

**2010 SACUBO BEST PRACTICES ENTRY:
LEAN/SIX SIGMA METHODOLOGY FOR A LEANER OPERATION**

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Abstract

The University of North Carolina at Chapel Hill (UNC) was founded two centuries ago as the nation's first public university. UNC is a doctoral, research-intensive university, with a faculty actively involved in research, scholarship and creative work. The UNC Eshelman School of Pharmacy is a nationally recognized leader in progressive pharmaceutical care practice, education, and research. Over the past few years, its Doctor of Pharmacy program has risen to the number two spot in U.S. News & World Report's ranking. It is also second among the nation's pharmacy schools in research funding.

A little more than three years ago, the School prepared an extensive strategic plan under the leadership of a new dean that detailed ambitious growth plans to dramatically increase research funding, grow the number of students and faculty, and enhance recognition as a premier school of pharmacy in the nation. A significant challenge to these plans was the infrastructure and staffing needed to support them. Being a state institution, the School was not likely to see any increased funding for staffing. On the contrary, the UNC system had mandated a permanent reduction of 10 percent in administrative costs, making the planned programmatic growth an even bigger challenge.

To meet the challenge of expanding in spite of reduced infrastructure funding, the School undertook a novel approach to reinvent itself. It decided to borrow the quality methodology used in the private industry, and to utilize Lean Manufacturing methodology along with some Six Sigma principles. This hybrid methodology focused on services as either adding or reducing value to School's objectives, identifying and eliminating non-value steps in the workflows while creating new value streams, and restructuring information provision and staffing to make those fit the new work environment.

Over the past three years, the School has cultivated a new culture that is process centric, quality focused, and transparent. It redesigned its business processes using technology where needed, redesigned information provision to fit faculty requirements, and restructured its staffing structure to fit the newly designed processes. The School developed personal portals for faculty and staff that provided an easy point-and-click interface to access up-to-date and easy-to-understand business information extracted from the UNC's hodgepodge of very old (30 years plus) systems and integrated to provide all the needed information in one spot. With this infrastructure support and streamlined processes, the School "does it right the first time" and eliminated 40 percent of the man-hours previously spent correcting errors, on meetings and telephone conferences on misunderstood or inaccurate accounting or personnel data, duplicative or redundant work or rework, and escalations. The Unit cost of doing business is lowered substantially in meeting the challenge of the difficult budgetary times.

Over these three years, the School increased its research funding by 138 percent; grew its faculty by 50 percent, graduate students by 28 percent; its professional students by 9 percent; while it reduced its business staff by 18 percent. Overall faculty satisfaction has gone up: infrastructure discussions have disappeared from departmental meetings where previously it was a number-one topic. Other UNC departments and schools have been visiting frequently to understand the business model and systems.

Introduction of the Organization

The University of North Carolina at Chapel Hill was the nation's first public university to open its doors and the only public university to award degrees in the 18th century. Authorized by the N.C. Constitution in 1776, the University was chartered by the N.C. General Assembly December 11, 1789, the same year George Washington first was inaugurated as president. The cornerstone was laid for Old East, the nation's first state university building, on October 12, 1793.

Carolina offers bachelor's, master's, doctoral, and professional degrees in academic areas critical to North Carolina's future: business, dentistry, education, law, medicine, pharmacy, nursing, public health and, social work, and others. In 2007–08, Carolina awarded 7,220 degrees: 4,164 bachelor's, 1,851 master's, 601 doctoral, and 604 professional. In fall 2008, Carolina enrolled 28,567 students from across the United States and more than 100 countries. Students learn from a 3,400-member faculty.

The UNC Eshelman School of Pharmacy was founded in 1897. It is the only public school of pharmacy in the state of North Carolina and one of the oldest in the nation. It is accredited by the Accreditation Council for Pharmacy Education and a member of the American Association of Colleges of Pharmacy. It was ranked number two among the nation's doctor of pharmacy programs in U.S. News & World Report magazine's 2007 edition of America's Best Graduate Schools. It received more than \$24.4 million in total research funding in 2008, second among the nation's pharmacy schools.

The School offers the Doctor of Pharmacy (PharmD), a Doctor of Philosophy in Pharmaceutical Sciences (PhD), and an MS in Health System Pharmacy. The School has five academic divisions representing the primary scientific and practice disciplines that underpin the profession of

pharmacy and the pharmaceutical sciences, with a combined full-time faculty of 99 to instruct 588 professional students and 115 graduate students.

Statement (restatement) of the Problem/Initiative

A little more than three years ago, the UNC Eshelman School of Pharmacy prepared a comprehensive strategic plan that laid out ambitious educational, research, and service initiatives, with related growth plans. The School had planned to dramatically increase its professional program, graduate program, research awards, available space, and faculty. Almost all of the planned growth needed to occur without increased state funding. An additional challenge to support this growth was the resulting administrative, clerical, and managerial infrastructure needed to support the faculty, graduate students, and research teams. The staff already in place was overwhelmed with the workload created by the old, cryptic information systems. These systems required specialized knowledge and long experience with them, and required labor intensive processes with multiple levels of checks and approvals. The confusing rules and requirements routinely caused deliberations and escalations and constantly required that the faculty be provided specially prepared information in the format they understood. The 30-plus years old UNC finance, payroll, and human-resource systems were silos, separate entities that required looking up data in one and cross referencing with another. This infrastructure could not scale with the planned and desired growth. Moreover, the School did not have the funds to increase staffing commensurate with the faculty and research growth.

The School had to look for some novel ideas and decided to turn to the business world. This approach was fraught with risks. There were strong arguments against borrowing any corporate practices from stakeholders who held a general mistrust of anything that even smelled like the corporate world. They insisted that academia was not business and that business would not work

in this world. However, the faculty was dissatisfied with the information they were (or were not) getting; their inability to manage their contracts, grants, and trusts with any degree of confidence; and their lack of understanding of future-year commitments and liabilities. These limitations, along with general irritation at inconsistent application of fiscal and labor policies and a distrustful and strained relationship between the faculty and staff, left the School no choice but to try methodologies used by private industry.

The School also had to rely on staff who had long experience with the systems because of the inscrutable legacy information systems (as did all the other University schools). The how-to of processes and systems was vested in individuals. As there was no institutional memory, the loss of any staff member resulted in a major loss of productivity for a long time, which created in “hero-worshipping” culture. Additionally, haphazard hiring practices over many years had created a staffing structure in the School that institutionalized inequities in job duties and responsibilities, causing malaise among the staff. From another perspective, the staff competencies did not match the job requirements, creating significant performance gaps.

Given these circumstances, the School’s challenges were:

- to address these infrastructure, information, process, staffing, and employee satisfaction issues without additional available funding while pursuing the planned aggressive growth;
- to develop and implement an appropriate business methodology ;and
- to discover whether a business tool be applied to academia and succeed in the academic culture.

Design

The School set out to address these challenges by starting with a primary goal and five core objectives that had to be met. The primary goal was customer satisfaction with the customer defined as anyone who was involved in the business processes: faculty, departmental staff, and School administration. Anything that could lead to customer dissatisfaction had to be considered as an operational defect and had to be corrected and improved.

Five core objectives were defined as follows:

1. Redesigned processes, systems, and staff roles must add value to School's mission and reduce hassles and frustrations.
2. Information must be useful, timely, and at the fingertips to empower faculty and principal investigators.
3. Support costs must be reduced to scale and enable the growth stated in the School's strategic plan.
4. New work environment must be deployed rapidly with minimal financial investment
5. Culture of improvement that continues removing successive layers of waste must be sustainable.

The School chose Lean as the methodology best suited to accomplishing these objectives. Lean, in its simplest form, is an approach to identify non-value-added activities and eliminate the wasted effort and time. It also holds that it is better to have an 80 percent solution today than a 100 percent solution tomorrow. This one-layer-at-a-time approach made Lean an ideal solution in terms of low financial strain, acceptance of cultural change, and the ability to experiment and perform a course correction along the way

Lean methodology is used to streamline processes to make them run faster while reducing costs by removing waste, such as duplicate entries, redundant checks, and unnecessary work. Lean looks at all the steps in a given process and identifies ways to eliminate the non-value-added steps, reducing the costs driven by those steps. This systematic approach to understanding, improving, and managing a business has the potential to yield substantial and long-term benefits. Moreover this approach allows for incremental or gradual improvements by improving one process at a time or even just a part of a process.

School administrators agreed to borrow from Six Sigma to complement Lean. Six Sigma fits with Lean well since the desired results are expected to require continuous efforts to achieve the needed stability and predictability. The methodology requires that the current processes be defined, measured, analyzed, improved, and controlled; and there had to be commitment from the entire organization, particularly from top management. In following that, faculty champions were sought and the school's Executive Committee, composed of Division Chairs and Associate Deans, was given the responsibility to steer this Lean/Six Sigma initiative. As the changes were contemplated over time, the divisional administrative staff was to be the testers for the resultant processes and systems. The entire faculty was, naturally, involved in any changes, which were to be made in real time.

Because the School did not have resources to create another separate operation to test its new designs while keeping the current operation running and did not have time for trial and error, any changes had to be reasonably well designed to be able to work. This was compatible with Lean methodology to not spend a tremendous amount of time creating a design to work in all situations. Rather the designs were meant to work in 80 percent or more of cases but were

released rapidly as soon as there was a staff consensus on their workability. These new processes and systems would be continually improved upon once implemented.

The School plan was to attack on three fronts simultaneously: 1) create clearly understood procedures and make policies consistent, 2) streamline operating processes, and 3) put easy-to-understand business information at-the-fingertips. Without an ability to add any resources, staff was encouraged to work on various Lean assignments while continuing on with their routine work. The only way to do this was to break down the assignments in small pieces, each group of staff working on just one issue at a time.

- 1) Policy and procedures consistency and documentation would be addressed with a Web-based solution incorporating interactive process charts and policy forums that provided policy interpretations and procedures in a question and answer format.
- 2) To improve processes, the decision was made to address them in sequence, starting with the most time-consuming, error-prone, and visible process causing the most consternation for everyone concerned and then going to the next one deserving the most attention, and so forth. For each process, the process was to be defined and performance was to be measured and benchmarked. The measurements would include:
 - a. number of steps,
 - b. number of loops the process had (going through the same person more than once),
 - c. average time to execute each step,
 - d. quality in terms of error rate that required rework, and
 - e. effort required to resolve any related misunderstandings.

Each process was to be analyzed for bottlenecks, redundancy, duplication, wasted efforts, elimination of which would result in a better process. The School also was determined to utilize technology where it could to automate the resulting processes, making them consistent and paperless to a large extent.

- 3) The School administration desired the business information to be Web based, with a simple point-and-click user interface, providing all the information faculty needed to manage grants, contracts, and divisional budgets but without too much data to make it extraneous. This had to be done without any duplicate key entries, required to be synchronized with the UNC systems, and without regard to which UNC system the needed data resided in. The School had insisted that the information had to seem integrated and simple enough to be usable at eleventh grade level.

Implementation

The three prong approach of 1) consistency of processes and policies, 2) streamlined efficient processes, and 3) business information at the user's fingertips began with deliberately modest objectives that were delivered rapidly. Because there was little funding to organize or manage this activity, most of the formalities of project management were dropped in favor of individual responsibility and once-a-week meetings of the involved staff for oral status reports and issue resolution. These all-hands-on-deck weekly meetings were used to identify and discuss progress and any complications, to set the priorities for the most critical items, to decide on the next week's deliverables, and to agree on the designed solutions and their implementation.

Policy and Procedures Consistency and Documentation

The School created a Web portal that offered interactive step-by-step process documentation as was proposed. It also offered an employee forum where policy questions could be asked and an official interpretation would be given that anyone could search for using key words. This offered a consistency across the entire School and a quick resolution to any issues not addressed before. Using the portal and step-by-step process map reduced the calls, conferences, and meetings with and e-mails to the School's administrative staff by more than 20 percent. It also eliminated the transactions that were executed under a wrong assumption or interpretation and the rework related to them.

Process Improvement

The scope of process improvement was agreed on as all processes related to financial and personnel transactions, including purchase orders that did not require bids and the ones that did, travel reimbursements, payments on invoices, new hires, transfers, and terminations, and post award grant management.

The first process selected for this redesign was the small-order process (figure 1). This process is used to get an authorization to pay for an order (purchase order number) for less than \$5,000 and then authorizing the payment once the invoice is received. This process is used routinely to place orders and pay for lab supplies, services, electronic or IT products, food, and other incidental purchases. Typically the vendor delivers an order against an order number and then invoices against that number. The process was benchmarked and was found to be an excellent candidate for improvement.

This process was fraught with process loops, multiple checks, and bad practices that wasted a time and created delays in completing the process. For example, source of funds and availability

of funds were identified and verified after the order was already delivered. That meant the process was routinely going in a loop to resolve the funding as even more time was needed to transfer funds to where they should be. The rework rate (or rate of having to repeat the steps or correct the paperwork) was close to 40 percent. The process also caused delays in disbursing the payments and resulted in faculty complaints about the vendor calls related to late payments, which resulted in even more time responding to the faculty concerns.

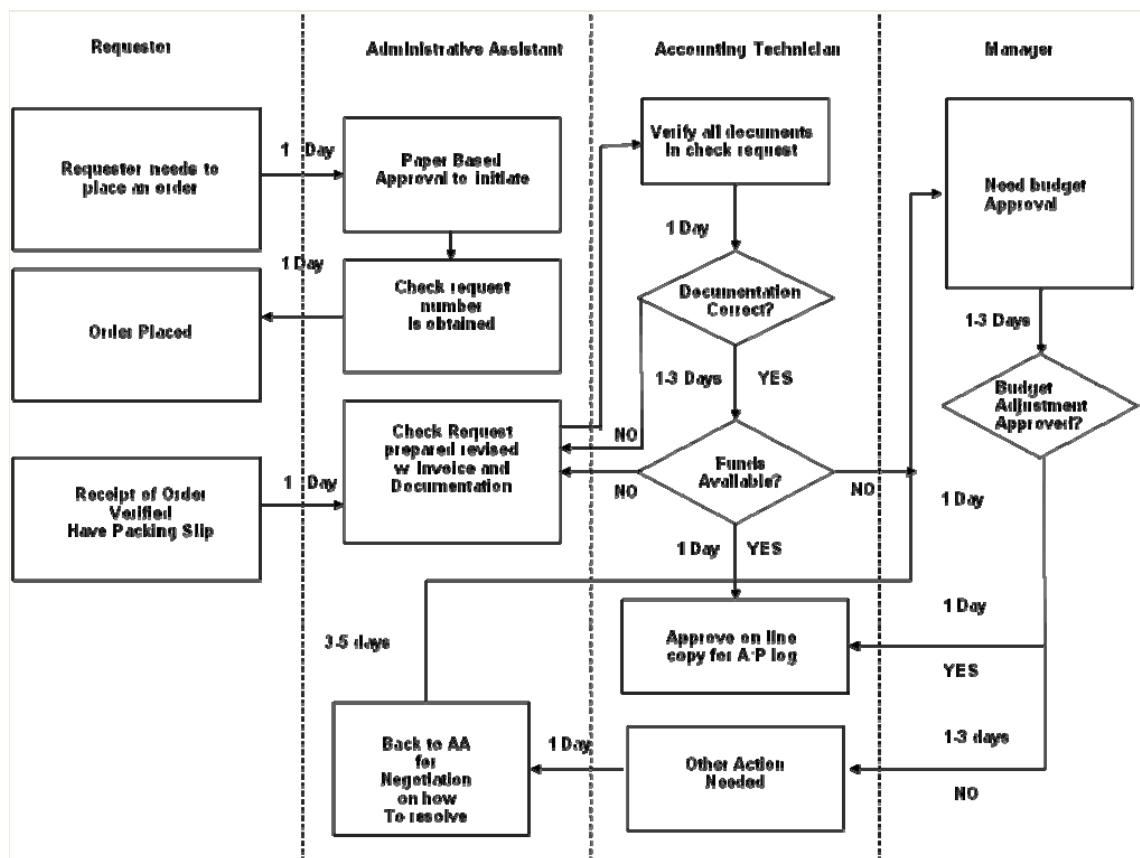


Figure 1

The redesigned process (figure 2) relied on the new information system (InfoPorte) approving the orders even before they were placed eliminating a few steps designed to check, approve, and

troubleshoot. The new process also reduced any lengthy after-the-fact disagreements on funding sources, and related arguments, negotiations, and rework. The payments were processed quickly because they did not require checks and cross-checks to ensure the availability of the right amount of funds from the correct source. Progress and status of the transactions were available to be viewed by faculty and staff alike. This redesigned process speeded up the process through automation and eliminated errors in execution and judgment, reducing the workplace hassles.

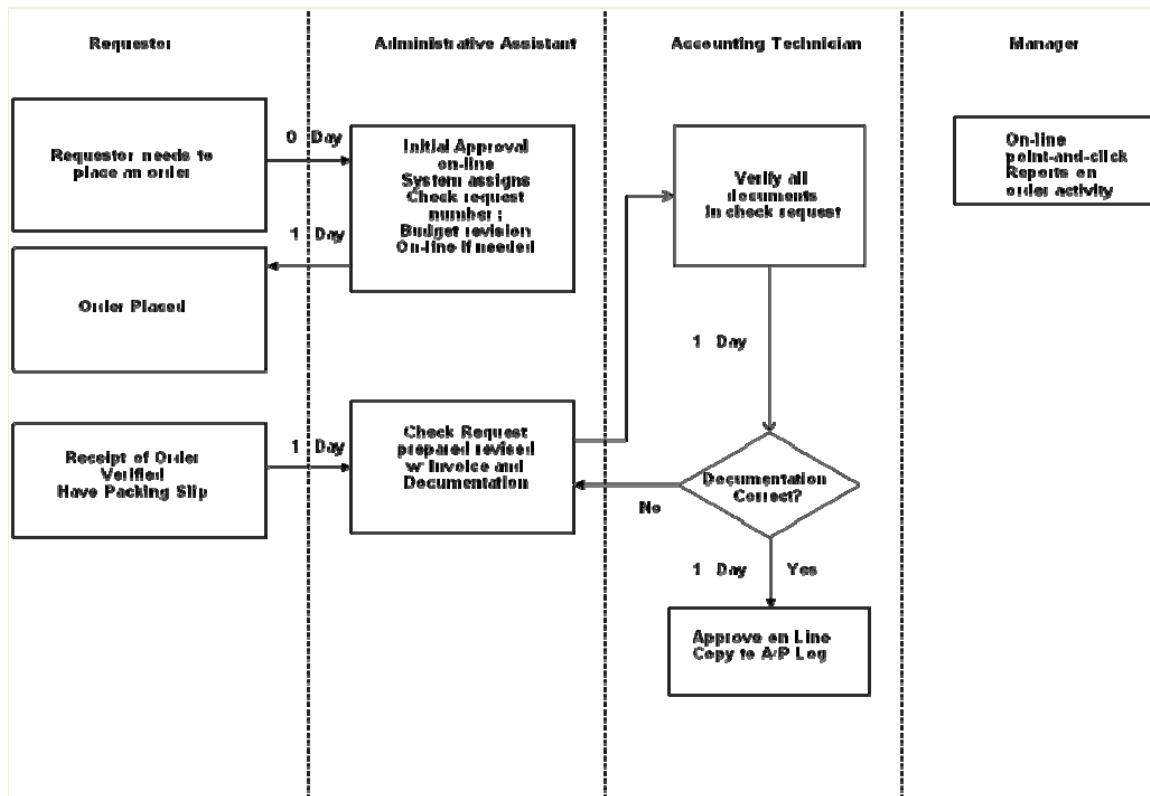


Figure 2

One by one other processes — including personnel actions — were and are being addressed similarly by streamlining, documenting, and then automating them to take advantage of system-based logic in authorizing transactions based on fund authority, fund availability, encumbrances already made, and the appropriateness of expenditure.

Business Information

The process work relied heavily on the availability of current and accurate information to work well. To overcome the shortcomings of the old legacy UNC systems, most UNC schools and departments had installed shadow systems that somewhat duplicated the accounting functions of the UNC systems, requiring redundant entries and creating a reconciliation challenge. The data in the shadow systems and the UNC systems was consistent only when they were synchronized and the information provided by these systems was not easily understood or usable by the faculty and support staff.

The School decided to take another approach. It created a Web-based portal for faculty and staff called InfoPorte to address this acute information need. At its simplest, InfoPorte gives users personalized access to the tools and information they need to do their jobs. It relieves faculty and administrative staff of any need to learn complex University systems or create shadow systems and work-arounds in order to get the routine information needed to manage funds and complete administrative tasks on a day-to-day basis.

The major benefit of InfoPorte is its ability to get around the incomprehensible, complex, unrelated, and inconsistent systems of UNC. Users no longer have to find (or be) an old pro with the esoteric knowledge and long experience required to decipher the mysteries of these systems.

InfoPorte is an integrated system that continually exchanges data with UNC systems, extracting data from them, correlating it, and tailoring it to the user. It lets users enter transactions and then transmits the data to UNC systems. By doing so, InfoPorte does away with the need for the recurring involvement of accounting and HR staff just to execute routine decisions. It provides the right information at the right place at the right time to simplify the work environment and

minimize any mistakes in judgment, transcription, or execution. It also minimizes the routine hassles involved in doing something over, making adjustments, and correcting errors.

This ability to be self sufficient was a major cultural change at the School. In particular, it enabled faculty, in particular, to manage their accounts confidently at a level they were comfortable. This particular self-help capability reduced the workload of the School administrative staff by more than 12 percent. No longer did staff receive calls to get the account balance or who is being paid on which accounts or for clarification of historical expenditure information. It helped the newly designed processes run smoother because of the transparency and accuracy it provided for all financial and personnel matters.

The School is in its third year of implementation and expects that this work will continue forever. After the second year of this initiative, the School evaluated its staffing needs — starting from scratch — based on the new processes and roles they eliminated and created, and restructured its staffing requirements and job descriptions to better fit the processes and the new or changed responsibilities. The process work and the InfoPorte system allowed the School to simplify the front end of the financial and human resources related work. That helped the School to eliminate some of the related job duties that were dispersed and fragmented throughout the organization and concentrate them in one office. With that the School lowered some of the competencies required in a large number of jobs while improving the overall quality of the work. The fewer number of staff involved in those roles improved the consistency and performance of processes and also reduced the training requirements. The School is still in the process of evaluating individual competencies and development needs to ensure that it has the right skill sets in the right spots. The School expects that the combination of processes, tools, and its people will continue to make it a successful institution.

Benefits

The School has seen its operations and customer satisfaction improve substantially. The often wasteful discussions over the veracity of the numbers, the number of calls made to find the most current balances, the decisions made without proper information, the penalties paid to the sponsors for financial mistakes, or funds underutilized and returned were all measurements that the School has significantly improved. At any given time, the faculty and their staff is capable of finding out, with a just a few clicks, the status of their funds, the expenditures against them, personnel funded by them, and status of their transactions.

This approach has created a work environment of well understood policies and processes, work simplification, well articulated staffing structure and competencies, and a focus on value-added work.

Benefits- Financial

Strictly from the numbers point of view, this is what the School was able to accomplish in three years:

Space/Locations Supported – 50 percent increase

Research Funding Growth- 138 percent increase

Graduate Student Growth- 28 percent increase

Professional Student Growth- 9 percent increase

Faculty Growth- 50 percent increase

Business Staff Growth- 18 percent reduction

Additionally the School was able to lower the job requirements for a large number of jobs as it concentrated the administrative work in one unit, and redeploy its staff for better productivity at a lower cost.

Benefits: Work Environment

The School has seen a more collaborative environment as a result of simplified and consistent processes. Angry emails, emergency calls, and problem escalations are now a rare occurrence. The routine escalations of the past are reduced to clarifications of unusual policy issues and interpretations. Having access to the same trusted and easy-to-get information for all concerned has increased the overall customer satisfaction.

Benefits: Improved Decision-making

With simplified interface, faculty and their support staff are now able to manage their contracts, grants, and projects. They have all the information needed to make the right decisions, including sponsors, renewals, personnel and effort distribution, terminations, and detailed expenditures, as well as any future commitments and liabilities, all on-line. For the first time, the School administration is fully knowledgeable about the overhead earned and salary offset (savings) by each contract, by faculty member, and for the entire School as a real-time information. The processes in place assure the data integrity and more effective execution and deployment, giving the faculty and administration more confidence in the decisions made.

Benefits- Morale Improvement

In addition to being able to administratively support rapid and aggressive growth, not having to invest into additional staff has helped the School invest more into faculty and research, creating an exciting atmosphere that fosters pride in its ability to grow in spite of the trying economic times. The staff restructuring that reduced many of the inequities in the staff roles and responsibilities and more closely matching process roles to the competencies has also helped bring a degree of consistency that, in part, enabled the investment in growth. This work is

serving as a model for and is expected to be adopted by the other schools and departments within UNC.

Retrospect

Times are tough and we are all, public or private, struggling with shrinking budgets. This is the perfect time to critically examine all aspects of our operations to find greater efficiencies and better ways of doing things to free up much-needed resources. Though a little skeptical that a business solution will be relevant in academia, we were able to use some of the best business concepts and tools to our benefits reducing the unit cost and helping meet the budget challenges. We found that business operations are pretty much the same in business or in academia even though their respective missions are vastly different.

Even though the methodology used was heavily based on Lean and Six Sigma, those names were never uttered during this work. The methodology was made to feel like it was home grown and improvised. The technology, top-management support, and patience with iterative improvements were three major ingredients essential for success. Technology was pursued tirelessly and relentlessly even though it was on the cheap and required continual persuasion of the system owners. The results were delivered in small increments but very rapidly, some as quickly as weekly. The organization did go through love-hate cycles where only top management remained unwavering and insistent, contributing heavily to the success of this effort. Right now, some of the faculty are the best promoters for this work across the campus.

Ultimately it helped to try a methodology that challenged us to look at ourselves all the way from our mission to the needed operations and rethink the way faculty and staff worked. That allowed us to reinvent our operations that met the challenge of aggressive pursuit of research and

education growth without adding corresponding costs. Productivity improvement also helped create a better working environment where people are proud of School's accomplishments.