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Advancing Data Literacy: Mapping Business Data Literacy Competencies to the ACRL Framework

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Advancing Data Literacy: Mapping Business Data Literacy Competencies to the ACRL Framework

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Abstract

The relationship between data literacy and business librarianship continues to grow in relevance as the conversation intensifies in higher education and the business world. Establishing shared vocabularies and mappings to foundational library professional documents is essential to moving the discourse forward. This article presents a mapping between seven baseline business data literacy competencies and the *ACRL Framework for Information Literacy for Higher Education.*

Keywords: Data Literacy, Business Librarianship, Academic Libraries, Big Data, Business, Information Literacy

Word count: 7941

Introduction

Previously, Pothier and Condon identified seven baseline data literacy competencies to help prepare business students for the workforce (Pothier & Condon, 2019). The business data literacy competencies grew out of an exploration of the conversation occurring in both scholarly research and professional business literature that examines the gaps in student and employee knowledge around data and data literacy. Business schools have a mission to educate students for the workforce. Therefore, the competencies reflect data literacy requirements for working professionals at an entry or broad level within an organization, recognizing that greater levels of competency would be developed in areas as needed by job type or gained through experience. The development of the baseline competencies particularly looked at stakeholders in data literacy education and how librarians specifically could incorporate data literacy support for business students into their work. Pothier and Condon's proposed competencies are:

(1) Data organization and storage

(2) Understanding data used in business contexts

(3) Evaluating the quality of data sources

(4) Interpreting data

(5) Data-driven decision making

(6) Communicating and presenting effectively with data

(7) Data ethics and security

Recent literature reiterates the value and relevancy of increasing data literacy efforts in business contexts. In 2020, the Special Libraries Association published a special edition of *Information Outlook* about data literacy. In 2021, the *Journal of Business and Finance*

Librarianship published a special double issue on "data" and featured many scholarly articles on business librarians' work towards increasing data literacy. However, research still points to gaps in data literacy within business education. Kalinowski and Hines noted in their article "Eight Things to Know about Business Research Data" that even with libraries' developing interest in data services, it has not been widely broached in the context of business librarianship (2020). Jefferson similarly notes that the literature does not clearly demonstrate a connection with "how librarians have evolved in this environment of data literacy (2020)." This is further echoed by Mendez-Carbajo (2020) noting that data is central to the study of economics, but the development of data literacy skills are missing from the literature involving economics education. Jefferson (2020) also published a study on the data literacy educational practices of business and economics librarians, examining the ways that librarians integrate data literacy into their teaching. Beyond the scholarly conversation amongst business librarians, the relevancy of data literacy to business remains forefront in professional discourse as indicated by Jordon Morrow's recent book *Be Data Literate: The Data Literacy Skills Everyone Needs to Succeed,* which offers practical advice for businesses to integrate data literacy into their workplaces (2020).

As research and scholarly conversations develop about the relationship of data literacy to business librarianship, establishing shared vocabularies and mappings to foundational professional documents is essential to moving the discourse forward. Because the *ACRL Framework for Information Literacy for Higher Education* (ACRL, 2015) is a core document for academic librarianship and the discipline's driving force behind library instruction, mapping the business data literacy competencies to the *ACRL Framework* establishes a contextualized conversation for greater adoption, evolution, and adaptation. In this article, we expand the

conversation by conducting a mapping between the business data literacy competencies and the

ACRL Framework. The mapping further articulates the relevancy of the business data literacy

competencies to business librarians and the relationship of data literacy to the foundations of

librarianship. We first approached this mapping by reviewing literature and conducting a deep

reading of the *ACRL Framework* and the business data literacy competencies. Next, we reflected

on potential scenarios, in both the classroom and workplace, for applying information and data

literacy skills. For each ACRL Frame we provide a business data literacy interpretation and a

practical and/or classroom application. We conclude with a discussion of observations about the

ACRL Framework and the business data literacy competencies that arose from performing this

exercise with particular attention to expanding application of each Frame in non-academic

contexts.

Literature Review

This article reflects perspectives from business information literacy literature, data literacy

literature, and ties both to the *ACRL Framework for Information Literacy for Higher Education*.

To establish foundational understanding of the *ACRL Framework*, this article also provides a

brief history and context on the standards for practice (for a more in-depth analysis of the *ACRL

Framework*, we recommend Foasberg, 2015).

Standards for Practice

In 2000, ACRL adopted the *Information Literacy Competency Standards for Higher Education*

(the *ACRL Standards*). The *ACRL Standards* defined information literacy as a central tenet of

library and information science and provided "guideline[s] for librarians and educators in

assessing information literacy skills and creating curricular content" (Ariew, 2014). The *ARCL

Standards* initiated a paradigm shift for librarians who were encouraged to move from

bibliographic or library skills instruction to information literacy instruction that embraced

information seeking using multiple technologies and as a lifelong set of skills.

In need of an update, ACRL replaced the *ACRL Standards* with the *ACRL Framework for*

Information Literacy for Higher Education (the *ACRL Framework*) in 2016. The *ACRL*

Framework differs from the *ACRL Standards* in that it is less prescriptive and built on

"interconnected core concepts, with flexible options for implementation" (ACRL, 2015). In

addition to addressing a rapidly changing information environment through the 2000's, the

ACRL Framework also tried to address some of the criticisms of the *ACRL Standards* and in turn

introduced another shift in the approach to information literacy. The less prescriptive and flexible

nature of the *ACRL Framework* "supports experimentation with learning principles from various

disciplines and frees librarians to adapt their teaching in ways that the previous prescriptive

ACRL Standards did not allow" (Pullman and Zilinski, 2017). The *ACRL Framework* too had its

critics, who struggled with interpretation and implementation (Berg, et al., 2015; Latham, Gross,

& Julien, 2019; Wilkinson, 2014). While the generalizability of information literacy is helpful to

librarians, it being positioned parallel to other disciplinary knowledge often makes

contextualizing the concepts challenging (Kuglitsch, 2015). And in many cases, librarians are

being asked to instruct students across multiple disciplines who are being socialized into the

modes of thinking of their major discipline.

Business Librarians and the ACRL Framework

Some research directly addresses business librarianship, information literacy, and the *ACRL*

Framework. For example, some literature discusses the ACRL Frames' concepts in application

to business information literacy. Jefferson (2017) links the *ACRL Framework* to Fink's

Taxonomy for Significant Learning, contextualizing the ACRL Frames with the Taxonomy in a

credit bearing business research class. This research demonstrated the application of the *ACRL Framework* to business information literacy lesson planning, especially as it applies to implementing the learner-focused Taxonomy. In a 2021 article, Liu, Guth, and Stonebraker discuss the Frame "information has value," and examine that Frame from three different approaches in the classroom. The article demonstrates how business librarians can integrate the *ACRL Framework* into their classroom teaching practices through several interpretations. Their literature review also notes that "Information Has Value has been found to be salient for [both] business librarians and business faculty (2021)."

There is a focus in the existing literature on the challenges that business librarians face with incorporating the *ACRL Framework* or the *ACRL Standards* into their instruction. In a survey of business librarians Guth and Sachs (2018), noted in their results, "when asked to comment, many librarians said that they were prevented from incorporating the *ACRL* Standards or Framework into their business information literacy instruction because they were not allowed sufficient instruction time or because business faculty requested the session be limited to a demonstration of the resources." Important findings from their research include how practices and responses by business libraries and librarians have changed between the issuing of the two documents and the decade separating them. Other key takeaways from this study point out the lack of business faculty familiarity with the term "information literacy". This term is notably absent in business literature and the vocabulary of working business professionals. Additionally, business schools are accredited by the Association to Advance Collegiate Schools of Business (*AACSB)*, and so business librarians must often think of mapping their work to those accreditation standards instead of the *ACRL Framework* (Guth & Sachs, 2018).

Critical business information literacy aligns well with the *ACRL Framework* but has been a difficult area for librarians to integrate into their classroom teaching due to the limits of the one-shot experience (Stonebraker, 2016). Stonebraker discusses how librarians could teach "decision management" instead of database access demonstrations to business students. Stonebraker notes that demonstrating access without informing context leads our patrons, students, and stakeholders to making worse decisions (2016). Another key takeaway from Stonebraker's research in this area points to the *ACRL Framework* and its associated knowledge practices in creating a shift towards developing students' abilities to formulate questions and focus on reflective discovery through their learning, while placing an emphasis on contextualizing the learning into both scholarly and professional environments (2016). Stonebraker, et. al discussed critical business information literacy in their 2017 article, examining the nuances of business information and the importance of learning how to use it, including how to "think deeper about information, bias, and the businessperson's role in society" and what ethical practices are involved with the cycle of business information. These sentiments align well to the proposed business data literacy competencies (Pothier and Condon, 2019), which also emphasize skill development and literacy rather than focusing on access to resources.

Data Literacy and the ACRL Framework

Both the *ACRL Standards* and the *ACRL Framework* acknowledge the inclusion of data as part of information literacy. The *ACRL Standards* quite broadly recognized data as a unique format that needs to be evaluated, located, and used ethically and effectively. The *ACRL Framework* carries this thinking forward in the introduction where the authors advocate those learners "have a greater role and responsibility in creating new knowledge, in understanding the contours and the changing dynamics of the world of information, and in using information, data, and

scholarship ethically" (ACRL, 2015). Although data is acknowledged, it is not an emphasis of

either document. In 2013, ACRL published a white paper that looked at the intersection between

scholarly communication and information literacy. The report argued "that these intersections

indicate areas of strategic realignment for librarians in order for libraries to be resilient in the

face of tremendous change in the scholarly information environment" (pp. 1). Digital literacies,

in particular data literacy, was one of the three strategic intersections.

It is generally agreed that data literacy is closely related to information literacy. Koltay

(2015) explores this relationship comprehensively in his piece *Data literacy: in search of a name*

and identity. In fact, many of the extant data literacy competencies, developed prior to the release

of the *ACRL Framework*, were inspired by the *ACRL Standards* (Calzada Prado & Marzal, 2013;

Carlson, et al., 2011; Schneider, 2013). For example, the data information literacy (DIL) project

team articulated the DIL objectives in terms of the *ACRL Standards* and found significant

conceptual overlap concluding that "data information literacy does fall within the scope of

previous library practice." While the *ACRL Standards* primarily focused on learner-as-consumer

of information and not on learner-as-producer of information, the DIL project team stressed that

for data information literacy competencies, learners need skills in being a both consumer and

producer of data (Carlson, et al. 2011). This duality was later addressed in the revised *ACRL*

Framework.

Data literacy instruction is also aligned with information literacy instruction (Bauder,

2021; Beauchamp and Murray, 2016; Cox, 2018). Frank and Pharo explained that "[d]ata

information literacy—the skills needed to understand, use, manage, share, work with, and

produce data—reflects the confluence of data skills with information literacy competencies" (pp.

526, 2016). When the draft *ACRL Framework* was in circulation, Bresnahan and Johnson (2014)

made a compelling presentation about integrating information literacy instruction and data

literacy instruction by mapping the UK Data Archive Lifecycle to the draft ACRL Frames. Macy

(2016) mapped the data literacy competencies presented by Calzada Prado and Mazal (2013) to

the *AACSB Business Accreditation Standards* and noted in the subsequent article that "[t]he

emphasis on data in the AACSB standards in conjunction with employer demand for skilled

workers makes it clear that integrating DIL into the curriculum is important" (Macy and Coates,

2016).

Proposed Mapping

From the literature review, we have highlighted that while negotiating the A*CRL Framework* can

be challenging, understanding how it aligns with other standards and competencies and how it

can be contextualized using disciplinary content is something that librarians have found valuable.

Part of this value, as we have noted, is about appreciating the role of a shared vocabulary and a

shared connection between our work as librarians. While an imperfect document, the A*CRL*

Framework provides a reference point for conversations about these connections.

The A*CRL Framework* is made up of six threshold concepts or ACRL Frames. The

ACRL Frames provide librarians the opportunity to "use a set of threshold concepts to frame the

large, meaningful questions that students need to address to become sophisticated researchers"

(Kuglitsch, 2015, p.460). Each Frame is briefly described and presented with several knowledge

practices and dispositions. Knowledge practices and dispositions are akin to learning outcomes

associated with each Frame and have to do with one's ability and capability, respectively. The

knowledge practices express sets of skills for working with information and the dispositions

express a mindset for working with information. The ACRL Frames embrace the student as both

a consumer and creator of information stressing engagement with information and self-

awareness about one's process. This is particularly relevant when exploring data literacy skills in which a student can both locate and reuse existing data and create, collect, or generate their own data.

For this mapping exercise we were generous in our interpretation of the ACRL Frames and probing of the business data literacy competencies. We made several assumptions in our proposed mapping:
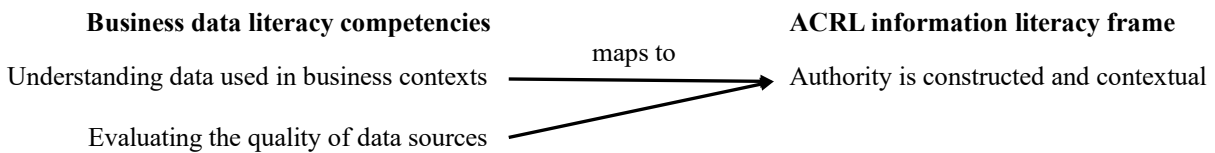
- We extended "information need" to "data need." While the *ACRL Framework* does recognize data in its introduction, the ACRL Frames and language of the ACRL Frames are about information and information need. On several occasions, we replaced "information" with "data" to assist in interpretation and mapping.

- A data literacy competency may map to more than one Frame. The competencies did not originate based on the *ACRL Framework* and so concepts presented in the competencies may extend across multiple ACRL Frames.

- We interpreted the *ACRL Framework* outside of the scholarly context. While the *ACRL Framework* does acknowledge the inclusion of professional fields, the language of the *ACRL Framework* is positioned within academia. We pushed the interpretation outside of academia and into the workplace because of higher education's role in preparing students for the workforce. We also approached our interpretation from the lens of how business students would apply the Frames in their professional lives, as higher education settings where the *ACRL Framework* is taught should speak to the contexts where students will apply their learning

- We contextualize our mapping in terms of preparing students for the workforce. The business data literacy competencies are designed for students to prepare for professional

expectations. When we discuss the context, the competencies both look outward to

professional roles and inward to student learning in the classroom.

Table 1 presents a summary of how we propose the business data literacy competencies map

to the *ACRL Framework*. Following, we provide a detailed discussion of our interpretation of

how each frame and the competencies are connected.

<center>*[Table 1 near here]*</center>

Authority Is Constructed and Contextual

Business data literacy competencies	ACRL information literacy frame
Understanding data used in business contexts — maps to → Authority is constructed and contextual	
Evaluating the quality of data sources	

The frame "authority is constructed and contextual" highlights that the authority or

trustworthiness of an information source depends on many factors such as who created it, why it

was created, and how is it being used. Important to this frame is the acknowledgment of biases

within information sources, biases in the availability of information sources, and biases of the

worldview of both the content creator and content user. When we extend information need to

data need, this frame asks the same questions of data sources – how the data was generated or

collected, what were the original purposes or applications of the data, how is the data being used

or reused, and what biases are in play with the data source/data creator. Data used in business

environments often vary from data used for scholarly pursuits in several ways: the context

around collection and use of data has different motivations; the recognition of authoritative

voices is distinct; and the systems for establishing trustworthiness, authority, and credibility are

unique. A primary distinction between the environments is the propriety, financial, or scholarly

motivations that guide each audience, thereby establishing different systems of publication,

authority, and contribution. Accordingly, business data sources often look very different from research data sources. We have mapped the frame "authority is constructed and contextual" to two of the business data literacy competencies: "understanding data used in business contexts" and "evaluating the quality of data sources."

In a scholarly context, we teach the frame "authority is constructed and contextual" with a focus on authority via author credentials, publication type, and nature of information need. While the same is true for business research, authorship will often be held by an organization instead of individual scholars and the publication type may be an annual report or market analysis – which vary greatly in nature from a peer-reviewed journal article. It is, therefore, the credentials of the organization that are evaluated for establishing authority and credibility of these resources. For the business student, an important aspect of understanding data used in business contexts is understanding that, in their role, they are likely contributing to a report or data resource in ways that they might not fully realize. Data that they generate may contribute to an authoritative report at some point in the future, which will not be directly attributed to them but rather attributed to the organization. While their contribution, large or small, may go unacknowledged, that contribution reflects on the authority, credibility, and reputation the organization.

Sources for business data can be challenging to evaluate because the proprietary nature of much of the data leads to a lack of transparency about the context of collection and analysis. However, within companies and organizations, data are used for day-to-day operations and can have significant financial and organizational (e.g., reputation) impacts. Quality data are highly valued and are often represented in terms of dollars and sales, the bottom-line for businesses. So, while the quality of data sources may be challenging to evaluate, the need for quality data within
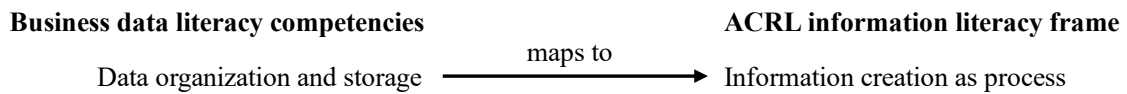
business is imperative. A further challenge for evaluation is the consideration that future users

(e.g., non-employees, business students) often interact with data after it has been analyzed or

prepared into a report, so part of the evaluation for secondary use lies in the analyst's

interpretation and not always with the data itself. In terms of the role business professionals have

creating data within or for an organization, creating quality data is not only beneficial for

successful business operations, but also ensures that "quality assurance" is built into the data

sources for future users of the data.

For information literacy instruction, these factors can create several issues. First, since

businesses need to create and use quality data to be successful and evaluating the quality of these

data is challenging due to lack of transparency, sometimes we are asked to simply trust in the

sources that are available because there are no other sources obtainable. This can be due to the

nature of the data or the costs associated with acquiring that data. Second, the sources that are

available may not represent the full story. For example, publicly traded businesses are required to

publish annual reports and analyses containing data about their business, while private

companies do not have this same obligation. Therefore, the available data represents only a

portion of business information. Third, the lack of transparency around the collection and

analysis of business data can hide biases or poor data practices. Finally, business students are

often interacting with data in different formats than paid employees have access to, and often

from an analyzed perspective that requires its own evaluation of quality.

Exposing business students to commonly used business databases, which are subscribed

to by academic libraries, public libraries, and corporate entities alike, furthers the conversation

about authority in the context of data literacy. These databases, such as IBISWorld or Mergent

Intellect, often provide robust applied analysis of data, adding an additional measure of

authoritative voice beyond the data's authoritative context. Due to high subscription costs,

students and librarians might only have one or two choices of data to examine but the librarian

can establish the conversation about how authority is determined.

Information Creation as a Process

Business data literacy competencies		**ACRL information literacy frame**
	maps to	
Data organization and storage	⟶	Information creation as process

The frame "information creation as process" emphasizes the format of information sources,

modes of delivery, and the process of creating and publishing an information source. The various

formats and modes of delivery of information sources offer different value, evoke different

perceptions, and are designed for different audiences. For this frame, we approach our thinking

of data in terms of a format. It is important to note that in business research contexts, the term

data is used broadly and can include raw or processed data, as well as summary statistics,

analysis, and interpretation. Understanding the breadth of formats for data is valuable knowledge

for the business professional and helpful for business students to contextualize their future work.

Using a common practical example of accessing company annual reports, we can look at varied

presentations of data in business resources. Annual reports are a fairly dense document that

contains comprehensive financial details for a company and are freely available in their original

format for public companies. Alternatively, common business information platforms, such as

Statista, provides 5 years of a company's annual reports condensed into a single graph. The two

formats differ in depth and size, yet both outputs offer access to data from the same source with

varied presentation. We have mapped the frame "information creation as process" to one of the

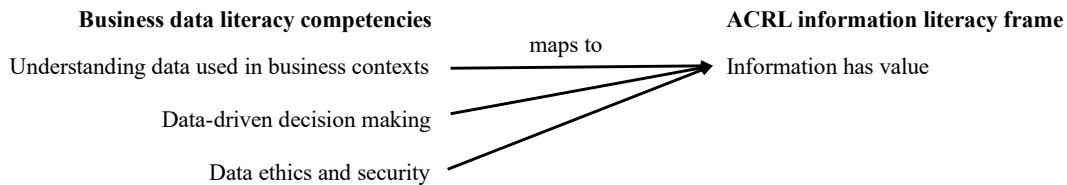business data literacy competencies: "data organization and storage."

Depending on one's role in an organization, the value of business data may lie in the interpretation and presentation of that data or in the original organization and storage of data. Responsibilities for different stages of the data lifecycle often align with different positions within an organization - the person who reads and interprets raw data might be a different individual from the person who makes decisions from those interpretations. Professionals benefit from understanding the basic concept that data are created, organized, and stored before the point at which the data can be analyzed, interpreted, summarized, and presented. Organization and storage of data in practice within a particular workplace might be different from the data that students access in the classroom. Analysis reports, for example, include a narrative about the data that contextualizes and interprets the data and often include a presentation of summary statistics for the data. Some business students may become accustomed to data having an interpretation layer, although this depends on specific disciplines (marketing vs. finance). But those data have an initial creation point, where credibility, integrity, and quality are established. How data is managed and secured as it transforms through the data lifecycle may be an indicator of its quality and integrity.

Business librarians can introduce business students to the data lifecycle and highlight distinctions between what we see in business contexts versus what we see in academic research, such as a faster and shorter lifespan of data. Students do not have to become experts at all stages of the lifecycle, but rather the goal is to help them understand the journey that data takes from being generated to presented to reused in secondary analysis. Depending on the field of study and professional role, one might only be exposed to data in certain formats and might be accustomed to interacting with data in certain ways or interact with data at certain points within the data lifecycle. This will help the student contextualize their future interactions with and use

of data as employees and how they may be able to effect decisions about data infrastructure to

improve company reputation, operations, decision making- which all effect the bottom line.

Information Has Value

Business data literacy competencies		ACRL information literacy frame
Understanding data used in business contexts	maps to	Information has value
Data-driven decision making		
Data ethics and security		

The frame "information has value" addresses the power of information by highlighting its legal,

societal, and economic value and how this value can impact the production, dissemination, and

use of information sources. The value of information is contextual – when extrapolated to the

often-proprietary nature of data for business use, value comes from data contributing to an

economic and strategic edge. In business contexts, data is used in many ways, including to

conduct day-to-day and long-term operations and to develop or improve products, services, or

marketing strategies. We have mapped this frame to three business data literacy competencies:

"understanding data used in business contexts," "data-driven decision making," and "data ethics

and security."

Data is a business asset of tangible financial value. In business contexts, data has real

currency in terms of profit, operations, logistics, and beyond. When a business can access better

quality data in higher quantities, the more likely the business can apply the data to make

decisions, which would ideally increase profit and help the company achieve its mission and

goals. While there is plenty of quality data freely available, the competitive edge frequently

comes from proprietary or purchased data. More specific and tailored data can be acquired when

there is more purchasing power available to buy data or the analysis of that data.
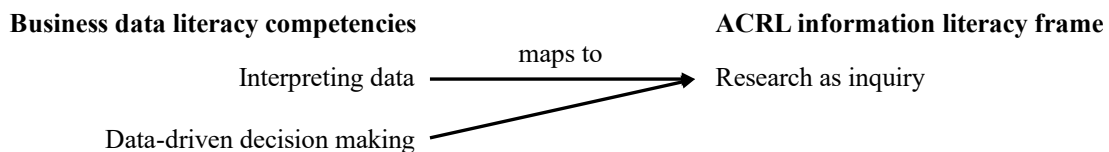
The value of data is further emphasized in its use in making business decisions. While often the role of management and leadership, decisions are made at many levels in an organization and data plays into these decisions along the way. For example, decisions about what data to use or collect can impact the decisions which are made, just as new data can change decisions and new interpretations can change the outcomes. Data is used by leadership to help make more informed business decisions to improve the bottom line for a business. This demonstrates "cash value" of data and helps to justify the proprietary nature of business data and why it is often limited in access by cost and/or privacy.

Significant here is the legal value of data, including intellectual property and attribution, and the social value of data including the intention and use of data. The technology that a company uses to secure the data that they create and use has a cost. Investing in the security of their data is a decision for a company. Businesses need to weigh the cost of ethical and secure data versus the value (e.g., profit, reputation, customer loyalty, marketing) of ethical and secure data. A business can make money from unethical data practices and, depending on the type of business, may not have the same oversight as in academic research practices. Since data is a commodity, business must consider the potential consequences of a data security breach or unethical uses or collection of data. For example, when a consumer provides their personal data to a company, that company typically can use and sell that data. While businesses may have a social responsibility to use that data ethically and store it securely, the company gained rights to that data in ways the consumer may not have fully understood.

Students can start to see this concept play out in the academic classroom, as they commonly rely on access to data through campus library subscriptions. Librarians can discuss the value, cost, and ethics of access to data. Just as different universities may have access to

different databases for research, so will different companies have access to data sources.

Companies will take advantage of the data that is available and accessible in their price range.

Small business might not be able to access data or generate data in the same way that a large

business would. Librarians can demonstrate the "cash value" of information though

demonstrating the differences between examples of open data and business database

subscriptions. In the classroom, students can practice with tools in experimental safe education

environments. Librarians can remind students that the data that they have access to for their

education costs money and that access to quality data and information is a large industry.

Research as Inquiry

Business data literacy competencies   **ACRL information literacy frame**

Interpreting data ——————— maps to ——————→ Research as inquiry

Data-driven decision making ———————↗

On the surface, the frame "research as inquiry" appears to be potentially challenging to

apply to business settings. The language and context of the frame are very academic and do not

immediately evoke concepts like proprietary information and competitive advantage that are

more aligned with practitioner or professional research, such as with business intelligence. This

echoes the findings of the literature review, where business librarians noted the challenges of

applying the *ACRL Framework* to business information literacy. Conceptually, however, the

frame draws on transferrable ideas, emphasizing that research is an iterative process of asking

questions, exploring findings, and engaging with the information – even though this may look

different in business contexts. The collection, interpretation, and application of data is an integral

part of the iterative, cumulative process of all research. We have mapped this frame to two

business data literacy competencies: "interpreting data" and "data-driven decision making."

Interpreting data involves engaging with the data, understanding the purpose and context of the
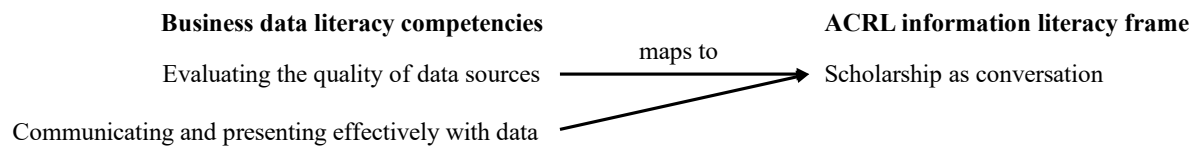
data, and recognizing the extent or scope of its applications. Data by itself does not provide

answers to questions. Data must be processed, and findings interpreted to separate meaning from

noise. The interpretation of data takes on distinctive significance in research for business

operations because those interpretations help inform data-driven decisions. Business is motivated

by competition, proprietary data, and the ongoing process of decision making. The interpretation

of data may lead to new questions or identify gaps or weaknesses, either in the data or in

application to business operations.

When considering the frame "research as inquiry," we can look to decision making as

iterative and driving business research - each decision leads to new questions, new data needs,

and additional decisions. Decisions can be made about the data itself before it is used to make

high-level decisions, such as what methods are used to process the data, who to consult with to

analyze the data, how to interpret the data, and what summary data to present to decision-makers.

In part, it is the objective of data-driven decision-making that propels business research and

highlights the iterative nature of the inquiry process.

In the classroom, the business librarian can contextualize data in non-academic scenario

by highlighting business practices that mirror the "research as inquiry" process. For example,

iteration is a foundation of "lean startups" and is often used in entrepreneurial endeavors in

which professionals will try something, change what they are doing based on data and/or

experience, and adapt something new to maintain progress. Another example is using case

studies from current events, such as the COVID-19 pandemic. For many businesses, much of

what they knew about their operations from a supply and demand perspective changed. For the

first few months of 2020, the costs, profits, and consumer behaviors were different for many

businesses (Helper & Soltas, 2021). So, while a company had data and it was applicable before

the pandemic, the environment changed and there was a need for more data and information to

reflect the new conditions and help businesses with current and future decisions. These practical

examples demonstrate the iterative process of "research as inquiry" regarding data in business

settings.

Scholarship as Conversation

Business data literacy competencies   **ACRL information literacy frame**

                                                                          maps to
Evaluating the quality of data sources ——————————————→ Scholarship as conversation

Communicating and presenting effectively with data ———↗

The frame "scholarship as conversation" underscores that the body of academic and professional

literature is a product of many voices and diverse perspectives participating in back-and-forth

discussions across time and space. Scholarship is an open and participatory exchange of ideas.

This frame requires us to consider the vocabulary of "scholar" and "professional" in the context

of data literacy and business. The business data literacy competencies were proposed for an

undergraduate audience, largely with the assumption that students would leave their higher

education experience and become business practitioners in professional settings. The ACRL

Frames often seem to contextualize "scholarship" and "research" in a way that feels distanced

from business vocabulary and practices, which harkens back to the literature that discusses

business librarian's lack of adoption of the *ACRL Framework* into their practice. But

professional engagement with data and information is also a conversation and is reflected in this

frame. The nature of this frame broadly points to all of the business data literacy competencies -

each demonstrate value in the "conversation." However, we highlight two competencies that are

very closely mapped: "evaluating the quality of data sources" and "communicating and presenting effectively with data."
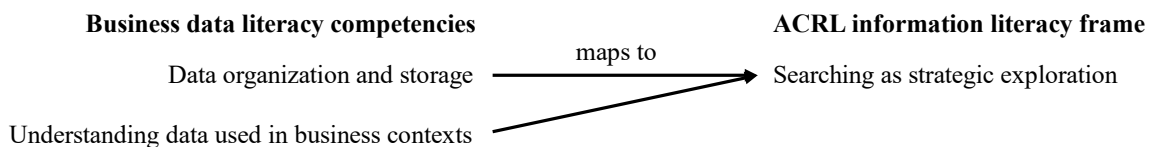
In the earlier discussion about the frame "authority is constructed and contextual," we highlighted the challenges associated with evaluating proprietary business data – if the data is not accessible or key details about the collection or processing of the data are unavailable, then the quality of the data source cannot be sufficiently evaluated. Additionally, because private businesses can be less transparent than public companies (e.g., are not required to publish annual or quarterly reports), the "conversation" can become biased toward public companies. Access to data sources and the ability to evaluate and assess the quality of that data bolsters the "conversation;" however, if available data privileges public companies, then it can create power inequity in terms of transparency and access to data. When evaluating data sources for inclusion in the "conversation," it is important to recognize that some businesses will not be represented as well (public vs. private, small vs. large) and some data will be presented in a manner that makes it challenging to evaluate. We often grant authority to databases and privilege publicly accessible data because it is what we have access to and therefore in the classroom there can be a tendency to study more public companies because of the availability of data. Business librarians can explain to students why companies contribute unevenly to the "conversation" and how this skews the record.

An important piece of the "conversation" is how to tell a story with data through effective communication and presentation. Depending on one's role in a company, the story that is presented can have a different focus. While the frame "scholarship as conversation" asks us to speak on a macro-level about the progress of science and the exchange of scholarly ideas, in business there is also a micro-level conversation. The micro-level conversation is within a

company between employees who are collecting, analyzing, interpreting, or making decisions.

Data is presented up in an organization and requests flow back down. At a macro level, the

contribution is at the company level, however a single corporate entity as author does not fully

explain the different roles of people who contributed. The research that an employee conducts is

part of a larger conversation within the organization and data is part of that conversation. Many

voices internal to the organization make contributions that lead to a final report or data-driven

decision. And while a contribution might be a straightforward output, such as a graph, there were

costs and a process associated with creating and presenting that output.

Business librarians can converse openly about the differences between research in

business and research for scholarly pursuits. The *ACRL Framework* naturally tends to lean

heavily academic and while the knowledge practices and dispositions can be applied broadly, the

narrative portion of the *ACRL Frames* do not always speak to the professional lens. The frame

"scholarship as conversation" can be interpreted broadly and has valuable learning outcomes,

such as helping students learn to share and demonstrate ideas through skilled presentations.

Searching as Strategic Exploration

Business data literacy competencies		**ACRL information literacy frame**
Data organization and storage	maps to →	Searching as strategic exploration
Understanding data used in business contexts		

The frame "searching as strategic exploration" emphasizes that the search process is a complex

systematic journey that is contextualized by the worldview of the searcher, the scope of the

investigation, and "the context of the information need." It involves understanding the scope of

research before undertaking it and outlining the tasks required to achieve the outcome. Despite

the challenges we have presented about the obscurity related to the proprietary nature of business

data, students can be taught how to develop a structured and well-documented plan for searching

available data sources. We mapped this frame to two competencies: "data organization and

storage" and "understanding data used in business contexts."

Data organization and storage is foundational to beginning the exploration of data. To

explore data, it must have been collected or generated, organized, and stored. And if the data are

not securely stored, cannot be located, or are not well-documented, then time and money will be

lost having to recreate the data if recreation is possible. The internal organization of data itself

may be a tool used by employees of a company to access data, interpret data, or make decisions.

Sometimes data will be accessible and available publicly (such as, open government data or data

from public companies), other times data is held by an organization (for example, for a private

company or before data is made public). For data held by an organization, finding and searching

for that data may be tied directly to how and where the data is organized and stored. If data do

not have solid foundation for quality and integrity, it limits the questions one can ask of it. The

structure of data and metadata need to be robust in order to ask questions, analyze, interpret, and

reuse.

Identifying who produces data and what kinds of data they produce helps students and

employees understand the kinds of documents and data that are available and can be accessed.

Understanding what is accessible within the scope of one's search is essential when looking for

available, usable data. One must understand the universe in which one can explore and have a

plan to "manage searching processes and results effectively" (ARCL, 2015). In business

contexts, this can mean understanding if the needed data exists and, if so, where to locate it. Or if

the needed data does not yet exist and how to collect or generate it.

In the classroom, business librarians can provide exposure to databases, exposure to different kinds of tools for finding or creating data, and discuss the structures and formats of data. Sometimes there is an inquiry, but there is not existing data to match the inquiry. It could be that the data is not being gathered or is not yet in a publishable format. The business librarian can discuss what data are available, why some data have not been created, and what decisions can be made by the data which is accessible. This can lead to discussion around the kinds of reports or data that exist, conversations about primary and secondary data, inequities of data access, and training in the responsible conduct of research. Librarians can also help students think about the contexts of data and how data is collected and moves in process from storage to decision-making within an organization.

Discussion

Overall, the business data literacy competencies mapped well to the ACRL Frames and the discussions we had improved our understanding of the *ACRL Framework*, enriched our engagement with the business data literacy competencies, and strengthened our appreciation for each other's roles (as business librarian and data services librarian). We made several observations about the *ACRL Framework* and about the proposed business data literacy competencies during this mapping exercise that we think are relevant to share. These fall into three categories; underlying presumptions of the *ACRL Framework* and business data literacy competencies; potential limitations of the business data literacy competencies; and the role of librarian stakeholders in the data literacy education of business students.

Information and data literacy needs in the business curriculum range from addressing the needs of scholars in the academic disciplines of business to preparing business students to be

professionals and practitioners. The business data literacy competencies aim to equip students

with a baseline of data literacy skills to prepare them to enter the workforce. As such, the

competencies focus on the data literacy expectations of professionals working in business at a

generalized level and are not targeted to directly address scholarly research within the business

disciplines. The language of the *ACRL Framework*, however, frequently skews to academic

research and scholarly practice. This is a challenge for business librarians and was a challenge

for our mapping exercise, as some of the ACRL Frames are more naturally adaptable to business

(such as "information has value") whiles others less so (such as "scholarship as conversation").

In particular, we found that the introductory text associated with each frame was geared

more toward academic scholars than professionals. However, the knowledge practices and

dispositions, which operationalized the introductory text, were broadly applicable and easier to

adapt to a variety of contexts. It was common in our discussions as we created the proposed

mapping to use the knowledge practices and dispositions as a guide for interpreting each frame

and reflect on potential scenarios in business education and in the workplace in which these are

evoked. In practice, creating contextualized learning outcomes related to business data literacy

(or business information literacy, for that matter) that speak to the knowledge practices and

dispositions is likely a more productive process than working from other aspects the *ACRL*

Framework.

Our mapping exercise emphasized that the business data literacy competencies originated

for workforce application with business students in mind. These were later adapted slightly to

focus on needs of employees already in the workplace; this was just a shift from preparation for

the workforce to development in the workforce (Pothier & Condon, 2020). However, the

competencies do not address scholarly research within business disciplines and mapping them to

the *ACRL Framework* brought this issue to the forefront. Use of data in the workplace and in business scholarship both touch on the nuanced and unique characteristics of how data is created, applied, and used in business settings. But data literacy for business scholarship is seemingly more aligned with other disciplines in terms of being embedded in the research process and scientific method. Articulating the underlying rationale for the baseline business data literacy competencies, is important for contextualizing them without minimizing the importance of data literacy for scholarly research in the business disciplines.

In conducting this mapping exercise, we also probed the business data literacy competencies for potential shortcomings. We found that some skills were not emphasized in the competencies. For example, the distinct skill of searching for or locating business data is not fully explored. There is an assumption underlying the competencies that they are focused on working with data, but the skills associated with finding that data are not fully addressed and yet are important skills for which the librarian plays a key role. As we have noted in the mapping, the often-proprietary nature of business research makes finding sources and searching for data challenging. This becomes noteworthy when addressing the topic of access to data, which was a recurrent theme in our discussions during the mapping exercise. Access to resources varies across institutions and organizations and may differ from what is available in the workplace. In the business data literacy competencies, understanding the availability of data is emphasized but through the mapping we discovered that the skillset of searching might merit specific inclusion.

Also not directly addressed in the business data literacy competencies are the topics of the creation and analysis of data, although they are touched on in the competency "understanding data used the business context." The business data literacy competencies were developed to

address a need for general working knowledge of data within an organization. Different roles and

responsibilities will require expert competencies, different skillsets, and more sophisticated, in-

depth knowledge of particular stages of the data lifecycle. The skillsets related to creating,

collecting, or generating data for use and the analysis of data, are examples of specialized

abilities that are developed depending on job type. However, the creation and analysis of data,

are essential when conducting scholarly business research and may be included in research

methods courses.

In turn, this again compels us to reflect on the many stakeholders involved in instructing

and advocating for data literacy for business students, in this context primarily the

practitioner/professional, the business scholar, and the business librarian. While many of the

learning outcomes associated with the business data literacy competencies fit comfortably within

the role of the business librarian, they would also benefit from being integrated more holistically

into the business curriculum via business school faculty and administrators. The business

librarian has a role as a stakeholder including in seeking partnerships with practitioners and

business school faculty to address high level issues, but generally lacks the authority to lead this

work independently. Overall, business data literacy needs to be integrated into business

education and in workplace settings on a larger scale than solely with the librarian.

Further Research

To provide a stronger foundation between the *ACRL Framework* and business

information literacy instruction, the Business Research Competencies (BRC) were introduced in

2019 and formally approved by Reference and User Services Association's Business Reference

and Services Section (RUSA BRASS) in November of that year. They were also approved by the

RUSA Board of Directors in December 2019. The Special Library Association (SLA) Business

and Finance Division Board officially endorsed the competencies in June 2020 (Reference and

User Services Association, 2019). The BRCs demonstrate "targeted skills and learning

outcomes and provides a standard vocabulary for 10 common business research areas"

(Reference and User Services Association, 2019). The competencies are designed to help plan

instruction and create lesson plans, along with other purposes including self-assessment of

knowledge and outreach. Howard et al (2019) provided examples of curriculum mapping using

the BRC. Further work that maps the BRC with the *ACRL Framework* and the business data

literacy competencies would foster needed discourse for librarians working with both data and

information literacy in business disciplines.

Conclusion

The business data literacy competencies were introduced to help prepare business students for

the workplace and emphasize the role of the business librarian as a stakeholder in data literacy

instruction and workforce development. The *ACRL Framework* provides a professional structure

for thinking more deeply about the business data literacy competencies. In particular, themes

arising from the mapping include how data literacy relates to our work as librarians, how we

convey these skills to students, and how we discuss data literacy with our colleagues (librarians

and departmental faculty, alike). With the increased focus on data literacy in both professional

and scholarly realms and importance of preparing data literate students for the workplace, the

need to integrate data literacy into library work grows more apparent.

In this article, we furthered the conversation about the role of the business librarian in

data literacy instruction by proposing how seven baseline business data literacy competencies

can be mapped to the *ACRL Framework*. This mapping contributes to efforts to implement the

ACRL Framework not only for information literacy instruction but for creating a shared

vocabulary and highlighting connections among librarians engaging with data literacy. With the

proposed mapping, we provided examples of engaging the business data literacy competencies in

the classroom and shared our observations from developing this mapping.

The relationship of data literacy to business information literacy and the work of business

librarians is progressing and it is still yet to be seen how instruction using the business data

literacy competencies in the classroom will evolve. Through scholarly conversation, business

librarians have articulated challenges with implementing the *ACRL Framework* into business

information literacy efforts. This mapping helps establish a bridge between foundational library

professional documents, business librarianship, and data literacy both in higher education and in

the workplace, extending the conversation to how the *ACRL Framework* informs data literacy

instruction.

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Table 1. Business data literacy competencies mapped to ACRL information literacy frames.

Business data literacy competencies (Pothier & Condon, 2019)	Description of business data literacy competency	ACRL Framework mapped frames (ACRL, 2015)
1. Data organization and storage	focuses on foundational data management practices	Information Creation as a Process Searching as Strategic Exploration
2. Understanding data used in business contexts	involves identifying sources or potential sources of data and thinking critically about the use of the data.	Authority Is Constructed and Contextual Information Has Value Searching as Strategic Exploration
3. Evaluating the quality of data sources	involves critically evaluating how data was generated, who created or generated it, and how is it being analyzed and interpreted.	Authority Is Constructed and Contextual Scholarship as Conversation
4. Interpreting data	highlights the importance of knowledgably decoding data in order to apply findings effectively.	Research as Inquiry
5. Data-driven decision making	emphasizes the data has the power to effect change by enabling decision makers to make deliberate and informed choices.	Information Has Value Research as Inquiry
6. Communicating and presenting effectively with data	"is about extracting a meaningful and cogent narrative from the data" (Pothier & Condon, 2020).	Scholarship as Conversation
7. Data ethics and security	embodies the "responsibility to approach collection, interpretation, use, and security of data ethically and with integrity" (Pothier & Condon, 2019).	Information Has Value