Business Process Optimization for RHIOs

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ABSTRACT

Implementation of an electronic health record (EHR) network entails significant changes in the business processes of participating organizations. Business process management, increased automation, process optimization, user training and end-user adoption together form the keys to success with an EHR. Redesigned processes should be mapped to benefit lines and performance indicators, and monitored continuously to identify improvement opportunities. It is important the new business work flows should match, if not exceed, the existing benchmarks for performance.

Business process redesign is all the more challenging in the context of regional health information organizations (RHIOs), as the business processes of the EHR network have to be aligned with existing process flows of several organizations, each with its own preferences and specific requirements. Even so, most of the discrete individual processes have to be converged, streamlined, assimilated and optimized in the redesigned business processes. This paper proposes a methodology for business process redesign and optimization for RHIOs.

KEYWORDS

- Regional health information organization
- Electronic health record
- Business process management
- Business process redesign
- Process optimization
- Key performance indicators

Business process management can make a tremendous difference in the success of a RHIO program for a simple reason—most of the processes related to an EHR initiative have to be designed from scratch because those processes have never existed before. A piecemeal and haphazard approach to designing these processes can prove disastrous. It is a herculean task that needs well-defined, meticulous and systematic efforts in accordance with business process management guidelines.

Having the infrastructure to support an EHR system and the data sources to feed information to this system are not enough to achieve the key objectives of RHIOs, namely improving quality of care, reducing clinical errors and increasing the efficiency of the care process. For example, an EHR system that is not complemented by a systematic process for periodic data quality checks and cleansing may become inefficient over time as data quality is compromised.

The success of EHR initiatives is also driven by end-user acceptance and participation. A sophisticated EHR system, using best-of-breed technology, can fail if users find it
cumbersome to use. The transition from the old way of doing things to the new way should be smooth. Hence, the process modeling for RHIOs should be a collaborative effort involving representation from all key stakeholders in participating organizations.

**RHIOs and Business Process Management**

RHIOs are newly formed organizational entities and are typically not more than three years old when they embark on EHR initiatives. Until then, RHIOs would have spent most of their time doing the paperwork to form the organization, managing contracts with participants and securing funds. They would have defined their vision and mission. A few of them might have lined out detailed requirements for the EHR IT system, but most RHIOs overlook the need for a methodical process modeling exercise. Process modeling should be completed before RHIOs define their IT system requirements because an EHR system is just one of the enablers supporting RHIO business processes; others include manual processes, skilled staff, resources and infrastructure.

All RHIOs have the common objectives of enabling secure access to clinical information at the point of service regardless of the physical location of that information, reducing adverse clinical events, improving the quality of care, enhancing clinical decision-making and coordinating cases across providers. Because they have similar goals, could RHIOs borrow process models from successful EHR implementations? The process models of successful RHIOs can serve as a starting point, but each RHIO still has to redesign and optimize these models based on organizational strategy, scope of pilot EHR initiatives, technology selection, state regulations and many other factors that are specific to each RHIO.

Business process redesign is vital for RHIO initiatives. Table 1 features a representative set of high-level business processes of RHIOs that need to be modeled. EHR programs in the United States are not as mature as similar programs in Europe or Australia. Business process redesign should be used as an opportunity to incorporate best practices related to workflow and information flow from successful initiatives.

Implementation of an EHR or a data-sharing network will entail significant changes in the business processes of participating organizations. When the organizations are being transformed because of EHR adoption, it is prudent to spend quality time and effort to methodically redesign processes in collaboration with the user community. Business process redesign with an operational perspective, where users are involved in the process design, helps increase system adoption. Process changes often force users to acquire new skills to support the redesigned business processes. Users are more willing to adopt new skills if they have been part of the decision-making process for operational changes.

EHR networks start as region-specific networks but ultimately they have to connect together to form a state network and then merge into the national network. To facilitate integration across networks, standards compliance is critical. Business process redesign can help design processes that comply with standards and vocabularies such as HIPAA, HL7, SNOMED, LOINC, NCPDP and others. Process redesign also can be leveraged for compliance testing of processes.

**RHIO Business Process Modeling (BPM) and process**

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**Table 1. RHIO Business Processes.**
characteristics identification for EHR systems provide significant inputs for defining EHR IT requirements. The use of relevant aspects of business process modeling principles and practices in specific areas like requirements engineering can help leverage existing IT infrastructure and investments. Business process modeling can serve as a tool to improve the effectiveness of requirements elaboration and gain system understanding. The results expected from implementation of processes can become determining factors for EHR system design and technology or product selection. To maximize return on investment from the EHR initiative, the “process-oriented” approach towards EHR program implementation should be synergistically entwined with the “IT-oriented” approach.

One basic business process modeling principle is to create agile business processes that ensure speed of change and flexibility while making sure the control of the process lies with business users. One technique is to modularize the processes and IT applications. This makes the processes as well as the IT system much more agile, ensuring quick adaptation to changing business needs. This also makes the system scalable with enhanced flexibility to change with the times. For example, a county-level EHR network with a modular design leveraging service-oriented architecture principles can be easily scaled up to form a statewide network in the future and ultimately be integrated with the nationwide network. Also, BPM tools can be leveraged to increase automation and enhance decision support in RHIO work flows.

Most RHIO programs are government-funded, and they start out with small EHR pilot initiatives. To sustain the EHR initiatives and secure more funding, it is imperative to demonstrate the success of the pilot program. While the focus is on designing realistic new EHR business operations with associated rules, an organization should also identify “low-hanging fruit” in operational improvements that can deliver early benefits. Business process modeling enables the definition and measurement of performance indicators relative to operations.

Quality control checkpoints can be introduced in the processes and measurement techniques and can be used to record tangible benefits from the EHR initiative. Incremental benefits come out of business process modeling as systems operate for a couple of years; some benefits and improvements in existing operational benchmarks can be demonstrated in a relatively short span of time. Demonstrable community benefit can be the most convincing way to ensure sustained sponsorship for future phases of the EHR program. RHIO initiatives have shared resource investments from participating organizations. Measurable benefits provide better visibility into program success for all the participants and ensure continued enthusiasm for EHR initiatives.

An EHR system can provide maximum returns only if the business processes related to the EHR system are streamlined and fine-tuned for optimal performance. Smartly designed processes help reduce risks, increase productivity, reduce costs, save time, improve service levels and improve the quality of information. In a RHIO, optimized business processes would result in reduced clinical errors, improved clinical outcomes, better patient throughput, higher patient satisfaction and faster, anytime-anywhere access to a 360-degree view of patients’ clinical information.

**Sponsorship for Business Process Management**

Business process management has evolved into an amalgamation of management practices and technology solutions leading to an agile enterprise best positioned to achieve sustained business growth and competitiveness. In several ways, it heralds a clear paradigm shift in the way processes are managed in industries. Business process management intertwines both process management and technology capabilities and it can be leveraged to optimize cross-functional end-to-end business processes to achieve business goals in a faster, inexpensive and better way.

Business process management and specifically process modeling for a new EHR initiative is not entirely an additional investment. In any case, RHIO organizations hire consultants, IT vendors or package vendors to define and detail IT requirements in collaboration with RHIO stakeholders. A process modeling exercise will add more structure to the gathering and elaboration of requirements. It will provide a holistic approach to requirements elaboration by defining end-to-end operations rather than restricting only the IT part of it. It also will mean the increased involvement of end users in process definition, thereby ensuring better acceptance of changed business processes.

An EHR system in which processes are not optimized to reduce wait times, and eliminate redundancy and impediments will have only limited effectiveness. Processes modeled after business process management principles have control points and measurable performance indicators that help identify processes that are operating suboptimally. These processes can be optimized using business process optimization techniques to improve return on investment. Systematically modeled processes also have greater flexibility to rapidly adapt to changing business needs, thereby reducing total cost of ownership.

Business process management should be an integral part of an EHR initiative; a RHIO program cannot be entirely successful just because it has high-quality data and a robust data-sharing infrastructure. Business process redesign,
increased automation, process optimization, user training and end-user adoption are critical for the success of a data exchange network.

Business Process Management for RHIOs

For RHIOs starting out as an EHR initiative, business process modeling, application design, data modeling and infrastructure planning should form a seamless continuum. (See Figure 1.) These should not be executed as independent isolated tracks. These activities have significant overlap and interdependencies, and they cannot be executed in a strictly sequential mode. Application design will be affected by business process design, while the data model may influence process design. Process and application design, in turn, will dictate infrastructure requirements. These activities should be executed in tandem in an iterative mode by three different teams because the skill set required for these activities is distinct.

Business process management. This team should focus on defining business operations in alignment with the RHIO vision, strategy and objectives. The team should be technology savvy and have good business analysis skills, process modeling skills and a solid understanding of business operations. Team members must be creative and innovative and must possess a high degree of intuitive reasoning skills.

Application design and data modeling. This team should be responsible for defining EHR system requirements and data models for a custom-built solution. They should identify and define all functions of each application in question, the relationships between functions, the edits, the data that has been captured and its source, the screens and the reports. If the RHIO wants to implement an EHR product, this team is responsible for defining product evaluation criteria and customization needs. This team should have a good mix of technical and domain skills.

Infrastructure planning. This team should be responsible for defining all the infrastructure requirements of the new business designs. Team members should begin by reviewing or creating a comprehensive infrastructure map showing all hardware, software, communications lines and other resources. This will be used to determine future infrastructure needs and possible changes as the business design solidifies. Limitations in the infrastructure may have a serious impact on the business operation design, and new design requirements, in turn, may call for additional equipment or capacity.

This article proposes a business process management methodology for RHIOs. However, it can be tailored and adopted by individual participating organizations. Processes associated with a RHIO program can be divided in three major subgroups: common processes, which are centralized and common across all participating organizations in the RHIO program; custom-designed processes, which have organization-specific implementations and may vary across participating organizations; and repeatable processes, which are widely accepted best practices that result from when a common process or a custom-designed process yields proven benefits repeatedly.

RHIO business process management has to be executed at two levels. It should be executed at the RHIO level for common and repeatable processes, whereas custom-designed processes should be handled by individual participating organizations. Business process redesign involves many closed-door brainstorming sessions, user interviews and workshops. Each participating organization must commit time of their experts and end-users for business process redesign at the RHIO level as well as at the individual organization level. Figure 2 shows a proposed methodology for business process redesign for RHIOs.

Initiation

Business process redesign involves significant participation from user groups. Business process management experts should lead the team, and investments should be made to train participants who are unfamiliar with BPM techniques. At this stage, it is important to engage with the management team to understand what the vision of the RHIO is, what its business objectives are and what the strategy is for achieving those goals. Business process redesign has to be in complete alignment with RHIO vision and goals.
It is also important to understand the organizational environment—sponsorship for business process redesign, the political environment, managerial style, work culture, skills available and so on—because it will influence the approach for process redesign. Organizational standards and guidelines related to operations also should be collated.

A clearly defined scope and process boundary for the process redesign exercise should be established. This will be especially challenging for RHIOs because there are some new common processes to be defined, while some existing processes have to be redesigned collaboratively across participating organizations, and some existing processes will have to be redesigned at an individual organization level. A clear boundary should be outlined around processes that all participating organizations will work on collaboratively. Process customization is required at an individual organization level because of unique process requirements or to converge with common processes defined at the RHIO level.

Based on time and people commitment from all organizations, a very detailed work plan should be created for process redesign. Because redesign is a coordinated effort requiring the presence of a large number of stakeholders for joint discussions, schedule adherence and timely communication is critically important.

Process architecture has to be created for all the processes within the defined boundary. The process architecture design involves identification of the levels of process hierarchy and defining processes at these levels (at the top, highest granularity; at the bottom, lowest granularity). It also involves predicting, based on existing business scenarios and changing business needs, what triggers the process; what data will be used; how and where data is accessed; who will use the data; how will the data be used and what happens to the data when the task is completed; when will the data be used; the volume of data flow and its periodic variance; what infrastructure and resources support the process; what are the key milestones in the process; what results are achieved by the process; and who expects these results.

It also involves identifying business process characteristics, like the sequence of tasks in a process, results of process, measurable metrics, automation level, interfaces and more. It is crucial to create a high-level conceptual data model based on the process architecture. It is important to identify all the enablers and impediments to a process.

"For RHIOs starting out as an EHR initiative, business process modeling, application design, data modeling and infrastructure planning should form a seamless continuum."

As-Is Process Mapping

To do process mapping, a process inventory and swim-lane diagrams should be created for these processes through staff interviews and brainstorming sessions. Business process management modelers available from various technology vendors can be leveraged for as-is process mapping.

Swim-lane diagrams are developed with an increasing level of details starting with handoff then flow model and, if required, task-level model. The process model should be aligned with the RHIO objectives. Leverage points for key processes should be identified, and participants should acquire a good understanding of process enablers, such as staff, policies, motivation, information technology, core competencies and others, as well as the factors that constrain the process. Available data should be collected on the performance benchmarks for these processes.

The technology and other support infrastructure related to the processes should be documented. After identifying process touch-points with other systems and their interdependencies. IT systems associated with processes should be analyzed for effectiveness at all levels, from the presentation layer to application logic to data management. Any inherent inefficiency should be noted and addressed during BPR exercise.

Operations Analysis

In this step, the as-is processes are measured against best practices to identify impediments, opportunities, bottlenecks, lack of compliance, operational and IT problems, thereby identifying processes for optimization. Process controls and performance indicators are identified for the processes, and target values for performance indicators are set, based on available industry benchmarks. Interdependencies and interrelationships of processes also are identified and analyzed to understand their impact on process design. Data from BAM monitoring tools and operational reports provided by BPM systems can be used for operational analysis.

This is the stage where categorization of processes into common processes, repeatable processes and custom-designed processes will be completed. The RHIO BPM team will focus only on common processes and some repeatable processes, while individual organizations should be analyzing how their custom processes need to be tailored so they can converge seamlessly with common RHIO processes. It is very likely that different organizations may have distinct implementations of common processes. The business process redesign team analyzes and discusses these discrete process flavors to develop a high-level straw man of a converged and streamlined common process that can address needs of most of the organizations and is aligned with best practices. More than one converged process straw man can be developed and analyzed.

As a part of a user adoption strategy, it is important to identify user groups, such as physicians, nurses, administra-
bative staff and others, whose work will be affected by the process change. Apart from involving them in the process design, organizations should simultaneously start a change management campaign that will prepare users for the changes to come. Communicating the vision, objectives, expected benefits and a work plan to enable users to adopt new processes should be the first step, followed by regular communication on progress.

**To-Be Process Definition**

It is essential to create a to-be process definition guideline to ensure consistency in process definitions and approaches across different work groups. The guidelines may contain simple design principles to specific RHIO preferences.

Some examples of design principles include eliminating operational problems and building efficiency into the operation, and enabling the new design to point out areas of the business that have the highest return on investment or greatest opportunity to improve quality or customer service and thus improve competitiveness.

Processes should be flexible in meeting the needs of individual customers. Processes should be easy for the workforce to adopt, requiring relatively little training and support; they should minimize customer interactions and human interventions; they should have absolute audit-ability and adherence to regulations. The information flow-through process should be seamless, and the data should be accessible anytime and anywhere; it should be compliant with standards and regulations. The process design should ensure that less time and effort is required to integrate new suppliers or customers into the process, and it should be aligned with beliefs and culture.

The desired process characteristics—task sequence, end results, performance indicators, level of automation, user group and so on—should be determined and decisions should be made about whether this process should be abandoned, outsourced, left as is, redesigned or improved. The work groups should have closed-door idea sessions to generate and assess new ideas. Ideas also can be borrowed from previous successful initiatives, recommendations from standards defining bodies and industry best practices.

Conceptual models of new operational activities for each relevant organizational unit should be constructed, following the prioritization scheme. Straw-man models will be work flow-based and enriched with the relevant business rules. Apart from the straw man for the main process flow, it is important to model all the alternate process paths and exceptions. Stakeholder feedback will be used to address problems, impediments and inefficiencies as well as to describe the desired outcome. Infrastructure and environmental needs for the processes should be identified.

The conceptual data model developed during the initiation phase should be revised in light of process changes. Information flow paths must be clearly defined, highlighting data gathering, cleansing and consumption processes.

Designing business processes should be an iterative activity in which processes are optimized by introducing additional ways to automate, reduce work, time and costs, improve member experience and quality, and so on. Design heuristics—activities that can happen in parallel and should not be sequenced—should be used to optimize the process. Staff should be trained to drive incremental improvement and should begin to imbibe the same as a culture. After the to-be process is finalized, process controls and key performance indicators should be identified. Third-party business process management modelers can be used for to-be process modeling.

**Scenario Development**

This stage is a link between business process redesign and IT development. In this stage, based on to-be process definitions, process scenarios are created. Also, for IT-driven process components, use cases are identified and created. These use cases can be used to build a custom application or can be used to evaluate product solutions available in the market. IT infrastructure needs are determined. All this information is used for effort and cost estimation. Finally, a detailed process implementation and IT development work plan should be created to drive the next stage of RHIO initiative.

By now, there should be sufficient information to create a logical data model and define the information architecture. The information flow model, involving data collection, cleansing and access, should be refined.

Job cards should be created that describe all the processes from a particular user’s perspective. These can be employed for user training.

Business processes have to be continuously reinvented because of changing market needs and new regulations. They also need analysis and optimization based on trends of key performance indicators and their impact. Operational report requirements need to be defined at this stage, which will serve as an executive dashboard for operational statistics and trends and will help in identifying process areas that need optimization. It is useful to create an organizational process optimization approach so it is a focused regular initiative and not a one-off effort from time to time.

**Optimizing RHIO Processes**

Business process optimization provides a sustained and continuous impetus for continuous process improvement. With the objective of improving business processes, it explores a wide range of operational aspects—people, IT, leadership, work culture, policies and regulations, and other areas. Several techniques are used as enablers for business process optimization, such as process maturity assessments, hybrid process improvement methods and change management techniques, to name a few.
Business process optimization should be a continued focus for RHIOs so they can enjoy sustained operational optimization, efficient IT systems, cost savings and better outcomes. Process improvements based on best practices without a systematic business process optimization approach is not sufficient to keep up with requisite business or application change.

A RHIO should have a well-defined plan for business process optimization. There should be a team of people responsible for process evaluation, selecting a process for redesign and then executing necessary projects. Business process optimization should be a periodic activity conducted at predetermined intervals. This will make business process optimization part of organizational culture.

The first step in business process optimization is selecting processes that need optimization. Critical success factors of the business should be identified and mapped to processes. Also, a matrix should be built to determine the impact a process has on critical success factors. Operations reports that provide trends of key performance indicators of processes would be the first place to look for inputs. Audit reports may also provide insights into process effectiveness.

The following questions can help in selecting processes for optimization:

- What is wrong with the process?
- What is the significance and impact of any change made to the process?
- How difficult will the process redesign be, in terms of size, scope and complexity?
- Will the process help improve customer satisfaction?
- Does this involve low-hanging fruit or will it take a long time to reap the benefits of process improvement?
- Is there management support and sponsorship for the process redesign?
- What is the estimated investment required for the process redesign?
- Are all the resources required for process redesign available?
- What are interdependencies of the processes? Is there a natural sequence or precedence?
- Are there any other issues influencing process selection, such as regulatory compliance or competitive issues?
- How can the core competencies of a RHIO be leveraged in process redesign?
- Are there any other initiatives or decisions that will affect this process?
- What are the risks associated with process redesign?
- Are there any constraints that need to be addressed during redesign?

There are many process analysis techniques that can be used for selecting processes for optimization, like failure mode and effect analysis, fault-tree analysis, Pareto analysis, process capability, selection matrix and many more. Performance indicators or key performance indicators provide an indication of the dynamics of the process before diving into assessment. Fairly crude metrics also will provide useful guidance to focus efforts on the right processes.

Some examples of high-level key performance indicators for an EHR system are reductions in clinical errors, reductions in prescription-related calls to and from pharmacies, patient throughput, cost savings as a result of eliminating duplicative tests, improvement in patient satisfaction and improvement in staff satisfaction. Each of these parameters can be divided and subdivided into more granular performance indicators that can be associated with specific processes. For example, clinical errors associated with the prescription process can be categorized as dosage error, drug interaction error, disease interaction error, handwriting error or other errors.

After the processes are selected for optimization, target performance values should be defined. The redesign efforts are focused on achieving these target values. The method for redesign will follow the sequence of activities under operations analysis, to-be process definition and scenario development in the business process management approach for RHIOs section.

**Challenges in Redesign and Optimization**

The challenges that RHIOs will encounter during business process redesign and optimization are similar to the roadblocks that most other organizations involved in business process management have been facing, such as overcoming resistance to change, getting management buy in and sponsorship, securing participation of key stakeholders, creating and training a business process management team, avoiding “analysis paralysis” and managing consensus.

Challenges specific to RHIOs would be process changes as a result of adding new organizations to an EHR network, scaling up from a countywide EHR to a statewide EHR to a national network, adding new e-health initiatives such as biosurveillance, personal health records, telehealth and others to the RHIO program, and seamlessly aligning business processes of participating organizations with RHIO processes. A well-defined business process management framework and an efficient BPM team can help manage these challenges to a large extent.

**Conclusion**

A well-structured business process management framework helps transform business processes for increased agility and operational performance. Business process management for an EHR initiative needs careful attention, just like the IT system design and implementation. To achieve RHIO goals of improving the quality of healthcare, increasing patient safety and reducing costs, the focus should not be restricted
only to improving IT system capabilities. An organizational
culture of business process management and incremental
process improvements can provide significant assistance in
helping RHIOs achieving their objectives.

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Sidebar: Glossary

- **Electronic Health Record**: A medical record or any other information relating to the past, present or future physical
and mental health, or condition of a patient. An EHR resides in computers that capture, transmit, receive, store,
retrieve, link and manipulate clinical data for the primary purpose of providing healthcare and health-related services.

- **Regional Health Information Organization**: Multi-stakeholder organizations or consortia of healthcare organiza-
tions expected to be responsible for motivating and causing integration and information exchange in the United
States’ revamped healthcare system. Generally, stakeholders are developing RHIOs to affect the safety, quality and
efficiency of healthcare as well as access to healthcare with help of health information technology, primarily
electronic health records.

- **Health Information Exchange**: The mobilization of healthcare information electronically across organizations within
a region or community. This term is used interchangeably with RHIOs.

- **Business Process Management**: A management discipline that provides governance in a business process environ-
ment, with the goal of improving agility and operational performance. Business process management is a structured
approach employing methods, policies, metrics, management practices and software tools to manage and continuous-
ly optimize an organization’s activities and processes.

- **Business Process Redesign**: A systematic, disciplined business process improvement approach that critically
examines, rethinks, redesigns and implements the redesigned processes of an organization. BPR’s goal is to achieve
dramatic improvements in performance in areas important to customers and other stakeholders.

- **Business Process Optimization**: The continuous management of performance and incremental business process
improvements efforts by measuring the key performance indicators and redesigning the suboptimal processes for
better performance.

References

