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Information Architecture Strategies in the Classroom: How Do Increasingly Complex Digital Ecosystems in Higher Education Shape the Contours of Instructor-Student Communication?

ABSTRACT

The proliferation of digital software is an increasingly accepted part of everyday life in higher education in the United States. While this software affords some opportunities, it can create confusing experiences for students as well. In this paper, I ask how might increasingly complex digital ecosystems in higher education shape the contours of instructor-student communication. To answer this question, I conducted an exploratory case study in the form of an online survey (n=83) and subsequent interviews (n=18) with user experience (UX) design students at a large public university in the southeastern United States. The research showed that students felt confusion regarding digital software protocols in their classes, how protocols varied from class to class, an inability to remember when and how to communicate with instructors outside of class, unsureness about where to locate information, and a preference for messaging applications over email. Research results suggest that instructor-student communication in higher education can be productively viewed through the lens of information architecture. In doing so, I argue for the need for instructors to implement strong information architecture strategies that help make sense of information in increasingly complex academic ecosystems.

KEYWORDS

digital, findability, information architecture, higher education, understandability

INTRODUCTION

The proliferation of digital software is an increasingly accepted part of higher education in the United States. This rapid change has been well documented—digital software has found its way "into most (if not all) aspects" of higher education (Selwyn 2014, 3). Digital software, in the form of tools and platforms,[1] has shaped how students receive content ubiquitously, causing students to regularly multitask across devices (Aljawarneh 2020; Ashour 2020; Scanlon et al. 2015, Virtanen et al. 2017). In their study of learning assessment practices, Sweeney et al. (2017) point to a proliferation of digital tools and platforms—social messaging apps, learning management systems (LMS), mobile technologies, interactive virtual environments, electronic voting systems, etc.—used across face-to-face, hybrid, and online learning environments. Digital software has also shaped the affective dimension of how instructors and students interact (Castañeda and Selwyn 2018). The COVID-19 pandemic only increased a digitization trend, further impacting structures of knowledge and

communication (Anghel 2023; Hast 2021; Pokhrel 2021; Rodríguez-Moreno et al. 2021; Turnbull, Chugh, and Luck 2021).

Software proliferation in the classroom enables instructors and students to interact in a variety of new ways and is the backbone for implementing online and hybrid modalities. Yet, all this software, often sold to higher education institutions by third-party educational technology (edtech) companies, is often "loosely coupled" (PowerSchool 2023). Much of this software does not easily share data, meaning that work done on one platform is not recognized by another. Furthermore, a proliferation of tools creates challenges for protocols about when, where, why, and how instructors and students should exchange information.

How might increasingly complex digital ecosystems in higher education shape instructor-student communication? If we understand communication broadly as the exchange of information, instructor-student communication might include information on a syllabus, assignment prompts, announcements of changes to deadlines or assignments, feedback on assignments, canceled class sessions, information that elaborates on class or assignment goals, or how content is structured, stored, and delivered.

As a way into this question, an exploratory case study was carried out on students in a User Experience (UX) Design-related program at a large public university in the southeastern United States. An online survey (n=83) and follow-up interviews (n=18) were administered to understand the concerns and needs of a particular set of students regarding how they make sense of communicating with instructors in an academic ecosystem full of digital software.[2] Results suggested that students felt confusion regarding digital software protocols in their classes, how protocols varied from class to class, an inability to remember when and how to communicate with instructors outside of class, an unsureness on where to locate information, and a preference for messaging applications over email.

Based on these results, instructor-student communication in higher education can be productively viewed through the lens of information architecture—the design of shared information environments (Rosenfeld, Morville, and Arango 2015). I argue for the importance of instructors having a clear information architecture strategy for how, when, and what software is used for the storage and exchange of class communication. Instructors need to ensure software used for communication exchange and storage is clearly navigable and important information is findable. Students also need to understand what to do with the information when they find it. This lens highlights the importance of communication structures in the classroom that take shape across a range of teaching modalities. While the process of learning itself should not be easy, an information architecture strategy would enhance, rather than detract, from class instruction.

To explain the importance of an information architecture strategy in the classroom, this paper first highlights the information architecture approach to this case study and the role of findability and understanding in complex, cross-channel academic information ecosystems. Second, I explain the context, administration, and methodology for this case study. Third, this paper analyzes e the results to show issues related to student confusion, including the affordances and constraints of strategies used by students to make sense of their ecosystem. Fourth, the paper explains some strategies instructors can implement to help students find and understand information.

INFORMATION ARCHITECTURE AND ACADEMIC INFORMATION ECOSYSTEMS

As a design discipline, information architecture aims to make products and services more usable by focusing on findability and understandability (Rosenfeld, Morville, and Arango 2015). Findability is defined as the quality of being locatable and the degree to which a system supports navigation (Morville 2015). Findability has spatial dimensions—where can information be found?—

well as temporal dimensions—when can information be found? (Benyon 2014; Karapanos et al. 2009; Narayan and Olsson 2013). Understandability refers to a designer's grasp of someone's needs and goals as well as how context within an information architecture shapes how that person understands information (Hinton 2015). Understandability focuses primarily on placemaking and sensemaking. Placemaking refers to the practice of helping people build a sense of place to reduce disorientation. It is achieved through how information is structured within a setting. Sensemaking refers to how people gain personal meaning related to information through experiences. These concepts apply equally to physical and virtual spaces.

In classical information architecture, findability and understandability were applied to structures like a website (Resmini and Rosati 2011). Good information architecture could be achieved with "clear, well-structured content" and through labels, markup, and search (Martin 2019, 76). However, information architecture has become increasingly complex. Information is less often organized in "discrete" structures (Buford and Resmini 2017) and is increasingly "blended" (Benyon 2014) across digital, analog, and terrestrial spaces. The term cross-channel ecosystem defines this type of ecosystem where actors[3] engage with information across different devices, locations, and the software that connect information flows (Resmini 2014). Experiences with information in these ecosystems is often "distributed, volatile, [and] transient" (Resmini and Lindenfalk 2021, 5).

Information ecosystems in higher education can be productively viewed as complex, cross-channel ecosystems. We can imagine a student's experience signing up for classes at a university. This student might interact with multiple devices, companies, actors, departments, and information layers throughout this process. A cross-channel ecosystem has its own language to describe how it operates: channel, actor, task, touchpoint, and seam.

A channel is a "semantic construct" that identifies a "pervasive layer" of information (Resmini and Lacerda 2016, 20). For instance, available classes, times, modalities, and instructors for upcoming classes are a channel of information. This channel exists in a database that can be queried by software on many types of devices. It can also be physically duplicated in printed formats. An actor is any "active agent" in the ecosystem (Resmini and Lacerda 2016, 19). The emphasis on the term "actor" implies agency to alter how ecosystem flows unfold. For instance, a student using information to make decisions about classes and an advisor the student speaks with are both actors within the ecosystem. A task is something an actor completes toward a goal, such as a student using a schedule builder feature embedded in a school's registration system. A touchpoint is any actor's interaction with a channel within the ecosystem, whether through a website, a kiosk, or another actor. Going to see an advisor, emailing the registration office for clarification, and seeking suggestions from other students regarding which classes to take are all touchpoints in a registration ecosystem. Moving between touchpoints would be called a seam between touchpoints. A seam allows the passage of "information from touchpoint to touchpoint" (Benyon and Resmini 2017, 6).

Thus, a registration experience can be designed to span space, time, devices, departments, and different actors. While cross-channel information ecosystems are designed—i.e., the "conscious and intuitive effort to impose meaningful order" (Papaneck 2005, 4)—there is no ability to determine the flow of actors in the ecosystem as they pursue goals (Benyon and Resmini 2017; Resmini and Lindenfalk 2021; Resmini and Lacerda 2016; Rosati, Schena, and Massacesi2014). Thus, students will have varied experiences. Even though actor behavior cannot be determined, actors can be nudged toward choices through the design of flows within the ecosystem. In a broad sense, the ecosystem has the potential to shape the actors' behavior as they engage with information in that system. In short, the ecosystem affords some uses and constrains others (Davis 2020; Evans et al. 2017; McVeigh-

Schultz and Baym 2015; Norman 2013; Robles Anderson and Ferguson 2022). As Davis (2020) states: "Technologies don't make people do things but instead, push, pull, enable, and constrain" (6).

RESEARCH CONTEXT AND METHODOLOGY

This research started with a question: How might increasingly complex digital ecosystems in higher education shape the contours of instructor-student communication? This exploratory case study offered a better understanding of a specific instance of instructor-student communication, which is part of a larger academic experience.

Research context

Research for this paper took place at a four-year, large[4] public university in the United States with a predominantly undergraduate population. The academic year is divided into semesters (16 weeks), the admission rate is 68%, there is no admission interview, and there is a requirement for applicants to have taken either the Scholastic Aptitude Test (SAT) or American College Test (ACT).

All research participants were enrolled in a user experience (UX) design-related degree. University data states that 86% of the students in the degree are between the ages of 18 and 24. 62% of them identify as female and 65% identify as something other than "White, Non-Hispanic." Classes offered in the degree are predominantly face-to-face or hybrid. Students are trained to design digital interfaces from a user-centered perspective, which includes classes on user research, usability testing, research synthesis, wireframing, and prototyping.

Viewed as a cross-channel information ecosystem, this ecosystem includes instructors, students, learning platforms, third-party edtech, institutional rules, and flows of information across many devices and terrestrial spaces. Instructors and students can communicate through myriad touchpoints as overviewed in Table 1. This data is based on an analysis of software available in the UX Design degree as well as self-reported tools and platforms from a wide range of other classes participants had taken.

Table 1. Overview of digital tools and platforms

D2L Brightspace A Learning Management System (LMS) through which instructors plan, implement, and assess learning	**Digital syllabus schedules** Some instructors create digital syllabi schedules instead of posting them on D2L
Discord An audio-visual conferencing and messaging tool that some instructors use to communicate with students outside of class	**Dropbox** Some instructors post and accept assignments through this cloud-based filesharing and storage service
Email – D2L An email embedded inside D2L, separate from the official school email	**Email – school** The official school email through which instructors and students communicate
FigJam/Miro Digital whiteboarding tools where instructors place assignments and communicate with students via the comment feature	**GroupMe** A messaging tool that many students use as an unofficial way to communicate with each other about classes

Microsoft Teams – conferencing An audio-visual conferencing and messaging tool that all faculty, staff, and students can access	**Microsoft Teams – filesharing** Some instructors facilitate their classes through Teams and not D2L
Pulse A third-party software mobile application that allows students to view certain portions of D2L Brightspace on their mobile phones	**Zoom** A version of Zoom, a video conferencing tool, that is embedded inside D2L

This instructor-student ecosystem and the larger information ecosystem at this university is loosely designed, and there are some institutional polices that govern specific acts. For instance, the Family Educational Rights and Privacy Act (FERPA) dictates what information instructors can share about a student and where they can post FERPA-protected information. Yet, outside of that policy, instructors have a wide latitude related to the software used to interact with students. Further, students import other software, like GroupMe, into the ecosystem. While GroupMe is almost always used to facilitate student-to-student communication (i.e., complaining about an instructor, asking students for clarification on what an assignment prompt means, etc.), I include it here because it impacts instructor-student communication. Combined, the perspective features of this ecosystem include the known elements of the system and an "organizational view" of how the system works (Resmini and Lindenfalk 2021, 16).

Methodology

This researched aimed to complete an intensive, holistic description of a bounded phenomenon (Ebneyamini and Sadeghi Moghadam 2018). The framework for research utilized an exploratory case study method to better understand a specific instance of instructor-student communication. Exploratory case studies are used to either form or identify the validity of a research question (Yin 2018). To structure the case study, an online survey (n=83) and subsequent interviews (n=18) were completed in the first five weeks of a semester (in January and February of 2023). Data analysis, completed in March 2023, focused on coding participants answers to survey and interview questions to seek relevant patterns. In the following sections, the credibility of the data is established through an in-depth discussion of study procedures and limitations of the research are discussed in the conclusion.

Online survey

An online survey titled, "Understanding Student Access to Institution and Classroom Information in College" (IRB-FY22-199)[5] was sent via Qualtrics, an online survey tool, during the first week of classes to 121 students across three face-to-face classes—two sections of a design methods class and one section of a professional development class. Eighty-three students completed the survey for a response rate of 69%. The survey asked two questions regarding time in school and degree, four open-ended questions regarding communicating with instructors, and two questions regarding name and interview willingness (see Appendix A). Four other questions were asked and related to student perception of communicating with academic institutions. The answers to those questions were analyzed elsewhere, since eliminating answers to those questions allowed for a relatively bounded case study. Answers to questions related to communicating with instructors included all the classes students had taken in higher education. They were not limited to the class in which they were surveyed. Open-ended questions included:

- What types of communications regarding your in-class experience matter to you?
- What apps or resources do you use to access class-related communications?
- What do you like or dislike about the apps or resources you use to access class-related communications?
- What do you wish instructors did better regarding communicating with students?

Since the design methods class is a prerequisite for the professional development class, there were no duplicative survey answers across classes. General demographics were not collected to protect participant identity since I was an instructor in one of the classes. Having said that, the demographics of all three classes were similar to the degree demographics discussed above. These classes were selected because students were far enough along in their education to have experienced different classroom settings. Find data related to time in school and degree-specific classes for survey participants in Table 2.

Table 2. Survey data (n=83) related to time in school and degree-specific classes

Years in higher education (undergraduate)						Degree-specific classes taken		
1	**2**	**3**	**4**	**5**	**>5**	**1–4**	**4–8**	**>8**
-	6	24	31	11	11	6	35	42

It should be noted that students were offered extra credit for participation, and those who chose not to participate were offered a replacement extra credit assignment. Because extra credit needed to be tabulated and interview willingness assessed, the last two questions on the survey came with a disclaimer: "The next two questions will be viewed to assess extra credit and if you want to be interviewed. These two questions will be deleted from the data set before answers are randomized":

- What is your name?
- Would you be willing to be interviewed for an in-depth review of your answers to this survey?

Once the survey was closed and data exported to Excel, I viewed the final two columns, assessing who took the survey and who was willing to be interviewed. These two columns were then deleted, and all data rows were randomized in the Excel file housing the research audit trail.

Interviews

I performed interviews to get a better understanding of the survey answers. After a first pass analyzing the survey, I determined that interviews would only cover the four questions related to instructor-student communication and contacted students who agreed to be interviewed. Since the survey data was anonymized after extra credit was logged, I did not know which interviewees corresponded to which survey responses. I selected interviewees randomly using a list randomizer on the internet and inquired with students starting from the top of the randomized list. Final interview selection largely came down to schedule alignment. The data related to time in school and degree-specific classes for interviewees is displayed in Table 3.

Table 3. Interview data (n=18) related to time in school and degree-specific classes

Years in higher education (Undergraduate)						Degree-specific classes taken		
1	**2**	**3**	**4**	**5**	**>5**	**1–4**	**4–8**	**>8**
-	2	5	7	1	3	-	7	11

I interviewed enough students to reach "saturation," or the repetition of similar answers (Ladner 2014), which is a goal of user research in UX Design. This happened at around 16 interviews, but two more interviews were completed for extra assurance. Face-to-face interviews were roughly an hour long and completed by the end of February 2023. Some of the interviewed students were in one of my current classes at the time. They were told they were under no obligation to talk about information practices in my current or former classes. Further, they were told that, if they did want to talk about information practices in my classes, they were free to do so; it would not affect their standing in class, and it was my ethical commitment to honor their beliefs about my classes.

Interviews were semi-structured in that original survey questions were asked. This was done to get interviewees in the mindset of discussing this material. The interviews then transitioned to open-ended questions. Using a germinal question—a question from which to grow a discussion (Young 2022)—I asked: What goes through your mind when you think about the process of communicating with your instructors? After this point, students were encouraged to elaborate with no specific agenda. After completion, audio recordings were transcribed. Notes and quotes for each interviewee were placed in the same Excel file that housed survey results.

ANALYSIS: SURVEY AND INTERVIEWS

When analyzing the results of the survey and the interview transcripts, I map the "emergent" features of the ecosystem, which identify how actors engage with said ecosystem (Resmini and Lindenfalk 2021, 16). This shows the student perspective on instructor-student communication. The credibility of the research was reinforced through method triangulation in comparing and contrasting survey responses to interview responses.

Each survey respondent was given an identifier of "S" plus a number (e.g., S-33), and each interview respondent was given an identifier of "I" plus a number (e.g., I-7). Since the survey was structured around the same open-ended questions and interviews were semi-structured, they were first analyzed separately. I analyzed participant utterances and inductively produced an eclectic mix of descriptive and value codes. Codes are words or short phrases that assign either literal or symbolic meaning to utterances. Descriptive codes focus on assigning words or phrases to summarize content while value codes focus on the attitudes and beliefs (Saldaña 2013, 111). For example, when assessing the tools used, a descriptive code was named after the tool itself (e.g., "Figma," "Zoom," "email"). In other instances, the descriptive codes summarized the meaning of the utterance (e.g., "quick," "efficient," "informal"). Value codes were used when participants discussed attitudes or beliefs related to communicating with instructors (e.g., "confusion," "slow," "frustration").

Codes were established based on the judgement of the researcher as coding is "primarily an interpretive act" (Saldaña 2013, 4). Utterances were initially determined per individual participant response, so where an utterance started or stopped was determined relative to that participant. However, most utterances were analyzed in sentence and paragraph chunks. Utterances were

allowed multiple codes, since sometimes descriptive and value codes were mentioned in the same sentence. Codes were then organized into categories to seek the frequency of patterns (Stake 1995). Table 4 exhibits the pattern frequency from the survey.

Table 4. Survey: common patterns

What types of communications regarding your in-class experience matter to you?	What apps or resources do you use to access class-related communications?	What do you like or dislike about the apps/resources you use to access class-related comms?	What do you wish instructors did better regarding communicating with students?
57 mentions – Reminders (e.g., class cancellation and changes, due dates) are important	***79 mentions –*** The LMS (D2L) is used by students.	***48 mentions –*** Different communication practices per instructor creates confusion.	***32 mentions –*** Students wished instructors gave them more reminders outside class.
23 mentions – Clear instructions are important on an assignment prompt or when/how to complete an assignment.	***67 mentions –*** Formal messaging Apps (Discord, Teams) are used by students.	***35 mentions –*** A preference for messaging over email by students.	***26 mentions –*** Students wished for clarity on assignment prompt or when/how to complete an assignment.
20 mentions – Messaging is preferred as a form of communication over email.	***42 mentions –*** Informal messaging Apps (GroupMe) are used by students.	***17 mentions –*** Notifications are seen as necessary but annoying and overwhelming by students.	***25 mentions –*** Students wished for more messaging rather than email by instructors.
18 mentions – Feedback on major assignments is important.	***35 mentions –*** Formal email is used by students.	***8 mentions –*** Frustration with the school's overuse of two-factor authentication.	***24 mentions –*** Students wish for faster response times from instructors.
	20 mentions – Pulse, a mobile version of the LMS is used by students.		***16 mentions –*** Students wish for more centralization (i.e., policy) between instructor's classes.

Confusion: communication software and usage protocols

A significant pattern related to confusion regarding communicating with instructors was identified. This pattern was mentioned 97 times across three survey questions and by 13 interviewees. It manifested in answers that expressed confusion in either the software used or the protocols for engaging with software across different classes.

First, in 69 mentions across three survey questions and by 13 interviewees, there was confusion related to which software to use. As one student said, "as long as teachers are consistent in how they use the tools, I am okay, but they rarely are" (S-4). Another student noted that "I'm in one class with multiple instructors and one likes to use Teams to post file[s] and answer questions and the other only uses D2L" (I-18). One student commented that their instructor seemed to change their

communication approach "on the fly" over the course of the semester by shifting to different software (S-77). Second, in 28 mentions across three survey questions and by 5 interviewees, students were frustrated that, even if the same tools were used across classes, the protocols of usage varied enough to create confusion. For instance, some instructors have protocols that only allow communication using limited tools, like the official school email, whereas others accept communication across varied software. As another student put it, "you have to memorize where things are for each class" (I-3). Another student said D2L was usually organized based on "instructor idiosyncrasies" (I-12).

Thus, student placemaking and sensemaking strategies to understand information were troubled due to confusion related to which tools to use and differing practices across classes. This pattern shows that students often became frustrated with the wide array of touchpoints and how to engage with them, leading to problems with findability and understandability in this cross-channel ecosystem.

More responsive communication

Students showed a strong preference for messaging apps over email for communicating with instructors. To many students, messaging apps that "meets me where I am at" are faster and less formal (S-59). One student said that "I don't love email and, really, I don't even get it . . . just send me a message" (I-6). Additionally, a student noted the temporal issues with instructor-student communication when speaking and preferred the ease of "back and forth for clarification" afforded by a messaging app like Discord. Messaging was preferred because "emails take forever and if you don't get the answer you want, you may not send another" (S-79). This pattern shows that, even if channels of information can be known to all actors within an ecosystem, issues related to touchpoint preference and temporal dissonance can occur. In short, students want messages in spaces and at times that work for them. By not using a preferred way to communicate with students, complexity in this cross-channel ecosystem increased.

Student strategies

As Table 4 shows, students want notifications (even when they are annoying) on assignment instructions, feedback, class changes, and due dates. Yet, the confusion over where and when to look for communication and the desire to have instructors focus more on software creates additional work for students who meaningfully engage. Seeing instructor-student communication through the lens of information architecture takes seriously that all actors within an information ecosystem have agency, even if the power to shape the ecosystem is unevenly distributed. This research shows that many students find ways to make sense of this ecosystem in a "bottom-up, actor-centered" way (Resmini and Lindenfalk 2021, 24).

One way that students make sense of this ecosystem is through informal networks to ask questions about class. GroupMe is often used by students as an informal, student-to-student messaging platform for individual classes. One student referred to GroupMe as a "salve" . . . "I just go there when I am confused" (I-12). Another said, "it helps students ask common questions and better understand the material without waiting to hear back from the teacher" (I-18). GroupMe is a student-led practice that adds an unofficial touchpoint to the ecosystem, allowing for conversation related to interpreting information from instructors. The use of GroupMe does have limitations. For instance, student-to-student GroupMe groups lack instructor input which affords the opportunity to increase confusion rather than abate it. As one student said, "GroupMe is great but I have to double check any info I get there" (I-2).

Search functions on computers and inside software also play an important role in many student strategies. While students do create strategies to accomplish goals in a complex information ecosystem, all the work to keep track of class information comes at a cost. As one student said, “I get exhausted [trying] to keep up with everything all over the place” (I-13). Chin reported that current college students are far more likely to preemptively use search functionality on their computers to find files. These students tend to see all information as existing in one large “bucket” (Chin 2021, 1). However, the bucket metaphor breaks down in a cross-channel ecosystem where seams do not exist between all touchpoints. Thus, while search functions aid findability within that software or computer, it is limited in scope. For instance, if an instructor communicated with a student on Microsoft Teams, that student cannot search for said communication on D2L or Discord, because these tools are not interoperable. This poses a challenging situation for instructors who want to reduce confusion and keep student effort focused on learning.

INSTRUCTOR OPPORTUNTIES

The findings show that instructors cannot discount how much the information architecture of a class experience impacts teaching and learning. Using the language of cross-channel ecosystems, there are a few possible ways for instructors to mitigate the problems of communication confusion in the classroom and apply lessons from this research to other contexts.

Framing the problem

A class can be framed as an information architecture problem; there is information for students to learn and the instructor needs to create an appropriate structure to foster learning. In this way, the instructor calls attention to the mechanisms of delivering information to students. This means the instructor explicitly states how information is stored in class and how and when communication should occur. For example, as part of the first agenda-setting lecture in class, I explicitly framed the class as an information architecture problem while discussing the range of software used in class related to storing and/or communicating information. I acknowledge all participants in the class as actors, or active agents in the class. I explain to students that their active engagement in learning about how to engage with class will make the learning process more effective.

Students are also asked to assess the appropriateness of the software during class evaluations. This enables consideration of how students want to communicate and if there are alternatives. As the research shows, participants preferred messaging apps over email for communication in this specific context. A preference for messaging apps has been noted in other pedagogical contexts as well (Chen and Siong Teh 2022) but may not be relevant to all contexts due to preference, cost, availability, etc. Whatever decision is made, opening a dialogue with students about strategies for communicating with them helps instructors understand student perceptions of technology (Crompton, Bernacki, and Greene2022).

Modeling the problem

An important part of discussing an information architecture strategy is modeling practices with software. Students exist along a continuum of technical savviness; likely, many students are not thoroughly familiar with relevant software. For example, if I am using a tool like Discord in class to communicate with students individually or as a group about changes to class, updates, and/or sending out weekly announcements, I will dedicate a second class (i.e., not the opening class session) to fully covering the relevant functions of Discord through a hands-on student activity. Additionally, I will refresh their knowledge of other software like D2L which is more commonly used at the university.

While some students are highly knowledgeable about Discord, others could be made aware of more advanced features like pinning, creating their own channels, utilizing bots to send messages or reminders, etc. This class session helps students learn about their class as an information architecture ecosystem and reinforces lessons discussed in the opening class session. However, this necessarily means carving out additional time in my class. This poses a problem since instructors only have so much time with students. Thus, how much time you might have to demonstrate how software works depends on the demands of the instructor's context.

Incentivizing the problem

To enhance the uptake of framing a class as an information architecture problem, it might be helpful to incentivize the problem. This can be done through multiple mechanisms such as quizzes, assignments, or activities. For instance, I include an assignment near the beginning of class that quizzes students on communication software and protocols. The assignment asks multiple choice questions related to the syllabus, the opening lecture (available as a PDF), and any instruction related to software that happens in the second meeting of the class. The assignment is "open book" and is completed outside of class.

Reinforcing the problem

While students were often knowledgeable on protocols at the beginning of class, they "tend to forget . . . if it is not written or verbally explained more than one time" (S-78). An information architecture strategy that unfolds over time to include periodic notifications reminding students could guard against this. For instance, I include communication protocols on all assignments along with an announcement pinned to their D2L class shell that reminds students every time they log in. Additionally, I send weekly recaps every Friday via a messaging tool like Discord that always includes the best practices for communication related to the class. Many students acknowledge that "notifications keep me on track" (I-7) and weekly reminders help with periodic refreshing.

CONCLUSION

This paper furthers a discourse on the challenges in higher education environments, which can be thought of as complex, cross-channel ecosystems. The complexity of juggling software and competing usage protocols means students are often overloaded with information (Davis 2011, Bawden, and Robinson 2009). The need for instructors to take seriously the time and effort necessary to architect durable information architecture strategies is important. Within the boundary of instructor-student communication, instructors can use classroom experiences to develop student awareness of the importance of information architecture to successful classroom experiences. Yet, this involves clear tradeoffs related to instructional time and the need for instructors to make serious decisions about the amount of software implemented into class and the time it takes to master and teach said software.

There are limitations to this research. First, this case study speaks to a specific instructor-student information ecosystem. More research is needed to understand how information ecosystems differ across boundaries. Second, the process of coding qualitative data depends on the lens of analysis (Saldaña 2013). Since I was the sole researcher and had no investigator triangulation, other researchers might analyze this data differently. Further, no member-checking occurred. Third, even though steps were taken to anonymize data, the fact that I was an instructor in the class used to collect data creates the opportunity for bias. Fourth, asking students how they perceive their instructor-student ecosystem does not explain the sum total of an ecosystem. While it provides

insight into valuable student perceptions, more work should be done to understand instructor perceptions of all the software utilized in the classroom experience. Fifth, this research does not address other aspects of a larger academic information ecosystem. This includes any information students get from administrators about life on campus, class registration, and graduation procedures. An analysis of what administrators might do to create comprehensive information architecture strategies that consider the reality of digital software is necessary. Park, Nam, and Cha (2011) showed that organizational support and training shape instructor and student acceptance of technology. Whatever administrators do, they should base their strategies on interviews with instructors and students to understand best practices (Shell, Tare, and Blemahdoo2020).

Instructors at many higher education institutions implement digital software to keep a pace with societal changes and meaningfully connect with students. Yet, as the research results demonstrate, information can remain unfindable and misunderstood. Software proliferation is unlikely to end as higher education institutions rapidly cycle through software with their own learning curves and complexity. While students do create personalized strategies to make sense of cognitively overwhelming academic information ecosystems, it comes at a cost. By focusing efforts on ways to make information more findable and understandable across a range of touchpoints, instructors can create durable information architecture practices in the classroom that produce better student experiences.

AUTHOR BIOGRAPHY

Michael Lahey (USA) is a coordinator and associate professor of interactive design at Kennesaw State University. His research currently focuses on the perceived disconnect between design education and contemporary design practices.

NOTES

1. I discussed both digital tools and platforms in this paper and often within the same sentence. A tool, or product, is defined as something that focuses on completing one task.
2. A platform is defined as some type of digital infrastructure that facilitates interactions between users. For example, in higher education, a learning management system (LMS) would be considered a platform, and widgets used within that LMS would be considered tools.
3. While the survey also allowed students to speak to a range of issues regarding information also coming from different administrative units at their university, this paper solely focuses on the research on instructor-student communication to help bind the case study.
4. The way the term “actor” is deployed in cross-channel information ecosystem discourse is seemingly borrowed from the term “actant” in Actor-Network Theory discourse (Akrich and Latour 1992; Latour 2007).
5. A large university in the United States is defined as having more than 15,000 students (Velasco 2022).

ETHICS

This research was certified by the Institutional Review Board (IRB) at Kennesaw State University. This board makes sure that human subjects research meets standards meant to protect the welfare, rights, and privacy of said human subjects.

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APPENDIX A

Online survey "understanding student access to institution and classroom information in college"

Questions

1. How many years have you been in college (at any institution)?
2. How many classes have you taken in your degree?
3. What types of communication regarding your experience in college matter to you? Include any information not related to your specific classes.
4. What apps or resources do you use to access college-related communications? Include anything not related to your specific classes.
5. What do you like or dislike about the apps or resources you use to access college-related communications?
6. What do you wish your school did better regarding communicating information to students? Include anything not related to your specific classes.
7. What types of communications regarding your in-class experience matter to you?
8. What apps or resources do you use to access class-related communications?
9. What do you like or dislike about the apps or resources you use to access class-related communications?
10. What do you wish instructors did better regarding communicating with students?

The next two questions will be viewed to assess extra credit and if you want to be interviewed. These two questions will be deleted from the data set before answers are randomized:

11. What is your name?
12. Would you be willing to be interviewed for an in-depth review of your answers to this survey?