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ALIGNING CURRICULUM AND INDUSTRY SKILL REQUIREMENTS IN ERP-RELATED EDUCATION USING JOB POSTINGS

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ABSTRACT

Aim/Purpose

Higher education institutions can partner with technology companies to reduce software costs and offer students training on specific products. This practice is increasingly popular, as resources are often tight for higher education organizations. SAP and other enterprise resource planning (ERP) systems are a prime example, as there is value in students gaining experience with specific software. However, exposure and experience in software are only a small part of what a student needs to succeed. This research aims to evaluate the skills and attributes needed to make students more marketable as they pursue a more technology-specific path. While general market research has been conducted on degree programs, little has been done specifically on ERP-related degrees or concentrations, prompting a call for further research in the area. This study examines ERP-related positions that require SAP, evaluates job postings for technical and soft-skill requirements, and assesses the prevalence of certifications and specific software requirements to answer the following research questions. RQ1: What technical skills related to the information systems (IS) curriculum are required in ERP-related jobs? RQ2: What soft skills are required within ERP-related jobs?

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	RQ3: Are there specific certifications or software knowledge that students should pursue to be more marketable?
Background	SAP touches nearly 80% of all transactions, making it a valuable software in the industry. This paper examines job postings on Handshake.com that list SAP software and are located in the southeastern United States to determine which skills and technologies should be included in the curriculum for students pursuing careers at firms that use an ERP system.
Methodology	To evaluate job market needs in the Southeastern United States, job postings on the career placement website Handshake that were advertised in the Southeastern states and mentioned SAP were selected. The postings were evaluated for duplicates, yielding 139 viable job postings. The job postings were then evaluated using qualitative content analysis by at least 2 scorers to determine whether they required specific skills and attributes. The skill requirements in the job postings are then evaluated quantitatively using frequency counts and percentages.
Contribution	This paper seeks to improve curriculum development by describing the skills required in ERP-related job postings. The analysis also outlines a methodology for evaluating skill requirements for a specific technology when creating a certification with a technology partner, such as SAP.
Findings	The study found that more than 50% of organizations specify in their job postings that they require various soft skills. The ability to perform analytics (60%) and design tasks (50%) was also in high demand. Organizations specifically list knowledge of Excel or spreadsheets as a requirement 59% of the time. The ERP-specific technology or certifications were not commonly listed; however, modules were mentioned for specific job roles.
Recommendations for Practitioners	ERP concentration courses should include analytics and promote an understanding of the processes and process improvement. Project-based experiential learning (PBL) and team-based learning (TBL) would be appropriate to improve soft skills. Industry partners should not only provide technological support to higher education but also help establish a community that fosters networking and more PBL opportunities to promote soft skills. As higher education institutions seek to manage their resources by aligning with technology companies, research is needed to ensure that the alliance makes students marketable and their education sufficiently general in the event of technology shifts.
Recommendations for Researchers	Researchers need to expand their evaluation of curriculum design to better align career paths with the skills covered in the classroom.
Impact on Society	Higher education has a responsibility to help students to realize their goals and to become valuable members of society. Helping to align other aspects of curricula and pedagogy with specific technology and career paths is important as students enter a competitive job market. If higher education is to survive as an institution, more work is needed to ensure that its value aligns with industry needs. By evaluating the needs for SAP positions, we provide evidence of the skills the curriculum should develop. This will help align higher education with career aspirations and encourage student success in meeting the workplace demands.
Future Research	Future research should automate the process and expand to examine other technologies or certification concepts. More research is needed to determine whether asynchronous learning can develop soft skills in ERP courses, since

many simulations are designed to foster teamwork in synchronous environments.

Keywords enterprise systems, SAP, career preparation, soft skills, curriculum design

INTRODUCTION

Higher education is facing several challenges, including reduced government funding, fewer traditional students, and a decline in the perceived value of traditional degrees. Higher education has responded in several ways, including forming partnerships with technology companies that make software available to students and offering career-specific concentrations and certificate programs aligned with specific technologies or technology bundles. Using training materials and curriculum suggestions from a corporate partner such as SAP, which provides free or discounted versions of technology, helps higher education institutions deliver affordable, relevant content. However, institutions must also evaluate their curricula holistically for their local environments. One of the most prevalent systems is enterprise resource planning (ERP), and one of the most popular ERP software programs is SAP.

ERP systems serve as the operational backbone of modern organizations by integrating core business processes – such as finance, logistics, human resources, and sales – into a unified system (Davis & Comeau, 2004). Within this landscape, SAP maintains a dominant market position. While recent reports indicate fierce competition in revenue terms, SAP systems continue to facilitate approximately 80% of the world's transaction revenue, underscoring the platform's critical role in the global economy (SAP, 2026). Furthermore, the global ERP market was projected to reach approximately $147 billion in 2025, driven primarily by the mass migration to cloud-based architectures and the adoption of SAP S/4HANA (HG Insights, 2025). Consequently, proficiency in SAP software has become a highly sought-after competency in the job market, prompting higher education institutions to increasingly align their curricula with industry standards to enhance students' marketability.

To support this, the SAP University Alliances program enables member institutions to integrate SAP software and curriculum materials directly into their programs (Fedorowicz et al., 2004). This partnership allows educators to transcend theoretical discussions of information systems, providing students with hands-on experience with the tools used by Fortune 500 companies. SAP has five universities that serve as competency centers, hosting and helping to coordinate technology and training for trainers within this alliance. Additionally, SAP has established an online learning hub offering free training and encouraging free attempts at obtaining certifications. This is a good example of a technology organization that partners with higher education. However, the availability of free services may also pose a challenge. If technical skills can be learned to some extent for free, higher education needs to demonstrate greater value than the systems themselves. Success in ERPs has shown that moving beyond simple keystroke training is essential to foster a deep understanding of how these systems support organizational goals. This pedagogical shift demands careful curriculum design and staff development (Fedorowicz et al., 2004). SAP's university partners have responded by advancing to offer university curricula with simulations, gamified experiences, and competitions to enhance the learning experience.

Effective engagement with ERPs demands a techno-functional skill set that robustly synthesizes the technical and soft skills outlined in the following sections. For instance, the ability to understand, query, and manage the vast data repositories underlying an ERP system is grounded in Database competencies. With the industry's shift toward in-memory computing (e.g., SAP HANA), the demand for hard skills has evolved to include advanced data visualization and real-time Business Analytics (Juhasz et al., 2025). Similarly, configuring, customizing, or extending system functionality often relies on programming logic and rigorous Systems Analysis and Design (SAD) to map business requirements to technical solutions (Scholtz et al., 2012). Apart from technical skills, deploying and

maintaining ERPs are fundamentally collaborative and problem-solving activities. Recent industry surveys highlight a significant talent gap in the SAP ecosystem, particularly in the soft skills needed to manage complex digital transformations (Whitehall, 2024). Navigating the ambiguity of ERP implementation requires strong critical thinking to resolve process conflicts. Prior research indicates that because ERPs span organizational silos, success depends heavily on teamwork and effective communication to bridge the gap between technical teams and business stakeholders (Scholtz et al., 2012).

Unlike software that serves a single discipline, ERP systems are used across nearly every business function, making curriculum design difficult because instruction must provide meaningful learning experiences for students pursuing diverse careers while maintaining a cohesive understanding of enterprise-wide processes. A wide range of professional roles, including finance, accounting, operations, supply chain, human resources, sales, marketing, and information technology, which students may pursue, require ERP exposure, underscoring the need for a curriculum or courses aligning with requirements for the requisite job market. As a higher education institution partners with industry and includes a particular technology as a major curriculum component, it needs to conduct ongoing evaluation to identify and address gaps between industry needs and curricula (Sahin & Celikkan, 2020). In particular, it is necessary to determine which skills, beyond understanding the technology, a student will need to thrive in a competitive environment that uses it. Research suggests that this practical experience not only enhances student employability but also helps learners visualize the complex integration of business processes (Davis & Comeau, 2004). However, we first need to understand the marketplace's demands to ensure effective exposure. This study uses content analysis of job postings, guided by the MIS curricula guidelines (Leidig & Salmela, 2021; Topi et al., 2017), to identify key skills sought in SAP jobs and to offer suggestions to improve teaching and advising for students pursuing an SAP or similar ERP-focused concentration.

Performing content analysis of job postings to identify key areas for positions is not a new research method (e.g., Mason, 2018). There has been a call from higher education institutions to research ERP-related curricula to address modern challenges (Lokuge et al., 2020). For higher education, it is important to research the required skills when forming technology-specific partnerships continually. Furthermore, academic research has explored job outcomes, suggesting that skills such as networking within the company improve job satisfaction and outcomes, implying that soft skills and encouraging communication among employees enhance job outcomes (Narmetta & Krishnan, 2023). Thus, the skills required to succeed in an organization that uses ERPs go beyond simply knowing the systems themselves. This led us to ask the following research questions (RQ).

RQ1: What technical skills related to the information systems (IS) curriculum are required in ERP-related jobs?

RQ2: What soft skills are required within ERP-related jobs?

RQ3: Are there specific certifications or software knowledge that students should pursue to be more marketable?

By answering these questions, this study contributes to the literature in two ways: academically, it offers a replicable content-analysis methodology for evaluating technology-specific skill demand that other institutions can apply to different ERP or software partnerships; practically, it provides evidence-based guidance for the inclusion of analytics, systems analysis and design, and soft-skill instruction within an ERP concentration. To answer these RQs, a literature review was conducted to identify IS curricular technical and soft skills and related keywords to facilitate a mixed-methods content analysis study. Job postings that contained the keyword "SAP" and were located in the southeastern United States job market in the fall of 2025 were collected from the career website Handshake.com and evaluated for whether they required the identified skills. The qualitative content analysis was performed on the job postings by at least two scorers, with any disagreements resolved through deconfliction. The identified skills are reported by their frequency of occurrence to indicate how often they were required. Because the sample is drawn from a single U.S. region and a single

job-search platform, findings should be interpreted as indicative of regional demand rather than generalized industry-wide requirements. The rest of the paper is organized into six sections: literature review, methodology and data collection, results and discussion, future research, limitations, and conclusion.

LITERATURE REVIEW

Knowledge of SAP and ERP is perceived as valuable in degrees within colleges such as business or engineering (Colvin & Carmona, 2020; Mishra & Garg, 2026; Qiu et al., 2020). Past ERP curriculum research has evaluated skill requirements, finding that systems analysis and design (SAD), domain knowledge, and soft skills are primary needs. In contrast, many technical skills, such as programming and database management, were needed but secondary for ERP graduates (Boyle & Strong, 2006). Higher education has recognized the need to research and update ERP curricula to account for factors such as the increased use of artificial intelligence and advanced analytics (Lokuge et al., 2020). To address this, we will first use the MIS curricula guidelines to identify which skills may be relevant to ERP, and then review the pedagogical literature. In reviewing the literature, we will also create skill-coding categories for our content analysis and identify initial keywords to help assess whether the content includes each skill category.

MIS CURRICULA

The Association for Information Systems (AIS) is a leading driver in establishing the management information systems (MIS) curriculum and in publishing curriculum guidelines for both graduate (Topi et al., 2017) and undergraduate IS programs (Leidig & Salmela, 2021). The most recent guidelines break down the knowledge requirements into competencies rather than simply recommending courses. The guidelines are updated roughly every 10 years. In this section, we will first examine the master's in management information systems (MMIS) guidelines and then the undergraduate guidelines. These guidelines discuss how higher education institutions implement them and are adjusted as updates continue.

The MMIS guidelines 2016 marked a significant change from previous guidelines by listing competencies rather than courses (Topi et al., 2017). The competencies are broken into three parts: Information Systems, Individual, and Domain. The information systems competencies (Table 1) describe technical skills that are recommended for the graduate; individual competencies focus on soft skills and some general knowledge, such as mathematics and statistical competence; and, finally, domain competencies focus on a particular field, such as business, healthcare, or government.

Table 1. MSIS2016 competency guidelines

Information system competencies	Individual competencies
Business continuity and information assurance	Critical thinking and problem solving
Data and information management	Intercultural competency
Enterprise architecture	Communication (written and oral)
Ethics, impacts, and sustainability	Mathematical and statistical competence
Innovation, entrepreneurship, and organization change	Leadership
IS operations	Creativity
IS strategy and governance	Collaboration and teamwork
IT infrastructure	Negotiation
Systems development and deployment	Ethical analysis

The competencies, while listed separately, have some overlap. For example, enterprise architecture suggests that graduates be prepared to design and implement it, while systems development and deployment address similar aspects in greater detail. The technical competencies are designed to overlap with individual competencies, such as systems development and deployment discussions, and working within teams to design and document IT systems. The MSIS guidelines, however, do not go into specific IT artifacts. The guidelines, however, recommend designing the curriculum to align with domain knowledge and professional profiles, using suggested modules. This is like the structure of ERPs, in that individual modules require different domain knowledge and may suggest using ERPs as an artifact in courses.

The IS 2020 Undergraduate Curriculum Guidelines followed a similar pattern, transitioning entirely to a competency-based framework with competencies listed under IS, Individual, and Domain (Leidig & Salmela, 2021). These guidelines also presented a clear path for change, aligning prior course recommendations with IS Competencies and, while recognizing the value of all the individual Competencies in the Graduate Curriculum, providing recommendations for areas of emphasis (Table 2). The 2020 guidelines differed from the 2010 guidelines, especially regarding enterprise systems: enterprise architecture was removed as a stand alone recommended competency, as it was argued that it was emphasized more at the graduate level. In terms of individual competencies, Critical Thinking and Problem Solving, as well as Communication, were emphasized.

Table 2. AIS 2020 undergraduate guidelines and changes

Information system competency realms 2020	Mentioned courses required or elected in IS 2010	Emphasized individual competencies
Foundations	Foundations, IS Strategy, Management, and Acquisition	Critical thinking and problem solving
Data and Information Management	Data Mining/Business Intelligence, Knowledge Management, Info Search and Retrieval	Communication (written and oral)
Technology and Security	IT Audits and Controls, IT Security and Risk Management	Lifelong learning and development
Development	Applications development, Collaborative Computing, HCI	High tolerance of ambiguity
Organizational Domain	BPM, ERPs, Social Informatics	
Integration	IS Project Management	

The technical competencies are further broken into required and elective competency areas (Table 3). The competency areas are then linked to the traditional associated classes. No class within the specific undergraduate competency areas is specific to ERPs. However, that does not prevent the ERP software from being used in the organizational domain and may be appropriately integrated with other areas, as well as with ERPs like SAP, which offer process modeling, analytics, and development options.

By evaluating the curricula guidelines for both graduate and undergraduate students, we identified specific competencies to focus on. We selected Data and Information Management, Development, and Integration as key focus areas for our study. Data and Information Management would be evaluated against the required database and analytics competencies; Development would be evaluated against the required System Analysis and Design and Programming competencies. Integration was originally represented by project management but was later redefined as soft-skills-related competencies such as accountability and timeliness. Individual skills related to critical thinking, both written and oral communication, and teamwork/collaboration were also identified for further study. The following sections will first discuss the technical skills and then the soft skills to be studied.

Table 3. 2020 competency areas

Information system competency realms 2020	Required competency areas 2020	Elective areas competencies IS 2020
Foundations	Foundations	
Data and Information Management	Data and Information Management	Analytics, Data Mining, Visualization, Database
Technology and Security	IT Infrastructure, Secure Computing	Emerging Technologies
Development	Systems Analysis & Design, Application Development & Programming	Object-Oriented, Web Design, Mobile Development, User Interface Design
Organizational Domain	Ethical Use and Implications for Society, IS Management, and Strategy	Digital Innovation, Business Process Management
Integration	Project Management, IS Practicum	Project Management

TECHNICAL SKILLS

Technical skills involve performing specific tasks, and within an IS department, these may represent standalone classes. While they may persist across multiple roles, such as analytical skills requiring basic math, the needs are more commonly associated with knowledge competencies. The following sections will discuss the technical skills to be scored, define the terms, list keywords, and outline common pedagogy.

The skills, their definitions, and keywords are listed in Table 4, which establishes a shared set of definitions and keywords for the content analysis. Each section will list popular modern pedagogies, such as Project-Based Learning (PBL) and Team-Based Learning (TBL), which are important to note because, when properly implemented, they are also related to the practice of soft skills.

Table 4. Technical skills terms and definitions

Skill	Definition	Keywords	References
Database	A database is a collection of data organized in a system that allows for retrieval.	Relational database, NoSQL, SQL, queries, database design, access, data modeling, MongoDB	Alshameri and Adhikari (2025); Leidig and Salmela (2021); Naik and Gajjar (2023); H. Wang and Wang (2023); Yue (2013)
Business Analytics	Business analytics refers to the systematic use of data, statistical analysis, and modeling techniques to support evidence-based decision-making and improve organizational performance.	Data analytics, predictive analytics, business intelligence, performance monitoring, data interpretation, forecasting, analytical dashboards.	Horani et al. (2023); Larson et al. (2021); Nasir et al. (2025); Zhang et al. (2020)

Skill	Definition	Keywords	References
Systems Analysis and Design (SAD)	SAD is the structured process of identifying business needs, modeling requirements, and designing technology-enabled solutions to support organizational operations.	Requirements engineering, process modeling, UML modeling, system design; requirements elicitation, process mapping, modeling, optimizing, design, designing.	Leidig and Salmela (2021); Recker et al. (2012); Surendran et al. (2005); Tanner and Scott (2015)
Programming	Programming, also termed software development, coding, or computational thinking, is the process of designing, writing, testing, and maintaining executable instructions that enable systems and applications to perform specific tasks.	Software development, coding, computational thinking, debugging, scripting, ABAP, C, C++, Python, R, and JavaScript	Berssanette and de Francisco (2023); Govender (2021); Hassenfeld et al. (2020); Jegede et al. (2019); Leidig and Salmela (2021)

Database

A database is a collection of data organized in a system that allows for search and retrieval. Databases have been associated with several skills and products (Naik & Gajjar, 2023; H. Wang & Wang, 2023; Yue, 2013). Two popular database types are relational (Naik & Gajjar, 2023; Yue, 2013) and NoSQL (H. Wang & Wang, 2023). These databases have been associated with a range of skills, including SQL, query writing, database design, and data modeling (A. Mitchell & Vaughan, 2022; Naik & Gajjar, 2023; H. Wang & Wang, 2023; Yue, 2013). Databases have been associated with specific software and languages in job postings, such as MySQL, MS Access, Oracle, NoSQL, relational databases, and XML (Alshameri & Adhikari, 2025). In the curriculum guidelines, the database was included under data information and content management alongside analytics within data management, but these serve different functions (Leidig & Salmela, 2021; Topi et al., 2017). The keywords and products used to identify skills are provided in Table 4. Next, we will evaluate how databases have been incorporated into curricula and popular pedagogy.

In modern programs, database instruction is increasingly embedded across multiple course levels and connected to real-world contexts such as enterprise resource planning (ERP) systems and analytics pipelines (Bajaj & Bick, 2020; Lending et al., 2019). The curriculum typically progresses from conceptual modeling to implementation and data governance and may incorporate cloud and collaborative tools within a single course (A. Mitchell & Vaughan, 2022). Whether the database is incorporated into a single or multiple courses, pedagogy incorporates Project-Based Learning (PBL) and Team-Based Learning (TBL) (Bajaj & Bick, 2020; Lending et al., 2019). A. Mitchell and Vaughan (2022) highlighted that TBL structures within database courses foster peer accountability and that cross-disciplinary teamwork is essential.

There is also an emphasis on including real-world exposure in database classes in capstone courses (Lending et al., 2019; Yue, 2013). The research aligns with the broader movement towards active, project-centered instruction and the AIS 2020 competency framework. Husain et al. (2023) demonstrated that integrating gamification and flipped learning in a database management course substantially enhanced students' achievement, motivation, and engagement compared with traditional teaching methods. A database can be one of the strongest predictors of overall student performance, emphasizing its role in cultivating analytical and problem-solving capabilities. It may be combined with

analytics and teamwork to enable (Alturki & Alturki, 2021). Enabling cloud-based practices can reduce the cognitive load needed for local installations (Carreón, 2025). While SAP uses a database and other data structures for analytics, it may not be the best tool for learning databases, as it relies on a columnar database rather than a traditional, normalized relational one. Some SAP curricula do include skills such as SQL in a gamification environment (M. Wang et al., 2024), which would allow the practice of relational database skills needed for database management and encouraged in analytics, although the outcomes for non-technical skills.

Business analytics

Business analytics refers to the systematic use of data, statistical analysis, and modeling techniques to support evidence-based decision-making and improve organizational performance (Horani et al., 2023; Larson et al., 2021). Related terms such as data analytics, predictive analytics, and business intelligence are frequently used to describe this domain, emphasizing analytical processes that transform raw data into actionable insights (Horani et al., 2023; Nasir et al., 2025). Business analytics has been associated with a range of core competencies, including data interpretation, visualization, forecasting, and the development of analytical dashboards that support managerial decision-making (Nasir et al., 2025; Zhang et al., 2020). In industry, business analytics is linked to organizational capabilities such as strategic alignment, performance monitoring, and technology-enabled decision support, demonstrating its growing importance across business roles (Horani et al., 2023). We have therefore used analytics-related keywords, tools, and competencies to identify the skills associated with this topic (Table 4).

Within curriculum guidelines and program design, business analytics is positioned as a core competency spanning descriptive, predictive, and prescriptive techniques and may be offered as standalone courses. However, it has increasingly been embedded in general business coursework. However, it may also be delivered in a program-specific setting, such as in marketing (Teimourzadeh et al., 2023), accounting (Garas & Wright, 2024), or information systems (Brau et al., 2020). Courses may be developed that use programming for analytics, especially with Python or R. Coding is optional and may be done with low- or no-code tools. SAP offers a cloud-based analytics program with low-code or no-code capabilities. However, there are also options to incorporate programming languages such as R for creating customized visualizations and JavaScript for scripting, indicating a potential demand for programming skills.

Programming

Programming, also termed coding or computational thinking, is the process of designing, writing, testing, and maintaining executable instructions that enable systems and applications to perform specific tasks (Govender, 2021; Hassenfeld et al., 2020; Jegede et al., 2019). In MIS education, programming is linked to core skills such as algorithmic reasoning, problem decomposition, debugging, and iterative refinement (Govender, 2021; Hassenfeld et al., 2020). These skills are reflected in commonly taught languages and environments, including Python, Java, and block-based systems, which are frequently used in introductory computing and IS courses (Govender, 2021; Jegede et al., 2019). Programming may also appear in jobs that emphasize scripting, integration, and workflow automation, reinforcing its relevance to analytics and ERP roles (Leidig & Salmela, 2021). A review of programming education shows that students learn more effectively in active, collaborative, feedback-rich environments than in lecture-based instruction (Berssanette & de Francisco, 2023). In the AIS 2020 curricular guidelines, programming competencies are included under Development (Leidig & Salmela, 2021). We therefore used programming-related keywords, skills, and tools to identify the competencies associated with this topic (Table 4).

Programming courses are often sequenced from introductory syntax and logic to applied development, with PBL assignments emphasizing integration with business systems. However, they may be incorporated into courses for specific purposes, such as Python in analytics courses (Brau et al., 2020). Programming lends itself to case-based or PBL approaches, and redesigning programming

courses to highlight authentic problem-solving reduced failure rates and increased student confidence (Corritore & Love, 2020). Programming in SAP may teach how to automate workflows or customize SAP functions, further embedding the skill into enterprise contexts. While SAP is compatible with Java, C, C++, SQL, Python, R, and JavaScript, the main programming language is Advanced Business Application Programming (ABAP), which is designed specifically for the software (Zečević et al., 2024). This narrow focus may not fit into a general programming course, so it cannot be a key component for a general IS major. Additionally, other concepts, such as vibe coding, may diminish returns on emphasizing programming skills and instead emphasize reasoning and system requirements in the future (J. Mitchell & Shaaban, 2025). For example, in 2020, programs began implementing low- or no-code into SAD courses (Crumbly & Field, 2020).

Systems analysis and design

Systems Analysis and Design (SAD) is the structured process of identifying business needs, modeling requirements, and designing technology-enabled solutions to support organizational operations (Recker et al., 2012). Related terms such as requirements engineering, process modeling, UML modeling, and system design are frequently used to describe this competency across MIS programs (Recker et al., 2012; Surendran et al., 2005). SAD has been associated with a set of foundational skills, including requirements elicitation, process mapping, modeling, logical design, and stakeholder communication, all of which are core IS development competencies identified in the IS2020 curriculum guidelines (Leidig & Salmela, 2021). Within job postings and curricular frameworks, SAD is consistently linked to tools and methods such as UML, data flow diagrams, use cases, prototyping, structured analysis, and testing (Recker et al., 2012; Tanner & Scott, 2015). In curriculum recommendations, SAD fall under the Systems Development Competency Realm, underscoring their role as a central skill in connecting business needs to system specifications (Leidig & Salmela, 2021). We therefore classify SAD as a distinct competency area and use these definitions, skills, and product associations to guide keyword identification for Table 4.

SAD courses typically advance from eliciting user requirements to developing process models (DFD, ERD, UML) and prototypes. In modern curricula, SAD often overlaps with agile project courses, emphasizing iterative development and collaborative team roles. Drawing on active-learning principles validated in programming and analytics research, which require understanding the processes (Berssanette & de Francisco, 2023), educators integrate case-based modeling exercises and team simulations to teach systems thinking. Institutions may elect to embed SAD projects into ERP contexts, where students design data models or workflow diagrams within SAP, providing an authentic application of their database and design skills. Flipped-classroom strategies within SAD allow students to review modeling tools before class and spend contact hours solving case problems in teams, enabling active learning and developing key soft skills such as problem-solving and critical thinking (Tanner & Scott, 2015).

Soft Skills

Soft skills, or durable skills, are valuable abilities that students develop and use throughout their careers. While technical skills may change rapidly, they are hard to define and are not typically listed among the learning objectives of most courses. The following sections define the terms and identify the associated keywords within various soft skills. The skills, their definitions, and keywords are compiled in Table 5, which establishes a shared set of definitions and keywords used in the initial coding of the study's content analysis. We will define each soft skill and then discuss research on teaching soft skills separately.

Critical thinking

Critical thinking has many definitions. It has been defined as the ability to think clearly and logically and to determine if something is true, higher order thinking, evidence based judgement, problem solving, analytical thinking, reflective thinking, deductive and inductive reasoning and a process for logical decision making (Condon & Valverde, 2014; Costley & Lange, 2016; Kachouie et al., 2025;

Leidig & Salmela, 2021; Thomas et al., 2007; Topi et al., 2017). Using definitions and keywords associated with critical thinking, we have compiled a list of terms, words, and phrases for content analysis (Table 5). We will adopt the definition from the most recent guidelines, which emphasizes the use of logical thinking to solve problems and make effective decisions (Leidig & Salmela, 2021). Current curriculum guidelines for Undergraduate and Graduate IS students stress the importance of critical thinking (Leidig & Salmela, 2021; Topi et al., 2017).

Table 5. Soft skills terms and definitions

Skill	Definition	Keywords	References
Critical Thinking	Using logical thinking to solve problems and to make effective decisions	Problem solving, making decisions, logical reasoning, higher-order thinking, analytical thinking, reflective thinking, judgment	Condon and Valverde (2014); Costley and Lange (2016); Kachouie et al. (2025); Leidig and Salmela (2021); Thomas et al. (2007); Topi et al. (2017)
Written Communication	Conveying information and ideas through the written word	Writing, creating, or generating reports	Hershkovitz et al. (2019); Kibar et al. (2019); Rob (2006)
Oral Communication	Conveying information and ideas through speech	Interpersonal communication, presentations, communicating with different groups, and interacting with different groups	Hershkovitz et al. (2019); Weinhandl et al. (2020); M. Wang et al. (2024)
Timeliness	Ability to meet deadlines through effective planning, pacing, and self-regulation, essential in project-based and online IS learning	Punctuality, time-management, self-regulation, workflow consistency, deadlines	Muljana and Luo (2019); Weinhandl et al. (2020)
Accountability	Taking responsibility for assigned tasks and fulfilling commitments reliably in both individual and group contexts	Responsibility, ownership, dependability, role clarity, reliability	Hershkovitz et al. (2019); Magen-Nagar et al., (2019); Weinhandl et al. (2020)
Teamwork	Coordinated collaboration where learners work interdependently to complete shared tasks and integrate diverse perspectives	Collaboration, coordination, shared decision-making, groups, team, committees, cross-functional, multicultural	Gafni et al. (2023); Goldstein and Gafni (2019); Magen-Nagar et al., (2019)

Communication

Presentation and communication skills refer to a learner's ability to convey information clearly and effectively across written, oral, and visual modalities, including organizing arguments logically, adapting messages to different audiences, engaging in feedback exchanges, and translating technical ideas into accessible forms (Hershkovitz et al., 2019; Kibar et al., 2019). In IS and technology-mediated learning environments, communication shapes relational trust, the quality of collaboration, and the effectiveness of knowledge construction. Communication skills encompass the capacity to convey information clearly, whether through written reports, oral presentations, interpersonal communication, visual artifacts, or multimodal formats **(**Hershkovitz et al., 2019; Kibar et al., 2019). IS graduates must routinely translate technical details into language comprehensible to business stakeholders, clients, or team members. Research in digital learning environments shows that the quality of communication directly influences engagement and relational trust, as sustained feedback exchanges strengthen understanding and deepen academic interactions (Hershkovitz et al., 2019). Within IS curricula, communication is foundational to activities such as documenting system requirements, presenting analytical insights, and explaining design decisions. System documentation has played a key role in development, communication, and teamwork (Rob, 2006).

Teamwork

Teamwork is collaboration toward shared goals, encompassing communication, negotiation, shared decision-making, and the integration of diverse perspectives (Gafni et al., 2023; Goldstein & Gafni, 2019; Magen-Nagar et al., (2019); Saimon et al., 2023). Related terms include collaboration, group work, participation, cross-functional, and teamwork. Information systems require collaborative efforts, with projects that involve contributions from analysts, designers, developers, and end users. Research on global virtual teams shows that cross-cultural digital collaboration strengthens interpersonal skills and broadens learners' ability to negotiate diverse viewpoints (Goldstein & Gafni, 2019). IS curricula emphasize TBL because system development and analytics rely on multidisciplinary cooperation, making it a core competency rather than an optional skill.

Timeliness and accountability

The concepts of timeliness and accountability are not explicitly listed in the information systems guidelines; however, they are important soft skills. These soft skills may be directly connected to project management and capstone courses as they attempt to create an atmosphere that mimics the workplace. Graduate failure in the workplace can be linked directly to the inability to perform tasks on time and manage their own workload (Intelligent, 2024).

Timeliness, which refers to the capacity to complete tasks within expected or scheduled timeframes through effective time management, planning, and self-regulation (Muljana & Luo, 2019; Weinhandl et al., 2020). Accountability is the willingness and ability to assume responsibility for tasks and fulfill assigned roles, implying ownership, ethical commitment, management, and professional reliability (Hershkovitz et al., 2019; Magen-Nagar et al., (2019); Weinhandl et al., 2020). This skill is critical in digital and collaborative learning contexts because accountability shapes team performance and project outcomes (Hershkovitz et al., 2019).

Soft skills in curricula.

Standalone soft-skills classes are limited but may be available through communications, leadership, or project management courses. IS and MIS programs can also embed these skills throughout their curricula (Kachouie et al., 2025). For example, critical thinking may be advanced through learning activities that require structured reasoning, such as case analyses, system troubleshooting tasks, and PBL assignments (Kachouie et al., 2025), while communication and teamwork benefit from TBL projects, collaborative case studies, agile design activities, and co-creation tasks (Saimon et al., 2023). PBL assignments completed within groups enable students to practice negotiation, shared planning, and collective decision-making (Magen-Nagar et al., (2019); Saimon et al., 2023). Group labs, system-prototyping tasks, and collaborative research projects create authentic situations in which teamwork

emerges organically as students must divide responsibilities and integrate contributions. These curricular structures are designed to mimic the expectations of IS workplaces. Case-based activities require teams to interpret business scenarios, debate solutions, and jointly present recommendations. These experiential activities should consider using a constructivist approach when designing their evaluation of internal and external factors, as learning is orchestrated (Mughal & Zafar, 2011). For example, evaluating classroom and online learning as external factors in the student's learning process.

In classrooms, instructors are encouraged to flip the class and require students to present analyses during class sessions, enabling iterative feedback that strengthens communication behaviors (Weinhandl et al., 2020). PBL assignments may be used in flipped classrooms, requiring students to summarize problems, argue for solutions, and justify their reasoning, all of which demand strong presentation skills (Saimon et al., 2023) and strengthen critical thinking; while adding a TBL component can allow instructors to observe team dynamics directly (Weinhandl et al., 2020). Research consistently shows that well-structured collaborative activities deepen engagement and promote learning (Goldstein & Gafni, 2019). PBL approaches integrated with TBL, such as agile mini-sprints or rapid prototyping, reinforce teamwork and project management skills, such as coordinating assignments to assign accountability and meeting time constraints. This combination of experiential, case-based, and flipped approaches reinforces communication as an applied, not theoretical, competency. Recommended SAP teaching curriculum supports flipped classrooms with gamification (M. Wang et al., 2024), which can promote interpersonal communication through teamwork and collaboration.

Gamification and simulation, however, are more difficult in an online setting as learning may be asynchronous. However, individual ERP case assignments may be administered to enable experiential learning and reflection, fostering critical thinking (Qiu et al., 2020). Reflective practice, spurred on by structured assignments and prompts that require students to understand a system's processes, promotes critical thinking and is taught as a cognitive habit (Condon & Valverde, 2014). Assignments may require creating infographics, dashboards, and multimedia presentations, encouraging students to translate complex technical insights into accessible visual narratives and improving their ability to think critically and communicate (Kibar et al., 2019). Peer-review and instructor-feedback cycles further support skill development by requiring students to critique the effectiveness of their communication and revise their deliverables accordingly (Hershkovitz et al., 2019) and may be incorporated online.

Accountability and timeliness are among the most difficult to instill, as students may want relaxed schedules to reduce their stress. Deadlines have been relaxed to reduce student stress, but this may hinder their learning (Smyser, 2024; Zhao et al., 2023). Timeliness issues are compounded in online environments, where learners must independently manage pacing, making them a key factor in academic success (Muljana & Luo, 2019). Some flexibility may be beneficial within a short time window to allow students scaffolding to learn and preserve their mental health (Smyser, 2024). Timeliness and time management may be embedded in IS courses through milestone-driven project structures, phased system documentation, scheduled design reviews, and weekly progress benchmarks, increasing the strictness of policies as students' progress could become an interesting area of research. Agile-oriented activities, such as short development cycles and incremental reviews, further reinforce the expectation that students adhere to deadlines while collaborating with peers and learning time management, but may also allow some flexibility, as the agile methodology implies (Marnewick, 2023), and may also require formal communication if flexibility is required on a particular task. Within these projects, time management and personal accountability should be emphasized, requiring students to demonstrate ownership of tasks and justify incomplete or delayed responsibilities (Marnewick, 2023). Soft skill development can be continued and assessed in capstones or internship courses in IS curricula.

RESEARCH METHODOLOGY AND DATA COLLECTION

To determine whether the previously discussed technical and soft skills were evident in recent job postings, this research employed a content analysis approach to assess their inclusion in text (job postings) (White & Marsh, 2006). Content analysis requires an iterative process of unitizing, sampling, recording, and reducing the text until the desired level of quality is attained (Krippendorff, 2004). The process used mixed methods, with human scorers first determining whether a concept existed in the job posting through qualitative analysis, then using quantitative analysis to assess its frequency of occurrence.

For this research, the process began by defining the scope of job listings relevant to this study: job postings that required SAP and were posted on the job site Handshake, located in the Southeastern United States. Handshake is a website used by many university career offices in the United States and is therefore viewed as a good representation of potential job postings targeted for students.

Data collection occurred in September 2025, with 145 job listings initially collected, representing jobs listed on the university's affiliated career website at a single point in time. After discarding irrelevant job listings, 139 remained and were manually downloaded as PDFs for the scorers to access. Four scorers were utilized to review the job postings. Figure 1 shows the methodological flow, and Table 6 provides additional notes on steps within the process for collecting and coding the job listings.

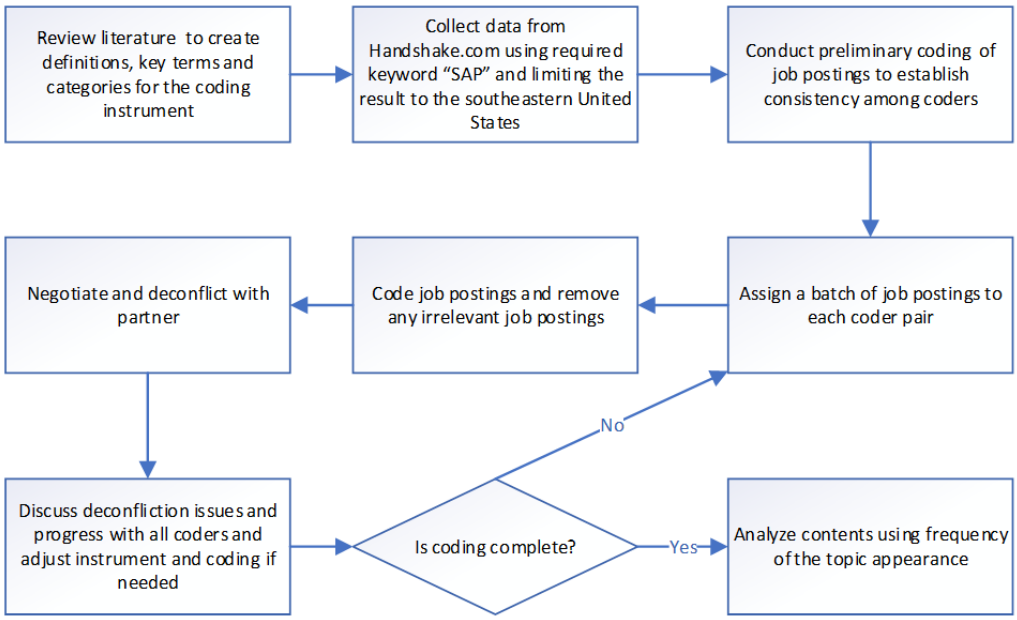

Figure 1. Methodological flowchart

During the process, all four scorers reviewed the first 15 job postings to establish an initial understanding of the coding instrument, which involved recording the years of experience for the position, indicating whether a skill was required, noting required certifications, and identifying the software the job posting required experience with. Once the initial coding of the first 15 postings was complete, the remaining postings were divided into four groups and assigned to different coding pairs to ensure communication among multiple scorers. Each scorer would score 20 postings at a time, then meet with their partner to deconflict and resolve coding disagreements. Additionally, after each set was scored and deconflicted by the pairs, a meeting of all four scorers was held to discuss and review the results and address any unresolved conflicts. The coding instrument was refined after coding the first group of job listings to ensure inter-rater consistency in understanding and to simplify the process.

Tables 4 and 5 contain the agreed-upon keywords used to evaluate technical and soft skills, respectively. If the keywords or similar terms were mentioned in the job posting in an appropriate context, the scorers noted that the skill was required. The scorers also recorded the minimum level of experience for jobs listed as having less than 3 years of experience, scored as entry-level, as well as any certifications or additional software requirements.

Table 6. Data collection and coding processes

Process	Notes
Data collection	Manually collected the job postings from Handshake from southeastern United States that were listed as including SAP and downloaded them as PDFs. Data collection occurred from 9/7/2025 to 9/20/2025. Initial n = 145; 6 removed by agreement of the scorers during the process; n = 139.
Establishing initial coding consistency	All 4 scorers met and scored 15 job postings together using the definitions and keywords. This included recording whether each skill was listed in the job posting, the years of experience required, and marking whether certifications and software were included from a list.
Dividing the data and assigning responsibility	The remaining initial records were divided into 4 groups, with 2 scorers assigned to each group. This ensured that scorers met with at least two other scorers during coding.
Initial coding	The scorers were tasked with coding 20 items from each group, assigned independently. After coding a group of 20, they stopped evaluating to ensure consistency with their partners.
Deconfliction meetings	The two scorers assigned to each group met to discuss coding differences and reach an agreement. If there was an unresolved issue, it was discussed when all scorers were present and resolved.
Group meetings	A meeting of all 4 scorers was held three times during the coding process. This resulted in some categories originally considered for elimination (such as specific analytics techniques, programming languages, ethics, AI, and auditing) being simplified, and in the recording of any additional software required being simplified. Following the group meetings, the initial coding process was repeated until all conflicts were resolved.

To answer RQ1 and RQ2, we used frequency counts and percentages. For RQ3, a list of required certifications and additional software was initially scored; however, group descriptions so infrequently included certifications that they were recorded as notes, except for coding, Excel, and visualization software such as Power BI and Tableau, which were treated as separate categories. The results are discussed in the next section.

RESULTS AND DISCUSSION

Our analysis yielded a final sample of 139 job postings, with 104 classified as entry-level (3 or fewer years of experience) and 35 as experienced positions. That more positions were entry-level was not surprising, as Handshake is a job search company that partners with universities and tends to offer more jobs aimed at entry-level positions. The coding was manual and slow, but it revealed many issues that may not be picked up in automated word counts, where "excel at" or "excel in" may be picked up as requiring knowledge of spreadsheets through simple word counts, or postings that included verbiage indicating that company products may facilitate communication would be counted as positions that require communication skills. Having two independent coders score each posting enhanced the validity of the coding.

RESEARCH QUESTION 1: TECHNICAL SKILLS

To examine RQ1 regarding the technical skills required in SAP-related job postings, finalized coding results were reviewed for frequency counts (Table 7) and percentages (Table 8) in each of the five technical skills: Database, Analytics, Programming, Testing, and Design.

Table 7. Technical skills count

Experience	n	Database	Analytics	Programming	Testing	Design
Entry	104	17	63	12	17	49
Experienced	35	7	21	4	12	21
Total	139	24	84	16	29	70

Table 8. Technical skill percentage

Experience	n	Database	Analytics	Programming	Testing	Design
Entry	104	16%	61%	12%	16%	47%
Experienced	35	20%	60%	11%	34%	60%
Total	139	17%	60%	12%	21%	50%

The most in-demand technical skill was analytical ability, with 61% of entry-level and 60% of experienced jobs requiring it. This is consistent with movements within the MIS curricula guidelines, which have emphasized the need for courses such as data mining and business intelligence within data management. However, only 16% of entry-level and 20% of experienced jobs required knowledge of databases. Programming was not often required in job postings, with only 12% of entry-level and 11% of experienced positions requiring the skill. This is not entirely surprising because jobs were not limited to developer or engineering positions; rather, they were more frequently directly related to analyst and consultant positions. In prior research, decision support, database, and programming were all shown to be of similar importance to the skills required of ERP graduates (Boyle & Strong, 2006). Our results suggest a shift in emphasis toward analysis and decision support as key skills for graduates. This finding supports the idea that ERP-related curriculum needs to be researched and continually reevaluated as job conditions change, particularly given the rapidly evolving environment of artificial intelligence integration (Lokuge et al., 2020).

Analytics, as a prevalent technical skill, implies that ERP-related curricula should include courses and projects that involve analysis. SAP offers analytical capabilities through a low-code or no-code approach, including its analytics cloud platform. SAP also leverages Joule, an embedded AI assistant that supports analysis and other capabilities, such as vibe coding. These capabilities, integrated into SAP, may partially explain the decline in postings requiring programming. Surprisingly, AI was mentioned in only a few job postings and thus was excluded from coding in this study. This needs to be revisited in future research, as SAP is increasingly incorporating AI into its processes.

The infrequent mention of the database as a requirement seems inconsistent with the growing need for analytics skills among ERP graduates, since data retrieval and data structures are often integral to analytics. This may indicate that the database is only required for certain tasks and that data governance may be limiting system access. However, it may also reflect SAP's database structure, which is not a normalized relational database, but a columnar database designed to handle large volumes of data within the system, a knowledge assumed from exposure to the system. The assumption of having the necessary database knowledge may also suggest that the systems used in that position are entirely self-contained within SAP, reducing the need for database integration skills. However, with one

in five experienced jobs involving SAP requiring database skills, these skills open doors and should not be neglected, warranting further research, although the current percentage is not very high.

During coding of the initial job postings, it was noted that the postings included a responsibility to aid in system design, separate from testing and auditing processes for validation and corrective actions. Therefore, for skills related to SAD, the category was divided into two areas: one evaluating whether testing was required, with 16% for entry-level and 34% for experienced positions, and the other evaluating whether design was required, with 47% for entry-level and 60% for experienced positions. These results represent a double-digit increase for experienced positions. The requirement for design and testing skills suggests that roles involving process improvement and quality assurance may have become increasingly important in IS as companies allow greater use of AI and vibe coding, which reduces the need for programming skills. The increase in the percentage of requirements from entry-level to experienced positions also suggests that this skill may be valuable for students seeking to advance within an organization. Therefore, the ERP curriculum should include courses and projects related to SAD. This finding is consistent with prior research (Boyle & Strong, 2006), suggesting that SAD is a durable skill that should persist as an emphasis across majors.

In summary, the analysis of technical skills indicates that analytics, design, and testing are the most prevalent skills required for ERP-related majors and concentrations, while databases and programming are required only for more specialized roles. Figure 2 shows the percentage of technical skills required in job postings. The figures underscore a greater need for involvement in system design and testing.

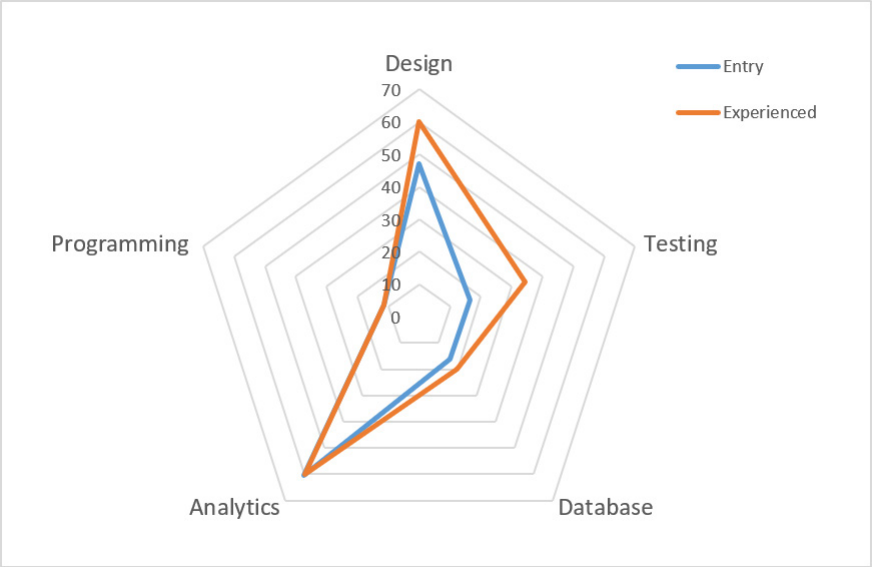

Figure 2. Percentage of job postings requiring technical skills

Research Question 2: Soft Skills

With regard to RQ2, which addressed soft skills mentioned in the job postings, the frequency count (Table 9) and percentage (Table 10) revealed that each of the five coded soft skills, including Written Communication, Timeliness, Teamwork, Oral Communication, Accountability, and Critical Thinking, was required by the majority of postings analyzed. This trend was consistent between entry-level and experienced positions. These findings are aligned with the MIS curricula guidance (Topi et al., 2017) and prior ERP skill research (Boyle & Strong, 2006). Teamwork was the most widely required at 70%. Given the recent finding that recent graduates are struggling to fit into the existing team-based corporate culture (Intelligent, 2024), the high frequency of teamwork in this study suggests that TBL should play a greater role in ERP Systems education. Related concepts such as communication

were also widely required, with 65% listing written communication and 58% listing oral communication. More research is needed across diverse learning environments for teamwork and communication as we transition to more online and hybrid course delivery formats (Morin et al., 2015).

Table 9. Soft skills count

Experience	n	Written communication	Timeliness	Teamwork	Oral communication	Accountability	Critical thinking
Entry	104	68	63	74	60	70	58
Experienced	35	23	22	23	21	24	20
Total	139	91	85	97	81	94	78

Table 10. Soft skills percentage

Experience	n	Written communication	Timeliness	Teamwork	Oral communication	Accountability	Critical thinking
Entry	104	65%	61%	71%	58%	67%	56%
Experienced	35	66%	63%	66%	60%	69%	57%
Total	139	65%	61%	70%	58%	68%	56%

Critical thinking and problem-solving were also widely sought, with over 56% listing these skills as job requirements. PBL is one of the most widely used pedagogies for developing critical thinking (Kachouie et al., 2025; Morin et al., 2015). Educators need to expose students to novel problems that they must think through and solve as a team, which should be encouraged through the curriculum and emphasized in research and learning objects, as well as in courses and projects.

Accountability and timeliness have become issues that need to be at the forefront, with a disconnect between students' and employers' perceptions evident in employer surveys (Intelligent, 2024). Job postings list timeliness at 61% and accountability at 68%. Higher education needs to explore the consequences of allowing flexible deadlines, which improve student satisfaction but may adversely impact long-term student habits. Many soft skills, such as accountability and timeliness, align well with project management courses and can serve as an excellent way to learn and practice them, as well as to coordinate tasks within a team. The results strongly suggest that TBL and PBL be included as part of experiential learning in ERP-related curricula; however, consideration should be given to implementing them using a constructivist approach to account for external and internal factors in the learning process (Mughal & Zafar, 2011).

Research Question 3: Software Knowledge

In addressing RQ3, only a few job postings required certifications or specific software knowledge. MS Office, specifically Excel, was the exception: MS Office or its component was listed in most job postings, and Excel was listed in 59% of entry-level positions and 40% of experienced positions. As MS Office is widely used for communications and Excel for analysis, this underscores the importance of communication and analytics in positions. Tableau, Power BI, or other similar visualization software was mentioned in roughly 12% of all postings, indicating the value of visualization tool experience and potentially suggesting that not all organizations adopt SAP-related products to perform those functions, and that some analytics or visualization may rely on external software. No specific certification or module was listed on more than 5% of the job postings. This indicates that certain technologies and certifications may not be required for most SAP positions available for recent

college graduates. This does not mean they lack value, but it implies that companies are willing to train employees in their specific ERPs, provided they have some SAP experience along with analytical, SAD, and soft skills. Further research is needed to evaluate the potential impact of certifications in the hiring process for specific roles.

CURRICULAR DISCUSSION

If SAP/ERP is offered as a concentration within IS degree programs, they need to be judicious about when and how they are offered. SAP is a popular software, but business domain skills and soft skills are listed as required more than technical skills. This implies that while exposure to the software is important, it may be best to incorporate the technology across different domains and create classes that encourage students beyond IS or computer science majors to participate, as this will result in more diverse communication and a different understanding of the processes. The most common technical skills involve analyzing, testing, and designing processes. SAD, Project Management, and Capstone Courses should also be encouraged, as improving and testing processes will be needed in many careers, and the experience gained in these courses can provide experiential learning that strengthens soft skills. As SAP has an established infrastructure, it is a viable option for incorporating its software into systems analysis, process management, analytics, development, and other courses. It also has the versatility to be used as supplemental material and exposure in a number of these courses. Products owned by SAP, such as Signavio, allow process mapping and simulation, which are important when understanding process improvement.

SAP's University Partners have also established courses that enable students to work in teams within gamified simulations, fostering experiential understanding of processes. Through simulation, teams can compete with others in the class and internationally. However, these games may be better suited to synchronous learning environments. PBL and TBL are beneficial for both technical and soft skills. Research is needed to determine whether asynchronous online simulation helps foster the soft skills necessary, including teamwork. Students should also be encouraged to participate in analytical courses, for which SAP offers cloud-based analytics and career pathways through its learning hub.

We have found a wide range of demand for SAP positions, and perhaps broadening exposure to allow multiple majors to participate and experience the software alongside IS majors may provide highly valuable experience. Integrating assignments and technology into supply chain management, accounting, and process management courses may enrich experience and enable IS students to work with students in other domains, providing soft skills that stand-alone IS courses would not. It would be most beneficial for courses that require SAP to enforce understanding and integration of the processes and to highlight the analytical capabilities. Table 11 summarizes our key findings on the curriculum.

Table 11. Summary of findings and curriculum responses

Finding	Curriculum response
No specific certifications were commonly listed within the job postings.	Courses do not have to be taught towards a specific certification to meet minimum requirements. These certifications would, however, provide evidence of industry knowledge and may help secure interviews.
Analytics is a key technical skill for many SAP positions.	SAP software includes Cloud-Based Analytics that can be offered as a standalone course or as assignments within other traditional analytics courses. Within an ERP Concentration, Analytics in SAP should be viewed as an essential area to provide exposure. Exposure to additional analytics courses would also benefit students in an SAP/ERP concentration.

Finding	Curriculum response
System design and testing are important for career success.	SAD may be an IS course that could supplement required skills. Additionally, courses that stress process integration in SAP. Within an SAP/ERP Concentration process, understanding and integration should be requirements and may represent a durable skill throughout a student's career.
Communication and collaboration skills are essential.	SAP cases offer options for incorporating TBL curriculum components, such as gamification through simulation. A course using a simulation can serve as a foundational introduction and foster collaboration and communication. These courses are designed to familiarize students with SAP. However, they are more aligned with synchronous learning environments. Individual cases are also, however, available. Courses such as SAD would allow for practice in documenting and communicating system requirements.
Timeliness and accountability require soft skills.	Courses such as capstones or project management would be beneficial for time management, responsibility, and learning in a group. Higher education may also need to enforce assignment deadlines more strictly to build good habits.
Technical skills such as database management and programming are less prevalent.	These skills were role-specific, and while SAP offers a platform for both students, they may be better served by general exposure to the concepts than by the platform. Some exposure to SAP/ERP-related databases may be appropriate and can be added to traditional courses as assignments.

This research has helped validate prior research indicating that SAD, along with soft skills and domain knowledge, is essential for ERP-related curricula (Mughal & Zafar, 2011). It also helps address a call for updates in ERP-related curriculum, as it shows that analytics are rising in prominence, while other areas, such as databases and programming, seem less prominent. We also seek to provide a basic framework for conducting similar research on market needs for a higher education institution, given our study's limitations.

LIMITATIONS

The job postings were limited to a single region in the United States. Therefore, the ability to generalize is limited. The sample also represents a snapshot of time, and postings were selected through only one job search site. Ideally, the researchers would have liked to include additional listings gathered from a variety of sources; there was a risk of duplication, and the chosen source was the one used by their career development department. As the primary focus was to support the regional university, using other ERP companies in the search would be more appropriate for generalizing ERP systems. The postings were further taken from a site that partners with universities to serve recent graduates. The site may contain detailed information, which reduces the ability to generalize.

FUTURE RESEARCH

This research involved a mostly manual process that can be repeated but is time-consuming. Future research could develop a data mining system to automate the process by scraping the web for data and using AI to assist with content analysis. This may be difficult, as the human scorers noted that the terms could be taken out of context several times. Additionally, further research is needed into

the most effective ways to incorporate soft skills into enterprise system courses and curricula. This is especially required in asynchronous courses.

ERPs are cross-functional, and courses may be function-dependent. Studies examining courses and curricula that include cross-functional students would be an interesting area of inquiry regarding both learning objectives and longitudinal career outcomes. For example, including SAP in a course appropriate for both accounting and information systems students may improve communication and teamwork skills.

While certifications are not prevalent as requirements, this does not mean they are not preferred in securing interview opportunities and standing out as a candidate. More research is needed on the value of the certification for students. This would also include the potential to improve communication, as it may provide additional confidence in discussing the technology for which they obtained the certification. Skills such as programming and database management require additional research to determine whether they are more widely needed to supplement suggested analytics skills within the job postings.

CONCLUSION

This study examined SAP-related job postings in the southeastern United States to identify requirements for technical and soft skills, certifications, and specific software knowledge to help align ERP-related curricula with industry needs. The findings indicate that soft skills are widely regarded as essential, while analytics and SAD-related skills are technical skills in demand. Excel was the only specific software knowledge requirement commonly mentioned beyond exposure to SAP. The extent of ERP exposure may not need to be the sole focus of ERP-related curricula, since certifications were not widely required within the job postings. Appropriate exposure, however, is needed and makes students more marketable. To serve this purpose, resources are available through corporate partners to help develop technical skills and obtain certifications in specific software, such as SAP. These training courses, however, do not necessarily help students develop soft skills. Higher education should look to fill that vital role and must incorporate soft skills into its curriculum at both the undergraduate and graduate levels while promoting marketable technical skills.

We recommend that TBL and PBL, grounded in sound educational theory such as constructivism, be included throughout the curriculum. SAP, as a partner, provides universities with a platform that supports gamified simulations and other PBL activities that can be incorporated into courses, allowing instructors to concentrate on orchestrating the experience rather than setting up software or designing a new case. Universities should look for partners that provide such resources to reduce economic stress and offer valuable educational experiences. Being a provider with gamified and PBL opportunities makes SAP a strong partner not only in teaching technical skills but also in soft skills, suggesting that providers need to go beyond simple technical training opportunities to be the most valuable business partners with higher education. Some simulations, however, may be less well-suited to asynchronous learning environments, so a constructivist approach should be used to evaluate whether the objectives and skill exposure are complete. Additionally, partners that offer low-cost or free certification opportunities, as SAP does through the SAP Learning Hub, provide assurance of learning for technical concepts and can strengthen student confidence in using their software. These certifications should not be the extent of the program, however, as educators still need to emphasize a holistic approach that includes soft skill development to ensure students are prepared for the workforce.

Researchers need to continue studying not only the alignment and development of skills but also the factors that drive students' success throughout their careers. Technological innovations such as AI and big data analysis continue to evolve, changing the skills and characteristics required of students in the workplace. This study adds to the body of knowledge on the required skills in an ERP-related curriculum, reinforcing prior research indicating a need for soft skills, and suggests that SAD is a

more durable technical skill that has endured while other technical needs have faded. For example, the shift away from manual technical tasks, such as programming and database management, has become a more essential focus toward analytical skills in modern ERP-related curricula. We emphasize five main points in curriculum design going forward.

1. Research and align skills and objectives for technical programs with industry needs to improve the marketability of your students.
2. Prioritize partnerships that allow for PBL and TBL, and research how they can be best implemented to promote additional soft skill development.
3. Encourage cross-disciplinary classes when applicable to promote teamwork and communication in cross-disciplinary teams.
4. Utilize industry resources in the classroom to supplement material and encourage students to find and use these industry learning opportunities that can advance into certifications.
5. While certifications are often not required in job postings, implementing them in the classroom may still allow students to stand out in the job market and provide evidence of assurance of learning.

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