Johns Hopkins University

INCREASING EFFECTIVENESS AND VALUE WITHIN RESEARCH ADMINISTRATION: PRIORITIZATION AND ENTERPRISE LEVEL PROJECT SELECTION THOUGH A LEAN SIX SIGMA LENS

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Abstract

Given the complexity in which research administration functions, process related inefficiencies, waste and defects are a familiar operational challenge. Lean Six Sigma provides a framework to deconstruct processes, identify waste, empirically measure the impact of the waste, and then correct sources of waste while quantifying the impact of the intervention. Core to meaningful process improvement is the selection of which projects an institution should undertake. Process improvement resources are often finite and limited. In order to optimize operations and outcomes, institutions must identify which projects should be invested in and prioritized. The objective of this Capstone Project is to: 1) Interview key stakeholders through the Baylor Scott and White Research Institute to determine strategic areas of need, 2) Develop project-based solutions to address system issues identified by the strategic needs assessment utilizing Lean Six Sigma methodology and 3) Create a prioritization matrix of strategic issues, opportunities, and projects to guide future process improvement efforts within the Baylor Scott and White Research Institute. Working with key stakeholders within the research institute, strategic areas of need were identified, project-oriented solutions were proposed, and projects were prioritized according to a Lean Six Sigma methodology. The results of the enterprise wise prioritization effort suggest the Baylor Scott and White Research Institute would benefit from dedicating resources to support two process improvement projects: 1) Identifying and correcting sources of waste and rework within the Contract Specialists workflow and 2) Selecting an appropriate project management software to facility study and project intake, prioritization, cost utilization, resource allocation, attainment of KPIs, and schedule of completion.

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Abbreviations

BSW	Baylor Scott and White
BSWRI	Baylor Scott and White Research Institute
LSS	Lean Six Sigma
KPI	Key Performance Indicator(s)
IRB	Institutional Review Board
PI	Principle Investigator

Glossary

DMAIC: A "data-driven improvement cycle" used for optimizing and stabilizing processes and designs. The Acronym stands for components of the improvement cycle: "Define, Measure, Analyze, Improve, Control."[1]

Lean Six Sigma: A process improvement methodology focused upon identifying waste within a process and systematically refining process through intervention. Pre and post intervention states are empirically measured and changes are evaluated utilizing statistical methods.

[1] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual (Buffalo, Wyoming: Harmony Living, LLC, 2018), 121

Chapter 1. Introduction

1.1. Background.

The idealized vision of scientific discovery, where a lone genius scientist inadvertently stumbles upon the epiphany which shifts of our understanding of the universe, is a rarity. The current great scientific questions which push forward the frontiers of knowledge are complex enough to require multidisciplinary teams to unravel truth.[2] The scope of resources required to support scientific discovery is daunting in its complexity. To meet this challenge, the research administration enterprise was born. It has undergone several evolutions over the past 7 decades.[3] In its current iteration, research administration duties "evolved into…groups of specialists"[4] whose expertise mirror the broad charge of research administration. Responsibilities of the research administration include the management of Federal research procedures which are tied to increasing complex compliance regulations,[5] the assurance of the ethical and responsible conduct of research, integrating evolving technology platforms, coordinating international cooperative efforts, and compliance with export controls are merely a sample of the breath of expertise required to successfully support research efforts.

Complex systems, especially those in which component elements to the system were developed in isolation from the remainder of the system, may suffer from defects

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[2] Committee on the Science of Team Science, *Enhancing the Effectiveness of Team Science*, ed. Nancy Cooke, and Margaret Hilton (Washington, D.C.: National Academies Press, 2015), 19.
[3] Kenneth Beasley, "The History of Research Administration," in *Research Administration and Management*, ed. Elliott Kulakowski & Lynne Chronister (Sudbury, Massachusetts: Jones and Bartlett Publishers, 2006), 27.
[4] Beasley, "The History of Research Administration," 27.
[5] Ibid., 27.

in process which impact efficiency and outcomes.[6] Efforts to improve efficiency or prevent mistakes within a complex system are challenging and benefit from a pragmatic approach to process improvement. One such approach, Lean Six Sigma, is a continuous process improvement methodology developed to "reduce errors and defects, make process more efficient, (and) improve customer satisfaction."[7] This approach seeks to identify "waste" in process which cause errors or decreased efficiency. Classically, Lean Six Sigma categorizes waste due to seven errors in process: overproduction (where a subprocess develops an output too quickly for other subprocesses to utilize), correction (where internal controls cause rework to occur), inventory (where excess inputs), motion (where employees spend excess time physically moving back and forth), conveyance (where products are moved inefficiency from place to place within a process), over-processing (where the output exceeds quality or quantity greater than is required by the customer), and waiting (where idle time causes the overall process to slow).[8]

Given the complexity of the research administration enterprise, especially in large organizations where the needs for research administration have expanded as research efforts have evolved within the institution, process related inefficiency, waste and defects are a familiar operational challenge. Lean Six Sigma provides a framework to deconstruct processes, identify waste, empirically measure the impact of the waste, and then correct sources of waste while quantifying the impact of the intervention. This

[6] Marcus Johnson, Melissa Middleton, Mackenzie Brown, Tara Burke, Tammy Barnett, "Utilization of a Paired Comparison Analysis Framework to Inform Decision-Making and the Prioritization of Projects and Initiatives in a Highly Matrixed Clinical Research Program." *Journal of Research Administration* 50, no. 1 (Spring 2019): 46.
[7] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual (Buffalo, Wyoming: Harmony Living, LLC, 2018), 17
[8] Ibid., 32.

approach has been successfully applied to healthcare, manufacturing, and research administration.[9]

1.2. Statement of the Problem.

The Baylor Scott and White Research Institute (BSWRI) is the research enterprise which supports the Baylor Scott and White Health System (System), one of the largest healthcare systems in the United States.[10] The ambition of the health care system is "to be the trusted leader, educator and innovator in value-based care delivery."[11] In line with their parent organization's ambition, over the past decade the BSWRI has shifted research focus from primarily science and basic science to clinical trials, translational research, and implementation research. This shift has required an evolution in the research administrative enterprise at BSWRI. To add further complexity to the organization, BSWRI is the result of the merger of two pre-exiting separate research institutes: Baylor Research Institute and the Scott and White Research Institute. The renewed operational model and focus of the BSWRI has led to dramatic improvements in output. The organization continues to have areas of operational opportunities. Lean methodologies have been incorporated into process improvement

[9] H.B. Gershengorn, R. Kocher, P. Factor, "Management strategies to effect change in intensive care units: lessons from the world of business. Part II. Quality-improvement strategies," *Annals of the American Thoracic Society* 11, no. 3 (March 2014): 444-53.
[10] "Our Story," Baylor Scott and White Health, last modified October 12, 2020, https://www.bswhealth.com/about.
[11] "Our Strategy," Baylor Scott and White Health, last modified October 12, 2020, https://www.bswhealth.com/about.

efforts at Baylor Scott and White Health to realize significantly improved patient outcomes in the clinical sphere.[12]

A core aspect of process improvement is to identify which projects an institution should undertake. Often process improvement resources are finite and limited. In order to optimize operations and outcomes, the BSWRI must identify which projects should be invested in and prioritized.

1.3. Project Question.

Can Lean Six Sigma process improvement methodologies be used to identify global issues within the BSWRI and prioritize process improvement efforts to realize the greatest return on investment?

1.4. Project Objectives.

The objective of the project will be to:

1) Interview key stakeholders through the BSWRI to determine strategic areas of need
2) Develop project-based solutions to address system issues identified by the strategic needs assessment utilizing Lean Six Sigma methodology
3) Create a prioritization matrix of strategic issues, opportunities, and projects to guide future process improvement efforts within the BSWRI

[12] A. Taenzer, A. Kinslow, C. Gorman, S. Schoepflin, S. Patel, S. Kraft, L Savitz, "Dissemination and Implementation of Evidence Based Best Practice Across the High Value Healthcare Collaborative (HVHC) Using Sepsis as a Prototype Rapidly Learning from Others," The Journal for Electronic Health Data and Method 5, no. 3 (December 2017), DOI: http://doi.org/10.5334/egems.192

1.5. Significance.

Inefficiencies in process ultimately require more resources, be they time, personnel, funding, to achieve the same end result. A more efficient and effective research institute makes BSWRI more attractive to sponsors and researchers. As a result, the patients care for within the Baylor Scott and White Health will have greater access to cutting edge treatments.

1.6. Exclusions and Limitations.

The Lean Six Sigma methodology reduces process improvement into specific stages known as DMAIC.[13] Process improvement of large scope strategic operational issues may take 24-36 months to complete. Given the time limitations inherent in the Capstone Project are limited to a semester, the Capstone will not address the completion of a specific process improvement project. In addition, interviews will be limited to key stakeholders of the BSWRI. As such, process issues faced by front line and individual staff will likely not be captured on this strategic assessment and prioritization matrix.

[13] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 120

Chapter 2. Literature Review

2.1. Overview of Literature Review.

Lean Six Sigma process improvement methodologies have been used to successfully optimize processes and reduce errors in healthcare[14] and manufacturing.

Project prioritization and enterprise level project selection is key to drive "effective change for the benefit" of the organization.[15] Six sigma-based project selection has been described previously and adopted by Agency for Healthcare Research and Quality.[16]

In the specialty of research administration, prioritization of projects and initiative is an "arduous task" due to the "need to simultaneously determine and evaluate the potential consequences and down-stream effect of those choices during prioritization efforts."[17] Johnson et al note research administrators "will be better prepared" to make decisions "by using a methodology that is structured, categorized, and inclusive of multiple stakeholder perspectives."[18] In their article *The Science is not enough: Aligning Research Operations to Maximize Research Strategy,* Deihr et al argue "maximizing an institution's research strategy through operational optimization does not happen by accident."[19]

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[14] H.G Gershengorn, R. Kocher, and P. Factor, "Management strategies to effect change in intensive care units: lessons from the world of business. Part II. Quality-improvement strategies," *Ann Am Thoric Soc* 11, no. 3, (March 2014): 444-453; S. Ahmed, "Integrating DMAIC approach of Lean Six Sigma and theory of constraints toward quality improvement in healthcare," *Rev Environ Health* 34, no. 4, (December 2018): 427-434

[15] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 120, 98

[16] S Deblois, and L. Lepanto, "Lean and Six Sigma in acute care: a systematic review of reviews." *Int J Health Care Qual Assur* 29, no. 2, (March 2016): 192-208

[17] Marcus R. Johnson, Melissa Middleton, Mackenzie Brown, Tara Burke, and Tammy Barnett, "Utilization of a Paired Comparison Analysis Framework to Inform Decision-Making and the Prioritization of Projects and Initiatives in a Highly Matrixed Clinical Research Program," *Journal of Research Administration* 50, no. 1 (Spring 2019): 46-65

[18] Ibid, 46.

[19] Ashley Deihr, Kimberly Ginn, and Colleen Lewis, "THE SCIENCE IS NOT ENOUGH: Aligning Research Operations to Maximize Research Strategy" *NCURA Magazine* 51, no. 2 (March/April 2019): 24-27

2.2. Details of Review.

Enterprise level project selection starts with the creation of a research strategy and vision. The primary aim of a defined mission and vision is to "direct the change."[20] In essence this vision acts "as a compass pointing towards the future."[21]

Enterprise strategic objectives flow from the mission and vision. Research administrators must make decisions and investments in the future to align with the vision and strategic objectives. Given the complexity of the research administration enterprise, appropriate prioritization of improvement efforts is critical.

2.3. Applicability of Literature Review.

The literature review supports the need for BSWRI to utilize a structured, categorized approach to project prioritization which reflects an effective operational strategy to realize the strategic needs of the organization.

[20] J.P. Kotter, "Leading Change," *HBR's 10 Must Reads On Change Management*, (Boston, Massachusetts: Harvard Business School Publishing Corporation, 2011), 2

[21] John S. Garrett, "Russian Dolls: Aligning Personal, Departmental, and Organizational Vision" (paper presented at Organization and Leadership for Research Administration, Johns Hopkins University, Baltimore, MD, Spring 2018).

Chapter 3. Need(s) Assessment

3.1. Need(s) Assessment.

The clear need for a systematic approach to evaluate potential operational opportunities was identified through interviews with senior leadership within the BSWRI. This was manifested by both a gap between current and future performance in key performance indicators, feedback provided by primary investigators, feedback provided by sponsors, and performance based upon national benchmarks.

3.1.1. Assessment of Need.

The need for this project was assessed though interviews with key stakeholders including senior leadership at BSWRI and principal investigators.

3.2. Metrics.

Structured and standardized interviews were conducted with key leadership within the BSWRI. Major areas of focus during these interviews identified operational opportunities within the pre-award space including time to site activation, and financial metrics evaluating ability of contracting to estimate budgets accurately. Specifics of the structured interview are described in detail in the Methods section.

3.3. Sources.

Key stakeholder interviews included:

1) President of the BSWRI
2) Former President of BSWRI
3) Chief Operating Officer and Senior Vice President of BSWRI

4) VP Chief Regulatory Officer

5) VP Chief Financial Officer of Foundations and Research

6) VP of Research Operations

7) Director of Clinical Trials Office

8) Director of Research Analytics

9) Manager of Operations overseeing Grants and Contracts team

10) Principle Investigators

3.4. Committees.

No committees were established to assist in assessing the need for the project.

3.4.1. Not applicable

Chapter 4. Project Description

4.1. Discussion of Project Elements.

This project consists of 5 phases:

Phase I: Data-Based Review of Current State of the Organization[22]

Structure interviews with key stakeholders and executive leadership for BSWRI to create a data-based review of the current state of the organization. The aim of phase I is to determine current opportunities within the BSWRI enterprise which impact the BSWRI ability to serve their customers. This is achieved through a structured interview focused upon the identification of customer, currently utilized metrics to define success within the organization, reported issues from staff, leadership, and customers, as well as gaps between anticipated future needs and current state.

Phase II: Brainstorm and Describe Potential Projects[23]

Data and opportunities identified within Phase I are used to brainstorm a list of potential projects. Very broad scoped projects are broken down into more fundamental, granular issues that compose the “Why?” an issue exists in current state. Individual projects also have an associated short descriptor. The descriptors contain sufficient information to identify how the issue is a hinderance to customers, employees, or the organization. They also contain details on the goal of the project and why BSWRI should address the issue.

[22] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 99
[23] Ibid., 99.

Phase III: Apply Basic Criteria to Shorten the List

Projects are removed from the list when they are inappropriate, do not work within a Lean Six Sigma methodology, are not scoped correctly, or are likely to have little return on investment of time, personnel, and process improvement resources. Projects with a very obvious solution are excluded as these issues do not likely require a full process improvement methodology to correct the underlying issue.

Phase IV: Create Unique Business Criteria[24]

The projects are prioritized based upon fulfillment of specific business criteria unique to BSWRI. Key stakeholders are utilized to identify and rank importance of specific business criteria to support the prioritization including how a specific project would impact revenue facing measurements, how the underlying issue is trending (if it is projected to have a large impact over a short time or over a long duration), how much the improvements would cost, likelihood of success, and resources required for the improvement. This effort starts from a basis of a more generic 15-point Project Viability Model.[25]

Phase V: Use Business Criteria to Prioritize Project Lists[26]

Utilizing the adapted project viability model, each project will receive a weighted rank within a matrix of potential projects. Key stakeholders then identify individual

[24] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 101
[25] Ibid., 102.
[26] Ibid.

project ranks within this framework. Utilizing weighted averages identified in Phase IV, the model develops a prioritization matrix of potential projects.

Chapter 5. Methodology

5.1. Methodology Overview.

Phase I consists of a structured interview with key stakeholders from BSWRI. The goals of this interview are twofold: to utilize internal and external sources of information concerning performance and to determine where areas of opportunity lie.

Key performance indicators (KPI) "measure how well the organization or an individual performs an operational, tactical or strategic activity that is critical for the current and future success of the organization."[27] The accurate and timely measurement of KPIs is resource intensive. As such, highly functional organizations aim to dedicate resources to measuring those KPIs which indicate success or failure to perform. As such, the initial interview focuses upon what BSWRI currently measures and tracks. The following questions were posed to each key stakeholder:

1) *Who are our (BSWRI) customers?*
2) *We tend to measure that which is important to us. Those things that define "success." What performance metrics /reports do you utilizing on a regular basis? These may be financial, quality, or outcome focused.*
3) *How about when others measure us? Do you have access to external reports about us? What do our consumer measure and value?*

[27] Harold Kerzner, *Key Performance Indicators. Project Management Metrics, KPIs, and Dashboards (2nd Ed.)* (Hobenken, New Jersey: John Wiley & Sons, 2013), 50

The remainder of the interview focuses upon identifying potential opportunities within the organization.

4) *Assuming our employees are all working their hardest to accomplish their goals, they will tend to voice issues that prevent them from functioning well. What types of complaints or issues are raised by employees?*
5) *"What types of things are customers complaining about?"*[28]
6) *"Where is the organization falling short of benchmarks?"*[29]
7) *What needs do customers have that the organization is not meeting?*
8) *A defect is a process produces something that is not as desired. A process can be anything where an input is acted upon to create an output. A process is a collection of task, steps, or activities that are performed to result in an end product. An example may be a protocol submitted to the IRB enters and is then approved. Another example is a PI must be onboarded to perform human studies research. What processes are outputting the most defects?*
9) *Sometimes a process has internal controls to catch defects before the output is created. This usually manifests as rework, where an intermediate output is identified as a defect and sent back to be reworked. An example may be the IRB requires a PI to submit a form*

[28] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 65
[29] Ibid.

in a specific manner, so they send it back to a PI. What processes are known for the most rework?

10) *What are the slowest or most expensive processes in the organization?*

The final aspect of the structured interview is to look at the future. Given the current state of the BSWRI and the future need it looks to fill, where does the organization have required growth?

11) *"What needs might customers have in their near future that the organization is not yet able to meet?"*[30]

12) *What are some of the obstacles preventing the organization from attaining its goals?*

Phase II takes the opportunities for improvement identified through the structured interview of Phase I and creates potential projects to correct these issues.[31] The correction of defects within a process may be identified through "asking increasing granular why questions about a process or process."[32] The "5 Whys" are a brainstorming tool applied to problems which require individual familiar with the process to ask increasing granular why questions, seeking to understand the root cause of an issue. The ultimate root cause is then the subject of focused process improvement

[30] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 65
[31] Ibid.
[32] Ibid.

through a DMAIC lens. This results in specific projects which can be evaluated through a Project Viability Model.

Individual projects are then paired with a project description which allow the team to identify specific issues, if the root cause can be corrected through a DMAIC model, and the nature of the problem. Each project description contains sufficient information to answer the following questions:

1) "How is the issue painful to the customer, the employee," or BSWRI?[33] How is this issue an impediment to achieving BSWRI's mission & vision?
2) "What is the goal that would be accomplished with the improvement"?[34]
3) Why should BSWRI address this issue now?

The aim of Phase III of the project is to eliminate projects which are inappropriate for a Lean Six Sigma methodology, are not properly scoped, or have little likelihood of return on investment. This starts by removing projects in which there is not significant need for improvement. Removal occurs when the current state and the desired future state are without a significant difference. In addition, projects are removed if they have a very obvious solution.

[33] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 100
[34] Ibid.

Phase IV, creating unique business criteria, is achieved by starting with Project Viability Model and refining criteria specific to the unique business cases desired. The Project Viability Model is demonstrated in Figure 1.

Figure 1. Project Viability Model[35]

Criteria	**Definition**
1. Sponsorship	The project is likely to be sponsored at a high level. Sponsorship increases the chance that teams will have access to the funds and resources required for a successful potential project.
2. Corporate Alignment	The goals of the project are aligned with the goals of the business. Working on potential projects that aren't aligned with business goals can reduce business effectiveness.
3. Data	Data is available or can be accessed so the team can design project metrics. Without access to data, a Six Sigma methodology can't be applied. If data is excessively time-consuming or expensive to collect, then the potential project is usually not the best choice.
4. Definition of defect	There is a specific, well-defined defect or problem. Without a well defined defect, potential projects run the risk of scope creep.
5. Stability	The potential process is stable and there are no expectations that the process is going to be overhauled, redesigned, or changed in the near future. There is usually no reason to spend time and money improving a process that will driastically change soon anyway.
6. Customer	The planned goal of the potential project would creat a substantial and positive impact on customer satisfaction or preception of quality.
7. Benefits	The potential project has a strong cost-benefit ratio.
8. Timeline	The timeline for a potential project is relatively short. Timelines for

[35] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 103

	most Six Sigma improvement projects are around 6 months, though some do run longer. Longer timelines decrease the chance that an improvement fits within the DMAIC methodology.
9. Solution	The potential project purpose is to find a solution that is not already known or defined. As we previously stated, if a solution is obvious, you don't need to run a project to find it.
10. Implementation is likely	A solution identified and verified by the potential project is likely to be implemented. If, for any reason, change is very unlikely within a process, then going through Six Sigma improvement work is a waste of resources.
11. Required investment	The potential project requires a large investment of cash. Generally, the greater the cash or capital investment required, the less likely a project will be selected or a solution will be implemented due to cost-benefit analysis.
12. Available Six Sigma Resources	The Black and Green Belts required for the project are available.
13. Inputs can be controlled	For a Six Sigma process improvement project to be successful, at least some of the inputs must be within control of the team or organization. For example, a team can't work to improve the quality of a part that is provided wholly by a vendor.
14. Redesign	The process can be improved as is and doesn't need a complete redesign.
15. Process quality is improved/maintained	The improvement doesn't negatively impact the quality of service or products along the value chain.

From this basic model, key stakeholders will be asked to weigh, on degree of importance using a Likert scale from 1-5 with 1 being the least important and 5 being the most important, the relative importance of that item for BSWRI. Each of the 15 criteria thus receives a weight by which the BSWRI can reflect that which is important to their local culture and resources.

In phase V, the key stakeholders complete the prioritization matrix by taking each project and determine how the project meets each of the criteria listed in the Project Viability Model on a 5-point scale from “no” to “yes.” The key stakeholders will enter a 1 in each box corresponding to their vote of the answer to the criteria question. Median score will be used to calculate the projects final score.

Figure 2. Project Prioritization Matrix[36]

Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
Is there a sponsor or champion?						
Does project goals align with BSWRI goals?						
Is data available or accessible?						
Are defects well defined?						
Is the process stable?						
Are there customers benefits to the project?						
Are there compancy benefits to the project?						
Can the project be completed in 6 months?						
Is the solution unknown?						
Is it likely a discovered solution will be implemented?						
Would a new solution cost little to no cash?						
Are their available of LSS resources?						
Can inputs in the process be controlled?						
Can the process be imporved without a full redesign?						
Will the improvements maintain or improve quality across the value chain?						
Total						
					Score	

Once the key stakeholders complete the Project Prioritization Matrix, the weights are normalized by dividing each weight by 3.[37] The weight is multiplied by each selection

[36] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 103
[37] Ibid., 105.

for the criteria (a).[38] Each column is then totaled (b).[39] Each of the summed weighted scores is then multiplied by the number at the top of the column (c). The results from each column are added together (d). The result is then divided by the sum of the total weights from step b.[40] The resultant number determines if the project is viable and provides a rank by which projects can be compared.[41]

5.2. Project Design and Discussion.

This project was designed utilizing the framework for selecting appropriate enterprise-level projects for process improvement according to the Lean Six Sigma DMAIC methodology. The output of this methodology is an individual weighted score for each project. Traditionally, projects considered viable within a DMAIC methodology will have scores of greater than 3.0. Projects with a score between 2.0 and 3.0 are considered potentially viable, but organizations should validate further. Projects with scores of less than 2.0 are not considered viable for DMAIC[42].

The final deliverable for this project is a matrix of potential projects, their descriptions and weighted final score. Projects are ranked within the matrix according to final score and presented within the context of viability.

[38] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 105
[39] Ibid., 106.
[40] Ibid.
[41] Ibid., 107.
[42] Ibid.

5.3. Discussion of Questionnaire.

A questionnaire was not utilized in this project.

Chapter 6. Project Results and Discussion

6.1. Project Results 1.

Initial interviews with key stakeholders at BSWRI identified 74 specific strategic areas of need. These ranged in scope from simple (statisticians do not have appropriate computer equipment to manipulate very large data sets) to complex (contract specialists are not able to accurately identify study cost). In general, the 74 strategic areas of need fell within 7 categories:

1) Study startup (23)
2) Tracking (7)
3) Infrastructure (12)
4) Communication (5)
5) Financial (4)
6) Principle Investigator (15)
7) Other (8)

6.2. Project Results 2.

Following phase II and phase III of the project, the 74 strategic areas of need were redefined, refined, and reduced to 9 projects (Table 1) which were amenable to a Lean Six Sigma approach, were actionable, and would lead to return on investment based upon an estimate of required work to achieve a desired outcome.

Table 1: Narrowed Strategic Areas of Need and Project Oriented Solutions

	Strategic Area of Need	Project Solution
1	Contract Specialists are not able to accurately identify study cost	Identify and correct sources of waste and rework within the Contract Specialists workflow
2	Study start up is very expensive. Volume is high enough we engage outside council. This gets very expensive and represents ~ 50%. We do not break even for this.	Quantify resouces currently spent on outside council and determine alternative approaches
3	Duration of creating a clinical trial agreement is too long	Evaluate and correct sources of waste and rework within clinical trial agreement
4	Progress and metadata tracked with different systems which do not communicate, Dashboards pull data from many sources, system are expensive	Identify and implement analytics platform which captures enterprise KPIs and presents them in a usable manner
5	Communication is hard (between executive and front line, between staff and PI)	Identify and implement standardized communiation tools for use within BSWRI
6	Align research efforts with what health system wants, stop diverting research into one offs	Create an oversight mechanism which determines how research administrative resources are allocated to specific projects.
7	No good way to determine what employees are working on, project management	Select appropriate project management software track project intake, prioritization, cost, resource allocation, attainment of KPIs, and schedule of completion.
8	Clinicians are too busy to do research, it is not prioritized	Develop protected time for researchers, supported through grants and industry.
9	New investigators have no formal process for onboarding or development. We are always retraining	Develop an onboarding, training, and mentorship program within BSWRI to support new investigators.

Of the 74 specific strategic areas of need identified though key stakeholder interviews, 23 issues focused upon issues with study start up. This represented the work ranging from initial introduction of the potential study to BSWRI through the time the first patient is enrolled. This work includes a complex interplay between estimating the cost of a study to create a budget, determining which of the required elements within a study are standard of care versus only necessary for research, negotiations with drug or device manufacturer (if indicated), institutional review board approval, and implementing screening and enrollment. Many of the areas for improvement focused upon the challenges the contract specialists face which make accurate completion of their task, estimating the cost of the study and accurately capturing this in negotiations, very difficult. For this reason, 3 of the 9 proposed projects focus upon study start up. The first proposal, project #1 is to utilize LSS methodology to identify and correct

sources of waste and rework within the Contract Specialist workflow. Of note, the Contract Specialists have a tremendous amount of rework incorporated into their normal workflow due to the changing conditions in which they work: updated protocols, changing PI expectations, and a near constant back and forth with drug and device manufacturers during negotiations ensure a Contract Specialist will rework the same product multiple times. Project # 2 is also related to study start up. This effort is purely focused upon reducing the cost of external legal review of study contracts. The effort of work for this project is likely relatively low. Project # 3, evaluating the sources of waste and rework within a clinical trial agreement, aims to reduce the duration of time required to work through the clinical trial agreement process. Current metrics followed by BSWRI include a goal of 120 days from study introduction to first patient enrollment. This goal is often met, but BSWRI senior leadership would like to further reduce this goal to 90 days.

Another common strategic area of need identified by key stakeholders included lack of functional and integrated informatics and analytics to support the enterprise. For this reason, potential project 4 focused upon identifying and implementing an analytics platform which captures enterprise KPIs and presents them in a usable manner. This same analytics platform would ideally integrate individual employee projects, departmental operations, and roll up enterprise level metadata to support operations. Potential project #7, selecting an appropriate project management software track project intake, prioritization, cost, resource allocation, attainment of KPIs, and schedule of completion could potentially be integrated into project #4, though the focus and tools

required for these two major strategic areas of need are likely sufficiently different as to necessitate distinct solutions.

Communication was another strategic area of need identified through key stakeholder interviews. Current infrastructure makes it difficult for senior leadership to communicate with front line staff. Communication within the organization often flows through the hierarchy of reporting: senior leadership communicated effectively with directors, directors communicate well with managers, managers communicate with project leaders and front-line staff. During exploratory interviews, senior leadership mentioned communication tends to get stuck at the manager level, and not make it to font line staff. In addition, communication between BSWRI research staff and PIs, who often balance other duties with research endeavors, has opportunities for improvement. Potential project # 5 focuses upon utilizing a LSS framework to identify and implement standardized communication tools for use within BSWRI.

Key stakeholders with BSWRI also noted a disparity between the type of research performed within the institution. As noted previously, BSWRI has shifted research focus from primarily science and basic science to clinical trials, translational research, and implementation research. The organization continues to support grandfathered research projects and one-off small projects from PIs. Research administrative support of these projects pulls limited resources away from projects which support the mission and vision of the parent organization. Project solution # 6, to create an oversight mechanism which determines how research administrative

resources are allocated to specific projects, would serve the purpose of ensuring alignment between BSWRI and BSW.

The final common strategic area of need identified by key stakeholders focused upon PIs. Two of the major issues involving PIs were identified as potential projects. Potential project #8 seeks to develop a mechanism to allow protected time for researchers, as supported through grants and industry. Potential project #9 aims to address the lack of formal program to support new PIs through the develop of an onboarding, training, and mentorship program within BSWRI to support new investigators.

6.3. Project Results.

Project solutions were then entered into the prioritization matrix. Key stakeholders weighted each section of the prioritization matrix (Table 2).

Table 2: Criteria Weighting as Determined by Key Stakeholders[43]

Criteria	Weight (from Phase IV)
Is there a sponsor or champion?	1.3
Does project goals align with BSWRI goals?	1.3
Is data available or accessible?	0.7
Are defects well defined?	0.7
Is the process stable?	1.0
Are there customers benefits to the project?	1.7
Are there company benefits to the project?	1.7
Can the project be completed in 6 months?	0.3
Is the solution unknown?	1.0
Is it likely a discovered solution will be implemented?	1.3
Would a new solution cost little to no cash?	1.7
Are their available of LSS resources?	0.3
Can inputs in the process be controlled?	1.0
Can the process be improved without a full redesign?	0.7
Will the improvements maintain or improve quality across the value chain?	1.3

This weighting was then applied as an assessment of each of the components of the project prioritization matrix as described in Chapter 5. The results of the project prioritization are listed in Table 3.

[43] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 103

Table 3: Final Prioritization Matrix

	Project	Weighted Score
1	Identify and correct sources of waste and rework within the Contract Specialists workflow	3.77
2	Quantify resouces currently spent on outside council and determine alternative approaches	2.79
3	Evaluate and correct sources of waste and rework within clinical trial agreement	3.73
4	Identify and implement analytics platform which captures enterprise KPIs and presents them in a usable manner	2.88
5	Identify and implement standardized communication tools for use within BSWRI	3.27
6	Create an oversight mechanism which determines how research administrative resources are allocated to specific projects.	3.44
7	Select appropriate project management software track project intake, prioritization, cost, resource allocation, attainment of KPIs, and schedule of completion.	3.75
8	Develop protected time for researchers, supported through grants and industry.	2.21
9	Develop an onboarding, training, and mentorship program within BSWRI to support new investigators.	3.00

Individual project scores and matrices are found in Appendix A. Criterion within the prioritization matrix were weighted by senior leadership according to BSWRI's goals (Table 2). With this lens, several criterion were heavily weighted: "Are there customer benefits to the project," "Are there company benefits to the project," and "Would a new solution cost little to no cash" all received a weight of 5.[44] Least important to the key stakeholders were the criterion of "Can the project be competed in 6 months," "Are their

[44] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 103

available LSS resources," "Can the process be improved without a full redesign," "Is data available or accessible," and "Are defects well defined."[45]

The final prioritization matrix provided a quantitative valuation of the nine proposed projects though a weighted score. These projects are then ranked according to final weighted scores. The limited LSS project improvement resources within BSWRI may then be applied to the projects with the top two scores. The two projects which earned the top weighted score received weighted scores above 3.7. These two projects were selected to proceed with implementation. The remaining projects, all of which were potentially viable and successful project, should be undertaken after completion of the top two scoring projects. Of note, three projects scored between 2.0 and 3.0, signifying the projects were viable, but further validation is required before moving forward with implementation. These projects were 1) the development of protected time for researchers supported through grants and industry, 2) identify and implement an analytics platform which captures enterprise KPIs and presents them in a usable manner, and 2) to quantify resources currently spent on outside council and determine alternative approaches.

The two projects which warranted implementation were 1) To identify and correct sources of waste and rework within the Contract Specialists workflow and 2) Select appropriate project management software track project intake, prioritization, cost, resource allocation, attainment of KPIs, and schedule of completion. Of note, the third highest scoring project, to evaluate and correct sources of waste and rework within

[45] The Council for Six Sigma Certification, Lean Six Sigma Black Belt Certification Training Manual, 103

clinical trial agreement, may be addressed though the implementation of the highest scoring project, #1.

Chapter 7. Recommendations and Discussion

7.1. Introduction.

The Lean Six Sigma framework described for selecting appropriate enterprise-level projects for process improvement creates a weighted score ranging from 1 to 5. Per the DMAIC model, scores below 2 are not considered viable projects. Of note, none of the narrowed down projects produced by the team of key stakeholders at BSWRI feel below a score of 2. The finding that each project was scored high enough to represent a viable project is likely a byproduct of the initial selection process defined in phase II and III. The strategic areas of need and their resultant projects naturally aligned with the priorities and weighting created by the key stakeholder.

The two highest scoring projects focused upon disparate areas of work. The highest scoring project, identifying sources of waste and rework within the Contract Specialist workflow, has several downstream implications. Correction of these root cause issues would directly impact the financial health of BSWRI, improve the efficiency of study start up, reduce study start up turn-around times, make BSWRI more attractive to potential external partners, and allow BSW to bring novel therapies to their patients. Likewise, the second highest scoring project directly supports BSWRI and BSW's mission to care for their patients, though from a different focus than the highest scoring project. The selection of project management software which tracks project intake, prioritization, cost, resource allocation, attainment of KPIs, and schedule of completion allows for much tighter control and operational support of research.

Of note, six of the nine projects scored well enough, between 3.0 and 5.0, to be immediately viable. The aim of this Capstone is to create a prioritization matrix of strategic issues, opportunities, and projects with the goal of guiding which projects should be invested in and prioritized. Given the limited LSS process improvement resources at BSWRI, only two projects were selected to move forward with implementation.

7.2. Recommendations.

7.2.1. Recommendation 1: BSWRI Would Benefit from Dedicating Resources to Identifying and Correcting Sources of Waste and Rework Within the Contract Specialist Workflow.

As noted in Table 2, BSWRI key stakeholder placed heavy emphasis and priority on projects in which there was executive leadership support, the project aligned with BSWRI goals, there were customer and company benefits to the project, and the solution would require little cash investment. Less important to the prioritization was how long it would take to complete the project. Full weighting and score for each potential project are found in the Appendix 1. Based upon these weights, correcting issues with the contract specialist workflow received the highest weighted score.

7.2.2. Recommendation 2: BSWRI Would Benefit from Selecting, Purchasing, Implementing, and Operating Project Management Software to Facilitate Study and Project Intake, Prioritization, Cost Utilization, Resource Allocation, Attainment of KPIs, and Schedule of Completion.

Tracking project intake and completion is not standardized within BWSRI. Each department appears to utilize a system developed locally. In some cases, there is no system available and requests are made directly to frontline staff without managerial input. This results in frontline staff who are attempting to balance their own workloads, intuit system level priorities, and potentially doing duplicative work. Appropriate project management software would allow manager to know which projects their staff was working upon, ensure it was aligned with system priorities, and time was allocated appropriately.

Chapter 8. Conclusion

The described approach to selecting enterprise-level projects for process improvement has several strengths. Every organization is different. As such the mission, vision, availability of resources, and prior attempts to correct known issues must play into a strategic assessment of where limited process improvement resources should be focused. The discovery of strategic areas of need is straightforward and consists of asking the right people where problems, both historic and future, exist within the organization. This approach is more robust when external customers are presented with the same query.

The LSS approach to enterprise wide project selection folds the organization's own heuristics into the prioritization process in two manners. First, the 15 elements of the Project Prioritization Matrix (Figure 2) are weighted to reflect the importance of those sub-elements within the selection process. An organization must determine how important it is for the project to have senior administrative sponsorship, the expected duration of time required to fully implement the project, and if the project will actually succeed. If a conservative organization only wishes to invest in projects which are sure to succeed, they will apply a different ranking than the organization which tolerates the risk of failure. Second, key stakeholders are able to rank each project according to the sub-element of the Project Prioritization Matrix according to how likely they are to achieve those results. The result is a weighted score that takes into account the origination's needs, resources, risk tolerance, support from senior leadership, and projected likelihood of success.

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Appendix 1. Individual Project Scoring

Project:	Identify and correct sources of waste and rework within the Contract Specialists workflow						
Issue:	Contract Specialists are not able to accurately identify study cost						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3				1.3	
	Does project goals align with BSWRI goals?	1.3					1.3
	Is data available or accessible?	0.7			0.7		
	Are defects well defined?	0.7		0.7			
	Is the process stable?	1.0		1.0			
	Are there customers benefits to the project?	1.7					1.7
	Are there company benefits to the project?	1.7					1.7
	Can the project be completed in 6 months?	0.3		0.3			
	Is the solution unknown?	1.0				1.0	
	Is it likely a discovered solution will be implemented?	1.3			1.3		
	Would a new solution cost little to no cash?	1.7				1.7	
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0		1.0			
	Can the process be improved without a full redesign?	0.7		0.7			
	Will the improvements maintain or improve quality across the value chain?	1.3					1.3
	Total		0.0	3.7	2.3	4.0	6.0
					Score		60.3
					Weighted score		3.8

Project:	Quantify resouces currently spent on outside council and determine alternative approaches						
Issue:	Study start up is very expensive. Volume is high enough we engage outside council. This gets very expensive and represents ~ 50%. We						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3			1.3		
	Does project goals align with BSWRI goals?	1.3			1.3		
	Is data available or accessible?	0.7					0.7
	Are defects well defined?	0.7				0.7	
	Is the process stable?	1.0		1.0			
	Are there customers benefits to the project?	1.7		1.7			
	Are there company benefits to the project?	1.7			1.7		
	Can the project be completed in 6 months?	0.3	0.3				
	Is the solution unknown?	1.0			1.0		
	Is it likely a discovered solution will be implemented?	1.3			1.3		
	Would a new solution cost little to no cash?	1.7		1.7			
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0				1.0	
	Can the process be improved without a full redesign?	0.7	0.7				
	Will the improvements maintain or improve quality across the value chain?	1.3			1.3		
	Total		1	4.3333333	8.333333	1.6666667	0.666667
					Score		44.66667
					Weighted score		2.791667

Project:	Evaluate and correct sources of waste and rework within clinical trial agreement						
Issue:	Duration of creating a clinical trial agreement is too long						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3					1.3
	Does project goals align with BSWRI goals?	1.3				1.3	
	Is data available or accessible?	0.7				0.7	
	Are defects well defined?	0.7		0.7			
	Is the process stable?	1.0		1.0			
	Are there customers benefits to the project?	1.7				1.7	
	Are there company benefits to the project?	1.7				1.7	
	Can the project be completed in 6 months?	0.3			0.3		
	Is the solution unknown?	1.0					1.0
	Is it likely a discovered solution will be implemented?	1.3			1.3		
	Would a new solution cost little to no cash?	1.7				1.7	
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0				1.0	
	Can the process be improved without a full redesign?	0.7		0.7			
	Will the improvements maintain or improve quality across the value chain?	1.3				1.3	
	Total		0	2.3333333	2	9.3333333	2.333333
					Score		59.66667
					Weighted score		3.729167

Project:	Identify and implement analytics platform which captures enterprise KPIs and presents them in a logical manner						
Issue:	Progress and metadata tracked with different systems which do not communicate, Dashboards pull data from many sources, system a						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3					1.3
	Does project goals align with BSWRI goals?	1.3				1.3	
	Is data available or accessible?	0.7		0.7			
	Are defects well defined?	0.7	0.7				
	Is the process stable?	1.0	1.0				
	Are there customers benefits to the project?	1.7		1.7			
	Are there company benefits to the project?	1.7				1.7	
	Can the project be completed in 6 months?	0.3		0.3			
	Is the solution unknown?	1.0			1.0		
	Is it likely a discovered solution will be implemented?	1.3				1.3	
	Would a new solution cost little to no cash?	1.7		1.7			
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0			1.0		
	Can the process be improved without a full redesign?	0.7			0.7		
	Will the improvements maintain or improve quality across the value chain?	1.3		1.3			
	Total		1.666667	5.6666667	3	4.3333333	1.333333
					Score		46
					Weighted score		2.875

Project:	Identify and implement standardized communication tools for use within BSWRI						
Issue:	Communication is hard (between executive and front line, between staff and PI)						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3					1.3
	Does project goals align with BSWRI goals?	1.3				1.3	
	Is data available or accessible?	0.7		0.7			
	Are defects well defined?	0.7		0.7			
	Is the process stable?	1.0	1.0				
	Are there customers benefits to the project?	1.7				1.7	
	Are there company benefits to the project?	1.7				1.7	
	Can the project be completed in 6 months?	0.3		0.3			
	Is the solution unknown?	1.0				1.0	
	Is it likely a discovered solution will be implemented?	1.3				1.3	
	Would a new solution cost little to no cash?	1.7		1.7			
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0			1.0		
	Can the process be improved without a full redesign?	0.7	0.7				
	Will the improvements maintain or improve quality across the value chain?	1.3				1.3	
	Total		1.666667	3.3333333	1.333333	8.3333333	1.333333
					Score		52.33333
					Weighted score		3.270833

Project:	Create an oversight mechanism which determines how research administrative resources are allocated to specific projects.						
Issue:	align research efforts with what health system wants, stop diverting research into one offs						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3				1.3	
	Does project goals align with BSWRI goals?	1.3					1.3
	Is data available or accessible?	0.7			0.7		
	Are defects well defined?	0.7		0.7			
	Is the process stable?	1.0	1.0				
	Are there customers benefits to the project?	1.7		1.7			
	Are there company benefits to the project?	1.7				1.7	
	Can the project be completed in 6 months?	0.3		0.3			
	Is the solution unknown?	1.0			1.0		
	Is it likely a discovered solution will be implemented?	1.3					1.3
	Would a new solution cost little to no cash?	1.7					1.7
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0			1.0		
	Can the process be improved without a full redesign?	0.7	0.7				
	Will the improvements maintain or improve quality across the value chain?	1.3				1.3	
	Total		1.666667	2.6666667	3	4.3333333	4.333333
					Score		55
					Weighted score		3.4375

Project:	Select appropriate project management software track project intake, prioritization, cost, resource allocation, attainment of KPIs, and
Issue:	No good way to determine what people are working on, project management

Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
Is there a sponsor or champion?	1.3				1.3	
Does project goals align with BSWRI goals?	1.3					1.3
Is data available or accessible?	0.7				0.7	
Are defects well defined?	0.7			0.7		
Is the process stable?	1.0			1.0		
Are there customers benefits to the project?	1.7			1.7		
Are there company benefits to the project?	1.7				1.7	
Can the project be completed in 6 months?	0.3		0.3			
Is the solution unknown?	1.0				1.0	
Is it likely a discovered solution will be implemented?	1.3					1.3
Would a new solution cost little to no cash?	1.7		1.7			
Are their available of LSS resources?	0.3			0.3		
Can inputs in the process be controlled?	1.0					1.0
Can the process be improved without a full redesign?	0.7		0.7			
Will the improvements maintain or improve quality across the value chain?	1.3					1.3
Total		0	2.6666667	3.666667	4.6666667	5
				Score		60
				Weighted score		3.75

Project:	Develop protected time for researchers, supported through grants and industry.
Issue:	Clinicians are too busy to do research, it is not prioritized

Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
Is there a sponsor or champion?	1.3			1.3		
Does project goals align with BSWRI goals?	1.3		1.3			
Is data available or accessible?	0.7			0.7		
Are defects well defined?	0.7				0.7	
Is the process stable?	1.0	1.0				
Are there customers benefits to the project?	1.7	1.7				
Are there company benefits to the project?	1.7			1.7		
Can the project be completed in 6 months?	0.3	0.3				
Is the solution unknown?	1.0				1.0	
Is it likely a discovered solution will be implemented?	1.3		1.3			
Would a new solution cost little to no cash?	1.7	1.7				
Are their available of LSS resources?	0.3			0.3		
Can inputs in the process be controlled?	1.0		1.0			
Can the process be improved without a full redesign?	0.7	0.7				
Will the improvements maintain or improve quality across the value chain?	1.3			1.3		
Total		5.333333	3.6666667	5.366667	1.6666667	0
				Score		35.43333
				Weighted score		2.209979

Project:	Develop an onboarding, training, and mentorship program within BSWRI to support new investigators.						
Issue:	Starting off new investigators has no formal process or onboarding, always retraining						
	Criteria	Weight (from Phase IV)	No (1)	Mostly No (2)	Possibly (3)	Mostly Yes (4)	Yes (5)
	Is there a sponsor or champion?	1.3		1.3			
	Does project goals align with BSWRI goals?	1.3				1.3	
	Is data available or accessible?	0.7			0.7		
	Are defects well defined?	0.7	0.7				
	Is the process stable?	1.0	1.0				
	Are there customers benefits to the project?	1.7				1.7	
	Are there company benefits to the project?	1.7				1.7	
	Can the project be completed in 6 months?	0.3				0.3	
	Is the solution unknown?	1.0		1.0			
	Is it likely a discovered solution will be implemented?	1.3				1.3	
	Would a new solution cost little to no cash?	1.7		1.7			
	Are their available of LSS resources?	0.3			0.3		
	Can inputs in the process be controlled?	1.0				1.0	
	Can the process be improved without a full redesign?	0.7	0.7				
	Will the improvements maintain or improve quality across the value chain?	1.3				1.3	
	Total		2.333333	3.9666667	1.033333	8.6333333	0
					Score		47.9
					Weighted score		3

Appendix 2. Biography

Dr. John S Garrett currently serves as the Chair of Emergency Medicine at Baylor University Medical Center, flagship hospital of the Baylor Scott and White Health System, and Chief Medical Officer of Beacon Emergency Services Team. He most recently served as Chief Patient Safety Officer and medical director for healthcare improvement at Baylor University Medical Center at Dallas, the flagship hospital of Baylor Scott & White Health. Dr. Garrett completed his fellowship in EMS medical directorship, disaster response, and pre-hospital research at Carolinas Medical Center in Charlotte, North Carolina and then relocated to Baylor University Medical Center in Dallas, Texas. His research efforts have focused on implementation science, bringing the newest developments in resuscitation science to the emergency departments of Baylor Scott & White Health. With the overarching goal of improving system of care and to prevent avoidable patient harm, Dr. Garrett leads and participates in multidisciplinary teams which reduce hospital acquired conditions, improve the efficiency, decrease utilization of healthcare resources, and address rapid recognition of critical illness.