Business Performance Modeling for ERP Projects, Part 2

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Areas of Focus

The areas of focus get back to the tagline of "Focus on the Business." The dynamic models help to keep the business performance focused when undertaking a large and complex gap analysis and implementation initiative with ERP.

Key business process performance based questions addressed by the simulation models are

- What key business processes need to change/expand to serve the organization better?
- What key business process is consuming a lot of an organization's resources/time?
- What business processes served by legacy systems can be adapted to ERP-implied processes?
- What key business processes will be rendered less efficient by ERP-implied processes, and is there an overall (enterprise-wide) improvement gained from the ERP-implied processes to offset any inefficiency? Note: This is a question that is often unmeasured and unnoticed in COTS ERP implementations since static models cannot show performance dependencies and bottlenecks moving across an enterprise process.

Building the "As Is" models starts the process. Projecting one or more "To Be" models (including COTS as "To Be" reference models) provides the future perspective, and then gap analysis between them can commence.

User Buy-In and Support

The use of simulation models is key to gaining buy-in from the functional users. Gaining buy-in and functional support are among the most important steps in avoiding change management risks. Our approach will assist functional users to achieve the following for ERP COTS:

- Perform independent evaluation of how well the ERP-implied processes support their business operations
- Translate fear of the unknown into measurable, specific areas of concern and non-concern
- Propose alternatives to how the ERP COTS might be configured to best support their operations
- Gain the confidence and support of their functional peers
- Provide independent data and recommendations to senior AFD boards.

Approaches to Gap Analysis

Traditionally, gap analysis for COTS ERP modernization has been focused on function/feature, and data matching. We recommend adding in the business process and operational performance gap analysis as well. After all, the COTS ERP vendors are selling "industry best practices" so the military needs to measure the performance of those COTS-Implied processes to be sure they support the mission performance. COTS packages can certainly be mapped from a pure data and IT perspective, but it is the operational performance that is most critical to an organization.

One of the first critical uses of the "To Be" models is a Gap Analysis of COTS products. Traditional technical gap analysis (function/feature, and data mapping) is essential. But the operational performance of an organization must be considered when migrating critical information systems to COTS products in order to QUANTIFY the outcome. The military simply

cannot afford to cause significant operational performance impacts while focusing only on the technology solutions. Overall organization performance improvements are the heart of modernization justification. The real promise of these models, repositories, descriptions, and representations is that of a dynamic representation of the business and IT systems as they evolve. For some organizations, this is critical; for others, the analysis of this major change is all that is needed/supported.

A key by-product of doing the process, function/feature, and data gap analysis, as described in this paper, is a set of gap/configuration matrices that become the blueprint and configuration documentation of how the ERP product is configured and implemented. Since ERP product implementations don't have formal detail design documentation that the DOD is familiar with from custom software development projects, these matrices are invaluable as a living document of the configuration. The proof of concept on the aircraft maintenance project showed the following documentation that would be used as a configuration management tool for the life of the product:

- Process, function/feature, and data gaps are documented as well as the implementation decisions made that trace from the customer's requirements to the configuration choices in the ERP product.
- Gaps that document the areas where customization or plug-ins are required to bound the scope, isolate, and provide traceability to those requirements.
- A tool for tracing from the customer's requirements to the ERP product configurations that will be useful when customers need to change/improve their processes in the future and determine the impact to the ERP product configuration. Likewise, if the COTS ERP product changes/improves the embedded processes, then traceability to how and where the product modules were gapped and configured, will be used to determine the impact of product upgrades. Forward and backward traceability from requirements to product configuration is essential for maintenance of the product implementation.

Process Gap Analysis

The business process models need to be developed to address a particular organization's business workflows, including resources, decision points, business entities, organizational roles, cycle time, activity based cost metrics, and key points where the information system is needed to support the business process. It is crucial to have these business performance based models to ensure each service and each component within each service is having its mission critical processes supported by the information technology solutions.

The process models fulfill the DODAF OV-5 and OV6a&b content, in addition to laying the foundation for business performance analysis through the simulation tools. The stakeholders will be able to visually understand the process flows, control flow, process sequence, process dependencies, and inputs/outputs by viewing the static process flow diagrams. The simulation of the process models will provide an additional dimension of analysis between the static "As Is" and "To Be" models, resulting in a measurement of improvement from the legacy processes to the industry best practices processes implemented through the COTS ERP. These measurements focus on the business performance, and not on system performance, although there can be a direct relationship in some instances.

The following is a screen shot of a simulation example in the aircraft maintenance project that shows the customer's "To Be" process compared to a gap analysis and mapping to the Oracle HR product for maintenance training. The simulation provides a business-based measurement (Individual Training Plan cycle time graph) that places the correct focus on the process changes. This approach also provides an early and critical foundation to change management activities since it is used to communicate to the end users how the COTS-based process will work compared to their legacy process.

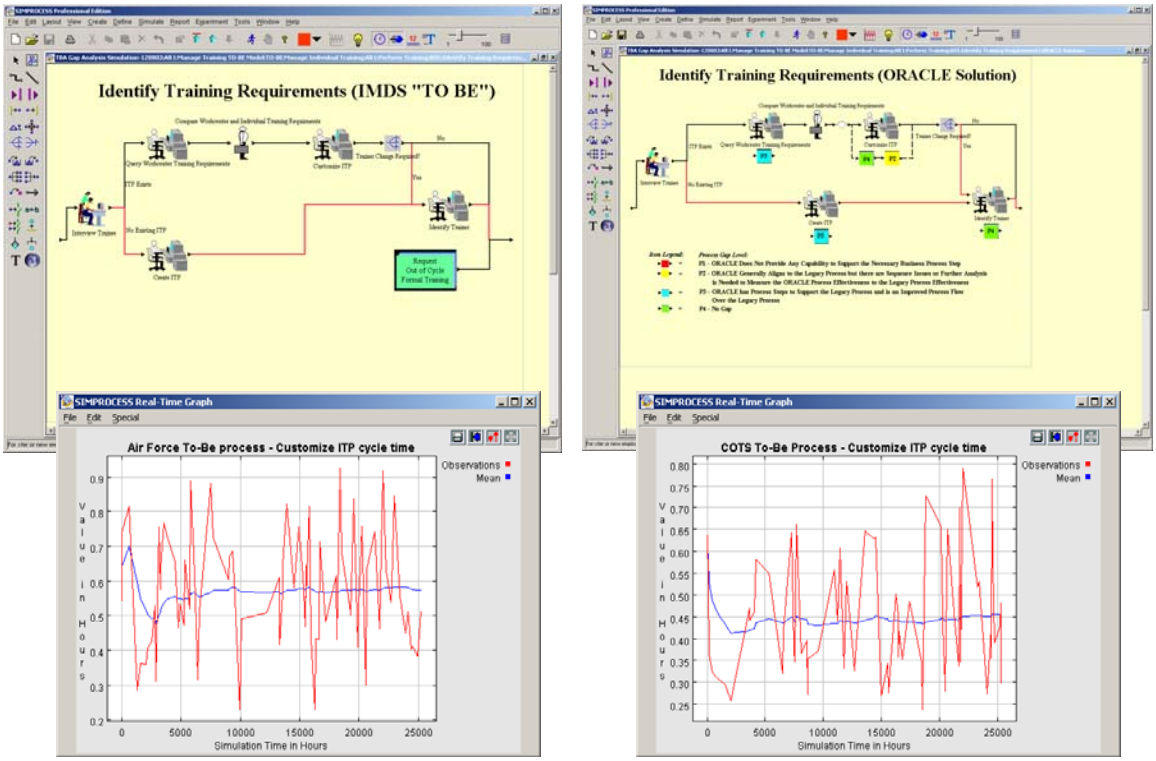

Figure 1.

Data Gap Analysis

The data gap analysis is performed by extracting the legacy data definitions and associated business rules from the existing systems and modeling the analysis in a C4ISR OV-7 Logical Data Model. The OV-7 data model is then used as the "As Is" baseline and compared to the "To Be" COTS ERP data model to determine the gaps in data. The OV-7 should be developed in parallel to the development of the OV-5 and OV-6 process models so that a better understanding of how the data is used in the business processes is gained. This understanding will be needed when mapping and reconciling the "As Is" data to the "To Be" data, since semantic differences can often camouflage data mappings.

The data mappings are then used to determine the gaps by comparing the differences between the "As Is" and "To Be" models. The differences are used to formulate translation and/or conversion plans to remove as many differences as possible when moving to COTS ERP. It is important to remove as many differences as possible since this can cause or lead to unnecessary customization of the COTS product.

Function Gap Analysis

The function gap analysis is performed by defining the basic functional requirements the system must meet to support the users work. The function requirements are best done in conjunction with the business process models, and link directly from the process diagrams to a formal requirements methodology such as UML Use Cases. At a minimum, the function requirements can be declared in traditional requirement statements (a.k.a. shall statements in a Software Requirement Specification); however, some of the overall business context is lost as opposed to the integrated process models and Use Case models.

The requirements must focus on "what" the system functions should be and not "how" to do them. If you get into the definition of "how" functions are to be carried out, this can be counter-productive to COTS gap analysis and lead to unnecessary customization of the COTS. The integration of the Use Cases with the process model activities helps to keep a business perspective on what the system needs to do to support the business work steps and helps to alleviate the problem of specifying "how" in the functional requirements.

By aligning the functional requirements (preferably, Use Cases) with the process model activities, the gap analysis for the functions can be done in conjunction with the process gap analysis described above and will provide a more comfortable means of determining why, where, when, and how functional requirements are needed in support of specific business steps. If the COTS-implied industry best practices can eliminate business steps in the "To Be" process models, then gaps in the functional requirements can be eliminated as well. This approach can avoid unnecessary demands for functional "clones" of legacy system functions when adopting COTS.

Business Measurements

With the modeling of business processes there are three basic constructs that the business performance metrics are centered around. They are

- Entities – the things that are worked on in performing the business processes. An example would be an aircraft in an aircraft maintenance organization. Entities are also used to define the related objects of work such as paperwork, customer requests, etc.
- Resources – the people, facilities, consumables, and equipment that are used to perform the work on entities.
- Activities – the work steps (a set of activities define a process workflow) where discrete events of work are done on the entities. Activities typically utilize or require resources to perform the work.
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The following are a minimum of the business performance metrics that should be considered when comparing the "As Is" and "To Be" process models:

- Entity Cycle time – the total duration that a business takes to perform the work on an entity.
- Resource Utilization – the amount that resources are utilized to do the work in a process.
- Entity Cost – the cost for doing work on the entities, usually expressed in average cost per entity.
- Activity Cycle Time – the amount of time it takes to do work by activity.
- Activity Based Cost – the cost of doing work by activity. This is a very important metric since it can reveal where the real cost of doing business is.
- Throughput – the total capacity of an activity, subprocess, or entire process measured in the number of entities through the business.
- Delays – delay times and bottlenecks in the process where entities slow down or are queued up waiting to be worked.

Many variations of the above metrics can be produced from SIMPROCESS™ to provide a rich set of business measurements when comparing the "As Is" business processes to the "To Be" COTS processes. These metrics are much more important when considering COTS than how many of the data elements map or how many bells and whistles the COTS software product implements.

These metrics provide both a quantitative (times, cost, etc.) and qualitative (response time to customer's needs) view of the business when doing gap analysis.

Simulation Support to Blueprinting and Implementation

The simulation models used in gap analysis are also very beneficial to ERP blueprinting and implementation tasks. Similar to how simulation models are used to make gap analysis decisions, it is also used to communicate, via business metrics, to stakeholders how the ERP will be configured to support their processes. This may appear subtle on the surface, but is a powerful capability in beginning to address change management issues. For example, the simulated performance shows the users how their changed processes will work. This provides two key capabilities to support change management: 1) removing the unknowns of how the new process will work in their environment, and 2) removing the emotions of changing the processes by focusing on the business performance metrics and how the new processes will improve their jobs overall.

Simulation of the models will help to avoid “push back” by users by examining the impacts of the changed processes across an enterprise and not allowing a narrow focus on small groups of process steps. This approach solves a pitfall in most ERP implementation methodologies since most are based on “conference room pilot” approaches that address increments of the overall enterprise process. In the “conference room pilot” approaches, it becomes difficult to negotiate with functional users to change their process if it appears the COTS ERP will cause a negative impact to their operational performance when, in fact, the negative may be offset somewhere else in the enterprise by larger improvements. This is a classical sub-optimization concept. The simulation model allows us to address the “push back” on isolated subprocesses by simulating the gains and impacts downstream in other processes. Basically, it assists in avoiding premature decisions in configuring the ERP to achieve or avoid improvements or impacts. Preventing these premature customizations avoids a domino effect of changes down stream in the ERP product implementation project.

Change Management

Change management starts with the decision-makers and stakeholders understanding the targeted environment. People do not change their way of doing business easily. The biggest roadblock is in the stakeholder not understanding what they are changing to and how it will impact them. This ties back to understanding and quantifying the "As Is" processes against the "To Be” processes and communicating the differences and improvement to the stakeholders at all levels, not just the decision-makers. It is our opinion that even though organization and process changes have been successful in industry, it has not been easy, and that the magnitude of a military organization with its various components is much more complex than in a private company.

Our suggestion to use dynamic simulation models that support visualization of people’s roles in the business process and workflow is crucial in getting the stakeholders to understand their new role and how it fits into the big picture. This is not a “silver bullet,” but it will certainly be very helpful in the process of change management.

Risk Mitigation

The ”focus on the business” approach is at the heart of risk avoidance. The processes and effectiveness of an organization must be understood and quantified for the operational architectures or the DOD runs the risk of damaging the missions of its organizations. The modeling approaches we have described here provide the engineering discipline to examine, measure, prototype, and review changes before technology is inserted (including COTS-implied processes). This will help the decision-makers to understand the potential improvement of certain changes in technology as well as understand the risk of a change to one part of the business affecting another part of the business downstream. The use of the simulation models helps to find the "domino effect" of changing one area that potentially damages another area. This phenomenon is extremely difficult to uncover using traditional static process mapping technologies and methods. The bottom line is that changes and transformation must be driven by the business and not driven by technology.

Post Implementation Support

Maintenance/Sustainment

The models and gap matrices that are developed from the business analysis, gap/configuration, implementation, and change management phases become a critical configuration item for continued maintenance and sustainment of the implemented solution. For example, the gap matrices become the "design" of how the COTS is configured and implemented for the customer. This provides trace ability from the requirements (process, function, and data requirements) to the configured instance of the COTS application. Since the matrices document the gaps and the configuration decisions made during configuration and implementation, they replace what would be a "design document" in a custom built application. This critical configuration item is used to trace back to configuration decisions and estimate impacts when the business process needs to change later; or it provides the ability to do impact analysis when a new release of the COTS affects configurations done for the customer's implementation. The trace ability is bi-directional, and the gap matrices become a living document of the configuration design for the COTS.

Continual Process Improvement

The process models are not one-shot deals. They become the basis for continual experimentation and the "what if" analysis for business process improvement. Whether the military is looking at new doctrine, changes to administrative processes, or adoption of new technology that will improve the process, they can examine the impact to the information system (the implemented COTS configuration) in considering these process changes using the simulation models. This is a "fly before you buy" approach. The models and the gap matrices work hand-in-hand to provide the business operational architecture that is used to maintain and improve not only the business processes but also the information technology requirements that support the business processes. As this paper's theme is "focus on the business," the continual process improvement approach keeps the "focus on the business" post-implementation.

Business Performance Monitoring

An important capability in using the simulation models, such as those in the aircraft maintenance project, is the ability to reuse the models as part of the business performance monitoring post ERP implementation. Business activity monitoring (BAM) is a term coined by Gartner Group and is focused around executive dashboard technologies that provide key business performance metrics. Another approach being used by DOD is Balanced Scorecard (BSC) dashboard. The BSC and BAM dashboards can benefit from the process simulation models in that it is much easier to see where key events are in the business process (this is obvious from the simulations) that map to the BSC or BAM dashboard metrics.

Additionally, the SIMPROCESS models used in the aircraft maintenance project are directly implement-able as a web service that is plugged directly into the BSC or BAM dashboard technology (such as Business Object, Hyperion, Cognos, or the actual ERP-based dashboards) and can be called on-demand to simulate the processes to predict performance. This is a powerful capability in that traditional BSC and BAM dashboards provide metrics up to the current date/time but don't predict into the future. The beauty of using the simulation models is that they are the same validated models for the customer that were used to do the gap analysis and ERP configuration. Therefore, the predicted business performance is within context of the customer's processes. An example of the use of this would be the prediction of the cost, cycle time, or resource utilization to meet a weapon systems availability schedule that may be dependent on supply chains, maintenance personnel, and equipment. An aircraft maintenance process model can be used to simulate the capacity and performance capabilities of the customer's maintenance organization.

Conclusion

The use of simulation models is a strategic capability that spans the planning, selecting, gap analysis, implementation/blueprinting, change management, and business performance monitoring tasks in an ERP program. The following diagram shows how the aircraft maintenance models are being planned to support each of the COTS ERP tasks.

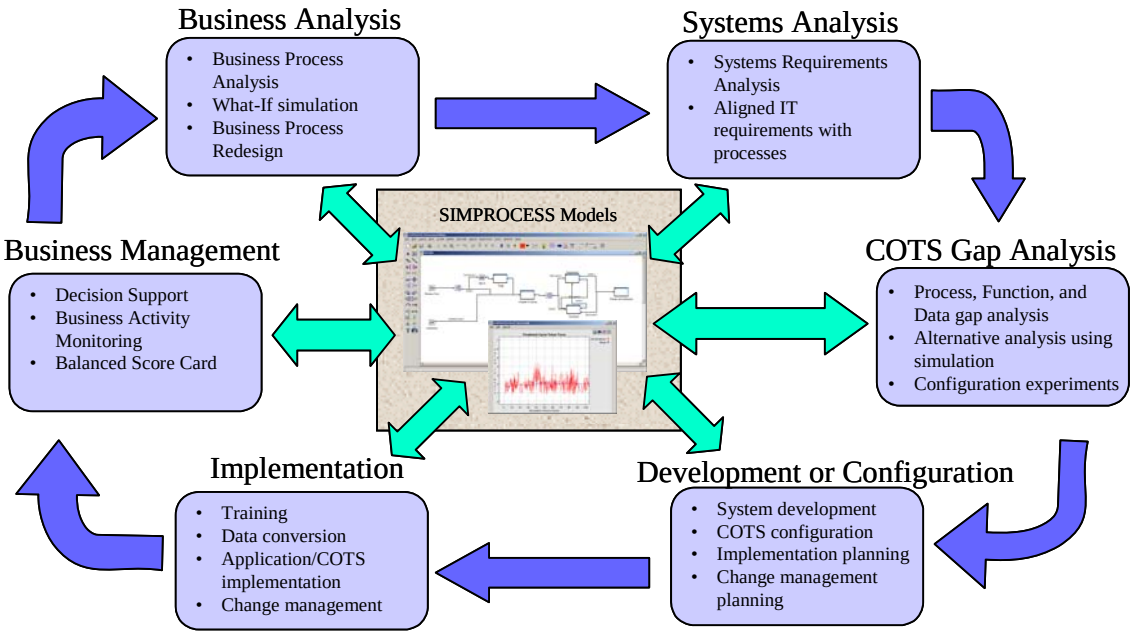

Figure 2.

The use of a modeling technology that supports static models but can be simulated to provide additional key insight to business decisions is critical in reducing risk in all phases of gap analysis, configuration/implementation, change management, and business performance management. The DOD cannot afford to have a failure with COTS ERP, and techniques such as the ones described in this paper will remove significant risk in all aspects and phases of the ERP projects.

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