

# **Role-focused process-mapping for documenting software systems usage at Hemlock Printers**

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## Abstract

This report introduces readers to the principles of process mapping, a flowchart technique widely used in manufacturing and engineering for diagnosis, analysis and improvement of processes and whose advantages can be applied to tasks carried out in Publishing.

We base this exposition on the experience gained during the process mapping of Hemlock Printers Ltd. a Burnaby-based company with 50 years in the industry, which started a project to document its workflows and the way software applications were used to automatize them.

We examine the nature of process maps, how the company was conceptualized for study and the ways to collect information used, followed by a step by step guide to draw these diagrams, ending with a detailed analysis of selected examples of workflows at Hemlock using these maps and how to apply them to identify problems and opportunities for improvement.

## Dedication

This report is dedicated to my beloved family, my wife Diana and our daughters Katheryn and Sofia all of whom have joined me in this journey with courage and who fill me with joy every day.

To my parents, Octavio and Araceli, who have always supported me, cared me and encouraged me to keep moving forward and who taught me to always give my best effort.

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## List of Acronyms & Abbreviations

CSR: Customer Service Representative  
ERP: Enterprise Resource Planning (system)  
FGI: Finished Goods Inventory  
KPI: Key Performance Indicator  
MPub: Master of Publishing  
MSI: Managing Information system  
PM: Process map  
PSI: Programmed Solutions Incorporated  
RFQ: Request for Quote  
RMI: Request Material Inventory  
ROI: Return of Investment  
SFU: Simon Fraser University  
WIP: Work in Progress

## Introduction

Process maps are a visualization technique that can be used to enhance the understanding of the elements and relationships that make up complex processes. They allow their users to think out of the box and find solutions, organize, rectify bad practices and set standards for procedures. While incredibly useful when used in appropriate contexts, process maps are not widely used. As such, this report lays out the benefits of process maps and how to document for, design and create them.

Some experts like Paul Harmon, Fernando Vera and Mary Ann Anderson consider the way process maps provide information in a graphic and easy-to-understand format is what allows us to take distance from the problem and approach it from a different perspective; my experience of creating such documents and talking to individuals who participate in the processes they represent gave me a unique appreciation for this visualization technique and the ways in which it gives people an overview of a situation and allows them to comprehend how activities flow from one step to the next.

I acquired this experience during the 2018 summer-term professional placement for the Master of Publishing program at Simon Fraser University, when I worked as a workflow analyst at Hemlock Printers Ltd. (a commercial printer based in Burnaby, BC). I joined as part of a project sponsored and supervised by the company CEO & President, Richard Kouwenhoven who wished to document the workflows in the company and understand how software platforms were being used from a role-centered perspective.

Parallel to this project, the implementation of a new managing information system (MIS) that will control the flow of information through the company was in progress, with the aim to replace the existing but outdated system in the short term with the goal of adding capability to provide real-time data for analysis. For a company the size of Hemlock (approximately 200 employees), this was a significant milestone, as these systems allow automated workflows by transferring a project (job) details from department to department, adding information and keeping track of it through the whole production process.

Richard Kouwenhoven realized it was critical to generate a model of current operations being carried out at Hemlock in the form of process maps to have a blueprint of the existing status and have the capability to measure the changes brought by the new system. This would also help identify if the proper software services were being replaced for the staff to continue their regular operations and later, to find ways to optimize them to increase productivity and devise improvements.

The usefulness of process maps for managing this transition prompted our interest in describing our experience using this tool to other publishers, who might similarly benefit from a clear overview of their own activities, facilitate conversations, analyze and find opportunities for improvement. Using my experience creating process maps at Hemlock, this document presents the case for using process maps, offers concrete examples from Hemlock as a case study, and

explains the methodology for how to create them so that others can use them at their own organizations. The report is organized in the following manner:

**Chapter 1** discusses what Process maps are and how they are useful. Of interest is the cross-functional technique used at Hemlock, that allows us to clearly define the role each participant has in a workflow as well as their responsibilities. I also offer design guidelines to ensure the proper formatting of these documents and finally, the properties of dedicated software tools available to create them.

**Chapter 2** analyses the organization, functional areas, roles and activities done at Hemlock Printers, I also discuss the main process carried out at the company, called the General Order Flow which takes a design file from a customer, process it through all the operations in the company and outputs a finished and printed document, whether it is a book, magazine, poster, catalogue or wide-format signage.

**Chapter 3** covers the design conventions used for Hemlock process mapping, such as special symbol systems and visual approach. We then describe the information gathering techniques and the methodology used to create the maps as well as a step by step drawing system which although simple, is absent in most flowchart and process mapping bibliographies, leading to difficulties in the creation these documents.

Finally, **Chapter 4** describes some guidelines to analyze process maps and extract information from them to identify problems and opportunities for improvement, followed by case study examples of some of the processes documented at Hemlock and the solutions devised based on them. Finally, a short section of recommendation on how to implement changes in processes with references to more detailed bibliographies for those wishing to expand their knowledge of the subject.

This report aims to identify the considerations and procedures to follow when publishers approach their own projects and inspire readers to integrate process maps into their professional practice. We believe that properly used, these tools can help boost the productivity, efficiency and chances of success of any project or enterprise.

## Chapter 1 Process mapping

In this Chapter, I will review the characteristics and structure of process maps, starting with a brief description of their history, properties, and techniques, followed by tools and software available to create them. Since process maps are visual communication products, we will cover a series of design guidelines to increase their effectiveness as well as points to consider when publishing them.

### 1.1. Characteristics and advantages of process maps

Process maps were the first type of flowchart and have been around for nearly 100 years. They were introduced in 1921 by Frank and Lillian Gilbreth in a presentation to the American Society of Mechanical Engineers (ASME) titled: *Process Charts: First Steps in Finding the One Best Way to do Work* who proposed them as a tool to analyze and increase the productivity of industrial operations.<sup>1</sup> Over time, their use has spread to fields as diverse as information technologies, business and engineering, demonstrating their versatility as communication tools.<sup>2</sup> In the 1970s, they gained popularity among software developers and business administrators and so, they started to be known outside their industries by the general public.

Just like a flowchart, a process map is a diagram that uses different shaped boxes to represent activities (*steps*), of an algorithm, workflow, or process and then connects them with lines and arrows to show the sequence they are carried out. — the *flow*.

What makes them different from flow charts is that they contain additional information related to the process they represent, (i.e. annotations) that can include things like the time it takes an activity to complete, resources used/produced, or software systems involved, to name a few.

The nature of such annotations depends on **what do we want to know about the process**, like Who is doing each part? How long does it take to complete each step? How many resources they consume? or How much it produces in an hour?

A typical process map looks like the one in [Figure 1](#) below.

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<sup>1</sup> Wikipedia contributors, "Flowchart," Wikipedia, The Free Encyclopedia, <https://en.wikipedia.org/w/index.php?title=Flowchart&oldid=864671209> (accessed October 26, 2018)

<sup>2</sup> Gemignani, Zach, et al. *Data Fluency: Empowering Your Organization with Effective Data Communication*. Wiley, 2015.

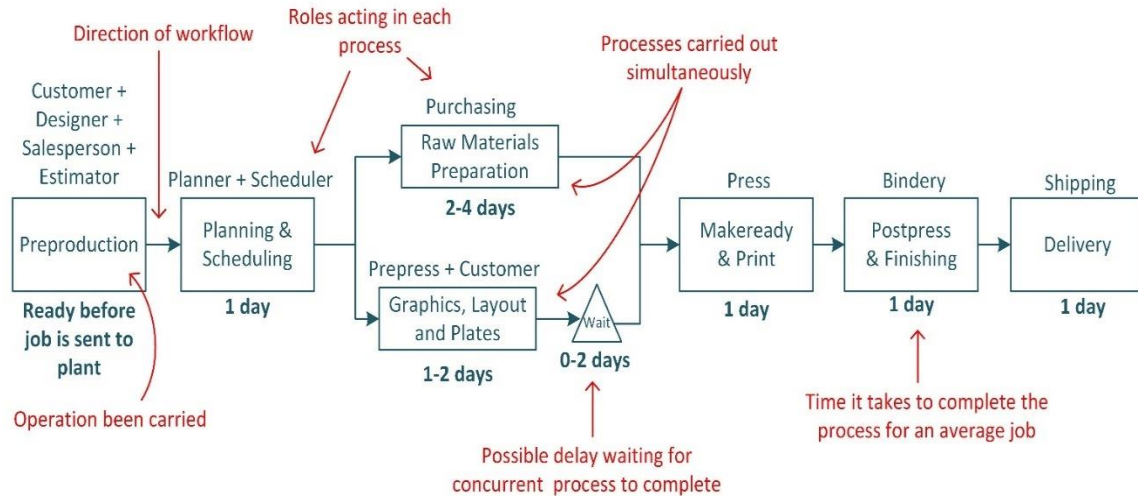


Figure 1. **Example of a process map.**<sup>3</sup>

*This is a standard process map showing a printing process which consists of seven operations (also called sub-processes) depicted as rectangles. It includes annotations around each box describing the individuals working on a step and the average time it takes to complete each of them. It provides a clear visualization of the overall workflow, the time each operation is carried out and which operations occur simultaneously. It also allows us to calculate the average duration for the whole process by adding the time spent on each operation, which can be between 6 and 8 days. This is also a useful tool to explain the process to new customer.*

Thanks to the additional information in the annotations (on top and below each box in Figure 1), process maps offer an opportunity for new levels of understanding because they:

- Capture complex tasks in an easy to understand format.
- Contain vital information about who is involved, what kind of data and materials are flowing and the transaction points between operations, departments and the supply chain.
- Allow the transfer of knowledge.
- Consistency allow for standardization or in-house processes or implementation of proved work methods. Which helps to propose and adopt best practices.<sup>4</sup>
- Add value by offering an opportunity to think outside of the box and ask questions that can lead to new solutions or improvements.
- Can be continually improved, updated and adapted.

<sup>3</sup> Source: Anderson, Mary Ann., et al. Operations Management for Dummies. John Wiley & Sons Canada, Limited, 2013. p. 14

<sup>4</sup> Wikipedia contributors, "Best practice," *Wikipedia, The Free Encyclopedia*, [https://en.wikipedia.org/w/index.php?title=Best\\_practice&oldid=883186054](https://en.wikipedia.org/w/index.php?title=Best_practice&oldid=883186054) (accessed March 18, 2019).

These characteristics help users get a clearer view of a process, providing relevant data to make informed decisions and improvements leading to a more effective use of resources, standardization of processes, waste reduction, quality improvements or increasing production output.<sup>5</sup>

## 1.2. Levels of detail in process maps

These diagrams have the capacity to represent activities of various complexity and are divided into three levels of detail depending on their scope and use (Figure 2):

**Level 1:** “Focus on the organization, its basic structure and environment”.<sup>6</sup>

**Level 2:** “Focus on processes, ranging from individual operations to value chains that integrate all the sub-processes and activities necessary to produce a major line of products and services and which are divided into processes, then sub-processes and so on, as necessary”.<sup>7</sup> However, no matter how large these “super-processes” may be, they are still considered under the Level 2 scope.<sup>8</sup>

**Level 3:** “Focuses on the activities that occur within processes and sub-processes”.<sup>9</sup> These can take the form of diagrams or lists of activities to fulfill a specific operation.

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<sup>5</sup> P. Savory and J. Olson, “Guidelines for Using Process Mapping to Aid Improvement Efforts,” *Hospital Material Management Quarterly*, 2001, Volume 22, No. 3, pp. 10-16 Downloaded from: <http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1038&context=imsefacpub>

<sup>6</sup> Harmon, Paul. *Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes*. Morgan Kaufmann, 2003. p.131

<sup>7</sup> Idem. P.132

<sup>8</sup> In this report, we review processes which are part of the value chain in Hemlock Printers, called the “General Order Flow”, by means of this value chain, Hemlock takes a digital design file from a Customer, prepares the files for printing, procures raw materials such as paper and ink and turns them into a printed and finished product. Hemlock value chain is like that represented in Figure 1 but includes many other processes and sub-processes that cover every step in the production chain in detail. With information from: Kenton, Will. "Value Chain." Investopedia. <https://www.investopedia.com/terms/v/valuechain.asp> (accessed February 22, 2019).

<sup>9</sup> Harmon, Paul. *Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes*. Morgan Kaufmann, 2003. p.132

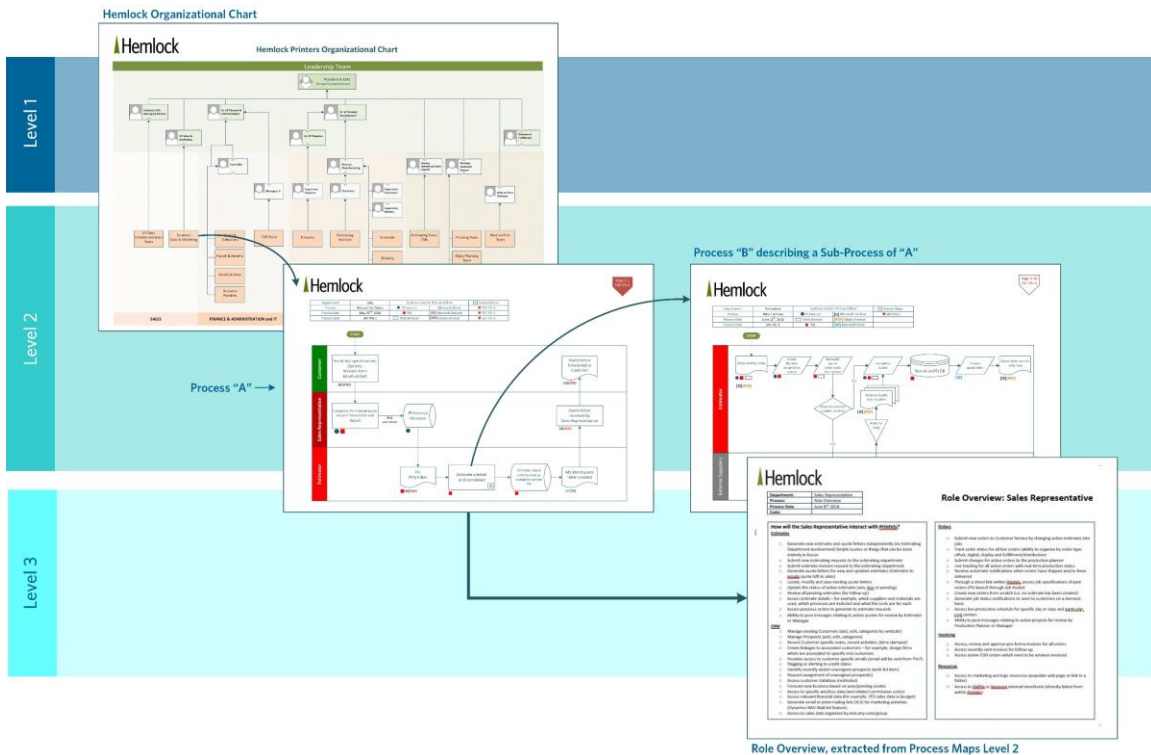












Figure 2. Visualization of the three levels of processes in Hemlock's project.

Here are the three process levels and how a map in each one looks like. Process A and Process B stay at the same hierarchy although Process B is a sub-process of A. Level 3 is for documents describing actions in detail. Diagrams property of Hemlock Printers Ltd, used with permission.

### 1.3. Shapes used in process mapping

Like flowcharts, each box in a process map has a shape that is conventionally associated with a type of activity. Rectangles are used to represent operations, diamonds for decisions, and ovals for terminals (start/end). Each of these boxes must represent only ONE activity, no matter how complex the operation or sub-process it represents is. Figure 3 shows some of the most common shapes used in process mapping.



Symbol	Name	Function	Symbol	Name	Function
	Start/End	Marks the start or end point		Delay/Wait	Represents a delay in the flow
	Process	Indicates any activity, action or process		Database	Represents the use of a database or processing through software system
	Connector	Shows relationships between shapes, arrow indicates the way it flows		Decision	Represent a decision and routes depending on each case
	Input/Output	Represents input or output		Document	Represents a document
	Manual Process	Represents process that is manually done		Record	Indicates a record is made

**Figure 3. Basic flowchart shapes.**

*These are some of the most important shapes used in process mapping. Source: Smartdraw.com and Mary Ann Anderson et al. in Operations Management for Dummies.<sup>10</sup>*

There are standardized conventions that cover the meaning of each symbol used by field of application, such as the ISO 5807:1985 that describes the symbols for data, program and software flowcharts,<sup>11</sup> or the ISO 9001:2015 which shows how to map processes for certification in high quality products and services.<sup>12</sup> These offer a specific set of shapes that may vary from those shown in Figure 3, like a process box with rounded corners or a multiple-choice decision box shaped like a hexagon. However, unless complying to a specific standard, the system is quite flexible if you define the meaning of each shape used in your project and make it clear to users.

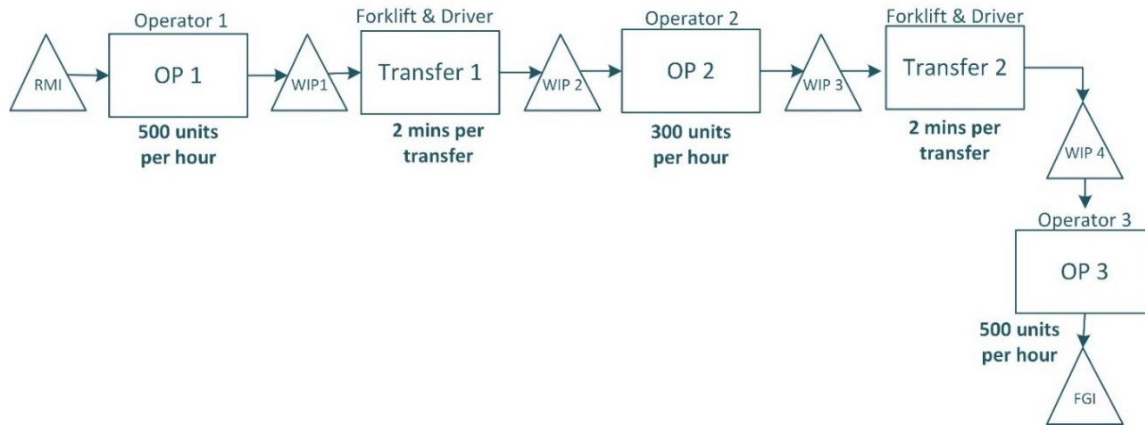
#### 1.4. The Swimlane approach

Many process maps follow the same structure as other flowcharts, aligning boxes from left to right in the order operations are performed, like the manufacturing process shown in Figure 4 on next page.

<sup>10</sup> Figure constructed with information from Smartdraw.com. (2019). *Flowchart Symbols*. [online] Available at: <https://www.smartdraw.com/flowchart/flowchart-symbols.htm> [Accessed 29 Nov. 2018] and Anderson, Mary Ann., et al. *Operations Management for Dummies*. John Wiley & Sons Canada, Limited, 2013.

<sup>11</sup> "ISO 5807:1985." *Developing Standards*, 17 Sept. 2015, [www.iso.org/standard/11955.html](http://www.iso.org/standard/11955.html). Accessed, Sep. 29, 2018

<sup>12</sup> "What Is ISO 9001:2015 – Quality Management Systems?" *What Is a Quality Management System?* | ASQ, ASQ, [asq.org/learn-about-quality/iso-9000/iso-9001-2015/](http://asq.org/learn-about-quality/iso-9000/iso-9001-2015/). Accessed: October 12, 2018



**Figure 4 Standard process map.**

*This diagram includes operations (OP) and transfer (Transfer) sub-processes. It has annotations that identify who is responsible for each step on top of each box and its output capacity at the bottom. Triangle-shaped boxes indicate delays between operations although we don't know what is causing them. There are various acronyms used as well: RMI for example means "request material inventory", WIP means "work in progress" and FGI is for "finished goods inventory". Diagram based on example from Mary Ann Anderson et al. in *Operations Management for Dummies*.<sup>13</sup>*

This diagram provides plenty of information to analyse, manage and improve this process. However, it is not clear how many individuals are involved in it, there is an operator for each "OP" step, but it is not clear who is responsible for the delays at the various "WIP" boxes. Also, if we wanted to add information, like set up times, waste or utilization of resources we will be constrained due to space. However, there is a way to represent this process in a format that clearly defines the activities taken by each role by using the *Swimlane* approach.

The *Swimlane* or *cross-functional technique* is a process map format that provides even richer information on *who does what*. This approach was originated by Geary Rummler and Alan Brache in 1990<sup>14</sup> and its name derives from the division of the diagram in *lanes* (as in a swimming pool), where every role has one or more activities performed at certain points in the workflow<sup>15</sup>.

In this approach, each participant has a lane assigned exclusively, and only their activities will appear in it, this makes easier to visualize when actions happen and what are the overall responsibilities of each participant. The company or organization actors are aligned together to

<sup>13</sup> Anderson, Mary Ann., et al. *Operations Management for Dummies*. John Wiley & Sons Canada, Limited, 2013.

<sup>14</sup> Harmon, Paul. *Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes*. Morgan Kaufmann, 2003. p.113

<sup>15</sup> Business Analyst Community & Resources | Modern Analyst. "Interview Questions for Business Analysts and Systems Analysts." *What Is a Context Diagram and What Are the Benefits of Creating One?* > Business Analyst Community & Resources | Modern Analyst, [www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/ID/1804/What-is-a-Swimlane-Diagram.aspx](http://www.modernanalyst.com/Careers/InterviewQuestions/tabid/128/ID/1804/What-is-a-Swimlane-Diagram.aspx).

keep a cohesive entity, whereas external actors are pulled to the borders. As a convention, Customers are assigned the first (upper lane in a landscape format), while suppliers and third-party participants are assigned the last lanes (bottom of the diagram in a landscape format).<sup>16</sup>

Figure 5 uses the same information in Figure 4 and displays it using the swimlane technique.

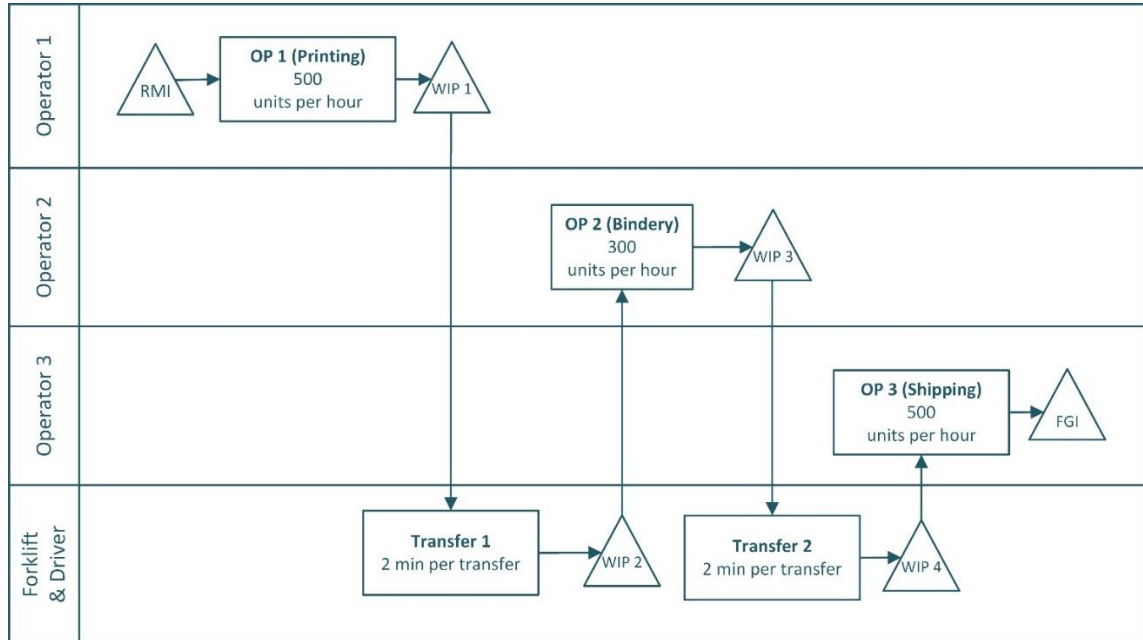


Figure 5 **Swimlane process map example.**

*This diagram contains the same information from Figure 4, but offers new insights as discussed in the text. We labelled operations as Printing, Bindery and Shipping for the purposes of section 1.5 below.*

The information displayed in Figure 5, clearly shows who is responsible for the delays before and after each activity of the process, it also let us see who does what at any moment and offers additional space to add information if required.

### 1.5. Calculations using a process map information

Another trait of process maps is that some of the information they contain can be used to make calculations to estimate processing times, resource utilization, waste and other factors. Let's look back at Figure 5 and suppose it is a process for producing books. OP1 is the Printing operation, OP2 will be Bindery and OP3, Shipping.

Printing (OP1) can produce 500 books each hour, however, Bindery (OP 2) is able to finish only 300 of these. If Printing works at its maximum output capacity, 200 printed but unfinished books will stack *in front* of Bindery every hour (500-300), because it is not as fast. Doing the numbers for an 8-hour work shift, Print would print 4,000 books (500 x 8) while OP 2 would finish 2,400 of these (300 x 8), leaving 1,600 unfinished every day (4,000 – 2,400).

<sup>16</sup> Harmon, Paul. Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes. Morgan Kaufmann, 2003. P.112

Also note that even if Shipping (OP3) can pack and ship 500 books per hour, meaning it can pack 4,000 on the same 8-hour shift, it needs to wait for the Bindery to finish them.

This situation introduces us to the key concept in process mapping of *Bottlenecks*. Bottlenecks are defined as the step with the lowest capacity, in this example, Bindery. Bottlenecks are very important as they highlight activities that need improvements, or which determine the whole process behavior. In our example, the bottleneck in Bindery would tell a manager to run the process with a (slower) print-run of 300 books each hour (OP1), because that is the capacity of the bottleneck, so even if the Printing (OP1) and Shippers (OP3) are faster, they must wait for the bindery to finish their job before starting. Under these conditions, the process will produce 300 books per hour at its maximum capacity.

As for improving the process, the analysis based on these calculations tell us where we should focus our efforts and there are several options for this, one is to increase the Bindery capacity to match the rest (500 books per hour), another is to run a second Bindery (OP4?) in parallel or outsource part of the process, to name some.

### 1.6. Considerations to help an organization to understand process maps

We have reviewed some benefits process maps have to offer, but all these symbols and representations are useful only when a project is seen as a *communication problem* that requires a good understanding of the subject, be it a company or organization, its industry, or its internal processes. As producers of such data products, we ideally want to make sure readers have “the ability to understand and draw meaning from data and the instruments where it is presented”<sup>17</sup>. To achieve this focus, it is necessary to ask ourselves the following questions early in the planning stage:

- What is the purpose of the project?
- Who are the users we are trying to reach?
- What do they know about the subject?
- What do they want to know?
- What do they wish to accomplish?

It is important to consider, every organization has its own “particular way of solving tasks, most times within an intangible frame of conventions and expected behaviours”<sup>18</sup> as producers of these documents we must become familiar with such conventions, as well as any jargon or practices used to communicate internally; on some cases, departments and hierarchies also become *balkanized* and develop their own norms, conventions and terminology within the organization, leading to communication problems such as providing and procuring data only a portion of the individuals can access or understand, when this is the case, it is essential to find a consensus and define a standard everyone is able to understand. It is worth saying, documents such as process maps help standardize or establish these practices.

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<sup>17</sup> Gemignani, Zach, et al. Data Fluency: Empowering Your Organization with Effective Data Communication. Wiley, 2015. p.23

<sup>18</sup> *Idem* p.22

## 1.7. Digital tools to draw maps and charts

Now that we have reviewed the characteristics and benefits of process maps, I will discuss the ways they can be created. The original tool to draw flowcharts was a template like the one shown in Figure 6. However, most process maps today are done digitally as this greatly increases their consistency, widespread distribution and duplicability. Applications like word processors and design software offer some options to draw them, but there is also specialized software available, which come in a variety of forms and platforms and in proprietary and open source licenses.

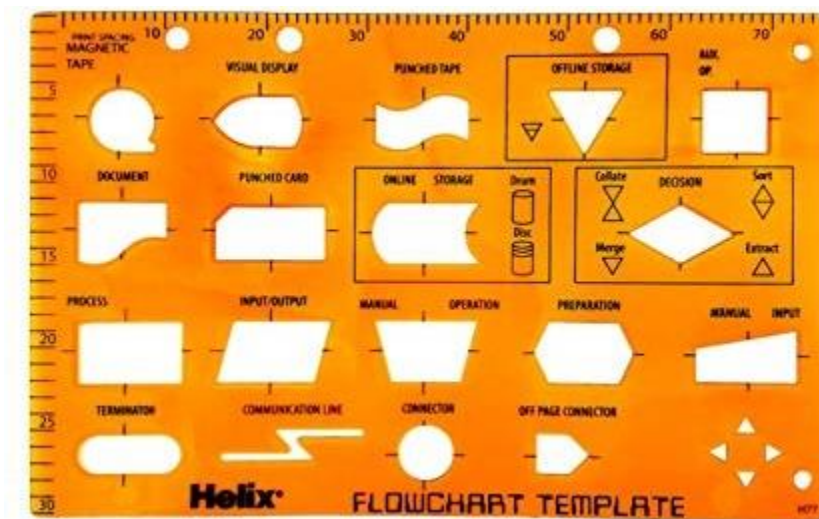


Figure 6. Process map drawing template.

We see many of the frequently used icons also shown in Figure 3.

Hemlock already had a widely specialized software solution for creating flowcharts as part of their software library called Microsoft Visio. Because of its widespread use in the company, the process mapping project was based on it, allowing the source files to be shared, modified and accessed securely. However, many features from Visio can be found also in cloud-based and free software such as draw.io.

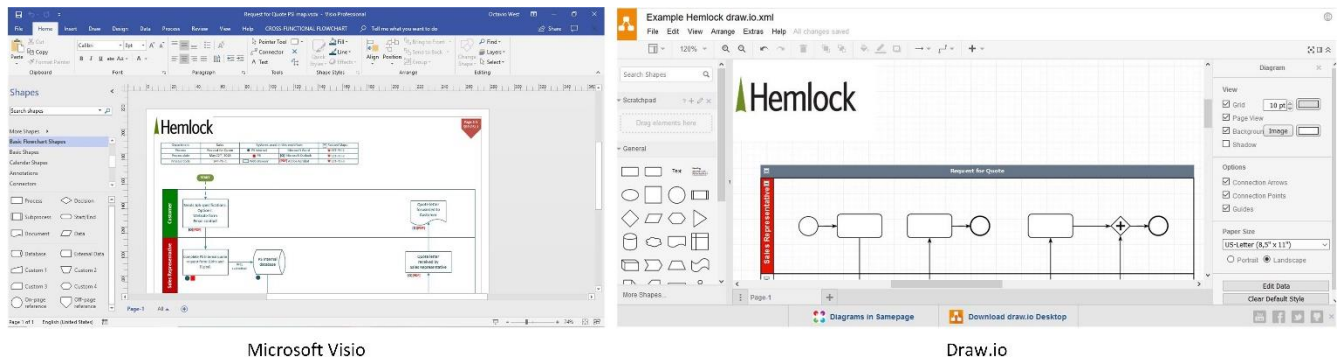


Figure 7. Licensed vs cloud-based, free flowchart software.

These are screenshots of the graphic user interface (GUI) in Microsoft Visio, a licensed product

*and draw.io a free to use, cloud-based application. Hemlock logo is a Trademark of Hemlock Printers Ltd, used with permission.*

Flowcharting applications offer similar capabilities that include multiple shape and symbol libraries with drag and drop features, automatic connector lines, text boxes for annotations, import data and images and some of them even create reports of the shapes used. Because of this, they are best suited to draw, share and edit process maps and export the files as images, PDF or publish in HTML or XML to name a few.

## 1.8. Design Guidelines

Process maps are mostly visual documents, so it is important to have some guidelines that help us improve their appearance and efficiency as communications tools; in *Storytelling with data*, Cole Nussbaumer Knaflic lists some points to consider when designing efficient and attractive visuals and divide them in four categories:

**Affordances:** “Refers to inherent aspects to the design that make it obvious how the product is to be used<sup>19</sup>. In process maps they can be achieved through careful use of typography (bold, italics, underline) size and color. Observe the following:

- Highlight the relevant parts
- Eliminate distractions
- Create a visual hierarchy You can use font size, gradients of the same color

**Accessibility:** “Designs should be usable by people of diverse abilities and specialties”.<sup>20</sup> For this:

- Keep it simple and clean
- Avoid overloading data
- Use text to explain, reinforce or clarify, always keeping a straightforward language
- Show only relevant data and information

**Aesthetics:** “In general, people perceive aesthetic designs easier to access and use than those which are not”.<sup>21</sup> This is a subjective topic of course and requires testing with the future users of these products. It is also important to consider, most companies have a visual identity manual that can help you understand the rules, colors and styles used, look at existing documents within the company and consider the following:

- Make it visually pleasing
- Check if logos, corporate fonts and colors are used accordingly to the company visual identity guidelines
- Organize and distribute the elements on the page so space between shapes is balanced.

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<sup>19</sup> Knaflic, Cole Nussbaumer. *Storytelling with Data: A Data Visualization Guide for Business Professionals*. Wiley, 2015. p.128

<sup>20</sup> *Idem*, p 138

<sup>21</sup> *Idem* p.145



- Use an underlying grid (like that used on square-ruled paper) to arrange the elements to the same position and alignment. This will allow a fluent reading and an easy transition between elements
- Make good use of white space, including margins
- Earth tones allow a better visualization in general as they are more relaxing to read, use bright colors only to draw attention to specific items or categories and always in moderate proportions

**Acceptance of a new design:** “For a design to be effective, it must be accepted by its intended audience. Humans tend to experience discomfort with change so if you highlight the characteristics to note how a new design is more beneficial than a past one, the audience will likely be more open to accept it”.<sup>22</sup> Some ways to do this are:

- Provide multiple options and seek input from stakeholders before submitting a final design
- Show the old and new styles side by side and explain the benefits of the new approach

There are many other considerations that can add value to a design and style to create process maps, these are beyond the scope of this document but considering recent techniques towards datafication of workflows,<sup>23</sup> processes and lifestyles, it is a good investment of time to keep learning how to improve the visual effectiveness of these communication tools.

### 1.9. Chapter 1 summary

In this chapter we reviewed the basic characteristics of process maps, introduced the swimlane, a popular diagramming style used to represent activities more accurately and which was of great use for Hemlock project as it identifies “who does what” during a process. We also demonstrated some calculations that can be made with the additional information these diagrams include and finally presented some guidelines to help readers create visually attractive maps which is important if we want to enhance their communication potential.

On next chapter, we will cover Hemlock printers and their value chain, focusing on their organization and operational areas as we did to create a model that serves as the base for the role-centered process mapping of every process held at this company.

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<sup>22</sup> *Idem* pp. 149-150

<sup>23</sup> Wikipedia contributors, "Datafication," *Wikipedia, The Free Encyclopedia*, <https://en.wikipedia.org/w/index.php?title=Datafication&oldid=842812215> (accessed October 28, 2018).

## Chapter 2 Approach to process mapping of Hemlock Printers

In Chapter 1, I discussed the characteristics of process maps which were the tool used to document Hemlock workflows and the way they were using software to fulfill its value chain to provide the company leadership with an overview of the existing procedures and help the team in charge of implementing the new managing information system to understand processes and services to be replaced and help plan new routes of development. In a later stage, maps will be used as templates for new workflows that can also be documented and in conjunction, will provide a picture of the actual changes and improvements achieved, leading to further optimization.

To achieve a successful process mapping, we first needed to understand Hemlock's value chain, fulfilled through the "general order flow", the company structure, to create a model that considered the transformation processes involved, the operational areas where they were carried out and the roles employees were performing to create an abstract model of the organization. This role-based model served as the foundation to document the tasks, processes and sub-processes each employee performed using the swimlane approach mentioned in Chapter 1.

### 2.1. The General Order Flow

Hemlock is a commercial printer, that turns design files provided by customers into high-quality printed and finished products. Besides printing and binding, they offer special finishing services like varnish coatings, foil stamping, embossing, folding and die-cutting, they can manufacture tens of thousands of units everyday and handle several projects at a time.<sup>24</sup>

For this to happen, its operational areas work together through a series of complex processes. For any given print project to come to completion, it must go through several operations that comprise the "general order flow". Such a project is usually called a *job* and starts with the reception of a digital design file provided by a customer along with a request for a quote, estimating the cost to produce it and if accepted by the customer, proceeding to planning, proofing, readying for print, manufacturing, and eventually shipping and billing. Every job goes through a variant version of this process, which, for offset orders, is illustrated in the following swimlane process map shown in Figure 8 that places each operational area of Hemlock in a lane.

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<sup>24</sup> An interesting note, the plant has an average of 170 projects scheduled at any given time.



## Hemlock's Litho Order Flow

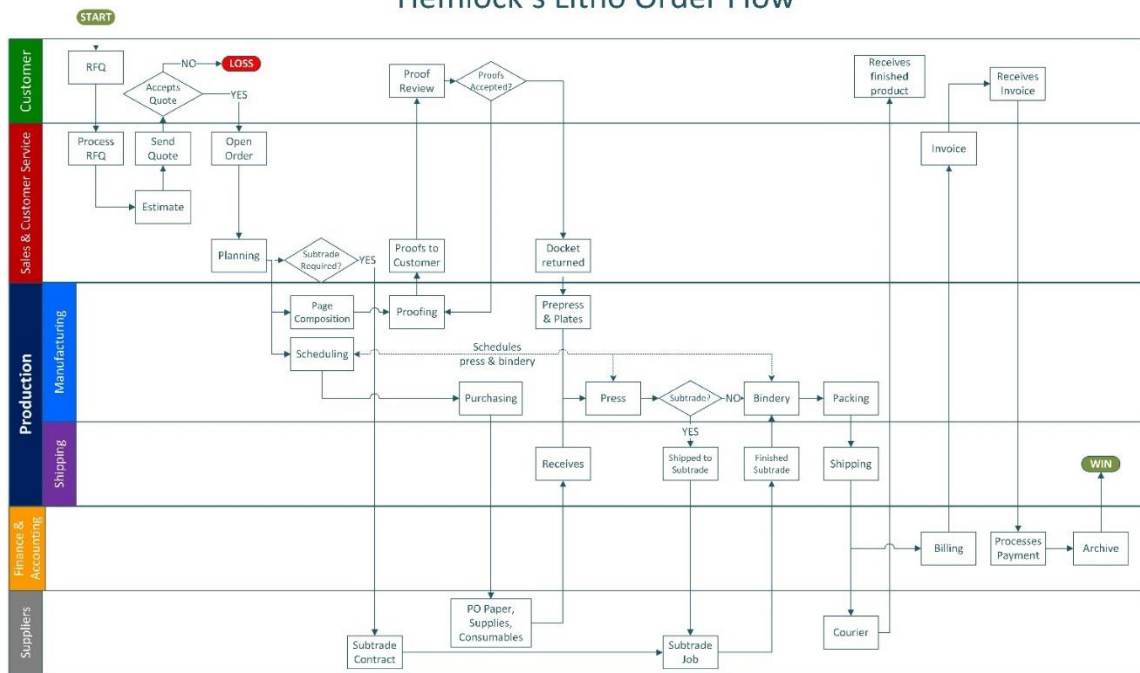


Figure 8. Hemlock's general order flow.

This diagram shows the ideal process for a project (job) is taken from a design file to turn it into a printed and finished product. It starts with a Request for Quote (RFQ) by the customer sent to the Sales & Customer Service area, which takes charge of the quoting and planning of the project. It is then turned over to the production area where it is proofed and manufactured using in-house and (sometimes) third-party capabilities. When the job is finished it is shipped by the shipping department, after this, the job costing passes to Finance & Accounting area for billing and payment. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

A process like this is called a *super-process*, it encompasses many processes and sub processes within them. For our mapping project, knowing the full set of operations served as a guide that defined the order to map each stage and allowed us to document the role each participant had into turning the order into a printed product at every stage of the super-process. When planning a large-scale project, it is a good idea to first identify the super-process, divide it into smaller sections until we get to the level of detail we aim to document.

### 2.2. About Hemlock Printers

Hemlock Printers Ltd. Is a Canadian-based commercial printer, founded in 1968, which offers offset, digital and wide format print services. Nowadays it is “one of the most highly revered commercial printing companies in world based on innovative, high-end sheetfed perfecting.”<sup>25</sup>

<sup>25</sup>PrintAction Staff, “Year in Review: 30 Moments to Shape Canadian Print.” PrintAction, [www.printaction.com/headlines/printaction-2017-4500](http://www.printaction.com/headlines/printaction-2017-4500). Consulted on November 19, 2018.

with offices and two plants in Burnaby B.C. It also has sales offices in Seattle and San Francisco and “was the first printer in Western Canada to venture into the US market”.<sup>26</sup>

Hemlock philosophy is: *Integrity, innovation, In Print*. The company has grown from a single-man stationery store-front operation in 1968 to a multinational company that uses cutting-edge technology on various sites totalling over 100,000 square feet, where they manage and process thousands of projects every year.<sup>27</sup>

The company has grown organically through its 50 years of existence, following a pattern where it first expanded capacities by means of investments in staff and technology to grow its production capabilities which increased the production output, turnaround times or created new services which in turn helped expand their customer base.<sup>28</sup>

For instance, in 1981 Hemlock purchased its first four-colour press, this acquisition enabled to print faster and in bigger formats, granting the capacity to print more sheets per unit of time which allowed to serve a higher number of customers and - as it happened- take jobs from customers with high volume demand like major advertising agencies in Vancouver. This effect also applies to technical expertise (in 1990 they secured a reputation as a fine art printer), innovation (sponsored and tested the development of a new “Computer to Plate (CTP)” process in 1996) and environmental programs (pioneered a zero-carbon program in 2004).<sup>29</sup>

## 2.2. Organization

The addition of technology and personnel expands the company capacities but also adds more complexity, new positions must be created to cover previously inexistent roles, additional staff is required to fulfill traditional tasks, departments diversify and (sometimes) split to manage new services, and operations become more elaborated. Such changes usually involve new processes which are integrated into existing workflows. For the process mapping project to document every process involving the use of software, it was necessary to understand the general organization of the company and identify the roles that performed each process in the value chain, then create an abstract model of the operational areas and roles that accurately represented how each of these roles, worked together to fulfill the general order flow.

Hemlock is organized into five *functional areas* that cover sales and customer services, production and fulfillment and finance and accounting. Figure 9 illustrates the overall organization:

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<sup>26</sup> Ofori-Dei, Sandra. Building an Efficient Print Production Workflow through Web-to-Print: A Case Study of Hemlock Printers, Simon Fraser University, 2015. p.4

<sup>27</sup> Hemlock Printers, Great impressions, colourful legacies, July 2003, BC Business Magazine / Canada Wide, Burnaby, B.C. 2003.

<sup>28</sup> Wikipedia contributors, "Organic growth," *Wikipedia, The Free Encyclopedia*, [https://en.wikipedia.org/w/index.php?title=Organic\\_growth&oldid=874737471](https://en.wikipedia.org/w/index.php?title=Organic_growth&oldid=874737471) (accessed February 27, 2019).

<sup>29</sup> With information from Hemlock Printers, Great impressions, colourful legacies, BC Business Magazine, July 2003, Canada Wide, Burnaby, B.C. p.10 and Interview with Richard Kouwenhoven, CEO & President of Hemlock Printers, November 12, 2018.

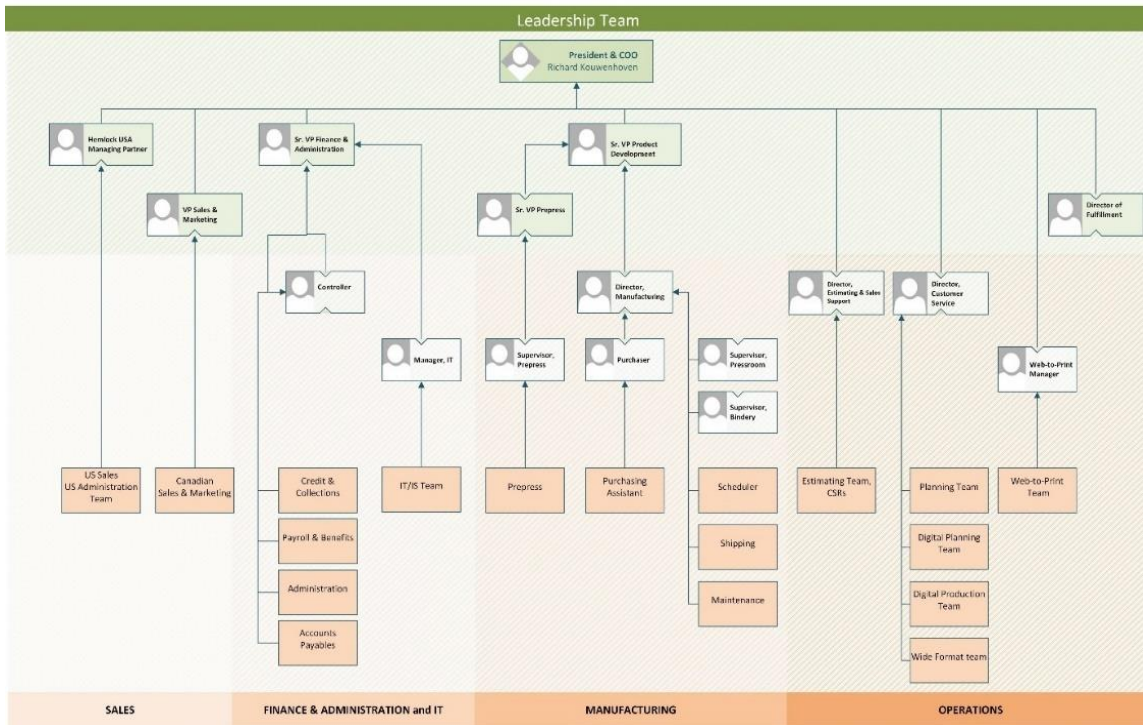


Figure 9. Hemlock Organizational Chart.

Here we see a Level 1 process map based on the existing organizational chart used by the company and describes the general organization in departments and managerial positions from a high level. It does not, however, establish any relation on how these departments interact with each other, but serves as a good starting point to analyse and understand the structure of the company. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

### 2.2.1. Leadership team

This group includes the Chief Executive Officer, Vice Presidents and Director of Fulfillment, they lead the operational areas of the company and “provide short term and long-term leadership and guidance aligned with the company strategic objectives<sup>30</sup>” as well as oversee the daily operations of each of their respective areas.

### 2.2.2. Sales

This area integrates the Canadian Sales and Marketing team led by the Sales & Marketing VP and the US Sales & Administration team, led by Hemlock USA managing partner (which is a separate company). They identify prospects, request quotes to the Estimation department, register new customers, negotiate prices and close sales, also inputting new orders into the system for *Planners* to follow-up with the project.<sup>31</sup>

For Hemlock Canada, it “serves in setting sales goals and strategies, directing and supporting the team in their efforts to exceed annual revenue budgets, including retention of existing accounts

<sup>30</sup> Jeff Taylor, Senior VP, Product & Development at Hemlock. Interview, October 24, 2018

<sup>31</sup> A prospect is a potential person or entity which has yet to do business with the company

and acquiring new clients in the BC and southern Alberta marketplaces. In addition, plays a key role in the company's Marketing efforts, including developing printed sales collateral, website and social media development, organizing events and sponsorships and developing other promotional opportunities to grow the Hemlock brand".<sup>32</sup>

### 2.2.3. Operations

This area oversees estimating job costs for the customer and the company, divide the job into printable parts (i.e. a book may be divided in cover, interior pages and possibly a dust jacket), and managing online web-to-print services. It is divided into the following:

**Estimating and Customer Support Representatives:** They provide the sales representatives with quotes for all types of print production under the supervision of the department's Director. "The Director also provides pricing support to the sales team if they have an opportunity which would require special pricing to be competitive, or a different solution to win a project for Hemlock. He is also responsible to set the pricing in their Management Information System to make sure that materials are quoted correctly and work with the accounting department to monitor and adjust estimating standards for equipment and staff".<sup>33</sup>

**The Planning teams** are responsible for creating projects to print jobs, send raw-materials purchase requests to the production area, manage contacts with outsource suppliers, contracting their services as required by each project. They also coordinate workflows and keep track of each job progress, communicate with the customer when required to verify and obtain approval for proofs and keep them updated about a job status.

**The Digital Production team** is responsible for planning, scheduling, purchasing, manufacturing and shipping digital prints jobs. They are considered a separate entity for accounting purposes and inventory, still, they get jobs inbound from a centralized sales area.

**Wide Format Production team,** shares similar responsibilities as the digital team but they manufacture wide format jobs, working closely with third-party suppliers to accomplish the installation of finished products.

The **Web development team** oversees several web-based applications which comprise the *Web-to-Print system* of Hemlock. They create digital platforms where customers can request an estimate, place orders, submit their print ready-files to get orders printed or manufactured-on-demand, manage their inventory, get billed, pay, track and fulfill orders.<sup>34</sup>

### 2.2.4. Manufacturing

This area is responsible of proofing, scheduling, procuring materials, printing and finishing the job and shipping to the customers. It is divided into six major departments:

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<sup>32</sup> Doug Climie, VP Sales & Marketing at Hemlock Canada. Interview, October 21, 2018

<sup>33</sup> Stan Potma, Estimating Director at Hemlock, personal interview, October 15, 2018

<sup>34</sup> Ofori-Dei, Sandra. Building an Efficient Print Production Workflow through Web-to-Print: A Case Study of Hemlock Printers, Simon Fraser University, pp 35-41

**The Scheduling department** is responsible for programming and calendarizing jobs within the production facilities of the company based on the Planner specifications, so it can be manufactured and delivered on time.

**The Prepress department** receives the graphic designs provided by customers and prepares them to be printer-ready, checks if the files are correct and the images comply with a minimum resolution standard, corrects color in files to match the printed process, converts RGB images into CMYK, generates proofs and color proofs, imposition and exposes plates in high resolution output<sup>35</sup> for the offset presses.

**The Purchasing department** is responsible of providing *just in time* paper, materials and consumables to these print shop as well as managing the paper inventory, receiving invoices, placing purchase orders and preparing documents to generate payment vouchers to suppliers<sup>36</sup>.

**Pressroom** is the area where actual print products are manufactured, after all required preparations; plates, paper and ink are taken to the press where jobs are printed and finished, (cut and bind, die-cut or folded depending on the job requirements) or sent to subtrade.

**Shipping & Receiving** department is responsible for shipping and fulfilling, it is also responsible for receiving paper and all kind of consumables as well as shipping/receiving outsourced jobs from third-party suppliers.

**Maintenance:** This area keeps the building premises in optimum working condition.

#### 2.2.5. Finance & Administration and IT

“The finance & administration department is responsible for invoicing customers, collecting payments and fulfilling financial obligations with suppliers and partners. They generate financial and status reports, manage the payroll and employee benefits, keep ledgers and general accounting, calculate taxes and maintain communications among all areas of the company and outside actors”<sup>37</sup>.

The IT/IS department, maintains the network and computer equipment, installs new software, updates systems and maintains databases, manages security threats and keeps all software in the company working. Also configure user access privileges to system<sup>38</sup>.

### 2.3. Manufacturing Divisions

In addition to the overall organization listed above, the company is divided into three manufacturing divisions, based on the type of printing process they use. All divisions operate with similar processes but manage them in a very different way.

**Division 1 (Litho)** comprises the main offices and plant, which are housed in an 80,000 sq. ft facility since 1986. This is where most of the print jobs for Canada and the US are manufactured

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<sup>35</sup> Peter Madliger, VP Prepress at Hemlock, Interview, October 15, 2018

<sup>36</sup> Lewis Kuiken, Purchasing Officer at Hemlock, Interview, October 18, 2018

<sup>37</sup> Mike Breukels, Senior VP Finance at Hemlock, Interview, October 15, 2017

<sup>38</sup> Jim de Zwart, IT Manager at Hemlock, Interview, October 15, 2018

using several cutting-edge prepress digital equipment, offset presses, bindery, cutting, folding, die-cutting and other finishing machines.

**Division 2 (Digital)** is based in a secondary 17,000 square feet facility and is equipped with digital printers and finishing equipment to manufacture short runs, express orders and other fulfilment services. It has its own planning, scheduling, billing and shipping staff. For the most part, it works independently from other divisions.<sup>39</sup>

**Division 4 (Display):** This division shares facilities with Division 2, and manufactures display prints using wide-format digital printers, the size of which allow to print display signs, banners, mesh banners, interior office graphics, indoor signage and everything that requires a format bigger than a standard press on paper and special materials.<sup>40</sup> Just like division 2, it has its own planning, scheduling and manufacturing.

#### 2.4. The organizational model created for process mapping

Once we understood the company structure, it was necessary to create an abstract model that satisfied the project needs, allowing to depict the workflows that made possible the fulfilment of the general order flow shown in [Figure 8](#) and the roles that made them possible. The organizational chart ([Figure 9](#)) shows the company departments but it does not group them in a functional way or describe the tasks performed, for instance, sales representatives are in close contact with estimators and planners regardless they belong to different areas of the company.

In order to accurately document the workflows and software usage, a new model based on the roles performed by staff and some external actors was devised. This role-centered approach harmonized with the swimlane technique as it had the potential to describe in detail the task each employee is performing and identify the applications, they use to accomplish them.

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<sup>39</sup> Except when hybrid projects are handled, these projects include products that are produced in two or more print systems, for example: a magazine where the cover is printed in offset and the interiors in digital printers, or the above-mentioned shells for business cards.

<sup>40</sup> "Display." Hemlock. Accessed October 16, 2018. <https://www.hemlock.com/portfolio/display/>





**Figure 10. Functional organization and color coding for hemlock operation areas and roles.** *The company is divided into three operational areas which incorporate the roles performing the tasks necessary to function, if you look at Figure 9, you will note this model merges departments from multiple organizational areas in order to accurately represent the workgroups that enable the General Order Flow.*

Under this scheme, the company was divided into three operational areas, Sales & Customer service (red), which grouped sales representatives, estimators, planners/coordinators and customer service representatives. Production (blue) which grouped all manufacturing-related roles, including scheduling, purchasing, prepress, press room operators and shipping and Finance & Accounting (yellow), which includes the roles of billing, accounts payables, accounts receivables, payroll & benefits, reception and IT. External roles were also considered, for the most common actors outside the company, specially those which interacted with the company systems such paper merchants whose software systems are connected to the company. Also note that each area is color coded with roles in tones of the main hue, following the visual guidelines mentioned in Chapter 1 for an optimal communication.

#### 2.4. Management software systems in Hemlock

Because the project required to document the software usage and the resulting process maps were intended to serve as a guide for the team implementing a new software system, it was also necessary to list every application used by the company, group them by operational area and understand which services they were providing to the staff.

As the company grew, there was a corresponding increase in complexity, this is one of the reasons Hemlock introduced a Managing information System (MIS) in 1999 to enable communications among departments and automatize tasks. The solution implemented was a

product named “PSI”, an acronym for Programmed Solutions Inc. By the company Electronics for Imaging (Efi).<sup>41</sup>

Every application in Hemlock worked around a core software system based on PSI which had the task to collect job-related information such as customer address, order quantities, format or paper stock, and process it to distribute it to the next recipient in the workflow or help automatize certain tasks. For example, when an estimator is creating a quote, the system automatically calculates the weight of the finished product based on the parameters inputted and consults a database with the shipping costs to provide them with an approximate figure of the rate to charge.

However, PSI did not cover all the company needs, so for the next 18 years since its introduction, Hemlock IT kept adding modules, linking other software and developing in-house applications. The result was a core system linked to each operational area specific solutions that connected to enable the transmission of data from one department to another, as shown in Figure 11.

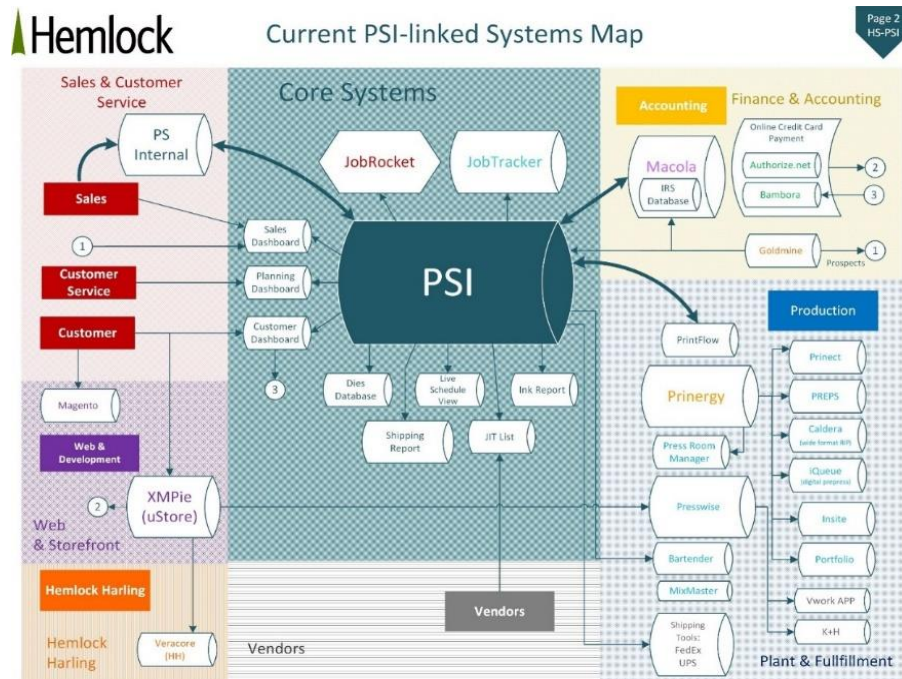


Figure 11. Core systems of Hemlock.

The core systems are all PSI-based and either feed information to the central database or uses it to process information. Area-specific applications enable departments to operate independently of the core systems, but their progress is reported back core system via applications such as JobTracker, PS Internal and PrintFlow. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

<sup>41</sup> Richard Kouwenhoven, CEO & President of Hemlock, Interview, February 15<sup>th</sup>, 2018. The name is actually that of the developer company, which was bought by Efi merely six months after Hemlock implemented it. Efi kept developing it until year 2010 where they replaced it with other products and turned it into a legacy software.



As can be seen, not every application is connected to PSI, however, the services and modules in the core system are used by every operational area. Of those, some deserve special mention because they are important communication hubs that automatize critical tasks in the value chain.

- **Printer Site Internal:** This is a web-based application that allows sales representatives (Canadian and US) to request quotes from the estimation team located in the main plant.
- **Job Rocket:** This is a browser-based software created for Hemlock by a third-party company to pull information about jobs from PSI and report it on a webpage. It is used for consulting and does not allow to input or modify any kind of information.
- **Job Tracker:** This module was specifically developed in-house and is unique to Hemlock. It pulls job-related information from PSI, such as customer shipping address, job specifications and production parameters, reports it and allows operators of different departments to modify or compliment it to record a job status<sup>42</sup>.
- **Print Flow:** Is a Scheduling expansion-module by Efl which allows dynamic scheduling of jobs.
- **Sales Dashboard:** This is an in-house developed, web-based application which allow Sales Representatives manage and register prospects and customers, input orders and, check schedules, shipping reports, interact with Job Rocket and Job Tracker, and download resources such as logos, guides and flyers.
- **Planning Dashboard:** Planners use this dashboard to monitor and manage orders and jobs, request materials, manage paper and ink inventories and connect with Job Rocket, Job Tracker and other internal applications.
- **Customer Dashboard:** Hemlock offers web-to-print services that allow some customers to order print-on-demand, manufacture-on-demand and pre-finished products directly from a web-based interface, it also manages online payments and automatically creates orders for new goods.<sup>43</sup>

## 2.5. Chapter 2 summary

In this chapter, we reviewed the value chain in Hemlock and the business framework they have created to fulfill it, we also isolated the roles that perform the essential tasks that make it possible to quote, prepare, manufacture and deliver a print job and identified the software systems that help the staff to carry out their duties. We also created an abstract, functional model that groups these roles as they operate everyday, all this with the intention to set the foundations for the process mapping project of every workflow in the company. In next chapter, I will review the graphical style and methods used to gather information and construct process maps.

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<sup>42</sup> Jim de Zwart, IT manager at Hemlock, interview, October 13, 2018

<sup>43</sup> Ofori-Dei, Sandra. Building an Efficient Print Production Workflow through Web-to-Print: A Case Study of Hemlock Printers, Simon Fraser University, 2015.

## Chapter 3 Hemlock process mapping techniques and methodology

Once I had a clear vision of the value chain being documented, its processes by area and the roles involved, it was time to gather the information necessary and build the process maps required. The first step was to agree on a design style that facilitated the information in a clear way, for this, some conventions were established. Next, we gathered existing documents that could help us understand the processes and set out to gather information by means of interviews, reverse-engineering of software and use of existing documents to create meaningful, role-centered process maps. These were drawn using the procedure described in the sections below and thoroughly revised by the staff interviewed, their supervisors and leadership team of Hemlock.

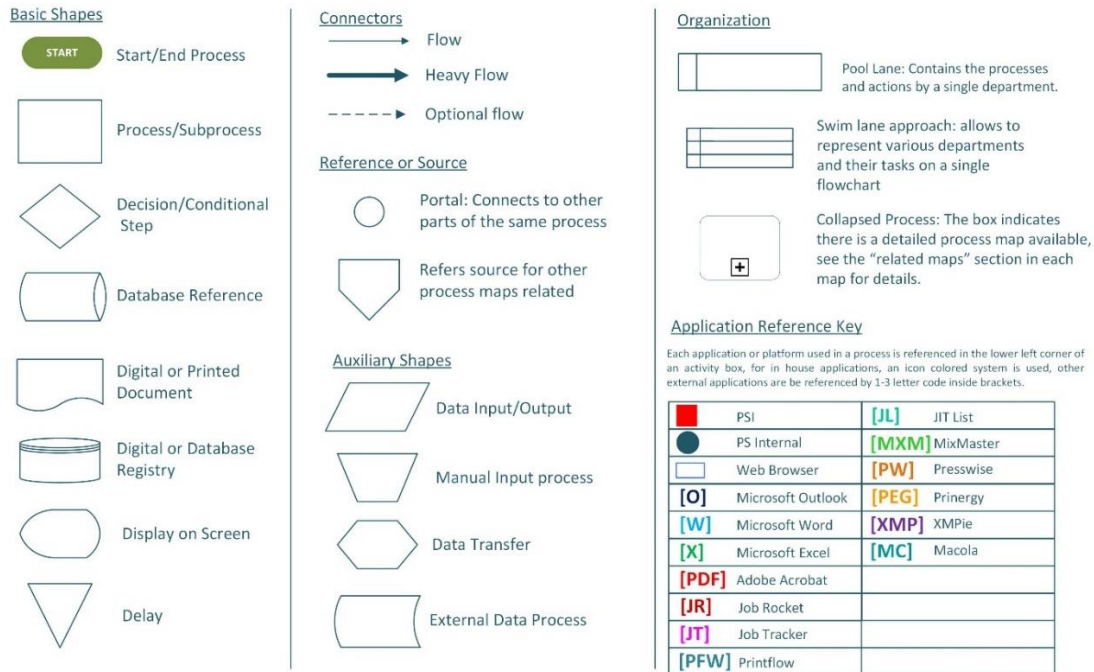
In this chapter I describe the visual style of Hemlock process maps, the information collection techniques used, the general methodology to build the diagrams and a step by step process of how we drew them. This is followed by the technique used to proof and review them and will conclude with a set of guidelines to organize and publish them for distribution.

### 3.1. Graphic style conventions

It was already agreed the swimlane system was ideal to document the processes at Hemlock as it will clearly depict “who was doing what”. We also knew the roles and operational areas of the company will be colour-coded and it was decided this feature will be used on each lane head, so readers could identify the areas involved.

A third step was to compile a selection of symbols from the software library and create a *Master Icon and Key conventions for (Hemlock) Process Mapping* which also included a guide to the flows and annotations used explained later. [Figure 12](#) shows this document which serves as the main reference when interpreting Hemlock process maps and specifies the meaning of each shape, connector and annotation.

## Master Icon and Key Conventions for Process Mapping



**Figure 12. Master Icon and Key Conventions for Process Mapping.**

*The document shown includes every possible shape used in the process mapping of Hemlock, it also includes details on the organization and software applications naming conventions.*

*Diagram and logo are property of Hemlock Printers Ltd, used with permission.*

To identify the use of systems in each step, a special code was devised in the form of either an icon or a three-letter code in brackets placed on the lower left corner of each shape allowing readers to clearly identify the systems used in the process with no need to resort to external aids (Figure 13).

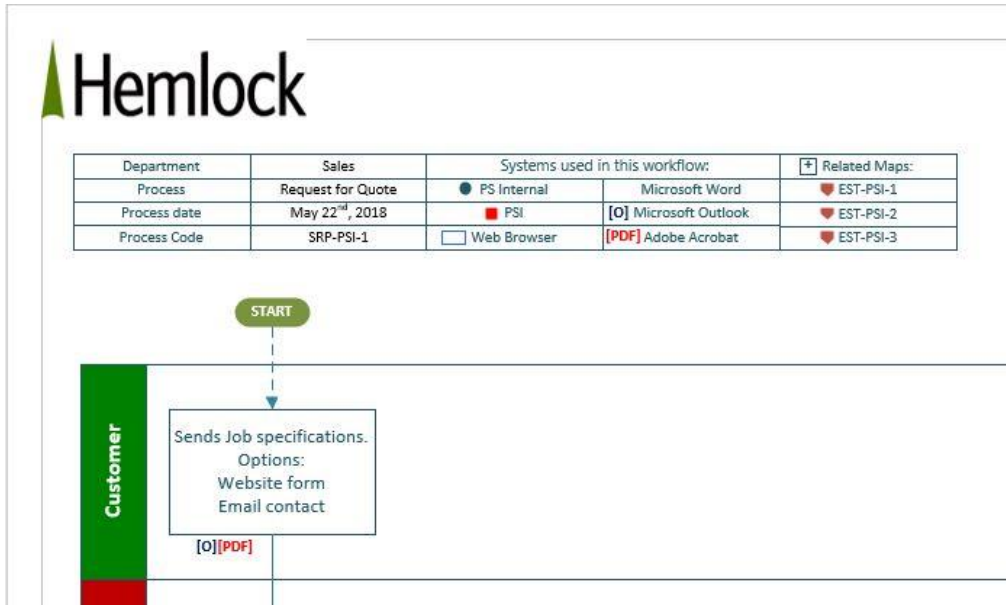


Figure 13. System usage annotations.

The [O] and [PDF] codes below the process box indicate it uses Microsoft Outlook and Adobe Acrobat as per the reference table on top of the map. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

### 3.2. Information gathering and documenting techniques used

Process mapping is always a custom-job, its characteristics change for each project; even among two companies doing a similar task, no two processes will be the same. To map a process, it is necessary to gather a significant amount of information before plotting diagrams. This information is based on a list of requirements which in the case of Hemlock where:

- 1) A list of stakeholders participating in the process (roles)
- 2) A list of all the activities that comprise the process, divided by roles
- 3) The decision points where the process can take different routes depending on the answer or result of a previous activity
- 4) The outcomes to those decision points
- 5) The connections between activities
- 6) The initial and ending activity of the process

Information was collected in three ways, by means of interviews to key-personnel, reverse engineering software applications by exploring their functions and links (most were web-based) and reinterpreting existing documentation to create a base process map that was later enriched with information gathered with other techniques. Let's see each of them in detail.

#### 3.2.1. Interviews

This was the most frequently used technique to document processes, talking to key-designated people performing the roles defined in our operational model, to understand each process and documenting how they accomplished their tasks, which systems they used and how they communicated with other areas to do so, separating parts that required software systems from those done manually.

Not every actor in a process needed or could be interviewed to gather information but their role may be assumed either because they have specific activity to do (e.g. a Customer paying for a job) or there are specific ways to complete the activity (e.g. paying online by credit card). When this was the case, other stakeholders can point-out the expected (ideal) outcome and they way it is accomplished.

Also, some processes are *black boxes*, where some activities pertain to a specific role and the process relies on their output without external intervention. When this is the case, the remaining information must come from the holder of the black box and sometimes, censored to the rest of the parties involved.<sup>44</sup>

Table 1 summarizes the results of one such interview for a *Request for Quote* process, where a prospect contacts the company asking for an estimate.

Customer	Sales Representative	Estimator
1.Sends job specifications using website form or email.	2.Receives quote request in outlook and inputs job specifications in PS internal	3. Receives email with quote number and job specifications
		4. Creates estimate in PSI (sub-process -> Create Estimate)
		5. Saves estimate and marks as complete
		6. Creates quote letter in Word and sends it to Sales Rep by email
	7.Receives quote letter by email and forwards it to customer	
8.Receives quote from sales representative by email		

Table 1. Interview notes for process mapping the RFQ at Hemlock.

*This is a primitive swimlane, every column under each actor includes the tasks they perform and the order they happen. This format was most useful when extracting information from notes, prior to process mapping as each cell would turn into a shape in the diagram.*

### 3.2.2. Reverse engineering of software

Some software applications were required to be understood in detail and even process-mapped as they were integral part of workflows and the services they provide, were essential to fulfill the general order flow.

For instance, the sales department of Hemlock relied on a web-based dashboard where Sales Representatives input orders, checked paper, ink and other raw-material inventories as well as pricing, or connected with other company divisions to check a job status, input request for

<sup>44</sup> "What Is Black Box? Definition and Meaning." *BusinessDictionary.com*, [www.businessdictionary.com/definition/black-box.html](http://www.businessdictionary.com/definition/black-box.html). (accessed October 24, 2018)

quotes (RFQ) to be sent automatically to estimators via a link to PS Internal and download resources such as logos, print guides and special promotions.

To document the services provided by this kind of web-based software, it was navigated following the links and services available. Figure 14 summarizes the procedure used to document the application.

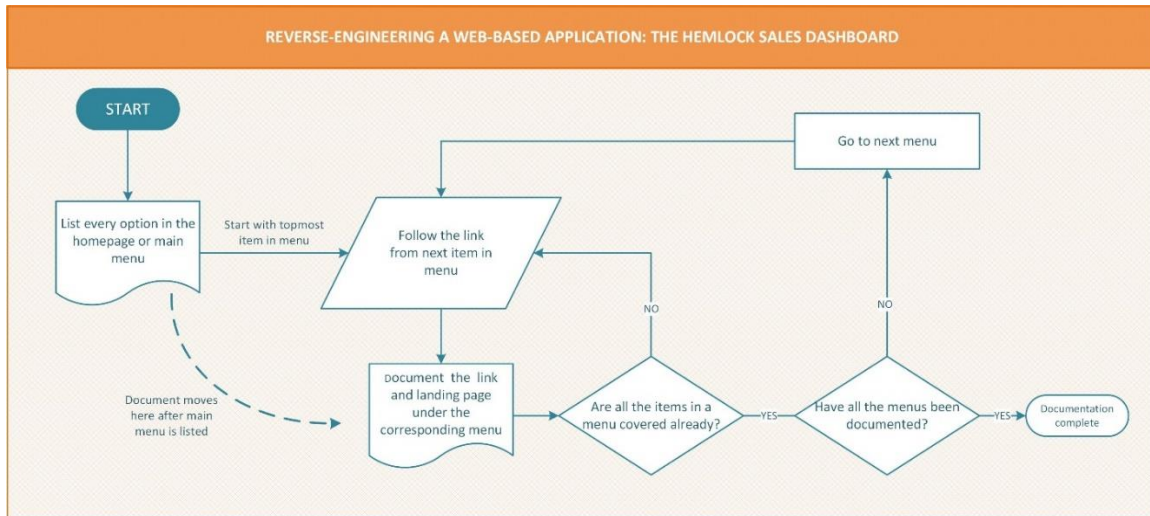


Figure 14. Reverse engineering of Hemlock sales dashboard.

*This diagram shows the procedure followed to navigate and document the web-based software applications in Hemlock.*

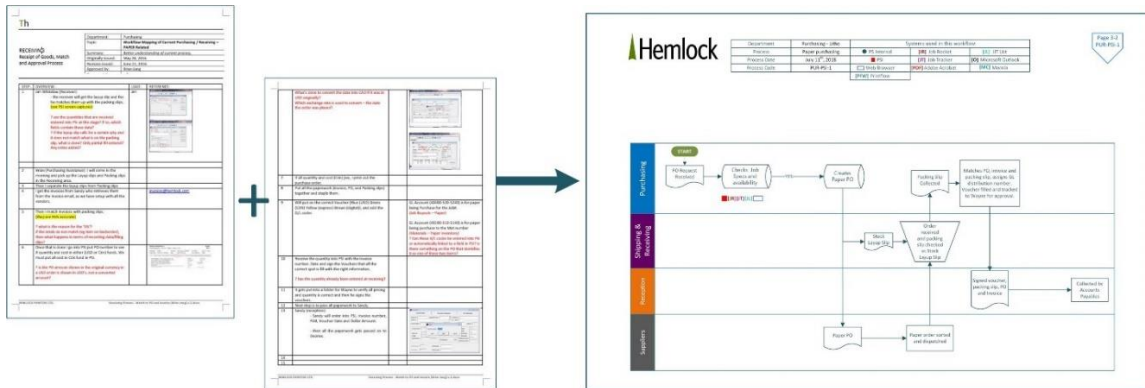
Just as we did with interviews, the information gathered was ordained chronologically and a process map was drawn. In this case, a single lane was used with the role of the staff that uses such software (e.g. sales representative for the sales dashboard) and software annotations show the links to other pages or applications and the software system providing the functionality.

### 3.2.3. Using existing documents

Documents describing the workflows already existed in some departments, they offered an opportunity to review the process before carrying out interviews and build a starting process map that would be later completed with the information required by the project.

For instance, we were provided with a list of the activities for the purchasing workflow carried out by Division 1: Purchasing department, this document even mentioned the software they used. As such, it was used to create a basic diagram as seen in Figure 15, then several interviews took place to complete and refine the process map.<sup>45</sup>

<sup>45</sup> In the end, this process proved to be so complex, it had to be split for clarity into three variants: paper, consumables and general supplies purchases.



**Figure 15. Using existing documentation to draft process maps.**

*Existing documentation of the purchasing workflow was provided and used to sketch a basic workflow. This is a good example of how efficient process maps are at documenting information, compare the extent of the existing documents on the left with the elegant, streamlined workflow on the right. Diagram and logo are property of Hemlock Printers Ltd, used with permission.*

### 3.3. General Methodology

The method to map Hemlock processes followed was:

- 1) Identifying and setting the scope: The goal of this first phase is to identify the processes and tools used by each area and department to understand the scope of the project and plan a work schedule.
- 2) Information gathering phase:
  - a. Carry out interviews with employees fulfilling the main roles being documented.
  - b. Document software, navigate the application, analyze and document each option offered by the menu as well as its connections, until all options are covered.
  - c. When using existing documents, try to find the author of such documents, if this is not possible, translate the documents to the new format and fill the gaps by interviewing people related to the process.
- 3) Drafting phase: The goal of this phase is to create a first-draft of the process map by:
  - a. Charting the workflow using the Swimlane system
  - b. Add notes for software usage
  - c. Solve discrepancies, dead ends and missing links by interviewing the interviewees or IT department
- 4) Review the process:
  - a. For interviews, approach the interviewee and other stakeholders participating in the process when applicable reading the maps with them
  - b. For software, navigate the application again checking if the map contains all steps of each service.
  - c. For diagrams based on existing documents, approach the stakeholders as in item 4a.



- 5) Make changes or adjustments to process maps, review each new version until the process map is complete.
- 6) Get revision and approval by a member of the leadership team or authorized officer managing the area.
- 7) Submit to CEO for final approval.

### 3.4. Drafting process maps

Here we will explain the way Hemlock process maps were drawn once information was gathered. It seems many authors of process maps and flowchart guides consider the drawing procedure an intuitive step, offering few or no examples on how to go through it. Thus, I offer a simple but complete step by step visual guide based on my experiences to approach this task.

#### 3.4.1. Header Section

Start by creating a header that includes the title of the map, process documented, key of symbols if necessary, map number or code, date it was created and updated and if required.<sup>46</sup> Add any brand or logos if necessary (see Figure 16).



Department	Sales	Systems used in this workflow:		Related Maps:
Process	Request for Quote			
Process date	May 22 <sup>nd</sup> , 2018			
Process Code	SRP-PSI-1			

**Figure 16. Hemlock process map header.**

*The header includes the basic process information like department, name, date documented and identifier code, it also offers space for references. Diagram and logo are property of Hemlock Printers Ltd, used with permission.*

#### 3.4.2. Draw lanes and add boxes for each process

A lane for every participant performing a role in the process and activity boxes was added based on the symbols defined in the *Icon and Key conventions for Hemlock Process Mapping*, its header color-coded according to the operational area and role as we stipulated in Figure 8. Each symbol includes a description of the activity performed. A convenient method found was to go through the process adding steps in chronological order from left to right (Figure 17).

<sup>46</sup> Smith, Fernando Vera. *Diagramas De Flujo*. Trillas, 1995. p.17



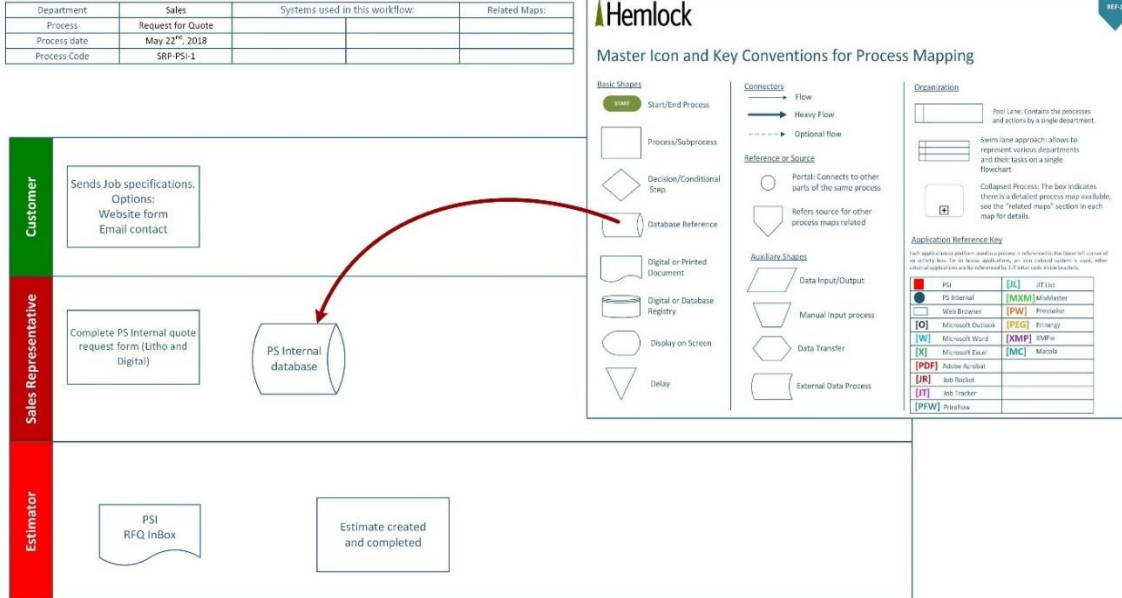


Figure 17. Adding lanes and activity boxes.

Steps are drawn based on the information summarized on Table 1. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

Sometimes, getting shapes fit into a limited space is a major challenge, particularly for very complex processes. Foreseeing the number of icons required in the busiest lane helps define the size of the boxes used, if space is a problem, you can separate the map in two parts to allow for all the activities involved to be clearly depicted. Also consider, conditional expressions always offer two or more flow ramifications (forks) and require a text specifying the conditions to follow each outgoing route. Keep them simple and note the options that lead to each route along the outgoing flows, not in the symbol.

After having added all the symbols to the map, distribute them chronologically from left to right. Make space for in-between annotations if required, try different layouts. If necessary, print a version of your map with no connectors and add them manually before moving to the next step.

### 3.4.3. Draw connectors

Connect the action boxes with arrows pointing in the direction the operation flows from one box to the other (see Figure 18). Be sure to have all shapes in place before going through this step. It's a good idea to keep flows clean and direct so each they can be easily identified. Bidirectional flows can be depicted with a single connector with two arrowheads or two arrows, depending on the nature of the flow.<sup>47</sup>

<sup>47</sup> In MS Visio as in similar applications, most symbols have one connector point on each side of the shape, so it is just a matter of choosing one of those points (usually the closer) and drag the cursor to the connection point in the corresponding shape, you can connect several flows to a point or add more connector points.

Department	Sales	Systems used in this workflow:		Related Maps:
Process	Request for Quote			
Process date	May 22 <sup>nd</sup> , 2018			
Process Code	SRP-PSI-1			

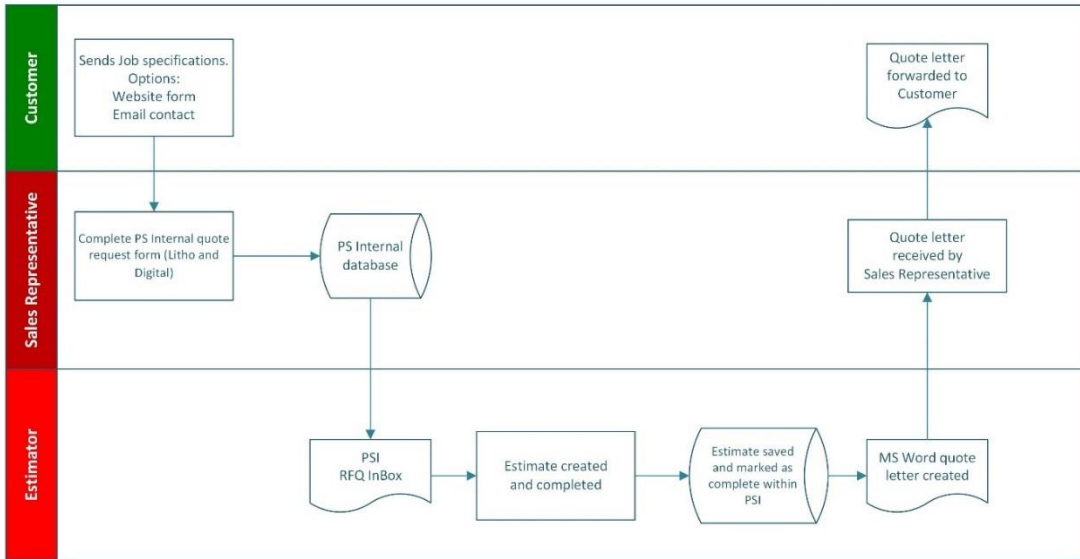


Figure 18. Step boxes arranged and connected.

At this point, a cross-functional workflow is complete, but we still must annotate them to create a proper process map. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

Some processes may lead to several outcomes, not necessarily being a decision box, e.g. a finished document which is both, sent by email and saved in a database. When this is the case, several connectors (referred to as *junction bars*) or forks and may require text to clarify the conditions that lead to each route.<sup>48</sup>

### 3.4.4. Add notes and special annotations

Notes add depth to the process map, must be systematic and standardized to avoid confusion. They can include anything from explanatory texts, production numbers or special codes, in our case, the most relevant and frequent annotation was that to identify the software used. Also, we can use different colors on boxes or connector lines of interest to show key activities, ideal flows, or default routes, use of multiple colors can also identify various processes happening simultaneously or using shared resources.

<sup>48</sup> Harmon, Paul. Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes. Morgan Kaufmann, 2003. p.113

Department	Sales	Systems used in this workflow:		Related Maps:
Process	Request for Quote	● PS Internal	Microsoft Word	♥ EST-PSI-1
Process date	May 22 <sup>nd</sup> , 2018	■ PSI	[O] Microsoft Outlook	♥ EST-PSI-2
Process Code	SRP-PSI-1	□ Web Browser	[PDF] Adobe Acrobat	♥ EST-PSI-3

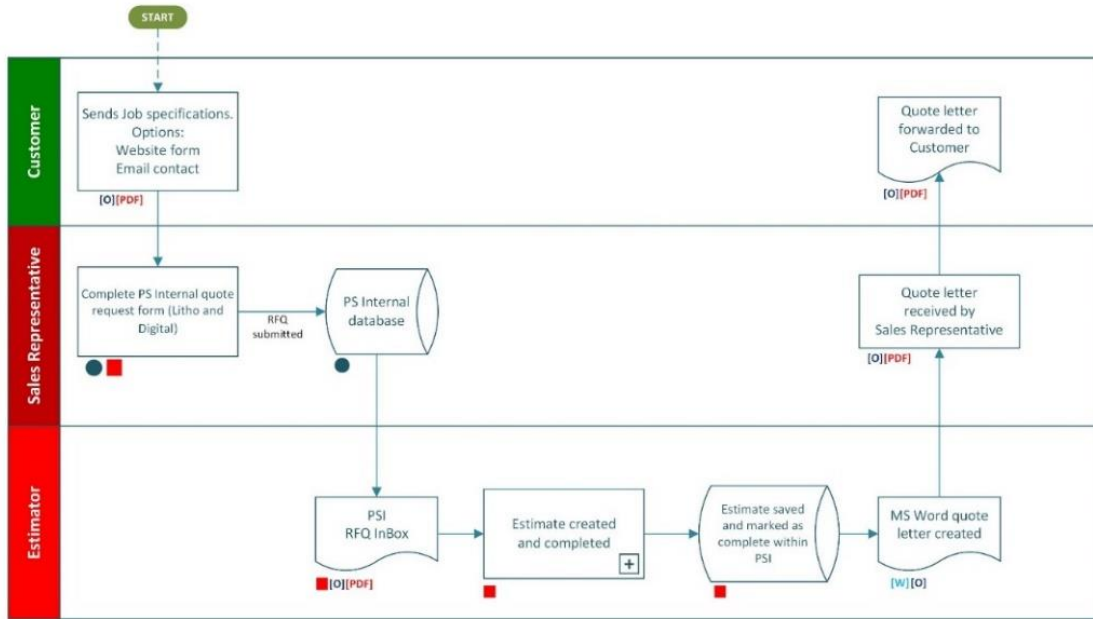


Figure 19. Finished RFQ map with annotations.

Note the systems used, the sub-process mark on step 2 on the Estimator lane, indicating there are other maps detailing this activity which are referenced at the completed references table at the top. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

Figure 19 shows the finished Request for Quote process map with three participants, besides the features and design style used. We added a “start” box, this was a feature added later in the project after finding some problems identifying the starting point. There is also a reference icon in the form of a small square box with a plus symbol to indicate this activity box links to a sub-process and has a separate map covering it. Software annotations using the conventions established at the beginning of the project were also colour-coded to make it easier to identify the application.

### 3.5. Reviews and proofing

After completing a process map, it must follow a proofing cycle to ensure the connections make sense and accurately represent the process, resolving dead ends and discrepancies. Every option must have a finishing point within the map, or a reference to another map if that is the case. This phase is essential to correct mistakes and misinterpretations -which are frequent- verify if it conveys the information it is designed to. The document will also benefit from a copy-edit.<sup>49</sup>

<sup>49</sup> Anderson, Mary Ann., et al. Operations Management for Dummies. John Wiley & Sons Canada, Limited, 2013.

As a rule, the more complex a process is, the more reviewers it requires. Ideally, all the participants in a process should provide feedback, however, sometimes this is not necessary or even possible.

For this project, the people asked to proof and approve the process maps created were:

- 1) The interviewee fulfilling the main role.
- 2) Other people fulfilling a similar or closely-related role.
- 3) Other Stakeholders appearing in the process map.
- 4) Managers and/or the VP of the area in question.
- 5) Hemlock's President & CEO.

After creating the first draft of each diagram, it is provided (usually as a set) to each interviewee and read step by step with them, in case corrections, additions or clarifications are needed, a second and subsequent versions of the diagram are generated, until the reviewers are satisfied with it, then proceed to the next level in the above list, following the same procedure.

### 3.6. Guidelines to organize and publish process maps

Once the map set is complete, it will need to be put together and organized with rationales, references, index and other relevant documents so users can access and understand them<sup>50</sup>. The following list suggest the minimum documentation to include when publishing them.

**1. Introduction and rationales:** These will be useful for new users to learn the context and goals of the project as well as what to expect from it. It should cover its nature and the benefits it has to offer, specifying the data and information contained within as well as a description of each part of the document. If processes involve measures or other calculations, this should be noted how to operate and apply them.<sup>51</sup>

**2. Include a reference chart of the graphic system that contains** all the symbols, annotations and conventions used in the diagramming system.

**3. Timestamp:** Processes by nature, are adapted continuously, sometimes daily, not giving notice to update them. This piece of data will allow readers know when the processes were documented and identify if changes or innovations have occurred since then or if the process is being followed as it is meant to.<sup>52</sup>

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<sup>50</sup> Even a single map will need a sort of reference to for readers to interpret the icon and annotation system it is based on.

<sup>51</sup> With information from the following sources:

"Structuring Your Essay – 2." *Ryerson University Library & Archives*, 24 Nov. 2016, library.ryerson.ca/guides/rusearch/module-two/structuring-your-essay-2/. / (accessed, October 22, 2018)

"Writing Advice Home." *Writing Advice*, advice.writing.utoronto.ca/planning/intros-and-conclusions/ (accessed, October 22, 2018)

<sup>52</sup> Although the participants of a process will usually have an idea of the steps involved by stakeholders, the essential nature is every lane is a Black Box to the rest.

**4. Indexing:** Once all maps, references and introductory texts are created, edited and completed, it is necessary to order them for consulting. This can be done chronologically, sequentially (in the order they are taken) or by area of application.

**5. Other resources** and references like visual or text aids can be devised to help readers gain a clearer understanding of a project. A master, macroscopic process map illustrating the super-process, such as the general order flow on [Figure 8](#), or a master process list or previous documentation to contrast with the new one.

### 3.7. Chapter 3 summary

This section covered the process of designing, collecting information, drawing, reviewing and publishing process maps. Although focused on Hemlock's project, this section also works as a guide for drawing other types of maps. In the following chapter, we will show some of the maps created at Hemlock and how they provide opportunities to visualize processes, identify situations that require attention and look for ways to optimize them.

## Chapter 4 Results of the Hemlock project and selected analysis cases

So far, we have described the characteristics and guidelines to create visually-efficient process maps, analyzed Hemlock Printers value chain and created an abstract model of the company dividing it into operational areas, then explained the techniques and methods used to document and draw maps for each process of the “general order flow”.

For Hemlock’s process map project, we started mapping the Sales & Customer Service area based on our abstract model for analysis shown in [Figure 10](#). The reason for this was the roles it encompasses are the first steps in the general order flow (see [Figure 8](#)), after completing the documentation of every role in this area, we moved to Production, then Finance & Accounting, following the same order a job moves through the company departments.

In this chapter, we will discuss some results and analyse selected process maps to show some uses Hemlock has given to process maps created during this project. The General Order Flow in [Figure 8](#) lists approximately 30 operations but the count for maps documenting Division 1-Litho was around 60, with an overall count of 84 process maps created. The reason is some processes include variants or subprocesses that require their own map, like the sales and planning dashboards which as well other cases of interest such as protocols for payment, credit approvals or internal material requests.

This is a good example of how process mapping helps identify operations which were assumed to be part of a process but in fact constitute a separate activity of their own, or how operations which are assumed to be fulfilled in a single step are (sometimes) distributed across several processes.

### 4.1. Systems usage in Hemlock

The process maps allowed to identify the activities where software was used and visualize the frequency of how systems were used by the operational areas of the company, as can be seen in [Figure 20](#).

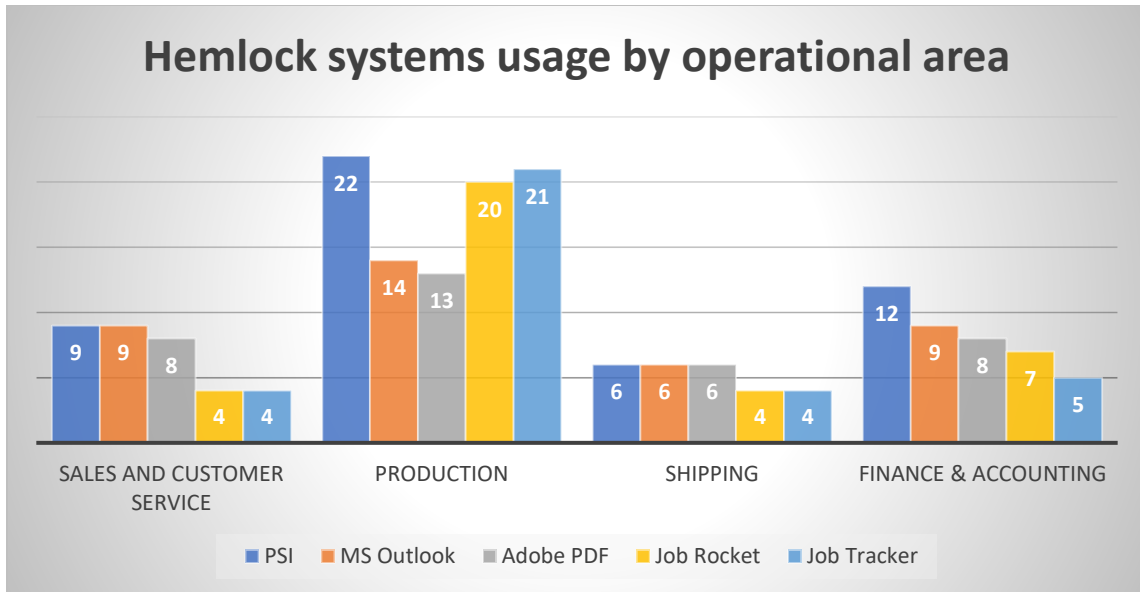


Figure 20. **Most used systems by operational area in Hemlock.**

*This chart shows the number of processes using each application per operational area. Shipping has been separated from Production to illustrate the difference in how this department use systems in a very different proportion than the rest of its operational area. Information used to build this table is the property of Hemlock Printers, used with permission.*

On 49 workflows where PSI enables the processing, transmission or reporting of information, we see that other core applications such as Job Rocket and Job Tracker are also heavily used, particularly in Production/Shipping, where at least 75% of the processes use both. This is interesting as we know the PSI application is used in production areas only to allow employees to punch hours, the real functionality is powered by PSI in the form of Job Rocket which is used to pull specifications and Job Tracker which allows to add information to the system, from status completion, to counts and waste.

What is also interesting, is the heavy reliance on third party systems not connected to PSI, such as Microsoft Outlook and the Adobe PDF extension, as most of the files shared internally and externally are in the latter format. This was a key point for the development team of the new ERP system, as the new platform did not have the ability to publish files in this format and the feature had to be integrated later based on the analysis that showed the heavy reliance on PDFs, specially for external communications.

#### 4.2. Analysis of workflows in process maps

Although the project had the initial purpose to document the system usage in existing processes, it also became a valuable tool for assessing situations where the activities and operations were inefficient or having difficulties. This provided opportunities for improvement, which is after all, one of the key-features of process maps.

It would be impossible to review all the maps created in this document, but we can offer a few examples on key cases which will also help us to illustrate some of the most common analysis points and opportunities for improvement by using process maps. However, before going

through some case studies found at Hemlock, we need to understand some base points that will help us identify problems and opportunities for improvement.

**1. Identify the bottleneck:** As we already explained, this is the step where the process flow becomes constrained, there is commonly one bottleneck per process, and this is what determines how fast a process can proceed overall or how much it can produce.<sup>53</sup>

**2. Examine decision boxes and junctions:** These offer two or more options based on the answer to the condition established. A common analysis technique is to document the percentage in each route occurrence, to gain insights into how often such decision is taken and why. This helps evaluate if *weak* choices are necessary, possibly streamlining the process by removing the decision box, running it parallel to other tasks or batch multiple decisions.<sup>54</sup>

**3. Examine loops:** When a process returns to an earlier stage after a decision box and needs to be run again through part or whole of the process, a *loop* occurs, some processes can be indefinitely locked into a loop unless the releasing condition is met. Loops are sometimes necessary, but when they involve a waste of time and resources, conditions leading to it should be re-designed or limited. e.g. A quote rejected due to incorrect information or a manuscript with persistent errors going forth and back.

**4. Check for waste:** This is a common point to monitor; if a process is wasting unnecessary resources or its output is of poor quality, the process may need to be reworked. e.g. Running a press under its maximum output capacity or (in publishing) returning a manuscript without having edited it thoroughly.

**5. Identify poorly-designed flows or steps:** For example, a slow turnaround time by a third-party supplier that prevents a job to proceed. See if these can be optimized, deviated, improved or even eliminated. Sometimes, these steps are weak because of external factors that correspond to a different process which will be exposed when process mapping it.

**6. Search for weak links:** This means parts of the process where an activity takes a long time to accomplish, thus, constraining the process, causes for weak links include: lack of training, poor or unreliable communication channels, frequent equipment failures and the like.

**7. Identify Non-Value Aggregated (NVA) steps:** NVA steps that do not add any value to the process output. Sometimes they are required for a process to complete though, e.g. Transferring a load of paper from a warehouse to the plant is a necessary step but does not add value to the process. Possible solutions would be to move the warehouse closer or have the paper delivered directly to the plant by the supplier to be printed.<sup>55</sup>

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<sup>53</sup> Anderson, Mary Ann., et al. Operations Management for Dummies. John Wiley & Sons Canada, Limited, 2013. p.27

<sup>54</sup> Quiles, Antonette. "HOW DO YOU INTERPRET FLOWCHARTS?" *Prezi.com*, 22 Sept. 2013, [prezi.com/oafbkusz1stz/how-do-you-interpret-flowcharts/](http://prezi.com/oafbkusz1stz/how-do-you-interpret-flowcharts/).

<sup>55</sup> Based on an example offered by Anderson, Mary Ann., et al. Operations Management for Dummies. John Wiley & Sons Canada, Limited, 2013. p.51



**8. Check for repeated steps.** Some processes go through an unnecessary number of steps, usually to check quality but also because of unnecessarily repeated activities. A classic example in publishing, would be an inefficient editing, where the manuscript goes into multiple revisions because the editor is not providing enough guidance or feedback, the author is not willing to make changes or comes up with new ideas.<sup>56</sup>

#### 4.2.1. Example 1: The new estimate workflow

The RFQ process map represented in Figure 18 shows a small icon on the “Estimate Created and Completed” box, this is an annotation telling us there are other sub-process related. For the RFQ map, which is a Sales Representative-centered process it was not relevant to show this sub-process in detail, so it was depicted in Estimator-centered maps, as shown below:

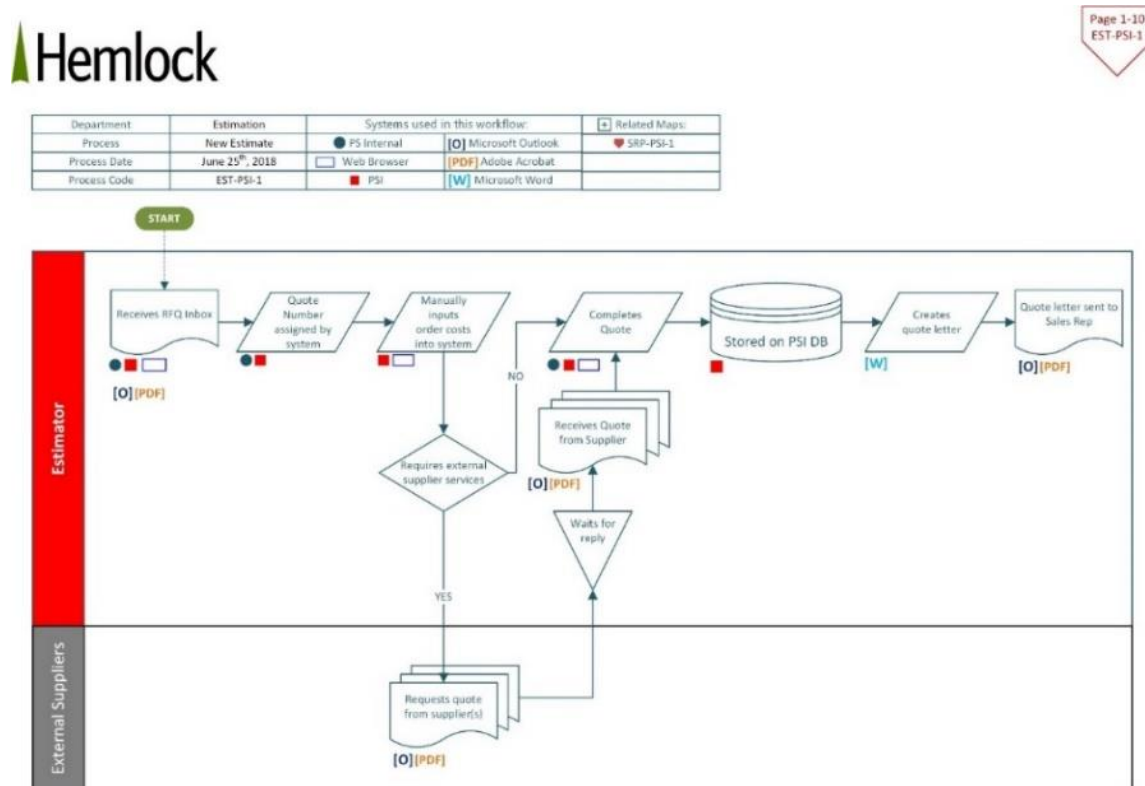


Figure 21. **Sub-process mapping example.**

*This estimator-centered map shows the process to create a New Estimate which is fundamental to complete the RFQ process. There were 3 variants of this process. Diagram and logo are property of Hemlock Printers Ltd, used with permission.*

This map was required not only because it was important to document estimator’s activities but because during interviews, sales representatives pointed out they experienced significant delays (a bottleneck) on RFQs due to estimators taking too long to respond.

<sup>56</sup> If you, kind reader, happen to be a member of the Publishing community (probably an MPub student), you may have heard one of those dreadful stories of manuscripts which took seven years in editing. From this perspective those are woefully planned processes and should be avoided.

For the most part, software systems were working properly, facilitating the exchange of information between sales reps and estimators. However, it was found that delays (triangle shape), occurred mostly when a job required special services, such as foil stamping or embossing finishes, which are worked by third-party suppliers who must be reached-out by estimators on a case by case basis to get quotes for such services. Thus, when a customer requires changes or adjustments, estimators must wait for updated quotes from such external suppliers. This is in effect, a *loop* where the quote goes and comes back for revisions following change in opinions or budget by the customer.<sup>57</sup>

This fact was known by all parties involved and the leadership team, the use of process maps to represent the situation allowed for a clearer view of the problem and prompted a change in protocols to deal with customers regarding sudden changes in design. A more solid solution was already being worked in the form of a “quick quote” feature in the upcoming system that will allow sales representatives to offer faster turnaround times for RFQs for simple jobs (only) that require no intervention from estimators. Although a solution to reduce the request-review loop on RFQs is still necessary.<sup>58</sup>

#### 4.2.2. Example 2: The paper purchasing workflow

As we saw in Figure 14, the purchasing department already had some documents listing the protocol they followed, this information served to sketch a base process map which was complimented with additional information gathered from interviews, turning into the document shown in Figure 22.

---

<sup>57</sup> Is common occurrence that when a customer ask for a quote, there is no clear idea of the costs involved, thus, quotes start with a determined amount which is negotiated based on changes to paper, quantities, inks, finishes and other factors.

<sup>58</sup> Beyond the general order flow super-process, this loop actually causes delays on the customer side, as they often ask their designers to make changes to the original design to adjust to a budget, leading to waste in resources and time. Another opportunity which an editor should consider before dealing with the printer.

Department	Purchasing - Litho	Systems used in this workflow:		
Process	Paper purchasing	● PSI Internal	[JR] Job Rocket	[JL] JIT List
Process Date	July 11 <sup>th</sup> , 2018	■ PSI	[JT] Job Tracker	[O] Microsoft Outlook
Process Code	PUR-PSI-1	□ Web Browser	[PDF] Adobe Acrobat	[MC] Macola
		[PFW] Printflow		

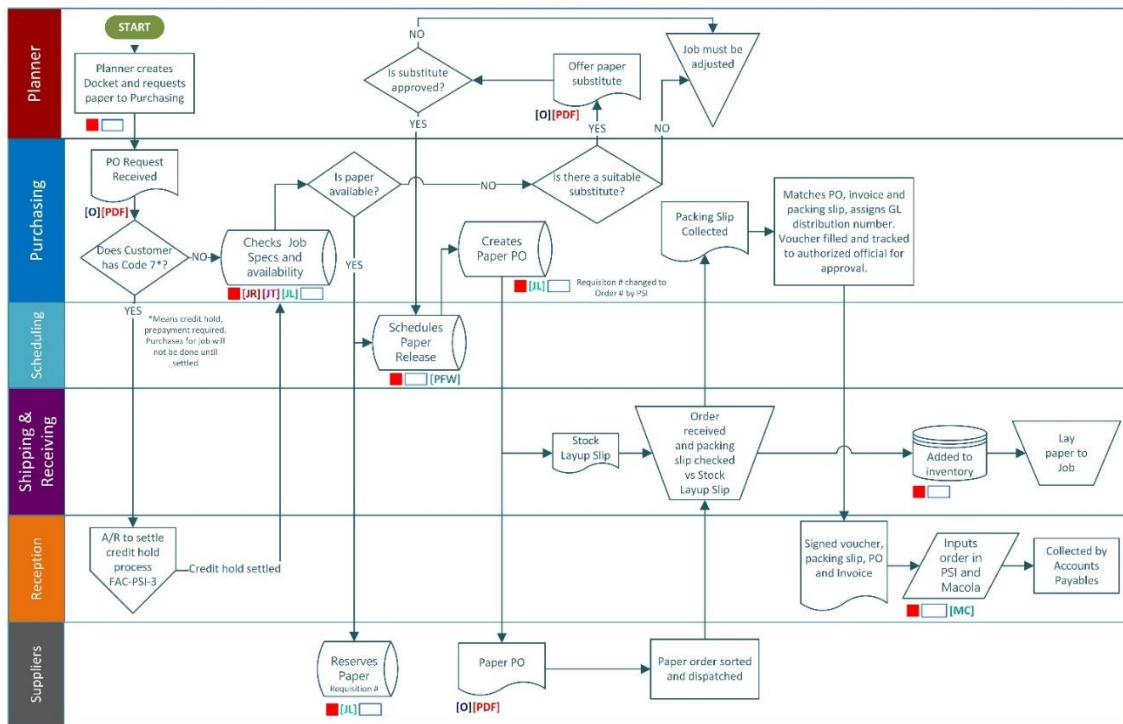


Figure 22. Hemlock purchasing department map.

This map shows the complex process of purchasing paper which involves several departments and conditions that must be met for the workflow to keep going, some of which happen simultaneously. This is an example where communications among departments is of paramount importance for the paper to get to the press on time, a critical operation for the general order flow. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

If we look at Figure 14, we will see a drastic jump from a 11-box sketch diagram based on the existing notes, to one with 24 for paper purchasing.

This workflow involves several actors to allow the purchasing department to carry out paper purchases. It is unique in that it has various potential bottlenecks, such as the “settle credit hold process” conditional which authorizes the purchasing of paper only after certain payment conditions have been met, the “availability of paper” decision box or even the “reception by (the) shipping” department step. After analyzing this map, the following conclusions were reached:

**Situation 1, Prepayment required:** Some customers with credit holds require making a prepayment before their job materials are bought, causing a delay in the process.

**Solution proposed:** This is a bottleneck problem that is solved outside this workflow, before the job reaches this stage, by asking the customer to pay the advance from earlier stages so its

cleared once the job moves to purchasing. The check still must be made though, but ideally, it will be already freed.<sup>59</sup>

**Situation 2, Paper availability:** This is a major problem, an example of a poorly designed or weak workflow. It also causes potential waste as the estimators and planners have invested time in quoting and creating a project with specifications for paper and ink based on a specific paper type not knowing if it is available. Ideally, the paper should be in stock with the supplier, but the long times at RFQ and estimating causes this to vary, or the stock may have been discontinued recently, or the turnaround time could be past the job's deadline. Thus, on many occasions, the purchasing department suggests a substitute, which leads to run the general order flow from the estimation process again (different paper means different costs, creating a loop), waiting time and resources spent.

**Solution proposed:** Hemlock has a real-time connection to its three major paper merchants to check for stock in the form of the JIT list application (part of PSI core), but access is only available to the purchasing department, planners have to their own paper list in the planner dashboard and estimators rely on catalogue references and base their calculations on specifications given to them by the sales representatives.

Thus, in the current state, access by estimators and planners to JIT list with the capacity for planners to reserve paper stocks would be ideal to minimize the risk of shortages and allow the standardization of tools. This solution will drastically change various workflows, such as that of figure 19 leading to a restructuring of responsibilities.

**Situation 3, Shipping department on inventories:** On the shipping department side, there are also potential problems as they tend to receive shipments as they come, so when order quantities do not match those required by the purchasing department, there is no way to alert this to the suppliers to solve the matter quickly, an example of another weak design and lack of decision capabilities.<sup>60</sup>

**Solution proposed:** The shipping department should have access to its own JiT-List messaging system to paper merchants to let them know when orders are incomplete or incorrect, instead of having to communicate this to purchasing to solve the matter. A reporting feature directly linked to other departments involved (planning, scheduling and purchasing) would also send an update of the situation and solutions available on time.

There are other situations related to this process map, and solutions are in the process to be implemented in the new ERP system, the diagnose however, has been made based on the information obtained during the process map.

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<sup>59</sup> Another fact is Division 2 usually omits this protocol to favor faster turnaround times, their deadlines being tight and paper not requiring additional investment as it is part of the stock in the warehouse.

<sup>60</sup> Receiving fewer paper than needed completely stops the production of a job as it cannot be printed until ink, paper and print plates are ready, by extension it affects scheduling, purchasing and planning.

### 4.2.3. Example 3: The time-sheet reporting workflow

Employees use PSI to punch their work hours, coffee breaks and lunch times, the system keeps track of those times and generate a report to be used by payroll. Staff supervisors also create their own reports on this matter and deliver them to the receptionist, who every day, compares the PSI report with that of the supervisors, exporting the file to Microsoft access and adjusting the digital report so that it matches the one of the supervisors and finally, creating a hard copy to be delivered to the payroll administrator.



Department	Finance & Accounting	Systems used in this workflow:	
Process	Payroll Consolidation	■ PSI	■ [ADP] ADP Payroll
Process Date	October 12 <sup>th</sup> , 2018	[A] Microsoft Access	[O] Microsoft Outlook
Process Code	FAC-PSI-9		

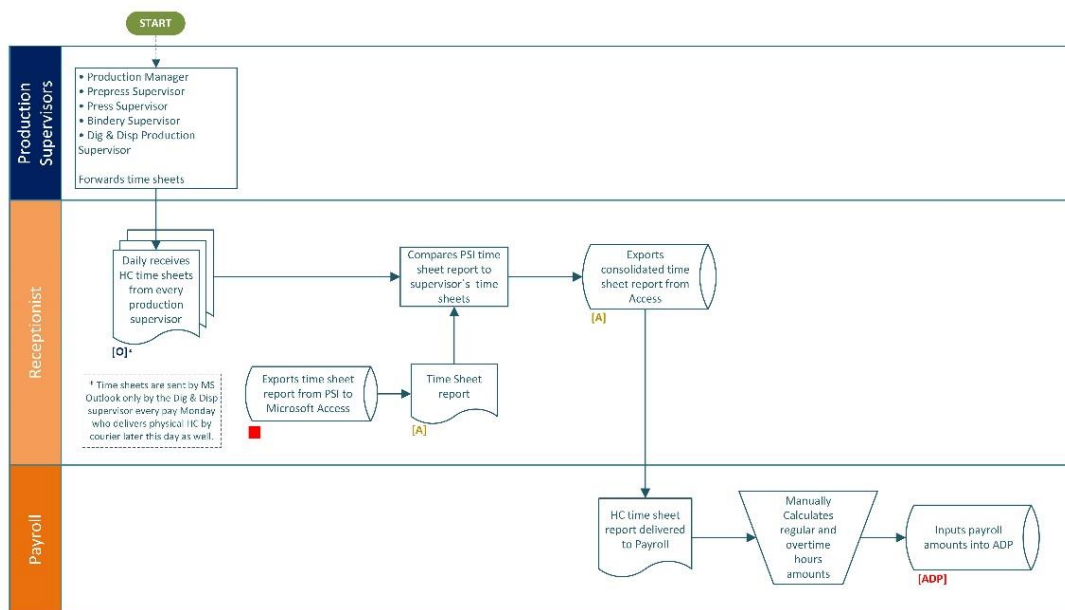


Figure 23. Hemlock time hours reporting map.

This map shows how paperwork for time hours reporting is tripled by having a report from PSI, which is compared to the supervisor's notes (also from PSI) and finally captured in a third database in MS Access to be printed and input into the payroll system. Diagram and logo are property of Hemlock Printers Ltd, used with permission.

This is a good example of a repeated process that causes waste of time for the receptionist and insists on working through a series of hard copy documents instead of through a digital system.

The reasons that lead to the supervisors list are mainly to record actual work time, versus idle times that are not considered in PSI. The workflow shows how the paperwork is tripled, from a simple report, to a second report by the supervisors, then to a third version processed a Microsoft Access file that is finally printed, forwarded and inputted again in the payroll system.

This process could be easily streamlined if everything worked digital, for example, if supervisors could modify the actual records in PSI and this file could be exported directly into the payroll

system. At this moment, there are considerations to allow the new ERP to measure actual work times only based on the machine operation with the supervisors confirming this, but the results will still need to be printed in hard copy to be inputted in the payroll system.

#### 4.3. Chapter 4 summary

We started this chapter with an analysis of the frequency on software systems used by each operational area in Hemlock and found a heavy dependency on PSI and other core applications as expected. What we did not know was the proportion on how they were being used by operational area and that third-party applications were equally important, particularly to provide communication services.

Next, we described some guidelines to identify problems and opportunities for improvement and went through three process maps describing operations at Hemlock and applied those guidelines, analyzed the workflow, found problems and proposed viable solutions.

We must clarify some of these solutions make assumptions based on information contained on maps not shown here, what it important is that information was gathered through the same project and is documented as well. This means that it is available for distribution among stakeholders and decision-makers to enable conversations based on a solid reference.

Before such documentation existed, conversations had to take place around the (assumed) common knowledge of subjects, where important details could be omitted involuntarily or as part of the balkanization effect mentioned in Chapter 1. Having process maps as reference not only enhances communication but also allows for a standardization which is fundamental to reach consensus on improvements.

Finally, the proposed solutions discussed may be feasible but require changes in other processes and such changes cause systemic changes, meaning they impact other areas in the production chain, or require investment in new technologies. This is one of the reasons process maps help members from different operational areas to discuss and find consensus as they provide input on their own area of expertise, leading to integrated solutions.

## Conclusions

In previous pages, I summarized a series of concepts to provide readers with the necessary elements to elaborate process maps in an efficient and visually attractive way (Chapter 1). Next, we talked about how abstract models of Hemlock Printers and its core software systems were created for study (Chapter 2). Then, I described the methodology used to create these diagrams, including the techniques to gather information and a brief, guide on how to draw, review and publish them (Chapter 3). Finally, we analyzed some of the diagrams prepared for the company and discussed possible solutions to the problems identified (Chapter 4). Here I will discuss conclusions based on my experience at working on Hemlock's process mapping project.

At the beginning of this document, I described the characteristics and capabilities of process maps with a focus on the swimlane technique, which allows to plot activities by role and, like other process maps, include annotations about subjects of interest. This style proved to be an ideal solution to address Hemlock's problem as it distinguishes each participant activities in a workflow and offers a clear view of how they use software in processes.

The process mapping project provided the company with a documented reference of the workflows in its value chain as they are carried out using the PSI management information system. As expected, this helped visualize and understand how processes take place and relate to each other and has been used to identify the services for data processing, automation and communications that each role requires and verify if the upcoming MIS offers suitable replacements for them.

To address this project in an integrated way and successfully map a company the size of Hemlock (whose complexity is distributed among many staff members), it was essential to have a general understanding of the value chain and the company organization as described in Chapter 2. The operational model and list of roles created for study provided solid grounds to work through the areas of the company and identify the people to look for relevant information.<sup>61</sup> It also helped create a new vision of the value chain. What I originally saw as a stepped workflow divided by departments, revealed to be a fluid operation consisting of several sub-processes that rely on many software applications that provide functionality, and intricated relationships where communication is critical. The simplified model that divides the company into operational areas helped me to integrate groups of roles performing functions at various stages.

The project was planned to proceed in a linear way, covering one department at a time, but this was not always possible because most processes involve people from different departments and areas. For instance, if you look at [Figure 22](#), you will see there are six roles involved in paper purchasing. When I was documenting this process, I had to interview people from these areas to know how they contributed to the process, even if their roles were scheduled to be mapped in a latter moment.

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<sup>61</sup> It is important to mention, that for interviews, I was assigned to work with specific advisors and key-personnel from each area appointed by the project director and sponsor, Richard Kouwenhoven.

The interviews carried out turned interviewees into active participants of the project, many of them offered opinions on current processes and suggestions on how to improve them. This additional input had to be recorded separately, sometimes as alternative process maps, others as reports but in general, proved highly valuable and were used as a guideline to improve processes and identify situations that were causing disruptions or highlight services which are important for the staff to keep in the new system.

The revision phase of (process map) drafts offered some interesting feedback to all parties involved. Mostly, we focused on correcting imprecisions, but also provided revisors with the opportunity to visualize a process from a higher perspective (for the first time to many), giving them a distinct understanding on how a task flowed (perhaps one they had started), how other departments got involved and what software they used. These were well-known facts, but until then, people understood it in an abstract or functional way, so it was common to hear an expression like “Mmmh... so this is what happens!” after those revisions.

While the project was conceived with the purpose of helping the MIS implementation team to identify the services provided by software and how workflows benefited from them, there were aggregated values. For instance, areas like Finance & Accounting found value in the new visual style based on the swimlane and asked to have some of their existing flowcharts to be updated so they could be used in negotiations with customers.

The project has not been made openly available to staff but is being used as part of an ongoing discussion with key-personnel to identify problems and propose solutions. These range from re-configuring MS Outlook to filter emails more efficiently to creating new functions in the upcoming MIS system.

A future phase of the project aims to create process maps that document the workflows using this new MIS, to compare the changes done and measure any increases in productivity. Going even further, a third phase aims to create an ideal workflow regardless of system capabilities which will set achievable goals for future innovations.

As it is happening in Hemlock, process maps have proved their value to several industries. We can confirm they are a useful tool to document, plan, innovate and transmit information. This may not be a surprise as they have existed for a long time and have a considerable support bibliography that continues to grow. The question is: can we find value for them in publishing contexts as well? Can they become a tool that we can adapt and use regularly?

Granted, publishing is not a manufacturing industry, but publishers follow complex processes too, like those aiming to create books and magazines. If process maps are flexible documents that constitute a convenient and easy to understand way of communication used by industries to understand themselves and optimize their value chains, certainly we can find ways to use them. Given the number of people involved in publishing projects, process maps may be helpful in organizing the workflows and movement of the various documents related to carry a work through to publication.

For instance, we can create a process map with the workflow of a substantive editing process to use with writers and customize it for each project, adding annotations for deadlines, word count



and number of manuscript revisions forecasted. This will be useful to explain the activities carried out at every step, establish a work agenda and set deadlines right from the start, then, as the project advances, we can keep track of progress. Once done, we can use this information to analyze the evolution of our projects to evaluate the benefits and problems in our ways to carry them.

Another idea would be to map the processes involved in book production (a super process), starting from the submission of a manuscript, to substantial and copy editing, graphic design and layout, print, marketing, launching and promotion, calculating sales and revenue and looking forward to future editions. This will be useful in many ways: first to visualize the entire process, assign times for each phase of it. Second, to train and negotiate delivery and work schedules with writers, editors, printers, distributors and other stakeholders. Third, to document the events that happen during the process which will in turn provide insights into which processes are acting as bottlenecks or areas that we can improve.

As tools specifically designed for analysis, with established methodologies for study and optimization and other benefits mentioned in this document, process maps provide opportunities to publishing as well, to think out-of-the-box, find opportunities for optimization or manage operations more efficiently, in effect, helping us to renew and innovate the industry.

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