BUSINESS PROCESS AUTOMATION CASE STUDIES

National Center for State Courts

September 16, 2013

NCSC Project Staff:

Lawrence P. Webster

John T. Matthias

This document was prepared under State Justice Institute (SJI) Grant SJI-11-P-085. The points of view and opinions expressed in this document are those of the authors, and do not necessarily represent the policy and positions of the State Justice Institute.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The National Center for State Courts (NCSC) is pleased to present *Business Process Automation Case Studies*. This document is part of the NCSC's initiative to develop the next generation of standards for court technology. The NCSC believes that future systems will focus on the automation of court business processes, applying methodologies and tools that have proven successful in the private sector. These case studies highlight courts that have taken steps in this direction, having utilized improved business process discipline and methods, or business process automation tools.

In Part I, this document examines private sector tools and techniques, followed by a discussion of their relevance to the public sector and to the judicial branch. It then explores the evolution of technology to support the work of the courts.

In Part II, this paper presents three case studies, including the Phoenix Municipal Court, the Michigan Court of Appeals, and the Judicial Branch of Puerto Rico.

The Phoenix Municipal Court was selected because of the way that its internally-developed case management system has evolved to fit local business practices, significantly reducing staffing needs.

The Michigan Court of Appeals was chosen because of its high level of business process discipline and the implementation of these principles in its case management system.

The Judiciary of Puerto Rico is included because of its use of business process automation tools to create SUMAC, its new case management system. The Puerto Rico courts focused on the automation of the work of judges, in addition to clerical staff, and used a number of other innovative techniques.

It is important to note that the case studies focus on the most impressive features of these three courts that are relevant to business process automation. While there are many more good things happening in the three sites than are described in the case studies, they are not included because they are not as directly related to the specific focus of this document.

In Part III, this document synthesizes the techniques and practices from which other courts and private-sector software providers can learn about the future of technology in courts.

Exemplary techniques and best practices extracted from the case studies have been organized into four categories: organizational structure, operations management considerations, case management system characteristics, and system development methods.

In the area of organizational structure, the need for competent business analysts and information technology staff (whether internal or contractual) was emphasized.

Under operations management considerations, a strong management focus on court operations was seen in each of the exemplary courts, including a desire to strengthen business process discipline within the court. Private sector quality methodologies also

show the need to manage quality and control variation in each individual business process. Developing and using performance metrics to manage quality also is a best practice.

In the area of case management system characteristics, a number of exemplary practices were defined: building process models for each case type, defining case properties and business rules needed for operational improvements, case state queues that can be managed by the CMS, and business process automation support.

The final category is system development methods. Successful courts use a combination of top-down and bottom-up perspectives in defining the scope of automation projects. Future systems also will be more concerned with automating the work of judges. The need for improved case management system standards also was emphasized. Business process automation tools should be considered by courts that are serious about improving court operations. Finally, integration with systems in other justice and justice-related organizations also is important.

The private sector can teach courts many techniques that can produce operational improvements, though the application of those methods presents many challenges. Certainly the need for efficiency must be kept in proper perspective, but very inefficient courts struggle to meet their higher goals of administering justice fairly. Better management and improved technology offer tremendous promise for dealing with these issues.

The NCSC believes that the next generation of court technology standards must focus on business processes, which involves management, measurement, automation, and improvement.

INTRODUCTION

Most courts rely on case management systems to support their work. Traditional case management systems are electronic filing cabinets: repositories of information, documents, and other content related to specific cases. Case management systems also automate some of the work of courts by producing documents, organizing calendars, reporting outcomes to other parties and organizations, etc. Unfortunately, few courts take full advantage of this automation capability, choosing instead to maintain parallel, manual processes. The net result of automation in many courts is to increase in human effort in business processes, rather than to decrease it.

One reason that courts are not able to take full advantage of technology tools is that they lack business process discipline. In many states, clerical functions reside in a separate organization, often in a separate branch of government. In most states, business processes are shared with many other organizations (e.g., prosecution, indigent defense, child welfare, child support), but are managed within separate silos. In all states, a high degree of independence exists in the way that individual judges do their work. This makes that management of business processes difficult and the automation of those processes almost impossible. Some states do not even attempt to manage or document business processes, letting the people who do the work decide how it will be done.

Business process automation is used extensively in the private sector. Tools and techniques have been available for more than twenty years, but now are much easier to use, much less expensive, and much more powerful. The focus of business process automation is the individual business process. Subject matter experts and technical specialists work together to define the best way to perform a task. They produce a flowchart that describes the business process. The flowchart is fed into a system that produces the software tools needed to automate the process. Some manual programming still is required, but the framework has been created and the work can be completed in a matter of days and weeks, rather than months and years. Individual business processes can be automated very quickly, but when there are dozens or hundreds of processes to be addressed, the complexity increases rapidly. Still, business process automation tools have the potential to replace traditional case management systems and to greatly streamline work processes and staffing in courts. A number of states are thinking about moving in this direction.

The purpose of this publication is to highlight and publicize efforts by innovative courts to follow the latest operations management trends in the private sector. By doing so, we hope to motivate other courts to take advantage of these powerful tools to

transform their business operations and to support a broader initiative to define the next generation of court technology standards, based on business process automation.

PART I: LEARNING FROM THE PRIVATE SECTOR

History & Background of Private Sector Tools and Techniques

It is not a simple thing to compare judicial branch practices with private sector innovations. Courts are modern organizations in one sense, and eighteenth-century institutions in another. Structure and management control issues make it difficult for courts to realize many of the benefits of technology that have accrued to private industry. Still, there is value in examining how improvements in human productivity and management have been and may be applied to the judicial branch.

Human Productivity and Management Innovation

The eighteenth century development of the steam engine and other forms of mechanization are considered to be the forerunners of the industrial revolution. These technologies helped to transform the world from systems of craft guilds and domestic production to today's modern manufacturing environment. Technological innovation, such as the concept of the assembly line, interchangeable parts, the railroad and other forms of transportation, electrical and computer power, and communications probably would have had a smaller impact were it not for progress in organizational and management theory. This scientific management revolution forever changed the way that work is done and the way organizations are structured.

Operations Research and Operations Management

Operations management and operations research emerged from the scientific management movement, though the titles are of somewhat recent origin. Operations research is a branch of mathematics that overlaps operations management and industrial engineering. It focuses on the application of advanced mathematical models to decision making. Operations research uses mathematical modeling, statistical analysis, simulation, queuing theory, mathematical optimization, and many other analytical techniques to find optimal or near-optimal solutions to complex problems. It emphasizes human-technology interaction and seeks practical, rather than theoretical application. It can be seen in almost all aspects of our lives – from the grocery store, to schools, to gaming, and to sports.

Operations management is concerned with overseeing, designing, and controlling the process of the production of goods and services. It ensures that the transformation of inputs into outputs is effective and efficient. It is tactical, rather than strategic. It blends both art and applied science. People skills, creativity, rational analysis, and knowledge of technology are key ingredients to success.

Some of the more notable products of the operations management movement include Total Quality Management (TQM), Six Sigma (another quality control approach), Lean Manufacturing, Just in Time, ISO 9000, and Business Process Reengineering. Key techniques in the service area include:

- Forecasting

- Quality assurance and control
- Decision analytics
- Service design
- Process planning and design
- Job design and work measurement
- Inventory control
- Operational scheduling and control
- Operational analysis and maintenance
- Project management

Productivity and throughput are key concerns of operations management. While there is much that the courts can learn from operations management in the area of work design and process performance management, the analytical tools of operations management may be the best untapped resource for judicial branch leaders. Caseflow management, CourTools, Trial Court Performance Standards, and the High Performance Court Framework, while excellent tools, pale in comparison to the rigorous mathematical modeling used in operations management. Of particular note are process simulation, queuing theory, and Markov chains. These tools have the potential to significantly improve customer service, scheduling, business process performance measurement, and differentiated case management, but few courts have tried to use these techniques.

Capability Maturity Model[1]

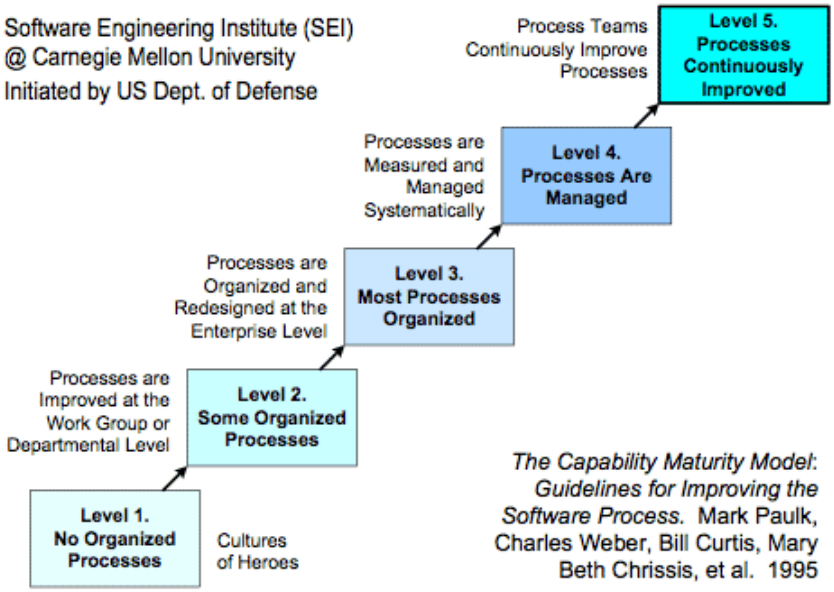
Another interesting development has been the capability maturity model (CMM). Originally created after a study of data collected from organizations that contract with the U. S. Department of Defense, it became the foundation of the Software Engineering Institute at Carnegie Mellon University. "Maturity" refers to the degree of formality and optimization of business processes from:

1. Ad hoc, chaotic practices
2. Repeatable processes
3. Formally defined steps
4. Managed results metrics
5. Active optimization

The capability maturity model was initially used to determine the capability of a company to develop computer software, but it has been expanded and can be applied to the work of almost any organization.

A diagram of the CMM below depicts progression from one level to the next, as business processes become more defined and as they are measured and improved based on measurement.

[1] The concept of business process discipline used in this paper is derived primarily from the Capability Maturity Model, though it also includes control of variation in business processes, as described in many quality management methodologies.



Courts typically score at level two of the model, but some are clearly at levels one or three. A score of one would be applicable in a court in which not effort is expended to control variation in the way that work is performed — either at the clerical or judicial levels – where individual judges and clerks decide how they are going to do their work. A score of two indicates that there are generally accepted ways of doing business, perhaps with some documentation, while level three includes courts where there is formal documentation showing how to perform each process.

Very few court organizations can claim to have the business process discipline defined at levels four and five because they lack the data required to measure individual process performance – at even a moderately detailed level – and to optimize processes based on that data. Analysis in most courts is generally confined to high-level outcome measures, such as CourTools, that do not reach the necessary level of specificity of individual business processes.[2] Courts must acquire knowledge and skills in these areas, not to mention higher quality data and better process models, to improve business process discipline.

Process maturity takes years of focused effort to achieve, and courts will go through phases, starting with improvement of a few processes, and gradually developing more

[2] According to Tom Clarke, both the Washington and California state courts carried out extensive and serious process simulation pilot projects in the 1980's, using rigorous techniques like process simulation, queuing theory, and Markov chains. Formal models were created and exercised using real court data. Presentations were made at professional simulation conferences. However, projects in both states were ultimately abandoned because the benefits of the models didn't justify the cost. They were very expensive to create and maintain, court data was of low quality, and the business insights were underwhelming.

sophisticated models, and then further refining the processes. The goals are to attain the ability to create enterprise process models for the local court environment, to measure process results, to manage business processes, and to use teams to continuously improve their processes, as envisioned by the High Performance Court Framework.[3]

Courts certainly have benefited from many modern management ideas: staff specialization and division of labor,[4] defined job descriptions, business process documentation, and training, but many other innovations have not been successfully implemented. It is certain the courts could benefit from more advanced tools and techniques. Here are some obvious areas:

- Work process design based on mathematical models
- Analytics in measuring and optimizing the performance of specific business processes
- Simulation tools and queuing theory for optimization of customer service and scheduling functions
- Division of labor and specialization in judicial processes

Recommendations for application of these approaches are discussed below in Section VIII: Exemplary Techniques and Practices.

Applying Private Sector Theory to Courts

An issue that is raised repeatedly when court leaders attempt to apply private sector approaches in the judicial branch is that "courts are different." This is certainly true, and it is worth exploring how courts are different and how the differences and similarities apply in trying to improve operations.

Courts as organizations are constitutional institutions, created at the founding of our country and of our states. Inherent in their establishment is the requirement that they be funded and supported in the execution of their duties. They resolve controversies; protect society; punish those who commit crimes; establish and modify the legal status of individuals; defend the rights of citizens against abuse by the government, private organizations, and individuals; and ensure that the work of government is accomplished. There is no question that they are an important part of our democracy and nation.

On the other hand, private companies produce goods and services (and jobs) that are of value to people and organizations. They are authorized and regulated – but usually are not funded – by government. They collect taxes from their customers (and employees), and a part of their profits usually are returned to the government as compensation for

[3] The High Performance Court Framework is used to integrate performance improvement into a court's ongoing operations. The steps include: focusing on key administrative principles that clarify high performance, understanding how a court's managerial culture can promote common goals and collegial cooperation, developing the capacity to measure performance, and learning to use the results for procedural refinements and communication with a variety of stakeholders. Taken together the steps form a functional system that courts can follow in enhancing the quality of the administration of justice.

[4] Even organizational specialization, i.e., treatment courts.

public services that they consume. The private sector also is an important part of our economy and our society.

Courts receive a budget allocation (and sometimes fees from customers) to support operations. Some courts return more in revenue to their funding bodies than they consume in operational costs. Court leaders must justify budget requests and comply with financial management rules, participate in audits, and provide other proof that they have appropriately expended public funds allocated to them. Often tensions exist between court leaders and funding bodies over the level of funding needed to adequately run the court system. Progressive court leaders assume that they have the responsibility to apply sound management principles in operating the courts as efficiently as possible, without sacrificing the more important purposes of courts – to administer justice fairly and impartially, to treat people with respect and dignity, and to uphold the law.

Private sector organizations are driven by the need to sell their goods and services. If the cost of doing business exceeds revenue received for very long, the business will not survive. The private sector must be as efficient as possible, but it also is constrained by higher goals — quality, compliance with legal requirements, and maintaining good relationships with their customers. Cutting corners in quality or customer service may increase profits in the short term, but it will lose customers in the long term.

Private organizations compete for customers and contracts. They must remain competitive with other companies in terms of cost and quality. Courts have no such incentive. Perhaps this is one reason why the private sector has made so much progress over the last 250 years – it has truly been the survival of the fittest. This is not to say that courts are not doing their best to be effective and efficient, only that the motivation of the private sector is much more substantial.[5]

The following subsections explore particular topic areas that describe fundamental differences between courts and the private sector, with regard to organization, structure, and management control.

Organization and Structure

Courts operate at a disadvantage to private industry in many ways. One important difference is organization. Private companies can organize and reorganize themselves to suit the changing competitive environment. Court organization and structure, in some states, is much the same as it was prior to the industrial revolution, when society was primarily agrarian. Local clerks and sheriffs managed the justice system because judges often were not available to do so, as they frequently rode circuit and their time was split between courts. Today, judges still ride circuit in some areas, however with modern communications technologies, they are never out of touch for very long.

[5] Internationally, there are examples of entire courts (Honduras) or the entire staff of a court (Bosnia) that have been replaced.

In some states, elected executive branch clerks are still responsible for court records, sometimes in addition to other executive branch duties. In many of these states, the relationship between the executive branch clerks and the judicial branch is excellent. In some states, however, court efforts at process improvement have been stymied by their inability to access court information and records in a way that works effectively. Executive and judicial branch officials often have differing views about what the law requires and what processes are best for their organizations. Lack of efficient access to court records is an inexcusable roadblock to efficient judicial operations in these places.

A similar problem exists in some states with the independence of prosecutors and public defenders.[6] Of course, the legal system has been designed to support an adversarial process — the court is an independent judge of the facts and application of the law. The problem comes when lack of resources, lack of competence, or lack of desire to move cases in an efficient manner keeps one or both of these legal agencies from working with the court to improve business practices. Many court leaders, for example, understand how an extraordinary number of continuances in cases can clog the system and make it difficult to resolve cases in a reasonable amount of time. Justice system partners do not always agree and sometimes resist and inhibit implementation of needed change. Of course, the courts sometimes are equally or more responsible for resisting change. Bureaucracies tend to evolve to the benefit of those who work there, rather than to the benefit of those whom they serve.[7]

In the private sector, if a supplier cannot deliver, you find a new supplier. In the public sector, success depends on voluntary cooperation, good will, and local legal culture. It has been said that it takes two people to make a marriage succeed, and only one to make it fail. The same is true in justice system operations, only there are interests of many more parties to consider.

Justice system structure is sometimes an impediment to efficiency and effectiveness. It was established intentionally, in part, to ensure that the proper checks and balances were in place to prevent abuse of power and to protect the rights of citizens. It was established unintentionally, in part, because more enlightened thinking did not yet exist. Courts have not been driven by necessity to innovate as the private sector has been forced to do. Some states have changed their structure by bringing clerical operations into the judicial branch and by changing the political orientation of some of the actors, and have found that some of the problems have been mitigated.[8] The nature of the adversarial system requires that there be independence in these organizations in the

[6] In some instances, even law enforcement agency actions can cause difficulties with moving cases in a timely manner because of delays in filing reports or processing evidence.

[7] Paraphrased from Dr. Frances Kahn Zemans of the American Judicature Society at the 1999 National Conference on Public Trust and Confidence in the Justice System.

[8] One problem is balancing independence with accountability. Elections make judges more accountable, but also may put them in a position of accepting campaign contributions from potential parties in cases and from attorneys who appear before them and whom they may appoint to represent indigent persons. Appointed judges are not subject to these conflicts, but they are also not as directly accountable to the citizens for their actions.

way that cases are presented, but structure and process can be improved in many states without violating these bedrock judicial values.[9] Structural enhancements, on their own, will not solve all of the problems of judicial branch effectiveness and productivity, but they should be considered a key element of the improvement process.

Management Control

While in the private sector, management control is strong because trained managers plan and oversee workers, in the judicial branch, where judges oversee management issues, management control is traditionally weak. In the courts, those with specific management training are overseen by judges. Administrators can advise and offer suggestions, but within a structured legal framework, each individual judge can do pretty much whatever he or she wishes.

In most states, the Supreme Court is responsible for the administration of the judicial branch. However, this does not mean that the court provides operational management over the lower courts, only that they set rules and may monitor performance at a very high level. Most multi-judge courts have some kind of presiding judge, but the presiding judge is the first among equals — he or she does not exercise operational supervision over other judges. Appellate courts can correct specific decisions of trial court judges with respect to the application of law to the facts of a case, but this is not the same as planning the work of judges and evaluating their performance. Thus, there is no managerial oversight of judges. Elections can be used to replace judges, but the public is seldom aware of most aspects of a judge's performance. Disciplinary organizations may correct a judge for egregious actions that go beyond the norms of judicial temperament or behavior, but the relationship is not like that of a manager to a line worker.

Local legal culture is another issue. Before judges are judges, they are usually practicing attorneys. They learn what judges do by working with them in courtrooms. When they become judges, they tend to operate in the ways they have observed in their predecessors. While training, bench books, mentoring, and other resources may be provided to help them, they tend to gravitate back to what they learned in many years of legal practice. There is an obvious legal tradition that tends to evolve rather uniquely in different areas.

Judges are at the pinnacle of the legal profession. Their skills and independence are valued and are necessary. The point is not that this arrangement is bad; it is that it is not overly conducive to efficient operations. It is a necessary sacrifice to ensure that

[9] Too often adversarial relationships spill over inappropriately into administrative and clerical processes and harm relationships, building roadblocks to more efficiency in the management of business processes that are shared between justice organizations. The effects can be malicious – actors in one organization intentionally take actions that require their opponent to do unnecessary work and to waste valuable (public) resources. Retaliation usually follows. Discovery practices in some parts of the country may be the most visible example of this unconscionable behavior, where winning and inflicting injury on the other side become more important than justice. The contrast with jurisdictions where automatic discovery practices are in place is striking.

justice is delivered. Efficiency can never be the most important objective in a system where justice must prevail.[10]

Because courts are different than private sector organizations with regard to both structure and management control, the application of modern management practices will not produce the same results as it will in other organizations. This does not mean that they are of no value, only that they must be applied differently and with a modified level of expectations. Improving business process performance still is a desirable goal within the unique judicial branch environment, but it must always be kept in its proper context.

Technology and the Courts

This section provides a brief history of the evolution of court case management systems and related applications. One of the primary impediments to more effective use of technology has been a low level of judicial branch business process discipline. Progress in applying technology to improve court operations has most often evolved as business process management has improved.

Case Management Systems

Technology has been applied in courts for many purposes and in many different ways over the years. First-generation character-based court case management systems evolved from simple statistics-gathering tools[11] that supported resource allocation and policy formulation, to graphical, web-based applications that assist with court operations — providing help with calendaring, document generation, information exchange, financial management, and reporting.[12] Automation of certain clerical functions in the court has increased the efficiency of court staff and has improved the quality of their work. These systems also have become a vehicle for sharing information with other decision makers in the justice system. They are both an electronic filing cabinet in which all case information is stored, and a tool for reducing human effort in court operations.[13]

A grand achievement of the technology industry has been the development of content management systems. The capability of integrating documents, photographs, audio, video, text, graphics, and other forms of information with formatted court data may be

[10] If justice delayed is justice denied, then certainly inefficient justice is ineffective justice.

[11] Some of the earliest systems were created for a different purpose: to provide an index of cases and parties.

[12] It is important to note that functional improvements in case management systems have coincided with technological innovation, but there are certainly examples of older systems being functionally superior to applications that are built upon more modern platforms. These examples are, nonetheless, exceptions, and not the rule.

[13] A parallel improvement has been the development of more configurable systems – applications that are 'built to change' rather than 'built to last.' They provide a flexible framework that allows a court to create something in between the off-the-shelf system and the custom application, at a fraction of the cost of system customization. This is a full-circle evolution that hearkens back to the 'tailor-able' PROMIS systems of the 1970's and 1980's.

the single most significant factor in making technology more supportive of court business processes. The use of electronic documents in place of paper files takes advantage of system capabilities and automated work methods.[14] However, even this generation of court case management system solutions has "hit the wall" as these applications have been unable to keep up with business users' increasing demands for changes to business processes and for efficiency and flexibility in operations. Knowledge work domains, such as court case management, still must handle routine work, but they also require adaptive capabilities to empower knowledge workers to solve problems. A new type of case management system is emerging to provide adaptive capabilities in ways that are not yet fully understood.[15]

As court case management systems have become more sophisticated, the need for alignment of systems and business processes has become more apparent. In the private sector, successful companies apply technology to automate their business processes, whereas record keeping and the collection of management and statistical information, while important, is secondary. Business leaders examine each process to determine how to optimize it, while applying technology to automate it. To optimize a business process means to maximize both effectiveness and efficiency — to do the job as completely and thoroughly as possible, with a minimum expenditure of resources. The decision to automate a process or to perform it manually is almost entirely financial in the private sector — if there is no monetary gain from the required investment in technology, then the work will continue to be performed manually.

Progress in automating courts is often "two steps forward, one step back." For instance, courts often install new technology solutions without eliminating the processes or systems they are intended to replace. Perhaps the best example is the electronic document management system (EDMS). Many courts now have fully electronic case files, but still operate with their old paper folders. The business case for EDMS technology can never be realized while the paper file is still in use.[16] Two systems always cost more than one.

Reduction of Operational Costs

In the private sector, successful companies minimize their costs (and become more profitable) by applying technology to automate their business processes. Record keeping and the collection of management and statistical information, while important, is secondary. Business leaders examine each business process to determine how to optimize it, while applying technology to automate it. To optimize a business process means to maximize both effectiveness and efficiency — to do the job as completely and thoroughly as possible, with a minimum expenditure of resources. The decision to automate a process or to perform it manually is almost entirely financial in the private

[14] John T. Matthias, "User Requirements for a New Generation of Case Management Systems."
[15] John T. Matthias, "Case Management Forecast: Mostly PCM with a Chance of ACM."
[16] See http://courttechbulletin.blogspot.com/2012/02/calculating-e-court-return-on.html for some nice Return On Investment information.

sector — if there is no monetary gain from the required investment in technology, then the work will continue to be performed manually.

In courts, recordkeeping is a goal in itself, not merely a secondary activity, because one of the purposes of courts is to create and maintain an official record of legal matters. Minimizing the cost of creating and maintaining the record was an original incentive for early case management systems. Development of standardized data exchanges between justice partners, as well as e-filing, have helped to minimize recordkeeping expenses.

As the court community has shifted its focus outward from internal operations to the interests of its stakeholders, a jurisdiction's cost minimization incentive is better customer service. This translates into maintaining the same quality of legal decision-making, but doing it more quickly from beginning to end.

Business Process Automation

Today, the focus of court case management applications is slowly shifting toward business process automation. The primary goal of these tools is to "replace human effort with machine effort" in order to automate repetitive, rule-based activity.[17] Traditional case management systems offered by the private sector often include some form of workflow — the ability to trigger multiple activities in the system from a single event.[18] This is a good beginning. Business process automation tools offer additional capabilities, but are accompanied by limitations that must be fully understood.

In order to automate court business processes, it is necessary to understand them in great detail. Success in applying technology to the work of courts is almost entirely dependent on how well processes are defined, understood, and managed. As the focus of technology solutions has shifted toward implementation of workflow tools and other forms of process automation, it has become apparent that the process knowledge of the judicial branch (as embodied in the software applications) typically is inadequate and is very far behind the private sector.

The business process automation approach, in the context of courts, is both simple and profound. The courts, like other organizations, are the sum of their operational, managerial, and administrative business processes. If they are to follow the example of the private sector, they must jettison the technology that is currently in place (the traditional approach to automation), and systematically analyze, optimize, and automate each business process with more advanced tools. This radical approach suggests a number of issues that must be considered, including the following:

[17] Dale Kasparek has ably noted that serious efforts to optimize and automate justice system business processes cannot exclude law firms. They share a stake in key business processes. While this paper touches very lightly on integration issues with institutional partners, it neglects to address integration with law office systems.

[18] Often business rules engines are included so users can maintain and update this process automation without relying on their vendor.

- Courts lack business process discipline. Some courts have made no attempt to even enumerate all of their business processes, let alone to document them. While some courts have done an outstanding job of documenting business processes on the clerical side of the operation, few have addressed courtroom operations in the same manner.
- Another aspect of business process discipline is variation in court operations. Each judge decides independently how his or her courtroom will be run, and each may have a different interpretation of how to apply court rules. Clerical operations may be very different from county to county in a state because of specialization and division of labor differences between courts of different sizes and the independence of elected officials. Court facilities and physical adjacencies often influence how staff and workflow are structured. Each court business process in a state may have dozens or even hundreds of local variations. This complicates the application of uniform tools and processes.[19]
- Court organization and structure is an inhibiting factor. In many states, courts do not have management control over the resources upon which they depend to do their work. Elected executive branch clerks are a prime example, but there are others.
- The work of courts is very complex. While a large, national corporation may focus on dozens of complex business processes, general jurisdiction courts will be required to address hundreds.
- There is also a great deal of overlap and interconnection between these processes, as well as shared management responsibility for inter-organizational processes, which adds layers of complexity to the problem. If a court were to begin, for example, by working on criminal case processing, it would immediately be faced with the need to see the bigger picture. For example, court scheduling in the context of a criminal case is similar to scheduling in other case types, but also has some very distinguishing characteristics. The optimal approach to case scheduling must consider the requirements of all case types, but this analysis will not be available if the court is focused on only one case type.
- Business process automation is most amenable to a single court, since enforcing uniform processes across large numbers of courts is not only nearly impossible, it is not even desirable given the legitimate differences between courts of different sizes that must be considered. Unfortunately, the cost and complexity of this undertaking are so high that it is probably not affordable for a single court, unless it is very large.
- Automation necessarily increases formal structure in the way work is performed, and this increased structure is seldom welcome. Change is always difficult.
- Case-centric process analysis does not always reflect the way that courts actually work. In reality, court workers perform operations on multiple cases simultaneously, particularly in high-volume courts. This is even true in the

[19] Variations in business processes should exist only when they enhance those processes, not when driven solely by the preferences or capabilities of judges and staff who do the work.

courtroom, where a judge may hold hearings that involves multiple cases and parties.

- Today, a court must start with a blank page in applying business process automation tools and techniques. If the development process lasts more than a few years, then the lifecycle of the application is shortened considerably and risk is increased, making the business case much more difficult to achieve.[20] This will be true until templates can be created for the judicial branch to relieve courts of some of this burden.
- Courts have been moving away from internally developed systems to vendor-provided software. As the case management system becomes more complex and as development tools are more difficult to master and require greater specialized knowledge, it is becoming more and more difficult for judicial branch organizations to maintain the levels of staffing and expertise needed to build and maintain systems internally.

It is clear that courts will not be able to apply business process automation tools in their work until they first address fundamental business process challenges. Operational optimization and increased business process discipline are a necessary first step if a court is to achieve success with business process automation technology. Also, the use of business process automation tools to create systems is neither simple nor fast.

The quality of court business processes can be assessed in four dimensions. These dimensions reflect the legal requirements imposed upon court processes; best practices that primarily relate to caseflow management techniques, but that also extend into other areas; the maturity of business processes with respect to the discipline (or degree of control) exercised in their management; and measures of business process automation. The components of this framework for assessing the quality of court business processes are described in more detail below.

Identify the Legal Foundations of Court Process

Court processes are based upon legal foundations of statutes, court rules, and internal operating procedures. Statutes and court rules provide legitimacy, consistency, and procedural fairness. Internal operating procedures evolve to accommodate changing circumstances in the court environment. Above all else, court business processes must be in harmony with the elements of its legal foundation.

Optimize Court Processes[21]

Optimizing court processes means ensuring that best practices for case processing are fully implemented. Caseflow management principles have been available to court leaders for decades. The High Performance Court Framework defines a more

[20] It has been said that implementing technology is like shooting at a moving target, and that if the target is moving faster than the bullet, there is little likelihood of success.

[21] See materials on the High Performance Court Framework, published by the National Center for State Courts.

accountable judicial branch that measures performance. The following list contains principles of process optimization suggested by the High Performance Court Framework.

- Maximize procedural certainty so parties will be prepared for hearings
- Minimize unnecessary extra events
- Minimize needless delay between court hearings
- Minimize the time required to process a case without sacrificing the rights of individuals or the opportunity for parties to collect, prepare, and present their evidence, testimony, and arguments
- Minimize the time, effort, and cost for a person to interact with the court
- Maximize the quality and availability of court information while minimizing the time and effort required to access and distribute it
- Equalize the workload among judges and among staff
- Exercise judge and staff work capabilities at their highest level
- Ensure that no work is done by a judge that could be done by a lawyer (with judge-developed checklists and active judicial supervision), that no work is done by a lawyer that could be done by a paralegal, and that no work is done by a paralegal that could be done by a clerk or case manager.

Build Process Discipline

Process discipline is concerned with management and standardization of court business processes (by eliminating unnecessary variation), and the organizational infrastructure supporting and enforcing court policies and practices. Process discipline for courts is based on principles of the Capability Maturity Model. The maturity level is high to the extent that a court does the following:

- Enumerate operational, managerial, and administrative processes
- Establish repeatable procedures for performing each process, using rigorous methods for the design of work
- Document operational processes fully and maintain the documentation
- Make the documentation easily accessible to all employees
- Train employees in performing duties (initial and in-service training)
- Hold employees accountable for following business processes (supervision)
- Ensure that automated systems are used consistently in all court locations to support performing the work
- Periodically audit employee and overall court compliance with processes
- Accommodate reasonable processing differences based on division of labor and staff specialization in courts of different sizes and locations (in multi-court jurisdictions and courts with multiple locations)
- Accommodate variation only if it provides tangible benefits, in terms of the effectiveness or efficiency of the business process in that particular location
- Document managerial and administrative processes
- Quantify the performance of individual business processes through automated metrics

- Conduct regular simulations and problem-solving exercises with performance data
- Use performance data to enhance and to optimize business processes.

Optimize the Fit between Automation Tools and Business Practices

Optimizing the fit between automation tools and business practices involves adapting the software application to the needs of the business, rather than forcing business practices to change due to limitations of the software application, even as business needs change over time. Examination of the issues listed below will help court leaders understand how closely automation tools fit with work being performed.

- The use of case-state flags to queue task execution by judges and court staff
- The number of steps and the length of time required to perform a process are reasonable
- The same information is not recorded multiple times in systems or on paper forms
- There are functions that the current system does not automate or does not automate adequately that should be addressed
- Information about all transactions is recorded in the system of record while the transaction is occurring, rather than additional work being required after the transaction is complete
- A complete and accurate record of all transactions exists in the CMS, the EDMS, and the paper case file (if it is still used)
- Court records can be accessed and understood by someone who is not a party to the case, a lawyer, or a court or justice system employee
- The CMS, EDMS, and case file entries are consistent within a case and across cases of the same type
- Workflow triggers, queues, or management lists guide the user from step to step in each process, based on statute, court rule, or business process, rather than requiring the user to remember what to do next
- Human effort is saved with current process design and automation tools
- No obvious improvements to processes or systems are needed.

PART II: CASE STUDIES

Phoenix Municipal Court

Overview

The Phoenix Municipal Court is an excellent example of building business process automation into a court case management system. It is a high volume, urban, limited jurisdiction court with 30 courtrooms processing roughly 350,000 cases (including 80,000 criminal cases) per year, with over 300 staff and judicial employees.[22] Jury trials are handled with a master calendar.

Like many courts, it has faced declining resources that have forced it to make difficult choices and to be creative in managing and automating its business processes. Over the years, it has created and refined a case management system that automates a great deal of the work of the court. This is a capability that all courts will need more and more in the future. The following is a description of the highlights and best practices of the Phoenix Municipal Court that other jurisdictions could emulate when automating their processes.

Background

The court began using automation in the 1970s. This consisted of a COBOL case management application that ran on a Burroughs mainframe, and a financial system based on a VAX minicomputer. These systems had some significant shortcomings. Entries had to be made in both systems, in different departments, and mistakes were often made. To note a payment in full, it was necessary to enter a SQL-like statement. Cashiers used the paper file rather than the case management system to determine what the judge ordered. Reconciliation of case and financial information was done in batch mode, overnight. While the court had good business processes, the work was very labor intensive and it was difficult to know if procedures were being followed.

The development of the new Phoenix Municipal Court CMS, which began in 1991, was driven by desperation, from a rapidly increasing caseload. Almost everyone recognized that automation tools were needed to support the volume of work. But, there were other issues. Personal preference in how work was to be done trumped management control in many parts of the court. Problems of ineffective automation tools, low business process discipline, and lack of uniformity made it difficult to keep up with the work and to improve how the work was done.

The court used the creation of a new computer application as an opportunity to improve business process discipline. Management commitment was required. IT governance was necessary to ensure that the computer-based tools met the business needs of the court. In order to do that, it was first necessary to figure out what those business needs were, and then to get a better handle on operations management. The goal of the court was to be fast, fair, and efficient.

[22] The Phoenix Municipal Court lost 48 of its 361.4 positions between 2009 and 2012.

Commercial systems that could work in the Phoenix Municipal Court were not available in the 1990s, so the court decided to develop the application in house. The creation of business analyst and technology positions in the court was a key step for the Phoenix Municipal Court. It was essential to have dedicated staff resources who could understand the business of the court, and to have them available to address its highest priority needs. Six analyst positions were created, plus a supervisor and an administrative staff person. A similar number of technical positions were filled.

Users were pulled into the design and development processes, which helped them to see the value of the new system in their work. A great deal of time was spent defining terms, business rules, and information needs. The users went back and shared their experiences with their coworkers, which helped to generate enthusiasm for the project and to allay concerns that are common to new system implementations. Little things, like providing appropriate space and equipment for the initiative also were helpful. These proved to be critical steps in the change management process.

It is interesting to note that the court began development of the new system with a data flow model, rather than with business process documentation. While this is not normally the recommended approach, it worked well for the Phoenix Municipal Court because the system that was produced was very successful.

One focus of new system development was an automated sentencing order. While judges were not as directly affected by court applications as was staff, they were required to make changes in the way they worked and to develop the capability to read system data. The judges proved to be able and willing to make necessary changes to ensure the success of the effort. The system was designed to allow some flexibility for judges to choose the order in which elements of the sentence would be addressed.

The main goals of new system development were the integration of case and financial management functions, and automation of as many of the manual processes needed to support two systems as possible. Another goal was to handle ever-changing criminal and traffic offense codes in easy-to-update tables.

As the initial system was delivered in December 1998, it suffered from some serious performance problems that required a lot of refactoring. Eventually, the system was stabilized and performance and reliability of the system has not been an issue for many years.

It is important to note that the new system was not developed overnight. In fact, it took many years to refine it, as the court learned, some staff retired, and other factors in the environment created a greater need for change. The court learned great lessons about leadership, technology governance, and business process management during the course of the project.

Unique Characteristics

Several unique characteristics of the Phoenix Municipal Court are highlighted in this section. Unique characteristics represent particular challenges or circumstances that

influenced the development of the solution, in either a positive or negative way. They include: 1) quality staff and judges; 2) operations management and system development; 3) the case management system that is used; 4) processes for managing courtrooms, hearings, and sessions; 5) financial management; and 6) protection order processing.

Quality Staff and Judges

Overall, the Phoenix Municipal Court staff and judges exhibit the high quality ideals that are essential to a successful court. Government organizations in Arizona are in a good position to hire and retain quality staff. Compensation and benefits are competitive with other market sectors there, which is not always the case in other states. The court has excellent leadership, management, and line level workers who are committed to doing their best and who embrace change and improvement. Also, the longevity of staff is an important factor. The court has had low turnover in key positions, in particular during critical stages of system development and process reengineering. Having high quality judicial branch employees facilitated the excellent work that was done.

Operations Management and System Development

The Phoenix Municipal Court's approach to managing operations and technology has been very effective. The court works as a multi-disciplinary team, involving technical and business experts from the appropriate parts of the court, depending on the issue. This approach has been institutionalized over many years, so it works almost automatically. It has also been extended by the court to relationships with justice system partners. While not all judges use the case management system extensively, many do. These judges are called upon to help find solutions when problems arise.

A good example of this was an initiative of the chief justice of the Arizona Supreme Court to reduce DUI case processing backlogs. This initiative imposed some very challenging goals on the court that could not be met without significant operational improvements by all of the justice system organizations.

The court convened a 2.5 day retreat for justice officials. They first identified all of the reasons why the chief justice's goals could not be met. They then discussed what they could do to solve some of the problems that were identified. Police officers and public defenders contributed some great ideas. The prosecutors then got involved. They found ways to quickly resolve cases that did not require a pretrial hearing. The police department found ways to speed up the production of accident investigation reports. With the reports in hand, it was then possible to take pleas at the first court date. They started using 'intelligent', rather than automatic continuances. They advertised the changes in the bar journal. Ultimately, the court extended the good ideas developed for DUI cases to other case types.

This systematic improvement through collaboration resulted in almost 80 percent of cases being heard on the first trial date. Of course, the court also established the necessary metrics so they could understand the effects of the changes that were implemented. Data for performance measurement are provided by the CMS, the

Quematic system in the customer service area, the call center software, and other tools used in operational areas of the court.

While maintaining and improving the business operation and the case management system do not require the same level of intensive commitment as the initial development phases, the court has learned that it is still necessary to devote significant resources to these activities because the environment is dynamic and change is constant. Novel ideas surface. Legal requirements change for the court and for justice partners. New technologies become available. New demands are placed on the justice system.

Case Management System

This subsection looks at areas where business process automation is very strong in the Phoenix Municipal Court, highlighting three particular functions: courtrooms, hearings and sessions; financial management; and petitions for orders of protection. This subsection will list some of the other unique features, though not in as much detail.

Most case management systems have the capability to create docket entries as a byproduct of other activities in the system, e.g., if a clerk schedules a hearing in a case, the scheduled date is also noted on the docket. The usual practice is to allow clerks to make free-form docket entries for matters of importance that are not automatically generated. In the Phoenix Municipal Court, all docket entries are generated when events are completed in the system. This provides complete control over the case history and ensures that the docket is not filled with overly terse and abbreviated entries that have little meaning to anyone but the person who made them.

In practice, this approach works very well, with a few exceptions. A fairly recent Arizona AOC Compliance Audit noted that "…the case management system does not include a screen where court staff can docket case notes, sentencing data, documents filed (i.e., motions, correspondence, etc.) and court responses (i.e., rulings). In lieu of an automated docketing tool, court staff currently use [sic] a manual docket sheet in the case file."[23] Sentencing information is, of course, in the case management system, but is not reflected in the docket text. It is a best practice for the docket to contain the complete case history.

The Phoenix Municipal Court case management system, like many systems for limited jurisdiction courts, does not allow multiple defendants to be entered into a case.[24] It does allow multiple charges to be entered for a defendant, which is somewhat unusual. Many municipal courts create separate cases for each count, which greatly increases the amount of paper to be generated, redundant data entry, and other work. In addition, the CMS allows sentencing on all charges in a single action (with up to five of them displayed), which is a great time saver.

[23] Phoenix Municipal Court Operational Review Evaluation, February 2010.

[24] Most commercial systems allow multiple charges per case, but many municipal courts that use those systems still create separate cases for each charge.

In practice, the entire court has not yet reached the point where paper has been eliminated in all courtrooms. The active session docket feature is used in some courtrooms, which allows the direct entry of data into the CMS while the judge is speaking. In other courtrooms, sentences are written down by the judge and are then entered immediately into the system by the bailiff. In criminal cases, some entries are made after the court hearing ends. This is important because cashiers must have access to sentencing information within moments of the end of the hearing, as defendants appear to make payments or to transact other business.

The court's goal is for the next generation of CMS to contain improved judicial and clerical interfaces that will solve the final few issues that make this operational redundancy necessary. It is important to note that only a very few municipal courts have successfully eliminated paper in the courtroom (except, of course, for necessary defendant copies), and that the Phoenix Municipal Court is more advanced in this respect than most limited jurisdiction courts.

An essential tool for high-volume municipal courts is the capability to perform certain tasks automatically on large numbers of cases, rather than requiring a staff person to individually access each case. This is an area where the Phoenix Municipal Court business processes and CMS excel. The system automatically checks for failures to appear and missed scheduled payments, and closes scheduled hearings and calendar sessions that have passed. Warrants for immediate issuance (and quashes) are automatically generated in a batch every two hours. Warrants that are based on FTA and compliance checks are generated in an overnight batch run. Proof of service hearings are automatically scheduled for certain case types if there is a failure to appear at arraignment. Referrals to collections agencies and the tax intercept program, data imports and exports, updates to financials, automatic dismissal of certain cases, and report production are performed as scheduled batches daily, weekly, or monthly. Cases for the next day are also prepared automatically.

Ensuring that separate identities are not created for the same person is likely the number one data quality issue in courts today. Robust business rules and tools are needed to help staff manage these important business processes, especially when data are received electronically from external sources. The Phoenix Municipal Court CMS has the necessary tools to merge and unmerge an individual's information in the system.

Another important aspect of the design of the Phoenix Municipal Court CMS is the user interface. It was designed to avoid unnecessary keystrokes with auto-fill fields, code value selection lists, and field formatting. Menu organization also was carefully considered to optimize navigation. On-screen help is provided to users, along with very sophisticated data validation that is sensitive to the case state. Workflow is provided to perform multiple functions from a single entry (such as the automatic creation of docket entries). The system remembers the case number from the prior transaction, to obviate the need to retype it over and over. Users also can copy and paste data from one screen to another. The goal was to make data entry as quick and easy as possible, and to eliminate the need for cheat sheets and other external tools. A case integrity pop-up

is provided to warn users about issues in the case that prevent it from being closed, such as scheduled events, money owed, outstanding warrants, etc. A case cannot be closed unless all appropriate issues are resolved.

In addition to the internal quality assurance provided by the CMS user interface, there are other tools to monitor data quality. There are seven audit reports that are run every day. All system activity is logged by each user. There are additional productivity reports, as well.

As previously mentioned, the improvements in operations management and automation have produced impressive results: almost 80 percent of trials occur on the first trial setting. With the new system, the time required to accept a payment was reduced from to three minutes from almost ten minutes. As a result, automation has reduced staffing needs in the court significantly — far fewer employees are required to do the work because the system automatically performs many routine tasks.

Courtrooms, Hearings, and Sessions

Calendar sessions are created for each courtroom, based on case type.[25] These calendar sessions have parameters that control how they are filled with scheduled hearings for cases. The number of hearings for a session depends on the average length of the hearing type and the amount of time available in the session.

A scheduling analyzer determines the best session in which to schedule a hearing. It considers the range of dates in which the hearing could be scheduled, the amount of open time remaining in available sessions, resources required for the hearing (e.g., interpreter, police officer, courtroom, attorneys, and defendants), etc. It checks to see if there are days when the participants will already be at the courthouse. Weights are assigned to each factor and points are computed for each possible session in which the hearing can be scheduled. The sessions with the lowest scores are listed first, indicating that they satisfy the most requirements. They also do load balancing to ensure that the amount of work is as evenly distributed between sessions as possible. Cases that are set for jury trial are weighted and distributed through a master calendar.

Cases are pulled into sessions prior to the hearing. There is a template for recording minutes of the hearing, and standard session information is provided so it is not necessary to repeat this data entry for each case.

Financial Management

The financial management component of the Phoenix Municipal Court CMS establishes financial obligations and applies payments to satisfy the obligations.[26] This includes partial payments and the creation of payment plans. Table values for standard revenue distribution are provided for all transactions. All distributions are recorded and can be reversed or adjusted, if necessary.

[25] By creating schedules for courtrooms, rather than for judges, the process of substituting a judge or using a pro tempore judge is made much easier.

[26] The Phoenix Municipal Court collected $45 million in revenue in 2010.

The system is sensitive to case state, so it takes into account the need to modify financial obligations based on case activity, such as adding fees for failure to appear or comply. Payment priorities are implemented. They allow overpayments on a case to be automatically credited to financial obligations of the defendant on another case. Financial obligations are presented to the cashier according to these priorities. If an overpayment is made for which there is no obligation to which it can be applied, there is a manual process for returning the overage to the defendant.

A final noteworthy feature is that during the sentencing, none of the entries are committed to the database before the process is complete and the entries are approved. This prevents a lot of thrashing in the system code when changes or corrections are made.

Petitions for Orders of Protection

Arizona law provides for many types of protection orders. These include domestic protection orders, injunctions against harassment, injunction against workplace harassment, seizure of firearms, exclusive use of the marital home, other protected persons, and custody of animals.

The court is currently working on a web-based front end for collecting data for orders of protection. The system collects the requisite information, produces orders, and tracks the progress of the case. Court staff assists parties with preparing documents before they go to the judge for hearing.

Exemplary Techniques and Best Practices

The following are the key practices, methods, and decisions from which other courts can learn from the experience of the Phoenix Municipal Court. They include the using business analysts and internal IT staff, maintaining a high level of business process discipline, having a strong leadership focus on court operations, operating a state-sensitive CMS, and using business process performance metrics.

Business Analysts

The Phoenix Municipal Court was one of the first to create business analyst positions.[27] Business analysts worked to define and document business processes and to identify and facilitate the correction of inefficiencies, inconsistencies, and other processing problems. This work was essential to building tools that would actually replace human effort with machine effort — the very definition of automation. Business analysts provided input into system design and could test the software that was created. They also could train users in modified business processes and the use of the case management application.

[27] It is important to note that business analysts come from the ranks of the best system users, not from the IT profession. This gives them the business sense that is needed to provide the proper input to technologists.

IT Staffing

It almost goes without saying that any attempt to develop court automation in-house requires internal IT resources. This includes both development staff and IT operations and support personnel. All courts outsource some of these functions, but providing committed, competent, and motivated personnel is a key to success.

Business Process Discipline

Successful organizations must actively define and manage the work of their employees. While courts are somewhat uniquely structured and managed, they also must have formal processes and management control if they are to operate efficiently. The Phoenix Municipal Court is an excellent example of judicial branch business process discipline. It excels because of both organizational and operational commitment to modern management and technology principles and practices.

Operational Focus

The Phoenix Municipal Court succeeded because it was not just looking for a computer system, it was trying to be a more effective court: fast, fair, and efficient. Technology was a facilitator of better operations management, not an end in its self. This kind of commitment must come from the top of an organization and must filter down through each of its levels.

Case-State Sensitive CMS

A key weakness of most case management systems is that they are not sensitive to the state of the cases that they contain. This makes enforcement of business rules difficult — a clerk can make any entry at any time, and the system will allow it. When searching for an appropriate code, a data entry person may have to sort through hundreds of possibilities, when only a handful may be appropriate for where the case is in the process. A case-sensitive CMS knows the circumstances of each case and filters processing and codes available to the user to reflect these possibilities.

The Phoenix Municipal Court has done an excellent job of making its case management system sensitive to the state of the case. This facilitates data quality, process efficiency, and operational effectiveness.

Performance Metrics

It is impossible to manage what you do not understand. Court leaders must know how business processes are performing if they are to optimize them. This requires detailed data for each of these processes, and the ability to make adjustments to system parameters to eliminate bottlenecks and to keep work flowing smoothly.

Most courts struggle with basic caseload, caseflow, and workload performance metrics. These broad, high-level indicators can highlight operational problems, but they lack the specificity to help leaders develop effective solutions. A presiding judge and court administrator may know that it is taking too long to process cases, but they cannot tell where the bottlenecks are located. The only data available to help them is anecdotal. Experience has shown that relying on this type of information is not very effective.

The Phoenix Municipal Court has excellent performance metrics in various places in the court operation, including customer service, the call center, and other judicial and clerical areas.

Remaining Issues

No system is every perfect or finished. The Phoenix Municipal Court still has work to do and problems to solve. One issue is that the nature of the technology used by the Phoenix Municipal Court makes it difficult to modify the system efficiently. Recent changes to scheduling and specialized dockets have illustrated this issue. There also have been a number of staff retirements in the last two or three years that have added to the difficulty of addressing system enhancements quickly. Newer commercial case management systems provide greater flexibility in configuring screens, data elements, data validation, business rules, workflow, data exchanges, and other functions in user-modifiable tables. The Phoenix Municipal Court CMS does not have this capability.

The current case management system is now almost fifteen years old. As the court has looked at replacement alternatives, it has been unable to find a system that offers the same degree of business process automation that exists in its current system. From a leadership and management perspective, the court knows much more about its needs than it did when developing the prior system. Certainly the business process discipline is much higher than it was a decade ago. System replacement will be a challenge, but one that will not be overwhelming, because the court understands its needs so well.

Key Players

Many individuals contributed to the success of the Phoenix Municipal Court over the years. While it would not be possible to list them all, the following individuals certainly understand the court very well and could provide additional information to interested courts.

Chief Presiding Judge Roxanne Song-Ong

Assistant Presiding Judge Eric Jeffrey

Municipal Court Executive Officer Don Taylor

Information Systems Officer Jennifer Gilbertson

Former Chief Presiding Judge Robert Dorfman

Former Municipal Court Executive Officer Jim Scorza

Former Information Systems Officer Ron Beguin

Michigan Court of Appeals

Overview

The Michigan Court of Appeals is as fine an example as we have found of business process discipline in the judicial branch, where court leaders have applied modern and innovative tools and techniques to operations management. It is an intermediate appellate court created in 1963.[28] At present, 28 judges sit state-wide and are elected or appointed from one of four districts.[29] The court sits in three-judge panels. The clerk's office has 42 staff located in the four district offices, and the research division has 41 central staff attorneys and supervising attorneys located in three of the district offices, not including part-time contract attorneys.[30] Case filings for 2012 totaled 6,267.

MAPPIS is the court's internally developed case management system. This software package is supplemented by other applications developed and maintained by the court's Information Systems department.

Background

The Court of Appeals developed standard business process documentation for most of its work in the late 1970s. This increase in business process discipline facilitated many other operational and management improvements that followed.

Compared to most general jurisdiction trial courts, the number of appellate court business processes is small. Most cases are handled in a similar fashion, with relatively minor variations. There is an intake stage, where all of the required resources (e.g., initiating documents, briefs, transcripts, and trial court records) are assembled. When the case is ready to be processed, it goes to the warehouse.[31] Eventually the case will move to the research stage (timing is dependent on resource availability), where it will be reviewed by a central staff attorney. After a research report and draft opinion are prepared by the staff attorney, the case goes into the judicial stage, where arguments are held, a decision is made, and an opinion is issued. Because of reduced staff levels due to budget constraints, not every case will have a research report and draft opinion; some cases are placed directly on case call, and the law clerk of the judge with primary writing responsibility prepares the report and opinion. Even though the number of business processes in the Court of Appeals is small, those processes are just as complex as those in any trial court.

The concept of management lists grew out of the desire to use automation to enforce court rule requirements. For example, when an appellant's brief was filed with the clerk, court rules provided a fixed number of days for a brief to be filed by the appellee.

---

[28] http://courts.mi.gov/Courts/COA/aboutthecourt/Pages/About.aspx

[29] By a statute enacted in 2012, the size of the court will be reduced to 24 judges through attrition.

[30] The court also uses approximately 25 part-time contract attorneys, most of whom are former research attorneys with the court.

[31] *Warehouse* is a term used by the court to describe a holding area for cases that are ready to be processed by research attorneys.

The case went on a list of cases awaiting appellee briefs. Many case management systems today provide "ticklers" to notify staff if the brief is not received on time. When the brief is filed in a timely manner, the tickler automatically disappears. The Michigan Court of Appeals created tickler reports, or management lists, showing all of the cases that were at various points in the process.

Over the years, the list concept was expanded to include areas that were not subject to specific deadlines in the court rules. Many lists came and went. Eventually, a list was created for every stage of processing and for every major exception condition. It is now even possible for a case to be on more than one list, such as when a motion is filed on a case that is in the research stage, or when both a docketing statement and transcript are overdue. This process culminated in the development of a list for cases that were not on any other list. Court staff is able to locate any case in the appellate court process at a very fine level of detail, based on the next expected action, and to determine how long it has been there.

The court also developed business rules concurrently with the creation of management lists. These rules are attached to the lists, along with case flags and properties, and define when a case should be placed on the list.[32] As the lists have been improved over the years, the business rules also have been adjusted and refined.

A COBOL mainframe application was developed in-house to support the work of the court in the 1970s. This package was used until Y2K concerns led to the development of MAPPIS, which was implemented in 1999. MAPPIS was designed using classic ASP and an Oracle database to support business operations in the Court of Appeals. Currently, the court is in the process of migrating MAPPIS to the Microsoft .Net platform and SQL Server database. During this lengthy transition, the applications actually write to both the old and the new databases.

MAPPIS contains robust document and e-mail generation capabilities, which is a typical need of appellate courts. The court also employs e-filing on a voluntary basis and has experienced a high level of participation. All documents for the case call are scanned, if they were not e-filed, and linked to docket events in MAPPIS. Most judges and staff work from electronic versions of documents, but a few still rely on paper files. Many judges download the materials for case call and motion dockets (e.g., the parties' pleadings/briefs and internal staff reports) onto their iPads where they can be read, edited, annotated, and shared electronically with other judges on the panel. It is not unusual for the judges to have only their iPads, and no paper files whatsoever, on the bench during case call.

[32] Flags are used, for example, to denote characteristics of cases, not unlike subtypes in a trial court's case management system; up to four flags may be defined on a case. Properties are stored in a table in the database and contain a history of all of the state changes in the case. This information is invaluable for performing analysis to support the optimization of business processes.

Unique Characteristics

Two characteristics of the Michigan Court of Appeals stand out: very strong management and information technology capabilities, and a very high level of business process discipline.

Strong Management and Information Technology Capabilities

The court has a culture of innovation and cooperation, along with a high level of vision and competence in its judges and staff. There was no conscious effort to implement private sector quality control methods and no grand reengineering initiative – only a long-term, incremental approach to gradually improving the way the court works. Over time, the chief judges of the court have been supportive, staff has felt empowered, and everyone has worked together. It is a well-organized, well-run operation that is, to an outsider, quite extraordinary.

Leaders of the business units (research and the clerk's office) have a tremendous amount of discretion in organizing their operations to be as effective and economical as possible. All parts of the court organization communicate and work together very well. Staff of the Information Systems Department and its leadership must be recognized for having the vision to build a responsive and flexible system that can be easily molded over time to accommodate changing court rules, caseloads, demographics, district geography, and court policy. Judges are generally willing to try new technologies and processes, but are focused on their most important mission – issuing correct and well articulated decisions in cases. This has not been easy with changing caseloads, tight budgets, and political pressure to cut operational costs. Even line-level clerical staff members who are relatively new to the court seem to be well-trained and understand their roles and responsibilities thoroughly. They are much more than data entry operators; they must understand all aspects of case processing in the court.

High Level of Business Process Discipline

It is hard to imagine a court having a higher level of business process discipline than the Michigan Court of Appeals. While the definition of business practices and management control of their execution has been achieved by many other courts, very few have the business process performance data available in this court, and even fewer use that data effectively in optimizing process performance.

In observing the court in action, one is reminded of an emergency room in a hospital. It seems that every aspect of the operation is constantly monitored. While it lacks the blinking lights and beeping alarms of a hospital facility, the court has an incredible amount of data. Triggering events take into account buffer time to ensure that delays in processing do not unfairly cause disruptive actions. They run all kinds of statistical reports that help them see exactly what is happening and where – right down to the performance of individual employees.

Many courts have performance data on overall case processing activities. An important lesson for other courts is the ability of the Michigan Court of Appeals to understand the performance of each individual business process – how long it takes a case to move

from one step to the next. This information can be analyzed by various case properties, e.g., comparing briefing times between domestic relations and general civil cases, measuring time to issue an opinion in cases for which a staff attorney prepared a draft opinion and those for which a draft was not prepared, and analyzing the number and ages of cases being warehoused in the four districts to determine the number of future case call panels to schedule in each courtroom location.

Exemplary Techniques and Best Practices

Several lessons can be learned by other courts from the Michigan Court of Appeals. First, it is important to define case states in the business process model to determine where a case is and how long it has been there.[33] Second, good management requires the ability to aggregate the state of all cases. Third, comprehensive business rules must be in place to define case state and to control the flow of work. Fourth, case properties are essential for two reasons: to analyze cases in logical groups, and to maintain a state change history for analysis and operational optimization. Fifth, it is necessary to implement all of this in a case management system.

Case State

Most court case management systems track the status of a case. These case status indicators may be as simple as *open* and *closed*. They may indicate whether a case has been disposed but is still open for post-judgment proceedings, or whether it is in inactive pending status because of a bankruptcy stay, issuance of a bench warrant for failure to appear, etc.

A more detailed case state offers many advantages. It can restrict the options that are available to court workers, e.g., a clerk would only see the four or five valid docketing codes for a case at certain point in the process, instead of being required to sort through hundreds of possibilities. The case management system would not allow an inappropriate event to be scheduled, e.g., a pretrial hearing in a case that has already been disposed. When implemented in a state-sensitive case management system, a detailed case state could save effort and improve data quality.

Of course, it would be necessary to develop processing models for each case type in the court in order to use the case state effectively. Certainly case state should be driven by the key milestones in a case, which are usually defined in court rules. Once a case passes one of these milestones, it would be unusual (but not impossible) for it to revert to an earlier processing point.

The granularity of the case state is an issue. If a criminal case, for example, were awaiting arraignment and a motion was filed by the defense, would that constitute the same state as a case in which a motion was filed after the arraignment was held? Perhaps a multi-level case state could solve this problem, indicating that the state of the case was *pre-arraignment with motion pending* or *pre-trial with motion pending*.

[33] While the Michigan Court of Appeals did not invent the concept of case state and does not even use the term, it has effectively implemented the concept in an exemplary manner.

Another important question is how to characterize the case state. The Michigan Court of Appeals focuses on the next likely action with its lists, but a court might instead consider driving the case state from the last completed action. While either could work, one method might prove to be less confusing in a trial court where there may be many more possible next events.

Could a case be simultaneously in more than one state? In a child welfare case, for example, would the case state follow the parents or the child? In a multi-party case, what if individual parties were at different points in the process? Clearly a court must think through all of the possibilities, as the Michigan Court of Appeals has done in building its management list system.

The Court of Appeals also has shown that it is not enough to know exactly where a case is in the process — it is also essential to know how long it has been there (by storing dates) and how it got there (by storing history). This implies keeping a record of state changes and other properties. These issues will be discussed later in this document.

Management Lists

Management lists are a way of looking at case state across a large number of cases. As mentioned, this can highlight case processing and data quality issues. At some points, a list is also like an operational work queue — it shows that someone must take a specific action on the cases in the list. Case state is really a byproduct of managing the flow of activity in case processing through lists.

The following is a list of the management lists currently available to court leaders in the Michigan Court of Appeals:

- List 1: cases not on any other list
- List 6: cases with no docketing statement
- List 9: cases with no transcript requests
- List 11: cases with late transcript – warning
- List 14: cases with transcript due, dismissal warning, not yet submitted
- List 15: cases with appellant's brief overdue
- List 16: cases with cross-appellant's brief overdue
- List 17: cases in settlement conference
- List 18: domestic relations cases in settlement conference
- List 19: cases with involuntary dismissal letter sent
- List 20: cases ready for noticing
- List 21: prosecutor appeal cases with appellee brief due
- List 22: cases with appellant brief overdue and notice due
- List 24: cases with record overdue
- List 25: cases with record show cause
- List 26: cases with level one record request
- List 27: cases with outstanding motions, not submitted
- List 28: cases with outstanding submissions, no order
- List 29: applications 90 days old

- List 30: involuntary dismissal docket, no order
- List 31: cases with rehearing not submitted
- List 32: cases with rehearing motion, no order
- List 33: cases with stipulation to dismiss, no order
- List 37: cases held in abeyance
- List 39: monitored cases
- List 40: TEMP cases needing review
- List 41: HOLD cases needing review
- List 50: remanded cases
- List 52: remanded cases to appoint new counsel
- List 53: cases with post-judgment motions overdue
- List 54: priority cases ready for research
- List 57: cases ready for research
- List 58: cases at research
- List 58A: cases at summary commissioner's office
- List 59: priority cases in research
- List 60: cases at commissioner's office
- List 61: cases ready for call but not noticed
- List 62: cases ready for case call
- List 72: cases on case call
- List 72A: Headlee cases on case call
- List 80: cases applied to Supreme Court and not closed out at Supreme Court
- List 85: cases remanded and record not returned
- List 87: status and close order of case inconsistent – reopened cases
- List 88: status and close order of case inconsistent
- List 89: cases closed by order, record filed
- List 90: cases closed by order, record not filed
- List 91: cases closed by unpublished opinion
- List 92: cases closed by published opinion
- List 95: cases inactive for six months

Some lists serve as quality control points — when data indicate an inconsistency between where a case is and where it logically should be, it is placed on a list for manual inspection. Most lists indicate that some action is required by someone in the court. In this respect, they function as work queues that are common to many systems.

Business Rules

Each of these 49 lists has business rules associated with it. Most are quite lengthy; the following example is one of the shortest, since rules for list 20 also are considered:

List 21 – Prosecutor Appeal Cases with Appellee Brief Due (cases will appear on this list, instead of list 20, if)

- The case is a prosecutor appeal case (PA in case flag) and the appellee counsel type is APP or SADO and the appellee brief has not been filed.
- A non-defective appellant brief has been filed and

- The appellee brief has not been filed, and
- At least 35 days have elapsed since the later of the following (if they exist)
  - Service on the appellee of the appellant brief
  - The extend-to date of any non-vacated order or stipulation extending time for the appellee brief
  - The "inside date" (proof of service date) of the "LCt Order – Appoint AE Atty"
  - The Proof of Service of an event "Proof of Service – AT Brief" if it follows the item above (LCt Order – Appoint AE Atty).
- The case has not already been noticed
- There is no Involuntary Dismissal (Invol Dismissal Warning – No Appellee Brief – Appointed Counsel for AE) that was filed after the due date of the appellee brief. Filters on this list do not need an expiration date. If a case is noticed after being filtered on, the Filter On entry will be nullified. This action will be noted in the comments for that docket entry.

A review of the lists and of a sample of the business rules shows that court leaders have access to an incredible amount of information about where cases are in the appellate process. It allows them to understand how business processes are performing at any time and to make adjustments easily, since all of this is built into the case management system. Optimization decisions are data driven and business rules can be easily modified to solve problems.

Case Properties

The case properties table contains key information about the case and case processing. For example, elements of the case properties table indicate if the case is an adoption case, a general civil case, a custody case, a delinquency case, a termination of parental rights case, or a worker's compensation case. The flags can be used to examine differences in processing and processing times for these case types. In addition, key events in case processing are recorded, e.g., all transcripts satisfied, appellant brief filed, appellee brief filed, docketing statement filed, lower court record filed (and returned), research complete, case closed, and case reopened. Also, the table contains information about processing steps, e.g., applied for leave to appeal with the Michigan Supreme Court, evaluated by commissioner, expedited case, and research evaluation date. In total, there are 129 fields for recording information about the case. While this information is used primarily for case processing, it is a gold mine of information about the performance of individual business processes in the court.

Users cannot directly manipulate this data. As with the placement of cases on lists, updates are driven by operational tasks performed by the clerks. Case state changes are automatically and permanently recorded in this table in the form of dates that key activities were completed.

Automation Support

In order to achieve successful business process automation, a court must exercise complete control over its case management system and other applications. MAPPIS is a

custom system that is completely integrated with the work of the court. This is essential in collecting, processing, and understanding the data about the performance of individual business processes. It is also necessary in easily implementing change. For example, amending system business rules that govern when cases move from list to list and adjusting how resources are allocated to performing work.[34]

Remaining Issues

The current challenge facing the Michigan Court of Appeals relates to maintaining the existing technological infrastructure even as new technologies are being introduced. In addition to maintaining MAPPIS, the Information Systems Department is working on a number of projects including enhancing the functionality of MAPPIS, integrating a new e-filing system, and migrating the file and print system to a more efficient platform. The NCSC observed that the pace at the court is intense and everyone works hard to achieve the goal of producing high quality decisions and opinions in a timely manner.

Key Players

The following individuals play or have played key roles in the development of the management and technology innovations in the Michigan Court of Appeals:

William B. Murphy, Chief Judge

Jerome W. Zimmer Jr., Chief Clerk

Denise Devine, Director of Information Systems

Larry Royster, Supreme Court Chief of Staff (former Chief Clerk/Research Director for Court of Appeals)

Sandra Schultz Mengel, former Chief Clerk

[34] The NCSC discussed a specific example with staff of the court. Research on certain cases is performed by staff attorneys, while this work is performed by research attorneys for other types of cases. When a backlog develops in one of these areas, managers can divert some case types in the other direction to balance the work and to give staff more time to eliminate the backlog.

Judiciary of Puerto Rico

Overview

The Commonwealth of Puerto Rico is a territory of the United States located in the northeastern Caribbean. The island of Puerto Rico is approximately 5,320 square miles, and there are a number of smaller islands that are a part of the commonwealth. The population was estimated to be 3,667,084 in 2012. The official languages used in Puerto Rico are Spanish and English.

The Judicial Branch of Puerto Rico consists of a supreme court (nine justices), a court of appeals (39 judges), 13 superior courts, and 78 municipal courts. The chief justice of the Supreme Court is responsible for the uniform administration of the judicial branch.

The courts have used a number of internally-developed case management systems over the years, but are currently developing SUMAC to replace all of the older systems. The approach to SUMAC development is the focus of this case study because of the innovative techniques that have been used.

Puerto Rico is a laboratory where tomorrow's technologies are being tested today. SUMAC development has heavily influenced the National Center for State Courts' next generation of standards for technology initiative.

Background

Planning for SUMAC development commenced in October 2007. The first step was to define the scope of the project, including boundaries, inputs, outputs, rules, etc. An extensive analysis of the constitution, statutes, and court rules was undertaken to identify all of the business requirements that they contained. A number of very large documents were produced, with hundreds of pages of spreadsheets that contained this analysis.

At the same time, it was necessary to build the organization and staff capabilities to do the work, and to acquire the tools and methodologies that would be needed for the initiative. At the time the project began, the Puerto Rico courts were at level one of the capability maturity model. They were not process aware and a common language of communication did not exist between the court staff and the technology team. It was not possible to consult business process documentation to discover how the work of the courts was performed, because it did not exist.

The existing court applications that support the work of the courts had to be kept operational during SUMAC development and implementation, so few internal technology staff resources were available. The court selected MetaStorm (later acquired by OpenText) as its primary provider of business process automation software. In addition, the court has contracts with many other companies to support various parts of the project.

The administrative office of the courts developed a team of business analysts from the various courts to begin the process of understanding judicial branch operations. Much

work was done in pilot courts, and focus groups were convened throughout the island. It took years to develop the internal expertise required to create SUMAC.

SUMAC requirements development began in March 2010. An AGILE approach to development was used — a system was created from the initial requirements, and then testing of the application revealed issues that resulted in additional requirements.[35] Many thousands of requirements were developed in creating the criminal module of SUMAC. In fact, refinements continue to be made as the criminal module is implemented in more courts. It is anticipated that work on the criminal module will be completed in 2013. Other modules have been developed and implemented for municipal drug courts and for child welfare cases.

Development of the criminal module first focused on the initial appearance (Rule 6 hearing), the arraignment, and the trial. An application to support Rule 6 hearings was implemented in the city of Humacao in November 2010. It took several months to stabilize this application. From April through December of 2011 the technical team focused on integration — primarily the receipt of documents from the prosecutor to support this event.

It quickly became apparent that implementation could not proceed with just these three hearings. It was necessary to address motions hearings, case consolidation, consultations, and other minor components before the system could be fully functional.

By September 2011, most of the processes were installed and running successfully in Humacao. Work then began to implement the system in other courts in that region, followed by implementation in other regions: Fajardo, Carolina, and San Juan, followed by Bayamon. Appellate court notification also will be added this year, along with work on the civil module. E-filing also is being implemented.

Development went much slower than planned. It turned out that the technical team provided by the vendor was too small. It took many months to get to critical requirements programmed, which caused delays and frustration. Gradually, the work was moved from vendor staff to internal and external technical people in Puerto Rico. This proved to be much more efficient, but it took some time for local staff and contractors to learn to use the tools sufficiently well to be productive. Local external teams developed the drug court and child welfare modules.

Overall, the cost to develop the criminal module using this approach was about $4.4 million dollars.

Unique Characteristics

Three characteristics stand out in Puerto Rico's use of business process automation tools and other advanced technologies. First, the governance and planning structure and process evolved over the life of the project. Second, the development of a higher level of business process discipline was essential – how could a court automate business processes if those processes were not defined and understood? Third, modern software

[35] See Section VII.D.3 Business Process Automation Tools for a discussion of agile methodology.

development processes have great strengths over traditional methods, however, they also have inherent weaknesses. Those weaknesses must be understood and managed if a project as large and lengthy as SUMAC development is undertaken.

Governance and Planning

It must first be said that the chief justice of the Supreme Court has made SUMAC development one of his highest priorities. He has remained engaged and supportive throughout the years of system development. He and the state court administrator have provided the kind of executive support that is essential to success. Everyone in the judicial branch, from top to bottom, has been required to change the way that they think and act. The change process has been, at times, painful and disruptive. Without strong leadership, it never could have succeeded.

The Agile software development approach has been somewhat problematic for court leadership. Agile and other spiral development methodologies have been touted as providing 'more bang for the buck.' Critics charge that while this is true, you don't know when you will hear the bang or how many bucks it will cost. Planning software development using iterative methodologies is very difficult. It is impossible to predict how many construction cycles will be needed to complete a job. At times, the patience of court leaders in Puerto Rico has worn thin with missed scheduling targets. The complexity of court operations also was underestimated, but court leadership persevered.

The court chief information officer (CIO) brought the necessary vision to the project. While no one fully appreciated the magnitude of operational changes that SUMAC would necessitate, the steady vision and sound understanding of leading-edge technologies also were key elements of success. Without the necessary vision, the SUMAC initiative would have run into insurmountable obstacles. More pedestrian issues, like how to plan, how to get vendors on the same page with the courts, and how to hold effective meetings, consumed a great deal of time. The combination of skill sets of the court CIO that enabled the progress that has occurred are rarely found in a single individual.

Decisions about operational changes could not be imposed by the Supreme Court or by technologists, but greater management, engineering, and planning discipline were required in the court organization. It was necessary for judges and staff to work through these issues to find the best solutions. Often this process required months of effort and, sometimes, a lot of backtracking. In the end, the participation of judges and staff in the development process paid off. They now think more carefully about their work and make valuable contributions to reengineering efforts.

Court leaders in Puerto Rico appreciate what leading courts throughout the country have long understood: it is necessary to dedicate resources to business process management if technology initiatives are to produce operational efficiencies. Creating both business analyst positions and business groups of court employees provided the institutional knowledge required to optimize and to automate business processes.

These people worked out a common language and business process definitions that are the foundation of SUMAC. Circles of excellence will be used to continue to refine and improve SUMAC in coming years.

Business Process Discipline

A uniform automation solution for courts requires fairly uniform business processes, even in courts of varying sizes, where differences in division of labor and staff specialization can radically alter optimization factors. Conditional branching in programs can support variation, and processes can be copied and modified when there is a legitimate need for a different way of conducting business in a location. But as a whole, process variation is the enemy of successful automation because of the exponential increases in complexity that it creates. It must only be allowed when required to provide maximum effectiveness and operational economy in different courts. It cannot be driven by personal preference that is not supported by sound analysis.

It is almost paradoxical that the device that created an extraordinary amount of work for judges in Puerto Rico also produced a fairly high (and almost accidental) level of uniformity in criminal case processing. The detailed forms that judges must complete at each of the key hearings have produced uniformity in operations that was never attempted by organizational, managerial, or policy means.

Key elements of business process discipline are measurement and optimization. Prior to SUMAC implementation, no data was available about the performance of individual business processes. Overall caseload, caseflow, and workload data also were limited. Consequently, there is little baseline data to use for comparison with operational information that will be provided by SUMAC. Given the rush to complete implementation of the criminal module, and to develop and implement the civil, family, and traffic and other case modules, it does not appear that much attention has yet been paid to these issues. SUMAC certainly is capable of providing appropriate data, once court leaders are ready to address these issues.

Development Process

The difficulty of planning when using iterative methodologies has previously been discussed. This has been a difficult issue for court leadership in Puerto Rico, but progress is being made and the system is being implemented in many courts throughout the island. Other issues also have proven problematic for court and technology leaders.

One problem was whether to use internal or external resources to develop SUMAC. The courts of Puerto Rico have relied heavily on consultants to supplement their own staff resources. This works very well when a particular type of expertise is needed only for a short period of time. While the courts may pay a little more to acquire this expertise from the private sector, they are not saddled with long-term expenses for employees whose skills will not be needed in the future. With respect to SUMAC development, there has been a gradual transition from reliance on external contractors on the mainland, to local vendors and internal staff. Maintenance of SUMAC will be an ongoing

issue and the courts must have this capacity. It takes a great deal of time for a court programmer to gain the same level of skill with a software tool that is possessed by the company that uses it continuously, hence the initial reliance on the MetaStorm/OpenText team. As older applications are phased out, more technical staff will become available to support SUMAC.

Another issue is the structure of the solution created with business process automation tools. These systems are designed to support individual processes, e.g., rule 6 hearings, arraignments, and trials. As the software for the first hearing was completed, it was implemented in the pilot site. This allowed the court to test the application thoroughly, but it also created new problems. When the case moved beyond the initial appearance, the older case management system was used. Much of the information entered into the new application had to be reentered into the old system — this redundant data entry stretched the capabilities of staff who were already struggling to learn (and to help debug) a new system. As other components were added (arraignment and trial), similar problems were realized. If a motion were filed, for example, there was no way to process it in the new system, so the court had to revert to the old system with that case. In a sense, the courts used a 'spiral implementation' process, in addition to their spiral development process.

A final development process issue has yet to be addressed. Although the court focused its attention primarily on criminal cases, components were built (e.g., scheduling, docketing, document generation) that will be shared with civil, family, traffic, and other case types. Certainly scheduling in civil and child welfare cases is much different than for criminal cases. Party and attorney information also may be more complex. Agile development operates under the assumption that if something does not fit the needs of the user, the developers will go back and start over. As SUMAC becomes larger and larger, there may be a practical reluctance to re-create these components, ending in a less than optimal solution for these case types. Another possible outcome is that the common functionality will not be treated as common – the court will create a separate scheduling capability for civil cases, for example. This would be redundant and wasteful.[36]

These are difficult decisions that require balancing the costs and benefits of each approach. A more strategic approach to planning and design may have obviated the need to address some of these issues, but it also would have delayed the production of a tangible product that would be of value to the court.

[36] A similar issue is database design. An initial design was done, but it was heavily modified as the SUMAC criminal module was developed. As new modules of SUMAC are developed, there will be questions about optimal data structures. What is best for criminal may not be best for other case types. It will be interesting to see how far the courts are willing to go in refactoring the criminal module to fit with database changes needed for other modules.

Exemplary Techniques and Best Practices

It is not possible to explore all of the interesting and innovative tools and techniques used by the courts of Puerto Rico in developing SUMAC. This case study will focus on four: the top-down and bottom-up approach that was used to define and develop SUMAC; automation of the work of judges; the use of business process automation tools, and integration issues.

Top-Down and Bottom-Up

As previously described, the courts began SUMAC development with an analysis of the constitution, statutes, and court rules to discover the scope of the automation efforts, including the constraints on business processes and information flow. This is the top-down view. This very comprehensive and thorough study provided an education for the technical staff in how courts operate and defined SUMAC's structure and operation.

For example, the spreadsheet for family cases listed each applicable legal reference to case processing in a row, and provide the following information in columns for each row:

- Action
- Effect of the action on:
  - Changing the state of the case
  - Producing a requirement for the court to notify parties
  - Producing a requirement for a party to notify other parties
  - Ending the processing of the case
  - Completing a business process
- Use of discretion
  - Does the court have discretion to take this step?
  - Is taking this step required by law?
- Reference (citation) for the provision in the constitution/law/court rule
- What medium is used to perform this action (e.g., form)
- What party or actor in the case performs this action?
- Notes related to the action

The structure of the spreadsheet for each case type was similar to the family case spreadsheet Described above.

The bottom-up view within this framework utilized the business analysts, groups of judges and court staff, and focus groups to create SUMAC requirements. It was a zero-based approach; older case management systems were not used as a basis for analysis and design. Judges and staff meticulously documented every step that they take in moving cases through to completion.

Start with the Work of Judges

It is important to note that SUMAC is an application that automates the work of not only the clerical staff, but also the judge. SUMAC is much different than any case

management system used in any other court for this reason. It is much more than a judicial view of the case or a judicial dashboard.

The work of judges in Puerto Rico is much different than in other states. Prior to SUMAC implementation, judges were required to complete very extensive forms for everything that they did. Each charge was a separate case in a separate folder. For each charge, it was necessary for the judge to mark on a form that the various elements of each offense were proven by the testimony of a specific witness. For example, if witness testimony referred to three charges for three defendants, the judge was required to fill out nine forms and mark the elements of the offense proven for each witness who testified. Witnesses are brought to each of the three hearings: the first appearance (rule 6 hearing), the arraignment, and the trial. The paperwork burden placed on judges in Puerto Rico is incredible. SUMAC allows the judge to record this same information once and apply it to each appropriate charge, defendant, and case.

Some would argue that the work of judges is too complex and variable to automate. The Puerto Rico courts are proving that this is not true. While much of the content of cases is very complex, the structure of court hearings and other activities is formal enough that information can be presented, decision making can be facilitated, and a record of the proceeding can be made with far less effort than with current methods. Even in the judicial arena, it is possible to replace human effort with machine effort. Judges should not be required to search for information, to fill out forms, or to write and stamp documents.

Business Process Automation Tools

Business process automation methodologies are not a magical answer to all technology problems. They are an incremental improvement in tools to marry automation to business processes. It is important to understand both their capabilities and their limitations.

Business process automation tools are designed to automate individual business processes. The goal is not to provide end-to-end automation of everything that the court does, but to optimize and automate selected functions. Of course, there is a lot of redundant activity in business processes, so there must be a way to reuse software capabilities instead of reinventing them. In most general jurisdiction courts, there will be hundreds of processes that require automation. The complexity will not be in the size of the applications, but in their number.

The starting point is a flowchart. This is not exactly the same as a business process flowchart, but it is similar. This flowchart must represent what the system does, not what all of the people do. Creating the detailed, accurate flowchart is definitely the most difficult part of the process.

The BPA system then uses the flowchart to generate the computer code for the application.[37] Today's tools do not create everything that is needed, but they are pretty thorough. For example, if there is a conditional branch in the flowchart – a decision point – it may be necessary for a programmer to write the code to represent the logic of the decision. If this condition exists, follow path A. If it does not exist, follow path B.

Perhaps the greatest capability of business process automation tools is their flexibility. If the business process changes, update the flowchart and regenerate the code. There is little advantage to using business process automation tools to build a system that will never change (built to last). The genius of this approach is apparent when modifications are required (built to change). Courts do not fully understand their automation needs, so it is not likely that the initial version of a system will ever be adequate. System refinements may go on for years before the system becomes stable. In addition, the environment in which courts operate is dynamic. Every year, new laws and court rules create headaches for technicians charged with maintaining inflexible case management systems. BPA tools can relive much of this stress.

Business process automation tools create custom solutions for courts. Creating custom systems is desirable because it is the best way to meet the needs of a court. It is also the slowest and most expensive approach. BPA does not reduce the size of applications or the amount of code that must be created. It does increase the quality of the solutions (with good architecture and design) and it provides superior flexibility.

It is important to note that BPA tools can work well with either agile (iterative) or waterfall (traditional) design and development methodologies, but they are most typically used in the agile environment. Agile software development is different from the traditional waterfall approach, and developers must be trained and competent in the methodology for it to be effective. It may be helpful to define these terms more completely.

Waterfall methodologies: Waterfall methodologies are generally a sequential software development process.[38] One step follows the previous step. Typically these steps usually include conception, initiation, analysis, design, construction, testing, implementation, and maintenance. The advantage of this approach is that spending sufficient time in early stages can save a great deal of time in later stages. With adequate experience, it is easy to plan and estimate needs. A good set of blueprints makes it much easier to construct a building. If the court knows and can clearly articulate exactly what it wants, then the waterfall method is the superior approach.

The problem is that courts usually do not always know what they need and cannot articulate those needs clearly, because court employees are not software designers and

[37] It is interesting to note that the roadmap for the OpenText product used in Puerto Rico will provide several interesting features in the future: the ability to write the same feature for English or Spanish, the ability to display documents within the application, and built-in support for mobile devices.
[38] http://en.wikipedia.org/wiki/Waterfall_method.

usually are not experts in business process management. In this environment, waterfall methodologies can lead to disaster.

Agile methodologies: Agile approaches are different.[39] They are iterative and incremental. Requirements and solutions evolve through collaboration between developers and users. Tasks are broken into small increments that can be addressed in one to four week timeframes. Each iteration of code involves all of the planning, requirements analysis, design, coding, and testing steps. Users get nearly immediate feedback on information they provide — they get to see an improved version of their system every few weeks. Developers also get feedback as they present an evolving prototype of the system. The agile collaboration definitely gets more out of users and developers – they see and understand their application as it is being constructed. Agile methods are preferred if users do not know or cannot articulate what they need.

As previously mentioned, agile methods can be very frustrating from a planning and management perspective. It is impossible to say how many construction cycles will be required to complete a project. It is difficult to know how long it will take and how much it will cost to complete a system. What can be most frustrating is when a problem surfaces that requires foundational changes to the application — at some point it becomes impractical to start over, even if that is the only viable option. While many developers prefer agile methods, most organizations prefer an approach that takes advantage of the strengths of both the waterfall and agile approaches.

Business process automation tools and agile approaches will not save a court time or money, but they will deliver a better product, one that is much more flexible in the future.

Integration Issues

Every court faces issues with the varying levels of technology and business process sophistication of its justice partners. This is especially true in Puerto Rico. SUMAC has been built to rely upon the receipt of electronic documents and data. Unfortunately, all justice organizations are not in a position to supply them. Many agencies are reluctant to change the way things have traditionally been done, referred to locally as 'the path of the goat.'

A CJIS[40] organization is in place in Puerto Rico and the courts have been required to do a lot of work to support this agency. Some law enforcement agencies have great technology, but connecting and sharing data has been extremely challenging. In some cases, the courts are using scanning and intelligent OCR[41] to process the paper that they receive.

[39] See Wikipedia article: Agile software development.

[40] This acronym refers to an integrated or criminal justice information systems, which is more than a system, it is an initiative to get justice system leaders to work together to exchange information electronically.

[41] OCR stands for optical character recognition – a technology that turns scanned images into typed text.

Remaining Issues

The rapid pace of development has led to many shortcuts in the process, with respect to implementation of criminal system modules. The development of civil and other case types while the criminal module is still being implemented will present some challenges as staff resources are further diluted with more and more to do.

It will be interesting to see what kind of refactoring of the criminal system will be required as other modules are implemented. Certainly, lessons learned and capacities developed thus far should make the work on other modules go more smoothly.

Finally, the Puerto Rico courts face a similar problem to that faced in California with CCMS. If a product takes too long to complete, it may be obsolete before implementation is finished. If it requires another four or five years to finish and implement the other SUMAC modules, the useful life of the software may become an issue. Of course, the flexibility of the business process automation approach may allow updates and improvements to be made more easily, which could extend the life of the software considerably.

Key Players

Key players in the SUMAC initiative in Puerto Rico are:

Federico Hernandez Denton, Chief Justice of the Supreme Court

Sonia Ivette Velez Colon, State Court Administrator

Felix Bajandas Lamela, CIO

PART III: EXEMPLARY TECHNIQUES AND BEST PRACTICES

This section is meant to synthesize the best practices from the case studies with other materials from this document in a single list. It will include a discussion of the adaptability of these approaches to other courts and issues that might arise. The best practices are organized into four categories: organizational structure, operations management considerations, case management system characteristics, and system development methods.

Organizational Structure

Two key organizational best practices were identified in the case studies: the need for a sound understanding and management control of business process, and the need for competent and dedicated staff. In each case, the court used a combination of visionary leadership, business process experts, internal technology staff, and external IT resources. In each case, the court developed a custom automation solution, although commercial systems are increasing in configurability and sophistication and have the capacity to meet this need in the future. The key point is that if any critical resource is not available to court leaders, the level of risk of failure is increased. While there is no one right way to provide staff support for court technology efforts, there are many wrong ways. The following two subsections highlight best practices in this area.

Business Analysts

Many leading courts discovered many years ago that it is essential to understand and manage court business processes, at least in the clerical areas, if courts are to succeed with automation. Business processes cannot be automated if they are not understood. They cannot be automated if there is a high-degree of variation in how work is performed between individuals and between courts. Processes should not be automated if they involve unnecessary or redundant steps. The independence of judicial officers has made courtroom automation an intractable problem in many states.

One answer for many courts has been to institutionalize business analyst positions. These analysts are business process experts who have varying degrees of authority over line level court staff. In decentralized, non-unified court systems, they are typically advisors who work to find and document consensus. In centralized, unified systems they can take a stronger role in raising the business process discipline of the organization.

Beyond helping to manage operations, business analysts provide input into system design and help to test solutions. In many courts they also train users and prepare documentation and training programs, videos, etc. Technologists often are reluctant to devote too much energy to understanding how the business works; business analysts bridge this gap and raise the probability (and lower the risk of failure) of successful technology initiatives.

It must be admitted that some states have struggled to find meaningful work for business analysts or have had difficulty coordinating the work of these individuals with

IT staff. These leadership and management issues must be addressed, but they do not obviate the need for this function in the court system.

IT Staffing

Any court that relies upon technology must have the administrative resources to maintain its tools and to keep them performing reliably. While these functions may be performed by court staff, contractors, or other government entities, it is important that resources are available to perform these functions when needed. As courts become more reliant on technology, it will become more difficult for them to operate when and if that technology fails.

Every court outsources at least some technology functions; few courts outsource everything. Courts do not build their own computers or write their own office automation software programs. It is far more efficient to purchase most hardware and software from the private sector. The recent trend has been to purchase court case management system software products from vendors, rather than developing systems internally, but some states continue to find success building their own CMS applications.

Certainly, the need for internal IT resources varies, depending on the size of the court and the number of organizational units supported. Statewide court systems with uniform applications typically have very large technology shops, while small- to medium-sized individual courts may rely on other governmental organizations or private contractors for support. Good agreements that are well managed can ensure that the necessary IT capabilities are in place to support the work of the court (internally or externally staffed), but if critical capabilities are missing, are not supported by workers with the necessary skills and experience, or are understaffed, the court is in a position of higher risk. Courts that succeed with technology have addressed and actively manage all of the IT functions, either with internal staff or with contractors.

Operations Management Considerations

A main theme of this paper has been increasing discipline in operations management. Four particular best practices will be listed here: operational focus, business process discipline, quality management, and performance metrics.

Operational Focus

Courts should be most concerned, of course, about justice. Fair and unbiased outcomes are the highest priority. After that, it is important that individual rights are protected, that everyone has an opportunity to be heard and to present his or her case. Courts must treat all citizens with respect, regardless of their circumstances. Courts are also responsible to follow the law and court rules, and to make accurate records of their proceedings. No one wants a court system that operates like an automotive assembly line, but no one can afford a judicial branch that lets parties and attorneys control operational decisions and delay decisions almost indefinitely. Court leaders must focus on managing court operations.

An important element of the administration of justice is to ensure that matters are resolved as quickly as is reasonably possible. Some parties and attorneys seek to delay proceedings in order to gain a competitive advantage, to collect attorney fees from their clients, or to gain time because they are overcommitted or are not prepared. The court has the responsibility to move cases forward in a way that will not disadvantage either side in the controversy and that will ensure that public funds allocated to court operations are not wasted.

New management approaches and technologies make it possible for court leaders to understand and control court operations as never before. As with most forms of innovation, courts are usually not early adopters. Progressive leaders can, as demonstrated in these case studies, use these tools and techniques to significantly improve their grasp of how work is performed in their courts.

Business Process Discipline

There is very little excuse for courts to continue to operate with low levels of business process discipline. While attaining level four or five of the Capability Maturity Model requires more effective automation tools than many courts currently possess, the simple process of defining business practices, properly training employees to follow them, and holding them accountable is not difficult or expensive. Every court should be at least at CMM level three (formally defined practices), and should be aiming even higher (using performance metrics to manage and optimize results). Every court that is considering upgrading or replacing a case management system should be seeking tools that will deliver better performance data and management control.

Quality Management

If courts are to manage business operations successfully, they must learn the lessons taught by TQM, Six Sigma, Lean Manufacturing, and other private sector methodologies. It is not enough to look at finished products to define quality; one must develop statistical quality control measures for both products and processes, and control variation at every key stage in the life of cases.

To do this in a service industry like a court, it is necessary to develop a process model for each case type that shows all of the events and activities that can occur at each point in the process, along with the statistical probability and likely duration of each.[42] Courts must constantly monitor inputs to anticipate processing problems in advance. They must manage queues, including for example, inputs, wait times, dropped service, transaction times, and error rates.[43] Court automation tools then must track the state of cases as they progress from initiation through conclusion.

Developing these models will not be a simple task, but it is one that need not be repeated by every court in the country. One model can be created for each case type at

[42] Of course, the process model also must show inputs to the process (and the relative frequency of each input path), outputs, business rules, etc.

[43] This is particularly important for the customer service counter.

the national level or in a progressive state and shared with other courts, which can examine their cases and make appropriate adjustments to reflect operational realities in their jurisdictions.

Once the process model is in place, the next challenge is to measure the performance of each individual business process, both in terms of time and quality. Improving the speed of case processing does little good if the proper information is not available to the decision maker, if records of the proceeding are inaccurate or incomplete, if necessary procedural steps are skipped, or if inappropriate decisions are made. Court leaders must continually monitor court operations to ensure that quality issues are minimized and that cases are moving through the pipeline at an acceptable pace.

Performance Metrics

Every business process has inputs and outputs, with some kind of transformation of the inputs into the outputs. In service industries, these are less tangible than when producing an automobile, a shoe, or a loaf of bread. Inputs, for example, may be briefs, reports, other court documents, evidence, arguments, and testimony. Outputs may be decisions and orders. The court hearing is a transformative business process. Ultimately, the final product – the decision – is constructed in the mind of the judge. However, there are many intermediate decisions during the hearing that will significantly affect the final outcome, for example, a decision to admit certain evidence or testimony. The quality of the judge's decisions is subject to legal review by an appellate court. Perceived fairness of the proceedings may be obtained by surveying parties to the case. Timeliness may relate to the length of the proceeding or how long it takes the judge to prepare the order.

Court cases are characterized by small bursts of activity, often separated by relatively long periods of time when little or nothing is happening. Perhaps one of the most important metrics for courts is how to manage this 'dead time' in cases. Many court leaders view it as inconsequential, but this is an incorrect view. There is a queue of cases in each case state. Although they are invisible to most courts because of how scheduling is performed, they still exist. The longer the delay between events in a case, the more cases will be piled into the queues. A continuance in a case is like shutting down the assembly line for a brief period of time. Its effect on queues is much greater than the thirty seconds of court time that it takes to approve the delay; its effect is more like delaying every case and the work of everyone in the justice system for thirty seconds, similar to shutting down an assembly line momentarily.

In essence, an important part of caseflow management is queue management, which includes determining how to reduce the dead time between events, how to reduce the number of events that serve no useful purpose, and how to minimize wasted judge time when cases settle and there is nothing else for a judge to do. When the time between events is reduced, the number of cases in the queue is reduced, all cases proceed to resolution more quickly, the inventory of active cases shrinks, and less time and fewer resources are needed to operate the court. It is essential that court leaders acquire the capacity to understand and manage the case state queues in their courts.

It makes little sense to shorten the time between hearings to the point that a continuance is required because the purpose for the delay still exists. For example, processing of evidence by a state crime lab may delay proceedings because of backlogs at that facility. Setting a hearing that requires crime lab results before those results can reasonably be expected to be available only creates additional unnecessary work for everyone. Process models must take these kinds of issues into account and allow them to be actively managed through business rules.

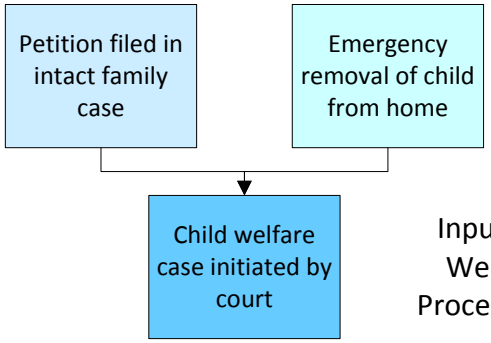
This brings the discussion back to performance management. Standards should exist for each business process and data must be available to compare the current event to the standard. When court leaders understand the performance of business processes better, they can focus attention on system bottlenecks and can improve overall performance with much less effort.

Case Management System Characteristics

Acquiring the necessary capabilities in a case management system may be the most significant best practice discovered in this project. What follows is a discussion of the key CMS issues that must be addressed: development of process models, case properties, business rules, case state queues, case-state sensitive CMS, and business process automation support.

Process Model

A process model defines the activities that may occur in all cases within a case type.[44] It defines various input paths, the possible case states, and all of the twists and turns in processing that may occur as business rules are evaluated in the context of case properties. The following sample illustrates input paths into the child welfare system:

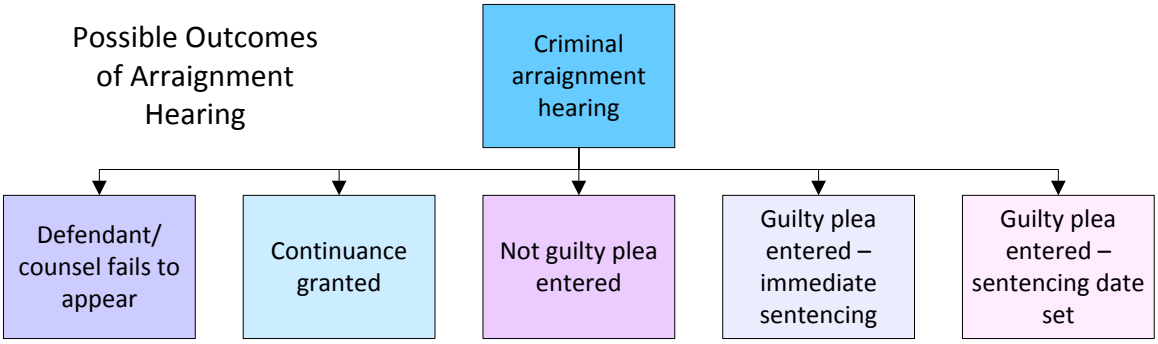


Inputs to Child Welfare Case Processing Model

For each case state in the process model, there should be a finite number of possible next steps. The case management system must be aware of the current case state and

[44] A single model may, in some instances, support multiple case types, and some case types may require multiple models to reduce complexity.

each of these next steps. The following diagram shows possible outcomes of a criminal arraignment:[45]



Each of the outcomes is then connected to subsequent steps in the process, sometimes looping back to the previous event, such as when a continuance is granted. A diagram containing all of the information and connections in a process model would be difficult to display on a single page.

Many outcomes will change the state of the case, and the model should designate the appropriate new state. If a defendant fails to appear, for example, the new case state may reflect that a bench warrant is outstanding. If the case is continued, the state likely will remain unchanged. If the defendant is arraigned and the case is set for trial, the state likely will show that the defendant has entered a not guilty plea.

The probability of each outcome in the process model is stored in a matrix, known as a Markov Chain. Probabilities are determined by periodically reviewing historical data in the case management system. The probability matrix can be used to simulate the effects of process changes[46] and as a filter for data entry into the case managements system, only presenting codes that are valid as determined by the model.[47]

Another key ingredient of the process model is the amount of processing time that is associated with each outcome, e.g., a guilty plea with immediate sentencing occurs in

[45] This is only a sample. Other outcomes may be possible, e.g., case dismissed or substantive motions filed.

[46] Simulation modeling could be used to drive staffing at the customer service counter. Predicting counter traffic by day of week, time of day, time of year, proximity to a holiday, dates of distribution of government benefits, and other factors could allow the assignment of court staff to counter duties from other parts of the court (e.g., collections, compliance, or even courtroom operations) when traffic is predicted to be highest. Once a simulation accurately reflects conditions in the court, it can be used to model the effects of tweaking the business rules, e.g., what would be the effect of scheduling preliminary hearings eight days after first appearance, instead of ten days? These can be powerful tools in optimizing court business process performance.

[47] This filtering is only done after stable probabilities have been determined.

zero days,[48] while a guilty plea with a sentencing date set may add 42 days of processing time.[49]

Case Properties

Case properties are another essential component of business process automation. Case properties are attributes of cases and parties that are used by business rule logic to drive activity in cases.[50] Case properties also should include a history of state changes in the case.

Case properties include the case type and subtype. This information connects cases to the appropriate process model that defines applicable case states, and to business rules that govern execution of program code. Case properties also include time parameters, e.g., how long was a case in a particular state?

It may be necessary to collect more information about a case and parties during the initial triage,[51] to ensure that data required to support business process automation are available as case properties.

Business Rules

Business rules are essential to proper maintenance of case state and case state queues. In the context of this discussion, a business rule must affect the flow of the case through the process model.[52] A system with a business rules engine provides the capability of adjusting these rules on the fly, which allows court leaders to optimize business process through rule configuration (and thus reach level five of the Capability Maturity Model). It also allows courts to adapt to a dynamic environment, such as an unusual influx of certain types of cases or requests for jury trials.

In a very large and complex justice system, it is easy to imagine that gaps could exist in business rules that would lead to unanticipated deficiencies in program logic – resulting in case processing errors or data quality issues. Careful analysis and flowcharting of complex combinations of business rules should minimize these problems.

Case State Queues

An essential step in effectively managing business processes is consolidating cases in various states for purpose of analysis. This is the management list (or case state queue)

---

[48] That is, the case is in the 'Disposed' state for zero days, because it immediately moves to the 'Sentenced' state.

[49] One issue that has not been addressed is how to represent time elements in the process model. Should it be a mean or median? Should measures of dispersion be included to show the degree of variation in the time elements?

[50] For example, a DUI case may have special processing steps that are not performed in other criminal traffic cases. It is important to flag the case as a DUI in the case properties to properly trigger the special processing steps.

[51] See the forthcoming book by Tom Clarke and Gene Flango on case triage, as well as their Future Trends article on this subject.

[52] Of course, the case management system must handle many other kinds of business rules. This discussion focuses only on those that are necessary to support business process automation.

concept, as described in the Michigan Court of Appeals case study. Court leaders must be able to see graphical depictions of caseflow activity, based on the process model for that case type. There also must be case state queries, so the contents of any queue (cases in that state) can be displayed at any time, along with how long the cases have been in that state and the current overall case age.

Some case state queues are also work queues, or cases awaiting action by a judge or other court staff, so it must be possible to consider other factors that might affect the priority of a case in the queue.[53] For example, if a case settles and a judge has free time, he or she should be able to call up a motions queue and prepare orders for the highest priority cases. The priorities may be affected by more than length of time in the queue or overall case age. For example, an imminent scheduled hearing on the calendar may raise the priority of the case in the queue because the court wants to avoid a continuance.

Finally, it must be possible to access queues of cases with problems, such as expired deadlines, data entry inconsistencies, or unlikely case states. Data quality assurance is enhanced when the capacity to work with queues is available.

One other point must be made with regard to the case state. A reasonable argument can be made that the case state should reflect the last completed action in a case, rather than the next anticipated event, as is done in the Michigan Court of Appeals. This could eliminate some of the need for parallel tracking, which is when more than one activity is pending at the same time. This is an issue that should be considered when building process models.

Case State Sensitive CMS

It makes little sense to define a process model and case states for each case type, without providing some type of automation tool that can effectively use this information. There are three important points to make in this regard. First, state changes must be calculated by the system, not entered by users. For example, when a clerk notes in the CMS that a scheduling conference has been held, this entry should automatically update the case state appropriately. When users must remember to make an entry, the task may be delayed, the user may make a mistake, or the data entry person may intentionally select a code that he or she remembers, rather than looking up the correct one. It is essential to build state change calculations into the system workflow.

Second, the current case state should be used effectively to ensure accurate case processing and data entry. For example, a system may have hundreds of docketing codes. The case management system should know which docket codes are allowable, based on the case state and other case properties. The user should only see codes that are appropriate – perhaps listing the most likely candidates first – this would make data entry easier and reduce the likelihood of error.

[53] A work queue indicates that some action is pending. For example, a queue might contain cases awaiting the issuance of subpoenas by the clerk or a decision on a motion by a judge.

Finally, case state can be used for quality control purposes. Programs can compare the case state and other entries with the process model for the case and see if there is an elevated probability that a mistake has been made. This can trigger an alert to a supervisor to check the case.

Business Process Automation Support

Additional CMS capabilities would aid courts in exploiting business process automation tools:

- **Process Dashboard.** Provide managers and supervisors with a process dashboard to monitor work in progress and to drive staffing adjustments for particular tasks to meet predefined service levels and customer outcomes. The dashboard should show the completion percentage of tasks of all types being worked on as tasks are completed and as new ones are added, and if a backlog is developing in any of those queues. Similarly, it could provide real-time guidance to switch workers to other tasks if a backlog is developing in higher-priority areas.
- **Terminology/Ontology.** Allow an authorized business user to globally set the terminology used in the local jurisdiction to describe cases, tasks, events, templates, states, and semantic relationships between them. This would cause names of court events, and roles of participants that fit the local organizational model, to consistently appear in docket entries and on task lists, on generated documents and reports, and on screens. An arraignment in a traffic case has different legal and operational implications, compared to an arraignment for a jailable misdemeanor or felony.
- **Process Template.** Provide the business user with a template to add tasks to a standard process to meet unique circumstances. A template to create and assign a task or obligation to someone, for example, would be available for the judge to use to:
  - Request an attorney to prepare a draft decision,
  - Request a special master to prepare a recommendation,
  - Appoint an expert to evaluate evidence,
  - Appoint a mediator to handle an issue in the case, or
  - Any other ad hoc task or obligation.
- **Resources Available.** Provide a list of resources available to judges and case managers, their organizational relationships, skill profiles, references in other cases to their performance, and performance ratings by judges and court staff that had used the services before.
- **Case Progress.** Automatically provide a judge with information on the age of a case, the number of continuances granted by judges at the request of attorneys or parties who are not prepared for a hearing or trial, issues not yet resolved by the parties, issues of evidence discovery, and the number of times hearings have been held to date. This will motivate the judge to assert judicial control over the case and bring it to a quicker disposition.

- **Workload Transparency.** In a work list, display tasks that workers are individually assigned or assigned in a pool to perform. Also, display links to tasks of other individuals and pools, enabling the worker to perform additional work and to be recognized for making the extra effort. This would balance workload, improve timeliness, and recognize high performance.
- **Training and Feedback.** Provide in-flight guidance to aid the worker, based on the state of the case. For training purposes, it should record the types of tasks performed by a worker that may have taken longer than the average time, based on metrics developed on the work of others performing the same task. A record of errors would be of similar value.
- **Audit.** Provide guidance to business users in real time during case record updates and other maintenance activities, based on person identity matching algorithms, indicating the probability that a court action involving a person being taken is correct or not.
- **Process Mining.** Provide a process mining capability that collects and analyzes internal and external event information, allowing insight into how many times a case was addressed at hearing or chambers review, who was involved in what role, how long it took, what the next scheduled event was to be, and the reason given for not disposing of the case. The information would be available to judges for their own use and to the chief or presiding judge with nominal authority over the judge, as a means of improving performance. Availability of this kind of information among judges has the effect of motivating them to examine their work methods.

Most of these application capabilities described above are not supported by the case management systems currently in use in courts of the United States.[54] Few systems are state-sensitive and few use case state queues in the manner described herein. Quite a number of systems have configurable business rules engines and a simplified business rule language that could be mastered by a business analyst in a court.[55] While most systems have a case history in a docket or summary of proceedings, very few maintain a history of state changes and other key properties that are useful for operational analysis.

Much work is required to improve automation support of courts that would allow business process management to the degree that is currently practiced in many private-sector organizations. These are worthy goals that would make courts more efficient and effective in operations management.

System Development Methods

It should be noted in passing that the business process automation exemplified in these case studies emanated from courts that developed their court case management

[54] Of course, analytics could be performed externally with data exported from the case management system, as is done by many private-sector organizations.

[55] Despite the existence of business rules engines in many commercial systems, declarative business rules and the ability to recognize conflicts among rules are not widespread capabilities.

systems in-house. The authors and the NCSC do not consider this treatise to be an endorsement of custom-built systems as superior to commercial off-the-shelf (COTS) systems. In fact, the trend at the state court level is to move from in-house custom systems to COTS systems for a variety of reasons, a trend they have in common with private and other public sector organizations for all kinds of systems. The conundrum, at present, is that there is a simultaneous need for greater standardization in systems across state courts, and for more customized automation support in individual courts. With highly configurable systems, private sector CMS providers are moving in the direction of better business process automation support, but they still have far to go to match the capabilities of business process automation tools.

Top-Down and Bottom-Up

Puerto Rico's approach to beginning a system development effort with a systematic analysis of the constitution, statutes, court rules, case law, and other resources was a brilliant idea. This top-down view of the court and justice system environment provided the legal framework that organized and systematized the development effort. It can be of greatest practical value when it is applied to the work of judges, rather than to clerical functions.

One obvious issue is that some legal mandates become outdated and are not removed from these controlling documents; they simply are ignored by the legal community. This kind of analysis certainly would reveal these issues and provide an opportunity for a general cleanup. Court leaders would be required to address all of these discrepancies before proceeding.

Perhaps the greatest benefit of the top-down approach is in the construction of process models, as this is primarily what court rules and statutes do. They provide definition to case types and define processing steps. This is not to say that the process models will not require some refinement, based on the bottom-up perspective.

The bottom-up view is obtained by more traditional means: business analysts, user groups, work process observation, analysis of business process documentation, etc. As with all business process analysis, care must be exercised not to confuse business practices that only exist because of the limitations of current systems with efficient ways of doing business. These workarounds often are difficult for court staff to give up. This is where experienced business analysts can be worth their weight in gold.

Start with the Work of Judges

It is important to note that the automation of a judge's work does not replace the judgment of judicial officers in legal matters.[56] The purpose of automating judicial processes is to provide judges with the information that they need, in the form that they

[56] Decision Support Systems can, however, help judges understand what most other judges would do in similar circumstances, with respect to bail, sentences, conditions of release, etc.

need it, at the precise time that they need it, with minimal effort on their part.[57] Some courts that have eliminated paper case files have discovered precisely what data and documents a judge must see for each case type in a specific kind of hearing. They present it to the judge in a simple, consistent format. While this is a detailed and difficult analysis to perform, it is very effective.

The other obvious reason for automating judges' work is to make the generation of orders and other documents, and making a record of proceedings, as fast and efficient as possible. The point is to maximize the quality of the record and documents produced and disseminated, and to speed their production and distribution, while minimizing human effort in their creation.

It is important to remember that any approach to courtroom automation must consider the varying styles and interests of judges. Some judicial officers want to be hands-on and control the technology, while others want to be passive observers and do not want to be distracted by technology. A one-size-fits-all approach to judicial automation will never succeed. The preferred approach is a flexible, configurable arrangement that responds to the requirements of individual judicial officers.

Case Management System Standards

One of the issues faced by many jurisdictions is the lack of up-to-date standards for court case management systems. Case management system functional standards for court case types, issued beginning in 2001, are generally acknowledged to be obsolete,[58] and new standards based on the Court Technology Framework are still under development. One deficiency is that all requirements seem to be equal, and no one has made an attempt to differentiate standard practices from common practice variations or from non-standard practices that a jurisdiction may have adopted.

Paula Hannaford-Agor of the NCSC has posited the following on this subject:

- A Standard is an application capability that the software MUST be able to support or provide because the business function is either universal to all case management systems (e.g., payment at the clerk's counter via credit card), or it is such a prevalent practice that the vast majority of courts have adopted it as a routine practice (e.g., accepting payments through a court website).
- A Common Practice Variation is an application capability that the software MUST be able to support with minimal customization (e.g., draw-down (pre-pay) accounts, where funds are held in trust until applied for specified transactions).

[57] In large, busy courts this includes using quasi-judicial officers, lawyers, paralegals, and case managers to perform work that does not require the expertise and experience of a judge. Staff always acts under the direction of judges using checklists and other materials prepared and approved by judges. Staff performs analysis, facilitates the correction of deficiencies, and prepares materials for judges, not replacing them, but helping them work more efficiently.

[58] They are obsolete because of their success – most case management system vendors brought their systems into compliance with the most important requirements, so these standards are no longer a differentiator in the marketplace.

- A Recommended Practice is an application capability that the software SHOULD be capable of supporting because the business function is generally regarded as the optimal practice in terms of efficiency, cost-effectiveness, accuracy, convenience to stakeholders, etc. (e.g., credit card processing in accordance with PCI standards). If the software supports the Recommended Practice, it should be configured as the default mode, forcing courts that opt for suboptimal practices to make a conscious request that it do so.

The result of not having standards is that case handling concepts, both good ones and suboptimal ones driven by a particular need with little general applicability, end up being supported by software – perhaps because "We have always done it that way." This imposes significant development and maintenance costs on the system provider and on court users, who must learn these quirks and support their upkeep.

Business Process Automation Tools

Business process automation tools are incredibly helpful in marrying business process management with automation. They generate much of the code to automate these processes, and they do it quickly and efficiently. They are most effective in building dynamic, rather than static systems – systems that are 'built to change,' rather than 'built to last.' Business process automation tools produce a custom-made system that is completely integrated with business process – the ideal scenario for court leaders. With respect to limitations of this technology, there are many.

- **Cost.** Licensing of business process automation tools, and the necessary consulting assistance to use them successfully, runs into the millions of dollars. The court also must have a highly capable and well trained staff to use them. It is likely that the capabilities of these packages will increase over time, and that their cost will decline, which will mitigate the expense issue in the future.
- **Software Development Skills.** Custom software development always takes time, much more time than configuring and implementing an off-the-shelf package. In addition, this type of development typically uses agile or iterative development processes, which complicates planning and budgeting. A court must have plenty of time and lots of patience to construct a system in this environment.
- **Complexity.** The private sector uses business process automation tools in situations of far lower complexity that exists in a general jurisdiction court. Companies focus on simplicity, speed, and volume. The number of case types and the overlapping functions between case types make the use of these tools a significant challenge for courts. Just as legacy systems can be tailored over many years to support every last detail of business practice – good and bad – business process automation tools can create systems that share the same problems.
- **Business Process Discipline.** Perhaps the most significant issue is the low level of business process discipline that is found in most courts. A reasonable amount of variation exists in the business processes of all organizations, but that variation should be deliberate and planned. Variation in court processes usually is driven by individual preferences of workers and is neither completely understood nor fully

documented. The complexity of applications developed with business process automation tools in courts with low discipline would explode because of uncontrolled process variation. Attempts at standardization may be undercut by the configurability of systems to the needs (and whims) of individual users.

- **Multi-jurisdictional Issues.** Another complicating factor is the multi-jurisdictional nature of many court systems. The judicial branch is usually a complex organization, and custom solutions cannot be developed for each location. Structural complexity is a driver of process variation.
- **Reinventing the Wheel.** One problem is that courts must start from scratch when using these tools. If a court or a company were to develop a package using business process automation tools, then perhaps other courts could be spared much of the cost and time needed – they could simply tweak a system developed elsewhere. This seems reasonable because, at least from the top-down view, what courts do from state to state is very similar. Of course, the bottom-up approach provides an entirely different perspective. No two courts are the same from this view.

In conclusion, the use of business process automation tools in courts carries high risk. No general jurisdiction court has successfully used these methods to create a new system for all case types. While there is great promise in the technology, it has yet to be realized in full by the judicial branch in any state. A scenario with the highest probability of success would be a large, limited jurisdiction court that only processes traffic and less serious criminal cases. These courts typically produce a lot of revenue, so a good business case could be made for increasing efficiency, even if the cost of the investment were high.

Integration Issues

Courts do not operate in a vacuum. They rely on inputs from and produce outputs for other justice organizations. Experience has shown that the lowest common denominator effect applies: courts are severely hampered in their technology initiatives if their information sharing partners have a lower level of technological sophistication. Successful courts must invest resources and energy in working with justice system partners, or they may find that the benefits of their internal technology improvements will be greatly diluted.

Automation of data exchanges has advanced greatly in recent years, facilitated by NIEM data standards and Information Exchange Package Documentation (IEPD), e-filing standards, etc. Whether buying or building a solution, a court can include these standards in its procurement specifications.

CONCLUSIONS

It should be clear that there is much that the judicial branch can learn from the private sector about operations management and technology, despite the obvious differences between the courts and for-profit enterprises. Case management systems have the potential to provide process-level data that could drive process optimization decisions. As noted in the High Performance Court Framework, this capacity of performance measurement and performance management is a key ingredient to improving the judicial branch. None of these methods will make much of a difference unless courts are willing to increase their business process discipline.

Business process automation is a method for achieving greater efficiency in court operations, but it does not address all of societal and operational goals of courts. In an era of diminishing resources, it may be one of the most important issues facing court leaders today. The key to improved efficiency is better analysis of court business processes and enhanced management of operations using the best practices outlined in this document. Knowing the state of the case, for example, that a pretrial conference has been held, that a jury-capable courtroom is likely to be needed on a certain date, that a certain number of defendants will need an interpreter for a certain hearing slot, that the standard period has passed for having a hearing after a meaningful plea discussion – requires that case characteristics, business rules, events, timelines, and standards be built into the court's case management system, and that they can be adjusted by court managers with minimal technical effort to realize optimal efficiencies.

Some courts will start by eliminating waste from process flows. Others may start by modeling judge or customer service processes and determining how they are affected by the court's internal administrative processes. Others may begin by defining business rules or by automating specific activities. Alternatively, some may capture and analyze data on specific processes that appear to be problematic, using case state information to clear process bottlenecks. Still others may try different staffing strategies, either specializing or generalizing job responsibilities. Pioneering courts will likely have several process initiatives going on simultaneously, whether they are all recognized as process management optimization or not.

To gain real momentum, a court must coordinate all of its process management efforts. Lean isn't enough. Six Sigma isn't enough. Balanced scorecards and business rules and software automation aren't enough. While any of these initiatives can serve as a good starting point, a coordinated assault based on a sound strategy for improvement will achieve the best results. Principles of caseflow management and the High Performance Court Framework should be combined with all of the other court management tools and techniques that have been developed in the past three decades.

These case studies have highlighted three innovative courts in the United States. They have demonstrated that case management systems can do more of the work that is now done by people, that the performance of individuals and processes can be managed at the same level as in the private sector, that business process automation tools will

become a much more significant force in court automation in the future, and that it is possible to better support the work of judges. While these are not the only innovative courts, they are leaders that are providing valuable instruction to their peers.

It is not a coincidence that these three courts have developed their own case management systems in-house. There are undeniable cost/benefit and IT staff capacity issues that drive many courts to acquire commercial, off-the-shelf solutions. On the supply side, vendors have not created the kinds of software features described in these case studies, and only in recent years are solutions being "built to change." Highly configurable systems, while a huge improvement over static systems, are not yet configurable enough to perform like business process automation tools. On the demand side, most courts (and the court community in general, including the NCSC), have not envisioned incorporating state-of-the-art business process automation thinking into their case management practices or systems. Examination, adaptation, and implementation of exemplary practices will help move the court community in that direction.

The NCSC expresses appreciation to the courts that expended a great deal of effort to assist in this project and the preparation of this document. Their stunning accomplishments in their pioneering work will help courts throughout the United States and the rest of the world.

The NCSC believes that the next generation of court technology standards must focus on business processes, which involves management, measurement, automation, and improvement. Development of process model templates at the national level – using both top-down and bottom-up approaches – that will shorten the time and lessen the expense of application development, and continuing adaptation to a changing environment (using either configurable packages or business process automation tools) will be of great value to individual courts and to state court organizations. In this respect, these case studies are not the end of the discussion, but are only the beginning.

GLOSSARY

Automation: To replace human effort with machine effort. Automation assumes that the cost of automating the process is less than the benefit received.

Automated workflow: Connects key functionality of the case management system to reduce the time spent by users performing tasks. For example, a user may enter information about a court hearing, which may automatically trigger the generation of a document, the scheduling of a new hearing, and an information exchange. This reduces the amount of training and experience that an employee must have to be productive and improves the quality and consistency of work.

Business process: Collection of structured, related activities in an organization that produce a specific product or service (or value) for a stakeholder (client, customer, etc.). There are three types of business processes: 1) management processes govern or control the operation of a system and maintain the production capability; 2) operational processes produce the products or services (for external customers) that are the core purpose of the organization; and 3) administrative processes are internal to the organization and support the core operational processes.

Business process analysis: Analyzing and documenting a business process, including the activities, relationships between the activities, and values of relevant metrics. Business process analysis generally includes: 1) defining the boundaries that mark the entry points of process inputs and exit points of process outputs; 2) creating a process flow diagram (or flowchart) that illustrates the various activities and their interrelationships; 3) determining the capacity of each step in the process and other relevant metrics (e.g., cost, quality, flexibility, and speed); 4) identifying bottlenecks, or the steps with the lowest capacity; 5) quantifying the impact of the bottleneck; and 6) designing solutions to improve the process.

Business process automation: The case management system, with EDMS and workflow, can partially automate court operations, but it is not designed to automate business processes fully. A new generation of tools allows applications to be created from business process documentation. This allows court business processes to be fully automated. The problem is that most courts have not defined their business processes to the point that these tools are useful.

Business process discipline: The degree to which a court has established and documented operational procedures, how it holds employees accountable for following those processes, how it quantifies performance through metrics, and how it uses performance data to enhance or optimize those business processes. Also, the degree to which it controls variations in business processes – allowing only those variations that in particular circumstances improve effectiveness or efficiency, rather than accepting variations based solely on the personal preferences of the worker.

Caseflow: Statistical measures of the amount of time required for cases to move through court processes.

Case management system: A CMS includes the hardware, software, processes, and support that enable a court to manage its cases effectively. Key functions include: case initiation and indexing, case disposition, docketing, judgments, calendaring and scheduling, receipting, document creation and tracking, accounting, court events, records management, decisions and orders, reporting, charges, bail, warrants, sentences, compliance and execution, ticklers, alerts, prompts, notification.

Caseload: Statistical measures of cases coming into the courts, cases leaving the court, and cases pending in the court.

Court performance: The degree to which a court meets its own goals and the expectations of society and justice system stakeholders. Court performance typically is concerned with making a fair decision, based on the law, without undue delay or cost to the parties, and without limiting the ability of a party to present evidence and make a case for a favorable decision. Court performance also can be measured by how a court treats those who bring cases, seeking justice, and those who are not directly involved in the outcome, such as jurors, staff, and individuals who work in organizations that are involved in judicial processes.

Court record: Verbatim transcript or digital equivalent (audio or video) of court events, including everything that was said at a hearing, except for those things excluded from the record by the judge. The court record is used by an appellate court in reviewing the actions of a trial court.

Electronic document management system: An "electronic filing cabinet" that holds the digital equivalent of paper case files. Some type of index to the documents is required - when the EDMS is integrated with the case management system, the CMS serves as that index and provides security. An EDMS provides for redaction of personal information and annotation of documents by judges and court staff. An EDMS provides version control, so there can be multiple versions of the same document. An EDMS also provides the ability to extract text from scanned documents (optical character recognition, or OCR).

Electronic filing: A system for filing electronic documents with the court, instead of filing paper. A mature e-filing system includes formatted information for the case management system, so clerical data entry tasks are reduced or eliminated. It also takes care of filing fees, service and notification, error handling, and automatic provision of court policies concerning e-filing. Also included in the e-filing concept are public access to the electronic case file, and integration with the attorney case management system.

Governance: A formal structure and a systematic methodology for managing technology, technologists, and technological change within an organization, including: defining expectations, setting priorities for IT initiatives, granting authority, allocating resources, making policy decisions that affect IT, making policy decisions that affect the court, resolving problems that arise during projects, holding the IT organization accountable, and terminating struggling projects.

Information exchange: The transfer of structured data and/or documents from a computer-based application (system) in one organization to a computer-based application (system) in another, without human intervention. These transfers require specific definition by consensus of the sending and receiving organization, or by agreement to rely on an external standard to govern the exchange.

Integrated justice: The transfer of structured data and/or documents from a computer-based application (system) in one justice organization to a computer-based application (system) in another, with little or no human intervention. These transfers require specific definition by consensus of the sending and receiving organization (custom interfaces), or by agreement to rely on an external standard to govern the exchange (standards-based interfaces).

Manage: To direct the work and resources of an organization with a degree of skill to accomplish its objectives effectively and efficiently, despite any obstacles and difficulties that may arise.

Operations: Ongoing, recurring activities (business processes) performed in an organization to accomplish its purposes. These are the physical and/or technical functions relating to the production of goods or services that provide value to stakeholders (clients, customers, etc.).

Operations management: Controlling or managing the work of the organization (or the collection of business processes) with a degree of skill to accomplish its objectives efficiently and effectively, despite any obstacles or difficulties that may arise. This includes establishing optimal division of labor, staff specialization, and workflow. This also may involve the transfer of knowledge from highly skilled and experienced workers to systems, documentation, and semi-skilled workers with less education, tenure, and experience.

Operations research: An interdisciplinary mathematical science that focuses on the effective use of technology by organizations. It emphasizes human-technology interaction and focuses on practical applications. Operations research seeks optimal solutions to complex decision-making problems.

Planning: Deciding what to do before you do it, and how it will be done, who will do it, when it will be done, and organizing resources (e.g., people, money, time, equipment, software, space, supplies) that will be needed. "The plan is nothing. To plan is everything." The act of planning creates consensus and common vision within an organization.

Production capability: The ability of a court to maintain its level of production. The managerial and administrative business processes that allow a court to complete its operational business processes with maximum effectiveness and efficiency.

Project: A temporary endeavor to create a unique product, service, or result. It has a beginning date and an ending date.

Project management: The application of specialized knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Project manager: An individual who understands and applies the knowledge, skills, tools, and techniques of project management to a specific project and who is responsible for the outcome.

Standards: A prescribed set of rules, conditions or requirements concerning definitions of terms; classification of components; specification of materials, performance or operations; delineation of procedures; or measurement of quantity and quality in describing materials, products, systems, services or practices. Standards are written statements of technical specifications that define parameters and properties of systems. Standards are agreed principles of protocol, often set by committees working under various trade and international organizations.

Strategic planning: Planning that is broad in scope, long term, and more general than specific. The strategic plan is a framework within which more detailed planning is conducted. It represents the strategic thinking of organizational leaders and is used to keep the efforts of everyone in the organization focused on a common direction.

Technology lifecycle: Every technology has a useful lifecycle and moves through a number of phases (though the speed may vary), depending on the technology. *Future technology:* a technology that is advertised but not yet available for purchase. *Emerging technology:* a technology that is just starting to become available, but that may still have problems. *Existing technology:* a technology that is readily available for purchase or use. *Obsolete technology:* another technology can do a better job at the same price or the same job at a lower price; or a technology that cannot function because of lack or parts, support, etc.

Weighted caseload: An objective and statistically reliable comparison of the need for judges and other staff resources in various parts of the court system. If a certain type of case requires three times as much time to process as an average case, it would be counted as three cases. If another case type only required half as much time as an average case, it would only count as half a case.

Workflow: Statistical measures of the amount of time required to perform certain activities in the court. This term also refers to the ability of a case management system to automatically route work to the appropriate individual and group queues, based on business rules.

Workload: statistical measures of specific activities performed by the court, such as court events, documents filed, and orders issued.

BIBLIOGRAPHY

In addition to the numerous Wikipedia articles mentioned in the body of the document, the following sources were used:

Bhat, U. Narayan, An Introduction to Queueing Theory (Boston: Birkhauser, 2008).

Brennan, Linda L., Operation Management (New York: McGraw-Hill, 2011).

Bronson, Richard and Govindasami Naadimuthu, Schaum's Outlines: Operations Research Second Edition (New York: McGraw-Hill, 1997)

Clarke, Thomas M. and Victor E. Flango, "Case Triage for the 21st Century," in Future Trends in State Courts 2011 (Williamsburg, VA: National Center for State Courts, 2011), pp. 146-150.

Matthias, John T., "User Requirements for a New Generation of Case Management Systems," in Future Trends in State Courts 2010 (Williamsburg, VA: National Center for State Courts, 2010), pp. 174-179 at http://contentdm.ncsconline.org/cgi-bin/showfile.exe?CISOROOT=/tech&CISOPTR=766.

Matthias, John T., "Case Management Forecast: Mostly PCM with a Chance of ACM," Mastering the Unpredictable: How Adaptive Case Management Will Revolutionize the Way That Knowledge Workers Get Things Done. Swenson, K. D., ed. (Tampa, FL: Meghan-Kiffer Press, 2010), pp. 49-57. www.masteringtheunpredictable.com (1st ed.; April 14, 2010).

Monks, Joseph G., Schaum's Outlines: Operations Management Second Edition (New York: McGraw-Hill, 1996).

Ostrom, Brian J., Matthew Kleiman, and Roger A. Hansen, "The High Performance Court Framework." http://www.ncsc.org

Shafer, Meredith, Operations Management for MBAs, Fourth Edition (Jefferson City: Wiley, 2010).

Shafritz, Jay M. and Albert C. Hyde, Classics of Public Administration (Oak Park: Moore Publishing, 1978).

Shenk, Al, Calculus and Analytical Geometry (San Diego: Goodyear, 1977).

Spiegel, Murray R. and Robert E. Moyer, Schaum's Outlines: College Algebra Third Edition (New York: McGraw-Hill, 2006).

Stewart, William J., Probability, Markov Chains, Queues, and Simulation: The Mathematical Basis of Performance Modeling (Princeton: Princeton University Press, 2009).