PROCESS MAPPING

Using Process Mapping to Improve Efficiency in a Forensic Laboratory

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INTRODUCTION

While value stream mapping may be new to your vocabulary, the term isn't so new to many in the business world. In the past few years, forensic science has become a household phrase, with many youth now listing forensic scientist along with doctor and lawyer as their dream professions. While forensic science has been popularized in recent years, the reality is that the discipline is being molded more and more into a business environment. With outsourcing labs and fee-for-service labs such as The Forensic Science Services in the United Kingdom (1), government forensic laboratories need to be run like businesses to keep up with both demand and competition for services.

Government forensic laboratories are businesses with customers, although the customers may be nontraditional, such as a submitting law enforcement agency or even the Combined DNA Index System (CODIS). While government forensic laboratories pride themselves on remaining unbiased when providing results, it is important to realize that acknowledging the existence of a customer in this context does not equate to providing the law enforcement agency with the results they desire. Instead, it is possible to acknowledge a customer and continue to generate the same unbiased results. One important step towards this business environment is to map all laboratory processes to determine the most effective and efficient way to generate quality results for the overwhelming amount of criminal evidence and convicted offender samples that need examination.

WHAT IS VALUE STREAM MAPPING?

Value stream mapping is a paper-and-pencil tool used to visually demonstrate all actions required to create a product. The main goal is to document all value- and nonvalue-added information and actions to eliminate wasteful steps within a given process; the overall concept is to optimize the entire process rather than focusing on specific parts. The value stream mapping tool has been used largely in manufacturing environments, mainly owing its existence to Toyota Corporation (2), but is being adapted to various environments, including forensic laboratories. With the aid of General Motors Corporation, the Michigan State Police CODIS Unit began to implement value stream mapping in 2004 and has continued the process to date. This improvement process, which begins as an organizational and communication tool, can eventually become a discipline, a culture and a way of thinking in your laboratory.

THE STEPS OF VALUE STREAM MAPPING

Before getting started, invest time to plan for this new project. The preparation steps must answer a few basic questions such as:

1. Who is responsible for the success of this project?
2. What process is going to be mapped?
3. What is within the scope and outside the scope of the project?
4. When and where will the value stream mapping occur?
5. What metrics will be used to measure success?

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Once preparation is complete, value stream mapping is comprised of three major steps: current state map, future state map and business plan.

CURRENT STATE MAP

The first step involves creating a map of all steps involved to make a product. For a typical DNA databanking unit such as ours, this involves all steps from receiving convicted offender samples through uploading a DNA profile to the National CODIS database and ends with reporting any resulting CODIS matches (Figure 1). Draw multiple process boxes to represent specific steps of the procedure, such as evidence or sample reception. A series of process boxes linked through the entire procedure will become the current state map. The map can capture a variety of information, such as time to process one sample, time that one sample waits during the process and quality of the finished product. Use additional icons to capture other items such as inventory or information flow.

Involve every person in the unit during all steps of the process, especially when creating the current state map. Not only does this ensure that the most accurate information is used, but it creates a sense of ownership that cannot be attained through mere demonstration of the finished product. Honesty and equality are the keys to success in the current state map—everyone needs to be honest about how long it takes to complete a task, and each person's voice needs to be heard.

FUTURE STATE MAP

Next, and most importantly, create a future state map by identifying all waste within the process and brainstorming improvement ideas (Figure 2). Document waste by identifying instances when tasks are completed without adding value to the product, such as tasks that are done purely because they have always been done, not because they are currently necessary. Waste can manifest in many different ways such as extra inventory, excess movement and waiting.

A simple example of waste in our laboratory involved movement waste—equipment was located in specific areas of the laboratory simply because it had always been there. We quickly reorganized the laboratory to virtually eliminate movement waste. After waste is identified, make system improvements, often called kaizen bursts or kaizen moves, to make the process leaner.

It is important to listen to all ideas during brainstorming, especially the bold ones. Often we get so caught up in our day-to-day work that we overlook improvement ideas that are right in front of us—we can't see the forest for the trees. Value stream mapping is an opportunity for all employees to voice their suggestions. As a result, a second map is created to show an ideal state if all waste elimination measures are taken.

BUSINESS PLAN

Finally, create a business plan to ensure that the steps outlined in the future state map are completed (Figure 3). Assign each improvement

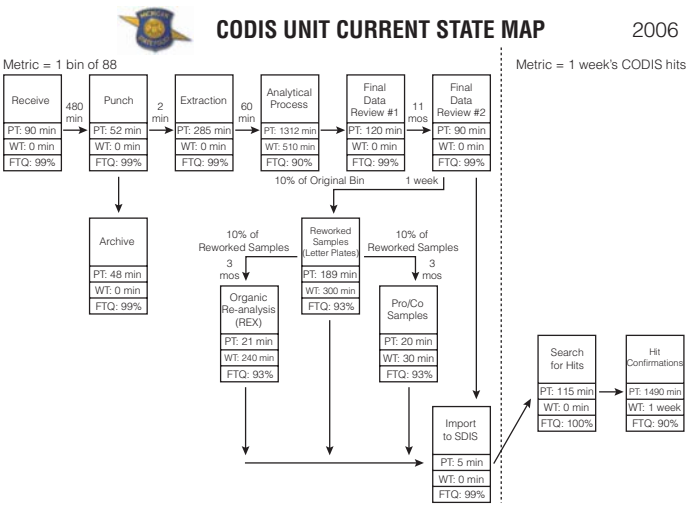

Figure 1. The current state map created for the databanking unit at the Michigan State Police Lansing Laboratory. Each process box represents a collection of steps to create a DNA profile to be uploaded to the CODIS database. PT = process time; WT = wait time; FTQ = first-time quality.

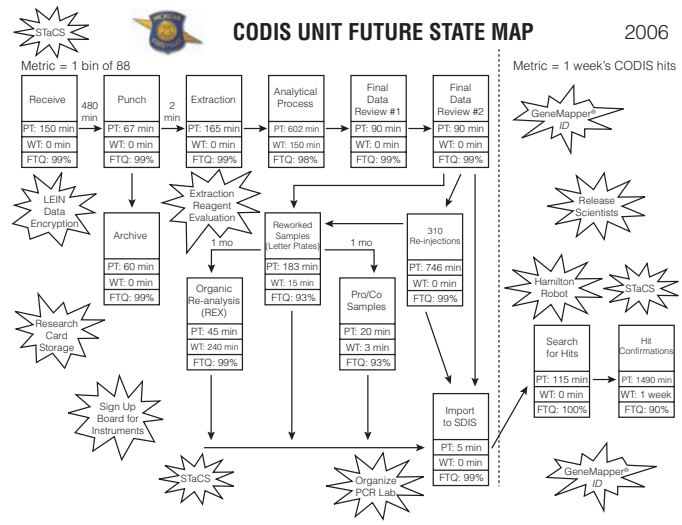

Figure 2. The future state map created for the databanking unit at the Michigan State Police Lansing Laboratory. The star-like figures are kaizen bursts representing improvement ideas.

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task to a specific person, thereby creating accountability. It is important to show that everyone, from supervisor to technician, will be held accountable for the tasks discussed during the value stream mapping session. The business plan must be detailed and direct, including names, completion dates and descriptions of measurable goals and objectives.

HOW TO SUCCEED

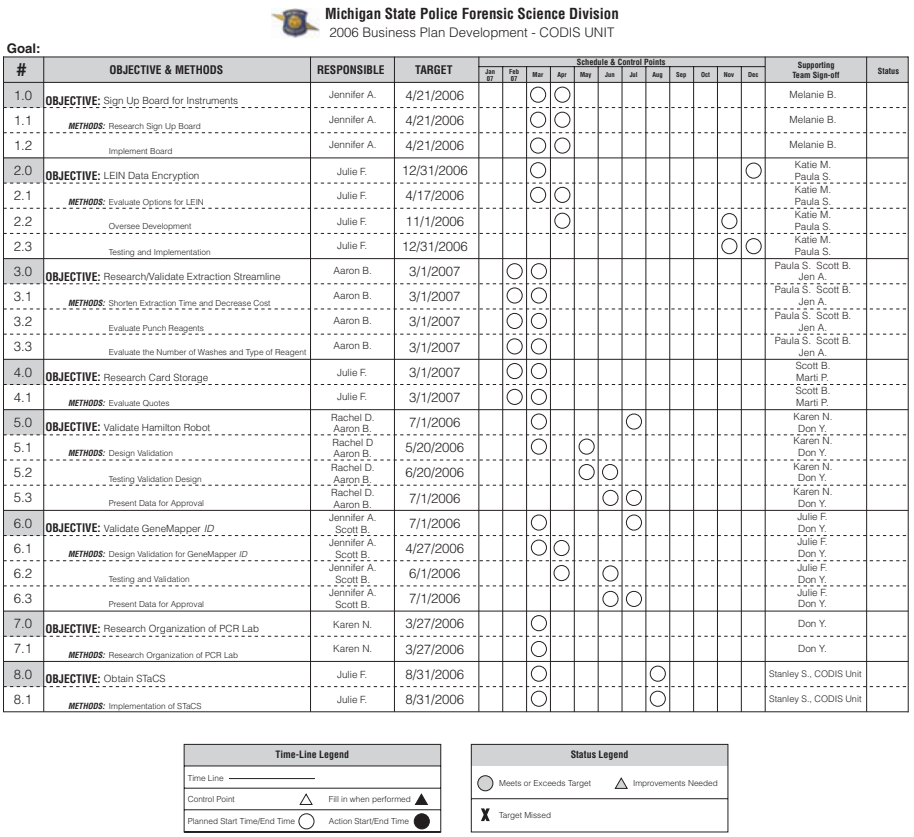
Implementation and followup are crucial to success. Revisit the business plan, evaluate the success of the newly implemented goals and track any delays that are causing missed deadlines. Determine and document the root cause of the delay, and develop a plan to get the objective back on schedule. While it may be difficult to envision finding time for the group to discuss the progress of each task, without accountability, the success of the program may be jeopardized. There is nothing more disappointing than investing time, resources and money into this self-improvement project only to have it fail due to insufficient followup. Additionally, do not skip steps, even if the result of the step seems obvious. The success of this self-improvement program is largely based on the teambuilding experience, not the result.

CONCLUSIONS

Although it is not a silver bullet that can solve all of your problems, value stream mapping has numerous and widespread benefits, including:

1. Creating a historical record of the unit to ensure continuity over time.
2. Creating a documented, graphical demonstration of your current processes to improve communication of the operations and future of the unit.
3. Experiencing a strong teambuilding exercise, creating a sense of ownership.
4. Developing a common language to discuss the lab process among scientists and managers.
5. Creating a disciplined work environment that is constantly working towards self-improvement

And perhaps most importantly, value stream mapping allows bench-level technicians and scientists to steer the direction of the unit, and the excitement and positive work environment this creates cannot be rivaled.



Michigan State Police Forensic Science Division
2006 Business Plan Development - CODIS UNIT

Goal:

#	OBJECTIVE & METHODS	RESPONSIBLE	TARGET	Schedule & Control Points: Jan 07	Feb 07	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Supporting Team Sign-off	Status
1.0	**OBJECTIVE:** Sign Up Board for Instruments	Jennifer A.	4/21/2006			○	○									Melanie B.	
1.1	***METHODS:*** Research Sign Up Board	Jennifer A.	4/21/2006			○	○									Melanie B.	
1.2	Implement Board	Jennifer A.	4/21/2006			○	○									Melanie B.	
2.0	**OBJECTIVE:** LEIN Data Encryption	Julie F.	12/31/2006			○									○	Katie M. Paula S.	
2.1	***METHODS:*** Evaluate Options for LEIN	Julie F.	4/17/2006			○	○									Katie M. Paula S.	
2.2	Oversee Development	Julie F.	11/1/2006				○							○		Katie M. Paula S.	
2.3	Testing and Implementation	Julie F.	12/31/2006											○	○	Katie M. Paula S.	
3.0	**OBJECTIVE:** Research/Validate Extraction Streamline	Aaron B.	3/1/2007		○	○										Paula S. Scott B. Jen A.	
3.1	***METHODS:*** Shorten Extraction Time and Decrease Cost	Aaron B.	3/1/2007		○	○										Paula S. Scott B. Jen A.	
3.2	Evaluate Punch Reagents	Aaron B.	3/1/2007		○	○										Paula S. Scott B. Jen A.	
3.3	Evaluate the Number of Washes and Type of Reagent	Aaron B.	3/1/2007		○	○										Paula S. Scott B. Jen A.	
4.0	**OBJECTIVE:** Research Card Storage	Julie F.	3/1/2007		○	○										Scott B. Marti P.	
4.1	***METHODS:*** Evaluate Quotes	Julie F.	3/1/2007		○	○										Scott B. Marti P.	
5.0	**OBJECTIVE:** Validate Hamilton Robot	Rachel D. Aaron B.	7/1/2006			○				○						Karen N. Don Y.	
5.1	***METHODS:*** Design Validation	Rachel D Aaron B.	5/20/2006			○		○								Karen N. Don Y.	
5.2	Testing Validation Design	Rachel D. Aaron B.	6/20/2006					○	○							Karen N. Don Y.	
5.3	Present Data for Approval	Rachel D. Aaron B.	7/1/2006						○	○						Karen N. Don Y.	
6.0	**OBJECTIVE:** Validate GeneMapper *ID*	Jennifer A. Scott B.	7/1/2006			○				○						Julie F. Don Y.	
6.1	***METHODS:*** Design Validation for GeneMapper *ID*	Jennifer A. Scott B.	4/27/2006			○	○									Julie F. Don Y.	
6.2	Testing and Validation	Jennifer A. Scott B.	6/1/2006				○		○							Julie F. Don Y.	
6.3	Present Data for Approval	Jennifer A. Scott B.	7/1/2006						○	○						Julie F. Don Y.	
7.0	**OBJECTIVE:** Research Organization of PCR Lab	Karen N.	3/27/2006			○										Don Y.	
7.1	***METHODS:*** Research Organization of PCR Lab	Karen N.	3/27/2006			○										Don Y.	
8.0	**OBJECTIVE:** Obtain STaCS	Julie F.	8/31/2006			○					○					Stanley S., CODIS Unit	
8.1	***METHODS:*** Implementation of STaCS	Julie F.	8/31/2006			○					○					Stanley S., CODIS Unit	

Time-Line Legend

Time Line ——————

Control Point △ Fill in when performed ▲

Planned Start Time/End Time ○ Action Start/End Time ●

Status Legend

○ Meets or Exceeds Target △ Improvements Needed

X Target Missed

Figure 3. The business plan created for the databanking unit at the Michigan State Police Lansing Laboratory.

ACKNOWLEDGMENTS

General Motors Corporation was instrumental in introducing and conducting value stream mapping for the CODIS Unit at the Michigan State Police as well as providing continued support. They were also gracious enough to allow me to attend additional educational courses on this topic at General Motors University.

Also, it would be incredibly short sighted not to sincerely thank every member of the CODIS Unit and all Forensic Division staff who participated in this successful undertaking to strive for continual improvement.

REFERENCES

1. The Forensic Science Service (2005) Annual reports and accounts 2004–05. This can be viewed online at: **www.forensic.gov.uk/forensic_t/inside/about/docs/04_05.pdf**
2. Rother, M. and Shook, J. (2003) Learning to see: Value stream mapping to create value and eliminate muda. Brookline, Massachusetts: The Lean Enterprise Institute.