Materials for Teaching Lean Accounting

Lawrence P. Grasso
Central Connecticut State University

Lean production and lean management practices are becoming more widespread, and conventional accounting methods may be incompatible with lean management. Lean accounting methods and performance measures have been developed that support lean management, but these methods receive very little coverage in cost and managerial accounting courses. One reason for the lack of lean accounting coverage is a lack of availability of classroom materials for teaching lean accounting. The Lean Accounting Content Depository hosted by the American Accounting Association has been created to address the lack of lean accounting teaching materials. The material available from the Lean Accounting Content Repository is described. Suggestions for incrementally increasing coverage of lean accounting in cost and managerial courses are presented, and a semester long course devoted entirely to lean accounting is outlined. Selected lean accounting materials suitable for classroom use available from other sources are described.

Keywords: cost accounting, instructional materials, lean accounting, lean management, lean production, managerial accounting

INTRODUCTION

On January 11, 2020, Orry Fiume (2020) made a presentation at the Management Accounting Teaching Symposium, "Manufacturing Dilemma: What to do when Standard Costs Don't Work for You Anymore." Orry, the retired CFO of The Wiremold Company, a pioneering practitioner of lean accounting, and a prominent author on lean accounting and lean management, described his experience at The Wiremold Company. In an email to the Board Members of the Lean Education Advancement Foundation, he wrote:

> My goal was to present a case for integrating Lean Accounting into the management accounting curriculum. Although I expected a fair amount of 'push back' there was surprisingly very little of it. In fact, the idea was looked upon favorably by most of the people that I talked to. In spite of that, very few accounting professors are teaching [lean accounting].
>
> After attending many of the other [conference] presentations and discussing this one-on-one with quite a few people, I learned that for any new subject (lean accounting or anything else) to be included in the curriculum the instructors want "plug and play" material. They said that they don't have the time to create the necessary teaching materials. My take on

> what they mean by "plug and play" is that they want the syllabus, specific reading assignments and case studies (O. Fiume, personal communication, February 3, 2020).

Lean management and lean production focus on creating value from the perspective of the end-use customer of a product or service. Waste is eliminated from the value stream, the entire set of dependent processes from customer order to the delivery of the product or performance of the service, and collecting payment (Womack & Jones, 1996; Maskell et al., 2012). The value stream is a system of dependent activities, so the effect of changes cannot be evaluated in isolation. Improvement is measured by the improvement in performance of the entire value stream (Womack & Jones, 1996). Pursuing perfection, waste-free value streams delivering products and services desired by customers, is the responsibility of every employee in a lean enterprise (Liker, 2004). Employees are respected, trained, and empowered to discover and solve problems (Liker, 2004; Emiliani, 2007). Lean accounting provides measures of operating and financial performance that support employees' continuous improvement efforts. Lean principles and tools are also applied to improve accounting processes in the context of the value streams with which they interact (Maskell & Baggaley, 2006).

Current managerial and cost accounting textbooks feature very little coverage of lean accounting. Most texts offer only a cursory mention of lean accounting in chapters featuring other topics. I am aware of only two managerial or cost accounting textbooks that (in addition to addressing lean accounting concepts in chapters on strategic cost management and inventory management) devote a chapter to lean accounting (Hansen & Mowen, 2018; Hansen et al., 2022). Accounting professors who might be interested in incorporating coverage of lean accounting into their courses are faced with the task of searching for relevant material or creating their own material from scratch. For professors, especially those not intimately familiar with lean accounting, this is a daunting task. Fortunately, help is available! This paper provides an overview of material in the American Accounting Association's Lean Accounting Content Repository. Any member of the American Accounting Association (AAA) has access to the repository. The materials are free for classroom use for any accounting professor. Suggestions are provided for introducing additional material on lean accounting into a course, and a semester-long course on lean accounting using the Lean Accounting Repository Materials is outlined. This paper also describes other lean accounting materials that are not available from the repository.

The Importance of Lean Management

The two fundamental principles of lean management are: (1) Respect for People, and (2) Continuous Improvement (Liker, 2004; Emiliani, 2007). In articles or lectures on lean management, continuous improvement is usually listed first, but respect for people is the most important principle of lean management. The respect for people principle has received little attention compared to continuous improvement (Emiliani, 2007). Respect for employees and for customers is key, but the principle extends to suppliers, other business partners, and members of the community as well. Continuous improvement refers to systematically and continuously eliminating waste, unevenness, and overburdening, enabling the creation of more value with the same resources or the same value with fewer resources. Waste is anything does not create value from the perspective of the end use customer. Pursuit of continuous improvement is not ad hoc or random. A systematic, evidence-based approach is used to pursue continuous improvement in the context of the value stream for a specific set of products or services. PDCA, plan do, check adjust, also known as the Shewhart or Deming cycle is the approach adopted by Toyota.

Lean management is arguably the state-of-the-art management system currently in practice. Byrne (2013, p. xiii) viewed lean management as "the biggest strategic advantage any company could have." Liker (2004, p. 11) described a case where a company already considered a "world class" manufacturer worked with the Toyota Supplier Support Center on a production line and in just nine months reduced lead time and inventory by over 80% and increased labor productivity by over 80%. According to Womack and Jones (1996, p. 275) the lean enterprise can achieve great leaps toward perfection by "putting the entire value stream for specific products relentlessly in the foreground and rethinking every aspect of jobs, careers, functions, and firms in order to correctly specify value and make it flow."

Lean's focus on eliminating waste can be a means to provide healthcare to an aging population at an affordable cost, and to provide a higher standard of living for a still growing world population while also addressing climate change and ecological degradation. Lean is also a humane management system. Lean is founded on respect for people, especially workers. Lean strives to eliminate overburdening and unevenness, removing obstacles to flow. The result is a more satisfying work environment. Lean empowers workers and provides them with the tools and training to improve their work processes. Lean work is challenging but much more interesting and valuable than simply taking and following orders.

Although there are currently only a small number of companies that fully embrace lean management, lean production tools and techniques are used extensively in manufacturing (Doolen & Hacker, 2005; Maskell & Kennedy, 2007; Shah & Ward, 2007), and their use is increasing in merchandising, services such as healthcare and finance, and in government agencies (Hadid & Mansouri, 2014). Students entering the business world are almost certain to encounter lean tools and techniques even if they do not experience lean as a complete management system.

The Case for Lean Accounting

Compared to conventional management, lean management represents completely different mental models of the production environment (Dennis, 2015). For example, conventional management adopts a mass production perspective, emphasizing high volume production in large batches to fully utilize fixed resources. Lean management focuses on producing only what the customer ordered, and strives to achieve one-piece-flow, an ideal batch size of one unit. Conventional management and lean management are also based on completely different cultural assumptions. Conventional management uses a command-and-control culture to maximize results for shareholders. Managers are the source of change, workers are costs. Managers own the information, and accounting reports on workers to enforce compliance. Lean management uses a continuous improvement culture and a stakeholder perspective. Lean focuses on creating value for customers, as customers are the source of wealth for shareholders, managers and employees. In lean management, workers are the source of innovation and learning – managers coach and enable the workers. Accounting supplies reports for the workers to supplement real time operational data for learning and problem-solving.

The different mental models and assumptions of conventional management and lean management lead to different product cost assumptions and cost management strategies as summarized in Table 1. Conventional management accounting was developed to support the conventional management mental model: a mass production environment governed by a command-and-control culture. Conventional management accounting does not support lean management. It does not supply the information needed by workers in a timely fashion. It also can send the wrong signals, rewarding anti-lean behavior with higher reported profits and punishing lean behavior with lower reported profits. Lean management needs lean accounting, an accounting system that will support and reward a continuous improvement culture.

TABLE 1
CONVENTIONAL VERSUS LEAN PRODUCT COST ASSUMPTIONS AND COST MANAGEMENT STRATEGIES

Conventional Product Cost Assumptions	Lean Product Cost Assumptions
Production volume decreases costs.	Production volume greater than customer demand is waste.
Shorter lead times increase cost.	Shorter lead times increase profitability.
Higher quality leads to higher costs.	Higher quality reduces costs.

Conventional Cost Management Strategies	Lean Cost Management Strategies
Rely on economies of scale and scope.	Rely on flexibility and responsiveness.
Spread setup and other batch costs over larger numbers of units,	Reduce setup and other batch costs by product and process redesign.
Spread indivisible capital costs over larger numbers of units.	Invest in divisible "right sized" capital equipment.
Bring costs down as volume increases (learning effects).	Design costs out before production begins (target costing).
Make production jobs simple. Outsource to low wage locations.	Increase the rate of learning by employing a skilled and trained workforce.

THE LEAN ACCOUNTING CONTENT REPOSITORY

Management accounting faculty may agree that lean management is the state-of-the-art management system, and that accounting students should learn about that system and about accounting to support lean management. Alternately, they may feel that their students should have some familiarity with lean accounting because it is being used by some companies. Still others may want to have their accounting students compare and contrast lean accounting with conventional accounting as a means of developing their critical thinking skills. Whatever their motivation, management accounting faculty need course materials pertaining to lean accounting if they are going to incorporate lean accounting into their courses. As noted earlier, managerial and cost accounting textbooks offer at best, very limited coverage of lean accounting. The AAA has created the Lean Accounting Content Repository to help address this deficiency.

Practical Lean Accounting (PLA) is a book targeted toward accountants and managers at companies that have adopted lean management (Maskell et al., 2012). The second edition included a CD that had, along with Excel templates and other materials geared toward practitioners, a set of questions and problems for each chapter. Multiple-choice, short answer, and discussion questions are included. There are computational problems, and a few extended mini cases. Because PLA was targeted toward practitioners, suggested solutions to the questions and problems were also included on the CD. CD's have been replaced by flash drives and streaming as the primary means of transferring computer files, and PLA no longer comes with a CD. However, all of the materials that were included on the CD are now available as a download from the publisher's website for the book (https://www.routledge.com/Practical-Lean-Accounting-A-Proven-System-for-Measuring-and-Managing-the/Maskell-Baggaley-Grasso/p/book/9781439817162).

The question and problem sets accompanying PLA provide a means for using the book as a classroom text or supplement. However, because suggested solutions are readily available, the questions and problems are only suitable for student practice, not testing. A test bank, a second set of questions and problems along with their suggested solutions was also created. The test bank (including six mini cases and three memo writing assignments) is made available only to instructors. Short instructor's notes have also been created for each of the 22 chapters in the book.

With the test material available, PLA was used as the principal text in a semester long course devoted to lean accounting. Fourteen of the 22 chapters were covered in the course, and lectures with accompanying PowerPoint slides were created for those chapters. For each recorded lecture there is an mp4 file, a Powerpoint file including the script associated with each slide in the notes section, and a Word document with the lecture script. Permission was also obtained to use one long and five short presentations by Brian Maskell and one short presentation by Bruce Baggaley as supplementary material in the course. Unfortunately due to lack of available bandwidth, the MP4 files for the recorded lectures and presentations files cannot be downloaded from the repository. However, those files are also available to be streamed from a page that is not password protected. Professors that want to have their students view any of the recorded lectures or presentations can send their students to the following site: https://aaahq.org/ Education/ Resources/Lean-Accounting-Videos. All of the materials described above, including the original question and problem files also available on the PLA publisher's website are available free for classroom use from

the Lean Accounting Content Repository to any member of the AAA. Any instructor who is not member of the American Accounting Association will either have to join, rely on a colleague who is a member, or contact me for other means to gain access to the materials.

A professor can gain access to the Lean Accounting Content Repository by going to the following web address: https://aaahq.org/Education/Resources/Lean-Accounting. A login page opens for AAA user ID and password entry. After a valid user ID and password is entered, the Lean Accounting Content Repository opens. A picture of the top of the site is shown in Figure 1. The side bar on the left contains information about the content, including the list of the 22 chapters in PLA, visible in Figure 1. The available content is not organized in chapter sequence. Instead, it is organized into nine topic modules. The nine module headings are shown in the main body of the site to the right of the side bar. Clicking on a module heading opens the module. Labeled icons for each file in the module are displayed in rows of four. In Figure 1, the Overview & Introduction module, containing only seven files, is open. The mapping of the 22 PLA chapters into the nine modules is shown in Table 2.

TABLE 2
LEAN ACCOUNTING CONTENT REPOSITORY MODULES

Module PLA chapters included	Presentations*	Mini case (MC) or Memo**
General Overview	2 lectures, Maskell	
Lean Management Concepts	6 lectures, Baggaley	
Why Lean Accounting? 1. Why is lean accounting important	3 lectures, Maskell	
Production Cell and Value Stream Performance Measures 3. Cell Performance Measures 8. Value Stream Performance Measurements 19. Performance Measurement Linkage Chart	 Lecture Lecture Lecture	 2 Memos
Value Streams – Managing by Value Stream – Value Stream Box Scores 4. Financial Benefits of Lean Manufacturing 7. Managing by Value Stream 10. Using the Box Score 21. Value Stream Cost (Capacity) Analysis 22. Value Stream Mapping	 Lecture Lecture, Maskell Lecture, Maskell Lecture (incl. w/Ch. 4)	 2 MCs 2 MCs
Lean Accounting Processes – Lean Financial Accounting 5. Eliminating Wasteful Transactions 6. Lean Financial Accounting 9. Value Stream Costing 12. Eliminating More Financial Transactions 14. Lean Financial Accounting II	 Lecture, Maskell Lecture Lecture (incl. w/Ch. 5) (incl. w/Ch. 6)	 1 Memo 2 MCs
Features & Characteristics Costing – Target Costing 11. Calculating Product Costs – Features and Characteristics 16. Target Costing	 2 lectures 2 lectures, Maskell	
Beyond Budgeting – Sales, Operational, and Financial Planning (SOFP) 13. Sales, Operational, and Financial Planning (SOFP)		

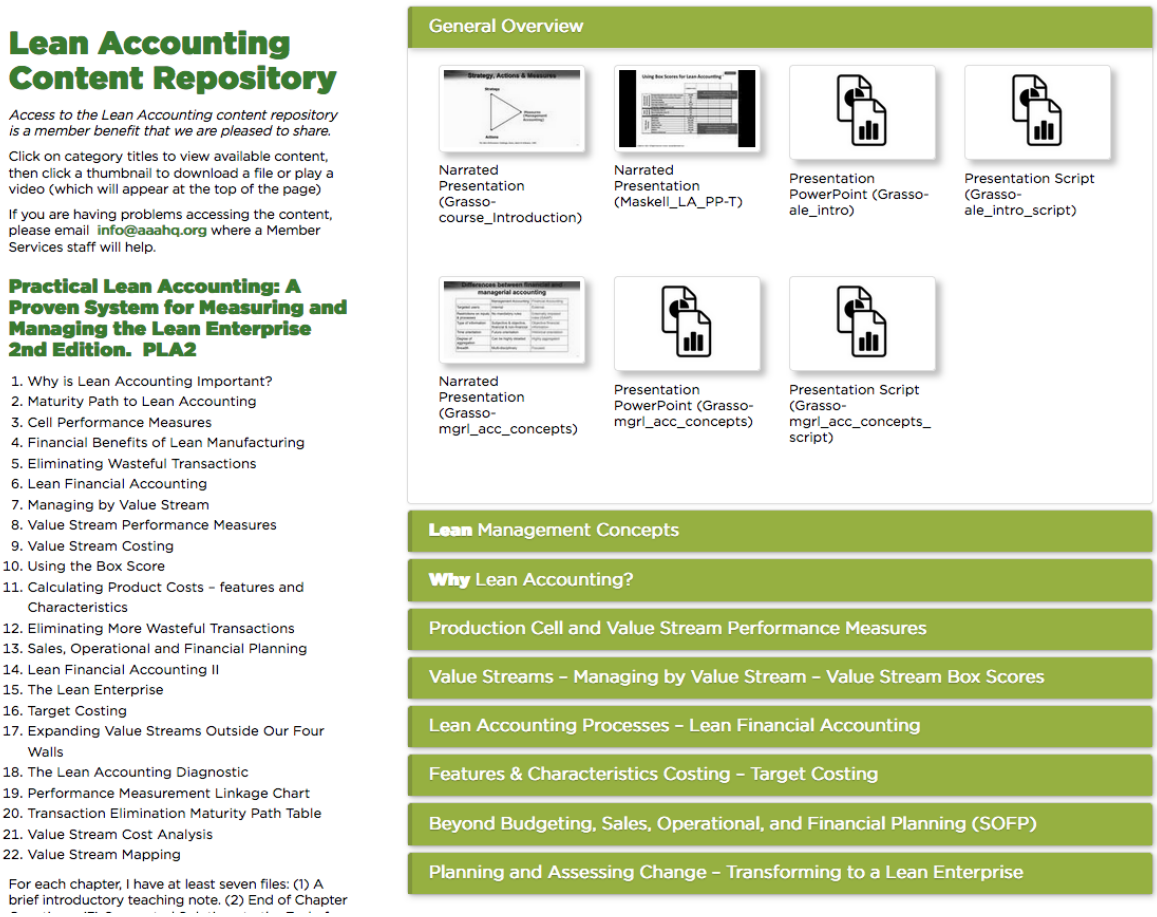
Planning and Assessing Change – Transforming to a Lean Enterprise 2. Maturity Path to Lean Accounting 15. The Lean Enterprise 17. Expanding Value Streams Outside Our Four Walls 18. The Lean Accounting Diagnostic 20. Transaction Elimination Maturity Path Table		

In addition to the recordings, mini cases, and memo assignments shown in this table, all 22 PLA chapters have seven files: (1) Instructor's note (2) Questions & problems, (3) Solutions to questions & problems, (4) Multiple-choice test questions, (5) Solutions to multiple-choice test questions. (6) Test questions & problems, (7) Solutions to test questions & problems.

* Recorded chapter lectures include accompanying PowerPoint and Word (script) files. Chapter lectures broken into parts (e.g., Chapter 1) have a single Word file covering all parts. PowerPoints and scripts are not available for the recorded presentations by Maskell and Baggaley.

** There may be multiple files associated with each mini case, including current and future state value stream maps, box score templates, and box score suggested solutions. Memo assignments have an assignment file and a suggestion solution file.

FIGURE 1
THE LEAN ACCOUNTING CONTENT REPOSITORY WEBSITE (PARTIAL VIEW)



IDEAS FOR INCORPORATING LEAN ACCOUNTING INTO AN EXISTING COURSE

For faculty unfamiliar with lean accounting and with only time in their course to provide students with an introduction to lean management and lean accounting, Brian Maskell's "Lean Accounting: Principles, Practices and Tools" could be assigned. The one-hour recorded presentation, located in the Overview & Introduction module briefly makes the case for lean accounting and it provides an excellent overview of lean accounting practices and tools. The presentation could be viewed during a class period, or it could be assigned to be viewed by students outside class with a follow up discussion to compare and contrast lean accounting with conventional managerial accounting practices. Or, to solidify students' understanding of the case for lean accounting one or two problems from the "Why Lean Accounting?" chapter could be covered in class. A production simulation comparing mass production and lean production can be used to make the case for lean, especially if accounting for costs is incorporated into the simulation (production simulations are discussed further in the Other Materials for Teaching Lean Accounting section of this paper). This level of coverage would be especially suitable for an Introductory Managerial Accounting course.

If lean accounting is incorporated throughout the managerial accounting curriculum, courses beyond the introductory managerial accounting course can build on the introduction and offer greater coverage of lean accounting. Professors developing courses on a stand-alone basis can increase their coverage as they become more familiar with lean accounting and determine which traditional topics to de-emphasize or drop to create more room for covering lean accounting. A module could be developed comparing and contrasting lean accounting with conventional accounting approaches to a particular area or problem. A prime example would be a product costing module, comparing value stream costing (and perhaps features and characteristics costing), activity-based costing (ABC), and standard costing. Another prime example would be a module on decision-making comparing value stream costing and management, activity-based costing and management, and conventional standard costing and relevant cost analysis. However, there are other possibilities depending on the course objectives and emphasis. Here are a few suggestions:

- A module on performance measurement comparing lean cell and value stream measures and value stream box scores with balanced scorecards and conventional budget-based financial measures.
- A module on control comparing lean transaction elimination with conventional automated and audit approaches.
- A module comparing sales, operational and financial planning using rolling sales forecasts with traditional budgeting.
- A module on target costing comparing a value stream orientation to a single product orientation.

Ultimately, an entire managerial or cost accounting course could consist of modules comparing lean, conventional and other (e.g., ABC) approaches to every aspect of managerial and cost accounting. The critical thinking skills developed by students as they compare and contrast the different accounting approaches would serve them well in their future careers.

Any professor considering using a significant amount of material available from the Lean Accounting Content Repository should acquire a copy of PLA for reference, as most of the available materials were designed to be used with that book. Unless or until coverage of lean accounting represents a substantial portion of the overall course, professors probably will not want to assign the book to their students. Although the cost of PLA is low relative to the cost of a traditional textbook, the cost can be burdensome to students already assigned a primary textbook. A professor with one or two modules covering lean accounting in their course can assign students two SMAs (Statements on Management Accounting) published by the Institute of Management Accountants: Lean Enterprise Fundamentals, and Accounting for the Lean Enterprise (Kennedy & Maskell, 2006, 2014). Lean Enterprise Fundamentals (33 pages, including references) provides students with a background on lean management philosophy. Accounting For the Lean Enterprise (35 pages, including references) covers most of the topics included in PLA in a condensed form,

and the material from the Lean Accounting Content Repository should work quite well with the SMA. The SMAs are free for classroom use from the IMA and they can be distributed to the students as pdf files.

A professor does not have to be a member of the IMA to access the SMAs. However, if IMA membership is strongly recommended for any professor with a significant teaching or research interest in managerial accounting for the networking opportunities, greater interaction with practitioners, and the other resources the IMA offers. The link for the SMA Lean Enterprise Fundamentals is https://www.imanet.org//-/media/7f5aa1be16fc40698b76933b63f910c0.ashx?as=1&mh=200&mw=200&hash=2579847F7ED5E5519F26BCF41AE3D75401004FC3. The link for the SMA Accounting for the Lean Enterprise is https://www.imanet.org//-/media/f56cba3786e148f486a61df52b0c03ee.ashx?as=1&mh=200&mw=200&hash=EE682F5DF312D6C81A43DD1337A083D725C0AB8B.

A SEMESTER-LONG COURSE DEVOTED TO LEAN ACCOUNTING

A course entirely devoted to lean accounting could also be offered for students interested in a deeper dive into the subject. This section describes one such course offered as an advanced elective for undergraduate accounting majors, and as an elective for MBA, MS Accounting, and MS Technology Management students. The majority of students were usually undergraduate accounting majors. The accounting students had little to no background in lean management. The technology management students had considerable background in lean management, but little to no knowledge of accounting. The backgrounds of the MBA students in both accounting and lean management varied considerably, but typically they had more knowledge of accounting than of lean management. The course was usually offered in hybrid format, with students viewing lectures outside class. Classroom time was used for discussion, review of work completed outside class, problem solving, and other activities. The organization of the course generally followed the modules as they appear in the Lean Accounting Content Repository (See Table 2).

Course Overview

The course began with a lecture introducing the course and providing an overview. The recorded lecture is included in the General Overview module. The recording does not include any course or university specific information (e.g., meeting times, assignments, grading policies), it covers course content and learning objectives. As with all the recorded lectures in the Lean Accounting Content Repository, the PowerPoint slides and the lecture scripts are included in the repository. Instructors can use the recorded lectures as is by directing students to the non-password-protected page, or they can modify the slides and or the scripts and rerecord the lectures to improve them or to better suit their particular course and students.

A lecture on management accounting concepts was included to get students with minimal accounting background up to speed and as a refresher for the other students. Accounting faculty will have a plethora of options available to cover conventional management accounting topics, but the materials and suggestions used in this course are made available should any faculty care to use them. A demonstration variance analysis problem was completed in class as a refresher. Students were then asked to complete the Berkshire Toy Case (Crawford & Henry, 2000) and a discussion of budget-based control using variance analysis followed. If all students enrolled in a course are familiar with conventional managerial accounting, this material could be skipped to devote more time to lean accounting.

Students were next asked to complete two Harvard Business Cases: Peoria Engine Plant (Kaplan & Hutton, 1992) and Romeo Engine Plant (Hutton & Kaplan, 1993). The full rather than the abridged version of both cases are preferred. Especially for Peoria Engine Plant, because the full case has an appendix with variance reports, giving students a better feel for the performance reports the managers actually used. While the cases are old, they are excellent cases to show the contrast between conventional management and lean management. Both are Ford Engine plants. Peoria uses conventional management and conventional accounting reporting, and Romeo adopts a lean management approach. After covering these cases, This American Life's NUMMI – 2015 episode 561 (This American Life, 2015, https://www.thisamericanlife.org/561/nummi-2015) can be assigned if desired. NUMMI was joint venture between Toyota and General

Motors. Implementing lean management, the plant was converted from one of GM's worst performing plants to one of its best plants. However, GM's attempt to replicate that performance at other plants was unsuccessful. Covering the NUMMI case can enrich a class discussion on what is necessary for lean management to succeed. If all students taking the course are already familiar with lean management, or there is less concern with making the case for the potential of lean management, these assignments can be omitted to devote more time to lean accounting. While working on the Harvard Cases, students also completed a production simulation in class.

Lean Management Concepts

Because most students were unfamiliar with lean management, Lean Production Simplified (Dennis, 2015) was assigned as a required supplementary text. The Lean Management Concepts module has recorded lectures covering the first six chapters of Lean Production Simplified. The SMA on Lean Enterprise Fundamentals could replace Lean Production Simplified if you want to de-emphasize coverage of lean management and lean production. Students were also asked to view Gemba Academy's "Introduction to Lean Manufacturing" (Gemba Academy, 2011, https://www.youtube.com/watch?v=zUUVy59J_54) video, available on YouTube. Bruce Baggaley's "Why You Need a Lean Management System" recorded presentation in the Lean Management Concepts module of the Lean Accounting Content Repository could also be used here.

Why Lean Accounting?

By this point, students should have an appreciation for lean management and understand how it differs from conventional management. Here, several examples in Chapter 1 of PLA illustrate how conventional standard costing fails to support lean management. Students also participated in an in-class production simulation with batch production and lean production rounds. In both production runs production was accounted for using both standard cost accounting and lean accounting to highlight the problems with standard costs in a lean production environment and to introduce lean accounting.

Production Cell and Value Stream Performance Measures

This module introduces lean performance measures as an alternative to conventional management accounting measures. Management by value stream is emphasized. Chapter 19 covering the Performance Measurement Linkage Chart was omitted from the course to save time. Professors wanting to emphasize a comparison between lean measures in PLA and the balanced scorecard may want to include Chapter 19.
Value Streams – Managing by Value Stream – VS Box Scores.

This is arguably the most important module in the course. The box score, as a compact but comprehensive display of measures of value stream performance, is introduced. A variety of ways to use the box score in managing the value streams are presented. Students may find the computation of capacity measures tedious or even difficult. Professors who want to save time here to devote to other topics can limit the discussion of capacity to a conceptual discussion and limit or exclude covering the computations. Chapter 21 can be covered briefly, or even eliminated.

Lean Accounting Processes – Lean Financial Accounting

Lean accounting's emphasis on presenting financial results of the value stream or the entire organization in a simple, easily understood format has already been addressed to some extent in the previous module. In this module, It is further addressed in chapter 9 of PLA. Chapters 5 and 12 of PLA focus on applying lean management concepts to accounting processes – eliminating unnecessary transaction records and improving control and reliability while reducing waste. Chapters 6 and 12 focus on simplifying the overall accounting system and financial reporting – providing needed information at a lower cost. Chapters 12 and 14 revisit the same topics that are covered in Chapters 5 and 6 at a later stage of maturity in the organization's lean transformation. The recorded lectures focus on chapters 5 and 6, but they also include references to chapters 12 and 14. To save time for other topics, chapters 12 and 14 could be eliminated from the course coverage.

Features & Characteristics Costing – Target Costing

Features and characteristics (F&C) costing is similar to ABC. In F&C costing, features and characteristics of products and services are identified that cause greater activities to be used with greater intensity or frequency, or that cause use of more or more costly materials. F&C costing can be compared and contrasted with ABC, but in this module F&C costing is used to lead into target costing. F&C costing is used to determine the cost of products or services. Companies also need to know how customers value the features and characteristics of the products and services they provide. In target costing the value and cost information associated with product or service features and characteristics are used to simultaneously design (or redesign) both the product or service and the production process used to create and deliver it.

Target costing has been adopted by conventionally managed companies as well as lean companies, and it is covered in a number of cost and some managerial accounting textbooks. In PLA, the target costing process is considered in the context of the value stream in which the new or redesigned product will be produced. This differs from the treatment in textbooks, which consider the product in isolation. This is the final module of the semester long course, and time devoted to this module was sometimes cut if more time than expected was needed for earlier modules.

Beyond Budgeting, Sales, Operational and Financial Planning (SOFP)

Conventional budgeting is usually an annual process, and the resulting budget is used for motivating performance as well as planning and control. Both the length of time from the setting of the budget to the later moths of the year, and budget games, as upper management strives for stretch targets to motivate improvement while lower management strives to set easily achievable targets lead to inaccurate forecasts and budgets and actual waste. Earnings management practices employed by managers to "make their numbers" create additional waste that will reduce future financial performance. The Sales, Operational and Financial Planning (SOFP) process begins with rolling forecasts that are continually updated. The focus is on planning. Stretch targets are set separately from SOFP to motivate improvement, and trends in actual results are monitored to track progress toward goals. SOFP results in more accurate forecasts and less waste. An article by Grasso and Fearon (2015) presenting a hypothetical case to illustrate the difference between conventional budgeting and SOFP could be assigned as supplemental reading. This module, consisting of material from a single chapter in PLA, was not included in the semester long course described here largely due to due to the time devoted to background material on accounting, lean production and lean management. Room for this module in a semester long course could be created by cutting time devoted to earlier modules, perhaps using some of the possible cuts suggested above.

Planning and Assessing Change – Transforming to a Lean Enterprise

Some changes cannot be made in accounting until the organization achieves a requisite level of skill and performance in lean production and lean management. Chapter 2 in PLA describes three levels of lean maturity and suggests the accounting changes that are appropriate at each level. The maturity path concept is mentioned in other chapters, but if an instructor feels students need more detailed coverage to fully grasp the maturity path concept, chapter 2 could be included in the Lean Accounting Processes and Financial Accounting module or in the Value Streams – Managing by Value Stream – VS Box Score module. Chapter 2 was assigned in the earliest versions of the semester long course, but it was dropped from more recent offerings to save time. Chapters 18 and 20 present diagnostic tools to be used in a lean transformation. These tools are more relevant to practitioners working at a particular company, and these chapters were never included in the semester long course. Chapter 15 of PLA describes the characteristics of a fully mature lean enterprise, and Chapter 17 extends lean management to address supplier and customer relationships, explaining how such an extension can affect lean accounting. No new lean accounting concepts are introduced in these chapters. They are just applying concepts already covered to a multi-organizational setting centered around a mature lean enterprise. If there is sufficient time available, and a professor feels it is desirable based on their student population, a module could be created with these chapters. These chapters were included in the earliest versions of the course, but they were quickly dropped to devote time to covering other topics in greater depth.

OTHER MATERIALS FOR TEACHING LEAN ACCOUNTING

In addition to the SMAs on the lean enterprise and lean accounting already mentioned, a professor could assign one or more articles on lean accounting published in practitioner-oriented journals. In particular, the journal Cost Management has published a many articles on lean accounting, sometimes devoting an entire issue to the topic. The IMA journals Management Accounting Quarterly and Strategic Finance have also published several articles on lean accounting. A review or listing of these articles is beyond the scope of this paper. Professors interested in using one or more articles as supplementary material on a particular lean accounting topic in their courses should conduct a library database search for appropriate articles. Professors should check on the journal policies regarding distribution for classroom for any articles they select. If appropriate for the course level and students, studies related to lean accounting published in academic journals could also be assigned.

Books

Jerrold Solomon (2003) wrote a novel *Who's Counting?* based on his own experiences in a company engaged in a lean transformation. The novel makes for entertaining reading, and it really illustrates the challenges created by conventional accounting as well as the challenges to the accounting function at a company undergoing a lean transformation. The challenge for the professor is finding time in the scheduled student workload for this lively but somewhat lengthy reading assignment.

Real Numbers is a book by Jean Cunningham and Orest Fiume (2003) making the case for lean accounting using examples from their own experiences at their respective companies. Their book is targeted at top executives. Their writing is concise and clear, making the book a good choice as supplemental reading for professors who want their students to compare and contrast lean accounting with conventional accounting at several points during their course.

Accounting in the Lean Enterprise (McVay et al., 2013) could be used in place of PLA as a supplementary text or as the primary text in a course devoted to lean accounting. It is comprehensive and well written, but conceptual in approach. It is a good choice for professors who want to focus on the concepts rather than getting into the mechanics and computations associated with implementing lean accounting practices. Several suggested discussion questions are listed at the end of each chapter, but to my knowledge, there are no suggested responses to the questions available to instructors. A professor could choose this book as their text and use material from the Lean Accounting Content Repository to give students exposure to the mechanics and computations involved with lean accounting.

Nick Katko and Mike DeLuca (2021) have just published *Practicing Lean Accounting*. The book was released too late to be reviewed for this paper. Like PLA, *Practicing Lean Accounting* is oriented toward practitioners. If their book is as similar to PLA in its content as it is in its title, it will be easy to adopt their book as a primary or supplementary text using material from the Lean Accounting Content Repository. Professors that have or want extensive coverage of lean accounting in their courses should review this book for suitability.

Teaching Cases

The mini cases in the Lean Accounting Content Repository are essentially extended problems abstracted from settings at real companies. Aside from the "Romeo Engine Plant" case (Hutton & Kaplan, 1993) mentioned earlier, I am aware of only four published teaching cases related to lean accounting with teaching notes available to instructors. In "Aero Gear, Inc." Grasso (2008) describes a company struggling with a standard cost system made obsolete by their reorganization of production into value streams. The officers of the company are also struggling to transition from a command-and-control style relying on the conventional accounting measures to lean management focused on lean performance measures. "Creating a Lean Enterprise" (Brewer & Kennedy, 2008) provides a fairly comprehensive description of the changes in organization and production in the beginning of a lean transformation at a manufacturing company despite being a fairly short case. Students are required to explain how those changes affect accounting and how accounting must change to support the lean company. An earlier version of this case was used in an

IMA student case competition. “Autoliv Inc.” (Fullerton et al., 2013) focuses on applying lean practices to improving an accounting function, the accounts payable reconciliation. The case also gives the students the opportunity to build and apply Excel skills using a fairly large data set. “The Wiremold Company: Ensuring Shareholder Commitment” (Grasso, 2021) provides an abbreviated description of the lean transformation made at Wiremold during the 1990s. Students are asked to prepare a presentation to encourage the private shareholders to stay with the company rather than selling. The case highlights the limitations of financial statement information and the importance of nonfinancial operating measures – even from a shareholder perspective.

Production Simulations and Plant Tours

Production simulations are an opportunity to use active learning to demonstrate lean production, highlight the problems with conventional accounting in a lean production environment, and demonstrate lean accounting. DeBusk et al. (2013) describe a production simulation with accounting that can be run quickly. It is highly controlled, and it focuses entirely on the accounting effects of inventory reduction enabled by lean production. The AICPA has teaching notes available for two more extensive and elaborate simulations, but access to the notes is restricted to AICPA members. One, labeled “Increasingly Lean Accounting to a Manufacturing Simulation” (Grasso et al., 2012) describes the simulation run in the semester long lean accounting course described above. The other, “Lean Accounting in Support of Lean Manufacturing: Ronny the Robot Simulation,” (Fullerton, 2013) is a five round simulation that offers opportunities to illustrate more issues but requires more class time. Links to the teaching notes can be found in the AICPA’s Management Accounting Classroom Materials page (https://www.aicpa.org/interestareas/ accountingeducation/ resources/classroommaterials/management.html).

Actually visiting a company employing lean production is a powerful way to enhance student understanding of lean production and lean management concepts. A live tour is especially valuable because the professor can ensure performance measures and visual controls being employed are highlighted. However, even before pandemic-related health issues arose, live tours could be difficult to arrange due to the lack of a willing host within reasonable commuting distance or logistical issues related to students’ schedules. Virtual plant tours are a second best but still valuable alternative. Gemba Academy provides some virtual plant tours (see https://www.gemba academy.com/search?query=Plant%20tours). Professors interested in finding virtual plant tours can also search YouTube, or they can contact nearby companies using lean and see if they have created virtual plant tours that they are willing to share with a class – even if they do not publicly post the virtual tour. Using a local company creates the possibility of having a recorded interview with or a class visit by a manager of the company to supplement the virtual plant tour.

Recorded Presentations and Webinars

The Lean Accounting Content Repository includes six recorded presentations by Brian Maskell and one by Bruce Baggaley. Additional videos and interviews with Brian Maskell are available on YouTube (https://www. youtube.com/user/BMALeanManagement). An interview with Brian Maskell on the Lean Nation program is also available on YouTube (https://www.youtube.com/watch?v=otHZDlIjMsU). Professors can search YouTube or other internet sources to find recorded presentations and webinars by other lean accounting consultants or lean production consultants addressing accounting issues. For example, Nick Katko, President of BMA, Inc. has a YouTube channel with number of presentations of varying lengths (https://www.youtube.com/channel/UCvOm ReXKkozmC1KwWdLnzLQ?view_as=subscriber). Mr. Katko also makes all BMA’s free webinars for the past two years available on a GoToStage channel (https://www.gotostage.com/channel/bmawebinars). The webinars are usually 60-minute information or education sessions on a specific lean accounting topic. The webinars could be used to supplement or even supplant a lecture on a particular lean accounting topic.

CONCLUSION

The Lean Accounting Content Repository is a source of classroom material for teaching lean accounting. The repository contains multiple-choice, short answer, discussion and computational questions and problems that professors can use to help students understand lean accounting concepts and practice their application. There are additional questions and problems to test students' knowledge of lean accounting. There are recorded presentations, and recorded lectures that can be used as is or modified and rerecorded. Managerial accounting professors who have not introduced more coverage of lean accounting in their courses due to a lack of available classroom material now have a ready source for that material. Whether professors use lean accounting material available from the repository or other material described in this paper – whether they add just a single item related to lean accounting to their course content or they create entire courses devoted to lean accounting, their students, our future accounting professionals, will be the beneficiaries. They will learn about lean accounting and they will improve their critical thinking skills by comparing conventional accounting to lean accounting and other innovative accounting methods.

Professors are encouraged to inform any colleagues they know who teach managerial accounting about the existence of the Lean Accounting Content Repository. Professors who are not members of the AAA are encouraged to join, but they can also gain access to the Lean Accounting Repository through a colleague who is an AAA member. Anyone with questions about the Lean Accounting Repository or any of its content is encouraged to contact the author at L.Grasso@ccsu.edu for additional information.

REFERENCES

Brewer, P., & Kennedy, F. (2008). Creating a Lean Enterprise: The Case of the Lebanon Gasket Company. *IMA Educational Case Journal*, *1*(4), Article 2, 1–8.

Crawford, D., & Henry, E.G. (2000). Budgeting and Performance Evaluation at the Berkshire Toy Company. *Issues in Accounting Education*, *15*(2), 283–294.

Cunningham, J.E., & Fiume, O. (2003). *Real Numbers: Management Accounting in a Lean Organization*. Managing Times Press.

DeBusk, G.K., Grasso, L.P**.**, & Moerland, C.L., Jr. (2013). Teaching Lean Accounting with a Manufacturing Simulation. *Accounting Instructors Report*, *68*, 13–31.

Dennis, P. (2015). *Lean Production Simplified* (3rd ed.). CRC Press.

Doolen, T.L., & Hacker, M.E. (2005). A Review of Lean Assessment in Organizations: An Exploratory Study of Lean Practices by Electronics Manufacturers. *Journal of Manufacturing Systems*, *24*(1), 55–67.

Emiliani, B. (2007). *Real Lean: Understanding the lean management system*. The Center for Lean Business Management, LLC.

Fiume, O. (2020, January 11). *Manufacturing Dilemma: What to do when Standard Costs Don't Work for You Anymore.* CGMA Teaching Symposium, Houston, Texas.

Fullerton, R. (2013). Lean Accounting in Support of Lean Manufacturing: Ronny the Robot Simulation. *AICPA*. Retrieved from https://www.aicpa.org/signin.html?returnTo=/content/dam/aicpa/interestareas/accountingeducation/resources/classroommaterials/management/downloadabledocuments/lean-accounting-support-lean-manufacturing-ronny-robot-simulation.pdf%3FcontentType%3Dsecured

Fullerton, R., Gunnell, S.F., & Murray, R.C. (2013). Autoliv Inc.: Using Lean Practices to Improve the AP Reconciliation Process. *IMA Educational Case Journal*, *6*(3), Article 1, 1–5.

Gemba Academy. (2011, May 16). *Introduction to Lean Manufacturing – 2011 Edition*. [Video]. YouTube. Retrieved from https://www.youtube.com/watch?v=zUUVy59J_54

Grasso, L. (2008). Aero Gear, Inc.: Performance Measurement, Cost Management and Product Costing in a Lean Transition. *IMA Educational Case Journal*, *1*(3), Article 1, 1–10.

Grasso, L.P. (2021). The Wiremold Company: Ensuring shareholder commitment. *Journal of Business Cases and Applications*, *30*, Article 12, 1–12.

Grasso, L., & Fearon, D. (2015). Moving Beyond Budgeting: Avoiding dysfunction and waste. *Cost Management, 29*(1), 30–39.
Grasso, L.P., DeBusk, G.K., & Moerland, C.L., Jr. (2013). The Application of Lean Accounting to a Manufacturing Simulation: A teaching note. *AICPA*. Retrieved from https://www.aicpa.org/signin.html?returnTo=/content/dam/aicpa/interestareas/accountingeducation/resources/classroommaterials/management/downloadabledocuments/increasingly-lean-accounting-manufacturing-simulation.pdf%3FcontentType%3Dsecured
Hadid, W., & Mansouri, S.A. (2014). The lean-performance relationship in services: A theoretical model. *International Journal of Operations & Production Management, 34*(6), 750–785.
Hansen, D.R., & Mowen, M.M. (2018). *Cornerstones of Cost Management* (4th ed.). Cengage Press.
Hansen, D.R., Mowen, M.M., & Heitger, D.L. (2022). *Cost Management* (5th ed.). Cengage Press.
Hutton, A.P., & Kaplan, R.S. (1993). *Romeo Engine Plant*. Harvard Business School Case 194-032 (Revised March 1997).
Kaplan, R.S., & Hutton, A.P. (1992). *Peoria Engine Plant (A)*. Harvard Business School Case 193-082 (Revised March 1997).
Katko, N., & De Luca, M. (2021). *Practicing Lean Accounting.* Independently published: Nick Katko & Mike Deluca.
Kennedy, F.A., & Maskell, B.H. (2006). *Statements on Management Accounting: Lean Enterprise Fundamentals.* Institute of Management Accountants. Retrieved from https://www.imanet.org//-/media/7f5aa1be16fc40698b76933b63f910c0.ashx?as=1&mh=200&mw=200&hash=2579847F7ED5E5519F26BCF41AE3D75401004FC3
Kennedy, F.A., & Maskell, B.H. (2014). *Statements on Management Accounting: Lean Enterprise Fundamentals.* Institute of Management Accountants. Retrieved from https://www.imanet.org//-/media/7f5aa1be16fc40698b76933b63f910c0.ashx?as=1&mh=200&mw=200&hash=2579847F7ED5E5519F26BCF41AE3D75401004FC3
Liker, J.K. (2004). *The Toyota Way: 14 management principles from the world's greatest manufacturer*. McGraw-Hill.
Maskell, B.H., & Baggaley, B. (2006). Lean Accounting: What's It All About? *Target*, *22*(1) 35–43.
Maskell, B.H., Baggaley, B., & Grasso, L. (2012). *Practical Lean Accounting: A proven system for measuring and managing the lean enterprise* (2nd ed.). CRC Press.
Maskell, B.H., & Kennedy, F.A. (2007). Why do we need lean accounting and how does it work? *Journal of Corporate Accounting & Finance, 18*(3), 59–73.
McVay, G., Kennedy, F., & Fullerton, R. (2013). *Accounting in the Lean Enterprise: Providing Simple, Practical, and Decision-Relevant Information*. CRC Press.
Shah, R., & Ward, P.T. (2007). Defining and developing measures of lean production. *Journal of Operations Management, 25*(4), 785–805.
Solomon, J.M. (2003). *Who's Counting? A Lean Accounting Business Novel.* WCM Associates.
This American Life. (2015, July 17). *NUMMI - 2015 (Episode 561)* [Radio Broadcast]. Retrieved from https://www.thisamericanlife.org/561/nummi-2015
Womack, J.P., & Jones, D.T. (1996). *Lean Thinking: Banish waste and create wealth in your corporation*. Simon & Schuster.