

BPM and Simulation

A White Paper

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Katharina Clauberg, William Thomas





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1. Executive Summary

Today's organizations are challenged with increasing competitive constraints and changes in customer requirements. To meet market demand, stay competitive and improve operational efficiency, organizations have to adjust to market changes quickly.

The concept of Business Process Management (BPM) gained widespread acceptance as an effective approach to capture and communicate processes as a part of an organization's efforts to improve operational efficiency. Once the potential for improvement has been identified, organizations are challenged with the question of implementing the proposed changes or not. Process simulation helps predict potential impacts of modifications to current operational processes and compare alternatives prior implementation. In addition, simulation provides a quantitative basis to support or deny a change initiative.

Simulation results depend highly on the quality of the process models and the correctness of input data. If inaccurate models are used or poor data is provided as input, decisions based on simulation results may harm operations instead of providing the anticipated improvements. To achieve reliable and meaningful results from simulation, the quality of data and corresponding processes should be ensured. When accurate data and well-defined models are used as input, simulation has the greatest potential to predict impacts of changes on current operations and provide guidance on the best path forward.



2. Setting the Scene for Process Change

Organizations globally accept the fact that they must continually improve their products and services. These initiatives require incremental or even large-scale changes to processes. Customer-valued processes are constantly evaluated and improved in light of their efficiency, effectiveness, and flexibility. Today, most businesses recognize the importance of adopting well-defined processes, and are now seeking to use processes as a competitive advantage, or as a means to comply with a rapidly changing regulatory environment. As such, many organizations began exploring ways to efficiently improve existing process assets and develop new ones.

During the last decade, Business Process Management (BPM) concepts have gained widespread acceptance as an effective approach to capture and communicate processes as a part of an organization's efforts to improve operational efficiency. Much of this industry-wide acceptance of BPM as a powerful management tool is due to the creation of the standard BPMN 2.0 notation by the Object Management Group (OMG[®]) standards body. Today, most businesses recognize that BPM establishes a standard way to document and communicate processes throughout their organization. They are looking for ways to capture the additional potential offered in BPM. This whitepaper concentrates on providing insights into business process analysis and the benefits of process model simulation.

Once process improvement opportunity is recognized, many managers responsible for bottom line results find themselves challenged when facing a myriad of questions: How do I know I'm making the right decision to change a process? What results can we anticipate when we make a change to the current process? What can we expect when we add staffing resources to address bottlenecks? Where should we reallocate resources? Have we sufficiently validated our process before taking on the additional effort and cost to implement an executable workflow? How much can we save if we are able to eliminate an unnecessary step in the process? More simply stated: How can I provide some assurances that we are making the right decision to change an existing process before we recommend making a change?

Obtaining organizational consensus that a process change is warranted can also be extremely difficult. Sometimes there is data supporting the argument that the current process is less than ideal. If there is no or little quantitative data available (or at the granularity needed) it is difficult to determine where the team should focus its improvement efforts. Even with historical data or if event run-time analytics support the argument for change, without a process context, it can be difficult to understand what is driving the results. In improving organizational understanding, it helps considerably if the related process activities and structure of the model are defined with the results in mind. Ideally, they would be represented at a sufficient level to answer typical questions such as: what is the recommended change for the current process, and what can be expected as a result? Hopefully, everyone is at least on board with the idea that something needs to be changed and has some ideas on what changes might be helpful. That's a start!



Without data supporting a recommendation to change to a 'new & improved process', everyone is left wondering: What will the result be, really? Even after deciding that changing a process is the better option, individuals may hesitate to support the process change. Hesitations usually arise from uncertainties of a positive outcome. How can everyone be confident that the 'To-be' is really going to be better than the 'As-is', and how long will it take for my organization to show a Return on Investment (ROI) related to the change? Change after all, is not without its own costs.

- The best way to ensure that you are making the right process modifications before implementing the change (with or without detailed data from analytics) is to simulate the impact of the proposed change, and compare multiple process scenarios. But before simulating your improved process, you first need to be able to document the process in BPMN 2.0.



3. Identifying the Goals of BPM

Business Process Management provides a holistic management approach that incorporates concepts and methods that support the design, documentation, analyses, and improvement of business processes.

In contrary to the functional view, BPM focuses on a process oriented view on the organization. Within the context of BPM, the organization is to be regarded as a continuous process of value creation. There are three main levels that need to be taken into consideration when referring to Business Process Management.

The first level includes questions related to the strategic level of business process management – specifically, questions that aim at aligning the business processes with achieving corporate goals.

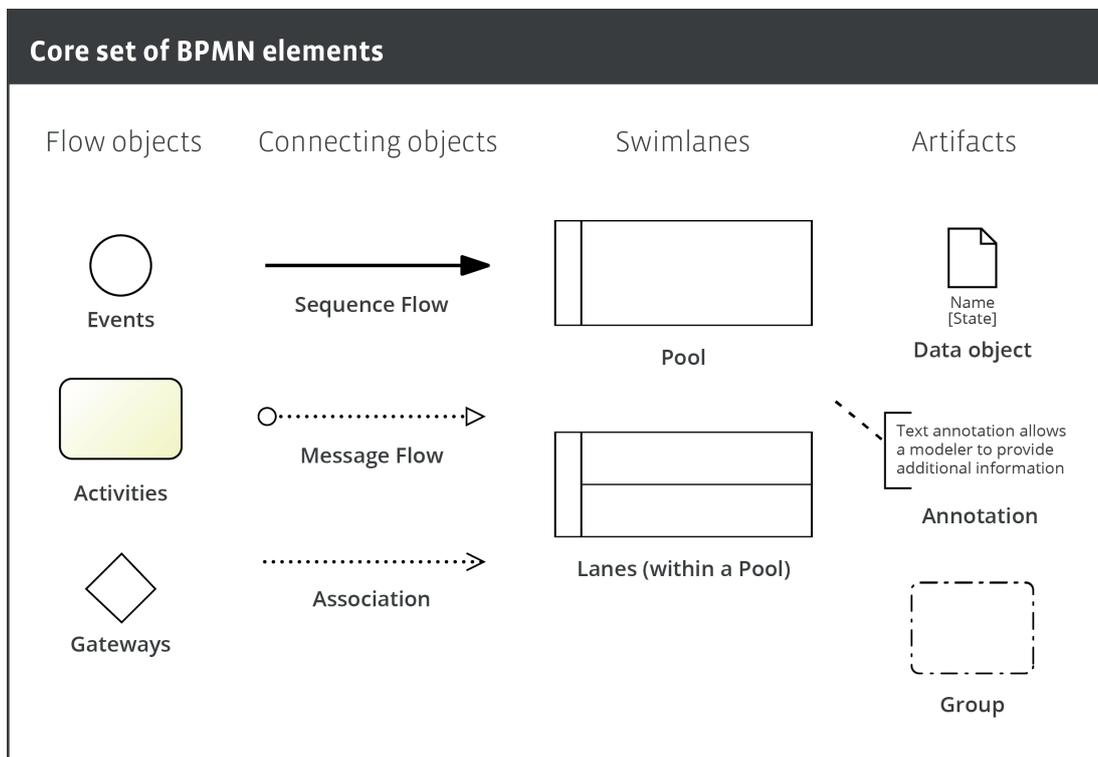
The second level is dedicated to operational process models that deliver comprehensive insight into the specific processes in the organization. It further refers to the execution of business processes.

Finally, the third level refers to the technical aspects of business process management. Many organizations rely on a professional process modeling software when designing their business processes. BPM software cannot only be used for modeling the processes, but often also provides analysis tools and a pathway to processes implementation. Of course, establishing automated workflow for business processes makes the most sense for a good and efficient process model.

Overall, the main aim of business process management is to improve business performance. The success of modern business process management initiatives depends on the quality of the models and the tools used to create them. To ensure that good and consistent process models are developed, it is essential to create standards-compliant representations of the process. The modeling language BPMN 2.0 helps organizations better understand, improve and communicate their business processes.

3.1 Using BPMN 2.0 for Visualizing Processes

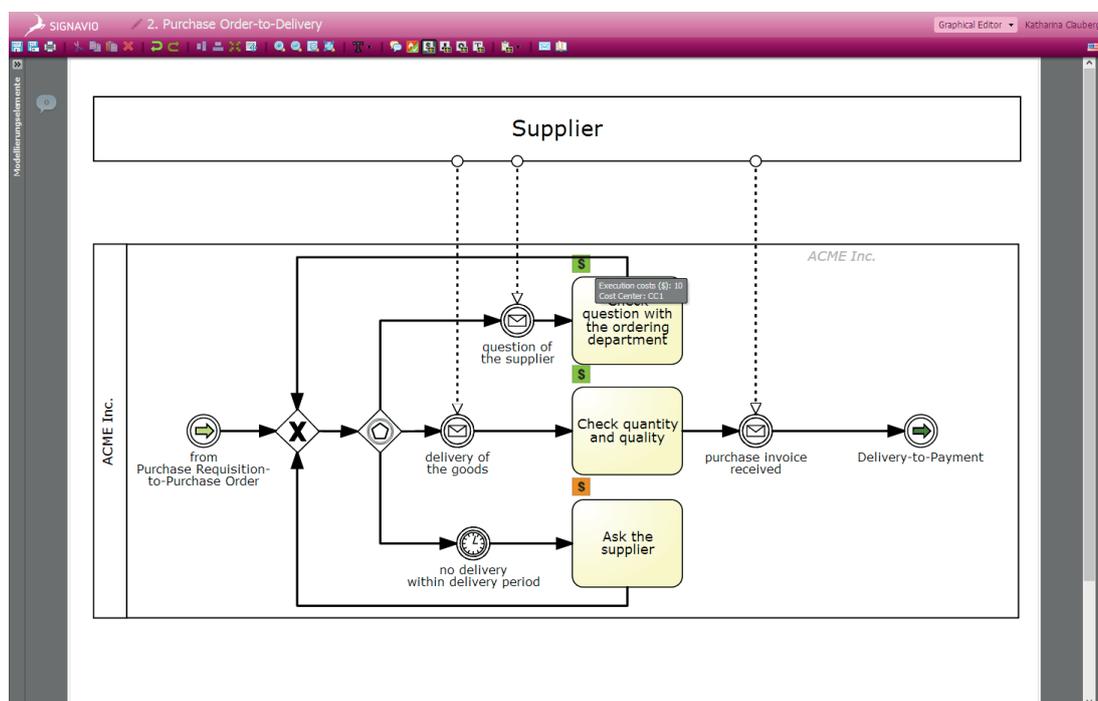
BPMN (Business Process Modeling Notation) is a modeling notation used for the graphical representation of business processes. It finds its roots at IBM® and was enhanced by the Business Process Management Initiative and the Object Management Group. In 2011, version BPMN 2.0 was established as a significant milestone in the development of the modeling language. Today, many organizations have chosen BPMN 2.0 as their process-modeling standard to document and improve their existing operations. The following figure, provided by OMG.org, shows the core elements of BPMN 2.0.



BPMN graphical elements

As diagrammed above, BPMN 2.0 provides a set of comprehensive modeling elements and the potential to incorporate relevant information within your process models

The following screenshot displays an example of a process modeled using BPMN 2.0 in the Signavio Process Editor. It illustrates different process activities, assigned responsibilities and process milestones, as well as the attribute values for one of the models elements. In addition, interaction points with an external supplier are depicted.

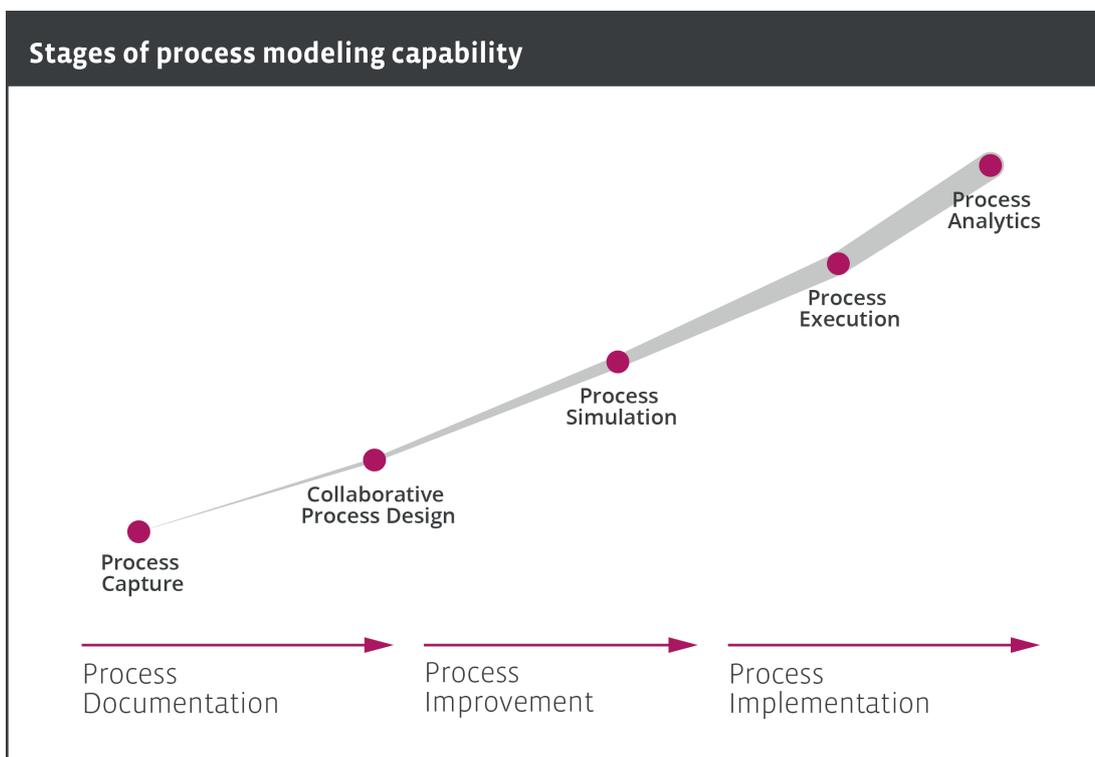


Screenshot of a Purchase Order to Delivery process modeled in the Signavio Process Editor.

Besides the graphical model itself, additional information directly associated with the specific process task in a diagram can be presented. These may include other documents, links to external documents, risk levels and cost information. The ability to visualize a process and its relevant information, in customized views with multiple dimensions, is a powerful way to communicate interactions between people, process, and systems – helping everyone understand how the process works.

3.2 Stages of Process Modeling Capability

It is essential to ensure the quality of business process models at all stages of Process Modeling Capability. This is especially true if you are going to spend time simulating various outcomes, or plan to implement a process through automation. More sophisticated Business Process Analysis (BPA) tools, such as the Signavio Process Editor, automatically check for adherence to modeling guidelines according to process quality standards you define for your organization. Applying a predefined set of modeling guidelines assures consistent quality of the process models; regardless of who was responsible for the process design, or at what stage the process is in on the modeling capability scale. The following figure depicts the five different levels of Process Modeling Capability for Business Process Analysis based on BPMN 2.0 process models. At each stage, significant additional value can be obtained from the process model and delivered to the organization.



Stage One: Process Capture

Discovering and identifying the individual processes is typically one of the first steps in any business process management initiative. A process needs to be documented before it can become the basis of an organization's process improvement efforts. Having the ability to easily capture and share a process model with all participants, all while collecting feedback, is an excellent way to establish operational consensus. It is the ideal way to validate the fact that you are accurately representing the 'As-is' or current state of the process you are looking to improve.

At Stage One, even without changing the process, well-documented models offer valuable insights into the organization's current state of business operations. They provide information about working activities, responsibilities and points of interactions. From product design to service delivery, having a common understanding of the current process helps align everyone, especially those who are new to the organization. This can be a critical consideration if the process documentation relates to regulatory compliance. Process models can be very effective in highlighting potential risks and associated controls. Moving forward, a single well-defined process model can establish a firm foundation for a successful business process improvement initiative. With a good process model, the opportunity or need to improve becomes more obvious.



Stage Two: Collaborative Process Design

Well before the automation question is even considered and once a process is captured, it can provide additional value to the organization's process improvement efforts. By involving all participants in process design, the entire process knowledge can be communicated in the process diagrams, leading to a comprehensive depiction and deeper understanding of the current business process. Collaboration on process modeling increases the success of process improvement initiatives by engaging everyone in creating the 'To-be' model. This creates a natural synergy where multiple ideas and suggestions for process improvement from each of the participants can be considered.

Many process-modeling tools are unable to provide additional value beyond Stage Two. When process models are tied with execution engines, additional improvements to operational efficiency can be recognized. In light of such tools, those that also offer the ability to run simulation and present analytics become powerful BPA tools.

Although it may be tempting after this stage to move directly to process automation or implementation, the preferred path is to test team's best process improvement ideas by first moving to Stage Three.

Stage Three: Process Simulation

Beyond the ideas on how things might be improved, a critical success factor to simulation is providing high quality process models as input. Once the process models have been validated, simulation helps to predict possible outcomes of considered process changes, highlighting both potentially negative consequences and opportunities for improvements. Without even considering changes to the process itself, simulation provides a useful, cost-efficient means to test assumptions related to existing processes (e. g. analyzing the potential impact of changing resource allocations). The results of simulation can be used to compare potential alternative improvement scenarios to each other and to the current processes. This helps to ensure that you are moving from the 'As-is' to a desired 'To-be' state as efficiently as possible. Without exposing current operations as a test platform, simulation offers business analysts an excellent method to verify whether suggested changes lead to the intended outcome.

By following stages 1-3, organizations can analyze the potential for improving a process incrementally versus making large-scale changes before the proposed changes are implemented. Once implemented, with or without a workflow engine support at stage 4, they become more difficult and costly to change.



Stage Four: Process Execution

Clearly, workflow automation can extract additional value from most processes. The potential benefits of automated processes are so compelling they can sometimes cause an organization to immediately focus in that area alone, bypassing Stages Two & Three, collaborative process design and simulation. The implementation of process changes or process automation efforts should only start once the processes have been simulated with positive results. Testing various scenarios with the simulator and optimizing the model help ensure the success of the intended improvements in the new operational processes. Given the enormous expense of implementing executable workflow, companies are sure to take that step with the highest degree of certainty. Once the executable process is established, it will generate data suitable for analysis and provide the first opportunity to test your predicted results against the real world. Once that data is generated, it is appropriate to move to the next stage.

Stage Five: Process Analytics

Finally, the stage of process analytics provides real-life data on the actual performance of the business processes. Being able to visualize this data in the context of a model can yield significant insights. This stage is the ultimate measure of how well the intended change met the desired objectives. In most cases, it is also appropriate to do a direct comparison between the simulated results and those shown through process analytics. Analytics reveal areas in which you could have improved input to the simulation model, thereby increasing the quality of the model and its ability to predict future improvements.

Today, analytics commands the attention of many. From an operational perspective, understanding the causes of the results grows increasingly more challenging without having analytics tied to well-defined process models.

Ideally, these stages should be followed in order to capture the full potential offered by process modeling. Simulation has the potential to eliminate unnecessary efforts and costs of implementing avoidable, sub-optimal processes. Because the result at each stage is derived from the preceding state, the importance of getting the best possible result at each prior stage cannot be overstated. Each stage in the process has the ability to provide feedback to the preceding stage. On their own, the output from any stage can support continual process improvement methodologies such as Kaizen.



4. Simulation of Business Processes

4.1 Prerequisites for Reliable Simulation

To simulate processes modeled by means of BPMN 2.0, some prerequisites need to be met. The modeling language offers an extensive variety of modeling elements, though not all elements can be included in the simulation of processes. Some symbols will be ignored during the simulation, as a message flow for example. In addition, complex gateways cannot be included when simulating processes.

As there are some limitations with regard to the use of BPMN 2.0 for the purpose of simulation, it is important to consider those during process design. One of the main prerequisites for a successful simulation of processes is correct process syntax. Good BPA tools not only provide an automatic validation of each model's syntax, but can also check against executable design rules.

Additional limitations may apply depending on the BPA software selected.

In every case, it is essential to take a close look at the prerequisites of simulation before process design, since specifically applicable rules may produce poor or no simulation results.

4.2 Benefits of Simulation

Once the processes have been documented and data quality has been ensured, it is valuable to simulate the processes. Effective simulation modules offer multiple possibilities for simulating the existing processes and comparing process alternatives. In a manual mode, a simulator lets the business user step through the process one activity at a time, determining the path a particular item (i. e. new client onboarding request) takes from start to finish. This shows the accumulated impact (e. g. cost and time for one unit) of each decision along the path. In the automated mode, the individual running the simulation can make some assumptions about the number of items going through the process and provide inputs to the related probabilities at each decision point along the way. When combined with staff resources, timing and costs (estimates or real data), useful insights can be derived under scenarios such as, "If I receive 10,000 orders this week, how many will be shipped, how many will be in backlog, and where will the bottleneck exist?"

Process simulation helps to identify cost-intensive activities hidden in the overall process flow – even when the data is not available at the desired granularity in other related systems such as the Enterprise Resource Planning (ERP) system. It provides insights about the duration of the processes, as well as consumed resources. By comparing different implementation scenarios, process simulation is regarded as a cost-effective strategy for testing and comparing process alternatives.

Simulating business processes not only provides a preview into how your new processes will perform, it also offers the opportunity to validate changes to existing processes without disturbing current business operations. Possible errors, queues and bottlenecks are highlighted at an early stage without impacting the business. The faster validation speed, low costs, and increased probability of a



positive real-world outcome, make process simulation an effective way to plan and validate future process flows.

But how does simulation add to an overall improved business performance?

Based on the results of simulation, suitable improvement measures can be identified without lengthy real-time walkthroughs. Being able to discover bottlenecks and easily identify optimization potentials speeds up decision-making, leading to savings in time and cost. Decisions can be based on the unbiased analysis of simulation results, which provides a basis for the comparative analysis between alternatives. The results of a simulation run may often point out the need to create improved process alternatives. These possible improvements can also be verified before implementation, and can be evaluated easily without impacting existing processes. Together, these benefits substantiate simulation as an essential activity before updating or implementing processes anywhere within the organization. A BPA tool that offers an easy-to-use simulation module can address many of the potential concerns about the impact of new processes or changes to existing process.



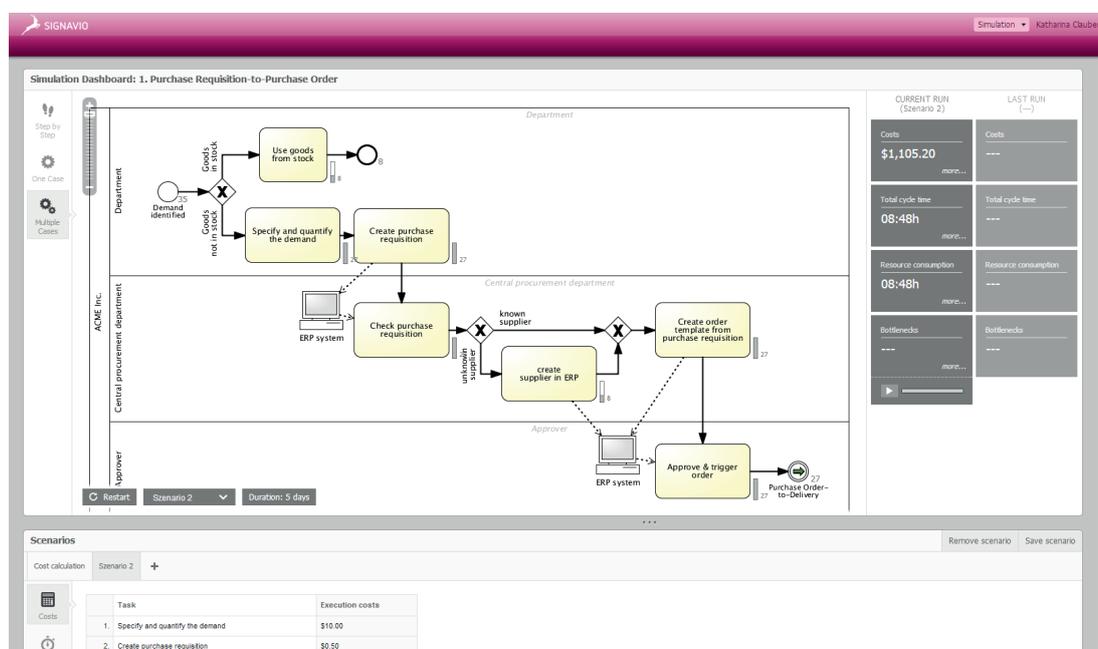
5. Signavio Process Editor

Signavio offers both On-Premise and SaaS-based solutions for business processes analysis using BPMN 2.0. The Signavio Process Editor is very intuitive and easy-to-use. Besides professional process modeling, simulation and analysis, the Signavio Process Editor offers numerous possibilities to include as many process participants as possible in process design. This makes Signavio the pioneer in [collaborative process design](#). Through a robust API, Signavio's software can be integrated with other enterprise IT systems such as CRM and ERP. Signavio's support of process execution engines including [SAP](#), [Activiti](#) and [jBPM](#), creates an ideal platform for improving enterprise operational efficiency. Our process validation module ensures that all models are developed according to the standards you define, no matter who creates the model.

5.1 Simulation with the Signavio Process Editor

Signavio's simulation package provides an efficient way to test various models before making the implementation decision. Before a process can be simulated in the tool, it is validated with regard to its adherence to predefined [modeling guidelines](#). As the results of any simulation are dependent on the input, the quality of the process models needs to be ensured before simulation is started.

The Signavio Process Editor offers simulation in three modes: 'Step through' simulation, 'one case' simulation, 'n case' simulation. The 'Step through' mode enables you to discover the process flow interactively. It helps you to understand the general composition of the process and related information. The 'one case' mode presents an automatic run of the processes, adding up costs, cycle times, consumed resources and bottlenecks. It even provides the possibility to compare different scenarios of your process models.



Screenshot shows '1 case' simulation of an example process.

In the 'n case' simulation, queues and bottlenecks across processes are identified, and different configurations of resources can be compared. Optimization potentials can be determined based on these results.

By offering a full range of configurable variables such as probabilities, frequencies and durations, simulation with the Signavio Process Editor provides various measurements to generate answers to questions such as:

How much of everyone's time is consumed in this process? How would 20% more requests affect cycle time? Would an additional headcount speed up cycle time?

In using simulation as a guiding indicator for real-world results, your organization can answer strategic operational questions.



6. Conclusion

So what is the main take away? With careful process design, there is no doubt that process simulation is a useful and cost-effective means for forecasting the possible impact of future changes on current operations.

The results of a simulation run may prevent organizations from undertaking improvement efforts that appear to be improving the process, that in fact, actually have the potential to harm operations if implemented.

If simulation is intended, it is essential to ensure that the processes are modeled using BPMN 2.0 elements accepted by the simulation engine. To ensure high quality results, vendors providing BPA software including simulation functionality should also offer the ability to validate the processes syntax for correctness. It should also confirm that the process logic is unambiguous.

The reliability of the results of simulation depends on the quality of the process models, and accurate data and assumptions provided as input to the simulator. Simulations based on good process models with realistic assumptions for event probability and frequency at each gateway have the greatest potential to cost-effectively generate useful insights. They also offer the best possibility to predict how the new or improved process will perform in real-life.



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Signavio, Inc.

440 N. Wolfe Rd.

Sunnyvale, CA 94085, USA

Telephone: +1-650-388-9251

Fax: +1-650-388-9252

Website: www.signavio.com

Email: info@signavio.com