The Intellix Approach to Optimization

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Introduction

Clinical care today has become increasingly more complicated, but Electronic Medical Records (EMR) and related information technology improvements have the potential to streamline these practices. Over the next decade, it is very possible that we will see more advancements in clinical care by improving today's workflows than we will by inventing new therapies. Unfortunately, the current state of many EMR deployments is not sufficient for clinicians to use the technology effectively and productively. These EMR systems are activated in a "factory build" version configured by the vendor, and have not been comprehensively optimized to best fit the needs of a specific organization's clinicians, staff, operations, and business practices.

EMR vendors emphasize that the initial go-live is only the first step in realizing the benefits of their systems. However, the complex, expensive and time consuming nature of an EMR implementation, along with the pressures of other mandatory IT initiatives such as ICD-10 implementation, mean that many optimization considerations are often deferred until well after the go-live, and then only done under the pressure having to make quick fixes to solve immediate crises. Most of the time, post go-live optimization merely becomes an adjunct of break-fix Help Desk support, performed on an ad hoc basis. Numerous reports have shown that the increasing use of EMRs has been accompanied by enormous challenges in EMR usability, leading to decreased clinician and business productivity, provider and staff discontent, decreased or stagnant quality of care metrics, decreased patient satisfaction, and consequent overall low ROI. Additional information and links to published literature on the challenges of EMR usability can be found in Appendix B.

At Intellix, we strongly believe that optimization is an integral part of implementing an electronic health record, and that it should be a carefully planned, multi-disciplinary, strategically managed Program. We look at Optimization as the process of using people, processes and technology to achieve quantifiable improvements in healthcare operational performance. We use intuitive building blocks based on clinical workflows, business processes, technology utilization, and data analytics. Our approach to optimization includes the following factors:

- Clear optimization goals that meet "SMART" criteria (Specific, Measurable, Attainable, Realistic and Timely)
- An engaged, integrated governing body with representation from clinical, technical, and business areas
- Experienced and multi-talented analysts who specialize in optimization work
- A vision that takes the User's perspective to optimize Process, and Technology
- A methodology that follows a cascading Building Blocks approach to combine simple solutions to solve complex problems
- An approach that utilizes industry-wide Best Practices to achieve goals without sacrificing standardization, efficiency, or proven techniques
- A program to support continuous, on-going training using advanced methods of adult education with proven effectiveness
- Objective metrics to measure clinical, operational, and business success of the optimization efforts

Optimization Methodology

Overall Process

Intellix's overall Optimization Process is shown below:

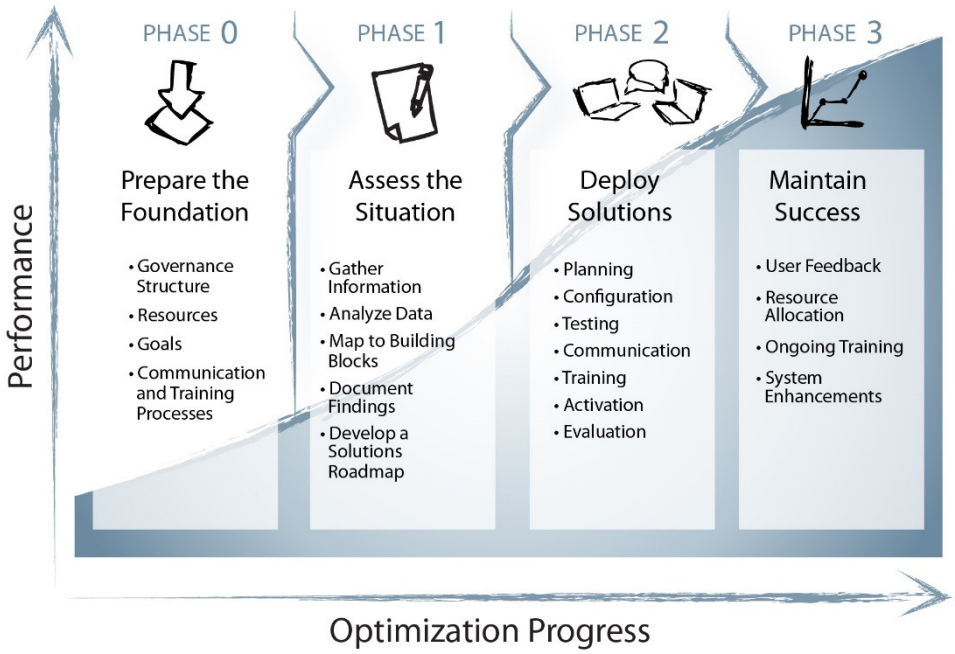

Figure 1: Intellix's Optimization Methodology

This methodology is driven by the guiding principle that optimization should be performance-guided, user-oriented, and data-driven. In other words, we believe that goal of optimization is to determine what clinicians and staff need to increase their performance, provide these tools, and evaluate the results whenever possible with objective metrics. This process is mature and reliable and has been shown to objectively improve key performance indicators, including operational efficiency, clinical quality, user happiness, and patient satisfaction. Please refer to the Client Experiences in Appendix A for specific examples of successes from using this process

At Intellix, we have learned from experience that optimization needs to be a prioritized organizational initiative, not just an IT project. Your organization should decide at an enterprise level to optimize since the EMR is merely one component of the optimization efforts. Optimization will require workflow improvement, strong management, and organizational transformation of varying degrees. It requires close collaboration between all divisions of your organization, including IT, clinicians, quality management, revenue cycle, patient access, operational management, and the business office. Senior leadership needs to be involved in the strategic decision to start a program of optimization as well as in setting the specific goals for the optimization initiative. Therefore, the first step in our Optimization Methodology is to validate that certain key elements needed for an effective Optimization Program are in place at your organization. If these have not yet been established, we can help your staff develop them in a preparatory "Phase 0" stage.

Once the prerequisites are confirmed (or developed), the optimization process will proceed in a phased approach. In the first Phase (Assessment), Intellix's experienced Optimization Analysts will use our Optimization Building Blocks methodology to analyze the target for optimization and develop recommendations for improvement. Then in the next Phase (Deployment), the Optimization Analyst(s) will build, test, train, and activate those recommendations. This unique, data-driven, user-focused Optimization Methodology enables Intellix to partner with your team to solve your most difficult optimization issues. Finally, our industry-leading experts will leave your team with the tools necessary to maintain ongoing optimization into the future (Phase 3, On-going Improvement).

Optimization Building Blocks

The heart of Intellix's proven, data-driven optimization methodology is the concept of Optimization Building Blocks. These Building Blocks are categories of optimization targets that allow our Optimization Analysts to analyze a seemingly complex problem and break it down into simpler, manageable issues, thereby making it easier to identify the root cause(s). These root causes are mapped to specific Building Blocks, as are proposed remediation actions. Groups of remediation actions in turn rollup into overall recommendations that give a custom-tailored roadmap to optimize the deficient situation.

At a high level, these Building Blocks fall into six broad categories:

- Behavior: How people interact with technology
- Process: How people interact with each other
- Systems: EMR system functionality including ancillary systems, hardware, network etc.
- Content: EMR data, including orders, notes, formularies, etc.
- Training: Continuous improvement training program and methodology
- Analytics: Collecting, analyzing, and reporting aggregate EMR data

Note that not all of these Building Blocks may be used to analyze specific optimization projects. The exact Building Blocks that are used will depend on the details of each situation. More information about these Building Blocks can be found in Appendix C.

Phase 0: Prerequisites and Preparation

An effective Optimization Program needs to be built on a solid foundation of communication/training processes, governance structure, resources, and goals. If these prerequisites are not already in place, they can be established as part of a preparatory "Phase 0" stage prior to beginning the actual optimization project. This phase can be done by the client prior to engaging Intellix in the Assessment phase, or can be done by Intellix's experienced optimization team. Please refer to the Client Experiences in Appendix A for example of how Intellix has helped a variety of clients develop the foundation of their Optimization Programs.

Communication and Training Processes: Communication with end-users and training are really two sides of the same coin. Communication lets end-users know what to expect with the EMR technology and, if done properly, also allows end-users to give feedback on the EMR and associated workflows. Training can be thought of as a (very important) type of communication that gives end-users the tools and experience they need to properly utilize the EMR. Communication and training are both critical to the success of almost all optimization projects. They are the final bridge between the project team's

work and the end-users, and the mechanism to transfer knowledge to end users so that they can use the new tools effectively to enhance the quality of patient care.

The EMR should just be one area for communication and training; other areas that can just as much from effective communication/training are processes and workflows that complement the technology. A large part of an organization's clinical preparedness and readiness for optimization is being able to communicate to end-users how their job will be different upon activation of the optimization, and then use training to bridges any knowledge gaps about the new workflows or EMR functionality and allow end-users to focus on their primary responsibility - patient care. Effective communication can be facilitated by following the "3 E's": *Engage* the end-users, *Explain* what will be done next, and set Clear *Expectations* about the expected benefits.

The ideal situation is to have processes in place from the very beginning to conduct continuous two-way communication with end-users as well as on-going training. This is not the same as conducting continuous classroom training: the training/communication can take the form of weekly "tips and tricks" e-mails, user groups, a monthly newsletter, town hall-style forums, or regular "lunch and learn" sessions. The important thing is to embed this communication and training into the end-users' normal routine so that they become accustomed to reviewing educational material for the EMR and know where to go to find the most up-to-date information. If this process is not already an established routine at your organization, Intellix can help you set this up using a team of analysts specialized in communicating with medical professionals.

Having an established communication and training approach in place will also help your project team experiment with the best methods to communicate with the end-users. Then when it comes time to communicate/train your optimizations your team will already know the most effective methods to use. Regardless of the exact method however, communication and training should be a collaborative process. Your project team and trainers will need to work closely with physicians, nurses, technologists, financial staff, and other members of the healthcare organization to successfully develop and deliver communications and training. Again, as mentioned above, if your processes for communication and training are not as well-defined or effective as you would like, Intellix has the staff and resources to help you set up a robust program for these important activities.

Governance: A formal, well-defined governance structure is the foundation for the optimization project. All your EMR optimization efforts should fall under a single governing body, and this group should represent key stakeholders from various areas of your organization, including a senior management representative(s). Suggested members include representatives from nursing (Med-Surg, OR, ICU, and ambulatory areas), quality management, office managers, ancillary departments (lab, radiology, OT/PT), procedural areas (Cath Lab, GI), IT, HIM, and patient access. Superusers and physician champions are also critical team members.

A well-rounded governance committee will engage Leadership from the very beginning of the optimization process thereby ensuring that they have appropriate expectations for the project, will facilitate the cooperation of their operational areas, and emphasize that they will need to act on the findings. A good governance structure will also help your optimization initiative by ensuring it is aligned with your organization's mission, strategic objectives and other initiatives, not blocked by lack of decision-making power, and in the best interest of the entire enterprise, not just a few "silos".

Resources: Although not entirely an IT initiative, optimization does require significant IT resources. These resources should be almost 100% dedicated to the optimization project and report to the optimization project manager. Dedicated resources will help you make measurable progress. It is very easy for IT issues to derail an optimization effort, which is ironic, since the optimization will usually mitigate many of the IT issues. Having dedicated resources will also make it easier to make sure you have the right people doing this critical work: an analyst who is good at implementations may not be good at optimization. In a time of increasing IT specialization, particularly with EMR, optimization still requires the skills of an experienced generalist. The ideal optimization analyst should have both technical knowledge and clinical workflow experience and be able to deal with complexity and uncertainty. The person should have the patience and empathy to interact with (sometimes angry) clinicians and translate their requests/complaints into clear change requirements and specifications, and the initiative and drive to see these requests through to completion – in the face of competing tasks and distractions.

All of this takes analytical skills, enthusiasm, excellent judgment, curiosity, initiative, patience, and strong communication skills. The optimization analyst must be a strong advocate of the EMR as it currently exists, but at the same time envision how the system can be improved for the future. If this sounds like an exceptional set of skills to find in one person, that's because it is. The truth is, you rarely find all of these traits in an individual. At Intellix, we have a special role of "Optimization Consultant" for those exceptionally talented and experienced individuals who specialize in this type of clinical and technical work.

Goals: The previous three optimization prerequisites contribute to the final and most important prerequisite: setting clear, realistic goals to accomplish with the optimization efforts. Feedback on optimization needs from communicating with end-users and trainers, prioritization of the needs by the governance committee, and allocating the right resources to tackle these needs are all critical to the setting of realistic and useful goals for your optimization initiative.

Having specific optimization goals will avoid one of the most common reasons that optimization efforts fail. Ambiguous or unrealistic optimization goals leaves everyone unhappy: the optimization team feels overworked and pulled in a dozen different directions, the clinicians feel that their specific optimizations are not receiving enough focus, and management is not seeing results. Without clear goals, optimization efforts can become unmanageable. To avoid this trap, your optimization goals should follow the SMART criteria of being specific, measurable, attainable, realistic and timely so that they can be clearly communicated and assessed. These goals should be aligned with and support the organization's overall strategic goals and should also allow for quantifiable metrics to measure results. Some examples of optimization goals are listed in Appendix C.

Phase 1: Assessment

Depending on the goals defined in the Preparation phase, the Assessment phase can be conducted as a rapid "snapshot" of a specific area of the organization, a more detailed evaluation of a single area, or a comprehensive assessment of multiple areas. In any of these situations, the goal is to identify the critical targets for optimization by objectively assessing the current situation using first-hand observations, data analytics, and well-crafted user surveys, and then map these targets back to the Optimization Building Blocks to develop a clear, efficient action plan to remediate. Assessments can be focused on a variety of domains, such as clinician/software interactions, operational workflows,

technology and functionality, reporting and data analytics, Whatever the domain of interest, a carefully planned and executed optimization assessment will identify the critical workflow or functionality points that can be leveraged to provide maximum benefits for minimal effort, help build a consensus for optimization among senior leadership, and provide the structure to develop a detailed, project-based improvement plan or drive goals for continuous improvement year after year.

Intellix's approach to an Optimization Assessment is shown below:

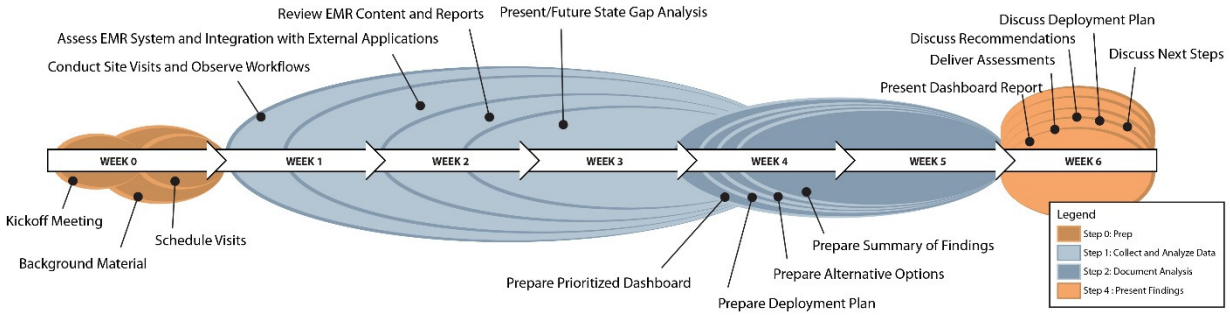

Figure 2: Intellix's Approach to Optimization Assessment

Whether it's a rapid survey, or a more in-depth evaluation, this approach follows the same basic steps: (1) Preparatory Work, (2) Collect and Analyze Data, (3) Document Assessment and Recommendations, and (4) Present Findings. These Steps are described in more detail in the following sections:

Step 1 (Preparatory Work): The first step will be to have a kick-off meeting with your project team and Senior Leadership to communicate objectives, engage stakeholders, schedule site visits, confirm system access, discuss high-level project activities, review project timeline, and establish project roles. In addition, there is often a Preparatory Call with site managers to finalize expectations and logistics for the visits.

It is also helpful in this preparatory step to review report metrics from your system and how they have changed over the past year. This might identify certain areas to follow-up with during the onsite assessment. Some data that would be helpful are financial numbers before and the EMR was implemented, financial numbers for the same month from different sites, time required to admit patients, metrics from quality reports (including Meaningful Use reports), order set usage reports, physician order entry reports, open/closed charts, Inbasket volumes, and chart deficiency reports.

Step 2 (Collect and Analyze Data): After the prep work is done, our experienced, knowledgeable Optimization Analysts will go to your operational and clinical areas and conduct a first-hand gap analysis to document the current state and compare it to the desired state. This analysis may consist of some or all of the following types of assessments:

- Interviews with providers and staff to get feedback about their use of the EMR: what works well, what does not work as well?
- Interviews with clinical managers and directors to get their perspective about what is and is not working with the EMR
- Observe providers and staff while they use the EMR, paying special attention to the workflows surrounding the computer use
- Diagram the information flow across the EMR: is information getting to the right people at the right time?
- Review the EMR to assess the efficiency tools available to the end-users, such as order sets, documentation templates, navigators, preference lists, and reports. This review can be conducted alongside your EMR analyst to make sure your IT staff are kept in the loop and aware of the findings.
- Review reports to evaluate key performance and quality indicators to identify potential deficiencies for further investigation
- Use Optimization Building Blocks mapping to analyze the identified issues, distinguish contributing factors, and extract root causes

Steps 3 and 4 (Document Assessment/Recommendations and Present Findings): Once the analysis has been completed, Intellix will document its findings and recommendations as described below and work with your project team and leadership to review the documents, gather feedback, and outline potential next steps to guide near-term and long-term optimization activities. As part of these discussions, Intellix will:

- Meet with the project team to outline a series of possible recommendations to address the conclusions shared and validated in Phase II.
- Develop costs, benefits, user adoption concerns, and assumptions for each recommendation.
- When necessary, determine if benefits can be achieved more economically by creating variations of the appropriate recommendations (altering assumptions, costs, technical elements, time line, etc.)

The findings from the Optimization Assessment will be presented in a ranked list, prioritized by an overall "Likelihood of Quick Success" (LoQS) score that is composed of six ratings:

- Potential Benefit: Small to Major
- Build Effort: Low to High
- Workflow Impact: Low to High
- Training Effort: None, Handout, Presentation, etc.
- Governance Effort: The stakeholder commitment needed to define and/or monitor the change
- Scope of Change: How many people will the change affect: a single person, a department, all ambulatory or inpatient users, or the entire organization.

- Dependencies: Potential impact of the change on other workflows or functionality.

The single aggregated LoQS metric can be clearly shown in a "traffic light" style dashboard with Green indicating a high likelihood of quick success and Red a low immediate likelihood (although the change still may have a high likelihood of success in the long run). This allows leadership to easily see which recommendations will yield "quick wins" and help them prioritize which ones should be deployed first, as shown in the following example:

Recommendation	Comments	Optimization Building Block	Potential Benefits	Build Effort	Workflow Impact	Training Effort	Governance Effort	Scope of Change	Dependencies	Likelihood of Quick Success
Add InBasket Speed Button functionality	Adding these buttons will offer more information right on the InBasket screen	System	◔	◑	◔	◔	○	●	○		🟢
Add more Flowsheet views	Build new flowsheet views or refine the current flowsheet views to only include pertinent data.	Content	◑	◑	○	○	◑	◑	◔		🟢
Telephone Note Workflow	Users are unclear on how to use the different types of Phone Notes. Train users on the difference between telephone notes and refill requests, and how to use flags and quick notes. Provide policies and procedures for using each of the documentation types.	Behavior, Process	○	○	◕	◕	◑	●	○		🟡
Deploy Anticoagulation module	Currently clinicians are using general EMR tools to track Anticoagulation patients. Installing specialized tools for this will increase efficiency and quality, especialy when combined with a Coumadin registry or therapeutic anticoagulation (Coumadin) registry; use Cardiology as a pilot site	Process, System	○	◑	◕	◑	◑	◑	◑		🟡
Allow providers to run reports on their patients	Top Requests were reports for Key Lab Results, Open Orders, Last Visit, Next Appointment, Demographics. Recommend this be a longterm project or a gradual rollout with pilot reports and users	Analytics, System	◑	●	◔	◕	●	●	◑		🔴

Figure 3: Example of an Optimization Assessment Dashboard.

Open circles represent the most favorable conditions (e.g.: greatest benefit or least effort), closed circles represent the least favorable conditions, with partially shaded circles indicating varying degrees of favorability.

The recommendations will describe what needs to be done to fill the gap between current and desired/future state, and make sure these activities are in compliance with your organization's regulations.

The Optimization Assessment deliverables will also include a high-level plan to execute, deploy, and activate the recommendations. This allows the Assessment team to provide a roadmap for future improvement and reduces the chances of information being lost between assessment and implementation. The plan will include:

- The technical, workflow, and training elements needed for successful deployment of the recommendation
- Where appropriate, post-deployment metrics for each recommendation that measures performance increase and end-user benefits.

- A projected timeline to deploy the recommendation, based on resource availability and testing/training time.

A sample six-week assessment plan is described in detail in Appendix E.

Phase 2: Optimization Deployment

The next phase is to execute, deploy, and activate the optimization recommendations. The biggest risk with this phase is that it may not be done at all due a perceived lack of resources or demands of other projects. The tendency might be to put the recommendations on the shelf and implement them at a later time. However, that "later time" seldom ever actually arrives and the users will never see the benefits of the optimization assessment. Moreover, any optimization plan will have a limited shelf life in your organization's dynamic, fast-paced environment, as continually evolving technology and operational improvements are likely to change the assumptions the optimization plan was based upon.

The key to avoiding this potential loss of momentum and planning is leadership at all levels of the organization: Leadership from senior executives to emphasize the important to the organization of finishing the optimization process, leadership from IT directors to show the tangible ROI that will result from implementing the optimization (using the same objective metrics used for the Assessment), and leadership from an Optimization Project Manager to ensure that the optimization team members maintain their focus on the project and progress with their tasks in the face of competing priorities. Having a prioritized list of optimization recommendations will greatly help generate momentum, because it will make it easier to pick only the most important optimizations for implementation, and make efficient use of possibly scarce resources. The implemented optimizations should be treated as a single project with multiple streams. This will help maintain the clarity of the optimization efforts, make it easier to manage and track the work, and maintains a "critical mass" so the individual recommendations don't get lost in a blur of small projects.

Having a strong Project Manager leading the implementation effort is also important. Optimization projects typically lack the budgetary, time-dependent, and enterprise-wide urgency of the initial EMR install, and so may be more prone to delays, diverted resources, and loss of focus. These pitfalls can be avoided with a solid project manager who has the initiative, drive, and leadership to keep the project on track and see it through to completion in the face of competing tasks and distractions. The good news is that if the Assessment has been done right and the recommendations prioritized correctly, then the optimization implementation will yield many more tangible benefits than other projects of similar size. Optimization implementations are among those rare projects that make life easier for the users, make a positive difference for the organization, and demonstrate an objective ROI. Done right, these optimization projects can easily justify themselves.

Communicating with the user community about these implementation plans and progress is also very important. This is where having an existing infrastructure to communicate with end-users becomes so valuable. The methods of communication must meet the needs of your audience and have a multi-pronged approach. Emails are often the easiest form of communication. However, it is also the easiest

way for users to ignore and delete the communication. Consider reaching the users via a dedicated communication board within their departments or units. Involve the staff to keep the board updated and hold staff members accountable for reviewing the posted information. Another successful tool is a newsletter that can be sent electronically as well as distributed throughout the organization. Communicating early and using consistent communication tools will help the optimization team succeed.

Finally, once the optimizations have been implemented, celebrate your success! Communicate the positive effects the changes have had on patient care and for the overall organization. Also be sure the optimization team has included the ability to report on improvements after the changes have been made so that Senior Leadership can visualize the gains and see a cost-benefit analysis of the optimization work.

Phase 3: On-going Improvement

Of course, the end of the optimization implementation does not mean that all optimization work is done. Ultimately, optimization is an ongoing, continuous process. Over time, you may want to implement additional findings from the initial Assessment or conduct additional Assessments to take advantage of evolving technology or upgrades to the EMR. You should also have a process to gather feedback from end-users in an incremental, but continuous manner. After all, they are the ones who interact with the EMR the most and will have the best feel for those activities that don't work as efficiently as they should. The best suggestions for optimizing the system often come from the end users and you should have a process for them to submit ad hoc feedback and optimization requests. User groups and "lunch and learn" sessions are also good forums to get this valuable feedback from your users. You should communicate back to users who provide feedback so that they are aware that that their comments were heard and have realistic expectations for when the suggestions will be incorporated into decision-making. In addition, it will be helpful to perform regular on-site visits to see user interactions with the EMR firsthand and gather as many unbiased observations as possible. Simple questions and discussions with the end users can lead to many great ideas and potential future optimizations.

Along with continuing to communicate with users, it will also be important to continue to devote resources to support optimization on an ongoing basis, either by having a dedicated optimization team, or (more likely) allocating a certain amount of time per week for each of your analysts to work on optimization. You should make sure that there is some degree of integration between your help desk and the optimization analysts so that support tickets can be transitioned into optimization requests as appropriate. Leadership should also continue to stress the importance of optimization to the organization by setting optimization benchmarks aligned with overall strategic goals and including these metrics in performance evaluations in all areas of the organization (not just in IT). Some organizations have an Optimization Manager to oversee all these continuing optimization activities, either a project manager or a resource manager if there is a dedicated optimization team. Whatever the details of your ongoing optimization program, it will be important to continue to engage end-users, gather ideas from

those who use and support the EMR, and continue to improve and refine the technology to better support your providers, your organization, and your patients.

Conclusion

Since our inception, Intellix Solutions has been helping our clients maximize the benefits of their EMRs. We are now ready to take this support to a new level by focusing on optimization as its own service line. We have accumulated a wealth of experience on optimization and understand that it is bigger than just the EMR, it is about fitting a combination of great technology and best practices to a dynamic clinician environment, and we have retained some of the industry's best and brightest optimization talent to tackle this potentially complex situation. We have industry-leading clinical, operational and technical experts with hands-on experience designing, leading, executing optimization projects across the country. Their myriad of experiences has led us to develop our Building Blocks optimization methodology, a reliable, repeatable, user-focused process, with quantifiable metrics for measuring success.

Appendix A describes just a few of the many optimization successes we have helped our clients achieve. Deriving the value out of an EMR and realizing its true potential is still problematic. Our talent and methodology will help your organization bridge this gap using a clinically, operationally, and technically balanced approach that will greatly increase the likelihood of achieving your desired optimization results.

Creating an optimization program is a challenging task, but if done right, has significant quantitative and qualitative rewards. It can set your organization ahead of its competitors, make patients smile, and improve staff and physician satisfaction. It is important to have senior level involvement, a solid governance structure and a communications strategy that includes the entire organization. An effective optimization program will transform your organization, leading to streamlined access to data, increased clinician collaboration, better processes, and improved outcomes.

Appendices

Appendix A: Sample Client Experiences

Below are brief descriptions of just some of the ways we have helped our clients achieve success through our Optimization Methodology. For references, or more information about these or other optimization projects, please contact Bill Gannon, VP of Business Development (e-mail: bgannon@intellixs.com; phone: 541-382-0939).

Intellix's Optimization Methodology has helped clients:

Achieve Long-term, Quantifiable Successes

- We helped create and lead a dedicated Optimization Team for two years for a large Virginia-based IDN. The team consisted of 8 dedicated optimization analysts along with support from 20 inpatient and ambulatory analysts from other teams. This team had several quantifiable successes:
  - Helped increase certain Core Measures scores from 80 to 99%,
  - Increased Admission Orders compliance from 85 to 98%
  - Increased Medicaid Admission Certification compliance from 67% to 100%.Reduced the time to implement software optimizations by 25%
  - Average number of open optimization requests was reduced by 50%.
  - Decreased the time to build new ordersets by 33% by developing a new Orderset Management Process
  - Increased User Satisfaction with the EMR from 67% to 93%.

Improve Quality

- We worked with a premier West Coast academic medical center to optimize their sepsis practice by integrating and automating paper screening tools with the EMR.
  - Extensive system design changes to workflow, decision support alerts, and false positive reduction were introduced to the production system and monitored.
  - Preliminary Results showed significant improvements in sepsis prediction, with detection rates of 87% (ICU) to 100% (Cardiac ICU, General Med/Surg) and positive predictive value of 72% (ICU) to 83% (Cardiac ICU)
  - As a result of the increased sensitivity of the EMR-based approach, the screening population is expected to be reduced to 10-15% of the total inpatient population (from 100% pre-optimization) with an overall sepsis mortality result of less than 10%

Increase Efficiency

- We led a multidisciplinary team through a rapid optimization of the Inpatient Admission workflow for an 8 hospital system in the Midwest. This optimization was accomplished in 6 weeks with significant results, as measured by objective metrics. For example:
  - Admission documentation time was reduced by 50%
  - Overall door to bed admission time was reduced by 33%
  - Patient Satisfaction with the new process was 95%, versus 80% for the old process.

Rapidly Assess and Enhance the EMR:

- We helped a large West Coast IDN address a number of inpatient and ambulatory post go-live issues.
    - The client had already established a 10-person optimization team, but this team was not successful due to ambiguous priorities, weak governance, low clinician engagement, and lack of knowledge of advanced EMR functionality.
    - The Engagement Objective was to use an experienced project manager and subject matter experts to conduct a rapid optimization assessment of key hospitals and clinics. This assessment consisted of four parallel tracks:
        - Assess current physician proficiency with the EMR and recommend an "at the elbow" training curriculum and plan
        - Review the current system build state and recommend build updates as necessary to support optimization activities
        - Recommend an organizational structure and process to provide ongoing governance of optimization activities and establish a physician Super-Users program throughout Sutter Health
        - Recommend tools and a process to regularly communicate optimization activities to physicians across the organization and receive feedback on an ongoing basis.
    - The assessment was completed in 6 weeks and led to immediate remediation in all four tracks. We were retained to enhance the system build and we provided sufficient knowledge transfer for the client to complete the remediation activities for the other 3 tracks.

Improve Operations

- We were asked by the executive leadership of a large West Coast academic medical center to help resolve a number of post go-live issues in a specialty department that had recently suffered a major loss of revenue since implementing an EMR one year previously:
    - After the EMR go-live, the providers were seeing significantly fewer patients per day, resulting in decreased provider satisfaction, poor patient access, significantly lower revenue, and low patient satisfaction.
    - We provided a functional and operational assessment within this group, resulting in recommendations for remediation in both areas.
    - We were retained to work with the client on the remediation efforts.

Create an Optimization Program

- We were engaged by a large pediatric hospital on the West Coast to help establish the infrastructure, policies and procedures for an Optimization Program, including:
    - Developing processes for end-users to request optimizations through the hospital's IT help desk
    - Creating a strong governance committee that allowed the Optimization Team to set and pursue the most beneficial and achievable objectives, while insuring the interest of the Users, Clinicians, Patients, and other Stakeholders were kept in mind
    - Establishing a transparent, standardized, numeric system for evaluating and prioritizing the optimization requests, including reporting capability to allow users to see the status of their requests on demand.
    - Defining metrics for determining ongoing optimization resource needs, based on the work effort of actual requests, to maintain a consistent, level work effort even if optimization demands increase in the future.

Develop a Strategic Optimization Plan

- We acted as an Optimization Advisor for several Ambulatory clients across the country, ranging from small community healthcare organizations to large IDNs and academic medical centers. As part of this role, we developed a rapid optimization methodology that walked the client from the initial assessment to recommendations to solution deployment in 6 weeks.

Appendix B: The Challenges of EMR Usability

If you would like to learn more about the challenges of EMR usability and adoption, these seven recent articles are a good place to start:

1. **Complicated, confusing EHRs pose serious patient safety threats**
   (http://www.modernhealthcare.com/article/20140620/NEWS/306209940)
   Excerpt: "Confusing displays, improperly configured software, upgrade glitches and systems failing to speak to one another—those are just a few electronic health record-related events that put patients in danger, according to a new study. The more complex an EHR system, the more difficult it may be to trace problems, patient safety experts warn. Hospitals planning to add new software or make updates should be strategic about changes and proactively include ways to monitor events….'It's not just the technological complexity, it's also the social aspect around technology," explained study co-author Dr. Hardeep Singh…."We're just now beginning to get an understanding of this,' he said."

2. **Ways EHRs can lead to unintended safety problems**
   (http://www.amednews.com/article/20130225/profession/130229981/4/)
   Excerpt: "Wrong records and failures in data transfer impede physicians and harm patients, according to an analysis of health technology incidents…171 health information technology-related problems [were] reported during a nine-week period to the ECRI Institute PSO, a patient safety organization…It is not enough for physicians and other health care leaders to shop carefully for IT systems, the report said. Ensuring that systems such as computerized physician order entry and electronic health records work safely has to be a continuing concern, said Karen P. Zimmer, MD, MPH, medical director of the ECRI Institute PSO…The institute's findings are just the latest to draw attention to the safety problems posed by health IT systems, such as EHRs. A December 2012 Pennsylvania Patient Safety Authority study found that the number of EHR-related adverse events reported to the authority doubled in just one year, from 555 in 2010 to 1,142 in 2011. A study in February's Critical Care Medicine showed that three-quarters of physicians' progress notes for intensive care patients were copy-and-pasted, a practice dubbed 'sloppy and paste' that experts say can lead to mistakes in care."

3. **Health information technology: fallacies and sober realities**
   (http://jamia.bmj.com/content/17/6/617.short?rss=1)
   Abstract: "Current research suggests that the rate of adoption of health information technology (HIT) is low, and that HIT may not have the touted beneficial effects on quality of care or costs. The twin issues of the failure of HIT adoption and of HIT efficacy stem primarily from a series of fallacies about HIT. We discuss 12 HIT fallacies and their implications for design and implementation. These fallacies must be understood and addressed for HIT to yield better results. Foundational cognitive and human factors engineering research and development are essential to better inform HIT development, deployment, and use."

4. **More complex EHRs can result in declines of quality measures**
   (http://www.amednews.com/article/20120904/business/309049997/8/)
   Excerpt: "Electronic health records boosted to meet stage 1 meaningful use standards produced an increase in quality. But there were setbacks once systems were further upgraded and became more complex, according to a new study. The reason for the disparity is most likely linked to the presence of CPOE, said study co-author Ajit Appari, PhD.…Appari said CPOE is not a fully matured technology,

and it needs to work with an effective clinical decision support system to yield positive results. He said most of the CPOE systems in use today have basic decision support capabilities, such as drug interactions, but not clinical guidelines and pathways…'[I]t is important to understand that EHR systems are 'living' systems requiring careful nourishment, continuous building of strengths, and consistently exploiting those strengths routinely at point of action,' Appari said. He said technology can be leveraged to improve quality by continuous use of the systems and constant updating to the data sets used for decision-making."

5. **Impact of Electronic Health Record Systems on Information Integrity: Quality and Safety Implications**
(http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3797550/)
Abstract: "While the adoption of electronic health record (EHR) systems promises a number of substantial benefits, including better care and decreased healthcare costs, serious unintended consequences from the implementation of these systems have emerged. Poor EHR system design and improper use can cause EHR-related errors that jeopardize the integrity of the information in the EHR, leading to errors that endanger patient safety or decrease the quality of care. These unintended consequences also may increase fraud and abuse and can have serious legal implications. This literature review examines the impact of unintended consequences of the use of EHR systems on the quality of care and proposed solutions to address EHR-related errors. This analysis of the literature on EHR risks is intended to serve as an impetus for further research on the prevalence of these risks, their impact on quality and safety of patient care, and strategies for reducing them."

6. **EHRs May Turn Small Errors Into Big Ones**
(http://www.medpagetoday.com/PracticeManagement/InformationTechnology/36474)
Excerpt: "As electronic health record systems become more interconnected, errors may propagate much farther than under old paper-based systems, a recent study suggested…. According to a review by the Pennsylvania Patient Safety Authority , mistakes and near misses involving electronic health records were analogous to those made with paper-based records with one caveat: those made with EHRs tend to be amplified and can affect a larger group of people. According to a review by the Pennsylvania Patient Safety Authority , mistakes and near misses involving electronic health records were analogous to those made with paper-based records with one caveat: those made with EHRs tend to be amplified and can affect a larger group of people…. Wrong medication was the No. 1 source of mix-ups, just as with paper-based records. Talking to reporters in a webinar about the study, William Marella, program director for the Patient Safety Authority, said, 'There's no question in my mind that EHR is the smart way to go, but in the short term we are seeing safety issues.'"

7. **Search is on to cure EHR alert fatigue**
(http://www.amednews.com/article/20120416/business/304169973/1/)
Excerpt: "Adventist Health System Chief Medical Information Officer Phil Smith, MD, said that at his hospital system, which is headquartered in Altamonte Springs, Fla., and has facilities in 10 states, alerts are becoming easier to customize as more data are available in the EHR systems to help refine them. For example, now that 90% of Adventist patients have a problem list in their records, the hospitals in the system can refine the alerts to be relevant to patients with particular conditions. When Adventist first went live with its CPOE system in 2010, the system produced 84 alerts per every 100 medication orders, 'which is horrible,' Dr. Smith said. Six weeks later, they got it down to 34 alerts per 100 medication orders, and doctors were making changes based on the alerts 50% of the time."

Appendix C: Optimization Building Blocks

Intellix's Optimization Building Blocks are categories of factors that affect users' workflows and interaction with technology. These Building Blocks can both contribute to issues that the users experience as well as be part of the solution. They provide a framework to break down a seemingly complex problems into components, and ultimately root causes.

At a high level, these Building Blocks fall into six areas:

- Behavior: How people interact with technology
- Process: How people interact with each other
- Systems: EMR system functionality including ancillary systems, hardware, network etc.
- Content: EMR data, including orders, notes, formularies, etc.
- Training: Continuous improvement training program and methodology
- Analytics: Collecting, analyzing, and reporting aggregate EMR data

The foundation of Intellix's optimization methodology is the mapping of observations and reported issues to these Building Blocks. For example, a problem with orders being sent to the wrong location could be due to deficiencies in Systems (incorrect order routing), Content (wrong order on the pick list), Process (system routing based on an incorrect workflow), or Behavior (provider is not picking the right routing choice). Identifying which of these Building Blocks is the basis of the issue will help pinpoint the root cause of the problem and simplify the process of finding a solution.

The Optimization Building Blocks methodology allows Intellix's talented and experienced analysts to investigate a complex problem and deconstruct it into simpler, manageable causes, making it easier to identify – and consequently resolve -- the underlying issues. This combination of unique methodology, talent, and experience enables Intellix to partner with your team to solve your most difficult, intractable optimization issues.

Detailed descriptions of the top-level Building Blocks used in Intellix's Optimization Assessments are shown below:

Behavior: Behavior optimization largely involves how the users interact, make appropriate decisions within the system, and use computers. Largely thought of as "adoption," the behavioral building block focuses on achieving predictable and reliable user interaction. Improvement in this area may be multifactorial to include cultural bias, technological deficiency, inability to apply training to practice, and areas of system design ambiguity.

Intellix initially engages these areas using an analytics first approach. Intellix evaluates user behavior from a systems standpoint with various reporting and direct query techniques to determine areas of user variation from policy, compliance, and decision making.

Undesirable variation is then evaluated using questionnaire, direct user interview, system design review with associated workflow, and observation. Improvements are seen with 1:1 intervention, focused education, system changes to recognize workflow context, and user education on downstream impact of undesirable variation.

Process: Process, or Workflow, is the group of activities, and the people or resources needed for those activities that are necessary to accomplish a given goal. Many workflows are intentionally designed, while others arise organically and evolve from regular routines. The process by which organizations accomplish certain goals may differ significantly from one another and some organizational workflows seem more straightforward than others. Typically, when processes are examined in isolation, the workflows appear logical and efficient. However, complexities can arise from the interaction of different as well as from differing priorities of various organizational areas. Organizations also need to adapt workflows to suit a dynamic environment. Over time, periodic evaluation of workflows may demonstrate that some activities are no longer necessary, or can be updated and optimized.

Intellix has some of the most experienced and knowledgeable workflow experts in the industry as well as a comprehensive library of process best practices, allowing us to do workflow analysis at all levels, whether a broad survey or a focused, detailed evaluation. Intellix Optimization Analysts will determine the optimal workflow as necessary by identifying, prioritizing, and ordering the tasks and information needed to achieve the intended result of a clinical or business process using tools that include direct observation, interviews, process flow charts, workflow movement diagrams, swim lane charts, and fish bone diagrams.

Systems: This refers to the technical infrastructure supporting the EMR, including EMR functionality and configuration, ancillary systems, network, databases, and hardware. The goal of all this technology can be summed up in one phrase: getting the right information to the right people at the right time. This can be challenging in the fast-paced, ever-changing world of modern healthcare. Increasing numbers of users, increasing data needs, and increasing expectations can lead to a perception that the EMR Systems are not adequate, when all that may be needed is a reconfiguration or load balancing of certain areas.

Intellix's Building Block analysis helps with System Optimization issues in two ways: first, it identifies the issues that truly are technical in nature, so that they can get the focused attention needed to improve them, and secondly, it highlights the systems issues contributing to apparent behavior or process problems, such as default EMR settings that users need to constantly change or functionality that is still in a "starter system" configuration and has not been adapted to the needs of actual users.

Content: Content is the actual material built into the EMR, such as documentation templates, flowsheets, ordersets, preference lists, medication formularies, and patient handouts. Issues with Content are among the most common issues we encounter in our Optimization Assessments. These deficiencies can be caused by several reasons: for example, there could have been too much reliance on vendor-supplied content not sufficiently specific to your organization, or perhaps providers are not creating as much of their own content as the support team expects Even though Content issues usually seem fairly simple, it is important not to underestimate their importance. The effect of good content on provider happiness is often out of all proportion to its build effort. Likewise, poor or missing content has a disproportionate impact on provider dissatisfaction. Fortunately Content is usually relatively straightforward to fix, since users typically have a good idea of what they want to see. However, some issues may end up requiring more complicated solutions because of build requirements, involvement of other Building Blocks, governance considerations, or training needs. Intellix's analytic optimization approach makes it straightforward to triage Content issues into simple and more complicated, and develop an action plan to resolve them accordingly.

Training: Many EMR issues are the result of inadequate or out of date training. Effective training is one of the most important parts of the EMR implementation process and is a large factor in its success. It is

also a large factor in ongoing EMR usability and adoption, but unfortunately, once the EMR is live, training typically tapers off to user-requested ad-hoc sessions and new hire training. It is essential that physicians and staff continue getting regular training to continue to understand the EMR's full features and functionality, whether it's through handouts, newsletters, workshops, or group forums.

Training also interacts closely with the other Building Blocks; solutions to problems involving these other Building Blocks will frequently include a Training component in the resolution. Intellix's Optimization Analysts have done EMR training firsthand and are experienced in principles of adult education. They can help your organization develop an engaging, meaningful training program for specific optimization areas or for a general continuing education program.

Analytics: The analytical building block may be considered from two different perspectives: (1) Improving and or extending a current analytics program, and (2) Utilizing various analytical techniques and insight to support the optimization focus.

Intellix approaches each optimization effort with analytics as a requirement. Any methodology with improvement as an outcome must measure the current state performance and post improvement results objectively. Generally reporting and visualization tools will be satisfactory in pre and post measurements. Advanced and or predictive analytics can be applied to areas where complex relationships and clear patterns cannot be recognized through direct query alone. Intellix has with advanced analytic engine vendors to assist with predictive modeling.

In optimization efforts where analytics is the focus or is used as part of the supporting tool set; Intellix has the skillsets to recognize compromised data quality, gaps in integration, compromised contextual information, and provide recommendations to remediate the specific issue. Underlying compromised data quality must be addressed to provide reliable baseline measurement, insight for solution design, and end state performance.

Appendix D: Sample Optimization Goals

Your optimization goals should follow the SMART criteria of being specific, measurable, attainable, realistic and timely so that they can be clearly communicated and assessed. These goals should be aligned with and support the organization's overall strategic goals and should also allow for quantifiable metrics to measure results.

Below are some examples of optimization goals that various organizations have considered.

- Improve Patient Care
  - Improve the timeliness of orders – ensure that patients are getting the procedures and tests they need when they need them
- Improves Data Quality, Completeness, and Availability
  - Improve the availability of certain reports – get data to the right person at the right time
- Meet Quality/Compliance initiatives
  - Modify workflows and technology to improve specific clinical outcomes
  - Support "Meaningful Use" efforts – set specific targets to achieve Meaningful Use
  - Increase certain Quality Core Measures
- Improve data analytics
  - Create enterprise-wide tools and processes to better measure certain key metrics - improved data analytics leads to improved efficiency which in turn leads to improved quality of care and reimbursement
- Maximize throughput and efficiency
  - Standardize best practices and workflows - Reduce 'work-around' processes in key clinical areas to accomplish work more efficiently
- Maximize Productivity
  - Increase EMR usability and productivity - decrease number of mouse 'clicks' to perform certain routine functions
- Increase Revenue
  - Maximize revenue in key areas by automating routine processes to enable better capture of charges
- Improve sharing of data
  - Implement Health Information Exchanges with other Health Organizations for more efficient patient care

Appendix E: Sample Optimization Assessment Plan

A sample six-week Optimization Assessment Timeline and Workplan is shown in Appendix E. In practice, the actual activities, their sequence, and the overall timeline will depend on the specifics of the type of optimization work that will be done.

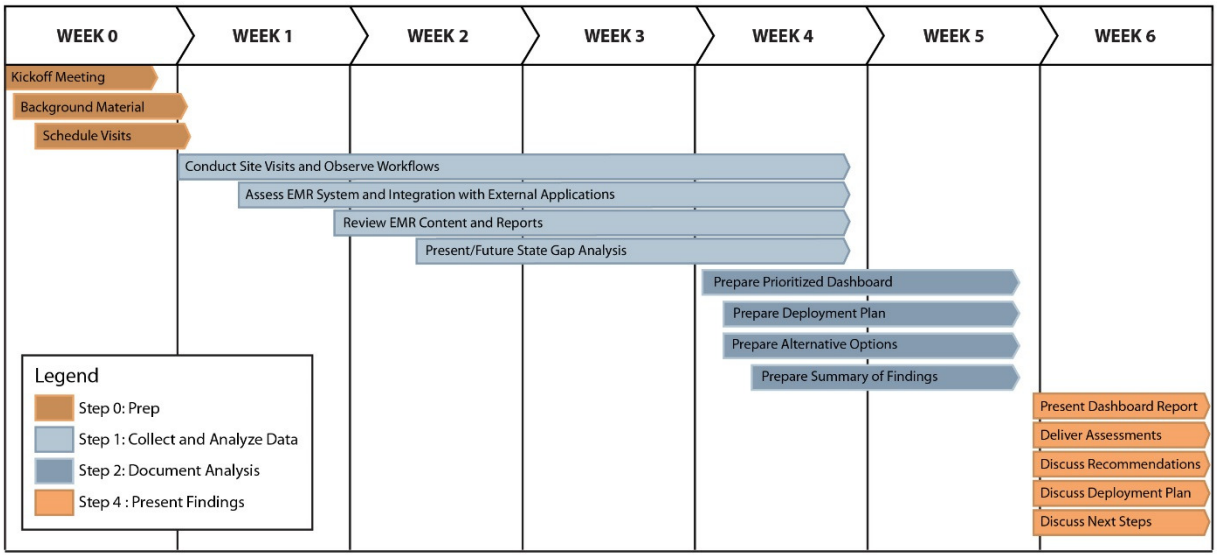

Figure 4: Sample Six-Week Optimization Assessment Timeline

Prior to Week 1 ("Week 0"): Preparations

1) Conduct Kickoff call/meeting with senior leadership
2) Schedule on-site visits
3) Conduct prep calls with site management
4) Gather background material for site visit. For example:
    a) Key Clinical and Management reports
    b) Workflow documentation
    c) Training materials
    d) Issues lists
    e) List of user requests or other feedback

Weeks 1-4: Collect and Analyze Data

1) Conduct onsite visit.
    a) Analyze and document workflows for each site
    b) Assess physician interaction with nurses, MA, and other staff
    c) Assess information flow across system
    d) Assess patient flow through the department
2) Conduct EMR system assessment of key functionality. For example:

a) Order Entry
b) Communication tools
c) Chart Review
d) Problem, allergy and medication custom lists
e) Handouts/letters

3) Assess EMR content
   a) Assess physician, RN, PA, MA documentation standards including process, templates, and consistency
   b) Assess Order Sets and Medication Lists
   c) Assess History, Immunization, Chief Complaint, and Problem List pick lists
   d) Assess Images and Patient Handouts
   e) Assess other EMR tools (flowsheets, careplans, etc.)
4) Review reports
5) Assess third party application integration and external interfaced data
   a) Integration with Lab and Radiology Information Systems
   b) E-prescriptions
   c) Health Information Exchanges
6) Evaluate readiness to achieve desired future-state goals. For example:
   a) Open access scheduling
   b) Centralized lab stations
   c) Patient-centered Medical Home

Weeks 3-5: Finish Analysis and Document Assessment and Recommendations

1) Document items encountered that were not initially listed on the project scope
2) Prepare drafts of the deliverables
   a) Report with Summary Red/Yellow/Green dashboard of optimization recommendations
      (i) Gap analysis of current/future-state workflows
      (ii) EMR build recommendations
      (iii) Scoring, ranking, and prioritization of recommendations
   b) High-level optimization implementation plan
3) Review draft documents with client project team and incorporate feedback
4) Finalize documents
5) Prepare executive slide presentation summarizing the deliverables

Week 6: Present Findings

1) Meet with Senior Leadership to present findings
2) Deliver final documents
3) Discuss next steps