Emerging Insights into the Use of Labor Market Information in Postsecondary Education

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MAY 2023

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and Labor Relations

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Acknowledgments

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Executive Summary

Introduction

Colleges and universities are confronting mounting competitive pressures intensified by the COVID-19 pandemic. Amid a quickly shifting pandemic job market, employer skill demands and student educational preferences have become more complex and urgent. Meanwhile, politicians and parents continue to call for more accountability and transparency around how degrees connect to work. Private online education providers are meeting this demand for skills-based education, altering the landscape of postsecondary credentials and introducing new competition for students.[1] While demand for online education has increased, undergraduate enrollment at colleges and universities has fallen by nearly 8 percent since 2019.[2] This is not good news for a sector facing a looming enrollment cliff—the number of high school graduates in the United States is expected to reach its peak in 2026.[3]

Labor market information (LMI) offers colleges, universities, and their competitors easy access to data that can be used in myriad ways, including to adapt programs and credentials to stakeholder needs and to create opportunities for institutional leaders to make better decisions about program demand and viability; staffing and other resource needs; and employer and community partnerships. Prior research has examined the use of LMI, as Bjorn and Kerrigan[4] review, but this field is quickly changing. As forms of LMI are newly emerging, many higher education practitioners have limited familiarity with these data and their potential. This study examines existing and emerging practices at 10 colleges and universities in the United States to better understand recent trends and issues in the use of LMI. This report can serve as a resource to colleges at all stages of the process of LMI institutionalization.

Research Questions

In this report, we draw on data from 10 case studies to find out how a variety of institutions use LMI. Five case studies examine LMI practices at two-year community colleges, and five case studies examine LMI practices at four-year colleges and universities.

Broad patterns of similarities and differences arose among the participating two- and four-year institutions. For example, two-year colleges' use of LMI was often dictated by federal and state policy and external funder

1   Diaz-Infante, N., Lazar, M., Ram, S., & Ray, A. (2022, July 20). *Demand for online education is growing: Are providers ready?* McKinsey & Company. Retrieved from https://www.mckinsey.com/industries/education/our-insights/demand-for-online-education-is-growing-are-providers-ready

2   National Student Clearinghouse Research Center. (2021, November 18). *Stay informed with the latest enrollment information.* Retrieved from https://nscresearchcenter.org/stay-informed/

3   Bransberger, P., Falkenstern, C., & Lane, P.,(2020, December). *Knocking at the College Door.* https://www.wiche.edu/resources/knocking-at-the-college-door-10th-edition/

4   Bjorn, G. & Kerrigan, M.R. (2023). *The Evolution, Conceptualization, and Use of Labor Market Information (LMI) in Postsecondary Institutions: A Systematic Literature Review.* EERC Working Paper, Piscataway, NJ: Education and Employment Research Center, Rutgers University.

requirements, often resulting in more formalized LMI processes than at four-year institutions. In contrast, four-year universities' LMI usage was primarily motivated by internal concerns like enrollment and serving stakeholders, and these institutions tended to see LMI as just one of many data points that informed decisions. In addition, two-year institutions used LMI to develop academic and strategic plans and tended to focus more on workforce development, though both two- and four-year institutions aimed to use LMI to help students achieve their future educational and career goals. Quality and equity concerns motivated LMI usage among both types of institutions.

We ask four main questions in our study:

1. How and why do college and university administrators and staff use LMI?
2. What sources of LMI do college and university administrators and staff use?
3. What infrastructure exists to support LMI usage?
4. What are administrators' and staff's perceptions of LMI?

Applications and Motivations for LMI Usage

Colleges and universities that adopt LMI do so in an effort to support and improve existing functions, motivated by both quality and equity goals. This became clear as participants shared examples of how their institutions applied LMI to core higher education functions including program review, development, and improvement; academic and strategic planning; recruitment and enrollment management; relationship building with external partners; and advising. Program development and review was overwhelmingly the most common and developed application of LMI that case study participants discussed. In fact, all participants in the case studies discussed the role of LMI in program development and review. At most of the colleges, case study participants discussed the use of LMI for academic and strategic planning purposes as well. Four-year institutions, especially those associated with liberal arts programs, were particularly concerned about using LMI in efforts to recruit and enroll students and to communicate the value of their degrees to prospective and current students and other stakeholders. Using LMI to build relationships with external partners—through collecting data, disseminating data, or identifying opportunities for partnership—was also common. Emerging practices include the use of LMI to advise students, but this is not institutionalized yet.

Because of their more direct connection to employers, the participants from two-year colleges were likely to focus on the role of LMI in tightening the alignment between their programs and employers' job vacancies and skill needs. Vendor-based and government data provide two-year colleges with new information with which to engage their advisory boards and complement existing employer data. These data also reveal opportunities for colleges and universities to get involved with their local community. Participants from four-year colleges and universities discussed the need to consider the relationship between LMI and their institutional missions and the importance of using LMI to communicate the value of the liberal arts degree to current and prospective students, parents, and the general public.

LMI Data Sources

Colleges and universities avail themselves of multiple data sources, both public and private, to collect and apply LMI. Public sources, including free government sources of LMI, provide information on job numbers, growth, and industry changes but tend to be less user friendly and not as current as vendor-sourced data. Private vendor data have quickly become an important source of LMI, providing skills and outcomes data in more easily understandable and visualizable formats. Institutional data and LMI from the community, employers, and industry organizations complement these two primary sources. The decision to use multiple sources results from necessity; no product has everything that participants want or need.

Although government data sources tend to be free, institutions that have applied LMI to their operations have found that doing so requires significant investment and oversight. Licensing fees for private sources are not transparent. Institutions may manage numerous licenses with little information about their use, contributing to uncertainty about how many licenses are necessary and how they should be distributed across the organization. The investment in LMI products also necessitates professional development, which may be provided by the vendor or require other individualized coaching.

LMI Infrastructure

Organizations that decided to use LMI created an infrastructure to support its use. That infrastructure included personnel, data structures, professional development, and policies. In our research, we identified LMI data users' roles in the personnel infrastructure, such as data analysts, power users (including data coaches), general users, implementers, and champions. Each of these roles contributed to and often collaborated with and supported the adoption, implementation, and application of LMI to institutional departments and processes. Participating institutions created new LMI-focused positions including executive-level positions, analysts, and data coaches. They created these positions as part of innovative structures that did not necessitate hiring externally but instead leveraged existing staff and faculty who were already familiar with the institution and were interested in learning the technology.

In addition to personnel support, institutions developed a variety of forms of data structures to collect, store, and share LMI. Colleges created master lists, simple reports, websites, and other resources to promote and support LMI usage and made them readily available and accessible. The institutions that participated in our study were at different points in their adoption of LMI and therefore shared varied levels of experience with building these data structures, which take time to develop.

Because LMI is complex, professional development is necessary to help practitioners understand its potential and learn how to put it to use. Participants shared examples of formal professional development they engaged in that was either supported internally or by their institutions' LMI vendors. They also spoke of creative approaches to professional development including one-time meetings with external consultants who modeled the LMI process or with internally identified data coaches.

In some colleges and universities in our sample, the institutionalization of LMI usage emerged as a result of top-down initiatives, while in others we observed a more grassroots emergence among particular LMI champions. Which of these categories a school fell into generally reflected the prevalence of formal policies regarding LMI usage at the institution. A common sentiment emerged among our study participants that data policies, the creation of tools and products, and adequate funding to support LMI were important for promoting and sustaining LMI usage. Institutions in our sample took one of three approaches to supporting LMI usage: a centralized approach, a decentralized approach, and an individualized approach. Not surprisingly, community colleges with the influence of federal (e.g., Carl D. Perkins Act) and state policy (e.g., state policies that govern program review and development) were more likely to take a centralized approach.

Perceptions of LMI

Participants universally agreed on the inevitability of LMI engagement for colleges and universities but also acknowledged its weakness and challenges. Concerns about typical campus users' data literacy; overcoming staff's skepticism about the data; and the missing capabilities or inherent limits of the applicability, availability, or timeliness of the data constrained its use. These limits were offset by professional development, which improved data literacy among users. Gaining experience using LMI helped staff to apply data skepticism appropriately while demonstrating the need for ongoing development in using LMI vendor products. Participants expressed the desire for more centralized data sharing, more granularity in LMI, improved alignment of job skills with education data, consistent alumni and longitudinal data, and improved student access to LMI in support of advising.

Conclusions and Recommendations

Participants were excited about the current use of LMI and the potential for even more applications in the future. To support institutions' efforts to remain competitive and relevant, we focus our recommendations on the policies and processes that support the adoption and institutionalization of the use of LMI. Specifically, we recommend that institutions examine potential LMI applications to their core activities; understand the cost implications of using multiple LMI sources; establish an infrastructure that includes users, organizational structures, professional development, and policies; and understand LMI's limits and how to support its adoption. But the momentum behind LMI usage is not coming from within higher education alone. Increasing accountability demands from the state and the public further compel the use of LMI. For LMI to reach its full potential, collaborative efforts and funding are needed to support the development of institutional infrastructures both to resolve some limitations of LMI and to support knowledge sharing.

Introduction

Colleges and universities are confronting mounting competitive pressures intensified by the COVID-19 pandemic. Amid a quickly shifting job market, employer skill demands and student educational preferences have become more complex and urgent. Meanwhile, politicians and parents continue to call for more accountability and transparency around how degrees connect to work. Private online education providers are meeting this demand for skills-based education, altering the landscape of postsecondary credentials and introducing new competition for students.[5] While demand for online education has increased, undergraduate enrollment at colleges and universities has fallen by nearly 8 percent since 2019.[6] This is not good news for a sector facing a looming enrollment cliff—the number of high school graduates in the United States is expected to reach its peak in 2026[7].

Concurrently, sources of labor market information (LMI), including data about the job market, student outcomes, and existing degree programs, have proliferated. LMI offers colleges, universities, and their competitors easy access to data that can be used in myriad ways, including to adapt programs and credentials to students' and employers' needs. For a comprehensive review of scholarship on LMI in the postsecondary education context to date, readers are directed to our systematic review.[8] Many internal and external groups, from faculty and students to funders and employers, are involved in aligning academic programs to address labor market needs[9]. The process is complex, often fraught, and involves balancing competing needs of different stakeholders.

As policymakers and practitioners attempt to navigate the broader trends in higher education, the increased availability of LMI raises possible opportunities, and with those opportunities, additional complexities. Ideally, LMI offers the possibility of making better decisions within higher education to more robustly meet the needs of the various stakeholders engaged in the process. At the same time, LMI, in many cases, is new or newly accessible, so higher education practitioners may have limited or underdeveloped knowledge of how to use it. This study examines existing and emerging practices at 10 colleges and universities in the United States to better understand recent trends and issues in the use of LMI.

5   Diaz-Infante, N., Lazar, M., Ram, S., & Ray, A. (2022, July 20). *Demand for online education is growing: Are providers ready?* Mckinsey & Company. https://www.mckinsey.com/industries/education/our-insights/demand-for-online-education-is-growing-are-providers-ready

6   National Student Clearinghouse Research Center. (2021, November 18). *Stay informed with the latest enrollment information*. Retrieved from https://nscresearchcenter.org/stay-informed/

7   Bransberger, P., Falkenstern, C., & Lane, P.,(2020, December). *Knocking at the College Door.* https://www.wiche.edu/resources/knocking-at-the-college-door-10th-edition/

8   Bjorn, G. & Kerrigan, M.R. (2023). *The Evolution, Conceptualization, and Use of Labor Market Information (LMI) in Postsecondary Institutions: A Systematic Literature Review.* EERC Working Paper, Piscataway, NJ: Education and Employment Research Center, Rutgers University.

9   Cleary, J.L., Kerrigan, M.R., Van Noy, M. (2017). Towards a New Understanding of Labor Market Alignment. In: Paulsen, M. (eds) Higher Education: Handbook of Theory and Research. Higher Education: Handbook of Theory and Research, vol 32. Springer, Cham. https://doi.org/10.1007/978-3-319-48983-4_12

Research Questions

In this report, we draw on data from 10 case studies, including five two-year community colleges and five four-year colleges and universities. We examine how those institutions use LMI. Broad patterns of similarities and differences arose among two- and four-year institutions. For example, two-year colleges' use of LMI was often dictated by federal and state policy and external funder requirements, often resulting in more formalized LMI processes than at four-year institutions. In contrast, four-year universities' LMI usage was primarily motivated by internal concerns like enrollment and serving stakeholders, and these institutions tended to see LMI as just one of many data points that informed decisions. In addition, two-year institutions used LMI to develop academic and strategic plans and tended to focus more on workforce development, though both two-year and four-year institutions aimed to use LMI to help students achieve their future educational and career goals. Quality and equity concerns motivated both types of institutions.

We ask four main questions in our study:

1. How and why do college and university administrators and staff use LMI?
   a. How do participants use LMI and how often?
   b. What is motivating LMI usage?
   c. Which stakeholders and conditions are influential?
   d. To what extent do colleges broaden or deepen LMI usage over time throughout the institution?

2. What sources of LMI do college and university administrators and staff use?
   a. What sources of LMI are they using, and why?
   b. Do they use multiple sources of LMI and if so, how and why?
   c. What are the costs of LMI usage?

3. What infrastructure exists to support LMI usage?
   a. Who is using LMI?
   b. What structures and policies exist to support LMI usage?
   c. To what extent have colleges institutionalized systems to administer LMI usage?

4. What are administrators' and staff's perceptions of LMI?
   a. What are the perceived strengths and limits of LMI?
   b. What are the concerns about LMI?
   c. What does data literacy mean for LMI users?
   d. How does industry knowledge inform LMI?
   e. How has the pandemic shaped LMI usage and perceptions?
   f. How would LMI users improve it?

To address these questions, we have organized this report into four parts based on the outline above. We begin the findings with a discussion of applications—how LMI is used—as well as the quality and equity motivations undergirding LMI usage. This section shares innovative practices and opportunities for leveraging LMI. Since LMI usage was often localized within an institution, we note that our findings are based on participants' knowledge and may not always reflect the aims of the broader institution. The next section highlights LMI data sources that the colleges and universities in our study used. Then we explore the infrastructure around LMI, specifically detailing various positions, structures, and processes the institutions had implemented to support the collection, analysis, dissemination, and use of LMI. Finally, we discuss the ways participants perceived LMI in terms of its sources and applications, as well as their ideas for how to improve LMI. The appendix addresses our methodology.

Case Studies

The case studies represent a diversity of colleges by region, state, sector, control, and sources of LMI (Table 1). Informational interviews resulted in a final purposeful sample of five four-year and five two-year institutions. We interviewed a total of 50 individuals drawn from across all 10 institutions from May 2021 to February 2022.

TABLE 1. Case Study Site Characteristics, by Sector

College	State	Institutional Characteristics	Uses of Data	Number of Interviewees
4-Year				
Eastern Connecticut State University	CT	Small, public 4-year liberal arts institution	Program approval and alignment analysis, work with faculty	5
Morgan State University	MD	Historically Black university, public 4-year institution	Expanding use based on grant experience	4
Southern New Hampshire University	NH	Large, private 4-year institution	Strategically at the college level to plan and market online programs	3
St. Catherine University	MN	Small, private, urban, women only; adults and returning students	Employer engagement based on values and alignment of programs to skills employer-partners need. Pipelines to employers.	4
West Virginia University	WV	Large, public 4-year institution	Show market demand for academic programs, career advising	6
2-Year				
Dallas College	TX	Public 2-year institution	In-house Labor Market Information Center provides data, reports, and resources. Provides resources for small business and information on the local economy.	8
Fullerton College	CA	Hispanic-Serving Institution, public 2-year institution	CTE-focused but schoolwide professional development efforts, creating "data experts" across college departments	6
Gateway Community and Technical College	KY	Public 2-year institution	Cross-state service area, located across from Cincinnati, uses regional LMI to promote strong outcomes	4
Lansing Community College	MI	Public 2-year institution	Developing process for program health assessment as part of program review cycles	7
Lurleen B. Wallace Community College	AL	Public 2-year institution	Leveraging LMI to change state designations that dictate what programs can be offered and where	3

Applications and Motivations for LMI Usage

Institutions were motivated by both quality and equity goals to adopt and institutionalize LMI usage. They applied LMI to a diverse array of core activities including program review, development, and improvement; academic and strategic planning; recruitment and enrollment management; relationship building with external partners; and advising.

Trends affecting higher education motivate and shape LMI applications and drive broader LMI integration with institutional practices over time. As a result, many factors motivate LMI usage, and applications of LMI abound.

Both quality and equity goals motivate LMI usage. Institutions reported using LMI to improve the quality of their programs and the alignment of their curricula with employers' needs and students' future education and employment goals. They were also motivated to use LMI to address equity issues, whether by preparing students of all backgrounds to enter the job market and have a good quality of life after graduation or by addressing workforce and economic needs in neighboring communities.

This section discusses how and why the colleges and universities in our study were using LMI. It explores the varied ways colleges applied LMI to achieve important goals, as well as which trends and stakeholders influenced LMI usage and how colleges expanded their use of LMI over time.

Program Review, Development, and Improvement

> » *LMI usage contributed to more formalized processes for program review, development, and improvement, enabling programs to align more tightly with employers' job vacancies and skill needs.*

The predominant use for LMI was program review and new program development. Decision-makers used LMI during the program review and new program development processes to help support or reject new and existing programs, as well as to sunset programs.

Across the case studies, various participants explained that LMI facilitated more formalized program review processes, a "revamped program review," or a more "holistic program review." Some noted that these new program review processes enabled more intentional growth. As noted below in the section on LMI users, different user roles, including data analysts and implementers, often worked together to better understand the data and how they may, or may not, be applied to support or improve an academic program. Such dialogues may have increased trust in the use of LMI as different users were able to voice their concerns and ideas as part of the process.

Further, LMI helped "untangle" what credentials were required and what the curriculum should be for certain occupations. This benefit alludes to the concepts of "job vacancy alignment" and "skills alignment" described in Cleary et al. (2017)[10]. *Job vacancy alignment* involves aligning degree production with current or future job vacancies. This is accomplished by creating and sunsetting programs through program development and review processes. As discussed in more detail below in the section on recruitment and enrollment management, job vacancy alignment also involves adjusting enrollment in programs to this end. By contrast, *skills alignment* refers to reviewing and adjusting skills taught within curricula to ensure students have the skills that align with available jobs. The remainder of this section explicates the nuances of these alignment types.

Considering the role of job vacancy alignment in program review and development, LMI helps programs consider how marketable current or prospective students will be after graduation and what the job market will be like for program completers. Job vacancy alignment helps programs identify new markets (of both students and job opportunities) by looking at LMI indicators such as annual job openings and growth percentage. LMI is also used to establish wage expectations for an occupation, which can help decision-makers determine if a program is a suitable target given student, or sometimes funder, expectations. LMI users in our study asked critical questions when developing a new education program, such as, according to one respondent: "Is there a labor market that exists? How long will that labor market likely exist for a program? Is it growing? Is it shrinking? What is the three-year trend for that? What is the trend for those particular areas is in our recruitment area?" Trend analysis is a key aspect of job vacancy alignment.

Regarding skills alignment, colleges used LMI to build tighter alignment between skills taught in courses and skills needed for jobs. Respondents from community colleges often mentioned efforts to embed critical skills into curricula in order to "set [students] up in a better position" to take advantage of more job openings. Two-year colleges were particularly focused on skills alignment due to requirements placed on them by outside funders and state policies. Respondents from four-year institutions with a liberal arts focus varied in terms of the degree to which they wanted to align curricula with employer needs.

Nonetheless, there was broad agreement among participants that the best role for LMI in the skills alignment process was to inform decision-making and drive conversations about balancing the needs of employers, students, faculty, and other stakeholders. As one participant stated:

> The biggest learning opportunity is for faculty to understand … the practical aspect of the purpose of educational institutions, to understand that you can have an innovative curriculum, you can have a traditional curriculum, but it depends, in turn … on how you've focused the curriculum.… So, what is more attractive to students? What is more beneficial for them when they graduate? And making it about them and their futures.… I think that the data can be very useful in moving those conversations forward.

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10   Bransberger, P., Falkenstern, C., & Lane, P.,(2020, December). *Knocking at the College Door.* https://www.wiche.edu/resources/knocking-at-the-college-door-10th-edition/

Most four-year university participants emphasized the importance of engaging with faculty and making data-informed decisions, not necessarily data-driven decisions, about how to use LMI to adjust curricula in ways that improve student outcomes.

However, expanding engagement beyond faculty makes sense when LMI usage compels programs to consider pathways, partners, and necessary resources. For example, discussions about credentialing pathways that span noncredit, certificates, associate degrees, and bachelor's degrees required the involvement of institutional leadership. Participants shared that LMI enabled them to identify new pathways unique to a particular regional need. In addition, community colleges in our study used LMI to help develop pathways that led to bachelor's degree programs at partner universities. This kind of alignment is not limited to undergraduate programs. We also heard from participants that they were working on aligning bachelor's degrees with master's and PhD programs.

> » *Universities were particularly focused on using LMI to build more transparency by matching career-relevant skills taught in programs with those necessary for career pathways.*

In addition to updating curricula to address employer skill needs (i.e., skills alignment), several participants discussed the importance of LMI for making transparent the skills that allow students to pursue many different careers and providing evidence to students that employers value these degrees and skills. One participant described this as "mapping or matching in-demand skills to curricula," while others discussed this in more general terms.

In some cases, participants identified connections between core educational requirements or program/course learning goals and foundational career skills, such as communication or analysis, that were identified in job postings or through other sources, such as the National Association of Colleges and Employers. One participant described their process of matching transferable skills developed in an educational program with job openings: "[You take a] deep dive into more of the skill set students are learning within our program, and take those transferable skills, match them with job postings. Now you have a wide array of occupations that those skills would actually line up with." Several participants mentioned the ability of employer partnerships to attract students by communicating that employers value the degrees and skills students are earning. Overall, these efforts conveyed how program and course learning goals align with broad skills that can help students access many careers.

For example, Southern New Hampshire University (SNHU) was perhaps the furthest along in mapping skills identified through LMI to courses and syllabi and integrating new skills into curricula. The college's Office of Product and Program Innovation was responsible for many activities relating to data use, including applying LMI to processes such as skills mapping. At SNHU, skills mapping occurred at a granular level, whereby skills needed for individual jobs were matched with skills taught in specific courses. SNHU used digital badges with skills microdata attached that describe specific competencies students develop related to each badge.

> » *Participants consistently framed program review as an opportunity to improve programs rather than only as a precursor to program elimination, reflecting a change in how program success is defined.*

Several participants described how LMI had evolved the program review and development process to avoid closing programs as much as possible. One participant commented that their institution had become a lot more

data-savvy, noting, "we just do not start programs on whims because 10 people in the community say we need this program." Starting new programs is expensive, and stopping undersubscribed programs signals a waste of resources. LMI helped program managers dig into the details, including opportunities for new programming. These details matter; for example, new program approvals by one institution's Board of Governors decreased from 100 percent to 25 percent during one participant's tenure. At another institution, the application of LMI had a "tremendous direct impact on creating stronger proposals, … which now include three or four rounds of iteration before winning approval to start a new program." LMI was also used to expand existing programs and justify extra costs, such as funding for a new faculty member and supplies.

Several participants described shortening program review cycles partially driven by the need to examine annual trends. The common sentiment was "program review on a four-year cycle is way too long." Participants explained that their institutions shifted from a review process that occurred every four or five years to every one or two years, intending to intercede earlier when programs exhibit concerning trends. In some cases, participants described this more frequent review approach as an intermediate step to a broader program review process that occurs every four to five years. Conversely, other participants noted that an annual process may be too short because it does not allow for adjustments within a single budget cycle based on LMI. Participants recognized that program improvements often require additional budgetary resources, such as labor and facilities.

Finally, LMI usage reflected a broader change in how higher education leaders thought about student success and what that means for programs. This reconsideration of success included moving beyond completing a degree or certificate or getting a specific job. Instead, student success prompted reflection on the careers into which students are moving, the associated wages, and opportunities for advancement. Participants across the two- and four-year sectors and into graduate and doctoral programs asked questions about the role of LMI in addressing program viability and future career options. One unresolved question was whether or not students needed a graduate degree to get a job in a particular area.

> » *Reporting requirements established by external stakeholders often drove LMI usage for program review and development, contributing to a highly formalized process, especially among community colleges.*

Community colleges were more likely to have requirements from external stakeholders that necessitate an LMI-driven approach to new program development and review. As a result, these practices appeared to be long-standing and more reliant on LMI for final decisions. Many new state, system, or institutional policies mandated that community colleges use LMI to answer specific questions about job demand and wages.

All participants from two-year colleges in the case study reported that their institutions received federal Perkins Career and Technical and Education (CTE) funding to support CTE programs. As one participant explained, "for Perkins dollars … we have to be responsive to the state on how we're utilizing their dollars with our programs." Recipients of Perkins funds are required to report LMI on the needs of their local labor market and the labor market outcomes of program participants. Therefore, it is not surprising that participants at several community colleges cited the Perkins CTE program as an initial driver of LMI usage for program review and development purposes.

The specific Perkins data reporting requirements are set at a state and regional level and enforced by intermediaries. These requirements often include submitting demand-based jobs data, such as job openings and existing programs, to justify establishing new programs, modifying existing programs, and setting up employer advisory groups. Other requirements include employment outcomes data on alumni, such as graduation and job placement rates. Perkins is not the only grant program that requires LMI. Other federal, state, and private funders expect LMI reporting to demonstrate the effectiveness of the programs they support. However, Perkins is probably the most influential grant given its ubiquity.

Community college participants referenced additional federal, state, and regional LMI reporting requirements. Participants from three two-year institutions spoke about being required by state policies to report LMI to their respective states as part of their program review and new program development processes. At Fullerton College in California, a standing subcommittee of the Faculty Senate performs program review. One participant described "the ingredients for doing program review" at Fullerton this way: "The program review committee really dictates what … the nature of the data is that is going to go into the program review process." In addition to reporting LMI to the state, Gateway Community and Technical College in Kentucky was required to submit new program proposals to a regional consortium. Representatives from each institution in that region served on a committee that met regularly to review and vote to approve proposals. The state mandated this process to ensure that institutions do not duplicate programs within their region. As one college administrator noted, "as a community college, we are required to report a lot of data, everybody wants data." Other external reporting requirements our participants cited include an industry-based Center for Excellence in California, statewide program review committees, system requirements, and accreditation requirements.

In contrast to a clear history of external influences that compelled LMI usage at two-year colleges, only one participant from a four-year institution in our study identified reporting requirements as a key driver of their LMI usage. In this case, the reporting was not motivated by funder requirements to report on labor market demand associated with new programs or employment outcomes, as many two-year colleges discussed. Instead, Morgan State University received a grant from the State of Maryland to work collaboratively with officials to build Maryland's state longitudinal data system (SLDS), which involved combining education and labor market data to aid research on student outcomes. A state regulation also required the institution to contribute data to the SLDS, including student-level data on course registrations, degrees, enrollment, financial aid, and earned credits from other institutions.

Most four-year institutions in the study (three of four) were in states with an SLDS that includes postsecondary data. These institutions were required to report data to their respective SLDS. However, based on conversations with individuals at these institutions, it seems they were not required to report LMI. One administrator shared that state legislators wanted data on student labor market outcomes collected from first-destination surveys on how recent graduates were faring in their careers, which they requested in the form of ad hoc reports.

> » *University review processes were motivated by internal concerns about enrollment and serving stakeholders and were less reliant on LMI for final decision-making compared with two-year colleges.*

Unlike at community colleges, which have multiple LMI reporting requirements to outside funders, LMI usage at the four-year universities in our study was largely driven by internal concerns. These included concerns about enrollment and about serving students, employers, and communities. For example, LMI usage in program reviews at several universities, including Eastern Connecticut State University (ECSU) and West Virginia University (WVU), began with initiatives by relatively new administrators who came to their positions with great interest in improving enrollment, retention, equity, and other mission-related outcomes. For liberal arts programs at universities, the effort to make career-relevant skills transparent was a response to the persistently negative public narrative about the value of liberal arts for careers. One participant from St. Catherine University, a liberal arts university, commented:

> If we start to be intentional about embedding [LMI] into the classroom, it both helps students identify the ways a philosophy course can help equip them with skills that can be beneficial for their careers [and] also play[s] a role in kind of pushing against that narrative that's out there in the world about the uselessness of certain kinds of degrees.

Overall, participants from two- and four-year colleges and universities agreed that LMI helped faculty and administrators make more compelling arguments for program support or discontinuation. However, the extent to which LMI informed final decisions in program review and development processes varied considerably, with four-year institutions being more likely to describe LMI as only one data point among many.

Participants from universities spoke about the reliance on LMI to make program decisions with more caution. On one hand, participants appreciated the insight it gave them into employers and industries. On the other hand, they expressed concern about being overly influenced by LMI given their mission to provide a broad education. As one participant from a university shared, "We don't want to be driven by that information. But it's not useful to be unaware either…. We want to be very careful about letting the market drive what we teach…. It's a very careful balancing act." Participants from ECSU and WVU also expressed that they are using LMI to inform program review decisions but not to dictate them.

During our study, formalized program review processes were under development at both four-year and two-year colleges. For example, during the course of our study, Dallas College, a two-year college, was organizing a more formalized review process that included new structures and resources. By the end of the study, the review included a program inventory dashboard that allowed the program review board to explore additional occupational data related to Dallas College program offerings. A participant from Dallas explained that developing their program review process included creating a steering committee to advise the revision activities. Several participants noted new requirements from administrators for academic departments to submit evidence for labor market demand that included LMI.

A formalized review process also appears to include broader engagement among internal stakeholders, reflecting greater institutionalization of LMI. Our participants explained that they shared LMI with institutional leadership. One participant reported that program review at their institution had shifted from the purview of faculty to an institutionally driven process: "Previously, it was very faculty driven, sort of like, 'I'm going to review my own

program and tell you how well I think it's aligned with the labor market.' That's not the case anymore; it's going to be at the school level, again, something that that vice provosts are very involved in for his or her school." Another participant indicated that their university leadership trusted their deans to review LMI with program coordinators to determine program needs. Determining needs is an evolving process. Some of our participants' comments reflected that their leadership was "working on what a comprehensive program evaluation might look like" or that student labor market outcomes would be considered as part of their program's evaluation. Measures of labor market alignment include placement rates, enrollment, the extent to which in-demand skills are addressed in curricula (skills alignment), and other indicators.

Despite these updates, our participants reminded us that using LMI in program review is a process in progress: "I will say that [the optimal use of LMI] is not yet worked out." However, participants were uniformly excited by the opportunity to move beyond "mushy program review" and think creatively about program development while meeting employer demands. "I have high hopes that [LMI usage] will create a better feedback loop with our faculty as well [as] with our program directors. We're not there yet." Universities were generally newer to LMI usage for program development, review, and improvement. Thus, developing practices that satisfy many different stakeholders will take time.

» *LMI is required by grant sponsors to receive funding to support existing programs and for the development of new programs, a factor that was especially relevant to two-year colleges.*

As discussed previously, external funders of two-year college programs often request LMI for various reporting purposes. In addition to outcomes reporting, many funders require institutions to include LMI in their grant applications to demonstrate demand for their programs.

Two of the five community colleges in our sample shared how they included LMI in their institutions' grant applications. The dean of CTE at Fullerton shared that the college included employment projection data in grant proposals. Lurleen B. Wallace Community College (LBW) recently used LMI to identify high demand, high wage occupations in its area to identify opportunities to develop a new program at the college. The college included this information in its application for a Department of Education Title III grant that it later used to support the development of a physical therapy assistant program. None of the four-year institutions included in our case studies discussed generating LMI to support a grant application.

Academic and Strategic Planning

» *Institutions' efforts to integrate LMI with academic and strategic planning varied. Four-year institutions reviewed LMI to identify areas of focus within broad, existing academic planning processes, while two-year institutions used LMI to develop academic and strategic plans.*

Note: While participants used the terms academic planning and strategic planning, they did not specifically define them. Nonetheless, their broader discussions suggested distinctions also found in the literature in which

academic planning relates to functions supporting curriculum and learning,[11] while strategic planning is more encompassing, addressing all aspects of the institution as well as its mission and vision.[12]

Participants reported broad strategic efforts to grow college enrollment and enhance students' employability. However, due to complex institutional missions, institutions generally used LMI as one among many tools and inputs to aid in decision-making and to implement strategic change. Six case study institutions (three two-year and three four-year) shared that LMI was incorporated into their academic planning efforts.

The four-year case study institutions in our sample used LMI to enhance broader academic plans. University staff analyzed regional LMI to identify gaps in the supply and demand in the region to support a new program review process. The analysis revealed opportunities to develop academic programs that would meet regional labor market needs. However, LMI was just one source informing these programmatic decisions.

Strategic planning often begins with college leaders. A participant from ECSU described engaging with LMI because of the president's institution-wide employability plan, which encouraged academic programs to identify their alignment with career-ready skills. Previously, they had used Valid Assessment of Learning in Undergraduate Education (VALUE) rubrics developed by the American Association of Colleges and Universities to do this. However, the School of Arts & Sciences used Burning Glass reports for the employability plan, prompting the school to identify the specific skills within their liberal arts majors that were most valued in regional jobs. The school then used this LMI in a separate academic planning project to revise the core curriculum. The goal of this project was to show the alignment between the skills in the curriculum and valued skills in employment. As a result, "people [were] convinced that employability doesn't have to mean that you're on the vocational track."

Several universities worked LMI into their academic planning efforts in less direct ways. A participant explained one approach to revising their university's academic planning process: "We want to make sure [students] have the information that they need, if they have other skills that they need to obtain to get the job that they want, that they know what those skills are." Often these new academic planning processes took the form of revising program review efforts to provide some evidence of employer demand for programs.

Two-year institutions, which tend to focus more on workforce development, were more likely to feature LMI directly in their strategic planning efforts. For example, one institution used LMI as part of a statewide academic planning initiative to identify high-growth areas in the labor market. After identifying high-growth opportunities for new programming, the institution planned to develop several pathways responding to those high-growth needs, including noncredit preparation and links to credit offerings. At Dallas College, incoming provosts were hired with the understanding that LMI was integral to the institutions' decision-making. At the time of our case study, this work was in the early stages. An administrator described their vision for the collaboration between provosts and the Labor Market Information Center (LMIC) as creating "a two-way street": the LMIC team would

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11   Rowley, D. J., & Sherman, H. (2004). *Academic planning: The heart and soul of the academic strategic plan*. University Press of America.

12   Dooris, M. J., Kelley, J. M., & Trainer, J. F. (2004). Strategic planning in higher education. *New Directions for Institutional Research, 2004*(123), 5–11. https://doi.org/10.1002/ir.115

share data with provosts to update them on changes in the labor market, then the provosts, as subject matter experts, would contextualize the data with knowledge from their industry networks:

> When it comes to … strategic investments … we have to pick something that is going to have the highest impact in the shortest amount of time, and it's going to create the most economic opportunity. … That's a conversation we start together from the beginning, with data guiding that conversation.

Two-year institutions incorporated LMI data throughout strategic planning initiatives. For instance, at Gateway, LMI data were analyzed and considered during facilities planning conversations. An administrator described the value of incorporating LMI into this work: "It really doesn't make sense to build buildings if you don't have programs in mind. [We're using data] to make sure we're designing spaces to meet the programmatic needs … driven by the needs of the region." Another participant emphasized:

> [A program review needs to] connect academics and workforce needs with the physical and operational aspects of the institution. All too often, colleges and universities complete these activities as separate engagements, leading to facilities that do not provide students with an environment that maximizes skills. Physical spaces need to meet strategic academic needs, and LMI informs the work.

Lansing Community College recently updated its strategic planning process to better incorporate data including LMI. Previously, the institution considered data at the end of the process when determining metrics for measuring progress toward its strategic initiatives. Reliable data to measure and track these initiatives were not always available. To address this issue, administrators partnered with the institutional research office to incorporate conversations about data throughout the strategic planning process. Analysts from the institutional research office joined strategic planning committees and participated in discussions about strategic initiatives, sharing their feedback on what they could measure and track with available data. Incorporating data throughout the strategic planning process helped ensure, where possible, that these initiatives and their outcomes were being measured and tracked. Measuring and tracking outcomes was important because doing so enabled the college to respond to trends and inform decisions about programs and new directions.

> » *Institutional, school, or unit missions, especially for equity, influenced the direction of academic and strategic planning efforts involving LMI.*

Several participants discussed aspects of their college's or unit's mission relating to LMI usage. Equity, community service, and the responsibility to serve a broad range of stakeholders were major themes. Participants from different universities referenced a desire to use LMI to address equity and to better serve various stakeholders, from students to employers and the community at large. One participant from a four-year institution summed up how their LMI work connected to their mission:

> I find the most crucial role of the data is ensuring that our curriculum is current and relevant.…We get a lot of first-generation college students, we get a lot of students who it

would serve them well to succeed and get good jobs. So, rather than creating students with particular degrees, and pushing them out into the community and expecting them to find— fend for themselves, [we are] finding out what the needs in the community are, what the employers want, what the stakeholders want, and then helping students develop those skills so they can go and serve in the communities.

Our respondents frequently expressed the desire to prepare students to serve in communities. It was this goal that motivated ECSU, for example, to begin using LMI in response to requirements emerging from a new institutional employability plan.

Two-year college participants also discussed equity concerns as a motivator for their LMI usage. As one case study participant explained, "The entire purpose of our existence is looking beyond just getting people credentialed and graduated [to] looking at the quality of life afterward. You know, happy, healthy, fulfilled alumni, that kind of thing." Finally, others mentioned LMI usage in the context of their college's mission to address workforce and economic development concerns in the community.

» *Declining enrollment was a key motivator of LMI usage in strategic planning at colleges of all types, but four-year institutions had more urgent concerns about declines, especially in the liberal arts.*

Case study participants at both two- and four-year institutions discussed the impact of enrollment declines, either in general or within specific programs, on their decisions to use LMI. However, concerns were more acute among those at four-year institutions. Participants from nearly all four-year colleges reported that deep concern about enrollment declines was a primary influence in their decision to use LMI in strategic and academic planning. College representatives cited several reasons for their enrollment declines, indicating that the enrollment issues they are trying to address with LMI were complex. Participants attributed enrollment declines, especially in the liberal arts and sciences, to the following factors:

o Changes in the demographics of their traditionally targeted markets for prospective students
o COVID-19 limitations on in-person recruitment events
o Job declines in academia
o Changes in student preferences for industry jobs and skills, internships, and related hands-on experiences

Several four-year institutions with schools of arts and sciences explained the added challenge of misleading narratives about the career value of liberal arts contributing to enrollment concerns. As one participant stated, "What we're finding is not only are people questioning the traditional liberal arts … like English, or performing arts or art, or history, but we're also finding that students are now questioning the value of even some of our [other] traditional majors like biology and math." Another college representative noted that concerns about student debt and the value of a college degree have become a public concern, especially over the last five years.

Just two out of five community colleges cited enrollment declines as a key driver of LMI usage in strategic and academic planning efforts. Concerns were limited to general demographic trends that were leading to a decline in traditional enrollment populations. These enrollment declines pushed colleges to think about using LMI for various applications related to identifying, recruiting, and retaining new groups of students.

> » *As part of broad strategic plans, liberal arts colleges and universities sought to promote students'*
> *employability by integrating LMI into curricula and advising—including by generating and sharing lists of*
> *employer-valued competencies—but most institutions were in the beginning stages of implementation.*

Participants at most universities in the study sample (four of five) explained the importance of integrating LMI into courses and advising as part of broad efforts to improve graduates' employability, especially in the liberal arts. Participants described a process whereby they used LMI to generate lists of competencies associated with skills sought by employers. Those lists were then distributed to faculty and staff members in the hope they would use that LMI to align skills taught in their curricula with skills needed for jobs (i.e., skills alignment in Cleary et al., 2017). Such a process can be understood as part of larger strategic planning efforts aimed at framing liberal arts degrees as degrees that impart skills desired by employers.

A second aim was to make the career-relevant skills taught in courses more transparent to students. Institutions used various LMI sources and types in these efforts, including survey data from organizations such as the National Association of Colleges and Employers and real-time jobs data, such as job posting and resume data. Initial efforts to promote academic integration of career-relevant skills, such as efforts at three four-year institutions to make students aware of career-relevant skills they were already learning in arts and sciences courses, yielded promising results. At one institution, a pilot program provided competitive grants for release time to allow faculty to integrate new career-related competencies into their courses.

Many faculty perceived benefits of LMI usage, even if implementation was not fully underway at their institution. Nonetheless, participants indicated that work needs to be done to teach faculty and advisors about these initiatives—for example, by responding to faculty concerns about potential conflicts between the initiative to use LMI and their institutions' liberal arts missions. In addition, faculty and staff members expressed feeling overloaded after years of the pandemic. Thus, the work involved in enhancing curricula can seem daunting.

Recruitment and Enrollment Management

> » *Universities used LMI to attract and identify prospective students. Liberal arts programs were especially*
> *concerned about communicating the value of their degrees to potential recruits.*

As discussed previously, four-year institutions had complex concerns about enrollment declines. Not surprisingly, participants from all four-year institutions in the study discussed the importance of using LMI to communicate the value of their degrees to prospective (and current) students, parents, and the community, often as part of the recruitment process. Those associated with liberal arts programs were particularly concerned about this issue. They used LMI to counter a misleading narrative that a college degree, especially in the liberal arts, is not valuable for a career. For example, one participant commented, "with a liberal arts education, you go into the workplace and you're leading, you're problem solving, you're not just fitting into the bureaucracy."

At one four-year university, participants discussed a unique way staff in the admissions department used LMI: to identify occupations in demand in target recruitment regions. Admissions staff then analyzed those data

to determine the skills necessary for those jobs and connected the skills to particular degree programs at the university. Using LMI this way empowered admissions staff to promote specific programs in particular regions early in the recruitment process, long before students had been admitted and visited campus to hear the LMI-based stories told by academic staff.

It is likely that we did not hear participants from two-year colleges discuss the use of LMI specifically for recruitment because these colleges frame the issue somewhat differently than four-year institutions. As discussed earlier, LMI was often used at two-year colleges to justify programs as well as to develop strategic and academic plans for the institution. The goals for program review were likely to have been driven by a funder and framed in terms of a particular goal—to align programs with employer job vacancies or skill needs, for example. This may have resulted in enhanced recruitment, but recruitment may not have been the primary goal. In addition, two-year colleges often serve limited geographic regions with less competition among colleges for students, so for those respondents, recruitment may not have been as salient of an issue as other goals, such as meeting the needs of key stakeholders, including students, employers, and others.

Relationship Building with External Partners

> » *Collaborating with external partners to exchange LMI fostered relationships with external groups and created opportunities to serve community needs.*

Participants from both two- and four-year institutions described sharing and discussing LMI with various external partners, including community partners, advisory board employers, employers not on advisory boards, state and system offices, and other institutions. Two-year institutions met with external partners via local community development groups, program advisory boards, and as part of state or local education systems (i.e., Fullerton and Gateway). External stakeholder engagement was more formal at these institutions than at four-year institutions, likely because of CTE program requirements. For example, two-year institutions receiving federal Perkins CTE funding are required to organize and meet with program advisory boards.

Two-year institutions within systems shared data with system offices and other system institutions. For instance, as an Orange County Center of Excellence Consortium member, Fullerton was required to include LMI in program proposals when recommending new credit CTE programs. Similarly, the vice president of workforce solutions at Gateway regularly shared and reviewed LMI to help inform workforce training and programming. This collaborative engagement enhanced the ability of institutions within the system to review and utilize LMI data to support workforce solutions initiatives. Three of the four-year institutions in the study (i.e., St. Catherine, ECSU, and Morgan State) participated in an SLDS, which also promoted collaboration across institutions.

In addition, institutions used LMI to identify opportunities to engage external groups in partnership. Two- and four-year institutions worked differently with external partners and for different purposes. Two-year institutions often engaged employers as members of advisory boards or as partners in developing and implementing

programs. For example, one two-year institution reviewed LMI to identify employers to invite to serve on advisory boards. LMI identified employers hiring workers to fill positions for which the institution provided programming. Advisory board members provided institutions with a "reality check of their LMI." They confirmed if the LMI data accurately reflected actual employment and skill needs:

> [Advisory board] data here helps us keep our ear to the ground and say, you know, 'We've seen [in LMI data] a tremendous need for automation technicians. Is that something you guys are looking to do?' And then sometimes they'll say, 'Well, yeah, but we can't afford them. So, we're not really hiring anybody.'

Another two-year institution used LMI in partnership with local community organizations to identify which programming was appropriate in specific communities. For example, one participant described working with a local professional development center, where they identified that 43 percent of local residents ages 25 to 64 had no high school diploma. As a result, the college began to provide GED courses along with skills training that could lead to good-paying jobs.

By comparison, collaboration with external partners was infrequent among the four-year institutions in our sample. In the few such institutions that did engage with employers, that work was less formal and occurred less frequently than at two-year institutions. In some cases, collaboration using LMI took innovative forms such as at Morgan State, where a participant reported regularly asking for feedback from employers on student interns. This was done to deliberately develop a pipeline of students who were prepared to work for the participating employers. Finally, as noted above, Morgan State also worked collaboratively with state partners to develop an SLDS that combined education data and LMI.

Colleges also collaborated with external partners to develop and improve LMI practices. For example, Fullerton reported working with a regional program review committee established by the state senate. The purpose of this committee was to provide a forum in which regional colleges in California could discuss the ideal "ingredients" for a program review process that was "good for our school, good for students, good for instruction." Morgan State reported working with the State Commission on Higher Education to determine the best measures and process for reporting LMI. A participant there discussed how they began with required data reporting elements for their SLDS project but then combined multiple data sources, including Lightcast, Equifax (available through Lightcast), MIT living wage, and six-month exit data on alumni to put students' salaries into perspective. They developed a poster presentation for the National Center for Education Statistics and sent the data they created to other units at the college, such as the career services office, for use in student advising.

Advising

» *Using LMI to advise current students was an aspiration, but structured practices in this area were still emerging.*

Participants from both two- and four-year colleges and universities indicated that they saw potential value in using LMI to advise students' decision-making. As one participant from a four-year institution noted, "I would really like to see our entire advising community … be aware of how this could be a powerful advising tool [so that] any student could go into an advising center and do their own exploration." Advisors could empower students to use LMI in their career explorations and decision-making. Major goals for LMI usage in student advising included raising awareness about transferable skills and career possibilities, connecting career interests to careers, and encouraging students to engage in experiential learning earlier.

A participant at a four-year school explained that career center directors in their state planned to gather to discuss how best to apply LMI in career counseling settings. They had decided to meet because LMI usage was so new in the field that few best practices existed. This administrator discussed the challenges in defining effective practices:

> What is the best approach to working with students with this? Because they want quick information: 'What are the jobs and where are the internships [that fit me]?' They want to know that information and be able to take it to make those informed decisions.

Another participant mentioned a lack of available professional development or limited funding for obtaining licenses for data tools. The same participant also mentioned that available tools were inappropriate for students because they required expertise to interpret the data. Moreover, several participants noted that it was essential to present relevant LMI to students as an advising aid because graduates do not "go out into the job field and [immediately] get that median wage." Thus, participants encouraged the use of LMI that is more relevant to early career stages, such as entry-level wages associated with an occupation, annual openings in those occupations, and the growth percentage.

Few participants discussed a need for standards for using LMI in advising. One participant reported asking students to do a career assessment during orientation that used LMI to display job demand and salary data from the national, public Occupational Information Network (O*NET) regarding careers identified in the assessment. Participants from other four-year schools discussed using LMI with students, including alumni and salary data, during career advising appointments. The use of LMI at these institutions was at the discretion of each advisor. For example, administrators at a four-year university discussed how advisors, based on student needs in individual counseling sessions, could show students a dashboard displaying data on alumni internships and jobs. The hope was that such data would shift students' focus toward engaging in career-related experiential learning and internships earlier in college.

Finally, respondents indicated that advising students with LMI required a shift in how the data were used to an approach that was uniquely focused on students' needs, with increased emphasis on earnings and getting a job after graduation. A career center director described focus areas that counselors used when working with

students around LMI: "This is where the jobs are. These are some of the places students may go with your major. These are some of the average salaries … and starting salaries. Are you developing the skills they need for that position?" This director described an LMI-based salary discussion as a "carrot to engage students," many of whom focus on salaries when making major and career decisions. However, the goal was to use the data to start a deeper conversation about skills and help students think about developing transferable skills. Other schools, such as LBW, used LMI to help students connect career interests to jobs or, like Lansing and Morgan State, to raise awareness about the importance of gaining hands-on experience in areas of interest as soon as possible.

LMI Data Sources

> *Colleges and universities often require multiple sources of data, a fact that has implications for the cost of implementation.*

In this section, we highlight the data sources of LMI for colleges and universities. We explore the range of options and how users combined sources. We also review the costs that colleges and universities paid to gain access to private data sources.

» *There are many public and private sources of LMI data for institutions to draw upon.*

College representatives in the study reported using multiple LMI data sources, including data from vendors, community stakeholders, institutional repositories, and government sources. Government data include federal and state government data sources, such as the Bureau of Labor Statistics, US Census, O*NET, and state departments of labor (e.g., Alabama and Maryland). Free government data sources provide valuable information on job numbers and growth and industry changes. However, these sources do not contain information on skills or alumni outcomes. In addition, government data are typically available in raw formats that may require additional sophisticated analysis to interpret.

Private vendor data are quickly becoming a significant source of LMI because they meet users' needs in unique ways. Several vendors derive skills and alumni employment outcomes data by scraping data from public job postings and resume websites and analyzing it using proprietary methods.[13] This is one reason why vendors can provide estimates of job and industry growth that may be more current than government sources. Participants in our study reported that several vendors also packaged, connected, and visualized data from government sources to add value to their own data sets and tools.

Participants collectively reported using LMI from several different vendors, including Burning Glass and EMSI (independent companies that merged as Lightcast during our data collection), Buzzfile, EAB, Chmura (the vendor that produces JobsEQ), and Steppingblocks. Participants sometimes used a single data product from one vendor, but more often, they used products in combination. The methods these vendors used, however, differed from government sources and from one another. As we will discuss later in this report, the methods vendors used to combine and analyze publicly sourced data were not transparent to participants.

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13   Dorrer, J., and Milfort, M. (2012, April). *Vendor product review: A consumer's guide to real-time labor market information.* Jobs for the Future. Retrieved from http://skilledwork.org/wp-content/uploads/2017/08/JFF-VendorProductReview_041712.pdf

Institutional data, another primary LMI data source, are internal data collected by institutional research offices. Tableau Software is one example of a tool institutions use to create internal databases. Institution-level data can also come from external research groups that the institution hires. One form of institution-level data, research group data, can provide granular, in-depth analysis of select programs, revealing trends such as which local hospitals need people in radiology and sonography at the associate degree level. In addition, nearly all institutions survey their students, including prospective students. However, this source of institution-level data tends to be incomplete because of low response rates.

Multiple Sources

> » *Institutional users mix multiple LMI sources and types based on needs and goals.*

Participants' reasons for choosing a vendor product varied. Some participants chose based on prior familiarity with a product, while others performed a more complex analysis, considering, for example, how majors related to employers. In fact, participants cited and described over 20 data types and sources, including public and vendor data, and nearly all participants reported accessing and using multiple sources simultaneously. Each data source offered uniquely valuable information.

Users mixed data types and sources to meet needs and goals, such as adding an economic development feature. A participant explained how this works: "EMSI [now Lightcast] doesn't really have an economic development feature, so we may go with JobsEQ because it does allow us to kind of use that for that role." Further, institutions changed vendor products as their needs evolved. For example, an institution's mix changed as its LMI personnel became more sophisticated data users. Moreover, vendor products also changed in response to labor market changes.

Finally, some participants reported using data provided by community, employer, and industry organizations. Some institutions communicated directly with local employers, while others had advisory boards. Either way, networking with employers was a significant source of local LMI. Some also included data from local community organizations and industry associations.

Data Costs and Features

> » *Access to public data is usually free, while access to private vendor data requires licensing fees that represent a significant investment.*

Most government data are free, including data from federal and state sources. Access to system-level data, such as the California Community College System's LaunchBoard, or stakeholder-based data, such as the National Association of College and Employers, is also generally free, but usually requires membership or organizational affiliation.

In contrast, products from vendors such as Lightcast or EAB require users to pay licensing fees, which are typically charged per user per year. The actual costs are not listed on vendor websites, requiring interested parties to contact the company for a quote. These fees represent a significant investment for institutions.

Because institutions tend to require multiple user licenses spanning various departments, licenses for proprietary products can cost tens of thousands of dollars per year. For instance, in 2020, one institution had, "34 licenses on campus and 29 used across 12 departments, such as admissions, advising, career development, alumni affairs, academic affairs, and the deans' offices." As we will detail in the section on institutionalization of LMI usage, the colleges and universities in our study used both external grant funding and institutional funds to support the purchase of vendor products.

Licenses for vendor products add unique value to the LMI resources that colleges and universities use. As discussed above, vendor products allow users to access timely data on skills, alumni outcomes, and other factors that are not available from free government sources. Because many vendors also create visualizations and custom analyses of government data, these licenses allow users to more thoroughly explore the program offerings of competitors. The in-depth view of LMI afforded by an analyst license is useful for many applications, such as program review and degree development.

One drawback of user licenses, general and specialty alike, is that vendors provide limited information about institutions' own internal usage. While institutions can see the most recent instance of license use, they are not granted the ability to determine the frequency of internal usage. This presents challenges to monitoring the frequency of license use and determining whether some departments are underusing their licenses or not using them at all, an important step in justifying the cost of the licensing and in determining who needs additional professional development.

> » *Vendor-based professional development is a feature of paid licenses. This support varies in scope and depth, but study participants found value in their individualized coaching models and quick-response help systems.*

When institutions subscribe to data tools sold or licensed by commercial vendors, professional development often comes with the product at no extra cost. The most basic level of vendor-based professional development involves instructional videos that users can view on the vendor's website. These videos are self-paced and accessible. Beyond videos, participants mentioned specific data products, including Lightcast as well as Chmura's JobsEQ, and described the vendors' professional development options. For instance, a participant described initial preparation with JobsEQ as an in-person professional development with a Chmura trainer that included only a small group of 10 users from the same institution (with corresponding software licenses). As the group grew and added more staff members, the experienced members trained new members to use the data tools such that "it's like an oral tradition; we pass on what we know." Thus, the workgroup started with the vendor's in-person professional development session, and then group members became skilled enough to train new staff members.

Moreover, participants explained their individual experiences with vendor products. One participant described a situation where they had no prior experience with a data tool and received job-based professional development during her first year. She explained that she was initially nervous, but the vendor's accessibility and quick responses to her questions made her feel more comfortable with the product. This participant described ongoing support beyond the initial vendor professional development, which itself lasted over a year.

Vendor-based support includes asking experts situational questions by email and phone and receiving quick responses. Another participant echoed the need for individual situational professional development, especially when users already have a strong background and instead need particular questions answered. These findings indicate that LMI data users need personalized, situational preparation akin to coaching that extends beyond instructional videos and group work, up to and including one-on-one sessions with a vendor trainer.

LMI Infrastructure

Institutionalization of LMI requires an infrastructure that includes users, structures, ongoing targeted professional development, and policies.

Organizations that engage with data to inform decisions, improve operations, and achieve goals establish an LMI infrastructure to support these uses. This infrastructure consists of the personnel, structures, processes, and policies that support LMI usage. The main activities include data collection, storage, analysis, and dissemination. Given the interest our study participants had in LMI, it is not surprising that we observed the presence of significant and sustainable structures and processes to support LMI usage across institutions, although they took vastly different forms.

In this section, we highlight the infrastructure that supported LMI usage in the two- and four-year colleges and universities in our study, including LMI users and staffing and their professional development. We also examine the tools that enabled LMI usage and explore how colleges are institutionalizing the use of LMI structures.

LMI Users

> » *Roles for LMI data users at study institutions included data analysts, power users, general users, and implementers. Each made valuable contributions to LMI usage.*

LMI users are a significant factor in the infrastructure. Data users are the select people on college campuses who use, interpret, and share LMI. Our case studies suggested four main roles for data users: data analysts, power users, general users, and implementers. All four roles supported LMI usage in various ways. An adjacent group of institutional personnel, LMI champions, may or may not have used the data themselves but appreciated the value that LMI provided and advocated for its usage.

Data analysts were staff hired to analyze data for use by others as part of their formal jobs at the institution. These included institutional research staff members as well as staff members specifically located in various information or data centers at their respective institutions. Occasionally individuals in this role were located in a particular division or even the Office of the Provost. Data analysts also interfaced with executive leadership by, for example, meeting and "[showing] them the specific reports that they needed for program review and the programs." In some cases, our study participants reported that data analysts were integrated into their institution's leadership team, which provided them with "a well-rounded view of what's going on at the college."

Power users were people "deputized" to analyze LMI data for their colleagues, but not to the same level of detail or sophistication as data analysts. They are people who "become very comfortable [with LMI tools] and then

can provide guidance." Among our study participants, this group included departmental power users at Lansing, WVU, and ECSU, and faculty data coaches at Fullerton. (We discuss the role of data coaches in greater detail below.) These users sometimes worked in other roles; for example, one power user was a librarian who received LMI professional development and then taught others how to use the data. Personnel at some institutions ended up in the role of power user because of their technical agility or because of prior experience with workforce development or an understanding of relevant labor market–related databases. Power users supported others in the institution by pulling information for program review, sometimes using analyst licenses. These reports could be digested by including data summaries and other interpretations.

General users comprise the third group of roles and include everyone else who accessed LMI or vendor products directly with a license or who used data reports run by analysts or power users. These individuals constituted the bulk of users. Although they may not have had the technical acumen of power users, they were important for the overall integration of LMI into daily academic and administrative functions.

Implementers were faculty, administrators, and other college staff members who received LMI reports but did not access LMI directly from data tools. The individuals in this role often required some coaching to understand the data and how they might apply those data to their work. Nonetheless, these personnel were largely responsible for implementing program changes, such as changes to curriculum or determining the mix of programs offered, using the results of LMI analyses performed by other users.

LMI champions hailed from many different areas and levels of the college and were often motivated by prior LMI usage. Their prior knowledge of workforce data and issues informed how LMI came to be used at their institutions. These individuals played important roles in expanding LMI applications associated with academic planning and strategic initiatives. In addition, they were often responsible for continuing, refining, and deepening LMI usage for local programs and initiatives, even when those efforts were initiated by the chancellor or president. Sometimes, individual champions in different parts of a college strengthened LMI use when they found one another and amplified positive messages about the usefulness of the data.

» *LMI users collaborated to build an institutional understanding of LMI and its applications.*

Depending on their roles, LMI users had various levels of understanding of the data underlying the LMI they received. Some worked with data sources directly, while others implemented changes based on analyses performed by others. Thus, data users had a range of knowledge of LMI's potential applications, strengths, and limitations, and of the areas in the college where LMI was being applied. Often, LMI users in different roles worked together to determine how best to use and apply LMI within an institution.

All case study participants described interactions between those who accessed data directly and those responsible for implementing changes in different parts of their institutions using LMI. For example, one of our participants described the collaboration process between their institution's director of assessment and a[n LMI] market research analyst:

> The director of assessment's job is to work with the programs and develop their objectives, and
> … to align with what HLC [Higher Learning Commission] requires and … to create programs

that are more aligned with ways that can be effectively assessed. [The Market Research Analyst] is on the other side to coordinate with employers to figure out what objectives employers expect or require of the people they hire. Then it's our job to come together in the middle and translate what employers want … figure out, "How do we develop programs that actually train students for what employers want?" And then how do we explain to employers that you actually do want these things that aren't necessarily directly related to the job, like you do want students capable of expressing themselves clearly and professionally in both oral and written formats?

Our case studies suggest that collaboration among LMI users in different roles increases institution-level understanding and aids in the development of more sophisticated LMI approaches over time.

Organizational Structures that Support LMI

> » *Case study colleges increased LMI-related positions and staffing levels.*

A common support structure among case study colleges and universities was the creation of new positions and the addition of staff members to support LMI collection, analysis, dissemination, and usage. These positions were frequently high-level leadership roles, as evidenced by titles such as senior director of labor market intelligence, director of graphic information systems (GIS) and data visualization, senior director of customer relationship management, dean of academic analytics, vice president of research and insights, director of curriculum and assessment, and assistant director of public information. As one participant explained:

You really need to make sure that you have someone focused. So, if this was a priority, then you know how they say, "Put your money where your mouth is." So, if it's a priority, then we need to bring somebody in with the skill set to just focus on researching.

The phrase "put your money where your mouth is" refers to directing resources toward priority areas—in this context, to the institutionalization of LMI. Overall, participants reported increases in staffing to support LMI at their institutions. For example, Dallas College recently hired a GIS analyst and a trainer in addition to senior-level, data-focused positions. Lansing hired a market research analyst. However, case study participants pointed out that there is no point in building data systems if people do not know how to use them. One college prioritized hiring a trainer for their data system. Another participant described the use of informal coaches who helped faculty learn how to use databases and interpret data. Other colleges created formal, paid roles for data coaches to support organizational data usage, including LMI usage, in the program review process.

Data coaches were a specific form of power user and were often among the earliest adopters of data tools. These individuals served as dedicated LMI resources within the institution, teaching others how LMI tools work, showing examples of data, and explaining how to use them. For example, data coaches "[supported] faculty through program review to make the process more collaborative." Data coaches were often central to collaborative efforts.

Data coaches and other power users were part of an emerging structure that promoted LMI usage and institutional research. Data coaches observed and reported where institutional research needed improvement and could serve as a conduit between faculty and leadership. Importantly, data coaches could act as a bridge between institutional researchers, faculty, and leadership. Participants from Fullerton and ECSU both described this approach to supporting data use. For example, they reported that data coaches were unique because they understood both the data and the academic needs of the institution. They could speak with faculty and explore what data were needed, how to use it, and how to "bring all the data together," and they were able to answer questions and develop relationships.

Some participants recognized that they could not expect their colleagues to understand and use LMI, such as data available through their Office of Institutional Effectiveness, immediately. Instead, they explained, they "need people engaged in the analytical and interpretive processes" to support the application of LMI. Although tools, reports, dashboards, and software have made LMI far more available and accessible than ever before, one participant shifted their focus and wondered, "How can we work with our campus community, for people to actually be aware of, and properly digest and utilize, the information, … to drive change?" In this way, data coaches were crucial to campuswide efforts to help faculty and staff members understand and use LMI. At Fullerton, each division selected at least one representative to serve in a data coaching role. These data coaches then engaged with a curriculum that included walking through the different tools and resources that researchers would need to use, including dashboards; going through state data sets; and communicating what the data might mean, how they are calculated, and where to find them. The participants felt that this was one of the strongest points of their experience of LMI usage: "Data coaches are not meant to be another analyst. Instead, they are individuals who can facilitate conversations that can link the data that exists into conversations across campus, really be resources for colleagues who have questions—questions that can be answered with these tools that are already available."

Several participants from four-year institutions discussed how various offices and positions, though not called data coaches, provided similar services to faculty and administrators. At SNHU, the Office of Product and Program Innovation worked with faculty and subject matter experts (SMEs) who assisted them in understanding how courses address labor market needs, even in the liberal arts. They also worked with faculty and SMEs to interpret and apply LMI for new program proposals or curriculum enhancements. Similarly, WVU had staff members in the provost's office who ran LMI reports for faculty and helped interpret and use these reports.

» *Organizational structures supporting LMI integration and consistency varied and were not necessarily complex.*

The incorporation of LMI into the academic institutions in our study coincided with changes in expectations about how and, notably, when to use data. For example, participants spoke of how the people who worked with LMI were part of projects from the outset. Therefore, they looked to the data "to drive … where [their project was] going" rather than turned to data when they were "already way down the road." Involving LMI users in project planning was key.

Another common structural approach to supporting LMI usage that our study participants discussed was the organization of LMI into easily usable products. For example, one college developed a process for creating "occupational master lists" for employees. The lists included data on entry wages, median wages, employment, and potential growth for specific occupational areas. In addition, the institution maintained a list of in-demand occupations and of occupations that corresponded to trending industries. These lists existed in a database accessible to all employees. Although the institution still faced the challenge of how quickly data became outdated, it was important that these data were readily available and consumable. Similarly, another institution developed easily understandable postgraduate student hiring data.

Some colleges pushed to integrate all data (LMI and other data) into one system to address accessibility concerns. For example, participants from Dallas College shared how they eliminated multiple systems:

> We're using Salesforce to manage our customer relationships … we want people to stop working in silos…. We can see in Salesforce; we are already working with this person. These are the initiatives [they] are already working with us on so everybody in the college can communicate internally and see what everybody else is working on.

A participant shared the example of previously having to post job ads to six different places at their institution, which created confusion for employers and students. They have since streamlined the process so that job postings appeared on a single platform.

Another example of LMI tool development was the referral page on Dallas College's website, which displayed two dozen services the college offered to businesses (e.g., advisory committees, job fairs, and internships). After employers checked their items of interest, the website sent referrals to the appropriate internal personnel to follow up. For instance, an employer could "put a little chart on [their] profile page that shows how many students they hired this year, [so visitors] can see quickly at a glance how involved they are." The data tool also generated reports of employer engagement.

Other practices reinforced LMI usage as part of larger structures that supported the institutionalization of LMI in the case study colleges. These practices included creating forms, handbooks, standardized data packets, and meetings. For example, at Lansing, faculty and staff described a process that involved submitting LMI and other data requests on a data request form; the submission was followed by a short conversation about what data are available, the necessary format, and a timeline for completion. Lansing also created "a standard data packet to ensure that the information is consistent." With so many practices, Lansing developed a guidebook for the program review process. This guide addressed their data and how to analyze the information. The guide provided users with support throughout the program review process and made the process more granular and less vague. Similarly, a participant from ECSU shared that their university's assessment committee developed a handbook to support programs in their annual assessment process. In addition, it was still common at ECSU for data analysts or data coaches to meet with less experienced LMI users one-on-one to help them better understand the data and to support their appropriate use as part of the data request-and-use process.

Case study participants from many of the study's four-year colleges and universities shared that LMI processes were still in development at their institutions. Two participants discussed forthcoming professional development programs for faculty and staff members that were expected to focus on LMI and its applications for recruitment and curriculum development.

Developing LMI processes takes time, in part because LMI is complex, but also because it is relatively new: few best practices exist to guide its adoption or usage. A participant at ECSU noted that conversations were ongoing regarding the need to establish mechanisms for and access to data that would ensure that users use the appropriate information consistently. That participant noted, "I think it's just a lot to ask for chairs and faculty to try to mine the data." Similarly, the director of the Center for Internships and Career Development at ECSU told us about a state-level consortium of career directors who were working together to develop guidance and best practices for using LMI from Chmura because many data users had found it difficult to understand how to apply this data source to their work with students.

Finally, participants from SNHU described their roles in a national network, the Open Skills Network (OSN). OSN members included a broad coalition from universities, LMI vendors, employers, government, and other organizations. The OSN aims to create a common infrastructure for coding job-related skills using metadata. Metadata are data that describe other data, such the origin, structure, or characteristics of computer files, web pages, and databases. Currently, this work is more visionary than applied, but the hope is that it will lead to a common information technology (IT) infrastructure that LMI tools and vendors can use to make LMI skills data more transparent and responsive to emerging definitions of skills and competencies. This example represents a unique form of engagement to develop the field of skills identification beyond the institutional or even the state/regional level.

> » *Institutions used external grant funds to support their access to and use of LMI.*

Both two- and four-year institutions in our sample used grant funding to access and collect LMI. Grant funding was critical to building and maintaining LMI infrastructure because it allowed them to purchase access to data tools their budgets could not support. For example, the Labor Market Intelligence Center at Dallas College used grant funding to purchase access to multiple data tools. This allowed the center to explore which tool best met its needs and would most likely be supported by the institution's budget in the future.

Grant funds were also used to improve institutions' existing data collection efforts. Morgan State used grant funds to bolster its efforts to collect data on alumni outcomes. Staff members from the university's Career Development Office previously administered the institution's first-destination survey of recent graduates. Grant support allowed the university to hire an organization to administer the first-destination survey and implement a data visualization tool that displayed data on alumni outcomes in ways that made the information accessible to more users.

Additionally, grant funding supported institutions' efforts to integrate LMI into existing processes. The vice president of career services and professional development at St. Catherine recently added LMI to the university's

list of career competencies as part of its professional development initiatives. As part of these initiatives, the university used grant funding to teach faculty how they could integrate those competencies into their course curricula. This grant supported professional development opportunities; select faculty who applied for the opportunity were given some released time to implement this work.

Professional Development

When participants reflected on professional development and preparation for LMI usage, two themes arose: preparing advisors to improve student outcomes and preparing data users as part of the broader data infrastructure. The latter theme included custom professional development provided by the institution.

» *Preparing data users was essential for developing institutional data infrastructure.*

Some colleges did not yet have a formal professional development process. Participants, particularly those at smaller colleges, shared that professional development and support were provided individually. For example, one-on-one meetings between data analysts and faculty or administrators as part of labor market data requests were common. These meetings ensured that the data analyst fully understood the request and subsequently contextualized the resulting data appropriately. These one-on-one meetings with someone in a data analyst role were distinct from the reliance on particular individuals. While this occurred at some colleges, it is our view that the practice is not sustainable. We heard from other colleges about structures they have implemented that make those individual consultations unnecessary. For instance, participants from St. Catherine and Gateway described using a group approach to data requests, such as hearing from faculty in a division or department meeting.

Although structures were in place to support and encourage faculty use of data, interviewees noted that an area of need for professional development was training aimed at preparing advisors to use data tools. Although other staff members' professional development with data tools often occurred early in the adoption process, advising staff often were not included, or the training insufficiently addressed their unique use of LMI. A significant rationale for preparing advisors to use data tools was to improve student outcomes after graduation. The goal was to achieve a deeper level of advisor professional development with hopes that advisors' improved expertise would translate into better long-term student outcomes.

» *Institution-based professional development complemented vendor-based preparation and supported applications of LMI usage in specific higher education contexts.*

Group professional development about vendor data products, like Lightcast and JobsEQ, was often embedded in other professional development contexts. These contexts included webinars, employer conferences, and professional development programs. For example, a participant described a professional development series on career competencies with an integrated learning component on data as a way to introduce the tools and build knowledge. In addition, data preparation was sometimes embedded into smaller team sessions within an institution. For example, a participant described engaging with smaller teams to support various projects and offering overviews to refresh participants' understanding. Staff members within SNHU offered small-group

professional development. In these sessions, the designers also embedded data tool refreshers and reminders, such as where the data came from, validation procedures, and other various data needs and issues. This view of data tool professional development reflected an ongoing conversation between institutional professional development providers and various teams that needed support when using data.

Another approach to institution-based LMI education was hiring an external consultant to provide a baseline of data, model the process of data analysis, and highlight opportunities identified by the data. Participants at Gateway reported working with an external consultant to gather and explore LMI. Once they had gone through the entire process with the consultant, they had learned what to do and did not need to retain that individual again. Yet they realized that there was "a whole series of questions that need to be asked to really understand the numbers." Thus, participants expressed that learning how to use LMI changed with experience and involved many types of support.

Data Policies

> » *Despite the ubiquity of LMI usage and shared expectations for its applications, the existence of formal LMI policies varied across participating institutions.*

The existence of formal LMI-specific policies varied across the case studies, although there was consensus that LMI expectations had become standard practice. Every participant who discussed LMI policy referred to LMI as an institutional, system, state, or federal requirement for program review or new program development. Institutions sometimes enforced LMI usage for program review processes because of institutional policy or state requirements for LMI in new program development.

The institutional formality of LMI expectations varied across case studies. Some participants shared that LMI usage at their institution was a "top-down mandate," or leadership expectation, although not necessarily a formal policy. For example, at Dallas College, senior leadership set expectations for LMI usage because these leaders were evaluated on program success and market alignment. As noted earlier, regulatory reporting is an external policy formally compelling LMI, predominantly among community colleges and less so among four-year colleges and universities. Notably, LMI emerged in one college's labor agreement in Academic Year 2022, where LMI became a requirement for hiring new employees. Dallas College used LMI to identify its goals in a process termed V2MOM (Vision, Values, Methods, Obstacles, and Measures):

> We're currently working on our goals. So, from the top down, from department to individual, we have
> to create our own methods, obstacles, and metrics. So, seeing the vision and values of the college and
> understanding all have to be in alignment kind of pushes us all in the same direction. But one of the
> steps in that process is to visit the LMIC if you are familiar with the data and plan to use it.

Data policies also supported and reinforced LMI usage. For instance, a participant at Dallas College described their institution's policy this way: "If data is involved, you need to go to the LMIC to confirm, or you need to go to the LMIC to understand this better." In addition, where LMI usage was not mandated by policy, or requirements

were not as "strict as they need to be," we heard about the role of culture in promoting its use. Even where LMI was not fully institutionalized, it was often part of routine operations within departments.

Institutionalization of LMI Data Use Structures

» *LMI institutionalization varied and included centralized supports for LMI usage, investments in LMI products, and increased staffing.*

The institutionalization of LMI usage requires a commitment of time and resources at a level that demands institutional financial support for purchasing LMI data tools and increasing staff. Among our case study colleges, two two-year and two four-year institutions received external funding to support their access to and use of LMI. This funding came in the form of grants (i.e., Dallas College and St. Catherine) and consortium and system funds (i.e., Fullerton's regional consortium and the ECSU system). ECSU, Dallas College, Lansing, and WVU used institutional funds to purchase LMI tools and services. As discussed previously, colleges and universities varied in the extent to which they invested in staffing to support LMI usage and professional development at their institutions.

We found that one way to better understand the extent to which colleges invested in institutionalizing LMI usage structures was to examine the extent to which the institution had centralized these structures. Three main models emerged in our case studies: a centralized approach, a decentralized approach, and an individual approach.

A centralized approach to LMI usage involved coordinated efforts to promulgate use throughout the institution. Colleges and universities that took a centralized approach (e.g., Dallas, Fullerton, Gateway, Lansing, SNHU, St. Catherine, and WVU) tended to have a single department or office that was primarily responsible for conducting LMI analyses, supporting faculty and staff access to LMI tools, and interpreting relevant information. Most of the institutions in our case study sample (seven of ten) had a centralized department or office coordinating LMI usage. A centrally coordinated approach to using LMI was more common among the two-year institutions (i.e., four of five institutions) than among four-year institutions because of the influence of federal and state policies.

At institutions with a central office coordinating LMI usage, LMI was integrated into existing offices, and staff members in these offices conducted most, but not all, of the LMI analyses for the institution. These offices also oversaw the distribution of data tool licenses to other staff members and departments at the institution, including power users. LMI users received guidance or preparation from the centralized office, which processed data analysis requests or helped individuals access and analyze LMI themselves (e.g., Lansing, WVU, and Fullerton). Faculty or staff members interested in reviewing LMI data placed analysis requests with these offices, usually by submitting a formal request via an online form (e.g., Lansing, Dallas, Fullerton, and WVU). They also made informal requests by directly emailing staff members in the coordinating office. After an analyst processed a request, that individual reviewed the report with the requester, explaining the metrics included. Then the requester assessed whether the report met their needs. The pair worked together to discuss whether the report could and should be run differently to better capture the LMI of interest.

A *decentralized approach* to sharing data licenses with departments was evident at one participating institution: ECSU. There was no centralized office at ECSU. The dean of academic analytics performed LMI analysis in her office but also trained and distributed licenses to faculty and staff so that they could perform department-specific analysis on their own. Last year, all departments used LMI in their annual reports. Feedback from participants at this institution indicated that this was an emerging strategy for institutionalizing the use of LMI. One administrator shared that few people used their respective license keys to access the data tool. Another administrator provided some context by saying that faculty and staff members did not have the bandwidth to explore the LMI provided by the data tool. Despite the presence of power users, participants suggested that more people at the institution would have been using LMI if a centralized office had been coordinating the work and processing analysis requests for faculty and staff members.

An *individual approach* was observed in institutions where LMI use was localized within departments or offices with no coordinated guidance. In these settings, interested individuals conducted LMI analyses with no dispersion throughout the institution, and a very limited number of individuals at the institution had access to its LMI tools. In the two cases in our study that used an individual approach, LBW and Morgan State, there was no formal guidance or training on the use of LMI. Unlike colleges using a centralized approach, LMI usage was not coordinated by any office or individual on campus; instead, it seemed to be limited to individual departments or offices. Likewise, LMI usage was not as diffuse and widespread as in institutions using a decentralized approach. For example, at LBW, a small group of people including the president used LMI for specific purposes, such as registering programs that trained participants for high demand, high wage occupations in a state database. Similarly, the career services office at Morgan State used LMI, but other departments on campus did not. Both institutions using this individual approach were relatively new to using LMI; it is possible their usage will expand over time.

Perceptions of LMI

> *LMI has many strengths, weaknesses, and applications, and great potential for improvement in the future.*

This section discusses various perspectives of LMI among the respondents in our study. Several significant themes arose, including weaknesses and challenges of data, strengths and benefits of data, data literacy, trust and skepticism, and data supporting an institution's liberal arts mission. On this latter theme, only participants from four-year institutions commented. In addition, participants identified many ways to make LMI more useful, including by sharing data in a more centralized way, making data more nuanced, aligning data more tightly with job skills and majors, improving alumni and longitudinal outcomes data, and expanding student access to LMI to enhance advising.

Perceptions of Data Sources

When participants shared their perceptions of LMI data sources, they shared both the weaknesses and challenges as well as the strengths and benefits of the data. We share these below and briefly discuss how we distinguished these attributes.

» *Respondents reported numerous weaknesses and challenges that limit LMI's use and application.*

Weaknesses of data represent essential functions or features that work poorly or are missing. In contrast, challenges with data reflect what users cannot do or accomplish. Participants reported both weaknesses and challenges with institutional and government data.

Weaknesses in the institutional data included reporting inconsistencies between associate and bachelor's degrees, insufficient career information context due to reliance on Wikipedia for job descriptions, and missing data for certain populations, such as women and early- or midcareer students. Weaknesses in government data included limited unemployment records, missing underemployment records, and inconsistent job codes and occupational titles. Participants also reported a lack of data granularity, where government data were less specific to the local context. For example, federal government data, such as information from the Bureau of Labor Statistics, often did not translate well to the state level. Another weakness participants cited was that government data reflected historical LMI, which could be a quarter or more behind the current labor market landscape. Participants observed that even real-time job data did not always reflect the rapid changes in the labor market brought on by the COVID-19 pandemic. Finally, current data systems could not capture longitudinal student trajectories, such as where students with associate degrees went after graduation or which four-year institution they later attended.

Given what is currently possible with LMI compared with the data's enormous potential, challenges reflecting what users in our study could not do or accomplish with LMI were substantial. Software licenses presented challenges because they were expensive, often underused within institutions, or presented a bottleneck for adding new users. Another challenge was data collection. This challenge turned up in various forms, including missing data, implications of external factors affecting data, problems collecting student and employer data as well as student survey data, and issues related to tracking students after graduation. Language inconsistencies were another issue, including academic versus employer language. There is an established framework for workplace-related discourse in science, technology, engineering, and math (STEM) careers but not in liberal arts. Word search and skill classifications were related challenges. For example, driver's licenses, which are categorized as a job qualification, often appeared in searches as an essential skill. Another challenge was data literacy, especially with regard to student advising. Data tools had limited efficacy for academic and career advising partly because they were too intimidating for students and sometimes even staff to use. Likewise, participants noted that their institutions' LMI tools did not necessarily align students with local opportunities such as internships, which is a fundamental goal of advising. The tools also presented an overly simplistic view of some careers. For instance, the broad category of retail professionals included IT professionals who work for retail companies.

A final set of challenges involved the need to connect LMI usage to long-term planning and institutional culture. Participants reported that LMI could be overwhelming and challenging to understand. For example, the learning curve is steep because it requires complex analyses. When people feel overwhelmed or do not see the relevance of their work, they will not use the data. Having a data coach or a go-to person for data can be very helpful in overcoming these challenges. Cultural challenges with data included changing thinking to focus on skills, budgeting time and resources to make the changes LMI suggested, translating LMI across the institution, including LMI in long-term planning across programs, and balancing LMI with the institution's mission.

> » *The strengths and benefits of LMI included helping institutions meet their mission and goals.*

Strengths of data represent essential functions or features that work well. In contrast, the benefits of data reflect what users can do or accomplish with it.

Participants shared several strengths of the LMI that they worked with, praising it as detailed and usable information that could be filtered and disaggregated; located on a single platform that is easy to learn and use; and a single yet comprehensive source of data external to the institution.

The perceived benefits of data were numerous and fell into five broad categories: advising and student support, equity and diversity, operations, program review and academic master planning, and meeting stakeholder needs. LMI was used in advising and student support to advise students about living wage careers, provide students with career projections, and support nontraditional students with credit for experience. With regard to equity and diversity, participants credited LMI with making visible economic and educational disparities, eliminating unintentional biases, and fostering a sense of hope.

Operations was another area where participants reported the benefits of LMI. These benefits included eliminating silos, improving communication between programs, and streamlining operations to reduce redundancies and save costs, such as through using business efficacy consultants and platform subscriptions. Another benefit of data was what they do not do; namely, data do not necessarily upset any core functions, such as current classroom practices.

Program review and academic master planning were other significant benefits of data; these included strategic assessment, validating programs with five- and 10-year career projections, and making program review easier for faculty. Seeing the big picture of the labor market represented in data visualizations and reports and being able to answer specific labor market questions were noted as critical factors in making program review easier. One participant felt that LMI helped them "make smart decisions." In addition, LMI raised the visibility of programs with other departments, making it easier to communicate and collaborate within institutions. Finally, participants reported that LMI's ability to help them identify and meet multiple stakeholders' needs (e.g., students, faculty, and employers) was a significant benefit of this form of data.

Perceptions of LMI Usage

Participants at both two-year and four-year institutions expressed themes of data literacy, trust in data, and skepticism of data. However, participants at four-year institutions expressed skepticism more often than those at two-year colleges. They were also more likely to frame concerns about the applicability of LMI to a liberal arts mission as a question of data literacy.

> » *LMI users expressed concerns about data literacy.*

One participant defined *data literacy* as understanding "what the data represents, what it means, and how data can be misinterpreted or skewed in various ways, depending upon how you want it to be presented." Data literacy means people understand where the data come from, how to use them, and their limitations. For example, while many vendor reports include aggregated government data combined with job posting data, the exact mix of sources may be unclear. Making meaning involves understanding LMI as part of broader processes and using those data to make decisions—such as assessment, program evaluation, and curriculum development. The goal of developing data literacy is to help people start thinking about how to use data and how to layer it with other pieces of information. In addition, data literacy can focus on specific types of data, such as federal data and their uses. For instance, a participant reported that nonfaculty staff members at their institution "are not familiar with federal data, particularly the US Department of Education … but also Bureau of Labor Statistics [data] and aren't aware that it's out there and that it's available." Thus, data literacy professional development should focus on specific aspects, such as federal data literacy, combined with other data skills, such as program-level assessment.

Understanding data literacy is important for helping users see the limitations of LMI usage for specific applications. For example, individuals often confused occupational and industry data, assuming that all jobs within an industry involved skills that align with that industry without regard for the job type. One user noted that industry categories sometimes obscured job openings. Thus, some users were likely to draw the wrong

conclusions about the skills needed to fill industry jobs; a highly literate data user would be aware of the need to flag instances where such misinterpretations are likely to occur. People unfamiliar with LMI data sources and their limitations were unlikely to know when something was wrong with the data they were working with.

> » *Experienced data users balanced trust and skepticism of data.*

Users of any kind of data typically recognize the value of the data while recognizing that proprietary algorithms are not transparent and require cross-checking. This stance reflects a balance between trust and skepticism based on data literacy. According to our interviewees, when exposed to LMI, most people trusted the data, trusted their colleagues sharing the data with them, and expressed curiosity. It appeared that if people understood the sources of data and their benefits, and the usage process was transparent, they would trust the data and not push back. However, as one respondent pointed out, every group has doubters who will not accept data because of "a preconceived idea they have in their minds." With LMI, this reaction appeared limited, and curiosity prevailed. Nonetheless, participants reported that faculty, as a group, had "the most skepticism and suspicion when LMI was first brought in." Providing faculty with better data about their programs, such as retention and enrollment patterns and rates, was key to building their trust in the data.

> » *Concerns about how LMI relates to the liberal arts mission were unique to four-year institutions in our study.*

Participants at four-year institutions explained the connection between data and the institution's liberal arts mission. At some institutions, the vocabulary of academic skills did not match that of job skills. Participants reported some pushback from faculty about focusing on jobs, which was often expressed as the question, "Why is everything about jobs and careers?" One participant expressed the view that career competencies were not that different from liberal arts learning goals. For example, some faculty in higher education already recognized the value of extending the classroom into the community, such as through political engagement, service-learning components, or volunteer experiences. Thus, career competencies naturally met disciplinary frameworks outside the classroom. For instance, a participant explained that what helped build faculty buy-in for LMI at their institution was "talking about … the skills that can be gained from a liberal arts degree and [can] transfer across many different jobs of many different disciplines." Finally, data-driven missions were sometimes issued from the top down, such as by the college president. When data was made part of an institution's academic plan, everyone eventually needed to use the data, creating a measure of inevitability that may have curbed resistance.

Improving LMI

When participants spoke about improving LMI in terms of what they wished for, several themes arose. Data users wished for new features, functions, and applications of LMI data. These included wishes for centralized data sharing, more granularity, the ability to align job skills and education data, better alumni and longitudinal outcomes data, and improved student advising through data access. Interestingly, participants expressed these wishes consistently across institution types.

> » *Centralized institutional data capture and sharing would create a larger, more useful data pool.*

A strong theme was the wish for centralized data sharing within an institution or a region. Participants described a need for a centralized data capturing process at their institution. Several perceived problems arose from a lack of data sharing, whereby data sat on departmental computers without a centralized capture and became owned by a particular individual or department in the institution. One way to counter this tendency is to create a centralized data collection system. If everyone at the institution could feed into the same data system, the entire university would share and benefit from a larger data pool.

» *More nuanced data would create clearer LMI connections with college students.*

The wish for more data granularity was another strong theme. Many participants expressed the wish for additional information their current data sources did not provide because there were always essential nuances that a report could not capture. For most data users, it was not that they did not trust the data they had, but as one participant explained, "they just wish they could get something a little bit different, which is not the same thing."

The additional data granularity that participants wished for fell into several broad categories, including subtypes of occupations, academic markets, and academic levels. Regarding subtypes of occupations, there was a level of granularity to occupational roles that was not reflected in the set of standard occupational codes (SOCs). For example, a participant explained, "the vice dean of the school of medicine asked me for market information based on medical subspecialty. That kind of thing does not exist in the SOC code because a physician is a physician." Occupation subtype data would be valuable because knowing about specialty career tracks could inform degree programs. For example, if there were a way to get these data, "that level of specificity would be really useful" because "you could do some interesting things with those [degree programs]."

In addition to more occupational granularity, participants wished for more data about academic markets and levels. Data sources such as JobsEQ do not separate postgraduates into master's and doctoral levels, knowledge that is, as one participant put it, "essential for institutional planning." Likewise, data about growth in academic markets, such as the number of institutions that have degree programs and the number of degrees granted, "would be helpful because you would have an idea of how the academic market is changing in that area, not just the occupational market." Finally, broader LMI would be helpful if delivered at the level of college students. For instance, one participant noted that LMI reports "talk broadly about job seekers" but wondered, "Well, what does that mean?" A wish for more data granularity specific to academic markets and levels reflected a need to understand how broadly LMI applied to college students.

» *Tighter alignment between job skills and majors would help colleges improve curricula.*

Another wish was for data on how job skills in demand by employers aligned with education programs. A participant described the current situation when trying to understand what level of education people need when they enter a particular industry: "We don't understand the [job] skills gap," but because this information was not in the jobs data, it required "see[ing] more of those job postings, and that … is a manual [process]." Though manually compiling millions of data points was not feasible, the underlying need to do so remained because having a better grasp of relevant job skills helped institutions include them in their curricula. For instance,

connecting jobs data to each major sometimes involved aggregating LMI reports, such as those by Burning Glass, "at the employer level, or even at the industry level, for each of our majors."

Finally, wishes for aligning skills to education connected to an underlying need for better student outcomes. One participant framed this as the need to "provide our students [and] potential students with what the outcome of a Gateway education can mean to them—what you're able to do as a result of your Gateway education—that's where the employment information is so key." Thus, the wish to align job skills and education programs centers on a desire to improve outcomes for college students.

» *Improving alumni and longitudinal outcomes data would improve college programs.*

Improving alumni and longitudinal outcomes data were two related data wishes. Alumni data were hard to come by, as were data on long-term outcomes, such as career and salary information. "I desperately wish I knew what our alumni were doing. We have anecdotal evidence of the careers that our students go into, but it is in no way systematic," explained a participant. Another noted, "we do not really know what [alumni] are doing unless we go to the [state] workforce commission, and that data is often outdated." Finally, institutional alumni data was often hard to access because many institutions did not have centralized data-sharing systems.

Why alumni and longitudinal outcomes data are important connects back to improving the curriculum. Outcomes information helps faculty identify relevant careers and skills and then build a curriculum that prepares students with those skills. For example, alumni data are essential for technical students, who often start working after graduating from high school and do not continue with credit education. A lack of longitudinal data raises many questions, such as:

Where are these students that have started these career academic programs and have credits towards them, but then don't go anywhere to finish? Where are they going? Are they getting employed? What's happening to them? How can we help them understand the value of finishing what they started before they go out and get a job in that field?

Knowing where former students ended up would help institutions understand how to best support their students during active enrollment.

Finally, several participants wanted more longitudinal data beyond alumni—about the education process overall and future trends. Texas provided an example: "Some states like Texas have a very strong system. You can track a student from K–12, through college into the workforce." Tracking students from kindergarten to the workforce would be a robust data resource, including future trends.

» *Expanding student access to LMI can improve advising.*

Finally, participants wanted to improve advising through expanded student access to LMI. Improved advising was a priority across institutions, and participants consistently connected expanded data access with better advising. For instance, participants wanted to use JobsEQ as an "academic advising tool" or "career advising tool." They hoped LMI would empower students to explore industries, occupations, and academic programs independently.

One participant said they would "love to see a day when we have an enterprise license [for Burning Glass], and any student could go into an advising center and do their own exploration." This participant hoped that someday students might connect their zip codes with SOCs and North American Industry Classification System (NAICS) codes to see labor market trends. The belief underlying this wish was that independent exploration of LMI would help students make informed career decisions.

Conclusion

LMI offers colleges, universities, and their competitors new insights from rapidly evolving data and products. Its myriad uses included adapting programs and credentials to stakeholder needs. LMI usage in higher education is relatively new, and staff's familiarity with LMI data was variable and often limited. This study provides insights on the use of LMI data in 10 colleges and universities. We focused on four central themes: (1) applications and motivations for LMI usage, (2) LMI data sources, (3) LMI infrastructure, and (4) perceptions of LMI.

Based on our findings, we offer four major recommendations for institutions seeking to adopt and institutionalize LMI usage:

1. **Examine potential LMI applications to your institution's core activities.** These may include program review, development, and improvement; academic and strategic planning; recruitment and enrollment management; relationship building with external partners; and advising.

    The predominant application of LMI at study institutions was program review, development, and improvement. Participants consistently framed program review as an opportunity to improve programs rather than simply as a precursor to program elimination. This focus on improvement reflected a change in how institutions define program success. Moreover, LMI usage contributed to broader and more formalized processes for program development, review, and improvement, enabling institutions to align their programs more tightly with employers' job vacancies and skill needs. Colleges mainly focused on using LMI to build more transparency and alignment by matching career-relevant skills taught in programs with those necessary for career pathways. Reporting requirements established by external stakeholders often drove LMI usage for program review and development, contributing to highly formalized processes, especially among community colleges. Finally, institutions, especially two-year colleges, often included LMI in grant applications to receive funding to support existing programs and develop new programs.

    Academic and strategic planning also emerged as a significant concern. Declining enrollment was a crucial motivator of LMI usage in academic and strategic planning for all college types. However, four-year colleges and universities had more urgent concerns about declines, especially in the liberal arts. As part of comprehensive strategic plans, liberal arts colleges and universities used LMI to promote students' employability by integrating LMI into curricula and advising. However, implementation was in the beginning stages at most institutions, and LMI integration with academic and strategic planning varied. Four-year institutions reported reviewing LMI to identify areas of focus within broad, existing academic planning processes, while two-year institutions reported using LMI to develop academic and strategic plans. Further, institutional, school, or unit missions, especially for equity, influenced the direction of academic and strategic planning efforts involving LMI.

    Participants described several other significant LMI applications. Recruitment and enrollment managers

applied LMI to attract and identify prospective students. Liberal arts programs at four-year institutions were especially concerned about communicating the value of their degrees to recruits. Colleges also used LMI to build relationships and collaborations. Collaborating with external partners to exchange LMI helped foster relationships with external groups and identify opportunities to serve community needs while institutionalizing LMI practices. Finally, colleges also wanted to improve advising. While using LMI to advise current students was much more an aspiration than a reality at the time of our study, structured practices were emerging.

2. **Know that your institution may need to use multiple LMI data sources and understand the resulting cost implications.** Many public and private data sources compile LMI for potential use by colleges and universities, and it was a common practice for higher education institutions in our study to use multiple data sources. Access to public data is usually free, while access to private vendor data requires licensing fees that represented a significant investment. Institutional users tended to combine these multiple LMI sources and types based on their needs and goals. Paid licenses were often accompanied by vendor-based professional development, and our study participants generally described this support as useful with variation in scope and depth. Users found the most value in individualized coaching models and quick-response help systems. Finally, many institutions in the study used external grant funds to support their access to and use of LMI.

3. **Establish an infrastructure that includes users, organizational structures, ongoing targeted professional development, and policies.** The roles of LMI data users we learned about included data analysts, power users, general users, and implementers. Each made valuable contributions, and they often collaborated to build an institutional understanding of LMI and its applications. In addition, individual LMI champions from many different areas and levels of the colleges advocated for LMI's use and played essential roles in expanding LMI usage associated with academic planning and strategic initiatives. The consistency of the organizational structures that supported LMI varied within and between colleges, but these structures were not necessarily complex. LMI institutionalization included centralized support for LMI usage, investments in LMI products, and increased staffing. All case study colleges reported increased LMI-related positions and staffing to support organizational structures. In addition, preparing data users was essential for developing institutional data infrastructure. Institutional-based professional development complemented vendor-based preparation and supported applications of LMI in specific higher education contexts. Finally, despite the ubiquity of LMI usage throughout participating institutions, the existence of formal LMI policies varied, although senior leaders shared expectations of LMI usage.

4. **Understand LMI's limits and how to support its adoption.** Participants shared that LMI had numerous weaknesses and challenges that limited its use and application, including a lack of transparency about vendor-based data processing. On balance, they also cited numerous strengths and benefits associated with LMI usage, such as helping institutions meet their mission and goals. The

most experienced LMI data users continually balanced their trust and skepticism of data. Participants expressed concerns about data literacy among typical campus users, and some at four-year institutions had unique concerns about applying LMI to the liberal arts mission.

Participants in our study offered numerous suggestions to improve LMI for use in higher education. These suggestions included the creation of a centralized, institutional data capture that could be shared to create a larger, more valuable data pool with more nuanced data that would allow users to create more explicit LMI connections with college students. Participants also saw value in tighter alignment between job skills and majors to help colleges improve curricula. Further, they felt that improving alumni and longitudinal outcomes data would help colleges improve programs and that expanding student access to LMI would help improve advising.

Although LMI usage in higher education is relatively new, and levels of implementation within institutions vary, it is clear that LMI has become a vital source of data for colleges searching for ways to stay competitive and relevant and improve student outcomes amid changing social and economic conditions. As more colleges and universities implement systems to support LMI usage—compelled in part by increasing accountability demands from states and the public—key issues relating to LMI limitations and poor institutional infrastructure will become more pressing. Funding and collaborative efforts to develop institutional infrastructures, resolve some LMI limitations, and support knowledge sharing will advance LMI even further.

Appendix. Methodology

This Lumina-funded research project sought to document and understand how colleges and universities use labor market information (LMI). Taking a broad definition of LMI—including public and private data; demand and supply-side data; information on industries, occupations, skills, and alumni; and historical, real-time, and trend projections—this project sought to understand how and why educational institutions use LMI, which LMI they use, and, ultimately, the challenges they have with LMI. Although this was a mixed methods study, this report focuses only on the findings from the qualitative case studies; the survey methodology and findings are detailed in a separate report.

Research Questions

We asked four main questions:

1. How and why do college and university administrators and staff use LMI?
   a. How do participants use LMI and how often?
   b. What is motivating LMI usage?
   c. Which stakeholders and conditions are influential?
   d. To what extent do colleges broaden or deepen LMI usage over time throughout the institution?
2. What sources of LMI do college and university administrators and staff use?
   a. What sources of LMI are they using, and why?
   b. Do they use multiple sources of LMI and if so, how and why?
   c. What are the costs of LMI usage?
3. What infrastructure exists to support LMI usage?
   a. Who is using LMI?
   b. What structures and policies exist to support LMI usage?
   c. To what extent have colleges institutionalized systems to administer LMI usage?
4. What are administrators' and staff's perceptions of LMI?
   a. What are the perceived strengths and limits of LMI?
   b. What are the concerns about LMI?
   c. What does data literacy mean for LMI users?
   d. How does industry knowledge inform LMI usage?
   e. How has the pandemic shaped LMI usage and perceptions?
   f. How would LMI users improve it?

Case Selection

In this study we took a realist sampling approach (Emmel, 2013) to reflect the expertise of the researchers and existing understandings of how organizations use information to inform practice. We began with a scan of the uses of LMI among postsecondary organizations including colleges, universities, and systems. We reviewed gray

literature including state-level websites, reports, and dashboards and spoke with experts including knowledge management and institutional research staff and data providers (e.g., Burning Glass and EMSI). We also spoke with program directors in states known for policies that promote LMI usage (i.e., CA, KY, NE, IL, TX, and WA) as well as at individual colleges that are aggressively pursuing LMI usage without a state push in the fall of 2020 and spring 2021. These initial screening calls served two purposes: first, to gather information on the nature, areas, and drivers of LMI usage, and second, to begin the discernment process about which sites we would include in the study.

The final selection of cases represents existing research on labor market responsiveness and enrollment patterns by institutional characteristics, as well as the limited literature on LMI itself.

Participant Selection

To select participants at the case study colleges, we identified individuals who have championed LMI usage and individuals with responsibility for procuring, managing, analyzing, disseminating, and using LMI within a unit. These individuals included unit leadership (e.g., college and program leadership), leaders in institutional review or knowledge management, and directors of workforce development/solutions, as well as LMI users such as faculty and career services, alumni services, and admissions personnel. We also relied on snowball sampling, asking every interviewee if there was anyone else we should speak with about LMI usage at their institution.

Data Collection

The research team developed two interview guides: one for an initial screening interview and another for a full interview for a chosen case study college. The screening interview enabled the research team to understand both how and to what extent LMI were used at a given institution and how and to what extent possible interviewees interacted with LMI. The full interviews enabled a deeper dive into what data were being used, how, why, and the structures that support LMI use.

We conducted all interviews virtually by Zoom. Each interview was recorded and fully transcribed.

Analytic Approach

We used deductive and inductive approaches to qualitative data analysis. Before analysis began, we collaboratively developed a codebook to guide consistent coding across the research team. We revised the codebook as analyses revealed additional concepts we should be considering. We uploaded all interview transcripts into NVivo and engaged in an iterative coding process. Once we finished coding, we analyzed the codes by institution and by sector, noting patterns. These patterns informed our ultimate findings. To validate our findings, we shared drafts of the report sections with the key contacts at each case study institution and then incorporated their feedback as appropriate.

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