

Monte Carlo Simulation for Cost Estimation

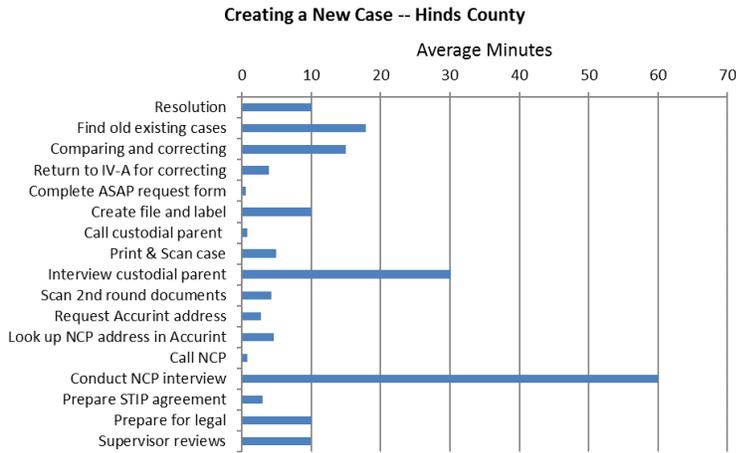
Senior leadership of every agency in every state is presented with decisions that require understanding of process cost. For example, Mississippi Department of Human Service's Child Support Enforcement wanted to know the cost of individual processes as part of considering outsourcing. Over 100 county CSE offices vary in size and underlying population demographics. Surveying the time spent by individual conducting each process would be impossible because case workers do not divide their day between processes. Instead, they perform a mix of tasks all day—setting up new cases, interrupted by calls concerning case maintenance, after which the worker prepares a different case for court. Individuals organize their day's differently, so reporting what percent of their day they spend with each process would be little more than a guess. Detailed time study of each worker would be cost-prohibitive and misleading because each day for each worker is different. Yet, the agency needed a tool for determining what processes cost in order to judge whether an outsourcer could perform the process more efficiently.

Mississippi's CSE agency knew its total labor cost by office, but had no way of knowing what individual processes cost—in order to assess whether an outsourcing vendor could do the process more efficiently. In another example, the Texas Department of Family and Protective Services was presented with the opportunity to invest \$40 million in field technology supporting case workers. Florida's Department of Children and Families was considering the invest \$100 million in new technology support for Child Protective Services. Still another example is when Indiana's Family and Social Services Administration was considering outsourcing all of benefits eligibility. In each of the cases, the question was whether major investment in process could reduce costs. Meaningful cost/benefit analysis needs to be built on a solid understanding what process costs today and what would be the true impact of a change in the work steps or decision paths that comprise work process.

The most common approach to allocating costs uses a cost study performed for the purpose of allocating for reporting costs to federal funding sources. For example, many states combine benefits eligibility and allocate costs to Medicaid, SNAP and TANF. This approach meets reporting and compliance requirements but lacks the ability to assess the impact of changes to process.

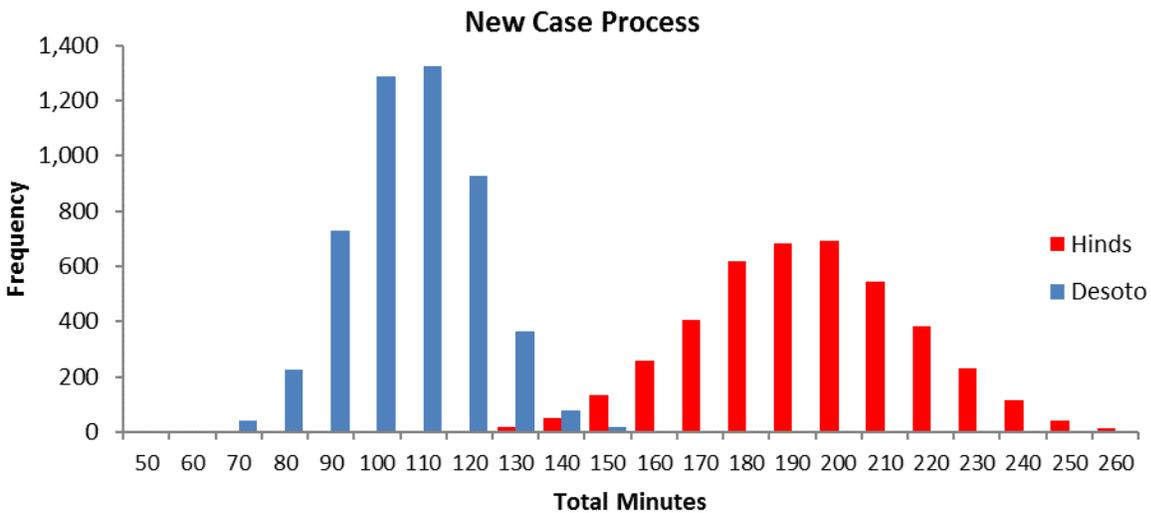
Monte Carlo simulation can economically and effectively allocate costs between processes or services. Using Monte Carlo simulation, Mississippi DHS created a bottom-up model of each Child Support Enforcement process—one that allowed the state to assess individual process costs as part of deciding whether to pilot outsourcing in some offices. Monte Carlo simulation created a mathematical model of each process, then "performed" a large number of transactions through the model to see what the cost of each would be. The result teased apart the costs of the six different processes case workers perform all at the same time. It provided average costs for each process. More importantly, it MDHS leadership a window into the range of process costs—within each office and across offices.





To conduct Monte Carlo simulation, MDHS first documented process using the brown paper method with worker focus groups each of eight offices. This allowed MDHS to collect workers' estimate of the mean and variation of each process work step, and path frequency at every decision point. The resulting model would be far too complicated to evaluate as an equation. Monte Carlo was able to "process" 5,000 example transactions and observe the mean and distribution

of the resulting total costs for a process. For example, Hinds county sets up new CSE cases in an average of a little more than three hours of work. Monte Carlo simulation validated the confusion case workers reported when asked to estimate the time to complete a new case—as it ranges from less than two to over hours. Thus, reporting an "average" is not an adequate way to describe the new case process. Monte Carlo simulation allowed MDHS to calculate the time for each work step along 10 different paths reflecting the complex range of decisions made during new case establishment.



Using Monte Carlo results, MDHS can now forecast the impact of improving the average time for one or a set of work steps, reducing the variance in time for work steps, or changing the frequency of paths at decision points. For example, CSE case workers estimated that 20% of the time they found inaccuracies in case information coming in from eligibility workers. This meant they had to return the case for correction—adding work steps and delays. Monte Carlo allowed MDHS to determine the potential time improvement from investment in systems to reduce or eliminate source data inaccuracies.

In addition to allowing MDHS to drill into specific process improvements, Monte Carlo allowed MDHS to compare costs between offices. For example, new cases averaged only about 105 minutes in the Desoto office, less than half the cost in the Hinds office. MDHS can conduct a t-test to determine that even

given the range of costs, MDHS can be 95% sure that the process cost estimates are really different. In this way, MDHS has solid evidence of the offices that truly exhibit “best practices”. MDHS can compare the process maps from the two offices to determine why the differences in total minutes per case. It can also recast the Hinds model using certain sections of the Desoto process map-and test how much the effect might be of a process improvement at Hinds.

An important side benefit of the Monte Carlo simulation is evidence of how widely processes vary from office to office. This provided solid evidence of need for better process management. MDHS was able to put metrics to just how widely processes varied. The county system was predicated on the belief that counties are different, and require different processes. However, the county approach had been take to the extreme of not providing state-wide training on CSE process. The result: not only did office process vary, but there was no vehicle for finding and spreading best practices among offices.

Missouri’s Department of Social Services commissioner used Monte Carlo simulation as an important part of improving the performance of the eligibility processes of the Family Support Division. FSD added a graphic processing modeling tool to visually represent the impact of simulating different process improvement ideas. Using this approach, the commissioner could be sure that processes would improve enough to justify investment in the technology and personnel required to implement the changes.

Thus, Monte Carlo is a tool that enables agency leadership to use evidence-based management to make better, data-driven decisions:

- Compare process costs as part of cost/benefit analysis
- Find the true best practices and promote them convincingly to the rest of the agency
- Measure the potential for cost improvement from process improvement
- Support key senior management decisions:
 - Investments in new technology
 - Outsourcing
 - Reorganization
 - Improve training programs
 - Improve quality management