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Teaching Tip
IS Capstone Course Design: Quasi-Internships Using Harvard Business Cases

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ABSTRACT

Quasi-internships can have a transformative impact on information systems' capstone courses. Realizing this potential depends on pedagogical design, course delivery, and student engagement. This paper presents a teaching method based on experiential-learning pedagogical design to engage students via quasi-internships to improve career preparedness and team dynamics. This teaching tip provides a procedure for converting typical Harvard Business Cases into more experiential quasi-internships. We provide a 16-week outline of the typical deliverables for six IS career trajectories aligned with the model information systems curriculum. Instructors can customize these procedures to fit their course- and module-level objectives. The assessment of students' feedback provides support for our customized quasi-internship methodology.

Keywords: Experiential learning & education, Capstone course, Harvard business cases, Computer information systems (CIS), Inclusion

1. INTRODUCTION

An information systems (IS) degree should reflect knowledge about programming, systems analysis, and project management, and enable the recipients of such degrees to solve business problems (Peslak, 2005). The applied nature of IS studies should prepare students to meet the demands of the job market. However, organizations hiring entry-level team members have consistently complained that they want individuals with more experience. In contrast, students beginning their careers complain that skill requirements are too high. Closing this gap between hiring organizations' needs and the skills of students in the job market requires IS education and the associated fundamental technical skills (Babb et al., 2019). One reason this skill development problem persists is students' lack of experiential learning opportunities. IS students have two main cumulative options for experiential learning: the capstone class and internships. Many capstone courses are primarily academic and lack activities that clearly focus on skill development, and the available internships do not always converge with students' career interests.

Furthermore, the chances to participate in internships are reduced for some first-generation college students, who are often employed part-time or full-time. To help alleviate these issues, we developed a capstone class using Harvard Business Cases (HBCs) to create a quasi-internship environment specifically designed to match students' career trajectories and provide an experiential learning opportunity similar to an in-person internship experience. Typically, Harvard Business Cases are used to provide students with teachable moments through participation, discussion, and reflection (Anderson & Schiano, 2014). While these are desirable, they do not produce a work product or provide experiential learning opportunities.

Experiential education immerses learners in an experience and then encourages reflection on the experience to develop new skills, attitudes, or ways of thinking (Lewis & Williams, 1994). This teaching style is typically facilitated or supplemented by internship programs or case studies. The National Association of Colleges and Employers (2023) defines an internship as a form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skills development in a professional setting. There are two primary modalities that facilitate student internships, a physical location or a virtual one. The latter has gained prominence because of the recent COVID-19 pandemic. Virtual internships expand the telecommuting concept to students. One definition of telecommuting is "working at home or an alternate location and communicating with work using electronic or other means, instead of physically traveling" (Mokhtarian, 1991, p. 274).

This paper proposes a teaching module designed for a career-driven virtual internship for students using Harvard Business Cases. This practice also addresses the problem of the limited number of internships and a lack of opportunities for diverse students during the pandemic. The next section of the paper summarizes the background literature on capstone courses, remote work, and the typical use of Harvard Business Cases. The implementation section is next, followed by an

evidentiary section with sample student projects. The final sections include the results, a discussion of the findings, and a conclusion.

2. BACKGROUND

2.1 What Constitutes a Capstone Course?

In higher education, capstone courses offer students approaching the end of their tenures in school the opportunity to summarize, evaluate, and integrate some or all of their knowledge and experiences. The capstone course's objectives include fostering integration and synthesis within an academic major and promoting meaningful connections between this academic major and career experiences. It is essential to develop student skills, competencies, and perspectives as part of the college curriculum, thereby improving seniors' career preparation, which facilitates the transition from the academic world to the professional world (Cuseo, 1998).

Capstone courses can have four formats. Firstly, such a course can be a discipline- and department-based course that summarizes learning within the academic major. This format was implemented in our school prior to the redesign. Secondly, courses can be interdisciplinary, combining two or more majors. Thirdly, the capstone can be a transitional type of senior seminar focused on preparation for work, graduate school, and life after college. Finally, the design can focus on career-planning courses to assist students as they engage in pre-professional development (Wagenaar, 1993). The newly redesigned course combines the discipline-based and career-planning types; this format helps students recapitulate theoretical concepts in the context of real-world career-driven examples.

This study defines a quasi-internship as a simulated career-based experiential learning project facilitated by an instructor and delivered face to face or remotely using information and communications technology (ICT). A gap in the literature exists because, to our knowledge, no papers have explored how to create a project-based quasi-internship program for undergraduate information systems students or evaluate its impact on students' preparedness for the job market.

2.2 Typical Use of Harvard Business Cases

Harvard Business Cases describe actual business situations, detailing some of the most critical aspects of organizational interactions. The value of HBCs is derived from their ability to showcase theoretical frameworks in practice; this benefits students with little to no work experience. Typically, an instructor asks students to read the case; then, the case is used to facilitate discussion in the classroom setting. This teaching strategy is illustrated in Figure 1. Using an HBC in this manner is a vast improvement over a passive theoretical lecture.

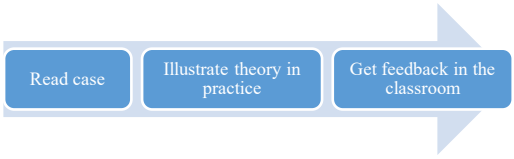

Figure 1. Typical Use of Harvard Business Cases

3. IMPLEMENTATION

3.1 Overview

An undergraduate bachelor's degree program in IS is offered by the College of Business and Economics at California State University, Los Angeles. The student population is more diverse than those of many other 4-year degree programs, with many first-generation and otherwise underrepresented groups. The program has three tracks that prepare students for careers in IS. Courses leverage theoretical concepts and cutting-edge technology to keep students abreast of employer demands. The capstone class is an integration of all the core information systems and technology courses. The class is designed to maximize students' exposure to the roles of IS and technology professionals in the industry. In the past, the class was a lecture-based recapitulation of core concepts; in Fall 2020, we redesigned the course to focus more heavily on experiential learning.

The course assesses students' technical skills, critical thinking, systems thinking, ability to collaborate, ability to experiment, and theoretical knowledge. It was delivered face to face and remotely. The course is composed of 16 weeks/modules. The instructional material was delivered by the instructor using five methods: passive lectures; interactive lectures; labs, specifically technical instruction, such as how to use software; videos; and small group meetings with the instructor. This mix of techniques is designed to maximize the interaction between students and faculty and improve the students' learning environment (Cleveland-Innes & Campbell, 2012; Garrison & Arbaugh, 2007).

The discipline-based section of the course divides theoretical concepts into six categories: foundations of IS, data and information management, enterprise architecture, IT infrastructure, IS project management, systems analysis and design, and IS strategy management and acquisition. To comprehensively assess students' ability to apply the knowledge they have acquired, they complete the Institute for Certification of Computing Professionals (ICCP) Exam. The second section of the course assists students with career preparedness; it requires them to demonstrate their ability to provide IT solutions to holistic business problems, utilizing Harvard Business Cases as the foundation for this effort. Students execute a career-driven project by designing an IT artifact, analysis, or procedure that solves a real industry problem. As job market competition increases, there is growing demand for micro-credentials – a certificate earned for demonstrating a specific skill. In this class, students will complete LinkedIn Learning Certificates. This notable micro-credential will enhance their resumes and diversify the teaching material. All assessments were aligned with the Bachelor of Science in Information Systems (BSIS) learning objectives, course level objectives, and IS model curriculum.

To facilitate interaction and data collection throughout the semester, the instructor utilized enhanced communication tools; these include Canvas, Microsoft OneDrive, Microsoft Teams, Slack, and Zoom. Utilizing rich digital communication tools was instrumental in the success of the quasi-internships. These tools allowed interaction between the students and, if necessary, the instructor could moderate or contribute to student discussions.

3.2 Experiential Learning Approach to Harvard Business Cases (HBCs)

The instructor utilized the following six-step approach to create a career-driven quasi-internship experience for each student. The six steps were standardized over several semesters and are shown in Figure 2. The HBCs simulate several real-world scenarios over a semester within the experiential learning approach.

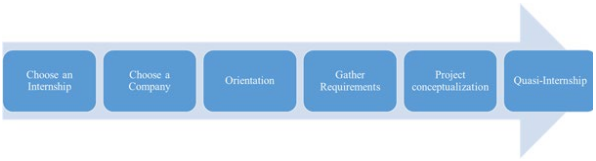

Figure 2. Experiential Learning | Quasi-Internship Approach to Harvard Business Cases

3.2.1 Step 1: Choosing an Internship/Career Track. Students select an IS career from a list provided by the instructor. The list of careers includes standard IS job titles and their Bureau of Labor Statistics classifications. Essentially, students will assume that role in the company they select in Step 2. Based on their career trajectory, teams of three to four students are created. The careers are categorized into one of six fundamental IS career tracks, which helps to determine which career-driven project they will receive, including project management, cybersecurity, network administration, systems analysis and design, database and information management, and data analytics. Students receive a description of the task required for each job title. An Excel document in OneDrive is used to collect each student's career choice and to form teams.

3.2.2 Step 2: Choose an Internship Company. Unlike regular classroom utilization of an HBC, in which the instructor chooses the case, students select a company they are interested in interning for or a career they plan to pursue. Instructors can compile a list of cases by choosing from the Harvard Business Cases (HBCs), which are based on recognizable Fortune 500 companies. Other options for selecting cases include choosing based on the size of companies where former students have been hired, for example, small or medium sized, or selecting companies that the school targets. Cases should be no more than 15 years old and lengthy enough, specifically 25 pages or more, to give students a good understanding of the company. All cases should have an IT/IS context. However, they should represent a mix of disciplines, for example, general management, information technology, international business, marketing, strategy, and entrepreneurship. The relevant discipline is displayed on the Harvard Business Publishing Education website (https://hbsp.harvard.edu). Cases should represent a cross-section of industries, for example, technology, banking, e-commerce, media and telecommunications, educational services, healthcare services, food services, travel, and utilities. Finally, the HBC should be representative of the geographic regions in which students work or live, for example, the United States, Latin America, China, India, Canada, the United Kingdom, and Australia. A comprehensive list of cases allows students the flexibility to choose and reinforces the concept that information systems are ubiquitous.

Student selection of a company is similar to submitting an internship application. However, unlike submitting an internship application, students are more likely to be assigned to the company they select. Using Microsoft Teams or Slack, each student discusses with their team why they selected a specific company and how this impacts their career trajectory. The discourse within the teams helps them understand different perspectives on each company. The instructor assists students in narrowing their choice of company when necessary.

3.2.3 Step 3: Company Orientation. Students read the HBC to understand the company's background and review its strategies to resolve the case issue. The case can be purchased from the Harvard Business Publishing Education website. Teams should be directed to complete supplemental research on the company's current strategic goal and review a published strengths, weaknesses, opportunities, and threats (SWOT) analysis. Using Microsoft Teams or Slack, students create a new channel via which to discuss a summary of their findings after reading the case.

3.2.4 Step 4: Assessing the Company's Needs. Students complete additional research and update their knowledge of the company. This is a crucial step, as some cases may be a few years old. Students analyze the company's strategic goals, vision, or mission statement and SWOT analysis. Teams post research findings about the company and discuss what issues the company must address on Microsoft Teams or Slack. The students discuss the needs analysis with the instructor.

3.2.5 Step 5: Project Conceptualization. Based on the career the students chose, they identify a unique IT artifact, analysis, or procedure they can complete for the company and thus increase or maintain its competitive advantage or meet its strategic goal. Instead of creating a hypothetical company, students research and design an IT artifact, analysis, or procedure for the company they selected. The case information provides the discipline, industry, and geographic region in which the company conducts business.

Instructors should understand IT operations within a business. This experience will allow them to act as the project sponsor or senior mentor for each project team. Conceptualizing each project is a "science"; however, this paper provides a sample of each project type. For the Project Management/IT Consultant career trajectory, instructors can ask students to propose an enhancement for an existing system, the replacement of an existing system, or the implementation of a new system. Students should be given a budget range and a projected timeline to help set the project scope. For the Data Analyst career trajectory, instructors may ask students to search the web for a dataset and avoid websites with "clean data." Instead, students can identify any "raw-uncleaned" proxy dataset, which can be company specific, industry specific, or contextually relevant. At a minimum, the dataset should have the following data types: numerical, both continuous and discrete; categorical; and date or time. For the Network Administrator career trajectory, instructors should ask students to propose a strategically based business reason for designing and implementing an Azure virtual network. For the Database Administrator career trajectory, instructors may ask students to propose the design of a new database to help the organization meet its strategic goals, exploit an opportunity, mitigate a

threat, improve a weakness, or create a competitive advantage. The design should include a discussion of alternate solutions, for example, relational versus NoSQL, and describe how they would integrate the chosen solution into the current infrastructure. Similarly, for the Systems/Business Analyst career trajectory, instructors should ask students to design and prototype a moderately complex IS application for the organization described in the HBC. For the Cybersecurity Analyst career trajectory, instructors should ask students to design a business continuity plan (BCP). They should select a scope, especially for multinational conglomerates, to help shape the breadth of the assessment. Each team will refine and revise the concept based on the instructor's feedback.

3.2.6 Step 6: Experiential Learning | Quasi-Internship with HBC. Students develop a unique IT artifact, analysis, or procedure. Each team receives a project template designed to match the job tasks of the following six popular IS careers: project management, cybersecurity, network administration, systems analyst, database administrator, and data analyst.

Steps 1 and 2 are included in Milestone 1, as highlighted in Tables 2-7 in Section 4.2. These steps are usually completed by week 2 of the semester. Steps 3-5 are typically completed by week 6 as deliverables for Milestone 3, as indicated in Tables 2-7. Steps 3-5 require that instructors meet with students virtually or in person. Step 6 is the bulk of the project, encompassing milestones 4-6, and spans 10 weeks of the semester. Suggested deliverables for each milestone are included in Tables 2-7.

4. EVIDENCE

4.1 Project Lifecycle

The quasi-internship uses an iterative approach. Students select an IS career, select a company to intern for, and conceptualize a project idea that focuses on helping each company gain or maintain a competitive advantage or achieve its strategic goal. Students then design an IT artifact, create documentation, or perform an analysis. A summary of quasi-internship projects is listed in Table 1. The quasi-internship culminates with a final presentation and project report. As shown in Figure 3, the first iteration is the planning phase.

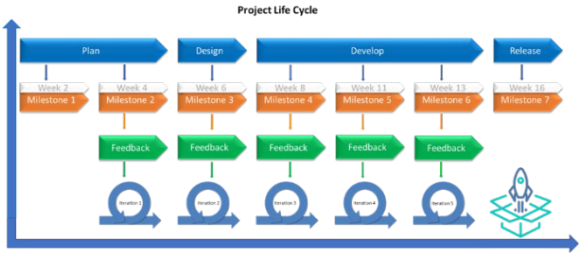

Figure 3. Experiential Learning Project Lifecycle and Agile Methodology

The instructor helps students select one career and a Harvard Business Case, and reviews their work breakdown structure and Gantt Chart created in Microsoft Project. The second iteration includes Milestone 3, which involves reviewing the developed concept with the instructor.

The third iteration is essential because it helps students select a project scope that can be executed by the end of the semester. This iteration is the design phase of the project lifecycle. Iterations 3-5 mark different milestones based on the student's career trajectory. This is the development phase, in which students gain most of their internship experience. This phase includes Milestones 4-6. To reach each milestone, students submit an updated version of the project template on Canvas. Submitting a version of the template on Canvas allows the instructor to monitor each team's progress and make suggestions for improvement. Submissions allow the instructor to play the supervisory role a company mentor would typically fill. As indicated in the literature review, the role of the facilitator is vital to the success of a virtual internship. Finally, the release phase, or Milestones 7-8, includes submitting a final project report and a presentation during class to show project stakeholders what work has been completed.

4.2 Quasi-Internship Project Examples

	Harvard Business Cases	
Career Trajectory	Example 1	Example 2
Project Management | IT Consultant	Tesla, Inc.	Pricing at Netflix
Data Analyst	Global Sourcing at Nike	DeepMap: Charting the Road Ahead for Autonomous Vehicles
Database Administrator	Adobe Systems, Inc.	Dell: Upcycling Ocean Plastics Through Supply Chain Innovation
Cyber Security Analyst	Delivering the Goods at Shippo	The Home Depot, Inc.
Systems | Business Analyst	Anthem Inc.	Progressive Corp.
Network Administrator	Airbnb, Inc.	Madras Cement, Ltd.

Table 1. Summary of Quasi-Internship Project Examples

4.2.1 Career Trajectory: Project Management | IT Consultant. Following are two sample projects created using the milestones outlined in Table 2. The first example is based on the Harvard Business Case of Tesla, Inc. (Rothaermel, 2020b), and the second on Pricing at Netflix (Ofek et al., 2020). Students created a project charter for each Harvard Business Case. Both teams developed a measure organizational value (MOV) statement and utilized Microsoft Project to develop a Work Breakdown Structure (WBS) and Gantt Chart with an agile methodology. Included in the project charter were detailed project budgets and resource management plans. Table 2 is a sample of the Project Management | IT Consultant milestones for the 16-week quasi-internship.

4.2.1.1 Tesla, Inc. Students conceptualized a car rental app, TeslaShare, that is unique to Tesla. The purpose of the application was to allow "*people to rent out a Tesla by the hour or day and return it to the same location they picked it up from. This concept is similar to Zipcar's rental system.*" The students

believed it would be helpful in meeting the company's strategic goal of developing new revenue streams.

4.2.1.2 Pricing at Netflix. Another team conceptualized an application for Netflix users to use in seeking mental health and wellness care. The project managers helped the company add a new module to the existing platform, in which it would be possible to meet a licensed professional. The application creates a medical record, allowing for medical billing. The students believed it would help meet Netflix's strategic goals by reducing the number of subscribers lost to other platforms.

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt Chart Form
6	3	Company History
		Proposed IT Project
8	4	Project Charter
		Project Stakeholders
		Measurable Organizational Value (MOV)
		Project Scope
11	5	Project Schedule Summary
		Project Budget Summary
		Quality Issues (Quality Management Plan)
13	6	Assumptions and Risks
		Project Administration
		Progress Report
16	7	Final Paper Version and Presentation
16	8	Individual Paper: Team Project Experience

Table 2. Project Management | IT Consultant Milestones for the 16-Week Quasi-Internship

4.2.2 Career Trajectory: Data Analyst. Following are two sample projects created using the milestones outlined in Table 3.

The first example is based on the Harvard Business Case of Global Sourcing at Nike (Hsieh et al., 2019), and the second on DeepMap: Charting the Road Ahead for Autonomous Vehicles (Greenstein & Keller, 2019). Each team uses the CRoss Industry Standard Process for Data Mining (CRISP-DM) methodology outlined in Table 3 to develop descriptive, dependency, and predictive models using Microsoft Excel and Palisade StatTools. Students with advanced knowledge leverage Tableau and Python for data cleaning and analysis.

4.2.2.1 Global Sourcing at Nike. Students completed a comprehensive assessment of proxy data from the Center for Disease Control and Prevention (CDC). By analyzing data on teen obesity, students provided insights for Nike to use in developing a program intended to provide teens with valuable resources for their digital fitness journeys. This program would allow Nike to personalize the experience of its consumers.

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt chart form
6	3	Select a Harvard Business Case
		Choose a Dataset
		Business Understanding
8	4	Data Understanding
11	5	Data Preparation
		Modeling
13	6	Evaluation
		Deployment
		Progress Report
16	7	Final paper version and Presentation
16	8	Individual paper: team project experience

Table 3. Data Analyst Milestones for the 16-Week Quasi Internship

4.2.2.2 DeepMap: Charting the Road Ahead for Autonomous Vehicles. Students comprehensively assessed San Francisco collision data from 2015 to 2020 to help DeepMap meet its objective of "accelerat[ing] safe autonomy by providing the world's best autonomous mapping solutions." By analyzing historical traffic-collision data, DeepMap will provide new insights with which to define key safety factors and enhance the safety of their AV mapping software product.

4.2.3 Career Trajectory: Database Administrator. Following are two sample projects created using the milestones outlined in Table 4. The first example is based on the Harvard Business Case of Adobe Systems, Inc. (Tripsas, 2000), and the second on Dell: Upcycling Ocean Plastics Through Supply Chain Innovation (Anupindi & Hoffman, 2018). Table 4 is a sample of Database Administrator milestones for the 16-week quasi-internship.

4.2.3.1 Adobe Systems, Inc. To keep track of Adobe's users, students designed a NoSQL database using DynamoDB to store virtual reality (VR) and augmented reality (AR) data. Adobe can track each user's purchases on their devices by creating a database. Students were inspired by "Adobe's battle with Microsoft to establish *de facto* standards in the emerging eBook space." The team expanded this idea to include developing additional VR and AR products for students so that Adobe could compete with Microsoft.

4.2.3.2 Dell: Upcycling Ocean Plastics Through Supply Chain Innovation. Students designed a relational database using Oracle to store environmental data for Dell. They believed their proposal would support Dell's mission to clean our oceans, promoting positive environmental solutions to corporate

pollution. The database would store waste information from all technologies to compare and contrast results between two initiatives.

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt Chart Form
6	3	Introduction
8	4	Database Design
		Entity Relationship Diagram
11	5	Implementation
		Create Database and Tables
		Insert Values in Your Database
13	6	Reports
		Database Administration and Monitoring
		Progress Report
16	7	Final Paper Version and Presentation
16	8	Individual Paper: Team Project Experience

Table 4. Database Administrator Milestones for the 16-Week Quasi-Internship

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt Chart Form
6	3	Introduction
		Assessment Survey
8	4	Risk Assessment
		Hazard
		Attack Tools
		Security Breach
		Malicious Attack
		Malicious Software
11	5	Business Impact Analysis (BIA)
13	6	Plan Activation and Communication Procedures
		Resumption Strategies
		Progress Report
16	7	Final Paper Version and Presentation
16	8	Individual Paper: Team Project Experience

Table 5. Cybersecurity Analyst Milestones for the 16-Week Quasi-Internship

4.2.4 Career Trajectory: Cybersecurity Analyst. Following are two sample projects created using the milestones outlined in Table 5. The first example is based on the Harvard Business Case of Delivering the Goods at Shippo (Bussgang et al., 2017), and the second on The Home Depot, Inc. (Ton & Ross, 2008). Students developed a business impact assessment (BIA), security risk assessment, and business continuity plan (BCP). Table 5 is a sample of the Cybersecurity Analyst milestones for the 16-week quasi-internship.

4.2.4.1 Delivering the Goods at Shippo. The BIA, security risk assessment, and BCP for Shippo cover all Shippo locations and its employees. The team learned to use Qualtrics and developed a comprehensive survey to execute a security risk assessment.

4.2.4.2 The Home Depot, Inc. This plan described how to defend the entire IT infrastructure against common malicious attacks, breaches, known attack tools, and harmful software. It explained immediate response measures, as well as preventative measures. The team developed a Qualtrics survey for distribution to employees who commonly access the system to assess the most likely risks.

4.2.5 Career Trajectory: Systems/Business Analyst. Following are two sample projects created using the milestones outlined in Table 6.

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt Chart Form
6	3	Introduction
		Requirements Survey
		Brief Use Case Descriptions
		Use Case Diagram
8	4	Domain Model Class Diagram
		State Machine Diagram
		Fully Developed Use Case Description
		Activity Diagram – For One Use Case
		System Sequence Diagram
11	5	Design Class Diagram (DCD)
		Sequence Diagram with View and Data Access Layers
		Package Diagram
13	6	GUI – Graphical User Interface
		Progress Report
16	7	Final Paper Version and Presentation
16	8	Individual Paper: Team Project Experience

Table 6. Systems/Business Analyst Milestones for the 16-Week Quasi-Internship

The first example is based on the Harvard Business Case of Anthem Inc. (Herzlinger, 2006), and the second on Progressive Corp (Sender et al., 2006). Students created a Qualtrics survey to gather system requirements and system component documentation using Unified Modeling Language (UML), including use case diagrams, use case descriptions, activity diagrams, class diagrams, sequence diagrams, and state machine diagrams. Table 6 shows a sample of the Systems/Business Analyst milestones for the 16-week quasi-internship.

4.2.5.1 Anthem Inc. Students developed a mock website based on the Anthem Inc. Harvard Business Case. Given their understanding of price transparency in healthcare, they developed a web solution to show patients the prices of oncology and heart disease care before receiving treatment.

4.2.5.2 Progressive Corp. Students developed a prototype video monitoring application for the Progressive corporation. The video telematics system would expedite the claims process, thereby increasing customer satisfaction, claims satisfaction, and agent response rates. Video evidence would provide underwriters with definitive data, allowing them to process claims quickly and efficiently. In turn, this would reduce underwriting expenses, including litigation costs and loss adjustment expenses, resulting in increased profitability for the company.

Week	Milestone	Description of Milestone
2	1	Select a Career Trajectory
4	2	Preliminary Schedule, in Gantt Chart Form
6	3	Select a Harvard Business Case
		*Activate Student Azure Subscription
		Create a Virtual Network using the Azure Portal
8	4	Filter Network Traffic with a Network Security Group Using the Azure Portal
11	5	Route Network Traffic with a Route Table Using the Azure portal
13	6	Connect Virtual Networks with Virtual Network Peering Using the Azure Portal
		Progress Report
16	7	Final Paper Version and Presentation
16	8	Individual Paper: Team Project Experience
16	8.1	Clean up the Resources

Table 7. Network Administrator Milestones for the 16-Week Quasi-Internship

4.2.6 Career Trajectory: Network Administrator. Following are two sample projects created using the milestones outlined in Table 7. The first example is based on the Harvard Business Case of Airbnb, Inc. (Rothaermel, 2020a), and the second on Madras Cement, Ltd. (Prahalad & Krishnan, 2014). Students created a virtual private and public network using the Azure portal. The network they created can enable the business to filter network traffic with a network security group, route network traffic with a routing table, and connect the virtual network with virtual network peering. Table 7 is a sample of the Network Administrator milestones for the 16-week quasi-internship.

4.2.6.1 Airbnb, Inc. A virtual network would give the company a more visible presence in its business neighborhoods. The virtual network would not require acquiring any real property, which supports Airbnb's business strategy of not owning real property. The most significant advantage of a virtual network is flexibility. A virtual network can easily be expanded or reduced to fit business needs, giving Airbnb an advantage over the competition.

4.2.6.2 Madras Cement, Ltd. Students proposed moving critical IT Infrastructure to Virtual Machines and Networks to save costs by reducing the need for hardware. In doing so, the company gains more security for its network.

5. RESULTS

5.1 Data Analysis and Results

Students were undergraduates enrolled in the capstone class between Spring 2021 and Fall 2021; the total number of students was 102. The data analyzed in this section was collected using Canvas, Qualtrics, and scores from the Institute for Certification of Computing Professionals (ICCP) Exam. The analysis includes only course-level objectives and knowledge areas from the ICCP exam that match the career trajectories examined in Section 4.2.

5.1.1 Student Self-Assessment Pre-Test on Concept Mastery and the Institute for Certification of Computing Professionals (ICCP) Exam Results Comparison. We collected structured data at the beginning of every new module, each of which aligns with the knowledge areas in the IS model curriculum (Topi et al., 2007). Students complete an assessment survey to gauge their understanding of knowledge areas that may align with one or more course-level learning objectives. The questionnaire contains a Likert scale with response choices of not-at-all, slightly confident, somewhat confident, fairly confident, and completely confident. The results are shown in column 3 of Table 8. The results were standardized to match the traditional grading system. The letters A, A-, B+, B, B-, C+, C, C-, D+, D, and D- indicate passing grades; F indicates failure. Tables 8a and 8b include only the grade symbols related to the results for the six knowledge areas and course-level objectives matching students' career trajectories.

To help us objectively assess students' mastery of the theoretical concepts reviewed in the capstone class, they complete the ICCP exam. The exam includes scenario-based test questions that focus on the skills required by companies and the learning objectives set by the Association for Computing Machinery-Institute of Electrical and Electronics Engineers (ACM-IEEE) and Association for Computing Machinery-Association for Information Systems (ACM-AIS) curriculum committees. Students' scores on the ICCP exam are compared

to those of their peers nationally, which provides a good benchmark for how well students can compete in the job market. The difference between scores ranges from 1 to 10 percentage points. Three faculty members agreed upon the grade symbol assigned to each difference range. The standardized results are shown in column 4 of Table 8.

For project management, 81.82% of students reported that they were only somewhat or slightly confident in their knowledge of the module's objectives. As shown in Table 8a, the ICCP exam results showed a marginal improvement in students' knowledge after reviewing the course materials. Our student's scores were average for this course objective as compared to the national project management score. For IT infrastructure, which includes networking, 91.32% of students reported that they were somewhat or slightly confident in their knowledge of the module's course objective. Students showed marked improvement after completing the ICCP exam; as compared to the national score, they performed well, showing achievement of the course objective.

Course Level Objective (CLO) – Student will be able to …	ICCP Exam Knowledge Areas	Pre-Test Grade	Standardized ICCP Grade
CLO 2: ... create an IT project charter	IS Project Management	C-	C
CLO 3: ... create information technology (IT) infrastructure	IT Infrastructure	D	B
CLO 4: ... design an IT artifact	Systems Analysis and Design	C-	A
CLO 5: ... create a database	Data and Information Management	D+	A
CLO 8: ... examine information systems security requirements	Foundations of Information Systems	C-	B
CLO 9: ... formulate visualizations and analyze data			

Table 8a. Student Pre-Test Results versus ICCP Exam

For the systems analysis and design knowledge area, which is aligned with the Systems/Business Analyst career trajectories, 80.27% of students reported that they were only or somewhat slightly confident in their knowledge of the module's course objective. Students showed significant improvement on the ICCP exam. Compared to the national score, their attainment of course objectives was outstanding. Also, 86.67% of students reported somewhat or slight confidence in their knowledge of the data and information management course objective. Students improved substantially after completing the ICCP exam and, compared to the national score, their attainment of the course objectives was outstanding. Business Intelligence and Security are included in the foundations of the information systems knowledge area. On average 74.88% of students reported that they were not at all to somewhat confident in their knowledge. Students received better scores compared to their peers nationally on the ICCP exam for this knowledge area.

Grade Symbol	Pre-Test Survey	Explanation
A	Completely Confident	Outstanding Attainment of Course Objectives
B	Completely Confident	Good Attainment of Course Objectives
C	Fairly Confident	Average Attainment of Course Objectives
C-	Somewhat Confident	Below Average Attainment of Course Objectives
D+	Somewhat Confident	Weak Attainment of Course Objectives
D	Slightly Confident	Poor Attainment of Course Objectives

Table 8b. Student Pre-Test Results versus ICCP Exam Traditional Grade Key

5.1.2 Students' Feedback on the Project. We developed a simple questionnaire regarding project self-reflection that included four items. Question 1: Discuss what you learned: Include in your discussion whether you feel more prepared for the career you chose at the beginning of the semester. Question 2: Write an overview of your team project experience. Question 3: Discuss how the team was successful or unsuccessful. Question 4: What are your recommendations about how to improve the experience of future students? After an initial analysis of the data collected, Question 1 was divided into two constructs: Overall Experience and Career Preparedness. Assessment Questions 2 and 3 were combined to form Team Dynamics.

Our analysis reveals that the students felt better prepared for the job market after taking this course. The students mentioned that the course allowed them to engage in realistic projects in their area of interest. Furthermore, the course required the students to review the prior knowledge acquired from previous classes.

Students are better prepared: *"I feel like I am more prepared for my career now and will gladly keep learning and preparing myself. I learned that a lot goes into a BCP, and I don't mean just the content it requires but I also mean explaining that content so that it's understood."* Another example of the course being perceived as extremely useful is as follows: *"I can guarantee that I will take the skills that I learned from this project and apply them to the real world after graduation."*

Students provided feedback on these quasi-internships being realistic: "1. *I chose a career that is related to IT, support officer and a network administration. Granted, I did choose the Tesla business case as my first option, but I was unaware that I would be creating a database.* 2. *Our project was based on*

building a virtual network and attempting to relate that to a Harvard Business Case. The goal was to attempt to replicate a team making a virtual network from planning [and] design to, finally, implementation for Airbnb. 3. *I learned how to connect different virtual machines on different networks together. It was an interesting and challenging effort, so I was intrigued [about] how it worked. [Madras Cement]."*

In addition to being a real-world learning opportunity, these quasi-internships are within the students' interest areas: *"Our project was based on Data Analysis, which was a great choice for me because I wanted to get more knowledge as a data analyst. Of course, I struggled while working on this project, but in reality, when you struggle, you're learning and embracing the reality [of] your future."*

These internships provide skills needed for the job market: *"I also enjoyed learning new modeling skills in Excel and how to make a regression table. Mostly, this project helped me see [what] it will really be like to work in this profession and all of the tasks I could potentially encounter in this field."* Another student stated that these projects would be translated into the professional environment: *"From learning about how close this project was to tasks given in an internship environment, it allowed me to see how some of the things we did in this project would translate into the professional setting. Additionally, another group member brought some python programming for data analytics experience that they picked up while working on another project."* Students also reflected on how being an IS professional would entail reviewing the prior knowledge and continually updating new skills. A student describes the helpfulness of reviewing previous courses by stating, "*This class had taught me things that I had already forgotten and things that I was learning in other courses a long time ago, and that needed to be revised in order to remember. The experience of working on this project was as accurate as it could get [in terms of being like] real life."* Another student describes the necessity to continue learning: *"A semester-long discussion about data analysis with my teammates required I articulate the concepts I've learned, increasing my understanding of them. Doing the work was enjoyable [and] gave me confidence…"*

The responses to the team dynamics were overwhelmingly positive, for example: *"*1. *I believe that my team in this class has been the best team I have ever had in my four years at Cal State LA. The freedom to pick our own careers and team project topics is what gave the team a [coherence] in terms of working styles and career goals.* 2. *All team members were active and dynamic in responding to project changes and, mainly, putting the efforts [in] to improve the overall quality by addressing feedback and doing additional research. The project was a great opportunity to learn various aspects of project management and working with a dedicated team."*

6. DISCUSSION

The capstone experience draws from previous work undertaken by the student during their course of study (Murray et al., 2008). It is often a comprehensive, well-thought-out project that allows students to demonstrate various abilities (Palomba & Banta, 1999). The quasi-internship is an ideal capstone course, providing a culminating experience. Because of its rigor and connectedness to other courses, quasi-internships require careful planning in order for students to succeed. Students must be familiar with programming, systems analysis, and other fundamental IS concepts. With foundational knowledge derived from core courses, students can maximize the benefits of the cumulative experience by applying the theoretical concepts they have learned. Thus, sequencing these courses to prepare students for a quasi-internship is essential. It would be difficult for students to take many other challenging courses concurrently with completing a quasi-internship.

Previous studies find that internship and mentorship experiences increase the likelihood of initial IT employment and promote the persistence in IT careers (Setor & Joseph, 2017). However, efforts to provide all students with these opportunities have been challenging. The challenge of securing internships may exacerbate equity gaps in IS employment. For example, a recent study finds that IS, cybersecurity, and engineering firms often miss large populations of female employees (Burrell, 2020). Other studies find racial and ethnic disparities in terms of providing opportunities in STEM-related disciplines (McKim et al., 2017). By implementing quasi-internships, the IS department can provide opportunities for all students to showcase their experience on their resumes, thereby improving the likelihood of securing a job. A residual impact is that quasi-internships can increase the pool of entry-level job applicants because students gain experience, regardless of demographics. This is a crucial finding, especially for universities with large first-generation and underrepresented student populations.

Recently, many organizations have increased virtual work or work from home. Recent graduates must experience these new working modes to be effective in the workforce. However, creating a culminating experience in remote settings has been challenging because it focuses primarily on a case presentation format (Herbert, 2018). Beyond presentations, the quasi-internship leverages technology to create an experience in the form of a multi-track, online event that satisfies all learning outcomes (Stahr & Davis, 2021). The cases described in this teaching tip are tangible, hands-on deliverables or work products that students develop. As indicated by a recent study, a virtual internship today might be good preparation for the virtual/remote work of tomorrow (AlGhamdi, 2022).

The university career centers accommodate students from various disciplines. Unlike many other fields, the career options in IS change frequently, which may create gaps in counselor knowledge. Empowering students to make the right choices is essential to the learning process. We observed that IS students could better engage with the university career center after completing quasi-internships. Students were more knowledgeable when discussing IS-related career opportunities with the university career center.

Another benefit of a quasi-internship is that the IS department can create a repository of projects. These repositories could include datasets, project templates, and other relevant work products. The knowledge generated from prior quasi-internships can be used as a launchpad for future students. Also, the instructors can implement feedback from students to improve the course. Future development could consider providing an industry mentor for the course. The students will gain even more realistic professional experiences when an outside expert is included.

Instructors should adjust when teaching online versus in person. For example, student collaboration was easier to track via MS Teams versus face-to-face meetings. Team dynamics were more difficult to manage face to face, as students felt

forced to meet in person. They stated that it was inconvenient, so teams did not meet regularly. Therefore, instructors should encourage student teams to meet online when classes are in person.

The quasi-internship teaching approach requires a fully vested instructor. This type of teaching is more time consuming and takes more effort. It is suited to a collaborative teaching style in which multiple instructors use the same curriculum, particularly for larger classes. This approach is most effective for small classes in that instructors can provide timely feedback to students before subsequent milestones are due.

7. CONCLUSIONS

Internships are a vital part of any undergraduate capstone course. Using an original pedagogical design, we successfully used HBCs to create a quasi-internship experience for 100% of students. When students apply and are selected for traditional internships, we hope their choices match their interests and skills. However, we have observed that this ideal scenario is only sometimes possible. Students also apply for internships for other reasons, such as geography, money, the commute, and remote work. The quasi-internship experience differs from regular internships in that it is more flexible, allowing students their preferred careers without restrictions. Furthermore, our approach to using HBCs as the foundation for internships leverages the well-known real-world feel of these cases. However, it implements them in a unique format, providing students with an orientation to the company strategy and a basis for designing a unique IT artifact, procedure, or document. Using a quasi-internship based on Harvard Business Cases addresses many issues: 1) the inability of students to find internships is ameliorated, 2) the infeasibility of students with a socioeconomic burden leaving their current gainful employment to find short-term internships is ameliorated, 3) students can complete internships that match their career trajectories, 4) even though hypotheticals are used, students can intern for a Fortune 500 company, and 5) students gain meaningful internship experiences regardless of their race or ethnicity.

The information on course design provided in the paper can form the foundation for implementing this structure in other universities, thus reducing the issues involved in finding student internships and offering more opportunities for experiential learning. Students also expressed positive feedback after experiencing the quasi-internship. We believe that this foundational model can evolve to include additional courses other than the capstone. Students in 4-year bachelor's or associate's degree transfer programs can have more opportunities to gain experience, thus building their resumes and giving employers greater confidence in their abilities. In future classes, professors can consider sharing students' work with companies to engage in meaningful discussion, thus fostering the relationships needed to create paid internship positions.

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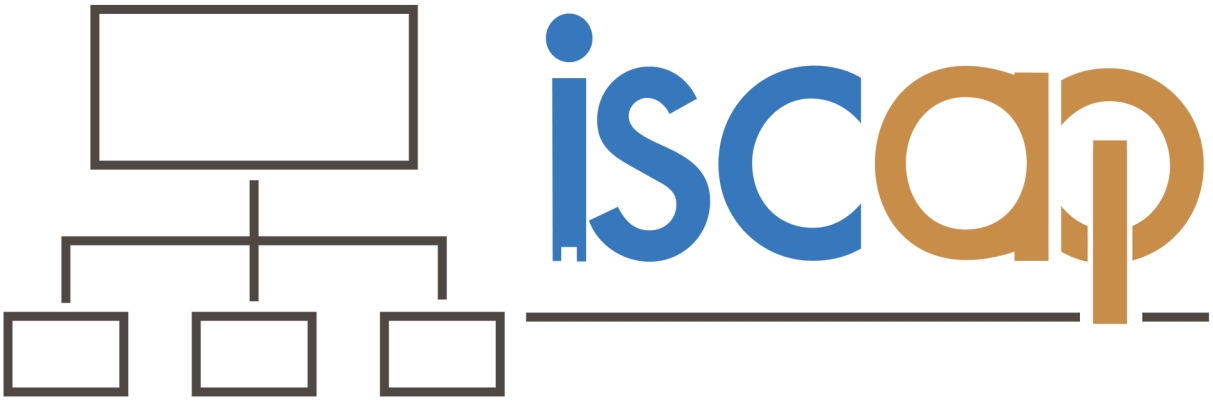

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