HOW ACTIVITY-BASED PLANNING HELPS MAXIMIZE THE BENEFITS OF LEAN

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In well-aligned lean deployments, projects may follow one of the many improvement methodologies within the lean area of study. Quick wins, kaizen events, and DMAIC (define, measure, analyze, improve, and control) projects are three commonly used approaches to lean problem solving, all with various levels of involvement. One of their core similarities is that they focus on existing processes and driving efficiency gains. DMAIC is a rigorous, five-phased approach to business problem-solving commonly used in Lean Six Sigma projects. It involves *defining* the project, *measuring* the current state, *analyzing* the root causes to understand the process, generating and *implementing* improvements, and *controlling* the process to ensure changes are sustained (hence, "DMAIC"). One of the common goals of these types of initiatives is to decrease the overall "time to serve," which can either refer to the lead time or the cycle time, depending on the industry.

The 4P model (shown in Exhibit 1) stems from the Toyota Production System and emphasizes this principle. It states there must be a clear first P, which is *purpose* (i.e., vision and mission) of the organization that is clearly communicated to the second P, which is the *people*. They include everyone from frontline workers to the CEO.[1] The people are those who work day-to-day in the third P, which is the *process*. This makes up the "what" and "how" in the business workings. The final P is a strong *problem* identification and solving methodology, which is also needed to deliver efficiency improvements in the process, enabling the people to achieve the purpose.

The concept of the triple constraint, often referenced from the "Project Management Body of Knowledge," refers to the ability to complete work being bound by three variables: time, cost, and scope.[2] The project manager's common adage, "I can only give you any two," is sometimes why

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EXHIBIT 1 The 4 P's of an Operational Excellence Program

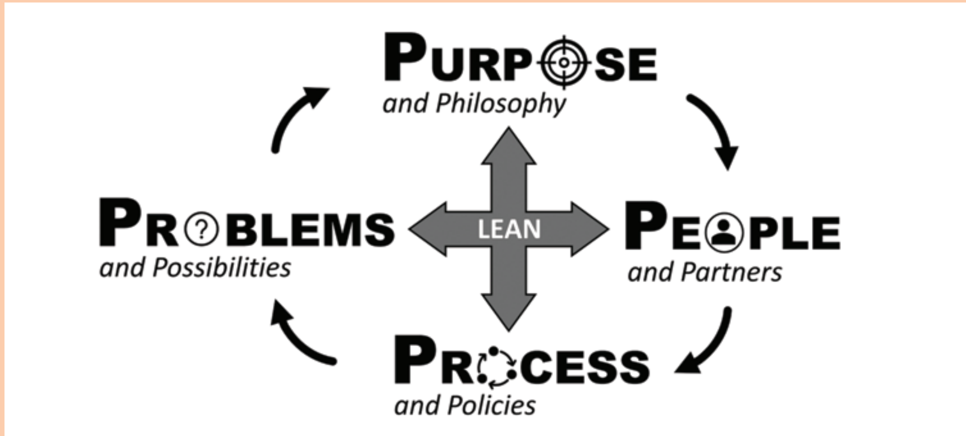
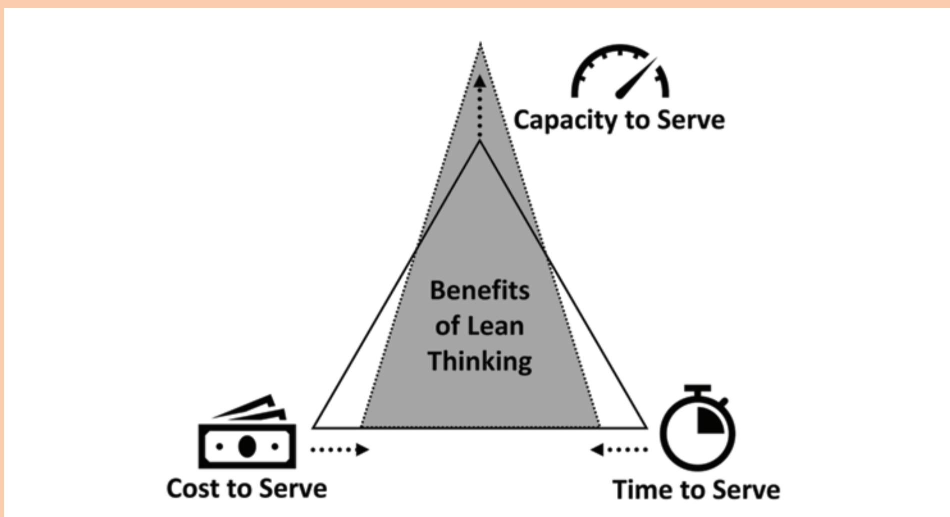


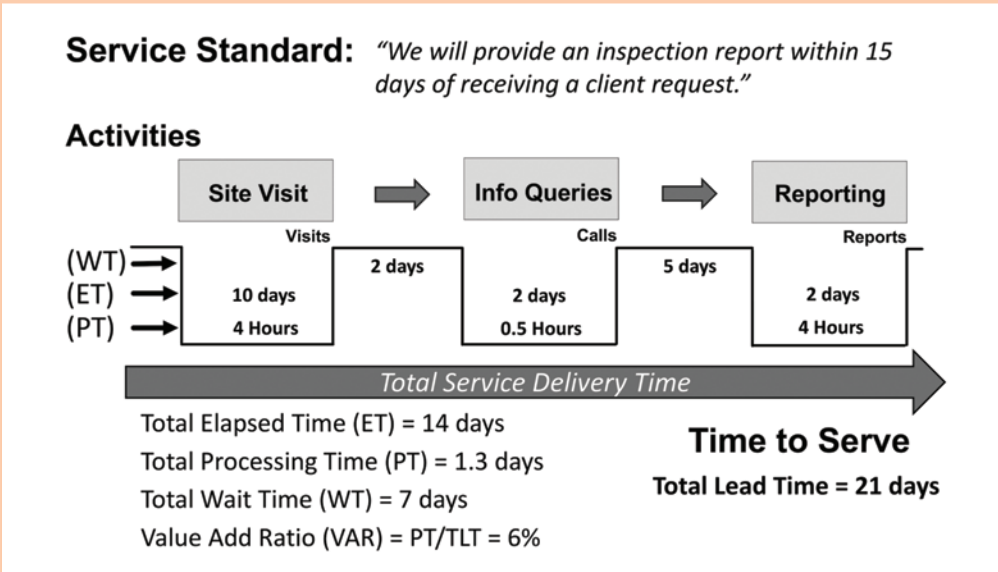
EXHIBIT 2 Lean Helps to Rethink the Triple Constraint



this constraint is also called the iron triangle. If we rethink the scope constraint to consider organizational capacity as a way to expand both scope and quality, Exhibit 2 suggests that lean seeks to reshape this triangle by decreasing both the "time to serve" and "cost to serve" while increasing the "capacity to serve" to achieve operational excellence.

The lean approach, regardless of the improvement methodology being used, starts by defining value. Value is defined by the customer and is sometimes referred to as what the customer is willing to pay for. Once this is clearly understood, many lean projects will begin by mapping the value stream — an end-to-end high-level map of the process flow — that includes the major activities to produce and deliver a product or service. The value stream map (VSM) helps document the current state and identify areas on which to focus improvement efforts while creating a visual representation of the process upon which all stakeholders can agree. Exhibit 3 shows a typical VSM from an illustrative

EXHIBIT 3 Regulatory Compliance VSM Model Example



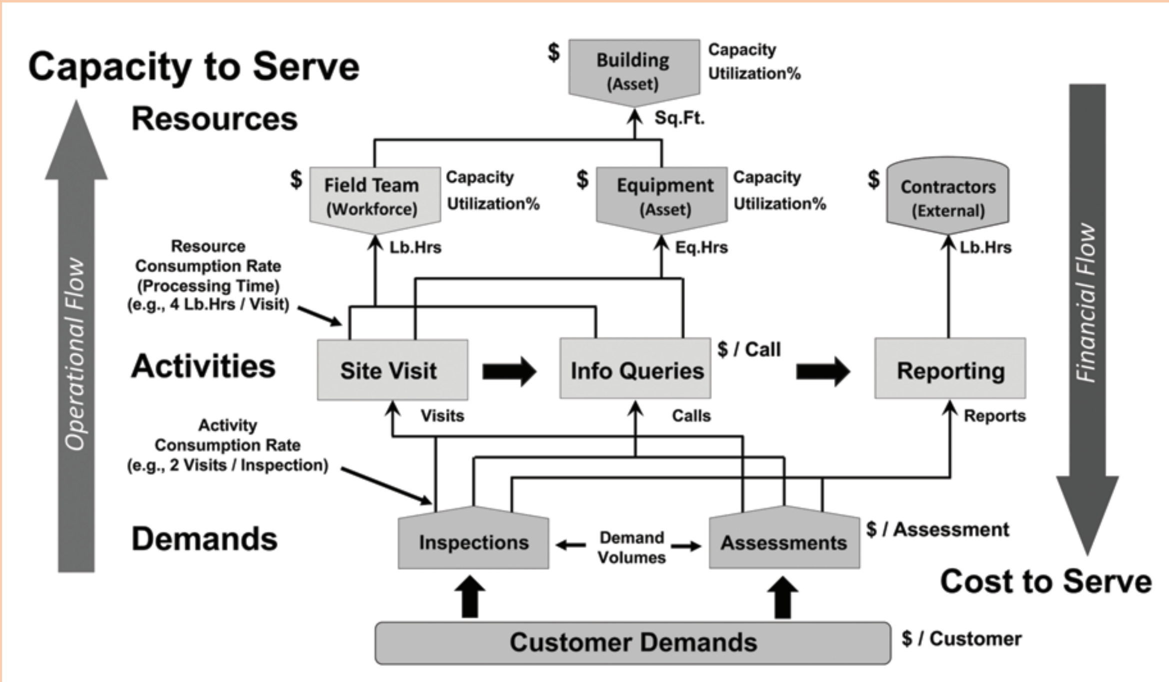
regulatory compliance organization. In this process flow, the business conducts site visits to ensure compliance. Then, it deals with queries resulting from site visits before writing a compliance report.

The VSM identifies critical process metrics that help determine where the project team should focus their efforts. The mapping process is a highly engaging exercise that leads to debate and consensus on how the process truly operates. This includes understanding customer demand, conducting discussions with the process stakeholders, collecting data to validate estimates around available time, processing times (PTs) and defect rates, and gathering input from the front line as to where their main points reside. As shown in Exhibit 3, a VSM includes time-based data for PT — the "hands-on" time to complete the activity, elapsed time (ET) — the time from start to finish for any activity, and wait time (WT) — the time between the end of one activity and the start of the next. A VSM can also include counts on the inventory volumes for work-in-process and defect rates, often termed "percent complete and accurate" (percent C&A), a reflection on how often the activity is done correctly the first time.

This level of information paints a robust picture on the "time to serve" — the overall time to deliver the product or service requested by the customer. This is shown in Exhibit 2 as the total lead time. In manufacturing environments, the "time to serve" is sometimes found using Little's Law, which states that the lead time is equal to the work in progress divided by the process throughput (i.e., production rate). However, in transactional environments, we often see additional waiting and batching and thus calculate the lead time by measuring how long the product/service waits between each major step in the value stream. Regardless of the industry, the VSM helps organizations understand the overall "time to serve."

This "time to serve" is one of the most common service standards organizations will set. Organizations with strong lean deployments typically use the VSM as the starting point to understand their current performance for establishing these service standards and, more importantly, identifying where the opportunities exist for improving performance. For example, in Exhibit 3, it is apparent that the large lead time and inability to achieve the stated service standard stem from the ET on-site visits and the WT between information queries and reporting. These two parts of the process alone account for more than 70 percent of the "time to serve."

EXHIBIT 4 Regulatory Compliance ABP Model Example



Lean initiatives typically place a strong emphasis on data-driven decision-making and on the ability to quantify the customer's perceived value of any improvements made in terms of lead times. However, standard lean projects do not place a heavy emphasis on quantifying either the true "cost to serve" or the "capacity to serve" of the process and its resources. Other approaches to process modeling, such as activity-based planning (ABP), capture these metrics, and as such, when combined with lean, they provide the ability to tackle and improve each element of the triple constraint.

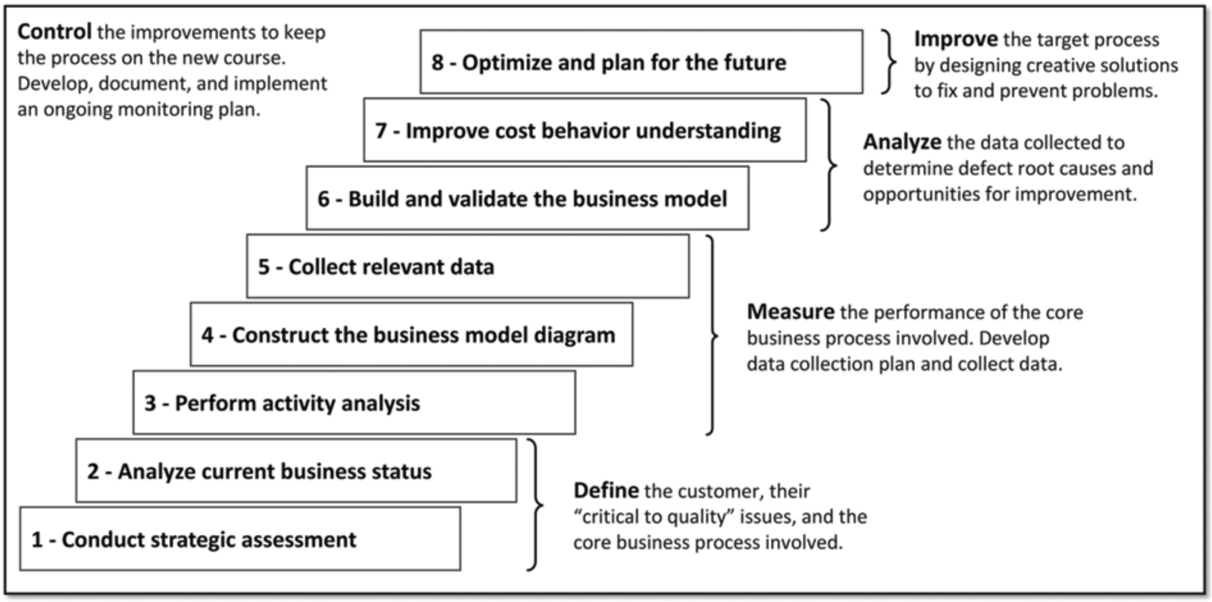
The merits of linking ABP with lean thinking

ABP is an evolved form of activity-based costing (ABC). It is often termed the "pull" methodology, as it focuses more on understanding the mechanics of the business to "pull" costs through an operational model. As such, it is a natural complement to lean methodologies. ABP was popularized by the research work of the Consortium for Advanced Management International in their publication entitled *The Closed Loop*.[3] As ABP models calculate operational and then financial flows in two separate and distinct passes, the approach is considered a loop in that financial cost distributions are fully driven by an operational business model where resource constraints play a critical role. ABP thereby enhances traditional lean implementations by providing the ability to incorporate resource capacities/utilizations and calculate the true costs of both current and future state processes or value streams.

Exhibit 4 continues the high-level storyline of an illustrative regulatory compliance business process. Now that the key activities of the value stream have been identified and quantified, demands can be added as follows to represent the organizational outputs that drive up to these activities. By determining the average "activity consumption rate," it is possible to establish a mathematical relationship that estimates how much activity would be required for a given volume of demand in any specific time period.

The next step is to determine which and how many resources are required for the execution of each activity in the value

EXHIBIT 5 Eight-Step Methodology for Aligning ABP with Lean DMAIC



stream. The average "resource consumption rate" defines this and the labor resource is equivalent to the PT established in a lean VSM. This expanded ABP model now provides the ability to determine the labor requirements for all demand volumes by calculating the entire operational flow "bottom up." These requirements can then be compared to each labor role's capacity for the time period of the model to determine utilizations (i.e., how effectively that labor resource is being consumed by the business process). In addition to the labor resources on which VSM traditionally focuses, ABP models can also include consumption rates for nonlabor resources (e.g., equipment, facilities) to help identify where bottlenecks exist in any business process. This is particularly important for asset-intensive organizations (e.g., manufacturing, food processing, mining, health care) where labor is only one potential limitation for increased throughput.

Once the operational model has been fully validated against known historical results, it can be used to determine activity, demand, or even customer costs by assigning actual expenses against the resource structure, both in terms of fixed and variable resources. Resource costs can then be "pulled down" and distributed across the model based on the previously calculated operational flows. This "top down" secondary calculation is how the loop is completed, providing accurate and "fully loaded" cost information based on the way work is actually done. From a planning perspective, if demand volumes or process efficiencies (i.e., consumption rates) change, these variations can be readily accommodated in the operational model, and the resultant costs can be recalculated (assuming there are no "broken constraints," which flag an over-capacity situation with any constrained resource). This makes the ABP model an ideal tool for scenario-playing, which includes "what-if" analysis, operational budgeting, and forecasting. ABP models thereby provide valuable insights into both an organization's "cost to serve" and "capacity to serve."

To develop reliable ABP models, organizations typically follow a structured eight-step implementation methodology, as shown in Exhibit 5. Step one begins with an examination of the business's key priorities and strategic direction to ensure the ABP modeling effort will provide valuable information to support the organization's vision. This is where the demands (outputs) and time period for the modeling effort ahead are also established. Step two focuses on developing an understanding of the current operational and financial information available to support the ABP model. Once the business process(es) to be modeled have been identified, step three involves an activity analysis where the required activity and resources are identified, including the causal relationships between all modeling components. If lean VSM or other forms of business process maps exist, they can be valuable inputs to this step.

Step four reinforces the understanding of operational relationships between components by creating a visual diagram that documents these interdependencies. This step is critical in building consensus across the organization on how the business actually works. It also serves as a template to identify the exact operational and financial data requirements that will be necessary to build a functional model. Step five involves collecting this data from either existing systems (where available) or through interviews/discussions with people who work in the process. Operational data include demand volumes, activity and resource consumption rates (i.e., PTs and efficiency factors), and resource capacities (i.e., the number of resources available for the time period of the model). Financial data are also collected and assigned to either the fixed or variable resources identified in step three.

GOOD COSTING IS ESSENTIALLY A BYPRODUCT OF UNDERSTANDING OPERATIONAL RESOURCE REQUIREMENTS AND HAVING A FLEXIBLE PLANNING MODEL TO ANALYZE AND FORECAST THE IMPACT OF BUSINESS PROCESS CHANGES.

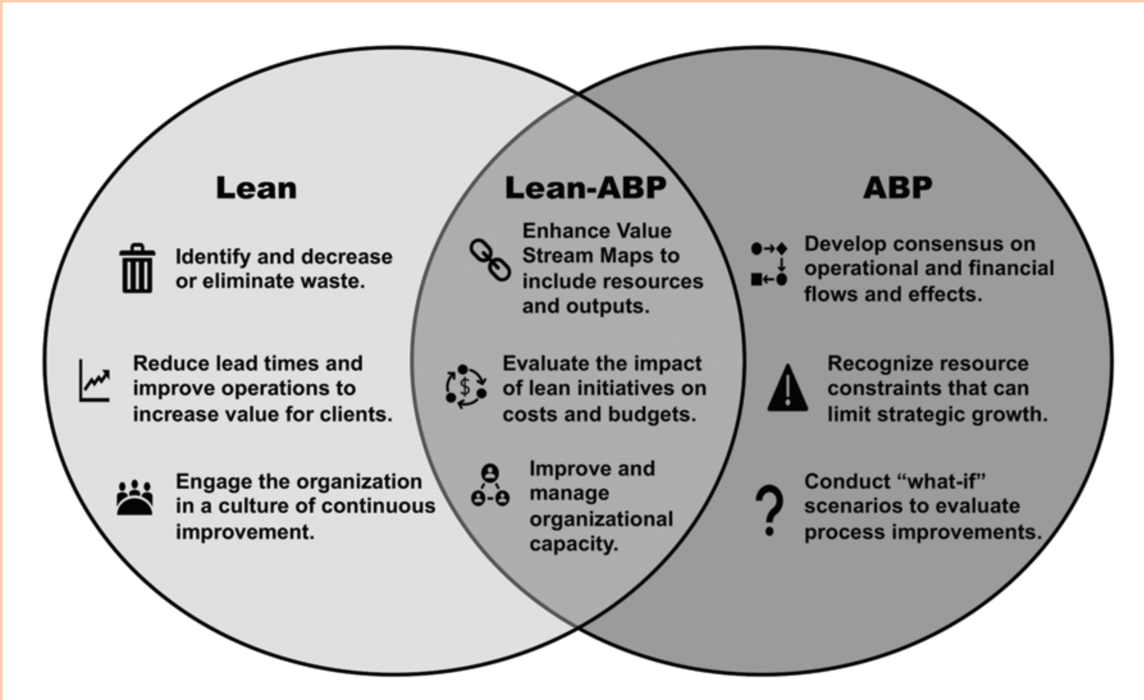
Step six is perhaps the most important stage, where a fully operable model is constructed in a suitable ABP technology that supports the two-pass, closed-loop calculations. ABP software differs from ABC or other types of costing software in that it allows users to fully visualize both operational and financial flows. It also provides constraint-based modeling, where financial results can only be generated if operational capacities are not exceeded. This is a critical ABP benefit for cost analysis and, more importantly, cost forecasting. This is because it is essential to understand the full cost of the resource adjustments needed to overcome any operational "broken constraints" in support of changing organizational demands. Traditional costing, and even most ABC costing exercises, do not provide this degree of operational rigor. By using suitable ABP software, users also can fully validate the ABP model to ensure it generates reliable results that mirror a specific historical time period, both in terms of operational flows (i.e., distributions and utilizations) and financial results (i.e., total and unit costs). This validation step is essential for building confidence that the ABP model accurately describes the business.

Steps seven and eight provide valuable fresh insights into how activity and overall business process costs are developed and can then be managed/optimized, respectively. Good costing is essentially a byproduct of understanding operational resource requirements and having a flexible planning model to analyze and forecast the impact of business process changes. ABP essentially enables Gartner's vision of a "digital twin of an organization (DTO)," which they define as a "dynamic software model of any organization that relies on operational and/or other data to understand how an organization operationalizes its business model, connects with its current state, responds to changes, deploys resources, and delivers exceptional customer value."[4] ABP is consistent with this definition in that it provides a virtual representation of the organization that is both accurate and comprehensive.

As also shown in Exhibit 5, this eight-step implementation methodology maps well to Lean Six Sigma's traditional DMAIC approach. Many of the DMAIC tools and other facilitation techniques beyond VSMs — such as SIPOC (suppliers, inputs, process, outputs, and customers), critical to quality, cause and effect diagrams, the "five whys," brainstorming affinity diagrams, and PACE (priority, action, consider, and eliminate) matrices — all have a role to play in a fully unified lean-ABP modeling approach.

Integrating these two well-established business improvement approaches generates enhanced benefits that neither methodology can deliver on their own. While lean provides an excellent means to identify and reduce waste, improve customer value, and instill a culture of continuous improvement, it typically falls short in its ability to adequately predict the true cost and profitability impacts of proposed process improvement initiatives. On the other hand, while ABP

EXHIBIT 6 The Power of Combining Lean with ABP



accurately determines resource requirements and costs, it lacks the ability to estimate the impact of process improvements on overall product/service delivery lead times. As Exhibit 6 shows, combining lean and ABP enhances resource planning, strengthens costing/budgeting estimates, and provides an ability to properly manage overall organizational capacity.

Lean and ABP technology

There is a myriad of technologies available to help organizations implement various lean business process improvement techniques. While some — like Creately and MoreSteam's EngineRoom — offer a wide variety of lean management tools, others — like SmartDraw, Visio, and Lucidchart — focus primarily on templates, including VSMs. Many of these technologies, however, have limited amounts of automation or calculation algorithms built into the standard packages. Others — like iGrafx or iFakt — include VSM but also offer a host of specialized functionalities for extending lean thinking into simulations, business transformation, and enterprise resource planning. Few, however, have incorporated any constraint-based process flow costing into their solutions.

On the ABP side, there are many software solutions available for conventional ABC. However, not all of these solutions have the capability to fully visualize/analyze both operational and financial flows. As with lean technology, few solutions can properly model resource constraints and utilizations and ensure they factor into any costing calculations. Only a handful of solutions, therefore, qualify as what would be considered true ABP solutions. Examples include CostPerform, Decimal Suite, and QPR Software.

Where the software field narrows considerably is with technology that supports both the lean VSM and ABP concepts described in Exhibits 3 and 4. One interesting solution, collaborative business planning (CBP), offers functionality in this area by integrating common data across both ABP and VSM models. Exhibit 7 shows an example of a VSM derived in CBP using the regulatory compliance example described earlier. The variable (V) symbol denotes

EXHIBIT 7 Regulatory Compliance VSM Model Example in CBP

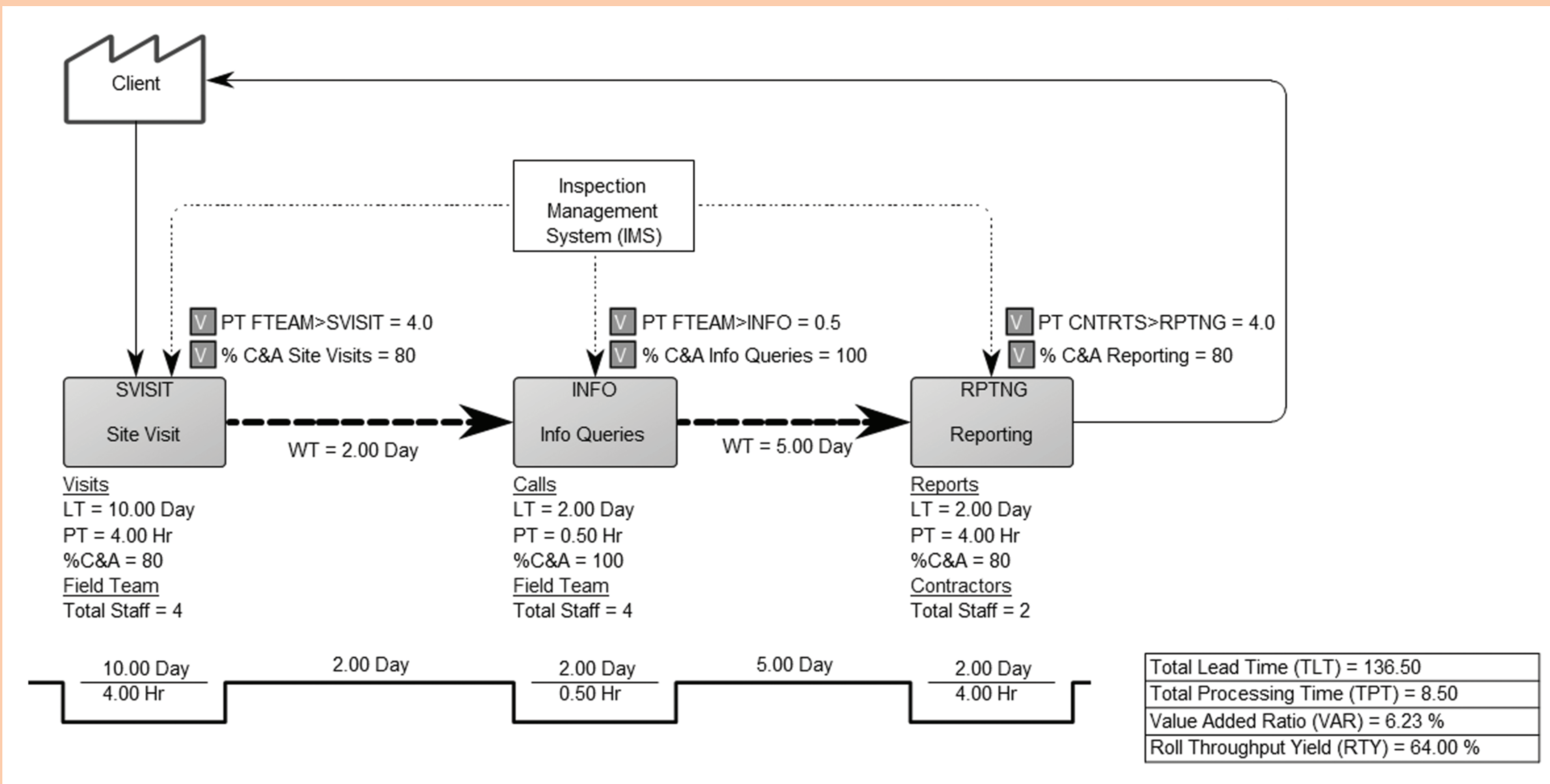


EXHIBIT 8 Regulatory Compliance ABP Model Example in CBP

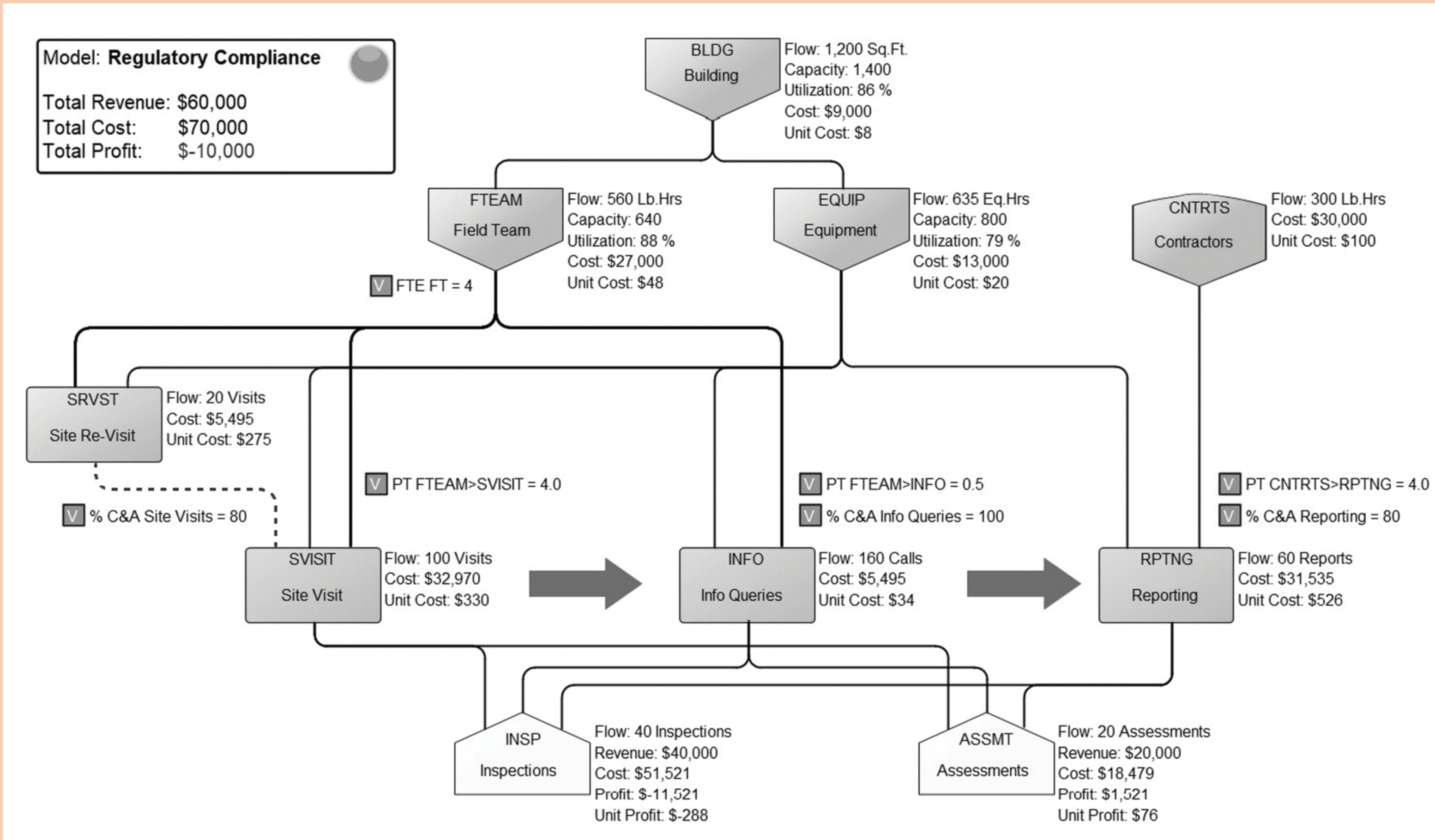
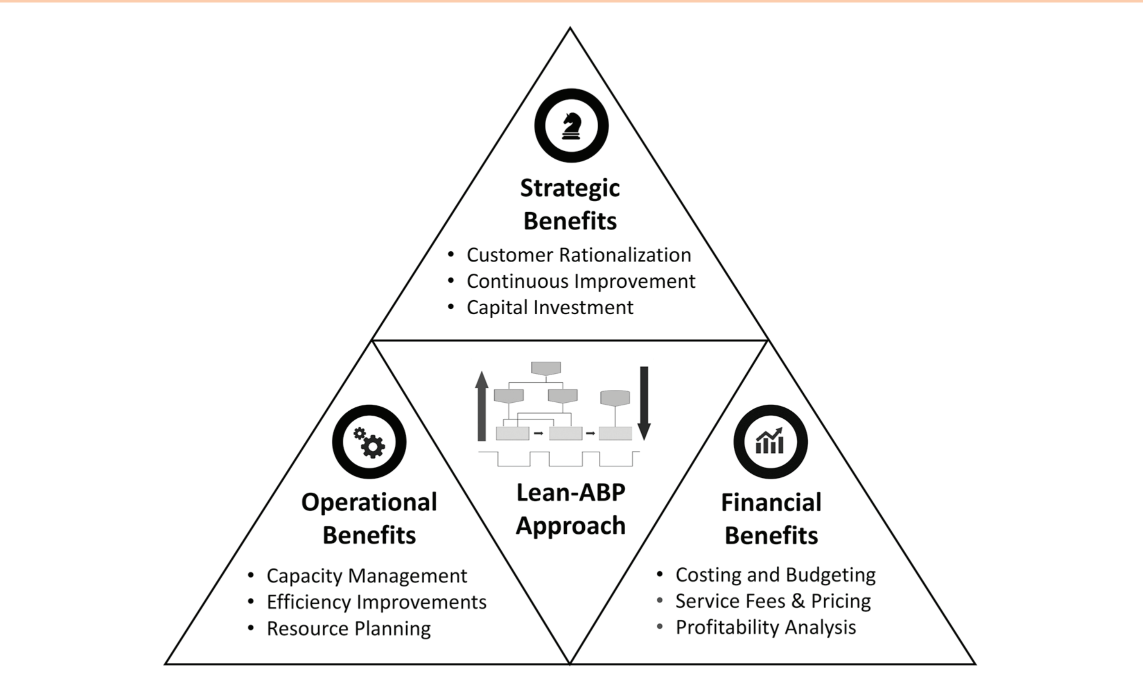


EXHIBIT 9 Key Benefits of an Integrated Lean-ABP Approach



operational data that is shared by both the VSM and ABP models. In VSM, percent C&A data are used for the calculation of the value-added ratio and roll throughput yield as shown in Exhibit 7. This data can also be represented in the dynamically displayed timeline associated with VSM diagrams.

This same data can also be used in an ABP model (Exhibit 8) to calculate labor resource requirements (e.g., consumption rates) and identify the magnitude and cost of waste activities such as site revisits (highlighted by a dotted line). For example, an 80 percent C&A on the initial site visits means that 20 percent (20 visits) must be redone, each of which would require additional labor (field team) and equipment resources. These would obviously be targets for process improvement and have direct implications for the overall cost and profitability of service delivery and service fees.

Essentially, as business improvement strategies are developed via lean thinking, they can be tested using lean-ABP solutions, like CBP, for their impacts on resource capacity, cost, and profitability. They can also help simulate the potential benefits of reducing overall product/service delivery lead time, thereby improving customer satisfaction, which can have knock-on benefits on demand volumes and overall profitability as well.

Conclusion: Key benefits and applications of lean ABP

In summary, lean ABP is an enhanced version of the typical lean approach, applying a constraint-based process flow costing that is unparalleled with other approaches. The coherency within the methodologies provides a rigorous framework for data collection and problem-solving with minimal additional effort. Furthermore, the final lean-ABP model provides insight into the process that is typically unmatched from either approach alone. The lean-ABP models and the understanding of the value stream gained by developing these models enable organizations to realize the benefits of all three facets of their businesses, as shown in Exhibit 9.

From an operational perspective, lean ABP provides a detailed analysis of capacity based on current or proposed resource allocations and actual or planned demand volumes within a stated time period. With appropriate technology enabled, all levels of management can conduct "what-if" scenario testing to understand the impact of efficiency improvement ideas and determine the optimal resource allocation to ensure they are staffed appropriately.

Financially, lean ABP provides a rigorous two-pass, closed-loop approach that calculates true costing and enables profitability analysis based on resource consumption. This level of analysis allows managers to better understand their activity and customer costs and to conduct their planning and budgeting requirements based on the current or future demands. These are then often used to understand what service fees are required to be profitable or to substantiate cost recovery strategies, as is often seen in government.

Finally, lean ABP allows managers and executives to explore their businesses strategically. A well-developed lean-ABP model provides the insights to examine and rationalize customer requirements. The actual development of the lean-ABP model also provides soft benefits to the organization. As the project team works with the front line, a culture of continuous improvement is instilled where the status quo is continually challenged, and all levels of the business continuously seek out additional optimization opportunities. Lean ABP also enables the organization to better understand and determine costs for capital investments that may be part of larger business process improvement initiatives.

Lean is a proven methodology that countless organizations have successfully adapted in their pursuit of operational excellence. It helps provide insight into the complete process flow and performance as it relates to the "time to serve." This approach can be further enhanced with ABP, a two-pass operational and financial process modeling technique, that provides insight into both the "cost to serve" and the "capacity to serve." The methodologies of these approaches follow a similar structure to measuring the current state, analyzing the data to identify the root causes, and developing "future state" process improvements. Although there are few solutions that integrate lean and ABP well, those that do exist provide a representative DTO, allowing leadership to conduct a what-if analysis and optimize improvement efforts from a cost, capacity, and time perspective. ■

NOTES

[1] Liker, J.K., *The Toyota Way*. (New York: McGraw-Hill, 2004).

[2] Project Management Institute, *Project Management Body of Knowledge*. (Newton Square, PA: Project Management Institute, 2021).

[3] Hansen, S.C. and Torok, R.G., *The Closed Loop: Implementing Activity-Based Planning and Budgeting*. (Austin, TX: Bookman Publishing, The Consortium for Advanced Management International, 2004).

[4] Kerremans, M. and Srivastava, T., Market guide for technologies supporting a digital twin of an organization, Gartner (2021). Available at: https://www.gartner.com/doc/4003512.