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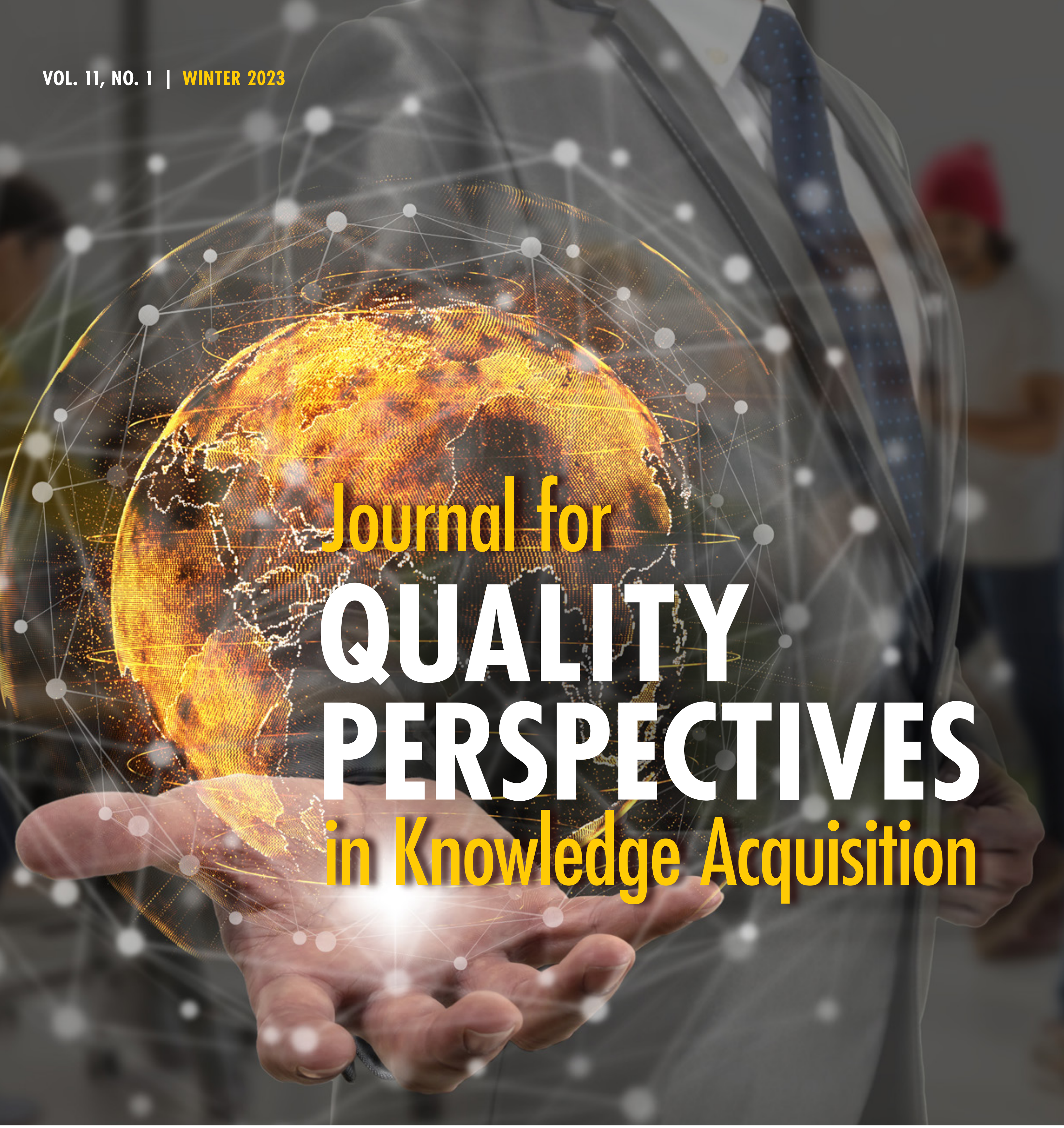

Journal for QUALITY PERSPECTIVES in Knowledge Acquisition

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Journal for Quality Perspectives in Knowledge Acquisition

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The Journal That Connects Quality and Education

Journal for Quality Perspectives in Knowledge Acquisition (ISSN 2692-4005) is a double-blind, peer-reviewed publication that is produced by ASQ's Education Division, the Global Voice of Quality, and the following Network Groups: Higher Education, Baldridge, STEM, Workforce Development, and K–12.

The purpose of the journal is to engage the education community in a discussion of significant topics related to improving quality and identifying best practices in the various dimensions of education, as well as expanding the literature specific to quality in education. Such dimensions interface with various disciplines such as medicine, science, law, healthcare, art, business, public safety, and administration, among others.

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Questions regarding this publication should be directed to ASQ's Education Division, Chair/2023, Marianne Di Pierro, JQPKAEditor@gmail.com and also at marianne.dipierro@wmich.edu

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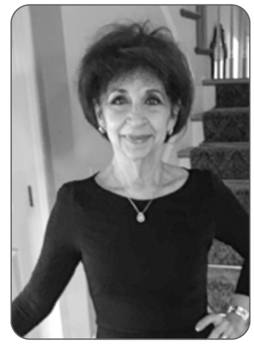
IN THIS ISSUE:

Journal for Quality Perspectives in Knowledge Acquisition

The Observation Tower

by Marianne Di Pierro, Ph.D.



Marianne Di Pierro

The ASQ Education Division is gratified to publish the third issue of the *Journal for Quality Perspectives in Knowledge Acquisition* and to disseminate critical information regarding quality tools and principles that embrace higher education and workforce development. Certainly, the quality initiatives discussed in the articles represent best practices in diverse fields and can be extrapolated within myriad organizational environments.

Ellen Belitzky's article, *Implementing Socratic Pedagogy with Learning Management Systems*, describes a compendium of literature concerned with online learning and represents a conceptual study that examines the merits and challenges of multiple learning modalities, including in-class and online, especially important amid the challenges of COVID-19 that confront institutions of higher learning. Belitzky argues for the value of learning management systems (LMS) that incorporate Socratic pedagogical approaches, a dual approach that provides flexible and effective instruction via the promotion of learner engagement to enhance student learning outcomes. Further, her article advocates for faculty experimentation with LMS tools aligned with hybrid instructional methods as pathways to advance contemporary teaching modalities. Her work is integrative and multidisciplinary, focusing also on the importance of such approaches, especially in light of faltering university and college enrollment rates, as well as on the educational needs of working professionals seeking advanced degrees.

In *Transforming Data Into Insights Using Flow Analysis*, Azizeh Elias Constantinescu unmasks Industry 4.0, a theoretical framework for her study that intersects with the practice of lean, and specifically with process design and development. Contemporary organizations are involved with integrating technology into their processes and relying on workflow tools to navigate through organizational structures that interface with those work processes. Constantinescu recognizes the centrality of studying flow through these processes and constructing reporting schema that illuminate them and the work being produced. Such insights and information building, she argues, are concealed within the data produced by information technology systems. Flow analysis, the approach she has developed, lifts the veil within the captured data and yields insights regarding the dynamic movement of work produced within a process.

Grace Duffy's article, *The Educational Value of the Improving Healthcare Monograph Series*, articulates the publication efforts sponsored by the ASQ Healthcare Division to generate a compendium of articles that feature a U.S.-based, patient-focused Healthcare Quality Management System. The series represents a recursive learning heuristic that accounts for assessments, improvement tools, and applications through which knowledge and skills are cultivated. The process is cyclical, drawing back upon itself as new skills are developed and implemented into progressive, dynamic procedures that align with best practices in healthcare. Duffy elaborates upon this four-part series in detail and provides insight for healthcare practitioners to optimize their efforts in ensuring quality healthcare for their patients.

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These articles represent a necessary paradigmatic shift in the ways in which we contemplate the nature of the work produced in diverse environments, the intended goals of that work, and the assessments and tools that help us measure quality outcomes through the processes of self-reflection, mindfulness, and objectivity.

In the spirit of scholarly generosity, the authors have included their email contact information for those interested in acquiring additional information. I encourage you to establish contact with them and to engage collaboratively in shared interests. We can all learn from each other and contribute to a better world.

Editor's Choice: The onset of COVID-19 has taken a toll on the ways in which we spend our time; for many of us, it was in isolation. As an avid reader, I found myself further engaged in reading and came across several titles that I would like to share with you.

Empire of Pain: The Secret History of the Sackler Dynasty by Patrick Radden Keefe. Keefe is an investigative journalist who writes of the opioid epidemic and the efforts of the Sackler family to perpetuate the addiction of so many individuals to OxyContin at unheralded profit.

Rebel Talent: Why It Pays to BREAK THE RULES at Work and in Life, by Francesca Gino. Ever wonder about those "out of the box" thinkers, actually *rebels for the cause*, who enter the world ready to toss out those constraining rules and embrace innovation and new ways of doing things? Gino writes that "most businesses are all about following the rules, not breaking them," and here is a book that engages us in the varied stories of those rule breakers. From reading about the culinary arts and war techniques to landing an airplane in the Hudson River, you will find yourself intrigued and thinking that breaking the rules just might be something that we all should try.

Journal Submissions: If you are interested in submitting an article to the Journal, please consult the Call for Papers and the Author Guidelines, located on the closing pages of this issue. Contact me at the following email address: marianne.dipierro@wmich.edu

Marianne Di Pierro, *Ph.D., is former Director of the Graduate Center for Research and Retention at Western Michigan University (WMU). As a graduate education specialist and researcher, she has coached over 100 Ph.D. students, across a spectrum of disciplines, to degree completion. She holds graduate faculty status at WMU and is experienced in curriculum and research design, assessment and evaluation, and policy development and implementation, as well as served on the Human Subjects Institutional Review Board (HSIRB). Di Pierro has been engaged as an expert consultant in graduate education for a law firm. She has participated in national research projects on Ph.D. completion and is principal investigator on several of her own studies that examine variables impacting doctoral attrition and retention. She has published articles in peer-reviewed journals and presented her research at professional conferences. Di Pierro is author of the second edition of the book,* Navigating the Dissertation – Strategies for Doctoral Advising Faculty and Their Advisees, *published by New Forums Press in May 2021 and has worked as a training consultant to graduate advising faculty. She is the current Editor of the* Journal for Quality Perspectives in Knowledge Acquisition *and serves on the leadership team for the ASQ Education Division as Division Chair. She is the current Examining Chair for the ASQ Healthcare Division. Di Pierro may be reached at the following email address marianne.dipierro@wmich.edu.*

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Congratulations to Susan Peiffer, ASQ Fellow

Congratulations to Susan Peiffer, whose impressive contributions to ASQ were recognized by the ASQ Board of Directors as a Fellow of the Society on November 21, 2022. Her contributions centered on implementing quality and performance improvement methodologies in the healthcare field while simultaneously preserving practitioners' time. Moreover, she led healthcare teams through project management, assessment, and evaluation efforts via the analysis of data and also assisted in the correlation of these data to real-world conditions, efforts that lend to best practices in contemporary healthcare. Her research has been published in peer-reviewed journals such as the Journal for Quality and Participation, the Journal for Clinical Microbiology, and most recently in the Journal for Quality Perspectives in Knowledge Acquisition. Her research agenda includes the analysis of quality issues related to healthcare, the human factors associated with hospital-based management systems, as well as an exploration of the enzymatic reactions of the infectious bacteria *clostridium difficile* in aerobic and anerobic environments. Sue is currently on the ASQ Board of Directors and has held positions as Vice Chair of the Technical Communities Council, and Chair-Elect, Chair, and Past Chair for the ASQ Healthcare Division. The Education Division joins the Healthcare Division in the recognition of Sue's outstanding work.

Associate Editors

Julien Kouamé

Julien Kouamé, *Ph.D., is an Extension Specialist for Program Development and Evaluation at the University of New Hampshire (UNH) Cooperative Extension, Durham, and provides state-wide evaluation and assessment leadership.*

Previously, he was Health Communication Specialist at Grady Hospital in Atlanta, Georgia; Research Assistant at the Centers for Disease Control (CDC) Malaria Branch, Atlanta, Georgia; and Research Manager in the Community Research Institute at the Dorothy A. Johnson Center for Philanthropy, Grand Valley State University, Grand Rapids, Michigan. He was responsible for the evaluations of the Early Learning Neighborhood Collaboration (ELNC) and the LINC Community Revitalization, funded by W.K. Kellogg, and also served as Evaluation Advisor for the Kent County Community Transformation Grant, funded by the Centers for Disease Control and Prevention.

Dr. Kouamé is a member of the American Evaluation Association since 2006. He earned a Bachelor of Arts degree in Interpersonal and Organizational Communication from Manchester University; a Master of Public Health from the Rollins School of Public Health, Emory University; and a Ph.D. in Research and Evaluation from Western Michigan University.

Dr. Kouamé presents his research in evaluation at professional conferences within the academic community and is a published writer. He can be contacted at the following email address: julien.kouame@unh.edu

Liam Honigsberg

Liam Honigsberg *earned the Ph.D. in Management from Brandeis University in 2021. His dissertation research constituted an analyzation of the effects of teamwork on the training of novice teachers. He is currently the Chief Strategy Officer at Dark Horse Talent. As a former Director of Effectiveness, Information Architect, and Data Strategy Consultant, he has a track record for enabling companies to achieve rapid, data-driven growth. He holds a Bachelor's in Cognitive Neuroscience from UC Berkeley and a Master's in Statistics from Harvard University. He lives in Davis, California, with his wife and son, where they enjoy hiking, riding bikes, swimming, and using data to drive decisions (i.e., taking full advantage of an average 267 sunny days per year).*

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Lincoln Jiang

Lincoln Jiang, *Ph.D., is a Data Scientist of the Selling Partners Service Department at Amazon. He builds Machine Learning models to evaluate riskiness of software developers who may enable fraudulent sellers to abuse the Amazon Selling Platform. He also provides insights to the investigation team for identifying, remediating, and enforcing suspicious cases. In addition, Dr. Jiang is a reviewer for the internal Amazon Machine Learning Conference. Prior to Amazon, Lincoln worked for Travelers Insurance for 7 years. His role there included building predictive models to detect fraud claims, refreshing insurance pricing models, and experimenting with cutting-edge Artificial Intelligence (AI) methodologies. In his spare time, he enjoys playing soccer with his kids and barbecuing in his backyard. He, along with his wife and two sons, resides in the Greater Seattle area. He can be contacted at the following email address: xiaoflyingbear@gmail.com*

Lisa M. Walters

Lisa M. Walters, *Ph.D., is an associate professor at the State University of New York at Fredonia and a faculty advisor for the ASQ Fredonia chapter. She also is a certified specialist in blood banking from the American Society for Clinical Pathology and serves on the medical-technical advisory board of the American Association for Laboratory Accreditation. She received her Bachelor of Science degree in medical technology from Penn West-Clarion, Pennsylvania; an MBA from St. Francis University, Loretto, Pennsylvania; and her doctorate in management from California Coast University in Santa Ana, California. A senior member of ASQ, Dr. Walters is an ASQ-certified quality auditor, a certified Scrum Master, and a recent SUNY Chancellor's Award Winner for Excellence in Teaching. She is the author of three quality-oriented books through the American Association of Blood Banks and numerous academic intellectual contributions.*

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This conceptual study integrates evidence from previous and current research that faculty implementation of Socratic pedagogy with learning management systems (LMS) is beneficial in providing flexible and effective instruction, enhancing student engagement, and fostering positive student learning outcomes.

Implementing Socratic Pedagogy with Learning Management Systems

Ellen Belitzky

Abstract

Literature has been published regarding online learning during the COVID-19 pandemic and its implications for the future of instruction. This conceptual study accepts the merits of multiple learning modalities, including in-person and online, as well as synchronous and asynchronous. It proposes that learning management systems (LMS) implemented with Socratic pedagogy can enable learner benefits with any selected instructional mode. In the literature and with practical anecdotes, the study concludes that Socratic pedagogy paired with LMS delivery provides flexible, effective instruction and learner engagement. Faculty can be motivated to experiment with LMS tools and capabilities and use hybrid instructional methods, as this effort inspires them to update their courses in design and content. This study integrates evidence from previous research that faculty implementation of Socratic pedagogy with learning management systems is worthwhile, providing beneficial student outcomes.

Key Words: Socratic Method, Pedagogy, Learning Management Systems, Hybrid Learning, Technology-Enabled Instruction, Business Analytics Instructional Design

Problem Statement

How do institutions leverage hybrid learning models to scale for economic viability? Online programs pre-pandemic, while proven in their learning models, were considered outliers targeted for people who could not forfeit employment income for their livelihood to obtain academic credentials (Ferdig, Baumgartner, Hartshorne, Kaplan-Rakowski, & Mouza, 2020). Skepticism of online education (Singh & Thurman, 2019) born, in part, from distrust of electronic communication was no longer legitimate by necessity during the pandemic, and alternatives were required. Similar economic considerations necessitated shifts from print publishing to online publishing akin to less volume of carrier-delivered mail and more email. Workers were successfully employed remotely for extended time periods, and the internet proved widely to be reliable and effective.

Universities in the U.S., such as Walden and Capella, have been long associated with successful pathways to academic degree completion as an alternative to traditional on-campus university education systems (Kebritchi, Lipschuetz, & Santiague, 2017). These remote learning institutions have viewed education as a consumer service, designed and implemented for the working professional, whereas academic faculty from traditional on-campus universities may not. Dating from the colonial era, brick-and-mortar education is deeply rooted in the interactive exchange between instructor and student (Sanders, 2022). The learning manifest is the iteratively bred outcome of the question-and-answer process.

What has come to light in COVID-19 conditions (Ferdig et al., 2020) is the requirement for institutions to provide hybrid models (Tuckman, 2002) that blend the best of online remote and traditional on-campus instructional delivery (Dhawan, 2020). We will discuss practical class examples that have been successfully implemented in a business analytics graduate program. This study investigates how faculty can overcome the challenges in implementing hybrid learning via the support of learning management systems (LMS)

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technology to align with Socratic method, while staying true to institutional values, traditions, and student learning outcomes.

Research Significance

Higher education, post COVID-19 pandemic, has awakened to the possibilities of using learning management systems (LMS) in new ways (Dhawan, 2020). An LMS, for the purpose of this article, is a cloud-based or institution-hosted software application that serves as the repository for instructional materials, platform for faculty course management, and portal for students to engage with the course, the instructor, and classmates (Singh & Thurman, 2019). While technology enthusiasts and other early adopters have been using LMS in a wide range of modes for some time, many faculty maintain historical course-delivery mechanisms, know little of instructional design, and see LMS as an administrative evil rather than a teaching enabler (Lu, 2022). A shift in faculty perspective with respect to use of an LMS requires understanding student perceptions of the learning process (Sanders, 2022).

Student perceptions of learning begin at a young age, long before students encounter faculty in higher education. The learning experience of youth is quite different from adult education (Yates, Starkey, Egerton, & Flueggen, 2021). Students may initially view faculty as presenter and evaluator, when the faculty role leveraging an LMS may be better described as designer and coach (Parihar, Mishra, & Srivastava, 2022). The LMS provides a comprehensive navigation system for students in a course (Dron, 2022). The destination is selected, a menu of routes is offered, a map of the chosen route is illustrated, alarms are set to advise when one deviates from the route, and a dashboard provides metrics to gauge progress to the destination.

Learning Theory and Student Perception of Learning

Unlike K–12 instruction (Yates et al., 2021), a misperception of higher education is that the lecture delivery model must prevail. Research has shown that students at all levels benefit from interactive learning opportunities involving multiple senses and structured with content building blocks that lead to achievement of course objectives (Kebritchi et al., 2017). University students expecting to be passive learners may be initially overwhelmed with requirements to engage actively in a class (Sanders, 2022). Student learning preferences differ, and effective instruction must cater to this variability. Universal Design for Learning (UDL) provides a framework with guidance in this regard. Faculty, as subject matter experts, may or may not be instructors who are well informed about quality education delivery. Regardless of interest and expertise in instructional design, all might benefit from improving their awareness and knowledge of learning models and student perceptions of learning.

Traditional Classroom Instruction: Learning Delivery Model

The traditional classroom can be compared to broadcast instruction. An instructor at the front of the physical space shares verbal information and written information on a board or via electronic slideshow, perhaps with annotation while speaking. There may be lecture and laboratory components. Dialogue with students may be in verbal question–response format or in large lectures using an automated polling device. Instructional content and faculty preference will dictate the degree of experiential learning delivery utilized in lieu of lecture time. Classroom conversation is generally synchronous, as opposed to the asynchronous posts in an online discussion forum. Similar to on-ground classes, when an online synchronous class is in session, the use of online chat (Lu, 2022) simulates the verbal dialogue of an in-person class in text format.

Technology-Enabled Instruction: LMS Delivery Model

Advanced instructional techniques using learning management systems (LMS) require deliberate practice to hone faculty skill and positive student outcomes. Deliberate practice is intentional and driven by objectives, not discovery of capabilities by accident. Experimenting with LMS classroom discussions and trying both asynchronous and synchronous modes provide opportunity for faculty to learn the best conditions to use each (Singh & Thurman, 2019). For example, an asynchronous discussion may be used to enable students to help each other with homework during a weekend. In contrast, a synchronous discussion may be used in a large class section to enable more students to contribute to the dialogue interactively in parallel to one student in the classroom speaking at a time.

LMS platforms afford a wide range of tools beyond discussions to promote active, experiential learning (Sanders, 2022) that encourages students to own their path to subject mastery and to the ways in which they demonstrate the facility of learning via assessment. An LMS employed beyond the capabilities of syllabus storage, course announcements, and gradebook can be a powerful instructional tool promoting accessible learning for all students. Additionally, if implemented with precision, forethought, and planning, LMS can provide alternative paths to achieving course objectives for diverse learners and can share institution content and process innovation.

Advantages of LMS-Centric Delivery as an Integrated Platform

LMS-centric delivery provides one-stop shopping for instructor and students alike. For faculty, it is the master reference location for publication of course materials. Information can be posted or removed, timely updates can be communicated, and a wide range of supporting tools and applications can be integrated. Institutions with multiple sections of the same course can designate a course leader who governs the LMS master template for the course. This leader ensures curriculum consistency and sharing among instructors as defined by institutional policies and procedures. For students, the LMS is the menu that offers selection of learning choices to achieve satisfaction of completing course objectives. Beyond the class minimum requirements, uploads of documents and multimedia can be distributed. Links to supplemental materials can also provide enrichment.

Remedial activities can be recommended to assist students who may find themselves struggling with academic requirements. Make-up assignments, alternative formats for assessments, and self-directed opportunities abound. All these opportunities more closely simulate the post-university employment experience and prepare students for life challenges after graduation. Therefore, the benefits of LMS expand far beyond the classroom learning experience and dovetail into the application of concepts within the workforce.

Challenges for LMS-Centric Delivery to Faculty Administration and to Student Learning

Both faculty and students face challenges with LMS-centric delivery. Faculty may fear their intellectual property rights can be compromised by storing documents, videos, and other materials on the LMS platform. If a faculty member has taught a course for many years, iterating course materials and converting to updated platform requirements may present unwelcome challenges. Faculty independence in favor of peer-review quality control may also be intimidating if university policy implements such procedures.

Students predominantly accepting of standard technology applications, such as Microsoft Office or Google Docs, may struggle with LMS adoption. Organizational skills, time management, and reading comprehension are basic student competencies that effective LMS usage can encourage students to develop over time. Monitoring systems (Borges, Sawant, Zarapkar, & Azgaonkar, 2011) and remedial attention to these skills may not serve students if an LMS platform is used independently. Based on the implementation style dictated by the instructor, students may find use of the LMS platform a lonely proposition and may require social skills to unlock potential learning. Instructors using LMS as an enhanced file cabinet and gradebook may not require students to be technology savvy; however, instructors using LMS as a lecture platform can find value in explaining to students exactly how it will be used. Instructors who expect high student engagement within LMS, not only with faculty but also with other students, must demonstrate the capabilities expected in the course and not assume all students are familiar with them. At minimum, the first day of class should include a walk-through of the LMS as it will be used in the course, with a recording posted to the LMS for reference.

University funding for centers of excellence—offering discipline-specific skills, such as writing and math, or generic teaching skills for faculty and learning skills for students—can range from extensive to non-existent. Teaching centers with LMS-focused capabilities would be staffed with instructional designers, while student success support centers would be staffed with tutors and advisors knowledgeable in using the platforms. Despite the availability of such resources, there may be difficulty in promoting faculty and student utilization of these services. The learning curve is steep because the technology tools frequently change. There are always distractions and excuses.

Argumentative Dialogue: Socratic Method as a Pedagogical Tool

When one tells a child not to touch a hot stove, the child may listen or the child may touch the stove, get burned, and learn not to touch a hot stove again. Not all problems are as clear to adults. The consequences of a problem may be complex with a great number of choices and variants in outcomes. As some children require iterations of instructions with different degrees of heat before learning that touching a hot stove is a bad idea, the Socratic method can be a helpful tool for faculty to iteratively pose questions to learners with the objective of guiding students to determine appropriate answers to questions, boundaries of problems, and limitations of actions, among other instructional goals.

The Socratic method is identified as cooperative dialogue because it uses debating tactics to question and argue until sufficient detail is known from which to draw a logical conclusion. The process generally begins with a thesis statement and follows a scientific approach to determine why the opposite of the thesis statement is not true. This basic hypothesis testing is carried out through a series of questions and responses by the instructor and learner. Variations of the method are wide; however, the claim is that this process serves to provide data for the learner to understand the subject and draw conclusions not otherwise possible if memorizing material with self-study or listening to a lecture. Students develop critical thinking skills by practice with the Socratic method because they are challenged to consider the pros and cons of multiple perspectives. The pedagogy is more complex than whether a response is correct or incorrect.

Socratic Pedagogy as a Solution to Overcome Faculty Challenges Using LMS Platforms

Why pair Socratic pedagogy with LMS usage? LMS platforms independently do not promote learner critical thinking skills. The Socratic method provides a process to focus student preparation and attention to course material. Through a series of questions, critical thinking can be developed in progressive elaboration. Thus, pairing Socratic pedagogy with LMS usage provides a technology platform for development of critical thinking skills.

What resources do LMS platforms have to support Socratic pedagogy? The most obvious is assessment modules, where instructors can ask different types of questions in structured and unstructured formats. Less familiar to instructors uncomfortable with technology is the concept of embedded peer-review capability, which can be configured to enable students to critically evaluate each other and revise work prior to grading. Discussion forums in LMS offer open-ended, threaded class dialogue whereby the instructor can choose to contribute and challenge. Content modules and announcements resemble instructor broadcast lectures. With creativity, they may be transformed to engaging crowdsourced documents that customize learning.

Why use Socratic pedagogy to address faculty challenges? This process promotes quality improvement for all and is flexible to learner needs and accessibility requirements. The following example is illustrative of a typical faculty–student interaction within the comments section of a submitted LMS assignment.

Instructional Dialogue Illustration

Challenge:

Student submits an assignment on LMS, and faculty cannot read the file to assign a grade.

Socratic approach to resolution:

Instructor: I see you submitted an LMS file, but I cannot read it. Did you use your laptop?

Student: No, professor. <if answer = yes, question if Windows or Mac system>

Instructor: Did you use your mobile phone?

Student: Yes, professor. <if answer = no, ask what type of device>

Instructor: Did you name the file with a .pdf extension?

Student: I don't know, professor.

Instructor: Do you know how create/name a .pdf file so the LMS can display it for me to grade?

Student: No, professor.

Instructor: Will you attend my office hours or go to IT for assistance with file submission?

Student: Yes, professor.

In this interaction there are several critical thinking skills reinforced rather than jumping to the final question leading to in-person assistance. First, the student is made aware that submitting a file does not equate to the intended recipient being able to read it. Second, the student needs to understand that not all devices submit files the same way or in the same format. Third, the student must recognize that specific skills are required to submit files successfully for grading. Finally, the student must understand that there are multiple paths to receive assistance and complete the task.

LMS Capabilities to Support Socratic Teaching

Learning management systems offer a wide range of capabilities to support Socratic pedagogy. Popular LMS implemented in higher education include Canvas, Blackboard, and Moodle, while text publishers such as Wiley, Cengage, and Pearson offer their own platforms with LMS interfaces to enable seamless integration from the student view. Professional platforms such as LinkedIn and Coursera also may connect, integrate, and provide content that instructors can use to flip their instructional techniques (Nguyen, Pham, & Tu, 2021) and provide faculty with more time to support student learning. A new generation of tools geared toward synchronous feedback includes applications that also provide opportunities for interactive engagement in the Socratic spirit. Kahoot, Socrative, Quizlet, and Slido are examples of tools gaining popularity as both students and faculty experiment in the in-person and virtual classroom.

Options for Faculty to Use LMS Capabilities With Socratic Pedagogy in Curriculum

There are many options for faculty who wish to use learning management systems to support Socratic pedagogy. The options are not mutually exclusive. One or more tools and techniques can be used solo, in tandem, or sequentially to deliver curricular objectives. Factors to consider in selection include (1) instructor tolerance for a learning curve, (2) complexity of subject matter, (3) student appetite for ambiguity, and (4) student requirements for urgency of feedback. Once implemented, LMS capabilities become part of the course fabric woven into the delivery model as if intrinsic to the curriculum.

1. Instructor Tolerance for a Learning Curve

Faculty are busy with increasing administrative responsibilities that take time away from teaching. Time to learn new tools requires commitment and willingness to invest in continuous improvement. Complete course overhaul is not necessary to use system software features. The simple addition of a discussion forum online and posting the written prompt that would be asked verbally in a classroom setting can add to student choice regarding how they wish to represent their class contributions. In turn, either the instructor or other students can respond to posts or answer questions with other questions to promote dialogue and critical thinking.

2. Complexity of Subject Matter

Complexity of subject matter presents an opportunity for alternative LMS capabilities to be utilized (Nguyen et al., 2021). Mastery paths can be created based on performance. For example, in a classroom the instructor may stratify students to groups based on response to questions, completion of class work, or engagement level. With an LMS, an instructor may give an assignment and a quiz. Based on the quiz results, the LMS can be configured to direct students above a defined score who have already mastered the material to skip some assigned work. Also, the LMS can be configured to direct students below a threshold score to complete all the remedial work to demonstrate knowledge acquisition. Lastly, students performing in a middle range on the quiz may be offered a choice of LMS activities to close the performance gap and confirm mastery, without unnecessary repetition to do work that they already know how to do.

3. Student Appetite for Ambiguity

Student appetite for ambiguity is much more difficult to measure. Checklists have been used in Canvas LMS to support faculty course design (Baldwin & Ching, 2019), and they may also help students. Checklists provided in the LMS can reduce the stress of ambiguity and provide guidance to students when they are not fully attentive in class, miss a class, or do not understand information that was shared verbally. When students approach an instructor after class and ask a question that was already answered in class, the initial stock answer aligned with the Socratic process, "Did you check the LMS?" can contribute to efficient course management.

4. Student Requirements for Urgency of Feedback

Peer review is another LMS capability to resolve student requirements for urgency of feedback. With large class sizes, instructor grading may be quite time-consuming to personalize qualitative comments on submitted assignments. LMS platforms have peer-review configurations that allow instructors to specify the number of reviewers, deadlines to complete reviews, and responsibilities of reviewers. Instructions to embed questions in the reviews rather than state "I agree" or "I disagree" can be reinforced with students. This practice has potential to enrich students' critical thinking skills as well as broaden their perspective on the course subjects.

Adjustment for Faculty Transitioning Teaching Style From Presenter to Facilitator

With so many options for faculty to use LMS capabilities with Socratic pedagogy, it may be overwhelming to consider what adjustments to make first. In my experience teaching 12 courses at six universities, the initial adjustment correlates to the instructor self-concept. Having the confidence to acknowledge oneself, both as a subject-matter expert and a learning orchestrator, is a start. New instructors learn how to present material in their area of expertise. Likewise, new facilitators must practice how to use the tools of their trade to provide engaging curricular experiences that challenge students to be self-reliant learners (Parihar et al., 2022). In some cases, this transition means breaking the inertia of how a course has been delivered for a significant time. Implementing Socratic pedagogy using LMS for students begins with the instructors trying the method for themselves.

Literature Search Results: "LMS and Socratic Method"

An initial Google Scholar search of 2022 literature with the term "LMS and Socratic method" yielded 159 results. When expanded to include 2021 literature, 533 results were listed, excluding patents and citations (search conducted June 29, 2022), which provided a broader dataset to consider. Converging on themes identified by classifying the first 100 relevant articles with five or more citations, a set of 10 articles was identified once duplicates were removed and one article eliminated as non-topical due to its focus on computer science and artificial intelligence versus teaching and learning in higher education. From these 10 articles, half referenced the COVID-19 pandemic and digital learning systems. Nine of 10 articles were more explicit in describing support for virtual or online learning for these digital platforms, with four mentioning the requirement for collaboration. The variety of learning subjects was broad, including

Table 1: LMS and Socratic Method Study Comparison

ID	Reference	Outcome	Process	Assessment
1	Karim, 2022	Positive responses to new approaches and methodology (student learning, attitudes, thinking and decision-making)	Online learning in Asia during COVID-19	Impact of Socratic method
2	Riley, Capps, Ward, McCormack, & Staley, 2021	Sustained learning quality, with no significant difference in students' course performance or satisfaction	Remote transition of a nursing obstetrics course	Learning quality of live and recorded whiteboard lectures with Socratic-style questioning
3	Madhavanprabhakaran, Francis, John, & Al Rawajfah, 2021	Opportunity to enhance faculty technical competency and learning management system use	Nurse educators' use of remote teaching during COVID-19 lockdown	Evaluation of flexibility considering threats including academic integrity and accessibility
4	Ivanytska, Dovhan, Tymoshchuk, Osaulchyk, & Havryliuk, 2021	Proper use of digital resources enhances foreign language proficiency, increased student online cooperation, and developed foreign language skills	Teaching English for future entrepreneurs	Survey and analysis of student priorities
5	Jalinus, 2021	Combining online and offline instruction provides flexibility for creative and innovative projects and project improvement	Blended learning model in vocational education	Questionnaires, observation sheets, and cognitive, affective, and psychomotor tests in Indonesia
6	H.-T. Nguyen, 2021	Motivation-boosting activities in the online learning process led positive changes in students' learning motivation and academic achievement	3rd-year law students taking criminal law course at a university in Vietnam	Experiments using LMS, collaborative, and social networking tools
7	Dron, 2022	Participative orchestration of technology is highly distributed in educational systems	All learners and teachers are educational technologists	Education technologies as human, complex, and social
8	Picciano, 2021	Campuses are creating new positions in distance learning leadership and this work prepares administrators who may not have the preparation for these roles	Issues and needs of distance learning administrators	Measure administrative and content capabilities required for leadership roles
9	Efthymiou, Zarifis, & Orphanidou, 2021	Linking the constructs of social constructivism with quantification enables us to develop a rational model of performance measurement	Engineering practitioners who study in postgraduate management programs that replicate face-to-face environments	Metrics (objectives, critical success factors, key performance indicators, and targets), constructivism techniques
10	Williams et al., 2021	Virtual medical student rotations are scalable and effective to approximate interpersonal clinical teaching	Virtual urologic surgery clinical rotation for medical students	Pre-course and post-course tests

medical education (nursing and urology), law, engineering management and sciences, and teaching English to entrepreneurs. Four articles referenced international students (Ukraine, India, Vietnam, and Indonesia), and one mentioned accessibility and equity challenges.

Methodology

This study had two phases: a literature review and a practical example. The literature review identified similarities across published studies with respect to technology and methods. The practical example demonstrated how instructor–student interaction evolves when Socratic questioning is paired with an LMS technology platform in the classroom. The choice to use both phases was to provide evidence that Socratic pedagogy can be implemented by an instructor using an LMS platform.

For the literature review, a summary of the 10 studies identified was coded. The categories are Outcome, Process, and Assessment. The first category, Outcome, refers to the extent that the study results impact higher education teaching effectiveness. The next category, Process, provides context for the study. The final category, Assessment, considers how learning outcomes are measured. Table 1 presents a comparison of these studies.

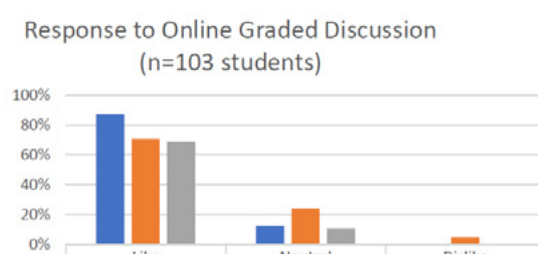
Pairing LMS with Socratic pedagogy in a practical example was implemented in a three-step, quasi-experimental design with no control group. The first step was an in-class show of hands, the second step was an in-class discussion *(stop, continue, adjust)*, and the third step was to request feedback to a series of questions in an online LMS discussion forum. Rationale for two pretests was the result of lack of participation in the show of hands exercise, as it occurred early in the term and all were international students new to U.S. classroom instructor interaction.

Summary of Study Outcomes When LMS Is Used With Socratic Pedagogy

Studies identified share common themes demonstrating Socratic pedagogy implementation using technology or interpersonal methodologies. LMS can be used for online and traditional face-to-face classes, and LMS supports synchronous and asynchronous learning. For instructor and learner, using LMS with the Socratic method is content neutral and applicable across disciplines for undergraduate and graduate higher education.

A graduate business analytics class provided a practical example of pairing LMS with Socratic pedagogy. Online discussions due after the third in-person class provided data for the instructor self-assessment. Feedback was requested in multiple modes for three sections of the same course. An in-class show of hands did not achieve student participation, so volunteers were requested to share their opinions of the LMS and whether the instructor should stop, continue, or adjust teaching style. It was not clear if class sentiment agreed with the few students who shared their views. Non-committal responses were expected when students were asked similar questions in the online LMS discussion forum. Surprisingly, students provided candid feedback to questions such as "How is the LMS platform supporting your study?" and "How can the instructor and other students help you to succeed?" The responses were coded (n = 103) and results are provided in Figure 1. More than half the students (69%) liked the use of both LMS and Socratic pedagogy as expressed to the instructor and classmates in the online discussion. While this sentiment analysis could be considered having positive bias where culture inhibits sharing of negative feelings, results warrant future study with student demographic data. Additionally, data should be examined for correlation with summative student assessments.

Incorporating the Socratic Method With



	Like	Neutral	Dislike
LMS	87%	13%	0%
Socratic Pedagogy	71%	24%	5%
Both	69%	11%	0%

Figure 1: LMS and Socratic Pedagogy Observational Outcomes

LMS Support: Future Class Examples

In the author's teaching experience, Socratic pedagogy has been used leveraging LMS with generally positive, yet sometimes inconsistent, results. There is opportunity for use of control groups and formal design of experiments to build on the prior studies. While experiential storytelling may support the claim, structured investigation to ensure quality of reported outcomes is required.

Three opportunities for future study have been identified: (1) online discussion forum using the five whys, a quality technique that involves asking a series of why questions to identify the root cause of a problem (Nguyen et al., 2021); (2) formative assessment with peer review using the fishbone diagram, a visual representation attributed to Ishikawa, used for analyzing causes of a problem (Priyadi & Suyanto, 2019); and (3) class engagement activity using checklists, a simple quality control technique to support analysis of conformance to specifications. These examples have been selected based on their feasibility in courses of varying subjects and by the ability to quantify measurements. For each study opportunity, there would be ample ways to use descriptive statistics and evaluate qualitative assessment of the feedback provided with the pedagogy. Additionally, these measures could be correlated with student grades to determine whether use of LMS and Socratic pedagogy influences student achievement in a course.

Analysis

Prior studies and author classroom experience contribute to shaping a repeatable process for achievement of continuous improvement objectives. Indeed, it is possible to implement Socratic pedagogy with LMS. Each process step has multiple components reflecting the iterative nature of argumentative questioning. Debates may be multi-faceted within the instructor as an individual, among instructor and colleagues, and among instructor and students.

The first step is for faculty to design and plan how the LMS will be used with a view of the target goals stated in the course syllabus. For example, in a business analytics course taught by the author, one of the syllabus course goals is to use analytical methods and tools effectively for decision-making purposes. Designing for student achievement of this goal translates to defining modules of the LMS in a structure that supports multiple methods and multiple tools. Planning for student achievement of this goal translates to mapping the methods and tools to the term calendar and identifying which will be presented and assessed in specific class sessions or via an online format. Combining design and planning efforts while iterating the product in the LMS constitutes the instructional design process. Interwoven techniques such as anonymous polls and class discussion boards can be included for student feedback with the Socratic element as the electronic facilitated dialogue.

Once mapped, learning to use the LMS features and practicing with supporting tools is important for content delivery. An LMS course sandbox may be allocated as a testing place in the LMS that the instructor will use to experiment with designs for a student learning space without giving students access. Next, the actual course development in a master shell specifically for the intent of publication removes the risks of students being assigned to a course in progress. This is where the instructor develops and self-tests using the LMS, publisher platforms, and technology add-ins if they bring value. When a working model of the course is available, peer review and modification of course components in response to feedback provides quality assurance. Faculty need not work solo, yet too many collaborators in the LMS course at the same time presents a risk to unwanted changes.

Finally, whether timebound by the term or at the satisfaction of the primary instructor, the course is published in the LMS along with updated materials and instruction methods during the term. It is important to capture improvements as they are considered so that they may be implemented in future courses. Quality professional teaching is an iterative occupation and not typically a one-time performance. Figure 2 illustrates this critical pedagogical cycle.

Conclusion

We may have identified opportunity for faculty to transform elements of their instructional role by leveraging LMS while implementing pedagogical alternatives. How might an LMS support this faculty transition in the eyes of students? One answer may be rooted in the application of the Socratic method. Using cooperative dialogue to stimulate critical thinking via a process

Figure 2: Socratic Pedagogy Cycle for LMS Implementation

of iterative questioning is not a common tool selection available in popular LMS systems. This research proposes alternative mechanisms for implementing the Socratic method in higher education learning management systems. These LMS applications may serve to enable the faculty transition from teacher to learning facilitator, freeing educator time from delivery channel and assessment officer to learner motivator and champion of diverse, inclusive, accessible learning of subject matter.

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Journal for Quality Perspectives in Knowledge Acquisition

This monograph series exemplifies the concept of recursive learning, an approach that holds great potential in the field of healthcare to meet the dynamic challenges confronting healthcare professionals and their patients through the implementation of quality-focused approaches aligned with best practices.

The Educational Value of the Improving Healthcare Monograph Series

Grace L. Duffy

Abstract

The ASQ Improving Healthcare Monograph series is a four-part compendium of articles that features a U.S.-based, patient-focused Healthcare Quality Management System, along with assessments, improvement tools, and applications. This series serves as an example of recursive learning, through which knowledge and skills are reinforced via action initiatives. Recursive learning is constituted by teaching, testing, and repeating simultaneously, with these skills drawing back upon themselves and the knowledge gained, recursively, before continuing to advance along quality levels. The process is cyclic in nature, and therefore progressive. Such an approach holds great potential in the field of healthcare to meet the dynamic challenges of healthcare professionals and their patients through the implementation of quality-focused approaches aligned with best practices.

Key Words: Quality in Healthcare Practice, Management of Effective Quality Interventions, Recursive Learning, Healthcare Improvement, Quality Assessment, Case Studies in the Application of Quality Improvement

Introduction

The Healthcare Quality and Improvement Committee (HQIC), a joint development of ASQ's Healthcare and Quality Management divisions, created the Hospital-Based Healthcare Quality Management System (QMS) model, the first monograph in a series of four described in this article as a foundation for leaders seeking to improve patient outcomes, safety, and satisfaction, as well as cost savings, risk management, and regulatory compliance. This series of four monographs describes the model and its components in detail (American Society for Quality, 2016). Monograph 1 can be accessed at https://my.asq.org/communities/files/28/4900

A QMS is a formalized system that documents the structure, responsibility, and procedures required to achieve effective quality management; it is expected to attain the following major objectives:

- Ensuring reliable processes
- Decreasing variation and defects (waste)
- Focusing on achieving better results
- Using evidence to ensure that a service is satisfactory

This QMS provides a framework for evaluating current business conditions against a set of commonly accepted quality management fundamentals adapted specifically for a hospital-based healthcare business environment. Its structure is built on the seven quality management principles associated with the ISO 9000 series of standards (International Organization for Standardization, 2015), Deming's Plan-Do-Check-Act cycle (American Society for Quality, October 2022), and other basic quality-improvement tenets. Overall, it follows the logic of the ISO standards, but it is written in terms that are recognizable to hospital staff members, providing a bridge from the original standards' generic descriptions to language and situations that make immediate sense in a hospital environment (Peiffer, Story, & Duffy, 2016).

The Model

Figure 1 presents a high-level model, and Figure 2 offers a more detailed version of this QMS, which could be expanded to support any part of the healthcare sector. The QMS model can be used most effectively once its overarching structure is understood. Its three concentric circles and overlay illustrate the framework for integrating the hospital's processes, measures, and improvement activities into a smooth-flowing, repeatable, and reliable QMS to meet patient, community, and regulatory body requirements for improved results and lower costs. Although it is not possible to delineate the model completely in this article, a summary is provided here.

The Inner Circle

The model's core delineates the expected results—exceptional quality, safety, and patient outcomes. From the patient's viewpoint these can be as simple as, "Make me better, and don't hurt me." From the provider's perspective, these goals often are defined by myriad qualitative and quantitative metrics handed down by government, payers, and other institutions, as well as personal motivations, histories, and perspectives. Although these are lofty and legitimate goals, all are relatively subjective and dependent upon the perspectives of both patients and providers. Failure to voice, coalesce around, and act upon the definitions of these results for each patient and their respective providers may result in unnecessary conflicts, dissatisfaction, and the perception of care failures. Proper communication is therefore essential so that the patient can fully experience exceptional quality. Indeed, the actions, processes, and systems engaged in the middle and outer circles should be driven, in part, by the realization of the definitions of exceptional quality of the inner circle.

The Middle Circle

This circle details four key components of the patient's care delivery: identification and assessment, development of a treatment plan by all primary and ancillary services, delivery of care, and transition of care to the next level or

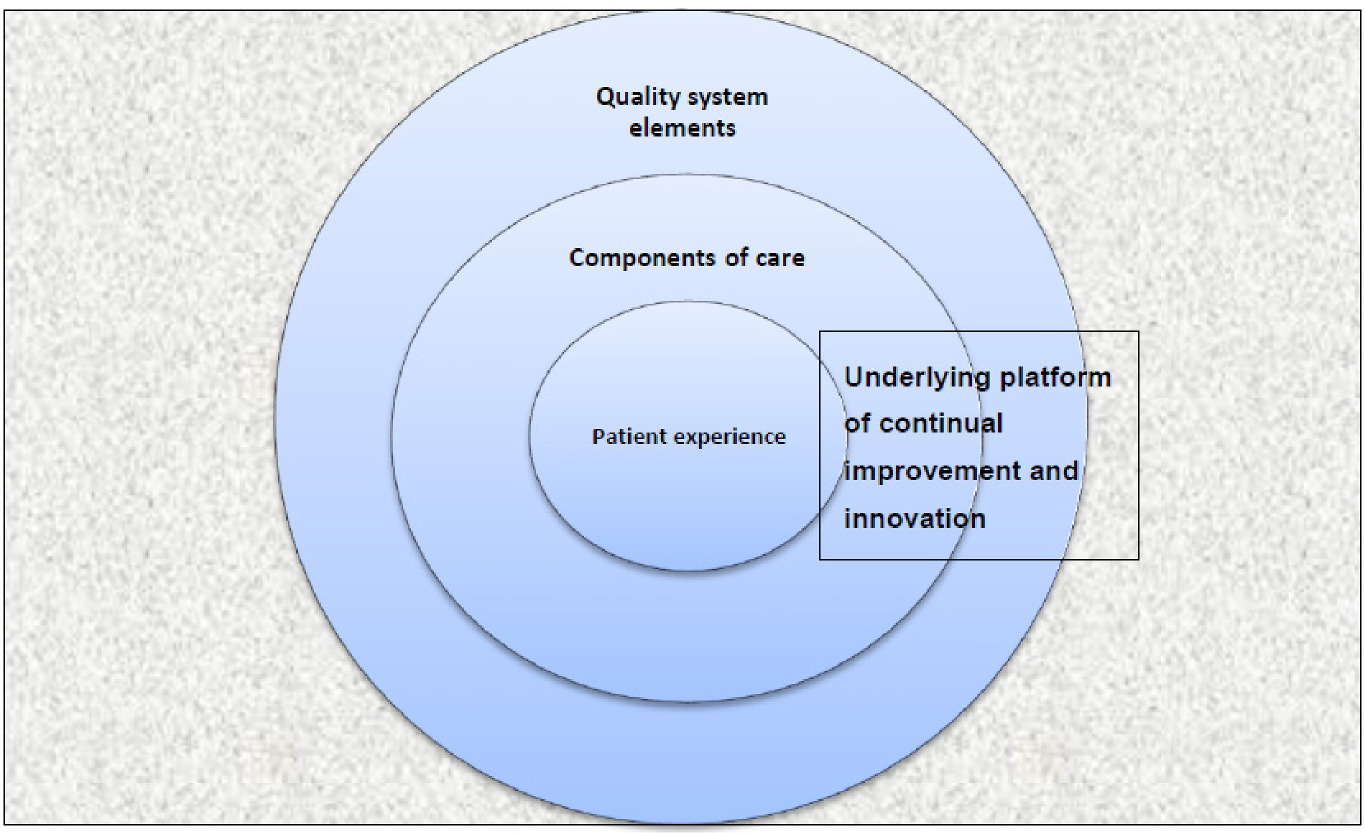

Figure 1: A High-Level Conceptual Representation of the Healthcare QMS

discharge. They represent the patient's typical experiential path through the care-delivery process.

Strategies to increase safety, efficiency, and effectiveness, as well as to reduce errors, include evidence-based medicine, decision aids such as algorithms and simulations, memory aids such as checklists, and situational awareness (to perceive environmental elements, understand their meaning, and predict what may happen). Mistake proofing or force function also can be applied, such as assuring that anesthesia gases cannot be improperly administered.

The Outer Circle

The 10 critical Quality System Elements that provide the infrastructure and framework for supporting and influencing achievement of exceptional quality, safety, and patient outcomes are described in this circle. These constitute the processes and structures necessary for overall business effectiveness and efficiency and reflect an interactive relationship comprised of the four key components of care delivery. Moreover, they reflect the model's core. If any one of these elements is not well-defined and/or well-implemented, it may cause a negative impact on the process's results, patient experience, and/or hospital business results. Such breakdowns can be very costly when they cause harm to a patient, damage the hospital's reputation, or generate financial loss.

The elements work together in differing combinations, based on the individual patient's requirements as the person passes through the four key components of care delivery. The Quality System Elements are interdependent, implying that the healthcare system depends on both leadership and structure to influence the component parts working together effectively (Mallory, 2018).

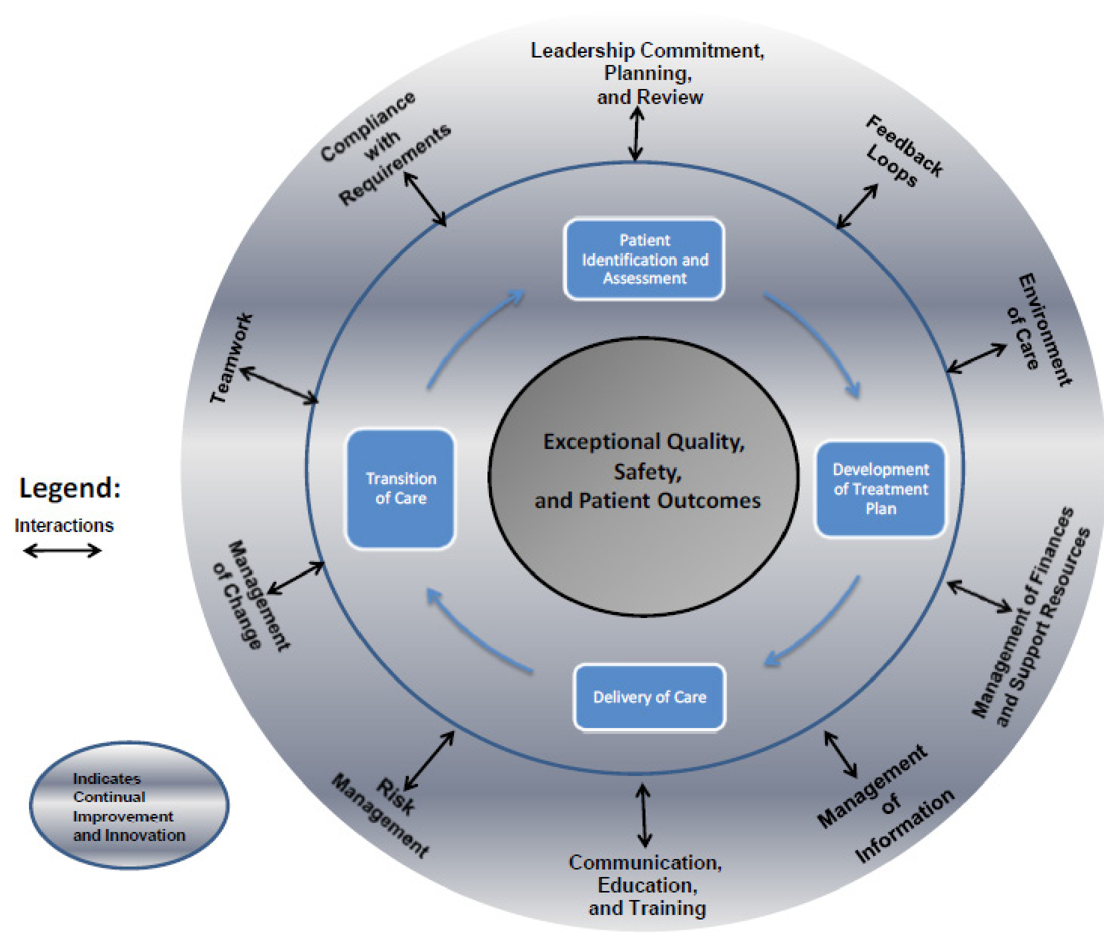

Figure 2: The ASQ QMD/HCD Hospital-Based Healthcare QMS Model

Although the overall structure of the Hospital-Based Healthcare QMS is formally presented within the model, the interactivity of the individual Quality System Elements cannot be standardized. The sequence of the patient's care delivery, as represented in the middle circle, is consistent across patient interventions, while the balance of activity among the 10 elements must be aligned anew with the specifics of each treatment or procedure. The interdependencies of processes within the QMS reflects a structured, although customized, network of activity to achieve the highest performance based on desired outcomes.

The Overlay

The integration of continual improvement and innovation is critical throughout all other aspects of the model to ensure that better patient care and business efficiency are achieved. By superimposing these two essential approaches over the three concentric circles, the model makes clear that they must be applied to all the previously described parts. Determining, measuring, and analyzing the results of the hospital's core processes makes continual improvement and innovation possible. Without this critical foundation, the model, and any advances it cultivates, may become static and fail to allow for future change.

Additional Application-Oriented Monographs for Continuous Learning

Once the ASQ Healthcare Quality Management System model was released, the committee received multiple requests for guidance on how to integrate the model into its daily operations. The HQIC professionals subsequently developed three more monographs, resulting in a total of four monographs, including a gap analysis tool, examples of tools and techniques to support each Quality System Element, and a final anthology of successful improvement projects. A description of these additional monographs follows:

- *Quality Management System Assessment.* This information presents the rationale for self-assessment and provides a standardized questionnaire and process based on the maturity level of the organization's current QMS. By conducting this self-assessment, organizations can identify the strengths and opportunities for improvement associated with their existing systems. For less mature organizations, leaders may pursue development of a new or substantially revised QMS that aligns with the previously published QMS model. Organizations with more mature systems may find specific areas that need focused attention or recognize the value of investigating best practices from other organizations (American Society for Quality, October 2018). Link to monograph 2: https://my.asq.org/communities/files/28/4901
- *Supporting Approaches and Tools.* This information shares a cross-section of data gathering, analysis, and reporting approaches that a healthcare organization can use in conjunction with its QMS. Although the practices are not an exhaustive list, they demonstrate how selecting and applying appropriate approaches and tools is instrumental for managing the QMS and ensuring that reliable information that can be interpreted properly is readily available when decisions must be made. The expert panel that created the original QMS model developed these approaches and tools, which include a wide variety of options gathered from global examples. The approaches and tools are shared with supporting instructions in formats that can be used off-the-shelf and applied immediately (American Society for Quality, 2020). Link to monograph 3: https://my.asq.org/communities/files/28/6767
- *Implementing the Healthcare Quality Management System.* This topic has a much different purpose. The fourth monograph provides examples of improvement to healthcare processes as described by participants in real projects. The contributors associate their improvement activities with one of the 10 Quality System Elements within the ASQ QMD/HCD Hospital-Based Healthcare QMS Model. Note that not all these improvement stories occurred in a traditional hospital setting. The value of the healthcare QMS model is being recognized in a greatly expanded health arena. It is useful for organizations that have embarked on a continuous improvement pathway, or that have concluded that major revisions are required, to improve their Quality Management System (American Society for Quality, March 2022). Link to monograph 4: https://my.asq.org/communities/files/28/9877

A Model for Recursive Learning

Recursive learning is teaching, testing, and repeating at the same time. In responding to a question, the answer to which you do not know, you discern the answer and then put it aside, retrieving it from long-term memory during future encounters. The Improving Healthcare series is an excellent example of recursive learning. The first monograph describes the model and teaches the basics of a quality management system and the 10 Quality System Elements. Monograph 2 provides the testing element to create a gap analysis between the organization's current system and a high-performing healthcare quality management system. Action lists created during the assessment phase highlight weaknesses in the Quality System Elements as implemented within the organization. Monograph 3 suggests quality and management tools tested by healthcare systems within each of the Quality System Elements. Monograph 4 ties the series together with case studies of successful improvement examples, thus closing the loop of teaching, testing, and repeating the skills required to implement a healthcare quality management system.

Summary

The most effective method for continuous improvement is a structured system of feedback loops, measurement, and learning. Most hospital processes are designed with measurement and reporting activities based upon federal, clinical, or organizational standards. A useful way to exploit these existing data-gathering activities is to view them as an integrated system of inputs. Taking a systems view of the data available from the full continuum of patient care allows the institution to balance and fine-tune the measurements into valuable reports that provide feedback for management decision making, learning, and improvement. For example, when data are gathered from disparate processes without looking at the interfaces from one activity to another, significant learnings may be lost. When the patient has more than one physician, the impact of test results, biopsies, medications, and treatment protocols can be impacted negatively. Too often a test result is reported only to one attending physician when the information might be critical to other diagnoses. Enhanced cross-communication and exploitation of electronic medical records are crucial for obtaining a holistic view of the patient's treatment and the overarching improvement of care within the hospital system (Peiffer et al., 2016).

This QMS and the monograph series that describes it provide a framework for evaluating current business conditions against a set of commonly accepted quality management fundamentals adapted specifically for the hospital-based healthcare business environment. The critical system elements described in this model interconnect based on the specifics of how the components of care delivery are balanced to meet individual patient requirements. The sequence of model description, assessment guides, examples of application of improvement tools, and case studies leads the learner through an effective cycle of improved results within a high-performing healthcare organization.

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This study unmasks those insights that are often hidden or concealed in the data captured by information technology systems. The mechanism of flow analysis converts captured data into critical insights regarding the dynamic movement of work through a process.

Transforming Data Into Insights Using Flow Analysis

Azizeh Elias Constantinescu

Abstract

The theoretical framework for this study is the fourth industrial revolution—Industry 4.0—as it intersects with the practice of lean and specifically with process design and development. Today, organizations are integrating technology into their processes and relying on workflow tools to navigate work through the organization structure imposed onto the work process. This observation especially applies in transactional work, back-office types of work, and knowledge work. It is important to be able to study *flow* through the processes and to build reporting that sheds light on the work being performed. These insights are often hidden in the data captured by information technology systems. This paper aims to share an approach I have developed to see and understand the elements of flow, called a flow analysis. The flow analysis converts captured data into insights about the dynamic movement of work through a process. This study focuses on transactional processes and the application of adapted manufacturing mathematical concepts, such as Little's Law, to transactional processes. The research presented does not appear to have a known precedent in literature and may be considered groundbreaking.

Key Words: Industry 4.0, Data Insights, IT-Systems, Flow Analysis, Little's Law, Transactional Process, Lean, Business Process Architecture, Organization

Problem Statement

As part of Industry 4.0, organizations are integrating technology into their processes and relying on workflow tools to navigate work through the organization structure. This observation especially applies in transactional work, back-office types of work, and knowledge work. It is important to be able to study *flow* through the processes and to build reporting that sheds light on the work being executed. These insights are often hidden in the data captured by information technology (IT) systems. Because the organization structure is imposed onto the work process, it is important to be able to map the information within an IT system. Further, sometimes more than one IT system is used to navigate work through the organization structure. Often, integrations between IT systems are questionable, which makes visibility into flow and what might be obstructing flow difficult to see. This lack of visibility results in delays and slower speed, which forces customers to wait. For many businesses that compete on speed in addition to quality, this lack of visibility can have a negative effect on service fulfillment. This paper aims to share an approach I have developed to see and understand the elements of flow, making use of the data captured in workflow tools in the form of a flow analysis.

Significance of the Research

The method described in this article is significant to business operations because it creates visibility into the flow of units of work through the process that creates value for the enterprise. Flow through a process contributes to inventory turns, which contributes to revenue and service fulfillment for customers. Understanding the elements of flow is also important because business measures its performance using key performance indicators (KPI) that are business focused (KPI_b), and oftentimes those KPI need to be translated into process performance indicators (KPI_p) that are closer to the work and more relevant to the operations found deeper in the organization hierarchical structure. Organizational failure to translate KPI_b into KPI_p restricts the actionable responses to improve business performance: increasing price, reducing head count, for example. Learning how to translate the business performance indicators into process performance indicators enables operations to improve performance. It is essential for organizations to understand the elements that make up flow through a process, as well as identify the units of work wait that result in delays. The method described in this article can be applied to any operation within a business enterprise and has merit due to this flexibility.

Many departmental operations within three distinct businesses and industries have used the approach described in this article:

- Sales
- Marketing
- Finance/credit
- Sourcing
- Ethics and compliance
- Laboratory testing operation
- Warehouse inventory management
- Engineering service operations
- Software development operations
- Audit operations
- Magazine subscription and publication
- Membership renewal

The distinct industries include the professional services industry, subscription as a service, and trade organization.

IT systems used include Oracle, Microsoft Dynamics, SalesForce.com, Open Air, WebDB, and other "home-grown" IT systems.

Theoretical Framework for the Study

The theoretical framework for this study is the fourth industrial revolution, or Industry 4.0 (Ullah, 2020, p. 1), as it intersects with the practice of lean and specifically with the practice of process design and development (Constantinescu, 2020, p. 6) within lean. Further, this study addresses the nexus among process design, "factory physics," which relies on Little's Law, and Industry 4.0. Little's Law is a mathematical theorem, a tautology (Little & Graves, 2008) that states that the cycle time to get through a system is equal to the work in progress divided by the throughput for a given system (Hopp & Spearman, 2000, pp. 223–225). This relationship is important to operations managers who are concerned with service fulfillment. According to Ullah (2020), "In Industry 4.0, humans, technology, and organizations are integrated in both horizontal and vertical manners using advanced information and communication technologies" (p. 2). This research focuses on the conversion of captured data from IT systems into insights or knowledge *about* the flow of work through a process. The term *flow* in this context refers to the continuous and dynamic progression of work through a process. This study focuses on transactional processes and the application of adapted manufacturing mathematical concepts to transactional processes.

Lean is a practice that originated in manufacturing, focusing on designing processes to enable flow and visibility and to eliminate or reduce waste in a process. In this context, the traditional wastes found in the process obstruct or hinder flow. *Waste* is considered work that is non-value-added in the eyes of the customer; the customer would prefer not to pay for that work. Traditionally, there are seven wastes: transportation, inventory, motion, waiting, over-producing, over-processing, and defects. Recently, an eighth waste, not using talent, joined the list. Each of these wastes hinders flow and adds *time* to the process. We care about this because "for customers who are concerned about time, the perception of the time spent waiting is a better predictor of satisfaction than the actual waiting time" (Davis & Heineke, 1998, p. 64). Because each of the "wastes" adds time to the process, which contributes to customers waiting, we need to study the process to understand the distinction between the time it takes to do the work and the time it takes to get through the process. In the ideal state—i.e., in a process without waste—the time it takes to get through the process is the same as the time it takes to do the work (Costanza, 1996).

The presence of waste in the process causes these two time-based measurements to vary. Therefore, waste is a barrier or hindrance to flow and slows the progression of work through the process. In the manufacturing environment, one can physically see waste within the space. In the transactional environment, professional services industries, back-office processes, and knowledge work, waste is less visibly obvious as it is hidden within the processes, which are executed not on an assembly line but rather through IT system(s) and across the organization. The challenge is to tap into the data captured in the IT systems to understand the elements of flow (Constantinescu, 2017), which will enable conversations about the hidden wastes in the process.

In his writing, Costanza (1996) explains that processes can be designed with intention to enable flow to meet customers' demands. He referred to this as "demand flow technology." Costanza writes for what he calls a "mixed-model demand" manufacturing environment, which means the process is not creating "widgets," but rather is more like a job shop in which there is variation in the mix of work coming into the organization and the steps involved in fulfilling the work. In transactional processes in the service sector and in back-office types of processes, the mix of work and the variation in steps needed to fulfill the work is analogous to Costanza's mixed-model flow.

The elements that comprise what I refer to as the *flow analysis* are adapted from Costanza's (1996) "Demand Flow Technology" concept described in his book *The Quantum Leap: In Speed to Market*. Costanza introduces Total Demand and Daily Rate. In this paper, these terms are adapted from the manufacturing context to the service/transactional context in the following way:

- Total Demand is simply called Demand (D). Costanza (1996) explains that Total Demand is the greater between forecasted order volume and actual order volume in the period in question (p. 341). This definition is adapted slightly for service/transactional processes because the operation does not rely on a forecast, per se. In the service environment, orders begin with a customer and represent incoming work. I refer to incoming work as Demand (D).
- Daily Rate is simply called Throughput (TP) (Costanza, 1996, pp. 325, 341). Costanza explains the Daily Rate as being the number of *good*-quality units produced at the end of the time period in question (p. 325). This definition is adapted slightly for the service/transactional processes because we are concerned with units of work that represent the complete fulfillment of the customer order; unlike a manufacturing process, completed units of work simply exit the process, indicating that the fulfillment is complete. I refer to units of work that exit the process as Throughput (TP), in line with the language Hopp and Spearman (2000) use in describing Little's Law.
- To address the quality dimension in Costanza's Daily Rate, I use different forms of Yield, depending on the type of transactional process.

In transactional processes, the data stored in the IT systems can be used to see units of work entering a process and units of work exiting a process. D and TP can be studied to see if the volumes of incoming and outgoing work are stable over time. It is important to see if TP keeps pace with D. If it doesn't, that means that work-in-progress (WIP) inventory is growing. Because of the relationship among WIP, TP, and cycle time known as Little's Law, if WIP inventory grows, the cycle time slows down (Hopp & Spearman, 2000). This scenario has service-level and customer satisfaction implications. Conversely, in a process that has a large WIP inventory, the reduction of WIP inventory results in faster operation. Tapping into the data stored in the IT systems to understand the flow of work through the process is helpful.

Tapping into the technology is not a new idea. The use of technology in our organizations to improve communication and solve complex problems has evolved since the 1950s (Mukherji, 2002, p. 498). Indeed, "it was in 1957 that the USA passed from the industrial era to the information era. . . . The number of employees in the country whose jobs were primarily handling information surpassed the number of industrial workers" (Mukherji, 2002, p. 498). Further, computers have been used in business areas such as planning, R&D, engineering, marketing, procurement, production, storage, distribution, operations and service, and management, in addition to budgeting simulation, automation, and as a tool for information and making decisions (Mukherji, 2002, p. 498). In addition, as the technology evolved, organization structures also evolved.

The evolution of both technology and organization structure is important to understand, as it connects to process design and flow of work through the process. The organization structure is imposed onto the work processes and those work processes are enabled by the technology in the form of IT systems. This reality is important to understand because it speaks to two blind spots that need to be recognized: (1) differing IT systems within different departments, and (2) differing levels of detail within a single IT system.

Blind Spot One: Sometimes different departments within the same organization use different IT systems to do the work and to route the work across departments. While the creation of units of work in a second system might involve manual duplicate data entry, which in itself might be considered motion waste or over-processing waste, the fact that work in the first system is no longer being acted on within that same system creates a blind spot in visibility. Many times, a department or operation might build reporting capability limited to the information contained in the single IT system. While this reporting is important and necessary, it can also be a blind spot because it fails to reveal what work might be waiting elsewhere in the different IT system. Such a blind spot exists if work is fulfilled in more than one IT system within the organization.

Blind Spot Two: This condition relates to the level of detail described within a single IT system. Many times, within a single IT system, the tool is configured to track the progress of work through different stages of the process and to enable the routing of work to different resources in the organization. Awareness of this tool configuration is important because processes exist within a business process architecture (BPA), which means the level of detail that needs to be understood about the work is not limited to the highest level, nor is it limited to the workflow routing rules programmed into the IT system. When businesses rely only on the stage level captured in the workflow tool, they inadvertently oversimplify their understanding of the work content involved to fulfill the service. For example, a basic "lead to order" process in an organization might be configured at the highest level to have four high-level phases, yet at the point of work, which is where the human being interacts with the process, there might be 50 steps to move the unit through the process entirely. When the reporting in the organization is limited to the high-level phases captured in the IT system, it fails to reveal the actual complexity of the work at the point of work, which is deeper in the BPA.

Although this article does not expressly provide specific corrective recommendations for the two blind spots, it does address the method of mapping the information flow for a process in order to see the elements of flow: demand, throughput, work in progress, turnaround time, aging, and yield. To that end, this paper aims to address the following questions: What elements of flow are important to see using the data captured by the IT systems? Can we track key process performance indicators (Costanza, 1996) from the data captured in the IT systems? This is important to operations because businesses rely on workflow tools to route work through the organization, and therefore it is requisite for businesses to track and monitor the work through the process and through the organizational structure.

Method

In a *flow analysis*, we are interested in seeing the volume of work entering the process, exiting the process, and aging in the process. We are interested in understanding how long it takes to get *through* the process. We want to understand *where* units of work might be stuck in the process, which means waste is present in the process. We are interested in understanding how well client due dates are being met. Each of the elements of flow listed below can be studied using the data captured in the IT system for unique transactions in the system.

To begin, the following elements of flow can be seen:

- Demand (D) – Incoming units of work or units of work entering the process.
- Throughput (TP) – Outgoing units of work or units of work exiting the process.
- TP minus D – For a given period, which is greater: TP or D? This sheds light on the growth or shrinkage of WIP.
- Work in Progress (WIP) – Units of work that have entered the process and have not yet exited the process.
- Turnaround Time (TAT) – The time it takes to get *through* the process from the time of entry to the time of exit.
- Aging – The amount of time the WIP is open, or alive, in the process.
- Process design efficiency – Time it takes to do the work divided by the time it takes to get through the process (Costanza, 1996). The denominator in this equation is the TAT.
- Yield in terms of Met Due Date – The capability of the process to complete on or before the specified due date, divided by the total units that exit the process in a period.
- Yield in terms of Win Rate (limited to a sales process) – The proportion of transactions that exit the process in the "won" state, divided by the total transactions that exit the process for a period.

To conduct a flow analysis, the first step is to develop the process architecture with IT system date stamp mapping. The objective of this visualization is to identify the labels and language used in a given configuration that supports a process. The intention is to capture the high-level phase, the date stamps as each occurs along the flow, unique identification numbers at the point where each is created in the system, and transaction status changes as a unit of work moves through the process. Getting this information involves working with individuals who

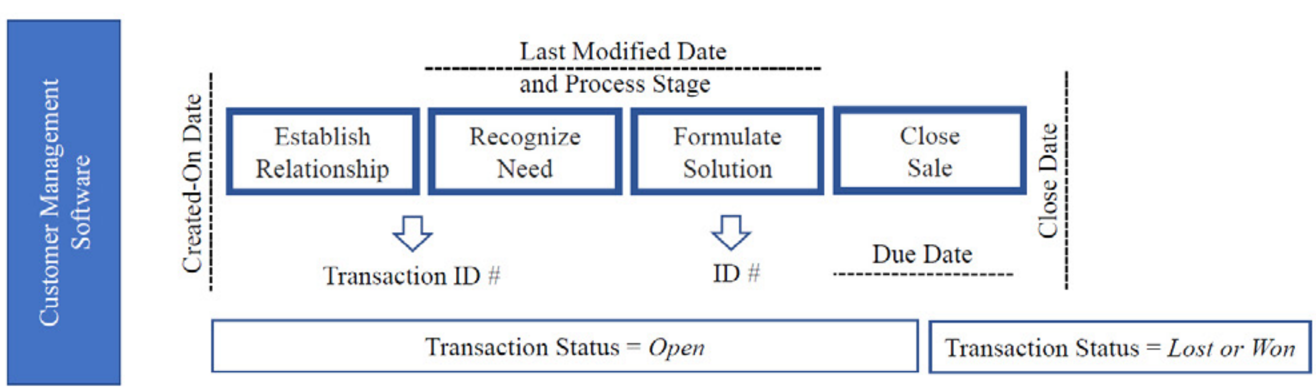

Figure 1: Process Architecture with Date Stamp Mapping

understand the database configuration and data storage structure, IT resources with access to retrieve data from the server, and the individuals who actually do the work in the process. The process architecture with the date stamp map needs to be documented at the phase level (L0), sometimes called a Stage in the BPA (Constantinescu, 2020, pp. 16–20). Refer to Figure 1 as an example of a generic lead-to-order process with date stamp mapping. In Figure 1, note that *time* moves from left to right, which means that certain work must be completed before some of these dates and fields are captured in the IT system. This understanding is critical because it is based on this that *logic* can be used to study elements of flow through the process.

Once the date stamp process map is created, the elements of flow can be studied. For the process depicted in Figure 1, demand can be seen using the Created-On date. The count of units entering the process each week can be aggregated and plotted in an I-MR Control Chart to see if D is consistent and predictable, or if there are seasonal patterns in D. Similarly, to understand TP, the count of units exiting the process can be seen based on the Closed date. There might be a repeating "hockey stick" pattern to TP (Costanza, 1996). This hockey stick pattern might appear by day of the week, week of the month, or month of the year. This observation is important because it reveals behavioral patterns in the operation. It is helpful to look at the difference between TP and D each week to get an understanding of the WIP. If TP is greater than D, WIP in the system is shrinking. If TP is less than D, WIP is growing in the system (Costanza, 1996). This observation is important because of the relationship between WIP and the time it takes to get through the process (Little & Graves, 2008).

In addition to understanding D and TP, we want to see the actual WIP inventory in the system. To see WIP, count the number of transactions with a Created-On date where the Closed date is null. This count is an aggregate of the WIP and is a "snapshot" in time. *Aging* of the WIP can be quantified based on the difference between the date the report is retrieved from the system minus the Created-On date for the transaction. Once Aging is quantified for open transactions, visibility into the approaching due dates can also be created.

For all transactions that have closed, the TAT can be quantified. TAT is what Costanza (1996) refers to as "total time" and consists of all the value-added time plus the non-value-added time (p. 46) in the process. TAT is also what Little's Law refers to as cycle time. As explained previously, Little's Law is a mathematical relationship that states that the cycle time to get through a system is equal to the work in progress, divided by the throughput for a given system (Hopp & Spearman, 2000, pp. 223–225). TAT is the time it takes to get through the process from the point of entry to the point of exit. TAT is historical in that a unit of work must exit the process before one can calculate TAT using the date-difference calculation. TAT is determined by taking the difference between the Closed date and the Created-On date. Sometimes, there might be a parent–child relationship in the data that corresponds to a single customer order. If this is the case, that relationship might need to be considered when calculating the TAT on closed transactions. For example, a single order might have multiple line items. In this case, to understand the maximum TAT at the order level, use the *minimum* Created-On date and the maximum Closed date. This date difference represents the *maximum* TAT associated with the order.

In addition, when we understand the time it takes to do the work and compare that to the time it takes to get through the process (TAT), we are able to understand what Costanza (1996) calls "process design efficiency" (p. 46). In the transaction environment, the process design efficiency concept is adapted slightly. In the numerator, include the work content time (WCT) for the process, which is the time it takes to do the work in the process, including value-added actions and business-value-added actions. In the denominator, include the overall TAT for the process. The TAT is the WCT plus waiting time. The ratio of WCT/TAT is multiplied by 100 to understand the process design efficiency (sometimes called process cycle efficiency). This view of efficiency is important because it deals only with time. It is not a measurement of revenue per headcount, nor is it a measurement of units per person. Both the numerator and denominator deal with time related to the process. This is an important translation from typical input/output definitions of efficiency to process-focused definitions of efficiency. In the ideal case, process design efficiency is 100% (Costanza, 1996).

In addition to the above elements in the flow analysis, we can also understand the Yield. Yield is a key process performance indicator (KPI_p) (Constantinescu, 2020, p. 99) and is a type of process capability measurement taken at the end of the process. Conceptually, Yield is the number of good units exiting the process, divided by the number of total units exiting the process; this ratio is then multiplied by 100. In the transactional setting and depending on the type of process, Yield might be defined in different ways. In Figure 2, there are two forms of Yield that are worthy of study.

The first is Yield in terms of *Met Due Date %*. The Met Due Date % can be plotted in a P-chart each week. It tracks the proportion of units that closed on or before the due date, divided by the total units that closed in the period. From Figure 2, the Met Due Date % can be seen by comparing the Closed date to the Due date for each transaction that exited the process.

A second Yield measurement for this process is in terms of the proportion of transactions that are "won" instead of "lost." This form of Yield is sometimes referred to as *Win Rate* and is typically for a sales type of process. Win Rate can be seen by plotting the proportion of transactions that exit the process in the "won"

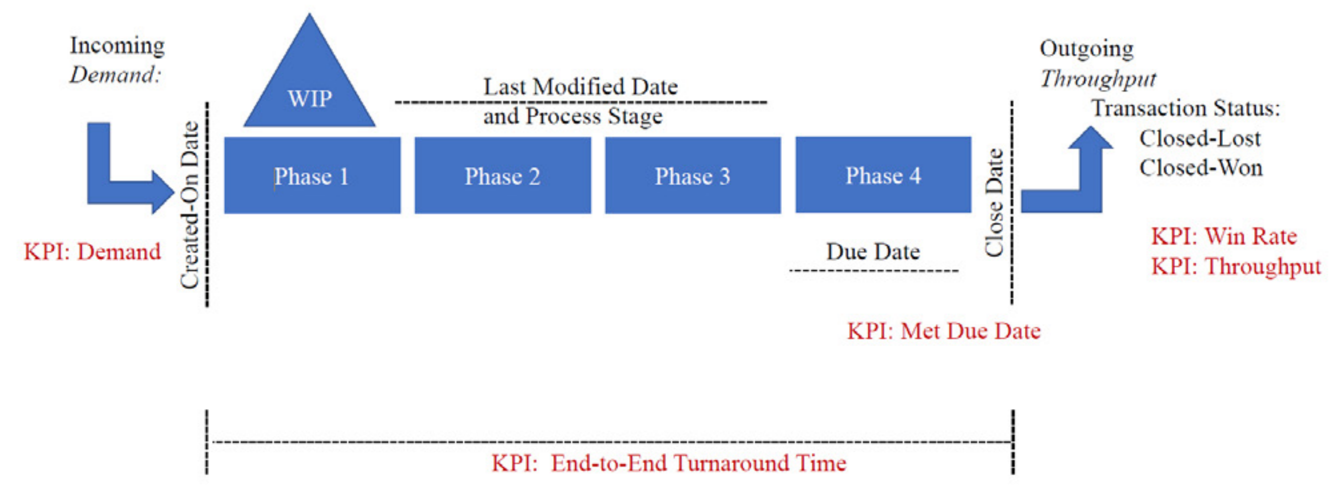

Figure 2: Flow Analysis Framework

state, divided by the total transactions that exit the process for a period.

The elements of flow can be studied from the data captured and extracted from the IT system. Figure 2 shows a general flow analysis framework with the elements that need to be studied, as well as some of the raw data fields that need to be extracted from the system in order to do the study. In addition to the KPI_p (D, TP, Win Rate, Met Due Date, TAT), the work in progress inventory can be seen for each stage in the process.

Results and Analysis

The results presented below refer to the study period 2020–2021 regarding a professional services industry with over 10,000 employees worldwide. From the extracted data, it is possible to understand flow of units through the process and also define and measure key process performance indicators. While the data were extracted from the IT system and analyzed according to the method described above, they were filtered in three different ways:

- The entire dataset was used to study Demand.
- A subset of the dataset was used to study WIP corresponding to an open Transaction Status.
- A subset of the dataset was used to study TP, TAT, and Yield corresponding to transactions that exited the process.

Figure 3 contains the Flow Analysis Summary Diagram. In this process, there are four stages: Establish Relationship, Recognize Need, Formulate Solution, and Close Sale. Each transaction entering this process is created in the IT system and a Transaction ID Number is generated. The date stamp mapping for this process reveals four dates: Created-On date, Closed date, Due date, and Last Modified date. Based on these dates, along with the transaction status, process stage, and unique identification numbers, the flow analysis was conducted.

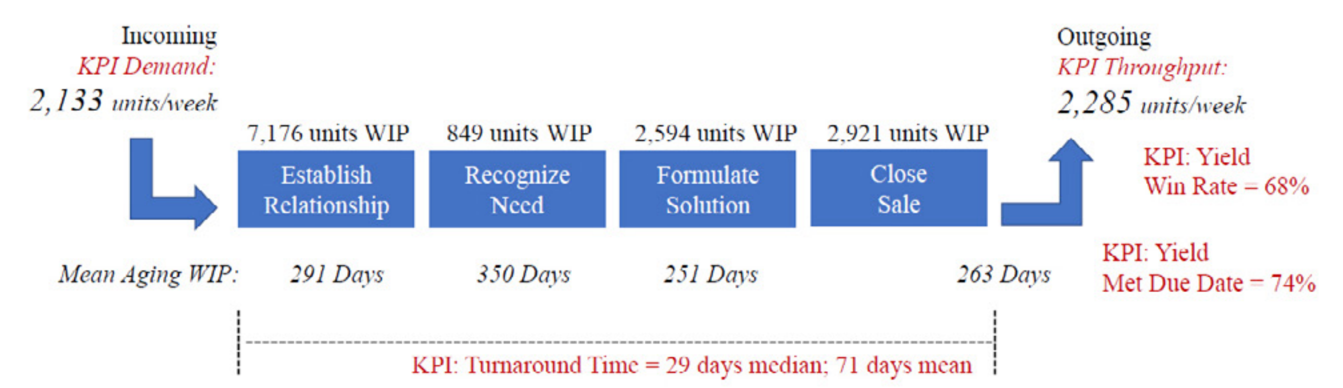

Figure 3: Flow Analysis Summary Diagram

Historically for this process, 2,133 units enter each week, and 2,285 units exit each week. The average time it takes to get through the process is 71 days (29 days median). When looking at the throughput of the process, we can see that the Win Rate is 68% and that this process meets due dates 74% of the time. There are 13,540 units of WIP in the process distributed across the stages. The current WIP is aging. The magnitude of the aging exceeds the historical average TAT. We cannot discern from these data whether the WIP is "phantom" WIP and might need to be cleaned out of the IT system. We can only see that the WIP is high and the aging is high, which will lead to longer TATs (Little & Graves, 2008).

Demand was counted weekly based on the Created-On date and plotted in an I-MR chart staged by year. The weekly incoming demand was 2,133 units per week in 2021. All transactions in the data set were included in studying demand because, regardless of the Transaction Status, the unit of work entered the process at a specific point in time.

The units that exit the process are considered TP, which can be seen based on the Closed date for all transactions *excluding* those with an open Transaction Status. The Transaction Status is important to consider when quantifying TP because some IT systems have a date populated in the Closed date field, which might represent an estimated due date in the future instead of reflecting the actual date the transaction closed. To discern the difference, rely on the Transaction Status. The average weekly TP count in 2021 was 2,285 units per week.

Using the TP dataset, the TAT was quantified for each transaction using the difference between the Closed date and the Created-On date. In 2021, on average, it took 71 days to get through the process. Median TAT indicates that it took 29 days to get through the process.

In addition to D, TP, and TAT, we can understand the WIP in the system using the dataset that corresponds to an open Transaction Status. At the snapshot in time when the data were extracted from the IT system, this process had 13,540 units of WIP, 71,103 units that were "lost" and 144,178 units that were "won." For the open transactions, this view does not reveal *where* in the process the units are; it simply reveals how many units are open, representing *work in progress*. Using a basic pivot table, the WIP can be distributed by Stage in the process. At the time of this study, 7,176 units are in the first step, Establish Relationship; 849 units are in the second step, Recognize Need; 2,594 units are in the Formulate Solution step; and 2,921 units are in the last step, Close Sale. By taking the difference between the date the data were pulled from the IT system and the Created-On date, we can understand the average aging of the WIP in each stage of the process. This aging represents the total age of the WIP, not the time it spent in each stage.

Two forms of Yield were studied using the dataset for TP. The first way to understand Yield for this process is the Met Due Date %. For this process, when we compare the actual Closed date to the Due date, we can understand how well the process meets the target date. The numerator represents the count of units that closed on or before their due date. The denominator represents the count of all units that closed in the period in question. In the aggregate, we can see that the process can meet the due date 74% of the time. When plotted weekly in a P-chart, we can see that the process's ability to meet the due date is *unstable.* The data are silent on why the process is unstable. In this context, an unstable process might be significant because customers care about timelines and due dates. This KPI_p constitutes an area for continuous improvement.

Because this is a sales process, a second way to measure Yield—Win Rate—can be seen from the same dataset. Win Rate aims to understand the percentage of units exiting the process that are considered "won," divided by the total units exiting the process in the same period; that ratio is multiplied by 100. The overall Win Rate can be determined through the count of transactions with a status of Closed "won," divided by the count of transactions closed in the period in question (where the count of transactions closed in the period is the sum of Closed "lost" and Closed "won" transactions). From these data, we can see that the "won" count is 144,178; the total count is the sum of "won" plus "lost" transactions, which is 215,281. This ratio is expressed by (144,178/215,281) × 100 = 67%. Understanding the overall Win Rate for the entire study period does not let us see if this Win Rate is consistent over time. To see if the Win Rate is stable over time, plot the data in a P-chart. In this process, the average weekly Win Rate is 67% over time and is statistically *unstable*, a fact that is not articulated via the data. In this context, the instability of the process to win the sales has business implications and might warrant improvement of the sales process.

The insights derived from the flow analysis also catalyze questions for continuous improvement efforts to better serve the customer. In this example, one might ask:

- Can the Win Rate be improved?
- Can meeting the Met Due Date % be improved?
- Can the TAT be reduced?
- What wastes are in the process that are contributing to the long aging?
- Can we study the touch time at each step to understand process design efficiency?
- Do we have enough capacity to handle the volume of work?

These are important questions to ask. A business measures itself in terms of business performance indicators such as revenue, cost of revenue, revenue per head count, and operating profit. Yet many of the business performance indicators relate to the processes that represent the work that gets done through the organization. Converting the data into insights that reveal the flow of units of work through the process translates the business performance indicators into process performance indicators (Costanza, 1996). These are measurements of the process directly and can be improved continuously because they are closer to the work itself and therefore are actionable at an operations level.

Conclusion/Discussion

Exceedingly today, businesses rely on IT systems to route transactional work through the organization for fulfillment. The process used in transactional work can be hidden in the IT system. The flow analysis method described here creates visibility into the flow of units of work through the process. This visibility catalyzes continuous improvement to reduce waste in the process as well as creates visibility into what work needs to be done on the units that are in the system and that are aging. The benefit to business operations is reducing TAT and improving process efficiency.

The factory physics principles from manufacturing, such as Little's Law and Costanza's "Demand Flow Technology," also apply in the transactional environment. In his work, Costanza adapted the principles from manufacturing for a mixed-model manufacturing environment. Transactional work and knowledge work is similar to the mixed-model Demand Flow Technology adapted only for the service environment. The work does not happen in a physical manufacturing facility but rather in and through the IT systems. Our task is to be able to make visible what is hidden in the IT systems so that the organization can continuously improve its processes for both customers and employees.

While this study makes good progress in creating visibility into flow, it does have limitations. This study does not address process mapping deeper into the BPA. This is an area that needs more explanation, especially when applied in transactional and knowledge work. What actually gets standardized in the process when it comes to transactional and knowledge work? This study also does not address studying flow across more than one IT system. This is an important area that needs more research. A single transaction of work can be aging in more than one IT system within the organization. How can we extract the data out of the IT systems to reveal where transactions are stuck waiting as a result of the organizational handoffs that coincide with a change in IT systems? This is particularly important to improve process design efficiency. Although mentioned as an element in the flow analysis, process design efficiency is not addressed in this study. More research is needed in adapting this KPI_p for transaction and knowledge work processes.

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Call for Papers

The *Journal for Quality Perspectives in Knowledge Acquisition* (JQPKA) is a double-blind, peer-reviewed journal that serves a triumvirate of educational research needs: Higher Education; Workforce Development and training in all fields (education, business, medicine, science, law); and K–12. If you are doing something innovative, interesting, and of benefit to the education community, JQPKA wants to know. We are interested in articles from diverse disciplines, which are research-intensive and also case study-focused. Methodologies can include quantitative, qualitative, and mixed-method approaches.

Continuing research and exploration of innovations that lend to continuous process improvement and quality enhancements in the field of education, as education relates to all disciplines and all organizations, are critical, especially during these challenging times that have required modifications in the educational/business delivery modality; crisis management plans; supply-chain reconfigurations; enrollment crises in higher education on both the community college and university levels; academic program excision; impacts on reductions in state budget allocations; concerns regarding the quality of mathematics, science, and English proficiency skills taught on the K–12 level; teacher preparation programs; Ph.D. attrition/retention; graduate advising; preparation for directing dissertations/theses/special projects; the ethics of doctoral advising and writing support; community college collaborations with universities and high schools to support advanced degree initiatives; STEM internships and business co-ops; and accelerated academic programs, among others. Many of these issues relate to the challenges of student retention, career preparation, success, and degree completion on all levels. The disciplinary practice of education is undergoing stimulating changes that educators in all fields, as innovative change agents, must be prepared to address, and the conduit to these changes lies in the collaborations and the learning communities that educators create in an effort to implement purposeful change via their research.

JQPKA is interested in providing such researchers with publication opportunities in an effort to disseminate their findings to all education practitioners. Research findings that relate to any of the elements expressed above, as well as all elements that interface with the enhancement of learning within all learning facets, are all welcome topics.

If you are uncertain whether your topic aligns with JQPKA's publication interests, please send an abstract to the Editor, Dr. Marianne Di Pierro, at her email address: JQPKAEditor@gmail.com or marianne.dipierro@wmich.edu.

Journal for Quality Perspectives in Knowledge Acquisition

Author Guidelines

The *Journal for Quality Perspectives in Knowledge Acquisition* (JQPKA) is a double-blind, peer-reviewed journal that is published online by the Education Division of the American Society for Quality (ASQ). The Journal engages the education community in an academic, scholarly conversation regarding significant topics related to continuous process improvement and the identification of best practices through which quality is anchored. The Journal considers manuscripts that have not been published previously and that are not under consideration elsewhere.

Topics of Publication Interest: JQPKA publishes manuscripts of interest to educators in a diverse spectrum of disciplines. It serves a triumvirate of educational research needs: Higher Education; Workforce Development and training in all fields (education, business, medicine, science, etc.); and K–12. The Journal welcomes manuscripts that encompass innovative techniques, applications, theories, ideas, and approaches that are of benefit to the community of educators. *We are interested in articles from diverse disciplines that are research-intensive and also case study-focused, that intersect with any aspect of quality and quality performance in education, and that are evidence-based.* Methodologies include quantitative, qualitative, and mixed-method approaches. Some examples of potential topics include the following: curriculum reform to enhance student learning outcomes; applying improvement science within teacher preparation programs; incorporating biomedicine and engineering in the Ph.D./M.D. curricula to solve complex interdisciplinary health problems (tensile strength of sutures in ligament repair, printing bone, analysis of leukocyte extravasation); teaching in the 21st-century learning environment; workforce development in hospital systems using Vascular Access Specialist Teams (VAST); employing the Malcolm Baldridge Criteria for Performance Excellence within the university system; community college partnerships with universities and high schools to further advanced degrees; among many others.

General Information: MANUSCRIPT FORMAT

Manuscript Word Length and Formatting: Manuscripts submitted to JQPKA should be between 3,500–5,000 words, written in Times New Roman (12 point font); submitted only as a Microsoft Word document; and formatted in APA style, 6th Edition. The manuscript should contain an Abstract, as well as Key Words that reflect its content. It is recommended that authors/co-authors submit final working drafts to a professional editor *prior to submission to JQPKA* to ensure that their manuscripts are prepared according to these specifications, as well as those that appear under the **Manuscript Content Considerations** heading in this document.

Figures, Tables, Charts, Diagrams, Illustrations, Photos: No more than three (3) may be included in a manuscript. Prepare figures, diagrams, charts, and illustrations only as PDFs and in no other format. Tables are to be formatted in Microsoft Word. *All figures, tables, charts, diagrams, illustrations, and photos are to be created as separate files, and are not to be included in the manuscript that is being submitted, nor are they to be included at the end of the manuscript.* Make certain to clearly label all figures, tables, charts, diagrams, illustrations, and photos with their correct number and title and center this information at the bottom of the respective figure, table, chart, diagram, illustration, or photo. Also, indicate in the manuscript the placement of these elements and highlight using red highlighting. For example:

PLACE FIGURE 3 HERE
Figure 3: Nationwide Doctoral Attrition

PLACE TABLE 1 HERE
Table 1: Annual Review Policies by Department

Education Division
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Journal for Quality Perspectives in Knowledge Acquisition

Author Guidelines

MANUSCRIPT CONTENT CONSIDERATIONS:

Writers should ensure that:

- Research expressed in the manuscript makes a contribution to the discipline.
- Methods applied align with the research questions and answer them.
- Manuscript reflects methodological and conceptual rigor.
- Outcomes/findings result logically and accurately from the data.
- Thesis of the manuscript is met.
- Figures, tables, charts, diagrams, and illustrations actually demonstrate key narrative points.
- Manuscript is well-organized, readable, clear in presentation, and error-free.
- Title of the manuscript equates with/describes its content.
- Internal citations in the narrative align with the references.
- Educational practitioners can benchmark against this study if they so choose.
- Terms are fully identified in the first reference prior to the use of acronyms for this term.
- Use of jargon has been eliminated from the manuscript.
- Exact names of the author/co-authors appear on the manuscript in the exact preferred order.
- Definitions of terms are provided to enhance readers' understanding of concepts.

OTHER REQUIREMENTS:

Along with their manuscripts, authors and co-authors are asked to submit a headshot photo (in jpg ONLY), as well as a brief biography of no more than 100 words. *These 2 documents (Photo and Bio) are to be submitted as 2 separate documents: Please do NOT combine them into one document.* Please ensure that all bios reflect the author's highest credential: Ph.D., Ed.D., M.A., M.S., etc.

SUBMISSION PROCEDURES:

MANUSCRIPTS: Submit manuscripts to Dr. Marianne Di Pierro, Editor, at the following email address: JQPKAEditor@gmail.com. Include all accompanying figures, tables, diagrams, charts, and illustrations as separate attachments, in this same email.

PHOTOS & BIOS: In a separate email (a second email), please submit photos and bios (2 separate documents) that reflect in the subject heading the following: (1) the full name of the lead author, (2) the identification of the subject (Photos & Bios), and (3) an abbreviated title of the article, and send to JQPKAEditor@gmail.com. Refer to the example below:

Peter Genovese et al. Photos & Bios: "Illuminating the Pathway"

For questions or concerns, contact Dr. Marianne Di Pierro at marianne.dipierro@wmich.edu AND also at JQPKAEditor@gmail.com