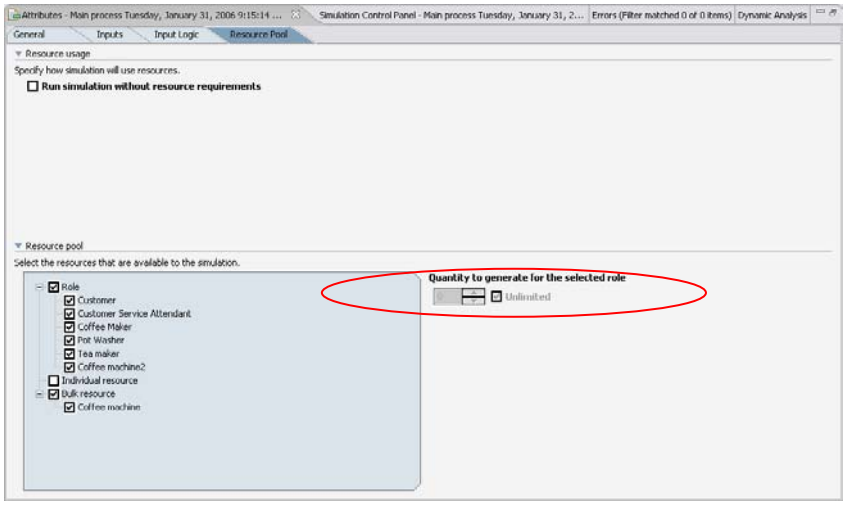
- The **Total Number of Tokens** should be set high enough so that the results are statistically significant. The following formula can be used to calculate the minimum number of tokens to use: Number of Cases x (Highest case probability/Lowest Case Probability). The case information can be obtained from the Static Process Summary All Levels report.

Figure 17: Set number of tokens



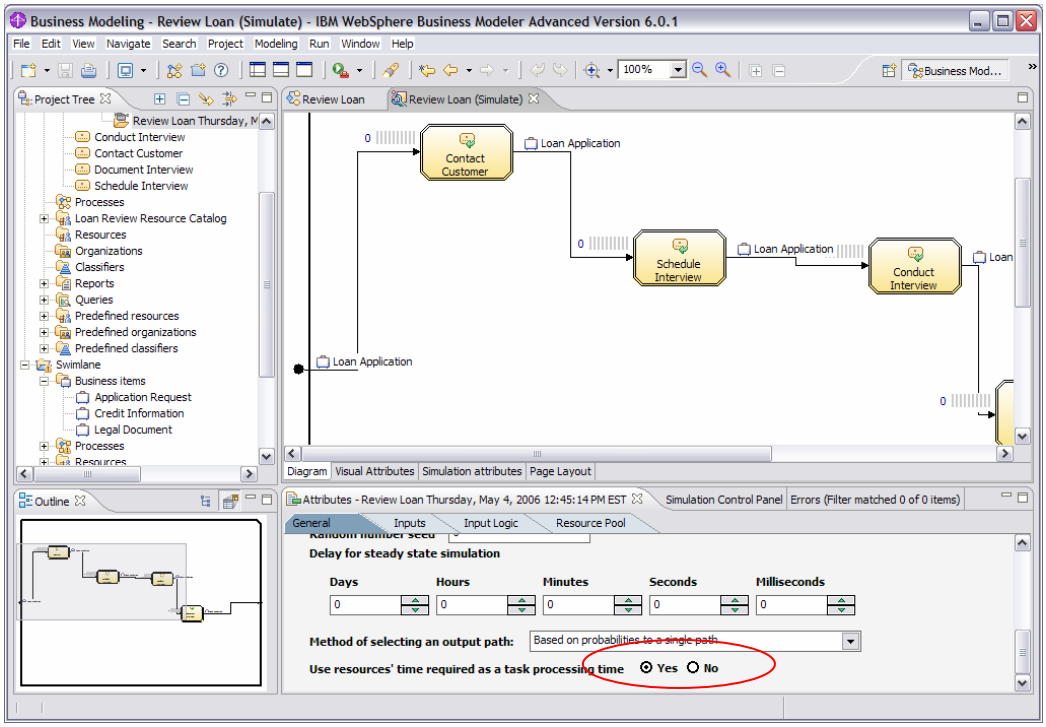
- The Simulation should be run with unlimited Roles. Resources (both Individual and Bulk) that are people should not be included.[34]

Figure 18: Set unlimited Roles



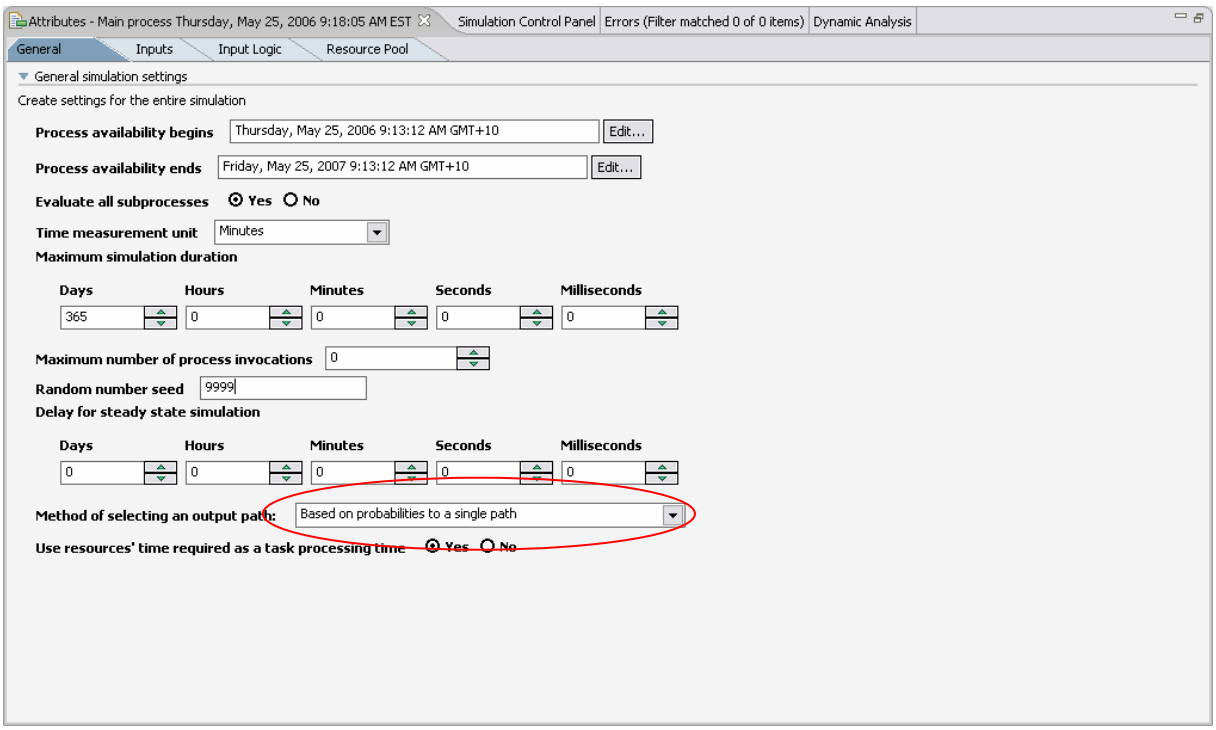
- **Use resource time required as task processing time** should be set based on the report that is to be extracted and type of analysis performed. Table 28:Process Analysis Reports contains a list of the settings required.

Figure 19: Use Resources Time as Task Processing Time



- **Method of selecting an output path** should be set to **Based on probabilities to a single path**

Figure 20: Select Output Path Based on Probabilities



- Ensure the start dates within simulation are aligned :
  - Process Availability : **Simulation Attributes → General → Process Availability Begins**
  - Token Creation : **Simulation Attributes → Inputs**
- Other settings should be left at their default value

5.7(c) Running Reports

The following reports contain the necessary metrics required for each analysis type. Use the following table to identify the report and settings required to produce the data required for each of the analysis types within the section.

Table 28:Process Analysis Reports

Report Name	*Analysis Type*			*Simulation Setting - Use resources time required as task processing time*
	Minimum Critical Path	*Labour*	*Classifications*	
Process Duration	P/C			N
Static Process Cases Summary All Level	P/C			Y
Process Resource		P		Either
Process Cost		P/C		Either
Process Cases Summary		C		N
Classifier Weighted Average			P	Y
			P	N

Report Name	*Analysis Type*			*Simulation Setting - Use resources time required as task processing time*
	Minimum Critical Path	*Labour*	*Classifications*	
Classifier Cost and Duration			C	Y
			C	N

Key **P: Process Level** **C: Case Level**

5.7(d) Extracting Reports

The following templates will support the analysis covered in this section:

- WBM Process Analysis Resource Template
- WBM Process Analysis Process Time Comparison Template
- WBM Process Analysis Process Cost Comparison Template
- WBM Process Analysis Minimum Critical Path Template
- WBM Process Analysis Classifier Template
- WBM Process Analysis Classifier Comparison Template
- Case Aggregation Template

See **instruction** tab of each template for instructions on how to extract data from WBM so that it can be loaded into the template.

5.8 Analysis & Interpretation

These reports provide a significant amount of information about the process. The requirements of the engagement will determine how this information should be use to present the most compelling evidence in support of the engagement.

A number of types of analysis and interpretation guidance are discussed below. These represent common examples of measures and graphs that are useful in displaying and interpreting the metrics available.

5.8(a) Case Analysis

It is possible to perform most of the analysis discussed below at both a process and case level. Process level analysis provides a high level view of the results for the process as a whole, taking into account the probabilities of each different event occurring. Case analysis provides a more granular perspective and can enable a greater focus on particular cases which have high probability, cost or other impacts. It is a useful tool for focusing attention on the parts of a process which cause the greatest difference in the results eg. high cost activities.

As described in the 4.8(a) aggregation of cases can improve focus on impact of business rules where there are a significant number of cases.

The Case Aggregation Template will also aggregate the Process Cases Summary reports into the same notable cases identified in Process Metrics. Use the Process Cases Summary report to understand the impact of the business rules in Labour Analysis when using the Critical Path Analysis Template.

5.8(b) Comparative Analysis

Processes may be analysed standalone or compared to future state processes in order to fully assess the impacts of any proposed changes. Many of the analysis measures and graphs discussed below provide options to view the result for a single process or to view the results compared across a current state and one or two future state processes.

5.8(c) Minimum Critical Path

The Minimum Critical Path analysis is the same as performed in Section 4.8(c) however the templates in this section utilise results obtained from Dynamic Analysis reports. It is recommended to utilise these templates if:

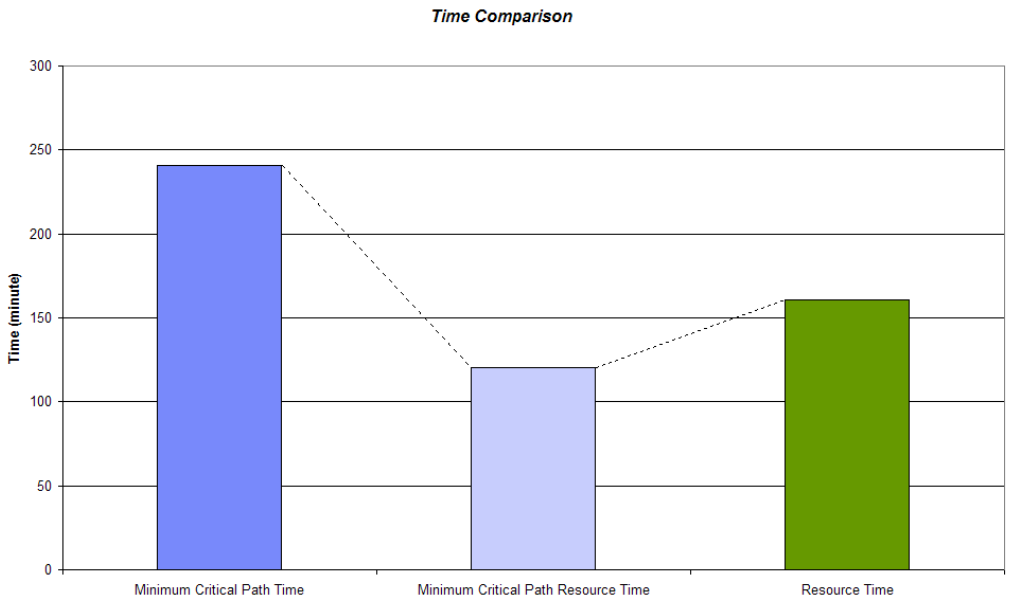
- The Process Model includes elements which are not supported in Profile Analysis[35]; or
- Engagement results are better supported by the random distribution provided by Dynamic Analysis than assigned probabilities supported by Profile Analysis.

Analysis

Table 29: Minimum Critical Path Analysis

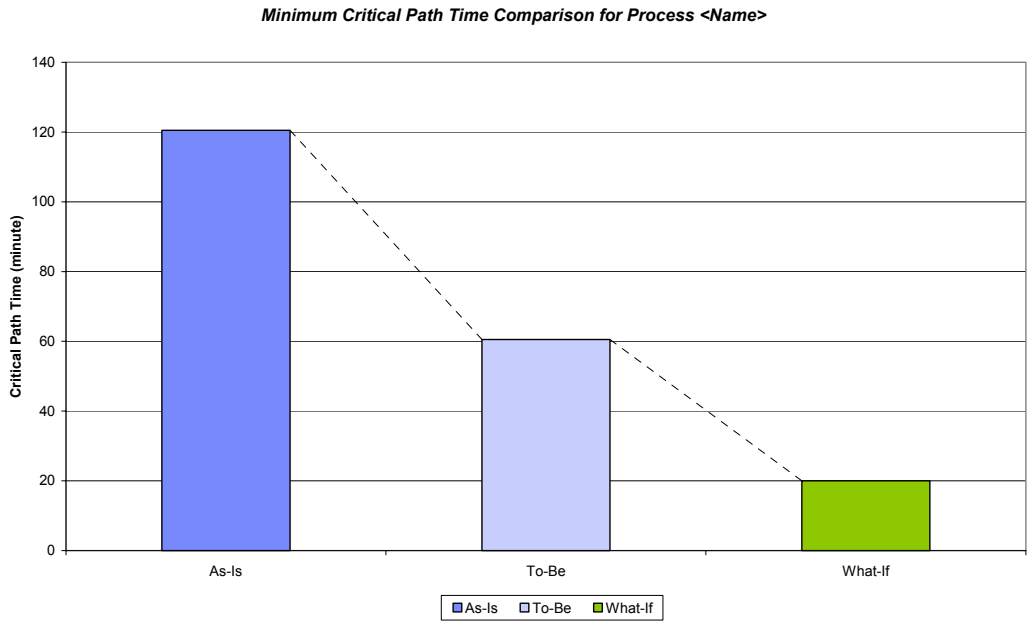
Graph name	*Description*	*Template*
Time Comparison	Shows the contribution resources make to the process and how much other areas such as transfer time or services contribute	WBM Process Analysis Process Time Comparison

Figure 21: Example Time Comparison Chart



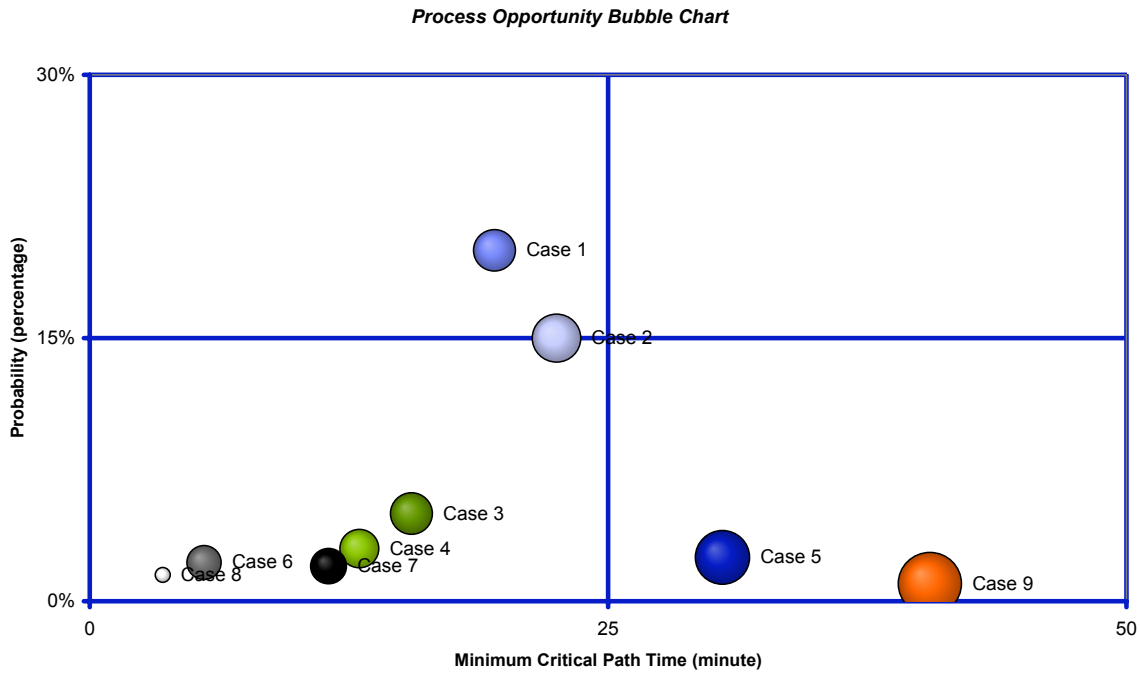
Graph name	Description	Template
Minimum Critical Path Time Comparison	Shows the change in the minimum critical path between the As-Is and To-Be processes	WBM Process Analysis Minimum Critical Path

Figure 22: Example Critical Path Comparison Chart



Graph name	Description	Template
Process opportunity chart	Shows areas of greatest potential for improvement by comparing Resource cost vs probability vs minimum critical path time per case. Run this report with the settings outlined in Section 6 to measure Cycle Time instead of Minimum Critical Path Time.	WBM Process Analysis Minimum Critical Path

Figure 23: Example Process Opportunity Bubble Chart



Interpretation

Refer to Interpretation in Section 4.8(c) for guidance on interpreting Minimum Critical Path analysis.

5.8(d) Labour Analysis

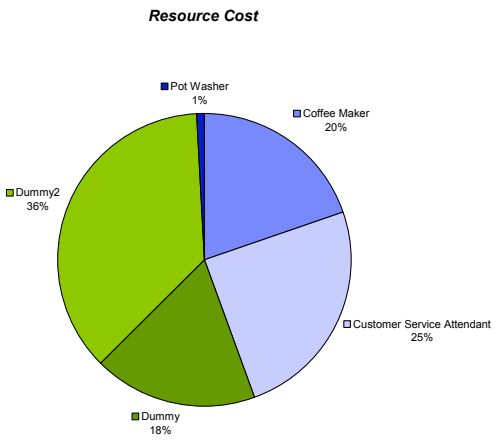
Labour analysis reviews the time and cost contributions of different roles within the process. When performing comparative analysis, it is also possible to determine the change in resource requirements within a process.

Analysis

Table 30:Labour Analysis

Graph Name	*Description*	*Template*
Resource cost Resource time	Shows the contribution of each Role to the process and therefore areas of greatest potential in improving	WBM Process Analysis Resource

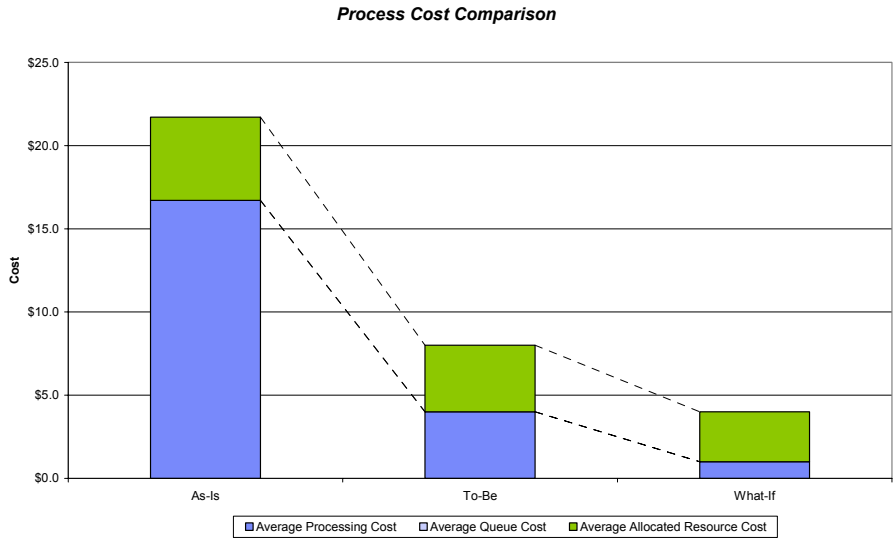
Figure 24: Example Role Cost Chart



Process Cost Comparison	Shows which type of cost are contributing to the cost of the process and therefore areas of greatest potential in improving. Run this report with the settings outlined in Section 6 to measure Queue Cost.	WBM Process Analysis Process Cost Comparison

Graph Name	Description	Template

Figure 25: Example Process Cost Comparison Chart



Resource Reduction	The change in resource requirements for each role between the current process and future states. Note: This analysis requires assumptions as to the Working Hours / Week and Working Hours / Year of each role. Adopt conservative values to reflect that resources are not truly productive for 100% of working hours and the impact of annual & sick leave and public holidays.	Resource Savings Table

Figure 26: Example Role Reduction Comparison Chart

	Role	Role 1	Role 2	Role 3	Role 4
	Working Hours / Week	35	35	35	30
	Working Weeks / Year	12	48	48	48
To-Be	Process 1	1.1	2	0	8
	Process 2	0.7	-0.5	0	0.5
	Process 3	4	1	0	-2
	Total Savings	**5.8**	**2.5**	**0**	**6.5**
What-If	Process 1	1.1	2	0	8
	Process 2	3	0	0	3
	Process 3	4	1.5	1.1	0
	Total Savings	**8.1**	**3.5**	**1.1**	**11**

Interpretation

Table 31:Labour Interpretation

Analysis	Possible Causes	Opportunities
Significant difference in ratios of time and cost for resources Figure 24	• High cost resources doing too much if cost greater than time	• Reallocate tasks to lower cost resources

Analysis	*Possible Causes*	*Opportunities*
Large # of resources Figure 24	• Siloed • No cross skilling	• Cross skill employees • Redefine roles
Reduction in resource requirements for a particular role. Figure 26	• Reduction in complexity of process activities • System automation of tasks • System support of tasks • Process re-design reduced resource working time	• Potential reduction in headcount. • **Exercise caution with resource reduction recommendations. This figure may be misleading if resources are not fully assigned to this process. It will not necessarily translate to a recommendation of removal of the calculated number of resources from the business. Assess the impact of resource reduction recommendation using the analysis methods outlined in** Analyse the Process Operation **below.**
Increase in resource requirements for a particular role. Figure 26	• Reassignment of activities to lower cost resources. • Greater investment in quality or revenue generation activities.	• Identify if existing resources can be cross-skilled to meet new role requirements. • Identify if additional resources are required to support process.

5.8(e) Classifications

Classification analysis analyses the proportion of a processes time and cost which is being spent on activities with particular classifications. While interpretation suggestions have been provided for the recommended classifiers, interpretation of the results on a particular engagement will be dependent on the classifiers and classifier values defined.

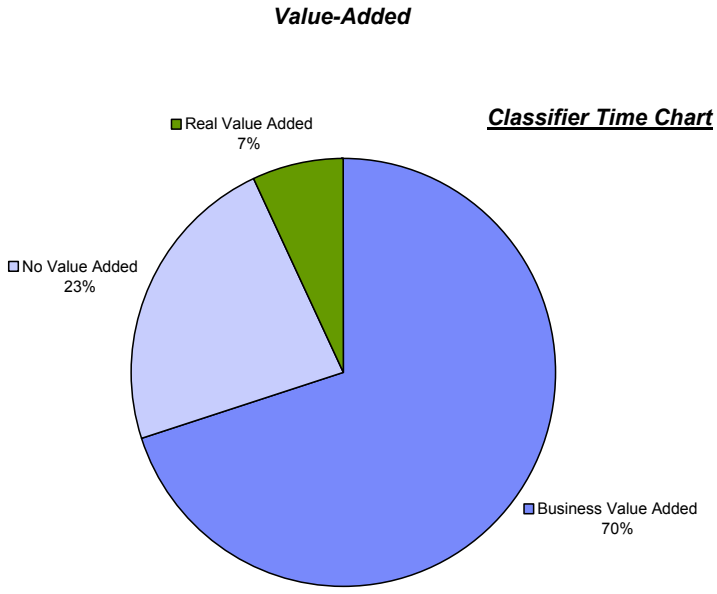
Exercise caution when utilising multiple classifiers to provide evidence of potential savings in cost or time. Each classifier is exclusive and savings identified by one are not cumulative on savings identified by another.

Analysis

Table 32:Classification Analysis

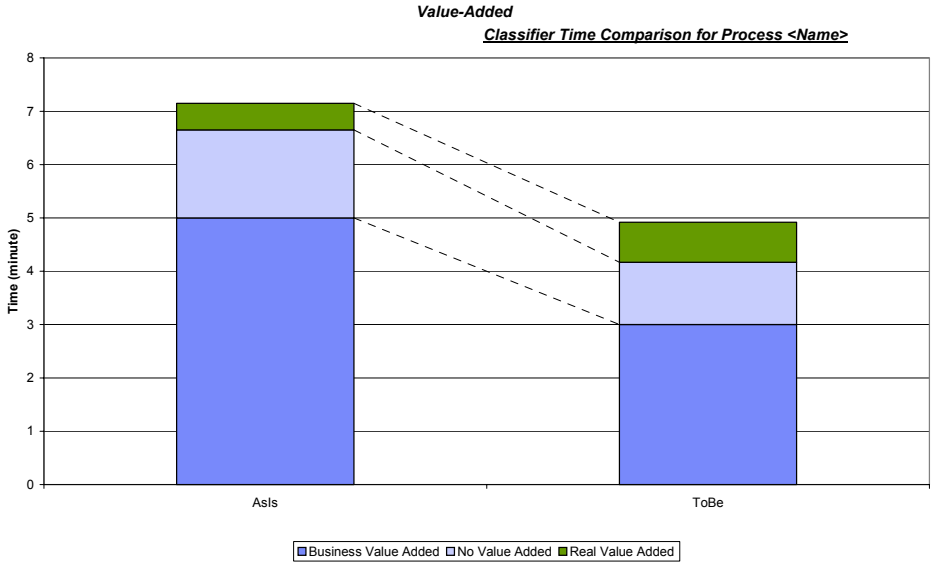
Graph Name	*Description*	*Template*
Classifier Time Chart	This illustrates the contribution each activity group makes to the total time (Resource Time or Activity Time) of the process	WBM Process Analysis Classifier
Classifier Cost Chart	This illustrates the contribution each activity group makes to the total Process Cost.	

Figure 27: Example Classification Chart



Graph Name	Description	Template
Comparison of current and future states for each classifier	This illustrates the impacts of the proposed changes to the process	WBM Process Analysis Classifier Comparison

Figure 28: Example Classification Comparison Chart



Interpretation

Interpretation of the results of Classification analysis is dependent on the **Classifiers** and **Classifier Values** utilised. The interpretation in the table below is based on the recommended **Classifiers** in Section 5.4(a).

Table 33:Classification Interpretation for Recommended Classifiers

Analysis	Possible Cause	Opportunity
High amount of rework compared to total process Figure 27 or Figure 28	• Poor quality inputs • Inadequate skills • High error rates • Subjective checks • End-to-end process not understood • Poorly documented procedures	• Preventative QA/TQM • Training • Automation • Well defined requirements and standards • Input quality assurance • Documentation • End to end success measures • Process education (end-to-end)
Real value add is low compared to other value activities Figure 27 or Figure 28	• Not enough time is being spent on client activities	• Increase focus on client

Analysis	*Possible Cause*	*Opportunity*
High proportion of transfer time Figure 27 or Figure 28	• Significant reliance on non-instantaneous communication mechanisms eg. Postal Service, Courier • Large number of hand-offs between different roles • Siloed organisation	• Implement automated communication eg. email, fax to desktop • Implement workflow solutions • Cross-skill resources • Organise resources along process lines • Organise resources to reduce transport times eg. more warehouse closer to manufacturing plant
High proportion of external time Figure 27 or Figure 28	• Process is significantly dependant of activities performed outside the control of the organization	• Implement SLA with service suppliers • Redesign process to reduce role of external parties on critical path eg. insourcing • Understand external constraints on process critical path time

5.9 Reporting Analysis Results

Process Analysis will generate a large amount of information about each process and a number of comparative or analytic models.

Use the analysis results prudently within the body of the engagement report to provide clear and considered support to your engagement findings, conclusions or recommendations. Use an appendix to fully document relevant analysis results for each process.

5.9(a) Process Analysis Results

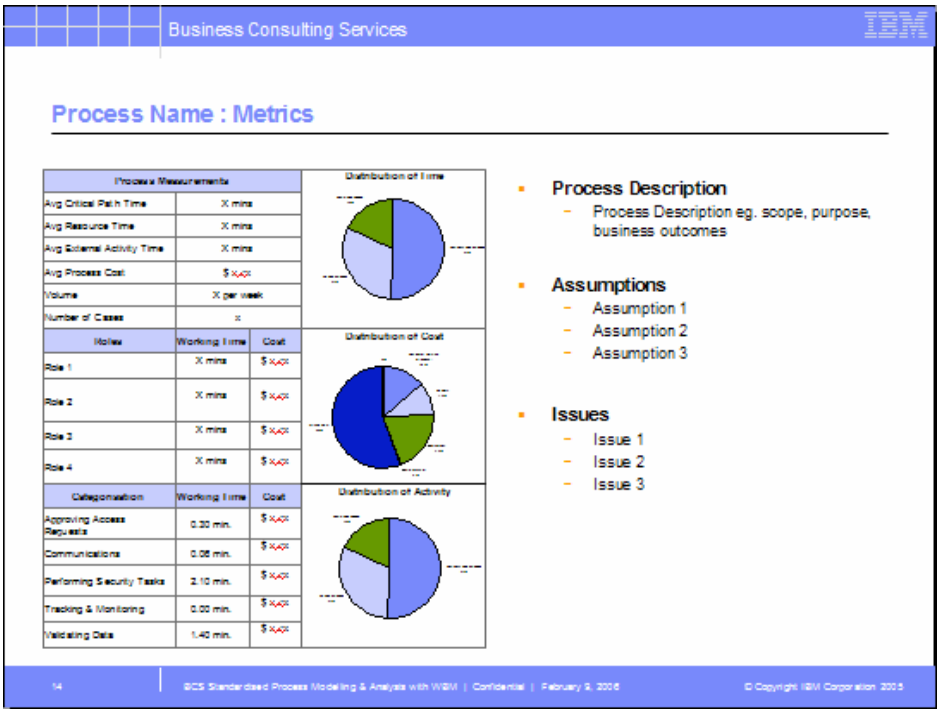
Define a template to record the detailed process level analysis results for each engagement. Use this template to capture the key data required to support the findings or conclusions that you develop using analysis results. Information which may be included in the template includes:

- Process Name;
- Process Description;
- Process Time;
- Resource Time;
- Minimum Critical Path Time;
- Resource Time per Role;
- Resource Cost per Role;
- Resource Time per Classifier; and
- Process Time per Classifier.

These results can also be supported by simple graphs generated by using the Templates described above. It is recommended to record time measurements in tabular form and cost measurements in pie charts as the total cost contributions of different roles may be a commercially sensitive result.

A separate page should be completed for the current version and each future state process.

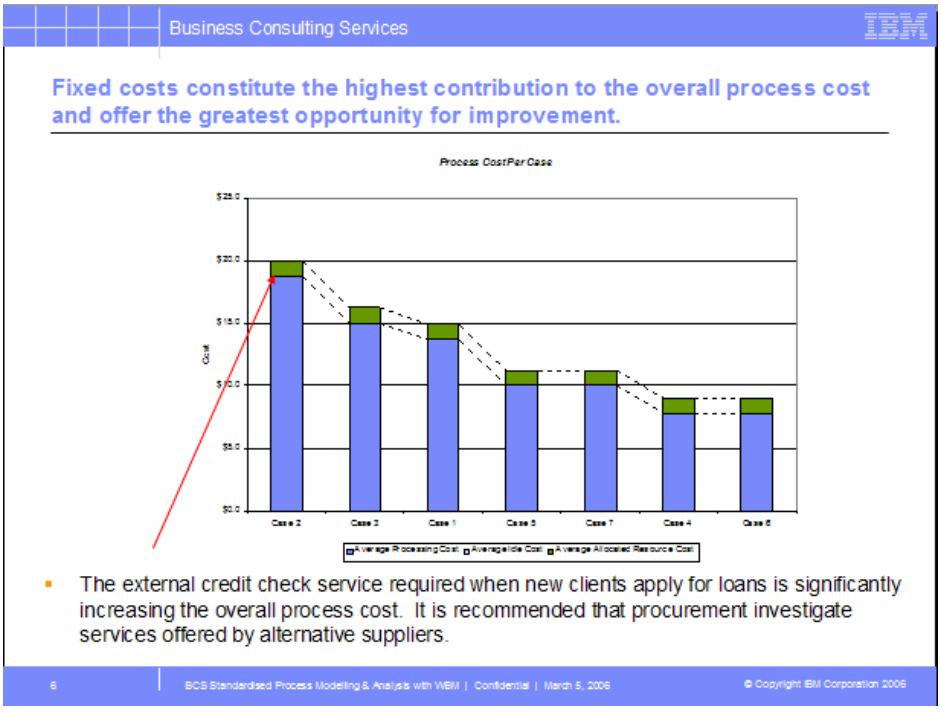
Figure 29: Example Process Analysis Results Templates



5.9(b) Single Process Analysis

Use graphs or models to focus on the key process characteristics that support the findings or recommendations. For example, a significant portion of the process is expended in rework or non-value add activities.

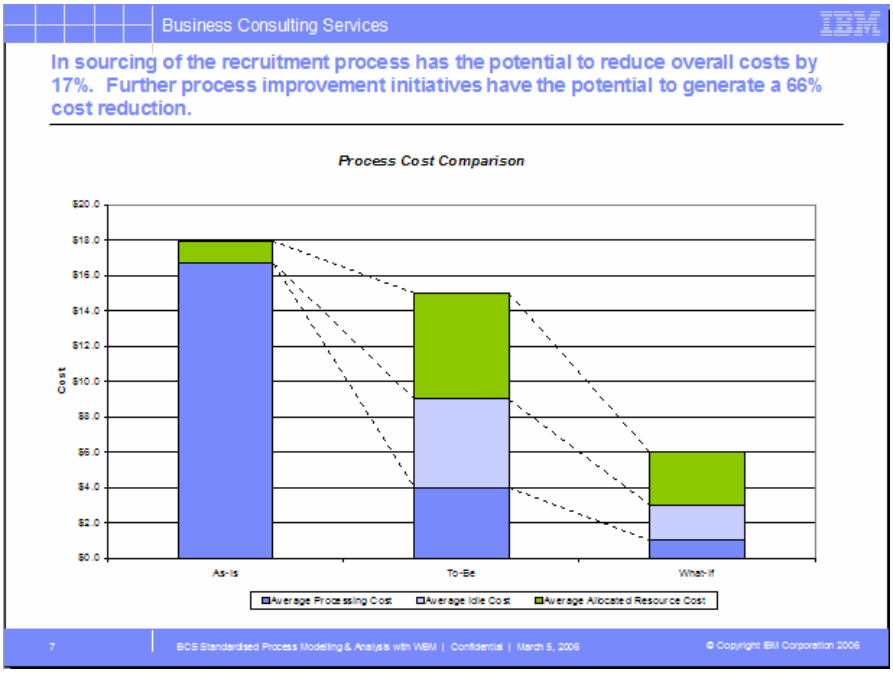
Figure 30: Example Single Process Graph



5.9(c) Comparative Analysis

Use summary tables or graphs which highlight the key changes in the process between the current and future states. Clearly define the opportunities which will drive the change. Ensure to support this analysis by qualitative benefits when required.

Figure 31: Example Comparative Graph



6. Analyse the Process Operation

6.1 Purpose and Value of Analysing Process Operations

6.1(a) What is Process Operation Analysis

Process Operation Analysis examines the process within its operational constraints. The constraints covered in this section are resource levels, resource timetabling and volume and timing of inputs.

6.1(b) Common Business Scenarios

Common business scenarios in which process operation analysis provides support for engagement findings, recommendations and conclusions are:

- A client wants to increase production levels;
- A business needs to reduce staffing levels;
- A company is restructuring its workforce;
- Service Level Agreements are not being reached; and
- Customer services times are too long.

6.1(c) How can process operation analysis add value to your engagement?

The previous types of analysis looked at a process from a static point of view only. Process Operation Analysis extends this to review how the environment in which the process operates impacts the performance of the process. This enables:

- Identification of bottlenecks in a process;
- Assessment of ability to handle growth;
- Assessment of ability to meet service level agreements;
- Assessment of impact of resourcing changes; and
- Assessment of impact of input volume and arrival timing changes.

Due to the increased ability to alter the variables on which the process operation is assessed, this form of analysis provides a valuable tool for scenario analysis.

6.2 Scope of Process Operation Analysis

Process Operation Analysis enables measurement of the process once resource and input constraints are applied. It does not cover bulk resource constraints for systems/machines[36].

Table 34: Process Operation Metrics

Metric	*Definition*
Queue time / Process	Average over all instances of the total amount of time the activity waits for a resource to be allocated
Queue Cost / Process	Average over all instances of Wait Costs incurred by the activity because it is waiting for a resource to begin
Cycle Time / Process	Average over all instances of the time between when the process starts and when it completes
Process Cost / Process	Average over all instances of the total costs in a process
Process cost / Case	Average of the total of all costs over all instances following the Case
Cycle Time / Case	Average cycle time over all instances following the Case
Queue Time / Role	Average queue time over all instances for activities performed by each role

6.3 Data Gathering

To perform Process Operation Analysis add resourcing and input information to the process model.

The templates provided with the 🕮 GBS Standardised Process Mapping with WBM Technique Paper will provide assistance with these data gathering activities.

The table below outlines that data that needs to be captured for each process element and the WBM Attributes Field in which they should be captured.

Table 35:Process Operation Data Gathering

Element	*Measure*	*Definition*	*WBM Attributes Field (Tab → Field Name)*
Timetable (Resource)	Working Hours	The hours that the resource is available to work on this process.	**Recurring Time Intervals →Recurring Time Intervals**
	Non-Working Hours	The hours that the resource is not available to work on this process. This includes weekends and lunch hours.	**Exemption Period → Exemption Period**
Timetable (Inputs)	Arrival Hours	Hours when process inputs arrive. A separate time period should be defined for each period when input arrival rates vary.	**Recurring Time Intervals → Recurring Time Intervals**
	Non-Arrival Hours	Hours in which process inputs do not arrive.	**Exemption Period → Exemption Period**

Element	*Measure*	*Definition*	*WBM Attributes Field (Tab → Field Name)*
Resource	Name	Name of resource	**Name**
	Role(s)	List of roles that resource can perform	**Qualifications → Roles**
	Availability	The timetable that applies to this resource	**Availability → Availability**
	Cost	Salary (yearly or hourly) cost rate for resources performing this Role. This is entered as Cost per Time Unit or Cost per Unit	**Costs → Costs**
Bulk Resource	Name	Name of resource	**Name**
	Role(s)	List of roles that a resource can perform	**Qualifications → Roles**
	Number	Number that are available to perform work	**Availability → Available quantity**
	Cost	Salary (yearly or hourly) cost rate for resources performing this Role. This is entered as either a Cost per Time Unit or a Cost per Unit	**Cost → Cost**
	Availability	The timetable that applies to this resource	**Availability → Availability**
Inputs	Number per bundle	Number of inputs that arrive at once	**Simulation attributes → Inputs → Total number of tokens**
	Arrival time/rate	Rate or time at which the inputs arrive	**Simulation attributes → inputs → Time trigger/Random time trigger/Timetable trigger**

6.4 Developing Process Model

To perform Process Operation Analysis, it is necessary to augment the process model with:

- the number of people that can perform the defined roles in the process;
- the working timetables of these people; and
- the volume and arrival patterns of the inputs into the process.

6.4(a) People

The people who perform the activities within a process must be defined either as Bulk or Individual Resources. Each Resource can then be assigned Roles which they can perform within the process.

Activities (eg. Tasks) must retain a Role level assignment only. Individual and Bulk Resources for people should **not** be assigned to activities[37].

The following scenarios provide guidance on when to define people as Bulk or Individual Resources.

Table 36:Individual and Bulk Resource Guidance

Scenario	Description	Recommendation
People with the same responsibilities, costs and timetables	A number of people with the same responsibilities within the process with similar working timetables and costs.	Define group of people as a Bulk Resource. Assign the applicable Roles as Qualifications.
People with different costs and/or timetables	People who have different characteristics for example, part-time employees or employees with significantly different costs.	Define each person as an Individual Resource. Assign the applicable Roles to each Individual Resource. This may require a significant effort if there are a large number of people involved in the process.
Most people share similar characteristics with one or two exceptions.	Most people working on the process have similar working hours and costs; however there are two part-time people who have responsibilities within the process.	Define the majority of the people as a Bulk Resource. Define only people with significant differences as Individual Resources.
Proportionally assigned employees	A person only works on a process for a proportion of their working day. For example, a surgeon may spend only 20% of their time seeing patients at an outpatient's clinic.	Define a timetable to reflect the hours person typically works on the process. This may requires significant effort to create timetables to show, for example, a 20 mins slot each hour this person works on the process.
Analysis and Reporting is required at individual person level	The contribution each individual person makes to a process is to be assessed as part of the engagement.	Create an Individual Resource for each person.

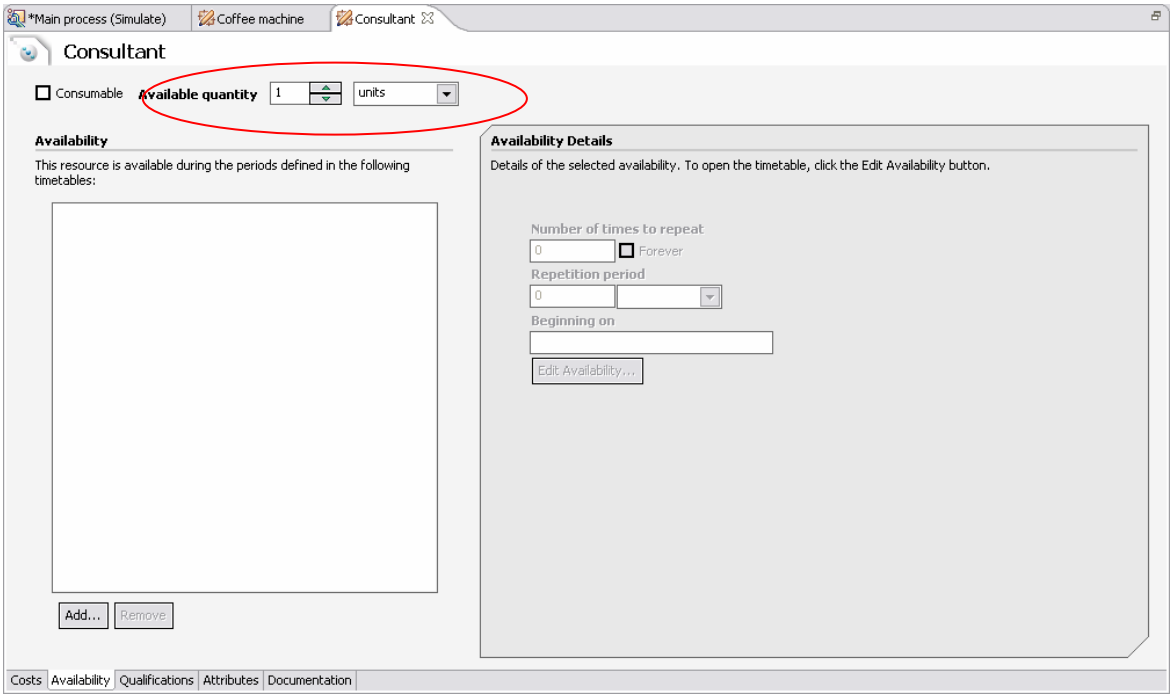
Defining Bulk Resources

Create a **Resource Definition** called "Person".

Create a **Bulk Resource** and assign the "Person" resource definition.

Use the **Available Quantity** field of the Bulk Resource definition to assign the number of available people.

Figure 32: Bulk Resource Quantity Assignment



Defining Individual Resources

Create an Individual Resource for each person. Assign the applicable Cost and Timetable to each Individual Resource. This may require significant effort if there are a large number of people involved in the process.

Assigning Roles to Resources

Each Role defined to perform activities within the process must be assigned to one or more Resources. These Resources do not have to be the same and each Resource (Bulk or Individual) may be assigned multiple Roles.

6.4(b) Resource Timetables

A Timetable for each Bulk and Individual Resource used in the process needs to be created and assigned. Timetables must **not** be assigned to Roles[38].

6.4(c) Input Timetables

If inputs to the process only arrive at certain times of the day or week or the rate of inputs varies throughout the day or month, a Timetable for this will have to be created. A different time period will need to be assigned for each period in which inputs arrive at a different rate.

6.4(d) Simultaneous Resource Requirements

To precisely model the simultaneous attendance of a number of human resources at one point in time, eg. a meeting, update the model to map multiple Roles for the same Task. This update will prevent calculation of Resource Time and Critical Path Resource Time[39].

6.5 Validating the Model

Validate the model to ensure all information added to perform Process Operation Analysis is complete and accurate. It is recommended to run the reports in the table below to provide a consolidated view of the information which has been added to the model:

Table 37:Process Operation Model Validation

Process Element	*Validation*	*Report Name & Navigation*
Resource	Ensure resources have appropriate roles assigned	**Reports → Static Analysis → Resource Roles**
	Ensure a timetable has been assigned to each resource	**Queries → Intermediate Profile → Standard → Resource Specification**
	Ensure costs has been assigned to resources	**Reports → Static Analysis → Resource Cost Summary**
Random Seed	Ensure same random seed is used between simulations	**Reports → Simulation → Simulation Profile**

6.6 Troubleshooting

This section describes possible reasons a report may not generate with data or the results are not as expected and what to do to correct this:

Table 38:Process Operation Analysis Troubleshooting

Problem	*Suggested Resolution*
Not all cases are reported on	This is not an error. Based on the actual volume and probability of cases occurring, it is legitimate that all cases do not occur within a simulation. Review probabilities of each case if concerned. To obtain all cases, increase the number of tokens to be used in the simulation.
Nothing in the model has been changed and results are different between simulation runs	Ensure **random number seed** is not set to zero and consistency is maintained across all simulations.
Simulation results are not visible in Simulation Control Panel	Resize Simulation Control panel to reveal results hidden in the middle of the page.
Simulation producing extended time measures.	Ensure accurate working times have been defined in processes. Ensure process start time and token arrival times are aligned.
Extended cycle times	Ensure no wait time has been incorporated in Processing Time measures
Process cycle times too short	Ensure timetables have been assigned to all Resources Ensure timetables have defined working and non-working times Ensure process simulation is set up to run from Resources not Roles Ensure a new snap-shot is created after timetables have been created and assigned.

Problem	*Suggested Resolution*
Queue times are very long	Ensure working hours in timetables are correct Ensure Resource Levels are correct for each Role
Process simulation is not generating the expected level of tokens	Ensure maximum number of tokens has been set to an appropriate level. Ensure process does not begin with a Start Node Ensure Token Arrival Times and Process Start times are aligned
Other issue or unable to resolve problems above	Refer issue to GBS Practitioner Support Network

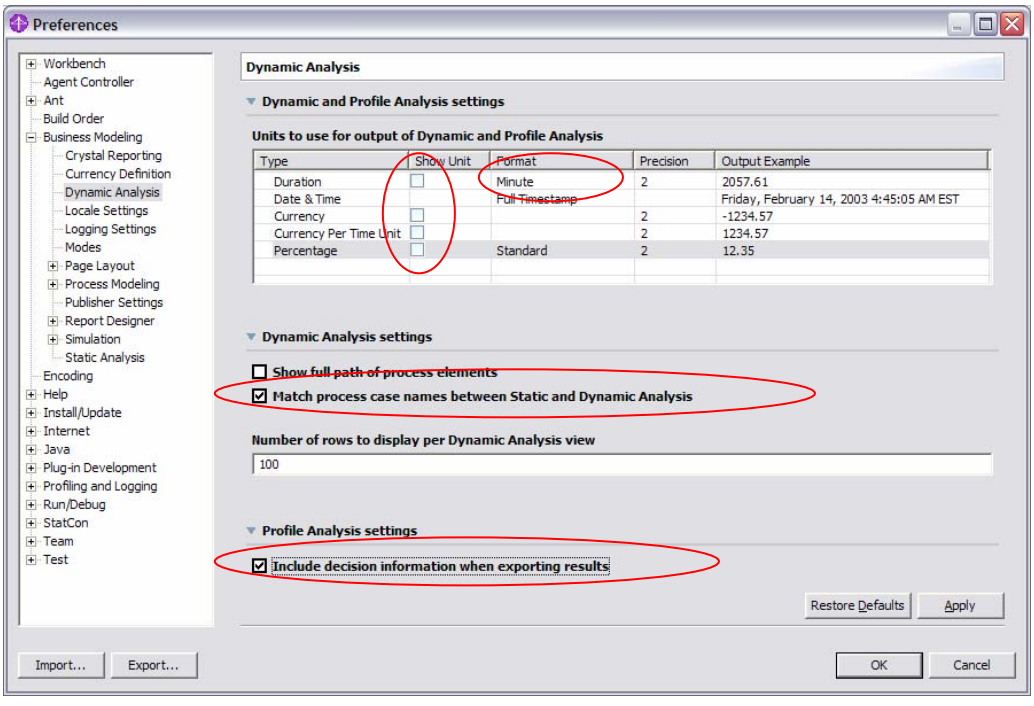
6.7 Measuring the Process

This section will provide guidance in how to configure WBM settings and the recommended reports to be used to generate results for analysis.

6.7(a) Configuring WBM

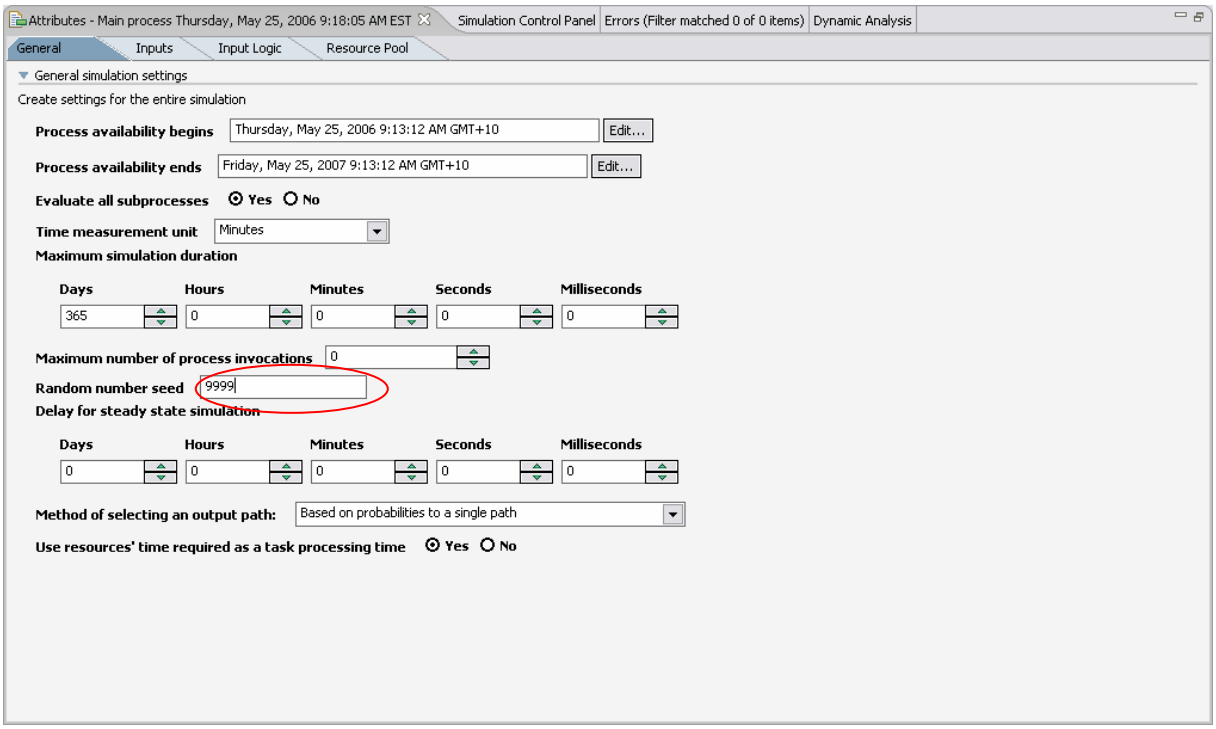
- Update **Windows → Preferences → Business Modelling → Dynamic Analysis Preferences** :
  - Match process case names between static and dynamic analysis should be selected
  - Ensure **Show Units** box is unchecked for all options except Percentage.
  - When using Cases Aggregation Template, check Profile Analysis Settings -> Include decision information when exporting results
  - When running reports for other templates, ensure Profile Analysis Settings -> Include decision information when exporting results is NOT checked.
  - Ensure **Duration** format is NOT set to **Expanded.**

Figure 33: Dynamic Analysis Preference Settings



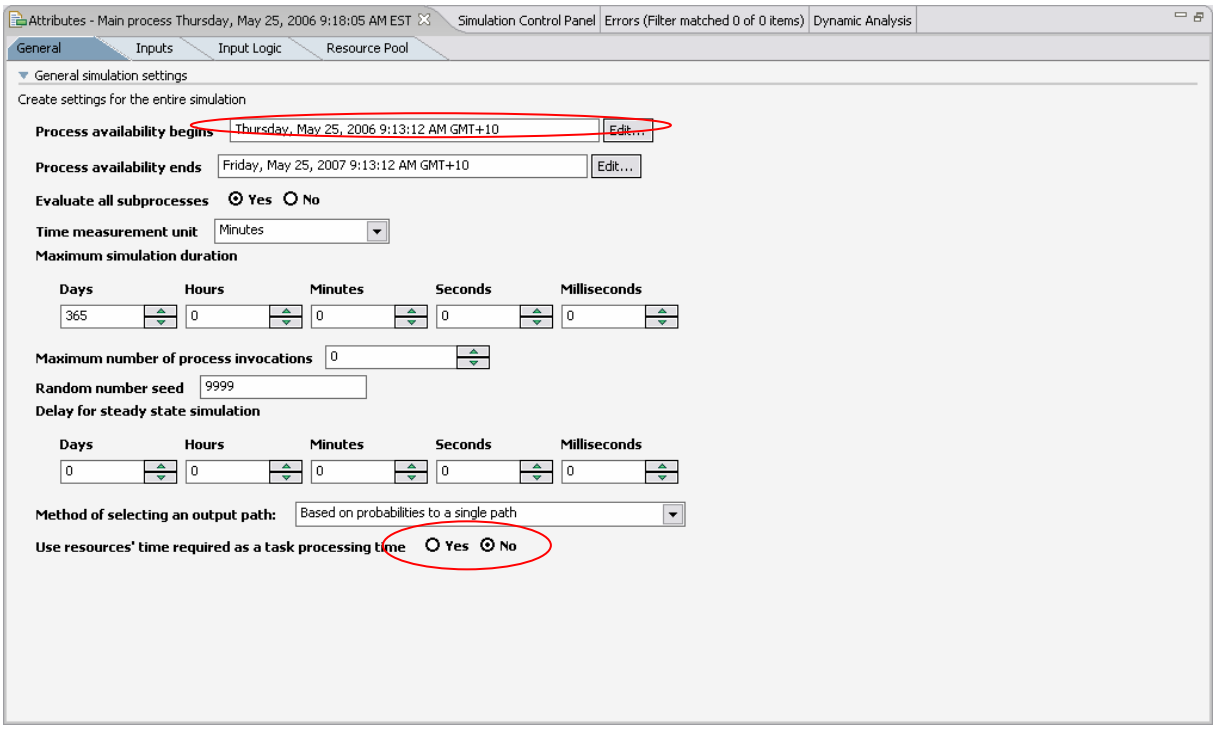
- Assign a **random number seed** other than zero. Use the same random number seed when running simulations from the same profile to ensure results remain consistent.

Figure 34: Setting Random Number Seed



- Set **Use resources time required as processing time** to No.
- Set **Process Availability Begins** to a value that is consistent for all runs of the simulation

Figure 35: Setting Processing Time for Simulation

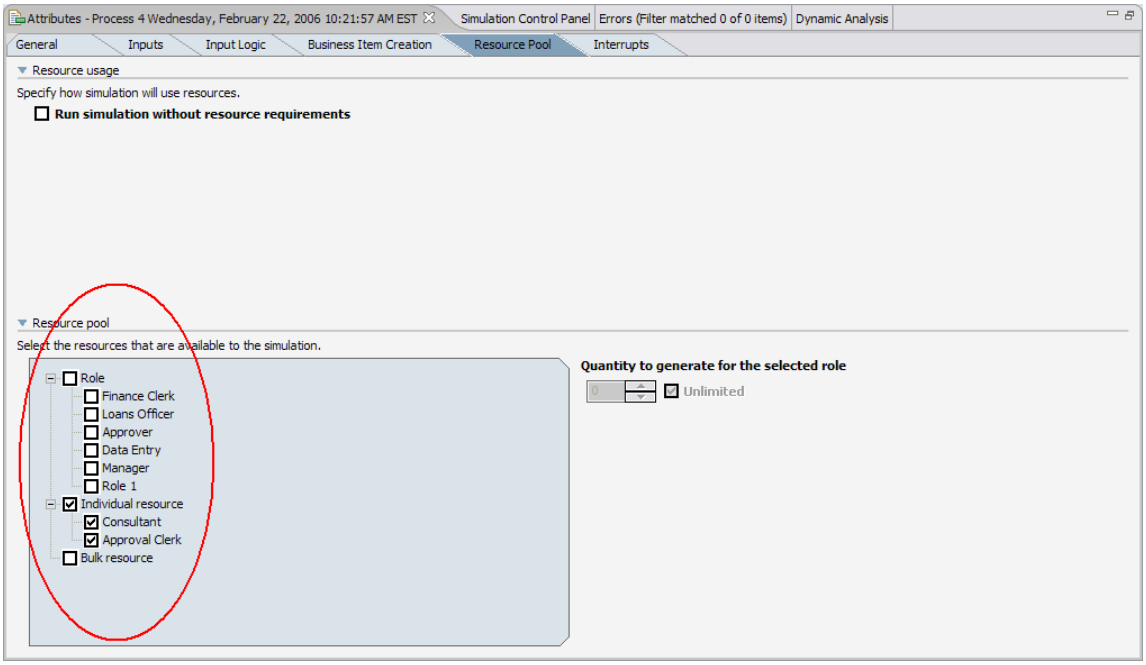


- In the **Resource Pool** tab, the **Run simulation without resource requirements** checkbox must be disabled.

Figure 36: Disable Run simulation without Resource Requirements

- Deselect **Roles** in the **Resource Pool**. Set which individual and bulk resources are available.

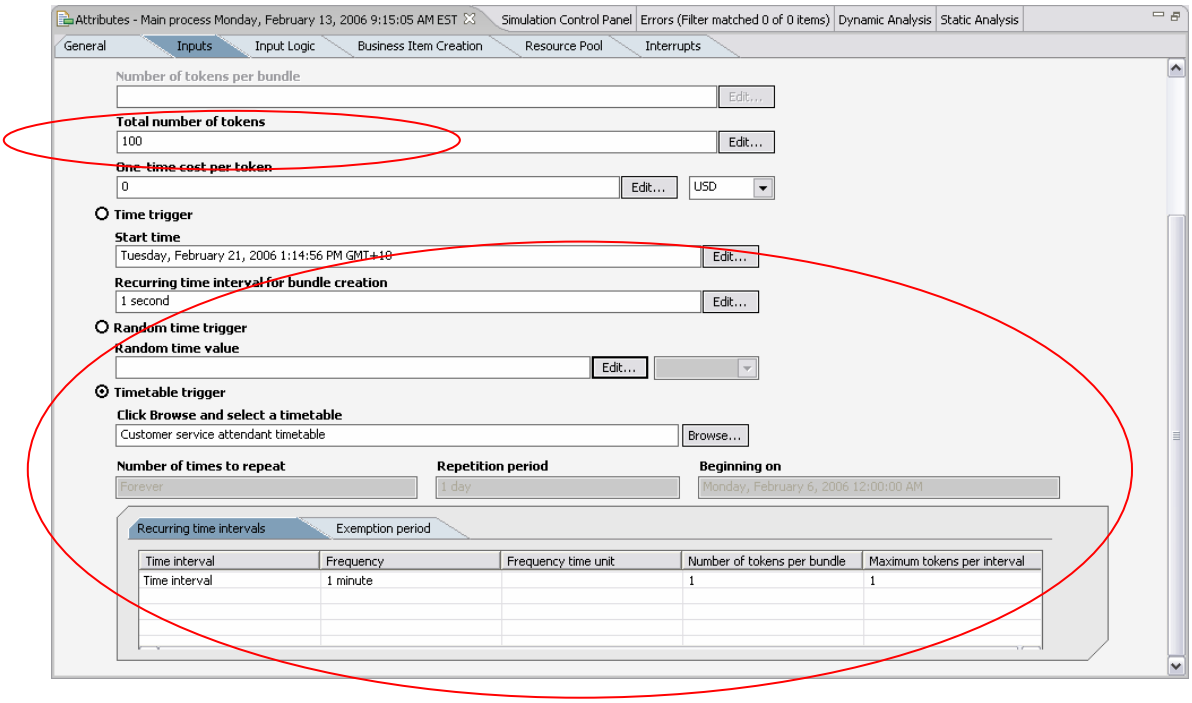
Figure 37: Set Resourcing for Simulation.



- Set **number of input tokens** using same formula as in Section 5.7(a). This is the minimum number of tokens that should be used. Increase the number if you wish to cover a longer simulation period. For example the number generated from the formula may only cover 3 months which may not be a long enough time.

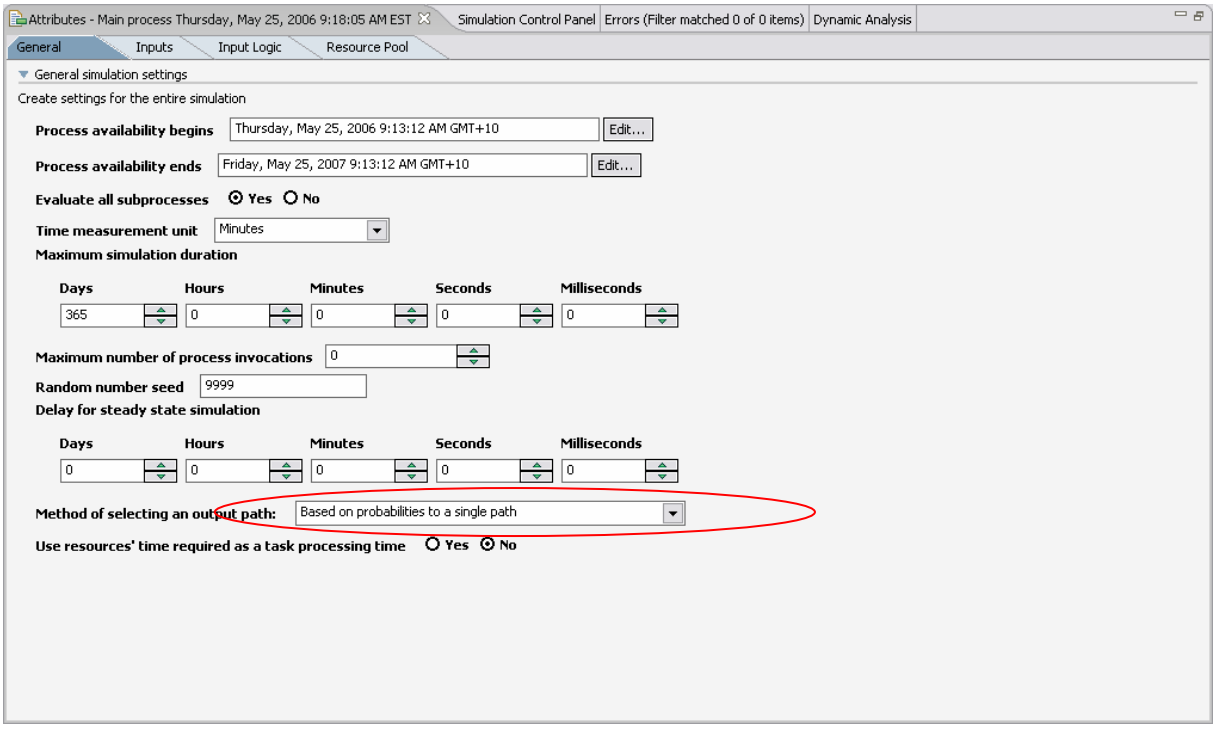
- Set arrival time of tokens:
  - If inputs arrive at a constant time interval, use a **Time trigger**. Ensure that this value is consistent for all runs of the simulation.
  - If inputs arrive randomly, use a **Random Time Trigger**.
  - If inputs they arrive at different times of the day and with different volumes, use a **Timetable Trigger**.

Figure 38: Configure Input Arrival Distribution



- **Method of selecting an output path** should be set to **Based on probabilities to a single path**

Figure 39: Select Output Path Based on Probabilities



- Ensure the start dates within simulation are aligned :
  - Process Availability : **Simulation Attributes → General → Process Availability Begins**
  - Token Creation : **Simulation Attributes → Inputs**
  - Resource Availability : **Timetable → Beginning On & Timetable → Selected Interval Details Start Time**

6.7(b) Running Reports

This table below describes the Reports required to obtain the metrics required to perform Process Operation Analysis:

Table 39:Process Operation Analysis Reports

Report Name	*Analysis Type*		
	Queue Analysis	*Cycle Time Analysis*	*Volume Analysis*
Activity Duration	✓	✗	✗
Activity Cost	✓	✗	✗
Profile Specification	✓	✗	✗
Process Instance Summary	✗	✓	✗
Process Resource	✓	✗	✗
Process Duration	✗	✗	✓
Activity Statistics	✓	✗	✗
Activity Resource Allocation	✓	✗	✗

6.7(c) Extracting Reports

Expand all details within report. Select **Copy** and then **Paste** the report into MS Excel or the supplied template.

The following templates will support the analysis covered in this section:

- Process Operation Queue Template
- Process Operation Cycle Time Template
- Process Operation Volume Template
- Process Operation Activity Template
- Case Aggregation Template

6.8 Analysis & Interpretation

6.8(a) Comparative Analysis

In addition to the current and future states of a process described in section 1.7, it is now possible to describe future states of the process operation by reference to new resourcing or process inputs.

This section uses the following terms to describe the changes made in the future state model in relation to resourcing and inputs.

Table 40:Process Future States – Resourcing and Volume

Future State Name	*Example of Use*
Current Resourcing	This is the current level of resourcing applied to the process as described by the allocation of Resources to Roles. It is used to measure the operation of the process within the current business environment.
Proposed Resourcing	This is a proposed change to resourcing. For example: • Two new clerks are being hired • All contract staff are not being renewed • Weekend service clerks will be doubled
Optimal Resourcing	This is the suggested state of resourcing required to achieve a business goal. For example: • Resources required to meet service level agreements. • Resources required to achieve a minimum wait time for customer of 10 mins. • Lunch hours are to be staggered
Current Volume	This is the current process input volume described in terms of the number and arrival pattern of inputs.
Proposed Volume	This is the proposed change to any input volume or arrival pattern. For example: • All inputs will now be available throughout the day rather than through a 2pm batch drop. It is predicted that an input will be generated every 10 mins. • Input volume will increase 10% of the next year
Optimal Volume	This is the suggested input volume or arrival distribution to achieve a business goal: • Inputs will be delivered at 8am rather than at 10am • Work-orders will be made available immediately to couriers through electronic devices.

All results from Process Operation Analysis need to be carefully described by each of the potential future state variables:

- Process State: As-Is, To-Be or What If
- Resourcing: Current, Proposed or Optimal Resourcing
- Volume: Current, Proposed or Optimal Volume

It is recommended that each of the simulation snap-shots and results being used to perform this analysis are renamed to fully describe the variables being utilised.

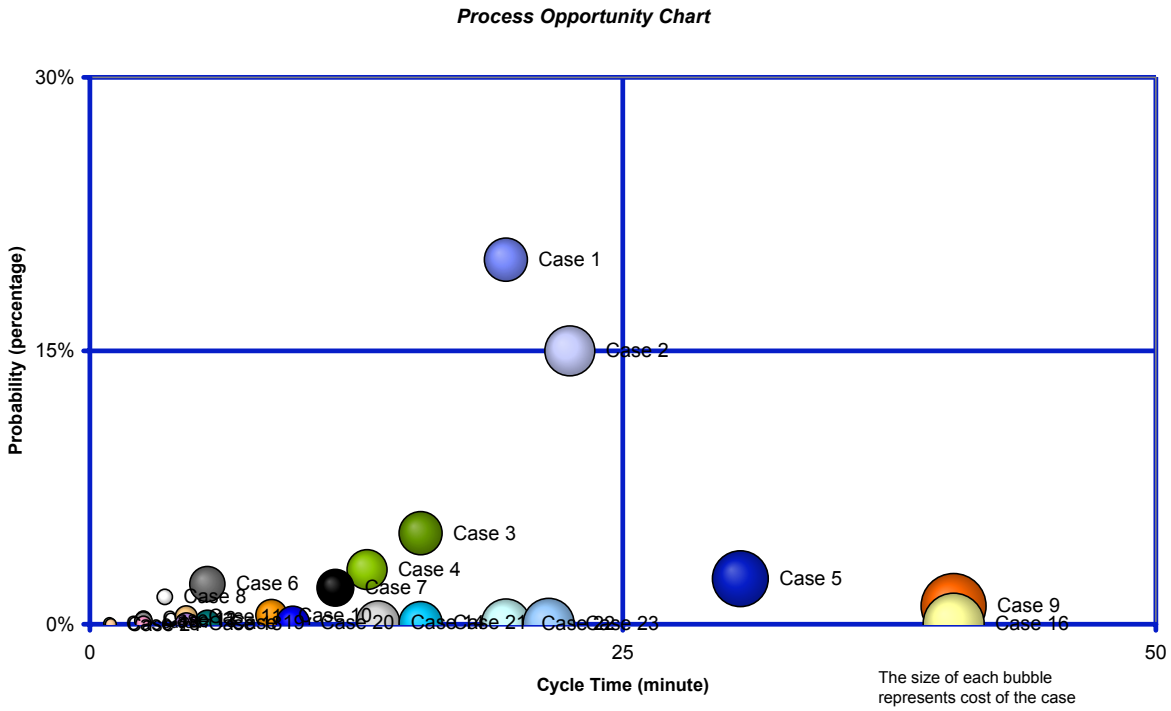
6.8(b) Case Analysis

Case level results are of less relevance when reviewing the operation of the process. This increased level of detail is provided in the template for analysing Cycle Time only. It may be of use in providing a greater focus on the circumstances which increase the overall cycle time of the process.

By utilising the Process Opportunity Bubble Chart from Process Analysis once the Resources and Timetables have been assigned, it will be possible to produce an Opportunity Chart for Cycle Time. This makes it easy to identify which cases are significantly contributing to the cycle time of the process.

Utilise the Cases Aggregation Template to group a significant number of cases into notable case groups to more clearly understand the impact of business rules on Cycle Time. For further information refer to Section 4.8(a).

Figure 40: Process Opportunity Chart for Cycle Time



6.8(c) Cycle Time

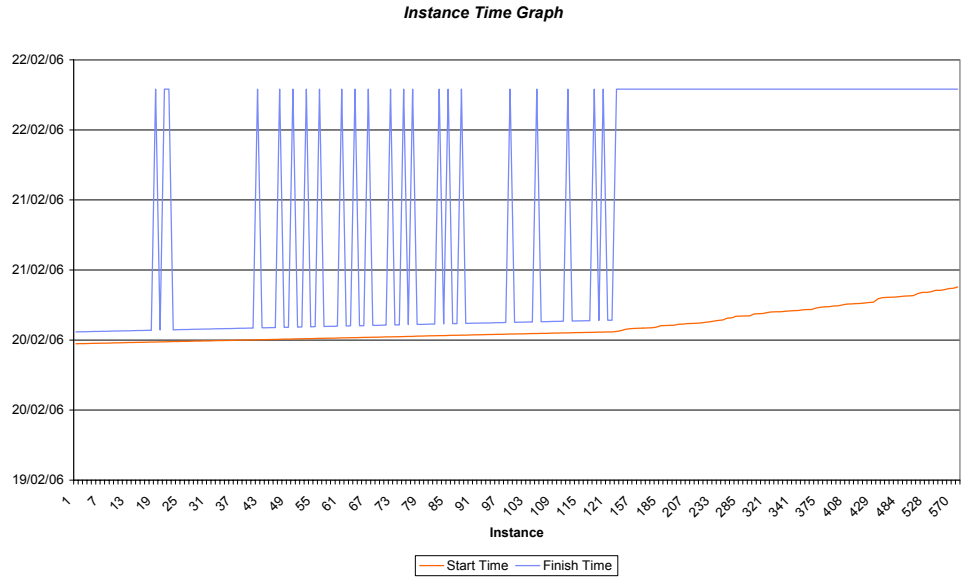
Cycle time is concerned with the time it takes to complete the process for any given input. It includes any delays caused by non-working time and resource shortages.

Analysis

Table 41:Cycle Time Analysis

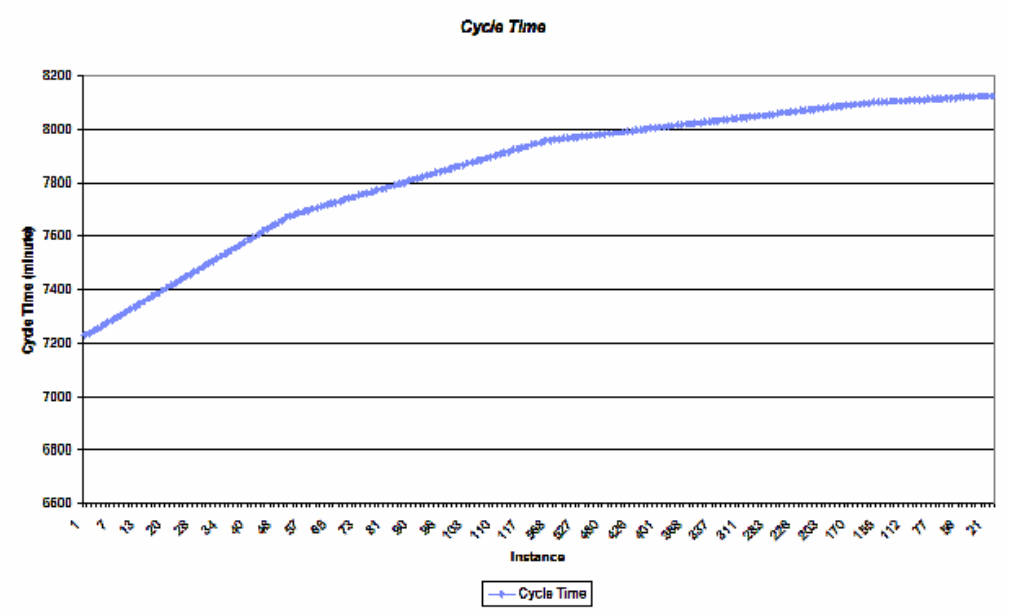
Graph Name	Description	Template
Instance Time Graph	Shows the start time and end time of each instance, with the difference between start time and end time equalling the cycle time.	WBM Process Operation Cycle Time

Figure 41: Instance Time Graph



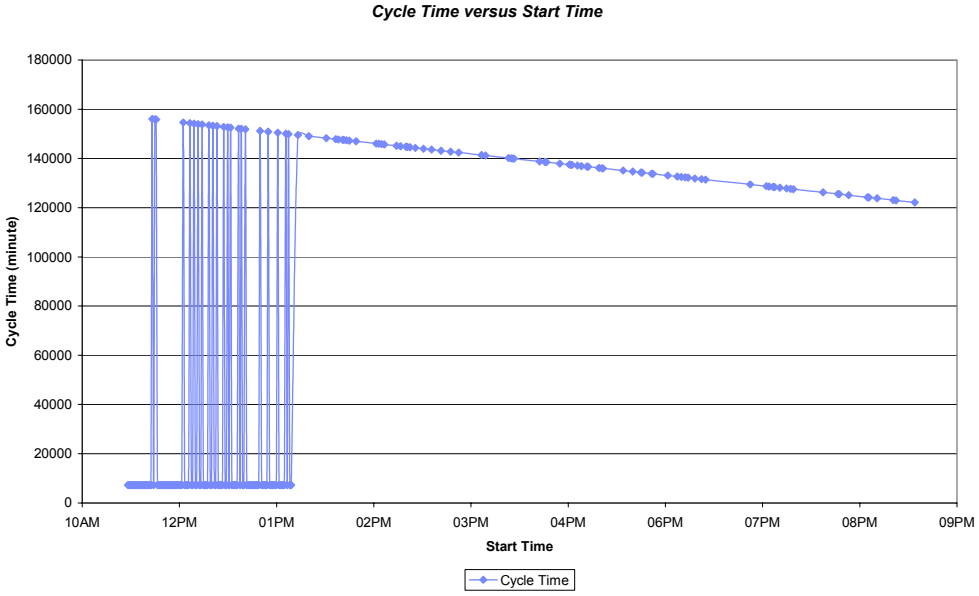
Cycle Time	Cycle time of each instance sorted by cycle time.	WBM Process Operation Cycle Time

Figure 42: Cycle Time Chart



Graph Name	Description	Template
Cycle Time versus Start Time	Shows how cycle time changes during the day	WBM Process Operation Cycle Time

Figure 43: Cycle Time over Time



Interpretation

Table 42:Cycle Time Interpretation

Analysis	Possible Cause	Opportunity
Volume remains constant but cycle time progressively increases over time Figure 41 Figure 42	• Queuing with one or more major bottle necks	• Re-engineer process to remove bottleneck • Adjust volume if possible
Constant volume with a temporary increase in cycle time Figure 41 Figure 42	• Resource not available (timetable issue) • Insufficient number of resources	• Change timetables • Perform queue analysis to investigate cross skilling
Increase in volume with corresponding increase in cycle time Figure 41 Figure 42	• Insufficient number of resources	• Increase available resources

Analysis	*Possible Cause*	*Opportunity*
Cycle time passes a defined limit (e.g. SLA) at a given point in time Figure 43 Figure 42	• Queuing • Insufficient number of resources • Resource not available (timetable issue)	• Identify the time periods during a day where the cycle time exceeds a pre-defined limit (e.g. SLA) • Increase resources to ensure SLA are met (see 6.9(c) below)
Large difference between Minimum Critical Path Time and Cycle Time	• Insufficient number of resources • Resource not available (timetable issue)	• Increase resources

6.8(d) Queuing

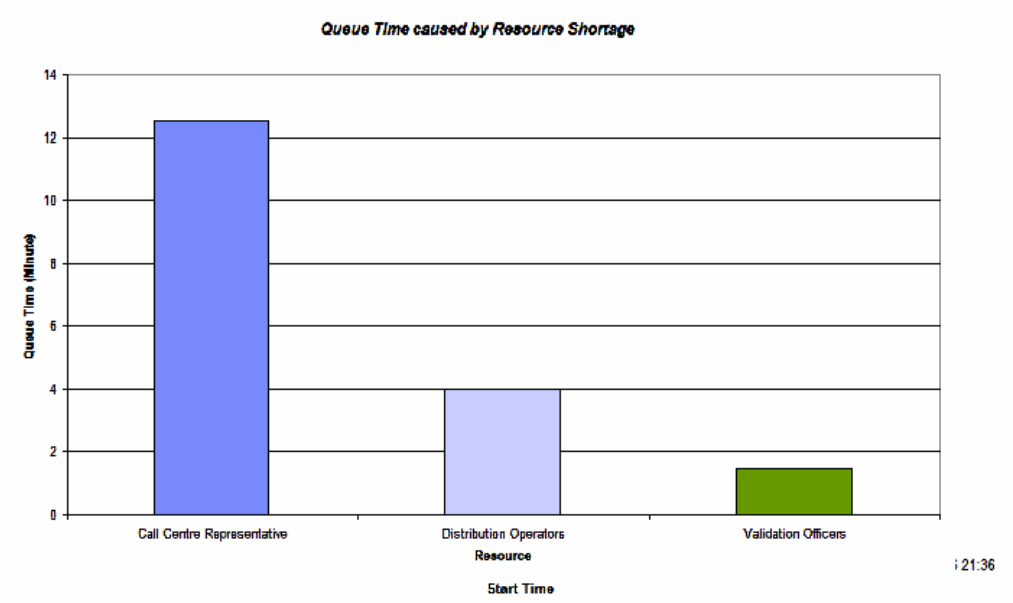
Queuing looks at the delays in the process which result from resource unavailability. It can assist in understanding which resources or activities are causing the bottlenecks in the process.

Analysis

Table 43:Queuing Analysis

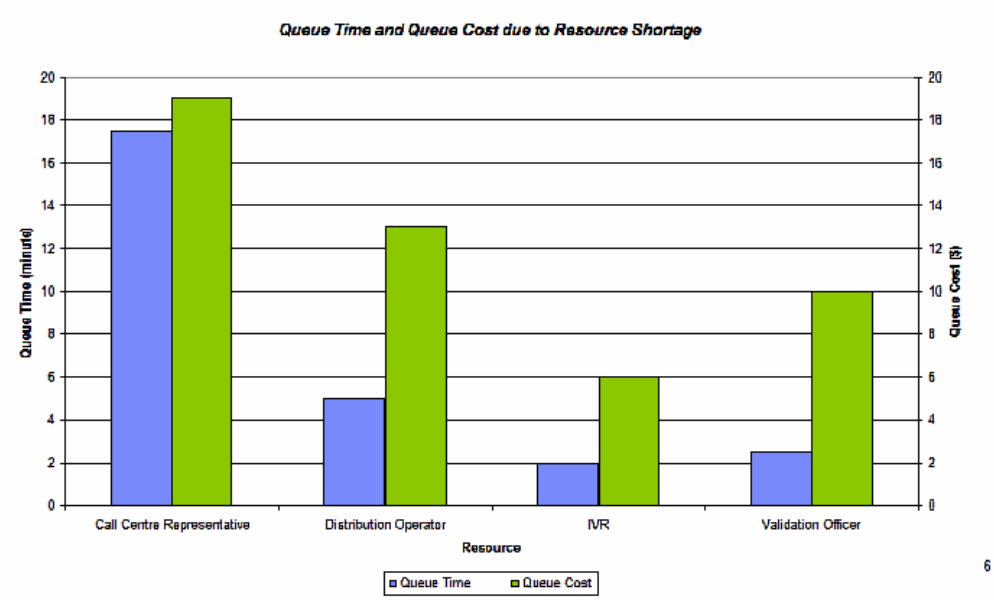
Graph Name	*Description*	*Template*
Queue time caused by resource shortage	Shows the total queue time for each resource within a process.	WBM Process Operation Queue

Figure 44: Queue time caused by resource shortage



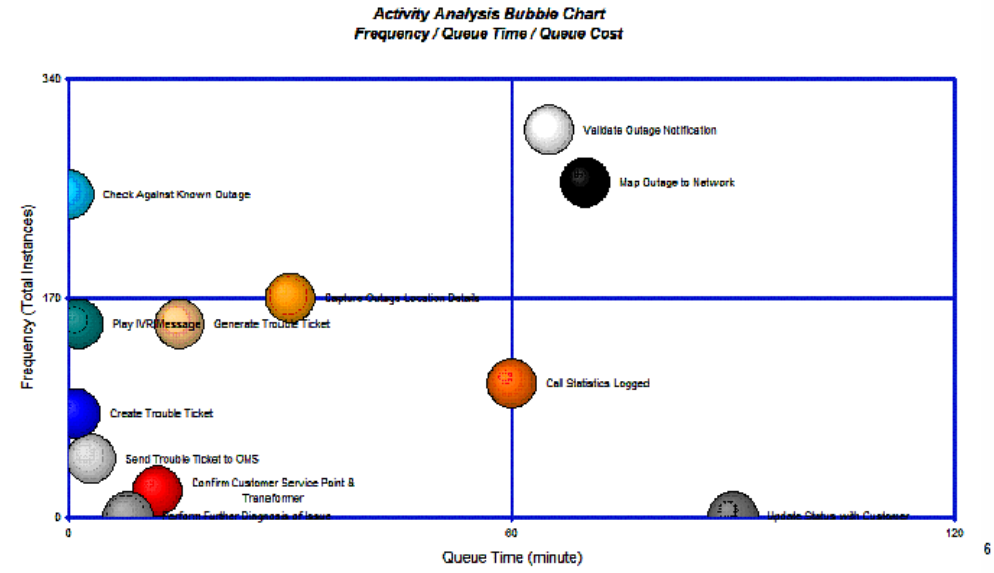
Graph Name	Description	Template
Queue Time and Queue Cost due to Resource Shortage	Shows the total queue time and total cost incurred for a resource not being available for tasks within a process.	WBM Process Operation Queue

Figure 45: Queue Time and Queue Cost due to Resource Shortage



Activity Analysis Bubble Chart	Identifies activities within a process that have a high queue time and incur a high cost due to resources not being available	WBM Process Operation Activity

Figure 46: Activity Bottlenecks



Interpretation

Table 44:Queuing Interpretation

Analysis	*Possible Cause*	*Opportunity*
High queue time Figure 44 Figure 45	• Too few resources • Timetable issues • High volume • High throughput of previous activity	• Increase available resources • Improve resource mix • Cross skill resources • Automate activities • Re-organize activity sequence • Improve timetabling of resources
High idle cost Figure 45	• Cost incurred while waiting for resource to be allocated to an activity	• Increase resources to reduce cost
High queue time for a specific resource Figure 44 Figure 45	• Bottleneck caused by lack of specific resource	• Cross skills other resources • Increase FTE for specific resource in question
High queue times for all resources Figure 44 Figure 45	• Too few resources	• Increase number of resources
Large bubble in high impact quadrant Figure 46	• Process Bottlenecks • High queue time • High Frequency of occurrence in simulation • High idle cost	• Identifies activities with significant queuing • Identifies activities that are incurring a high cost due to queuing

6.8(e) Throughput

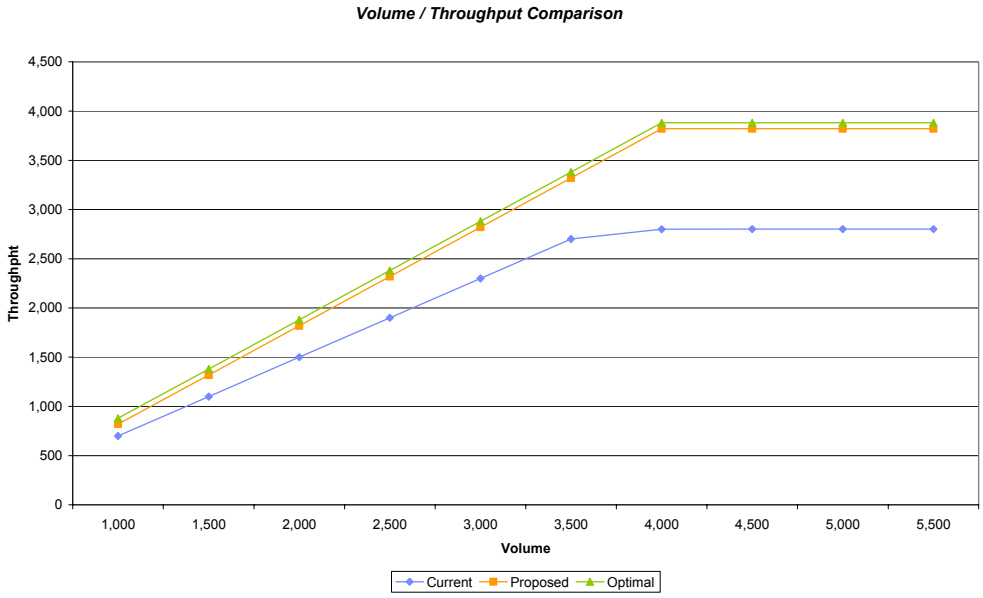
Throughput measures the rate at which the process produces outputs. It assists in determining the capacity of the process based on the number and arrival distribution of the process inputs.

Analysis

Table 45:Throughput Analysis

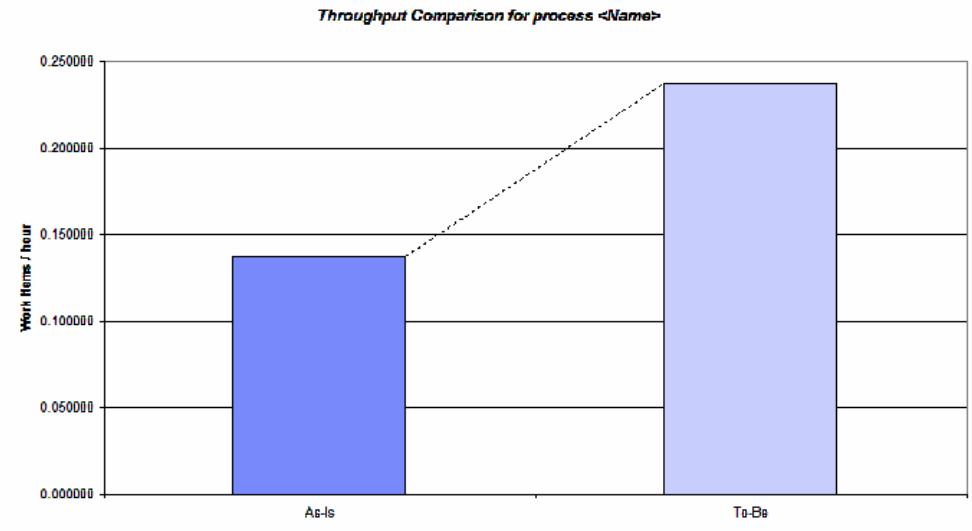
Graph Name	Description	Template
Volume / Throughput Comparison	Shows how process throughput changes with input volume.	WBM Process Operation Volume

Figure 47: Volume / Throughput Comparison



Graph Name	Description	Template
Throughput Comparison for process	Compares the throughput of As-Is and To-Be processes.	WBM Process Metrics Volume

Figure 48: Throughput Comparison Graph



Interpretation

Table 46:Throughput Interpretation

Analysis	*Possible Cause*	*Opportunity*
Identify the volume at which the throughput of a process reaches it's maximum throughput Figure 52	• Insufficient number of resources • Equipment limitations	• Re-engineer process • Increase resources
Low gradient, indicating a low increase in throughput relative to an increase in volume Figure 52	• Queuing	• Increase available resources • Improve resource mix • Cross skill resources • Automate activities • Re-organize activity sequence • Improve resource timetables
The input into the process does not equal the output Figure 52	• Queuing begins when the rate of input of tokens into the process is greater than the rate of output	• Increase available resources • Improve resource mix • Cross skill resources • Automate activities • Re-organize activity sequence • Improve resource timetables

6.9 Scenario Analysis

Process Operation Analysis provides an excellent tool for performing scenario analysis on proposed changes to the process, resources or inputs. When performing this type of analysis, it is important to carefully test the impact of each change being made in order to provide accurate results with an understanding of the impact of each change being made.

The following technique is recommended:

Table 47:Scenario Analysis Technique

Step	*Purpose*
Goal	Articulate the goal to be achieved by the scenario analysis.
Baseline	Understand how the current process operates and obtain baseline measurements.
Test	Test the impact of the change or the requirement on the process.

Step	Purpose
Configure	Make the necessary changes to a process to configure the future state to meet the engagement goals. It is advisable to analyse changes in the following order: • Process Changes → implement any process related changes and retest to determine if the goal has been met • Input Changes → Configure the simulation with any changes which can be made to the input variables eg. Staggering arrival times. Retest to determine if the goal has been met. • Resource Changes → Configure the resources with changes to resource levels or timetables. Retest to determine if goal has been met.
Validate	Obtain key measurements to compare with baseline to provide evidence that goal will be met.

Three common business examples of applying scenario analysis are outlined below to provide an example of how Process Operation Analysis can provide support to your engagement.

6.9(a) Going for Growth

Often an organisation will want to test the ability of its processes to handle growth through introduction of a new product, entering a new market or predicted response to an advertising campaign. Process Operation Analysis will allow an organisation to ensure that its processes will support the delivery of the increased outputs.

Table 48:Going for Growth Scenario Analysis

Step	Recommended Activities
Goal	• Understand the process and resourcing changes to handle a predetermined percentage increase in volume without increasing the cycle time.
Baseline	• Measure the current cycle time and throughput of the As-Is Process with Current Resourcing and Current Volume.
Test	• Increase the volume by the predetermined amount(assume same arrival distribution) (Proposed Volume) • Measure the new cycle time and throughput of the process. • Does this new cycle time and throughput meet the goal ? • If so, proceed to Validate. • If not, Configure the process.

Step	Recommended Activities

Configure	• Review process to identify potential improvements within the scope of the engagement. Make and document proposed changes to the process model. (To-Be Process)
	• Recalculate the new cycle time and throughput for the To-Be Process with the Proposed Volume.
	• Does this new cycle time and throughput meet the goal ?
	  • If so, proceed to Validate.
	  • If not, configure the resources.
	• Measure the queue time for resources and activities to identify bottlenecks in the To-Be process.
	• Identify the role that requires additional resources:
	  • If one activity only causing bottleneck, consider cross-skilling resources performing other roles.
	  • If a resource shortage is spread across more than one activity, consider increasing resource levels for this resource.
	• Increase the resource allocation in the process. (Proposed Resourcing)
	• Recalculate the new cycle time and throughput for the To-Be Process.
	• Does this new cycle time and throughput meet the goal ?
	  • If so, proceed to Validate.
	  • If not, repeat resource configuration.

Validate	• Document changes made to process and resources required to achieve goal with Proposed Volume. • Measure and report cycle time and throughput to demonstrate changes required to meet goal.

6.9(b) Downsizing

When faced with cost pressures, organisations often consider reducing contract or permanent headcount assigned to a particular process. In this situation, it is often important to determine the impact of the resource reduction of the process performance.

Table 49:Downsizing Scenario Analysis

Step	Recommended Activities
Goal	• Identify the impact of removing all contract staff from the process. • Identify opportunities to minimise this impact.
Baseline	• Measure current cycle time using As-Is process, Current Resourcing and Current Volume
Test	• Identify Contract Staff resources and remove these from process model. • Measure cycle time using only permanent staff (Proposed Resourcing)

Step	Recommended Activities

Configure	• Review process to identify potential improvements within the scope of the engagement. Make and document proposed changes to the process model. (To-Be Process)
	• Recalculate the new cycle time for the To-Be Process with the Proposed Volume.
	• Does this new cycle time meet the goal ?
	  • If so, proceed to Validate.
	  • If not, identify bottlenecks in the process..
	• Measure the queue time for resources and activities to identify bottlenecks in the To-Be process.
	• Identify the role which requires additional resources.
	  • If one activity only causing bottleneck, consider cross-skilling resources performing other roles.
	  • If a resource shortage is spread across more than one activity, consider reallocating existing resources to new roles within the process.
	• Measure cycle time for To-Be Process with updated Resourcing.
	• Repeat resource configuration until impact on cycle time is minimised
	• Document resource changes required to minimise impact of downsizing. (Optimal Resourcing)

Validate	• Document changes made to process and resources required to minimise impact of removal of 10 resources from process model. (To-Be Process and Optimal Resourcing) • Measure and report cycle time with removed resources only (As-Is Process and Proposed Resourcing) • Measure and report cycle time with To-Be Process and Optimal Resourcing to demonstrate minimisation of impact of resource reduction activities.

6.9(c) Meeting Service Level Agreements

If an organisation is failing to meet its service level agreements, Process Operation Analysis can be used as a diagnostic tool. It can also assist to identify the changes that are required to be made in its processes and resourcing required ensuring the service level agreements are met.

Table 50:Meeting Service Level Scenario Analysis

Step	Recommended Activities
Goal	• Identify the issues which are leading to an organisation failing to meet its service level agreements to complete all activities within a specified time.
Baseline	• Measure current cycle time using As-Is process, Current Resourcing and Current Volume
Test	• Does the cycle time show that all activities are completed within the necessary time frame ?

Step	Recommended Activities

Configure	• Review process to identify potential improvements within the scope of the engagement. Make and document proposed changes to the process model (To-Be Process).
	• Recalculate the new cycle time for the To-Be Process with the Current Resourcing and Current Volume.
	• Does this new cycle time and throughput meet the requirements of the Service Level Agreement?
	  • If so, proceed to Validate.
	  • If not, configure inputs.
	• Can any efforts be made to smooth the arrival patterns of process inputs. Update the input arrival distribution to reflect any opportunities for improvement. Document these changes. (Optimal Volume).
	• Does this new cycle time and throughput meet the requirements of the Service Level Agreement?
	  • If so, proceed to Validate.
	  • If not, configure the resources.
	• Does this new cycle time and throughput meet the requirements of the Service Level Agreement?
	  • If so, proceed to Validate.
	  • If not, configure the resources.
	• Measure the queue time for resources and activities to identify bottlenecks in the To-Be process.
	• Identify the role which requires additional resources:
	  • If one activity only causing bottleneck, consider cross-skilling resources performing other roles.
	  • If a resource shortage is spread across more than one activity, consider increasing resourcing levels for this resource
	• Measure cycle time for To-Be Process with updated Resourcing.
	• Repeat resource configuration until cycle time is within the Service Level Agreement requirements.
	• Document resource changes required to meet the Service Level Agreement. (Optimal Resourcing)

Validate	• Document changes made to process, volume and resources required to meet Service Level requirements. (To-Be Process, Optimal Volume and Optimal Resourcing) • Measure and report cycle time with To-Be Process, Optimal Volume and Optimal Resourcing to demonstrate a cycle time within Service Level Agreement requirements.

6.10 Reporting Process Operation Analysis Results

Process Operation Analysis will provide complex results for each combination of the Process, Resourcing and Input Volume simulated.

Ensure the analysis results are fully explained within the body of the engagement report to provide clear and considered support to your engagement findings, conclusions or recommendations.

Summarised simulation results should be included as an appendix to the report for each process. The simulation results created in WBM should be clearly labelled[40] and achieved with project work products.

6.10(a) Process Analysis Results

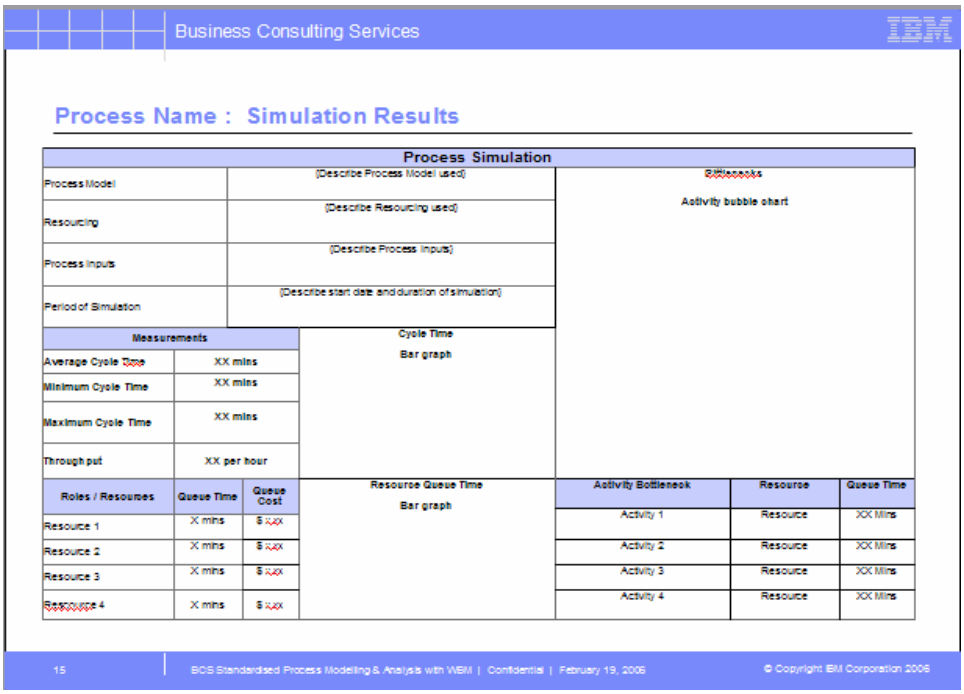
A template for recording the Process Operation results should be defined for an engagement. Depending on the requirements of an engagement, this template may include:

- Description of the Process being simulated including any changes made from the current state
- Description of the Input volume and arrival distribution;
- Description of the Resource levels and timetables;
- Period over which the simulation is run;
- Average Cycle Time;
- Maximum Cycle Time;
- Minimum Cycle Time;
- Queue Times & Costs by Resource and Activity;
- Key Activity bottlenecks; and
- Process Throughput.

The results can also be supported by the graphs generated by the Templates described above.

A separate page should be completed for each combination of Process, Input Volume and Resourcing used to support the engagement findings, conclusions or recommendations.

Figure 49: Example Process Analysis Results Template



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Process Name : Simulation Results

Process Simulation		
Process Model	(Describe Process Model used)	Bitlessss Activity bubble chart
Resourcing	(Describe Resourcing used)	
Process Inputs	(Describe Process Inputs)	
Period of Simulation	(Describe start date and duration of simulation)	

Measurements	
Average Cycle Time	XX mins
Minimum Cycle Time	XX mins
Maximum Cycle Time	XX mins
Through put	XX per hour

Cycle Time
Bar graph

Roles / Resources	Queue Time	Queue Cost
Resource 1	X mins	$ XX
Resource 2	X mins	$ XX
Resource 3	X mins	$ XX
Resource 4	X mins	$ XX

Resource Queue Time
Bar graph

Activity Bottleneck	Resource	Queue Time
Activity 1	Resource	XX Mins
Activity 2	Resource	XX Mins
Activity 3	Resource	XX Mins
Activity 4	Resource	XX Mins

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6.10(b) Single Process Analysis

Focus on the measurements which support the goal of the assignment. The results of Process Operation Analysis are often complex as they relate to the interaction of a number of factors on the process, any graphs or tabular results should be clearly explained and interpreted when being included in the body of the report.

Use the simplest chart possible to explain the findings.

For example, if process inputs arrive at a constant rate, the Cycle Time versus Start Time graph should be used instead of the Start and End Time for each Instance graph.

Figure 50: Cycle Time over Time Graph

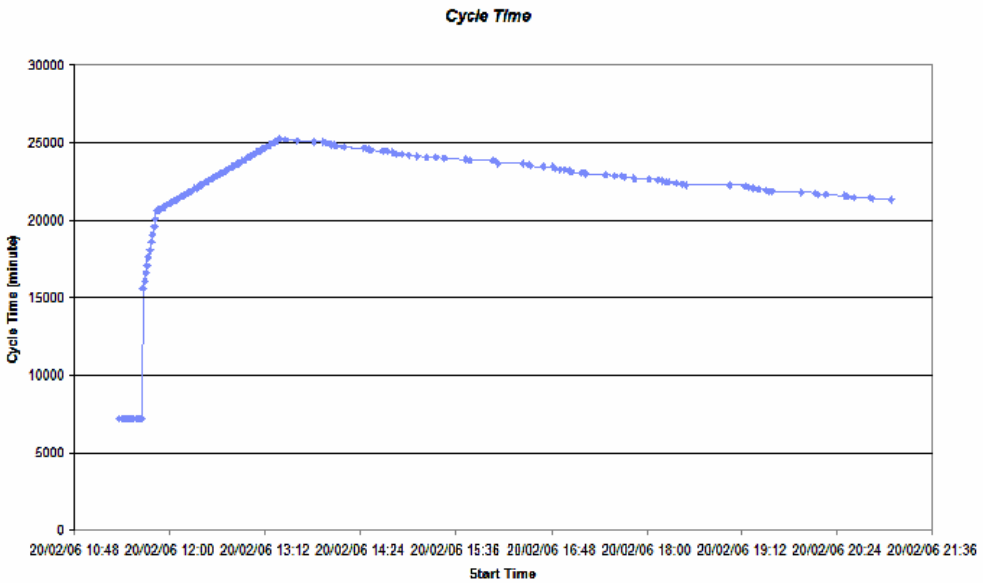
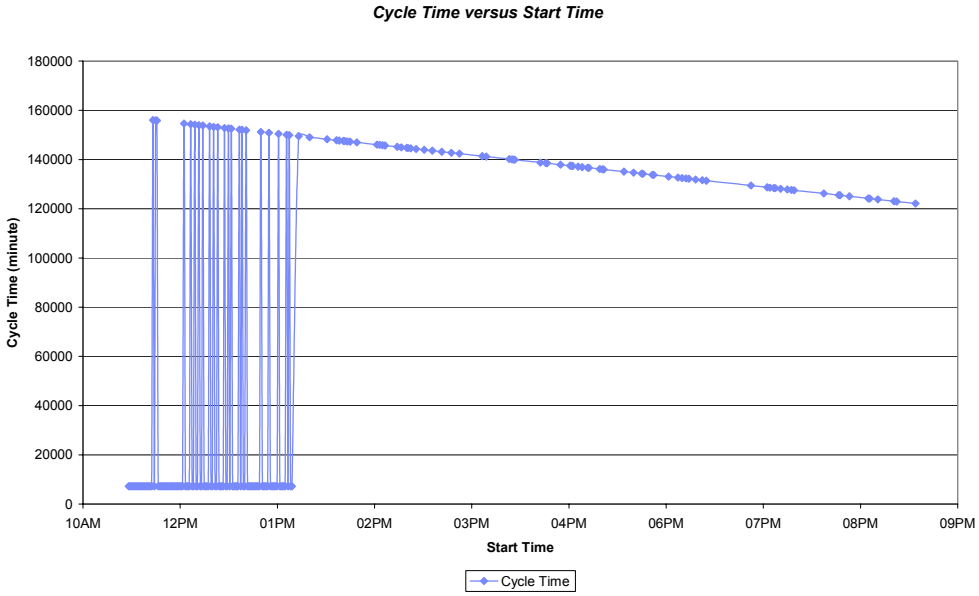


Figure 51: Process Start & End Time Graph



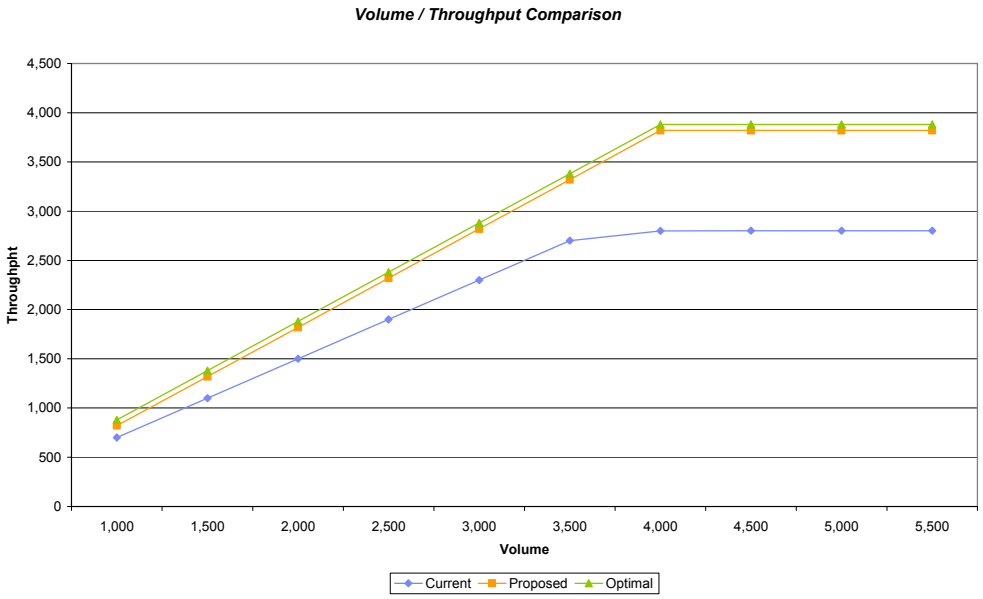
Maintain focus on the change of cycle time over time rather than obfuscating the issue with a representation of the input arrival distribution.

Conversely, if the cycle time increases in response to increase in input arrival rate, the Instance Time Graph should be used.

6.10(c) Comparative Analysis

If comparative or scenario analysis is being undertaken, ensure the future states are clearly defined in terms of Process, Inputs and Resourcing. The changes made to each of these variables to produce the outcome must be clearly defined in the body of the engagement report.

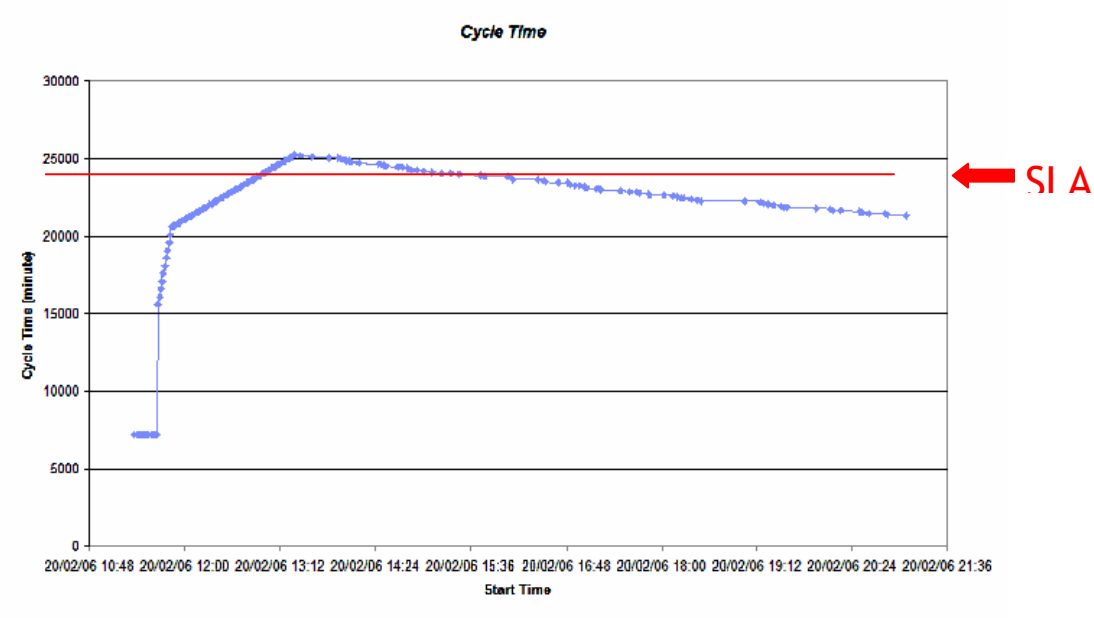
Figure 52: Volume & Throughput Comparative Graph



6.10(d) Scenario Analysis

Highlight the goal of the analysis on the graph.

Figure 53: Measurement of Performance against Service Level Agreement



7. Advanced Process Analytics

The previous sections of this document define a structured and controlled approach to analysis which is designed to meet the needs of the majority of GBS engagements. These approaches do not fully exploit the functionality available in WebSphere Business Modeler. It is possible to improve the precision of the model by exploiting this functionality, however the complexity and time required for the analysis and modelling activities will be increased.

Additional modelling & analysis functionality supported by WebSphere Business Modeler includes:

- Evaluation of decisions based on expressions instead of probability;
- Use of inclusive (as opposed to exclusive) decisions;
- Advanced Input and Output Logic,
- Timers, Repositories, Notifications & Interrupts;
- Use of statistical distributions to control input arrival; and
- Allocation of variable task processing times (based on specified variables or statistical distributions).

If the engagement requires a greater level of precision than provided by the analysis techniques covered in Sections 1 to 6 of this Technique Paper, it is recommended that the resources with deep experience in performing modelling & analysis with WBM be engaged on the project.

Appendix A: Useful references and links

WBM Help

Guidance on how to perform process modelling & analysis using WBM.

http://publib.boulder.ibm.com/infocenter/dmndhelp/v6rxmx/index.jsp

GBS Standardised Process Mapping with WBM Technique Paper and Templates

A technique paper outlining GBS standards for developing process maps in WBM.

http://w3-3.ibm.com/services/GBS/km/knowledgeviewportal/kvfeServlets/displayDocument.wss?syntheticKey=H883618V24604H52

GBS Process Data Gathering for WebSphere Business Modeler

A series of templates to assist in data gathering for process mapping, modelling & analysis.

Quick Reference Guide for drawing WBM maps

A customisable word document which provides guidance for process mappers on conventions to be adopted.

http://w3-3.ibm.com/services/GBS/km/knowledgeviewportal/kvfeServlets/displayDocument.wss?syntheticKey=R877790E06938M32

Quick Reference Guide for reading WBM maps

A customisable word document which provides guidance for subject matter experts or workshop participants on how to interpret WBM maps.

http://w3-3.ibm.com/services/GBS/km/knowledgeviewportal/kvfeServlets/displayDocument.wss?syntheticKey=C953865V54350A56

Quick Reference Guide to Modelling & Analysis Approach

A customisable word document which provide guidance for scoping analysis engagements and determining the correct value point for analysis.

Quick Reference Guide to Metrics & Measures

A customisable word document which provides definitions of the process modelling & analysis taxonomy and provides guidance in how to configure WBM reports to obtain specific metrics.

BI818 – Introduction to WebSphere BI Modeler (self-paced learning)

https://camdb10.lotus.com/w_dir/wbiski1lotus.nsf/27e5d21ab875a73f88256fc00023b598/5d8552ca38b9972285256f27008121bf?OpenDocument

Business Process Improvement (BPI) Methodology

Contact Debbie Van Pelt (Operations Strategy Lead) dvanpelt@au1.ibm.com

Appendix B: Glossary

Activity	Work performed in a business process. Processes, Tasks and Services are examples of Activities.
Activity cost analysis	Analysis reports which provides the costs of the process at an Instance level. The costs which are included are revenue, execution cost, idle cost incurred while waiting for resources, allocated resource cost, total cost, and profit.
Activity Time	Sum of durations for all activities.
Aggregated Analysis	Analysis reports which provide summary results based on the execution of the process through simulation.
Bulk Resource	A collection of resources in which the individual elements are not or do not need to be uniquely identified. Bulk resources are used when a quantity of a resource is required for a task. Bulk resources can be non-consumable (such as employees, vehicles, or equipment) or consumable (such as fuel or printer paper).
Business Item	An element used to represent either: a work product produced by a task or process, eg report; or a trigger for a process to begin eg customer enquiry.
Business process	A potential set of activities that represent all the alternative methods of performing the work needed to achieve a business objective. It is represented in WBM as a process that contains Tasks, other Processes, Flows, and Decisions.
Case	A specific execution path within a process that contains multiple possible paths.
Classifier	Group names which can assigned to every mapping element for the purpose of classifying eg value add, quality checking
Comparison Analysis	Analysis reports which compare analysis results for two simulated processes that use the same input parameters.
Critical path	The series of activities that must occur as scheduled for the completion date of a case to be met. The critical path is the path among parallel paths (in the same case) with the longest duration. The standard definition of Critical Path is not measured using the approaches outlined in this Technique Paper. Minimum Critical Path (which is the critical path without any wait or queue time) is able to be measured.
Critical Path Resource Time	Sum of resource time for activities on the critical path.
Cycle Time	The time between when a process commences and when it finishes. It includes non working time such as lunch breaks, nights and holidays.
Dynamic Analysis	Analysis reports of the results of process simulations.
Elapsed Duration	This is a WBM term which can represent many different time measures depending on the configuration of the simulation and the report which is generated. This term is not used to describe specific time measures in this Technique paper.
Idle Cost	The cost incurred by an activity instance while not actively processing because it is waiting for a resource.
Idle Time	The time spent waiting for resources rather than actively processing.
Metric	A measurement of a process or process element.

Minimum Critical Path Time	The sum of the durations for all activities on the critical path. It does not include non-working time.
Model	A representation of a process, system, or subject area, generally developed for understanding, analysis, improvement, and/or replacement of the process. It includes operational data as well as the flow of activities. It includes such things as the people required to perform a task, their timetables to work, the task duration and associated direct and indirect costs.
Non Resource Cost	The total of all costs in the process excluding costs related to Resources.
Probability	The percentage of business items that will take a given choice.
Distribution	The probability an instance will follow a particular case.
Process case	A particular path, based on outcomes of decisions, within a business process
Process cases analysis	Analysis reports which provide details of all process instances, and weighted average values across all cases calculated according to the distribution of process instances to each case.
Process cases summary analysis	Analysis reports which provide summary details for all the process cases produced during the simulation of a process.
Process Cost	The total of all costs in a process.
Process cost analysis	Analysis Reports which provide Process Costs.
Process duration analysis	Analysis Reports which provide time measures for the process.
Process instance	The path a particular token takes through the process during a simulation.
Process instances summary analysis	Analysis reports which describe the results from process simulation at a case and instance level.
Process Revenue	The total of all revenue in a process.
Processing Cost (Cost and Revenue Tab)	This is the cost that is incurred every time an activity is run. This is a unit cost (ie. expense)
Processing Time (Duration Tab)	Time required for the activity to complete. That is, from the time the input is received to the time the output leaves. This measure includes the preparation time associated with the resource before work can begin, the time the resource is actively working and any additional time such as recovery time for the output. Recovery time for the resource should NOT be included. Any waiting time due to resource constraints should NOT be included.[41]
Profit	The overall profit or loss from a process.
Queries	WBM has a number of predefined queries that can be used to extract information about the process
Queue Cost	The costs incurred by the process while waiting for resources.
Queue Time	Time an activity waits for a resource to be allocated.
Recovery Time	This is the time a resource or machine requires to revert to a state in which in can accept another input. For example, cool-down time.
Resource	A system or person who performs a responsibility (Role) within the process.
Resource Cost	The total cost of allocated Resources in a process based on the time contribution of each Resource.

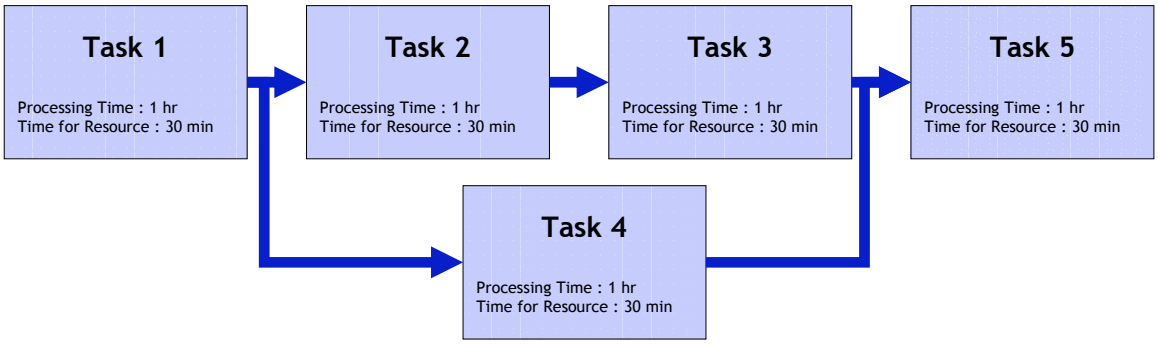
Resource Time	Sum of resource time for all activities
Resources Costs – Cost per Time Unit	The cost of Resource (Role) for a particular time. Eg. Hourly cost rate
Resources Costs – Cost per Unit	The cost of the Resource (Role / Bulk Resource) performing a task eg. cost per report.
Resources Costs – One Time Cost	The costs associated with the first use of a resource in a process.
Revenue (Cost and Revenue Tab)	The revenue which is earned when this task is completed.
Role	A responsibility within the Process.
Role Duration	Time spent by resource to complete an activity
Service	Services are activities performed by an external entity. Their internal operation should be seen as a black box.
Simulation	A faster-than-real-time performance of a process in a virtual environment. Simulation enables organizations to observe how a process will perform in response to variations of inputs to the process, just as in a real-life work environment. Simulation also provides the ability to vary process input volume over time by adjusting resources and current allocations. Simulation output provides detailed information regarding resource utilization levels and the results of cost and cycle-time calculations.
Simulation snapshot	A record of a process model at the moment when you simulate the process.
Start Up Cost	Initial expense incurred when a task starts
Startup Cost (Cost and Revenue Tab)	This cost only applies during simulation. It defines the cost incurred the first time the activity is executed in the simulation.
Static process cases summary analysis	Analysis report which list all possible cases within a process.
Static Process Cost	The cost of a process without impacts from simulation.
Static Resource Cost	The static costs of resources without impacts from simulation.
Subprocess	A process that is also a part of another process.
Task	An activity in a business process that does work and is the responsibility of a specified role. Visually, tasks represent the lowest level of work you can portray in a process.
Throughput	The average number of times per hour that an activity or a process can deliver output, calculated as an inverse of the average elapsed duration.
Time Required for Role (Resources Tab)	Time the role is active due to working on the activity. This may include preparation and recovery time in addition to the working time.
Timer	Mapping element used to model batch processes
Token	A unit of work that is transferred between nodes in a simulated process.
Transfer Time	Time required for a work product to be delivered from the time it is sent. This is for products sent by the client organisation, whether to internal or external entities.
Volume	The number of business items received as input to the process in the most appropriate time frame for the process

Wait Time Cost (Cost and Revenue Tab)	This cost measure can only be applied within a simulation profile. It is the cost of the activity while waiting for a resource to be applied.
WBM	Acronym for WebSphere Business Modeller
Weighted average analysis	Analysis reports which provide process simulation results for all the possible process instances of a process, aggregated by case.

Appendix C: Example Time Metrics Calculation

The following example will assist in understanding how each of the time measures is calculated for a process.

In the following example, each task has a Processing Time of 1 hour and a Time Required for Role of 30mins.



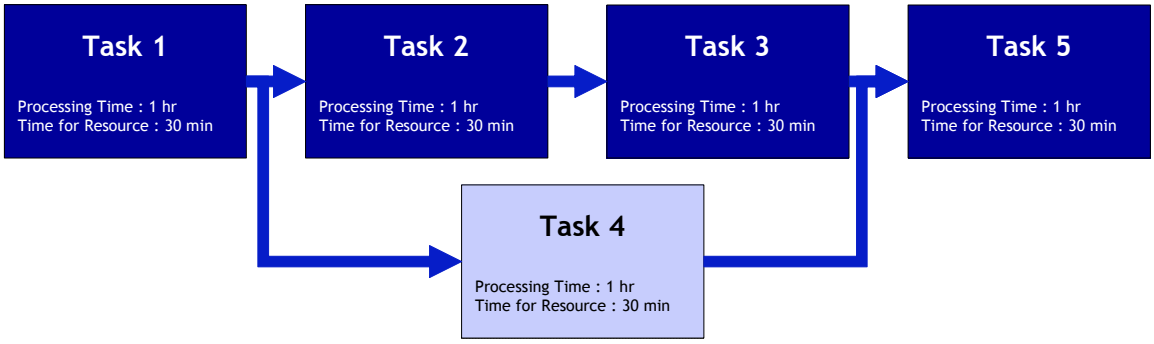
From this process, it is possible to calculate the Activity Time and Resource Time.

Metric	*Calculation*	*Result*
Activity Time	Sum of Processing Times for all tasks (Task 1, Task 2, Task 3, Task 4, Task 5)	5 hours
Resource Time	Sum of Time required for Role for all tasks (Task 1, Task 2, Task 3, Task 4, Task 5)	150 mins 2.5 hours

Other time measures are based on the time a process takes to complete.

These metrics are based on the critical path of the process, being the longest path through the process based on the dependencies between tasks.

In this example, Task 1, Task 2, Task 3 and Task 5 form the critical path.



The following time measures are calculated using these assumptions:

- Employees work from 9am- 5pm with a 1 hour lunch from 12pm – 1pm.

- Due to resource restrictions, Task 3 cannot commence until 2pm.
- The process starts at 10am.

Time	*Cycle Time*	*Minimum Critical Path Time*	*Minimum Critical Path Resource Time*
09:00 -10:00			
10:00 -11:00		Task 1 : 1 hour	Task 1 : 30 mins
11:00 -12:00		Task 2 : 1 hour	Task 2 : 30 mins
12:00 -13:00			
13:00 -14:00			
14:00 -15:00		Task 3 : 1 hour	Task 3 : 30 mins
15:00 -16:00		Task 4 : 1 hour	Task 4 : 30 mins
16:00 -17:00			
Results	***6 hours***	***4 hours***	***2 hours***

Appendix D: Metrics Index

The following table describes the simulation settings required and the report and field through which each metrics can be calculated.

Metric	Types						Report details			Simulation settings	
	Case	Process	Instance	Classification	Activity	Role/Resource	Report Type	Report name	Field name	Use resources time required as task processing time	Roles or Resources
Cycle time	Y	Y					Dynamic	Process Duration	Average Elapsed Duration	N	Resources
			Y				Dynamic	Process Instance Summary	Elapsed Duration	N	Resources
Minimum Critical Path Time	Y	Y					Dynamic	Process Duration	Average Elapsed Duration	N	Roles
							Profile	Static Process Cases Summary All Level	Process Elapsed Duration	N	-
Minimum Critical Path Resource Time	Y	Y					Dynamic	Process Duration	Average Elapsed Duration	Y	Role
							Profile	Static Process Cases Summary All Level	Process Elapsed Duration	Y	-
Activity Time	Y	Y					Profile	Static Process Cases Summary All Level	Process Working Duration	N	-
				C			Dynamic	Classifier Cost and Duration	Average Elapsed Time	N	Role
				P			Dynamic	Classifier Weighted Average	Total Weighted Average Elapsed Duration	N	Role

Metric	Types						Report details			Simulation settings	
	Case	Process	Instance	Classification	Activity	Role/Resource	Report Type	Report name	Field name	Use resources time required as task processing time	Roles or Resources
Resource Time	Y	Y					Profile	Static Process Cases Summary All Level	Process Resource Duration	Y	-
				C			Dynamic	Classifier Cost and Duration	Average Elapsed Time	Y	Role
				P			Dynamic	Classifier Weighted Average	Total Weighted Average Elapsed Duration	Y	Role
						Y	Dynamic	Process Resource	Weighted Average Allocation Duration	Y	Role / Resource
Queue Time					Y		Dynamic	Activity Duration	Average Delay Duration	-	Resources
Queue Cost					Y		Dynamic	Activity Cost	Average Idle Cost	-	Resources
Through-put	Y	Y					Dynamic	Process Duration	Average Throughput	-	Resources
Process Cost	Y	Y					Dynamic	Process Cost	Average Total Cost	-	-
			Y				Dynamic	Process Instances Summary	Total Cost	-	Resources
Static Process Cost	Y	Y					Profile	Static Process Cases Summary	Process Total Cost	-	-
Resource Cost	Y	Y					Dynamic	Process Cost	Average Allocated Resource Cost	-	-
Process Revenue	Y	Y					Dynamic	Process Cost	Average Revenue	-	-
			Y				Dynamic	Process Instance Cost	Revenue	-	Resources

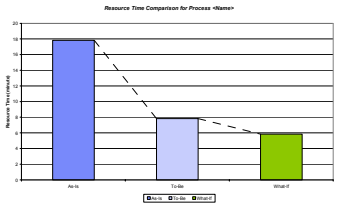
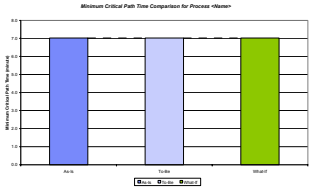
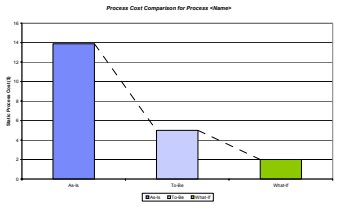
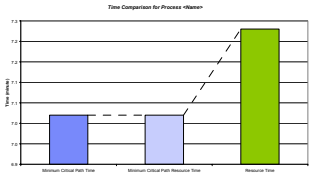
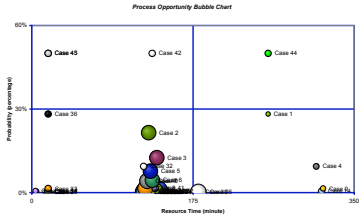
Metric	Types						Report details			Simulation settings	
	Case	Process	Instance	Classification	Activity	Role/Resource	Report Type	Report name	Field name	Use resources time required as task processing time	Roles or Resources
Profit	Y	Y					Dynamic	Process Cost	Profit	-	-
			Y				Dynamic	Process Instance Cost	Profit	-	Resources

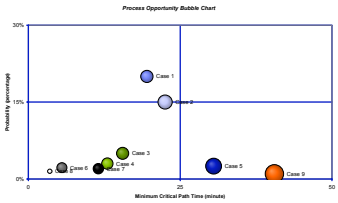
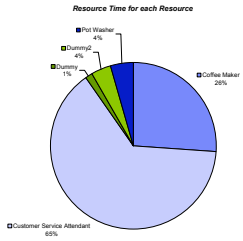
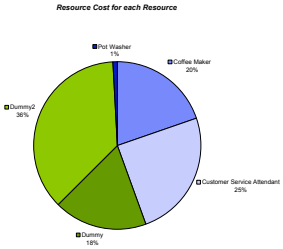
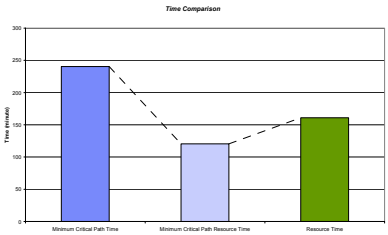
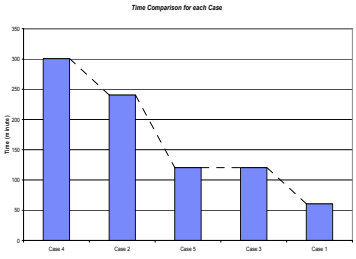
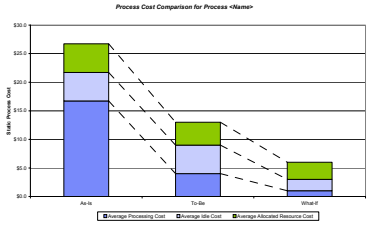
Appendix E: Templates

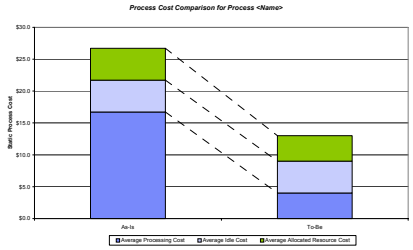
MS Excel Templates

The following MS Excel templates are available to support the analysis scenarios in this guide.

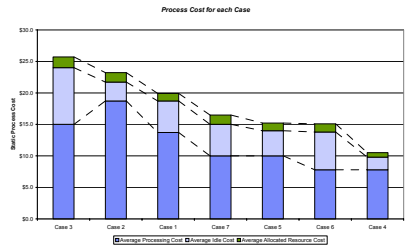
These templates include macros to generate graphs. To enable the macros, you need to make sure the macro security level of your MS excel is set to Medium and Trust all installed add-ins and templates option is checked. *This dialog box can be found by clicking on the Tools menu, pointing to Macro, and then clicking Security. You are also prompted on each file-open to enable or disable Excel macros. You need to choose 'Enable Macros'.

Template Name	*WBM Report*	*Sample Outcomes*
WBM Process Metrics Template	Static Process Cases Summary All Level	Resource Time Comparison for Process  Minimum Critical Path Comparison for Process  Process Cost Comparison for Process  Time Comparison for Process 
WBM Process Metrics Opportunity Resource Time Template	Static Process Cases Summary All Level	Process Opportunity Chart 

WBM Process Metrics Opportunity Minimum Critical Path Template	Static Process Cases Summary All Level	
WBM Process Analysis Resource Template	Process Resource	Resource Time for each Resource  Resource Cost for each Resource 
WBM Process Analysis Process Time Comparison Template	Static Process Cases Summary All Level Process Duration	Time comparison  Time comparison for each Case 
WBM Process Analysis Process Cost Comparison Template	Process Cost	Process Cost Comparison for Process 



Process Cost for each Case

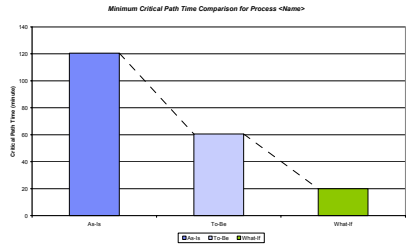


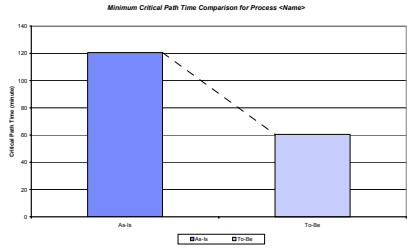
WBM Process Analysis Minimum Critical Path Template

Process Cases Summary

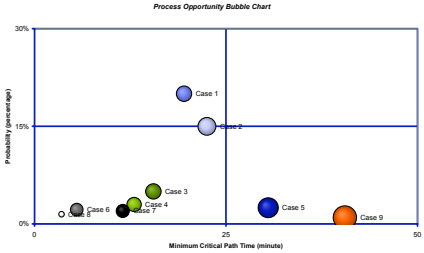
Process Duration

Minimum Critical Path Time comparison for Process





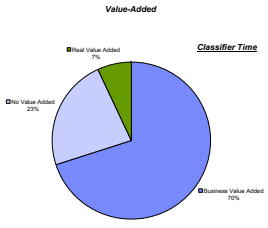
Process Opportunity Bubble chart



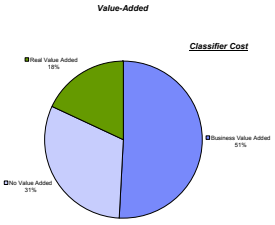
WBM Process Analysis Classifier Template

Classifier Weighted Average

Classifier Time



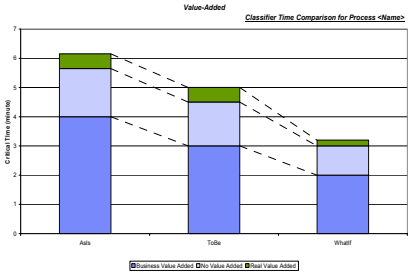
Classifier Cost

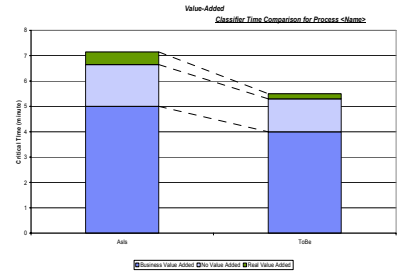


WBM Process Analysis Classifier Comparison Template

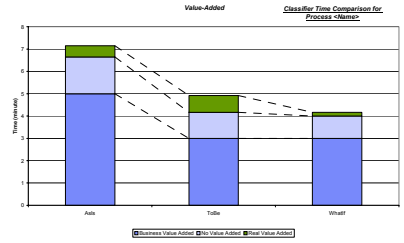
Classifier Weighted Average

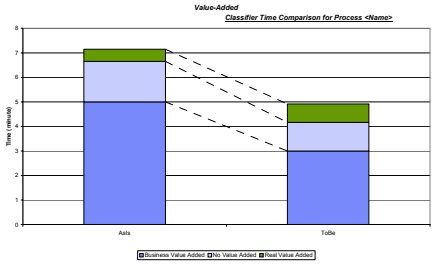
Classifier Time Comparison for Process





Classifier Cost comparison for Process





WBM Process Operation Activity Template

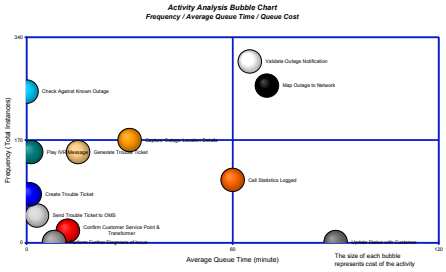
Activity Statistics

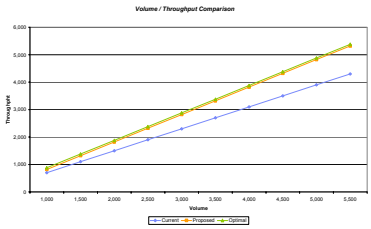
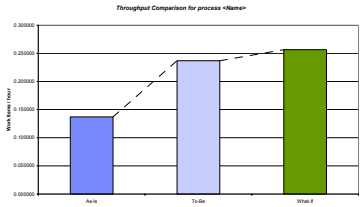
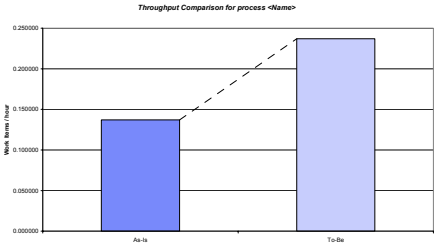
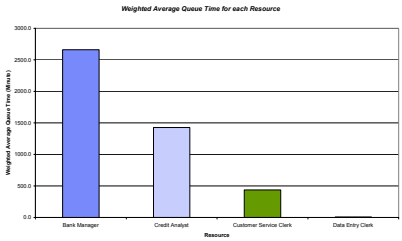
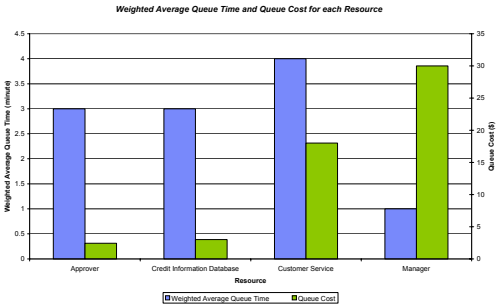
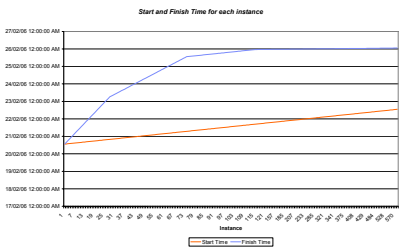
Activity Cost

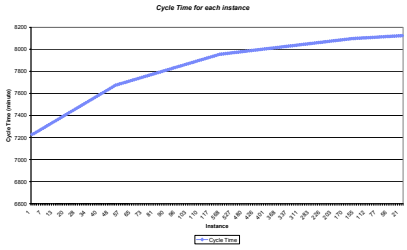
Activity Duration

Profile Specification

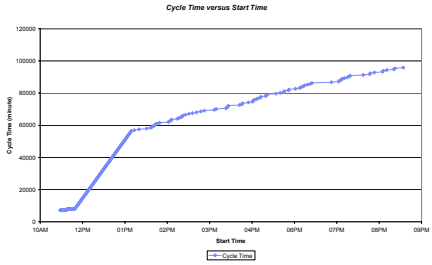
Activity Analysis Bubble Chart



WBM Process Operation Volume Template	Process Duration Volume Input (Need to type manually)	Volume / Throughput Comparison  Throughput Comparison for process  
WBM Process Operation Queue Template	Activity Cost Activity Resource Allocation Process Resource	Weighted Average Queue Time for each Resource  Weighted Average Queue Time and Queue Cost for each Resource 
WBM Process Operation Cycle Time Template	Process Instance Summary	Start and End Time for each Instance  Cycle Time for each Instance



Cycle Time versus Start Time



MS PowerPoint Templates

The following MS PowerPoint templates are available to support GBS teams in performing the analysis outlined in this guide.

Template Name	*WBM Report*	*Sample Outcomes*
Process Complexity Table	Static Process Cases Summary All Level	
Process Savings Table	Static Process Cases Summary All Level	
Resource Savings Table	Process Resource	
Process Analysis Summary Template	Process Duration Static Process Cases Summary All Level Process Resource Process Cost Process Cases Summary Classifier Weighted Average Classifier Cost and Duration	

	As-Is	To-Be	What-If
Number of Cases	20,000	1,000	50
Highest Probability Case	3%	10%	45%
Frequency	3 times per week	10 times per week	45 times per week
Cases comprising 95% of volume	10,000	200	8

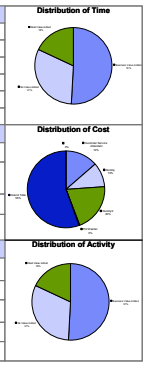
Proposed Solution	Process	Process 1	Process 2	Process 3	Process 4
	Resource Time	↓ 89%	↓ 82%	↓ 66%	↓ 39%
	Process Cost	↓ 100%	↓ 82%	↓ 99%	↓ 83%
	Resource Saving Per Week	↓ 1.7 hours	↓ 42.8 hours	↓ 4.8 hours	↓ 1.3 hours
	Cost Saving Per Year	⇔ $100	⇔ $100	⇔ $100	⇔ $100

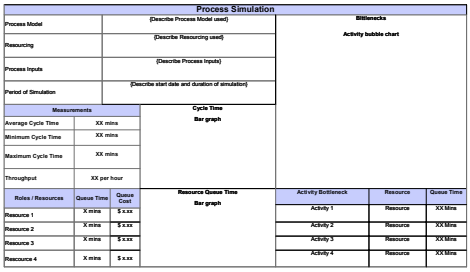
	Role	Role 1	Role 2	Role 3	Role 4
	Working Hours / Week	35	35	35	30
	Working Weeks / Year	12	48	48	48
To-Be	Process 1	1.1	2	0	8
To-Be	Process 2	0.7	-0.5	0	0.5
To-Be	Process 3	4	1	0	-2
To-Be	**Total Savings**	**5.8**	**2.5**	**0**	**6.5**
What-If	Process 1	1.1	2	0	8
What-If	Process 2	3	0	0	3
What-If	Process 3	4	1.5	1.1	0
What-If	Total Savings	8.1	3.5	1.1	11

Process Measurements	
Avg Critical Path Time	X mins
Avg Resource Time	X mins
Avg External Activity Time	X mins
Avg Process Cost	$ x.xx
Volume	X per week
Number of Cases	x

Roles	Working Time	Cost
Role 1	X mins	$ x.xx
Role 2	X mins	$ x.xx
Role 3	X mins	$ x.xx
Role 4	X mins	$ x.xx

Categorisation	Working Time	Cost
Approving Access Requests	0.30 min.	$ x.xx
Communications	0.06 min.	$ x.xx
Performing Security Tasks	2.10 min.	$ x.xx
Tracking & Monitoring	0.00 min.	$ x.xx
Validating Data	1.40 min.	$ x.xx



Process Operation Analysis Summary Template	Activity Duration Activity Cost Profile Specification Process Instance Summary Process Resource Process Duration Activity Statistics	

Process Simulation

Process Model	(Describe Process Model used)	Bitllenecks Activity bubble chart
Resourcing	(Describe Resourcing used)	
Process Inputs	(Describe Process Inputs)	
Period of Simulation	(Describe start date and duration of simulation)	

Measurements	
Average Cycle Time	XX mins
Minimum Cycle Time	XX mins
Maximum Cycle Time	XX mins
Throughput	XX per hour

Cycle Time
Bar graph

Roles / Resources	Queue Time	Queue Cost
Resource 1	X mins	$ x.xx
Resource 2	X mins	$ x.xx
Resource 3	X mins	$ x.xx
Resource 4	X mins	$ x.xx

Resource Queue Time
Bar graph

Activity Bottleneck	Resource	Queue Time
Activity 1	Resource	XX Mins
Activity 2	Resource	XX Mins
Activity 3	Resource	XX Mins
Activity 4	Resource	XX Mins

Appendix F: Recommended Classifiers

Classifier	Table text heading
Customer Status	Customer Engaged
	Customer on Hold
	Customer Wait
	Non-Customer
Exception Path	Exception Path
	Non-Exception Path
Governance	Corp & Reg Governance
	Corporate Governance
	Non-Governance
	Regulatory Governance
Labour Type	Automatic
	Manual
User Interface	Human to Human
	Human to System
	System to System
Communication Medium	Electronic
	e-Mail
	Fax
	None
	Paper
	Phone
	Courier
Business Requirement	Business Requirement 1
	Business Requirement 2
Business Requirement 1	Critical
	Desired
	Not Applicable
Request Status	Received
	Processed
	Escalated
	Resolved
	Closed

Appendix G: DB2 Installation Guidance

To provide a reasonable level of performance when running simulations with more than 100 tokens, it is recommended that DB2 be installed as the Simulation Database.

DB2 Installation

Download DB2 UDB Express Edition 8.1 for Windows (Part Number : C51BSML) from xTreme Leverage (http://w3-103.ibm.com/software/xl/portal).

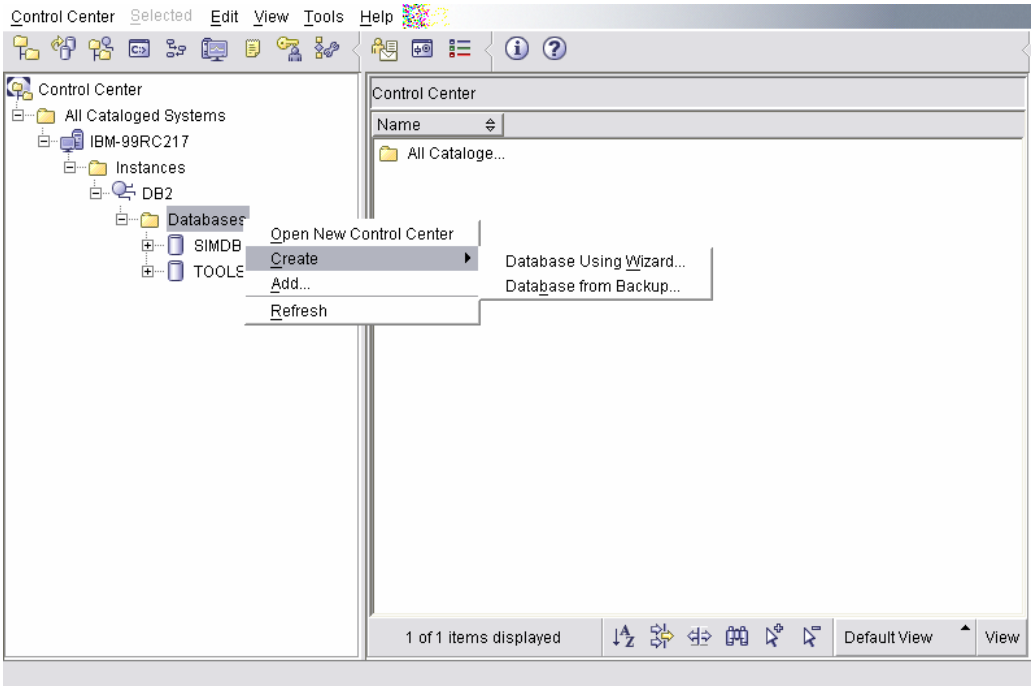
Install software. Enter a Username and Password for administration of DB2 databases. Note these are required for further steps in the installation process.

Creation of Database

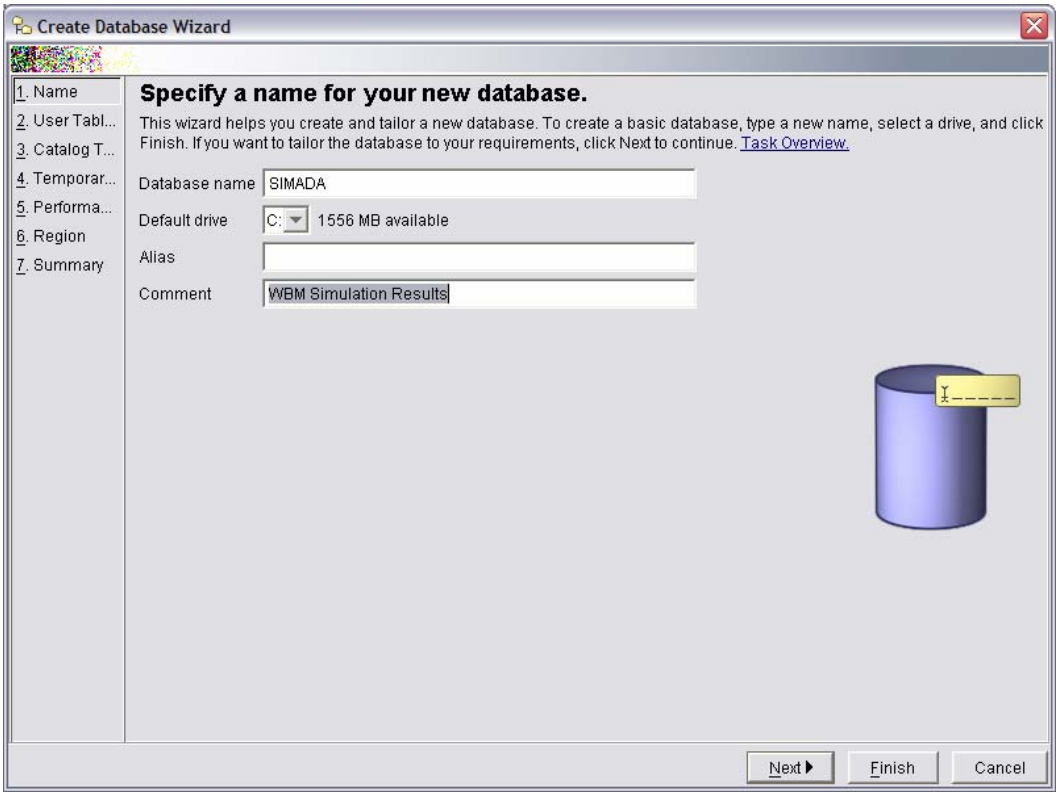
Use DB2 Control Centre to create a new database to store simulation results.

IBM DB2 → General Administration Tools → Control Centre

Navigate to **Databases**, Right-Click and select **Create → Database Using Wizard**

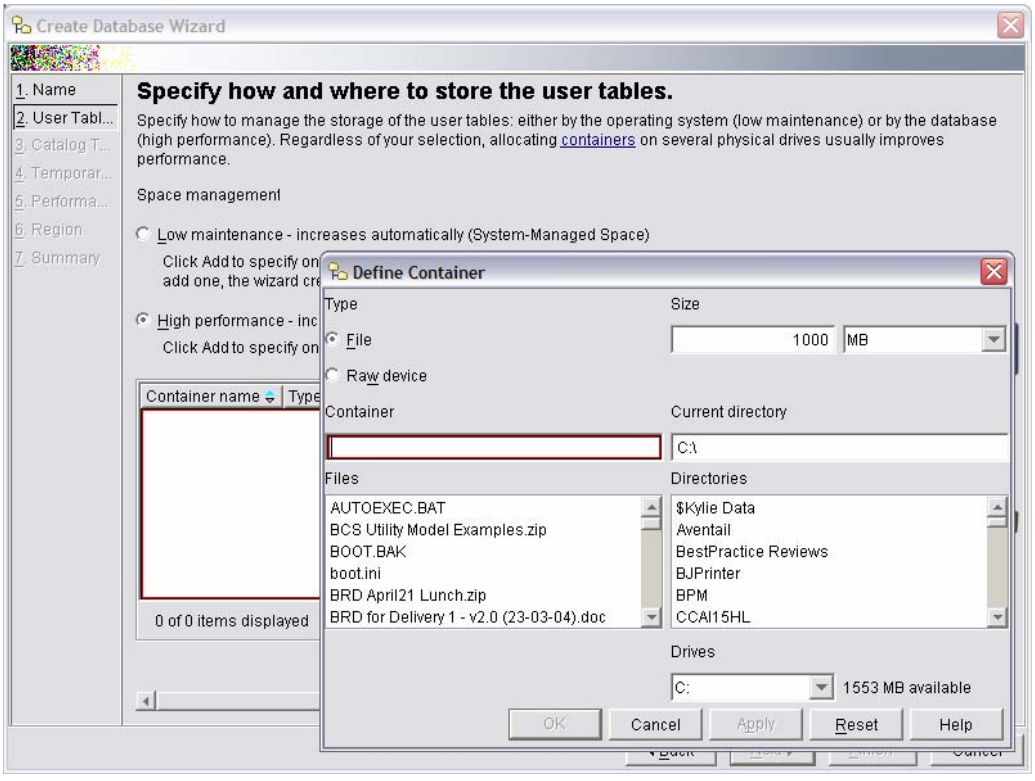


Create a database name eg. SIMADA



For User Tables, select **High Performance.**

Select **Add**, enter a file name for the **Container**. Select an appropriate file name and directory. Change the **Size** to 1000 – 2000 MB to ensure the database is large enough for simulation results. To handle simulations greater than 10000 tokens, it may be necessary to further increase the table size.

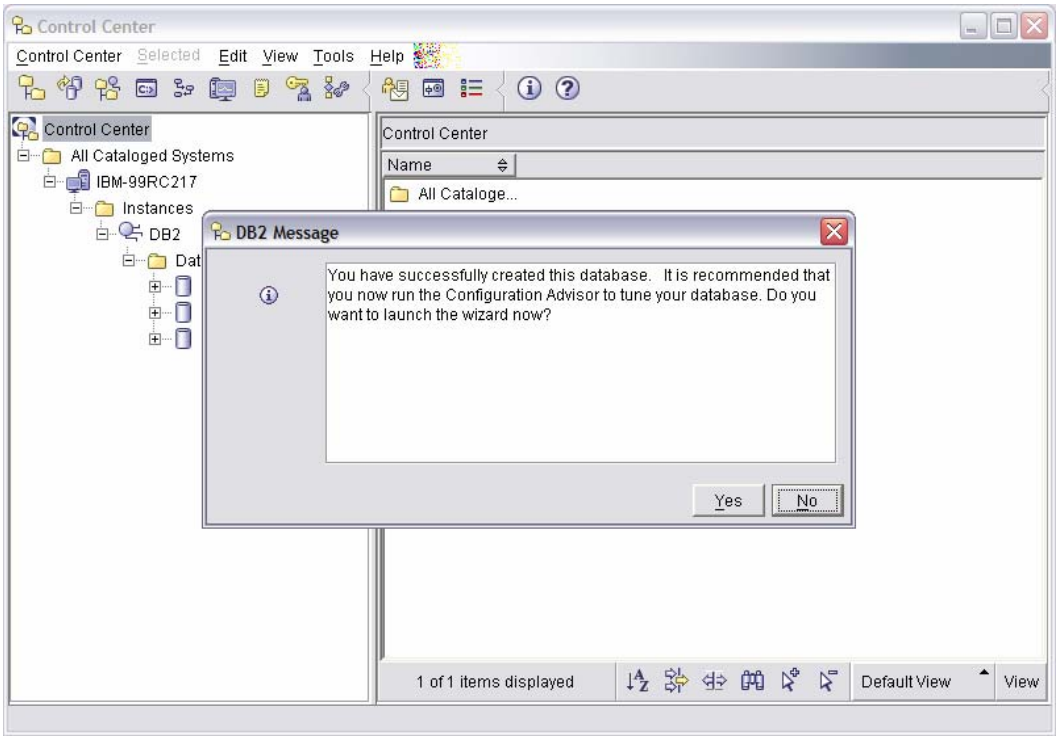


Repeat the same steps for System Catalog and Temporary Tables.

Select default values for Wizard Steps 5 – 7.

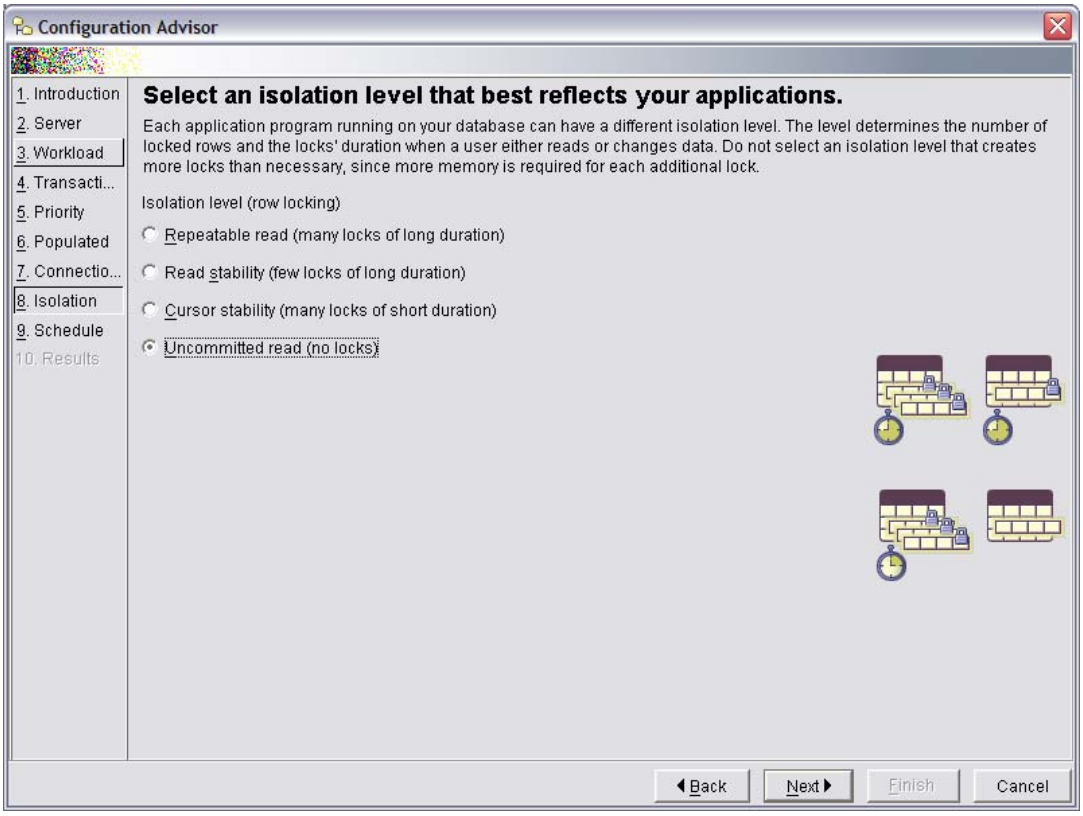
Select **Finish** to create the database.

Accept option to run **Configuration Adviser.**



Select default values for steps 1 -7

In step 8, select **Uncommitted**.



Select defaults for remaining steps and select **Finish.**

Setting DB2 to be used as the simulation DB in WBM

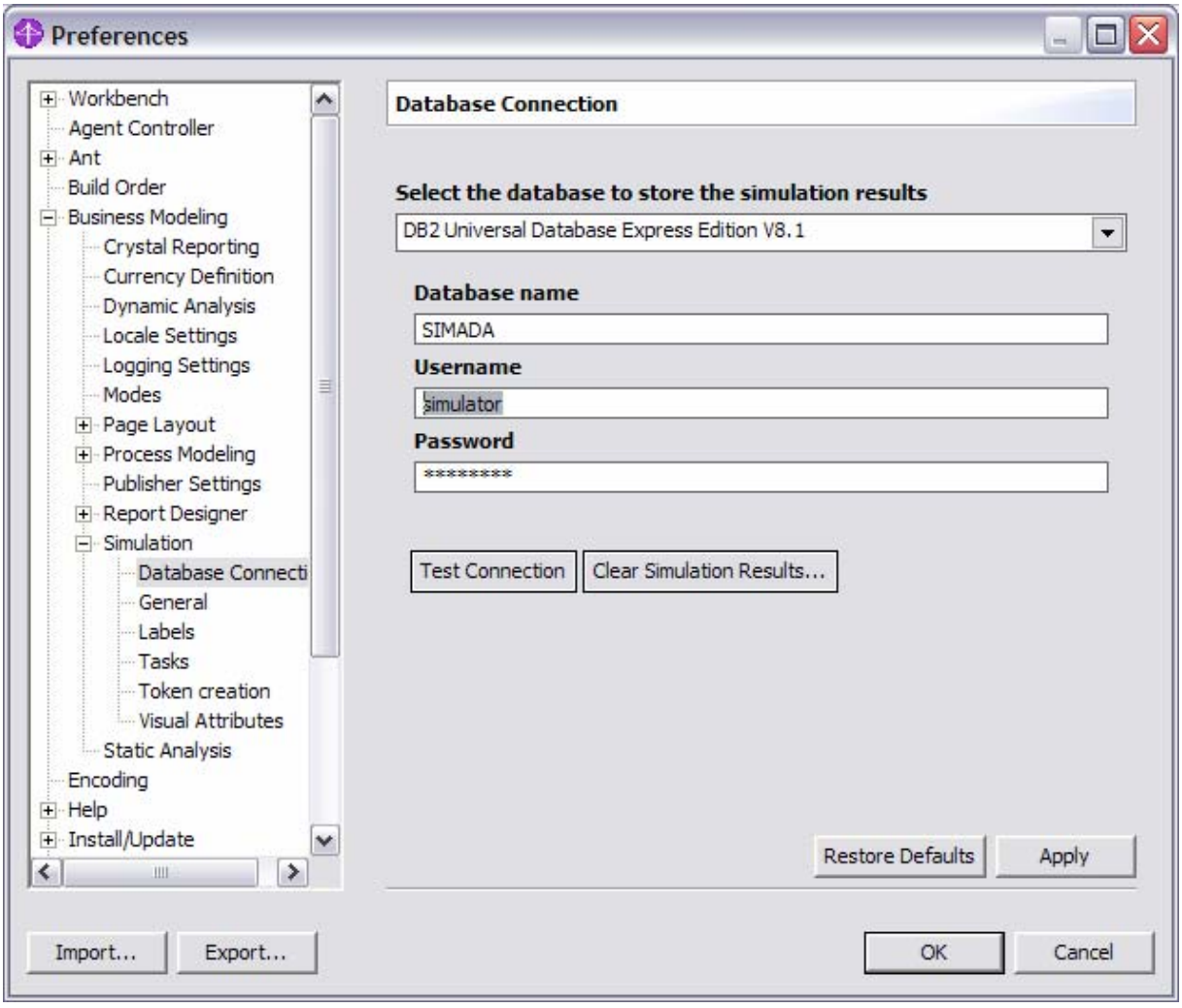
Launch WBM.

Select **Preferences → Business Modelling → Simulation → Database Connection**

Select DB2 as the **database to store simulation results**.

Enter the **Database name** created in DB2 eg. SIMADA

Enter the **Username** and **Password** with the same values from the DB2 installation.



Select **Test Connection** to validate the database connection.

It is recommended to regularly **Clear Simulation Results** to prevent filling the available database space. Errors in generation of simulation results or generation of dynamic analysis reports often result when the database table space has been filled.

WBM Help for DB2 Implementation

http://publib.boulder.ibm.com/infocenter/dmndhelp/v6rxmx/index.jsp?topic=/com.ibm.btools.help.modeler.doc/doc/tasks/analyzing/setupdb2database.html

Appendix H: Rationales & Explanation

[1] It is recommended that practitioners complete the two day GBS Modeling & Analysis class prior to performing modeling and analysis activities. This education provides education on "How-To" perform the activities described in this Technique Paper. Contact GBS L&K for information on available education.

[2] Process Metrics will provide high level process measurements and allow virility of the level of complexity of the process through reviewing the number of cases. Process Analysis will allow further testing based on grouping activities and looking at contribution of roles eg. Note that process analysis does require simplified simulation of the process model.

[3] Completing Process Operation Analysis will allow specific issues of resource dependencies or volume and growth to be investigated.

[4] For example, Benchmark, Competitor, Quick Wins etc.

[5] These are examples of use only. It is possible to use the three process states to represent any version of the process eg. Benchmark, Industry Standard etc. Simply update the labels in the Templates to represent the correct process state name.

[6] The accuracy of analysis results is depended on both the accuracy and precision of the data recorded in the model and the correct application of analytic techniques and interpretation of the results.

[7] To calculate the average time, multiply the time for a small orders by the probability of a small order occurring. Then multiply the time for a large order by the probability of a large order – the total will provide the weighted average time. Eg. 50% of 10mins plus 50% of 30 mins = 5 + 15 = 20 mins

[8] Processing time should only be the actual time the task takes to complete. Idle or waiting time due to resource constraints will be calculated automatically by the simulation. As system and transfer times will be set up as processing time as well, it is necessary to run the simulation based on processing time and not resource time only. It is not possible to set system, service and transfer times up as resource time as this will prevent measurement of resource time on a process.

[9] See 3 Process Metrics Taxonomy for full definitions of metrics.

[10] Time assigned to resource time for automated tasks, ie those assigned to a "System" role, will affect the Resource Time metric

[11] As time is not assigned to bulk resources, a cost by time usage is not applicable

[12] To aid later export to BPEL, it is recommended to join all alternate paths into one single point.

[13] While end-nodes can be used for readability purposes in the Mapping guide, once resource constraints are applied it is impossible to determine which the longest path is and there is a risk that a process may terminate before all parallel paths are complete. Therefore all paths should be terminated by using a join to a stop node.

[14] This is because a Join merely waits until all business items arrive and then passes these through as separate business items. The next task needs to accept all items and synthesize them back into one business item. If this doesn't happen, the model will, in effect, use each business items being joined as a separate token moving through the process.

[15] While two tasks may not be dependent upon each other, they should not be mapped as parallel if the expectation is that they will be performed by one person. A single person cannot be completing two independent activities at the same time. Assign a default order in which the tasks will be completed.

[16] Do not record transfer times as a part of Processing Time as Processing Time does not start until a resource is available.

[17] Transfer Time will be material when it is significant compared to the other times within the process. Eg. In a 3 day process, a 2 min email may not be significant, but within a 1 week process, a 2 day postal delivery is significant.

[18] Recording time against the role for Transfers will affect the Resource Time metrics

[19] This time should not be merely incorporated in the process time of a task as this can impact the simulation of resource assignment. Also, a task should be used and not a timer because a timer requires more effort to ensure that simulations work correctly ie you must change the logic for each timer in the snapshot

[20] This means that the measures and times used within the process have to relate to a consistent item eg. A single order (individual) or a group of orders (batch). This ensures that the measures received will also be accurate for a consistent item.

[21] When most of the processes occur as a batch and batch measurements are required – it is a lot less error prone to model the whole process as a batch.

[22] When measuring the time a process takes to occur and significant portions of that process occur as batch jobs, it can be difficult to work out the time at an individual level as there are lots of artificial waiting time and constraints which need to be built into the model. In this case, each task should be considered a batch and tasks that occur at an individual level should be aggregated into batch time.

[23] Exercise caution with Processing Time when this is different to Time Required for Role. Ensure that the aggregated number reflects the whole batch time and that there is not efficiencies generated from doing work as a batch.

[24] Even if there are extensive differences between the current and future state, make a copy and delete the extraneous elements. It is not recommended to start modelling future state processes as completely new models as this is prone to inconsistencies and errors.

[25] This simplifies the initial validation checks and reduces the time expended in identifying errors at the higher level processes.

[26] Every task or service should only be assigned a Role and a Bulk Resource for systems only. Resources for people should not be assigned to a task or service as this may result in non-working time being included in measures which should not include non-working time once timetables have been assigned.

[27] Time should not be assigned to Bulk resources as this may adversely impact the overall calculation of the Resource Time for the process. Use the Processing Duration to record the extent of time the system takes to process the event. Use the Processing Cost field to record any system related costs at a unit cost level.

[28] The time for system roles should be recorded as the Processing Time only This allows calculation of resource or labour time for the process without including system times in this figure.

[29] Record the time as Processing Time only as this enables calculation of total labour for the process without taking external time into account.

[30] This ensures that the process does not terminate unexpectedly.

[31] This allows validation of the classifier times as it provides a method to check that the total of each value adds up to the total time. It also allows the pie charts to be created to show percentage of overall time and cost each value within the classifier contributes to.

[32] To enable the calculation of measures eg. Minimum Critical Path time, it is important that no timetables are attached to Roles as this incorporates non-working hours into the calculations and prevents these measures being accurately determined. Timetables will be assigned to Resources and Resources assigned to Roles in 6 Analyse the Process Operation.

[33] Unlike resources, reports/queries do not exist for roles which display any timetable assigned

[34] Including people Resource may introduce Timetables into the simulation which will affect the results and mean that the time measures obtained do not match the definitions provided.

[35] See http://publib.boulder.ibm.com/infocenter/dmndhelp/v6rxmx/?topic=/com.ibm.btools.help.modeler.doc/doc/concepts/analysis/processcasessummary.html to identify the assumptions and limitations for the Static Process Cases Summary report.

[36] Due to assigning zero time to bulk resources for systems and machines, defining the number of bulk resources will not impact resource constraints

[37] As people resources should be assigned with roles, defining people resources against activities may cause inconsistencies

[38] Creating Timetables on Roles will prevent the measurement of Resource Time and Critical Path Resource Time for the process as non-working time will always be included in the Elapsed Time measure provided in the WBM reports.

[39] The addition of all Time Required for Role used to calculate these two fields only utilise the longest Resource time and not the sum of all Resource Times for each task.

[40] Label the final simulations which are used to generate Dynamic Analysis Reports with the Process, Volume and Resourcing states which have been applied.