Examining Patterns in Community College Students' Web Navigation for Transfer Information

Yunmeng Han, University of Cincinnati

Yunmeng Han is a PhD student in Engineering Education at the University of Cincinnati. She holds a Master's degree in Computer Science from Northeastern University and serves as a reviewer for prominent engineering education conferences, including ASEE 2025. Yunmeng has been actively involved in NSF-funded research projects and is experienced in applying quantitative, qualitative, and mixed-method research designs.

Dr. David Reeping, University of Cincinnati

Dr. David Reeping is an Assistant Professor in the Department of Engineering and Computing Education at the University of Cincinnati. He earned his Ph.D. in Engineering Education from Virginia Tech and was a National Science Foundation Graduate Research Fellow. He received his B.S. in Engineering Education with a Mathematics minor from Ohio Northern University. His main research interests include transfer student information asymmetries, threshold concepts, curricular complexity, and advancing quantitative and fully integrated mixed methods.

Dr. Siqing Wei, Youngstown State University - Rayen School of Engineering

Dr. Siqing Wei is an Assistant Professor at the Youngstown State University. He received a B.S. and M.S. in Electrical Engineering and a Ph.D. in Engineering Education program at Purdue University as a triple boiler. He was a postdoc fellow at the University of Cincinnati under the supervision of Dr. David Reeping. His research interests span several major research topics, which are teamwork, AI in education, cultural diversity, and international and Asian/ Asian American student experiences. He utilizes innovative and cutting-edge methods, such as person-centered approaches, NLP, ML, and Social Relation Models. He studies and promotes multicultural teaming experiences to promote an inclusive and welcoming learning space for all to thrive in engineering. Particularly, he aims to help students improve intercultural competency and teamwork competency through interventions, counseling, pedagogy, and mentoring. Siqing received the Outstanding Graduate Student Research Award in 2024 from Purdue College of Engineering, the Bilsland Dissertation fellow in the 2023-24 academic year, and the 2024 FIE New Faculty Fellow Award.

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Abstract

Transferring from a community college to a four-year institution requires students to locate and interpret extensive transfer-related information, a challenge that is particularly acute for engineering students given the rigidity of the curricula and program-specific requirements they must navigate. Institutional websites serve as a primary source of transfer information, yet their structure and organization may impede students' ability to locate critical policies successfully. This study quantitatively examines how community college engineering students' website navigation behaviors relate to the successful retrieval of transfer-related information.

Twenty-two pre-transfer engineering students completed a series of information-seeking tasks on two unfamiliar institutional websites during a think-aloud interview. Navigation traces were collected and summarized using quantitative metrics, including the number of pages visited, the number of clicks, and the time on task. Task success (1 = found correct information, 0 = not found) was modeled using a mixed-effects logistic regression with standardized predictors, task type, and institution, and a random intercept for each participant.

Results indicate that visiting more unique pages significantly reduced the odds of task success. In contrast, the number of clicks and time on task were not significant predictors after accounting for the navigation structure. Task type strongly predicted success, with policy-oriented tasks—such as GPA calculation, equivalencies, and credit evaluation timing—showing substantially lower success rates. These findings suggest that the structural organization of transfer information outweighs student effort alone in shaping access to engineering transfer pathways.

Introduction

Transferring from a community college to a four-year institution requires students to navigate a wide range of information sources, such as academic policies, requirements, and institutional procedures. Students who are unable to locate and act upon accurate transfer information often experience delays in progress, excess credit accumulation, or attrition from their intended majors [1, 2]. For engineering students in particular, this process is further complicated by highly structured and sequential curricula, program-specific admissions requirements, and discipline-specific transfer policies that vary across institutions [3-5]. As a result, access to clear and actionable transfer information is critical for engineering transfer pathways. However, in practice, students' access to such information is often constrained by how transfer-related policies and requirements are communicated.

University websites are a primary source of information for students seeking details on admissions, degree requirements, credit transfer, and GPA policies [5-7], complementing other information sources [8]. Despite their importance, institutional websites are often expansive and decentralized, requiring students to traverse multiple pages and interpret specialized terminology to identify relevant information. As documented in prior work, the dispersion of information across webpages and inconsistent linguistic framing can contribute to misunderstandings about transfer requirements, even when the information itself is technically available [5, 9-11]. These challenges are frequently described through the lens of information asymmetry, a condition in which one party possesses more or better information than another, creating unequal conditions for decision-making [12]. Information asymmetries emerge when institutions maintain complex or fragmented policies that students must correctly interpret to progress [13, 14]. At the same time, students vary in their transfer student capital (TSC)—the knowledge, skills, and strategies they accumulate to navigate the transfer process successfully [8, 15]. While prior studies have examined information asymmetries and TSC through surveys, interviews, and policy analyses [8, 15], less work has empirically examined how these challenges manifest in students' real-time interactions with institutional websites.

In particular, there is limited empirical evidence linking students' navigation behaviors on institutional websites to their ability to locate transfer-related information successfully. Research in usability and human–computer interaction suggests that behavioral measures, such as the number of pages visited, the number of clicks, and time on task, provide meaningful indicators of navigation difficulty and cognitive effort during information-seeking [16, 17]. However, these measures have rarely been applied to the study of transfer information-seeking in engineering education contexts, nor have they been systematically connected to task success using inferential statistics.

To address this gap, the present study quantitatively examines community college engineering students' navigation behavior while searching for transfer-related information on university websites. Navigation traces were collected during think-aloud sessions, a well-established protocol in which participants verbalize their thoughts while completing tasks, allowing researchers to capture authentic, real-time interaction behaviors with digital systems [18]. Students' browsing behavior was summarized using quantitative navigation metrics, including the number of pages visited, the number of clicks, and the time spent per task. Logistic regression [19] was then used to examine how these navigation behaviors relate to successful information retrieval across different types of transfer-related tasks. By focusing on navigation behavior as an observable indicator of informational complexity, this study provides empirical insight into how website structure and task characteristics shape students' access to transfer information.

Research Aims

The overarching aim of this study is to quantitatively investigate how patterns of website navigation are associated with the successful retrieval of transfer-related information among engineering pre-transfer students. Rather than evaluating website content alone, this work focuses on students' interactions with institutional websites as a dynamic information-seeking process. Specifically, this study seeks to: (1) characterize students' navigation behavior while completing transfer-related information-seeking tasks using quantitative measures such as number of pages visited, number of clicks, and time on task, (2) examine the relationship between navigation behavior and task success, defined as whether students successfully locate the requested transfer information, (3) identify task types that are systematically more difficult to complete, even after accounting for navigation behavior, thereby highlighting persistent areas of informational complexity in engineering transfer pathways.

These aims are addressed through the following research question: *How do website navigation metrics relate to the likelihood that pre-transfer students will successfully locate transfer-related information?*

By addressing this question, the study advances a quantitative understanding of how information asymmetries and navigation patterns manifest during students' interactions with institutional websites and provides evidence to inform the design and communication of transfer pathways in engineering education.

Theoretical Framework

This study is guided by a theoretical framework that integrates information asymmetry [11, 12, 14] in the transfer process with the construct of transfer student capital (TSC) [8]. Together, these perspectives provide a lens for interpreting students' navigation behavior on institutional websites and their relationship to the successful retrieval of transfer-related information.

Information Asymmetry in the Transfer Process

Information asymmetry refers to situations in which one party possesses more or better information than another, resulting in unequal conditions for decision-making [12]. In higher education transfer contexts, information asymmetries occur when institutions have complex, detailed policies—such as admissions criteria, credit evaluation rules, GPA calculation procedures, and degree requirements—that students need to understand to progress, but that are not easily accessible or clearly communicated [14]. Prior research has identified multiple domains in which transfer students experience pronounced information asymmetries, including credit evaluation, program-specific admissions, and institutional terminology [11, 14]. These asymmetries are often amplified in web-based environments, where transfer-related information may be dispersed across multiple webpages, embedded in lengthy policy documents, or framed using ambiguous or discipline-specific language [11]. In such cases, students may need to visit many pages, follow indirect navigation paths, or spend substantial time searching before determining whether relevant information exists.

In this study, information asymmetry is conceptualized as a structural characteristic of institutional websites that manifests through students' navigation behavior. Quantitative indicators such as the number of pages visited, the number of clicks, and the time spent per task are treated as observable signals of the navigational effort required to locate transfer-related information. From this perspective, inefficient navigation behavior reflects underlying informational complexity rather than individual shortcomings.

Transfer Student Capital

Transfer student capital (TSC) describes the accumulation of knowledge, skills, and strategies that students develop to navigate the transfer process successfully [8]. TSC includes familiarity with institutional processes, awareness of transfer requirements, and the ability to identify and interpret relevant information sources [8]. Prior research suggests that students vary considerably in their TSC levels and that these differences are associated with transfer outcomes, persistence, and academic progress [7, 15].

While TSC is often examined through self-report measures or interviews [8, 15], this study adopts a behavioral perspective, treating navigation behavior as an indirect indicator of students'

capacity to mobilize such capital during information-seeking tasks [11]. Prior research in information-seeking and usability has demonstrated that observable navigation behaviors—such as the number of pages visited, the number of clicks, and time on task—reflect underlying cognitive processes, including prior knowledge, strategy use, and task understanding [16, 17]. Studies using log-based navigation data further show that more efficient navigation patterns are associated with stronger task performance and learning outcomes; in contrast, extensive exploration and prolonged searching often signal greater difficulty or informational barriers [20]. Accordingly, students who locate transfer-related information with fewer page visits or less time may be using more effective search strategies or greater familiarity with institutional structures. In contrast, students who exhibit broader exploration or longer search durations may encounter greater informational complexity or less prior familiarity with transfer processes [21].
Importantly, this framework does not assume that inefficient navigation reflects a lack of ability among students. Rather, navigation behavior is understood as the outcome of an interaction between students' existing resources and the structural organization of institutional websites.

Linking Theory to Quantitative Analysis

Information asymmetry and transfer student capital provide a conceptual foundation for examining navigation behavior as an outcome shaped by both website structure and student resources. In this study, logistic regression is used to empirically test how navigation metrics relate to task success [19], examining whether structural indicators of navigation difficulty are associated with lower odds of locating the correct transfer information across different task types.

Literature Review

Transfer Pathways and Role of Information Access

A substantial body of research has documented the challenges community college students face when transferring to four-year institutions, particularly when transfer requirements are unclear or inconsistently communicated. Studies have shown that students who are unable to locate or correctly interpret transfer-related information are more likely to experience delayed progress, excess credit accumulation, or departure from their intended academic pathways [1, 2]. These challenges are not primarily attributable to students' academic preparation, but rather to the complexity and opacity of institutional policies and procedures that students must interpret to make informed decisions.

For engineering students, transfer pathways are often especially complex. Engineering curricula are typically highly structured and sequential, with tightly coupled prerequisite chains that limit flexibility and increase the consequences of misaligned course-taking [4]. In addition, engineering programs frequently impose program-specific admissions requirements and departmental policies that vary across institutions, further complicating the transfer process. Prior engineering education research has emphasized that variation in engineering transfer policies across institutions can create confusion and misalignment for prospective transfer students, particularly when requirements are not clearly communicated [11]. Together, this study establishes that engineering transfer is particularly sensitive to students' access to transparent, accurate, and actionable information.

Institutional Websites as Transfer Information Infrastructure

Institutional websites serve as a primary mechanism through which students seek information about transfer requirements, admissions processes, credit evaluation, and degree pathways. Research on community college transfer consistently finds that students rely heavily on institutional websites when gathering transfer information [6, 7]. However, these studies also report that students often struggle to locate or interpret relevant information due to fragmented content, inconsistent terminology, or unclear organizational structures.

Messacar [14] explicitly conceptualizes these challenges as information asymmetries, demonstrating that students' transfer decisions are influenced not only by the content of transfer policies but also by how easily that information can be accessed and understood. In engineering contexts, Reeping and Knight [11] document that transfer-related information is frequently distributed across multiple webpages and institutional units, increasing the likelihood that students will overlook or misinterpret key requirements. These findings justify examining not only whether transfer information is available online, but also how students interact with institutional websites when seeking it.

Navigation Behavior as an Indicator of Information-Seeking Difficulty

Research in human–computer interaction and information science provides a strong foundation for interpreting navigation behavior as an indicator of information-seeking difficulty. In usability evaluation, time on task, number of clicks, and task success are established metrics used to assess whether users can locate target information efficiently in complex digital environments, and these measures are commonly interpreted as indicators of navigation efficiency and user effort [17]. Information-seeking research further demonstrates that users rely on local cues—such as link labels, page structure, and system organization—to estimate the likelihood that a navigation path will lead to relevant information. When these cues are weak or misleading, users tend to engage in broader exploration and spend more time searching [16]. Empirical studies show that increased page visits, longer search durations, and more exploratory navigation patterns are associated with lower efficiency in locating target information, particularly under conditions of higher task difficulty [22, 23].

Importantly, prior work also demonstrates that task complexity and domain familiarity systematically shape observable navigation behavior. Studies of interactive information search indicate that users with clearer goals or greater familiarity with a domain tend to follow more direct navigation paths. In contrast, users facing unfamiliar or complex tasks engage in broader exploration, more frequent page transitions, and longer search episodes [23, 24]. Modeling studies further show that navigation behaviors—such as depth of exploration and time spent—can be used to predict search difficulty and user performance, reinforcing the interpretation of navigation traces as meaningful behavioral indicators rather than random actions [25]. Together, this literature supports interpreting extensive page visits and prolonged searching as signals of heightened informational complexity rather than as inefficient or unfocused user behavior.

Modeling Task Success Using Behavioral Navigation Data

Logistic regression is widely used in educational and usability research to model binary outcomes such as task completion or success [19]. In studies examining interaction with digital systems, logistic regression has been applied to relate behavioral indicators derived from log data (e.g., navigation actions and time on task) to successful outcomes while controlling for task characteristics and contextual factors [26]. Because transfer-related information-seeking tasks result in a dichotomous outcome, "whether the correct information is located," logistic regression provides an appropriate analytic framework for examining how navigation behavior relates to success [19, 26]. Incorporating task type as a predictor allows researchers to distinguish between navigation difficulty arising from the interaction process itself and difficulty inherent to the information being sought.

Gaps and Opportunities

Existing research has documented that transfer students, particularly those pursuing engineering degrees, encounter significant challenges in locating and interpreting transfer-related information. Prior studies have identified information asymmetries in transfer processes [11, 14], the structural rigidity of engineering curricula [4], and the central role of institutional websites as sources of transfer information [6, 7, 9]. In parallel, research in human–computer interaction and information science demonstrates that navigation behaviors such as page visits, clicks, and time on task serve as meaningful indicators of information-seeking difficulty and task complexity [16, 17, 23]. However, this literature has largely developed in parallel, with limited empirical work examining how students' real-time navigation behavior on institutional websites relates to the successful retrieval of transfer-related information in engineering contexts.

This gap presents an opportunity to integrate transfer education and information-seeking perspectives by quantitatively linking navigation behavior to task success. While prior research on transfer student information and transfer student capital has most often been examined through students' self-reported experiences and perspectives, including survey-based measures of transfer student capital [27] and qualitative interview work examining how students seek and use transfer information [6, 7], few studies have leveraged behavioral navigation metrics or inferential models to assess success in transfer-related information-seeking tasks. By applying established usability measures and modeling task success [17] using logistic regression [19], the present study addresses this gap. It provides empirical insight into how information asymmetries manifest during students' interactions with institutional websites, offering a quantitative foundation for improving the communication of engineering transfer pathways.

Research Design

Participants and Study Context

Participants included community college engineering students planning to transfer to engineering programs at four-year colleges (n = 22). They were recruited via social media posts and snowball sampling [28]. All participants were pre-transfer students and had prior experience gathering information on transfer requirements.

Our study focused on students' interactions with institutional websites to find transfer-related information, including general admissions, program-specific requirements, course equivalencies, transfer credits, GPA calculation, degree requirements, and credit evaluation timing. Two institutional websites unfamiliar to participants were selected to ensure that navigation behavior reflected active information-seeking rather than prior familiarity with specific site layouts.

Data Collection Procedure

Data were collected as part of a larger research project investigating transfer students' information search strategies. Specifically, we conducted think-aloud interviews, a protocol in which participants verbalize their thoughts while completing tasks, allowing researchers to capture real-time interaction behavior with digital systems [18]. The think-aloud protocol was used to bolster ecological validity and to capture more authentic navigation behavior as participants searched for information. During each session, participants were asked to complete a series of prompts designed to elicit information about the transfer process.

Although verbalizations were collected during the sessions, the present analysis focuses exclusively on quantitative navigation traces derived from participants' interactions with the websites.

Navigation Data and Measures

Participants' browsing sessions were logged to record page visits, page transitions, and timestamps for each action using the igraph package in R [29]. From these logs, navigation behavior was quantified using three primary measures:

- *Number of pages visited*, defined as the total number of unique webpages accessed during a task.
- *Number of clicks*, defined as the total number of navigation actions taken during a task.
- *Time on prompt*, defined as the total time spent (in seconds) attempting to locate the requested information for a given task.

These measures are among the most fundamental metrics that characterize one's navigation of a website for information seeking [17]. The outcome of interest was task success, coded as a binary variable:

- 1 = successfully located the requested transfer-related information,
- 0 = did not locate the requested information.

Task success was determined based on whether participants reached the webpage containing the correct and complete information required to answer the task prompt. Because the outcome was dichotomous, logistic regression was used as the primary analytic approach [19].

Analysis

Correlation Diagnostics and Predictor Selection

Before model estimation, pairwise correlations among navigation metrics (number of pages visited, number of clicks, and time on task) were examined to assess potential multicollinearity [19], [30]. Strong correlations were interpreted as evidence of overlapping constructs, and these diagnostics informed model specification decisions to ensure interpretability and numerical stability [31]. Correlation checks indicated that the number of pages visited and the number of edges (the total number of page-to-page transitions) were highly correlated ($r = 0.93$); therefore, only the number of pages visited was retained as a structural navigation indicator in the final model. In contrast, the number of clicks showed minimal correlation with the number of pages (r

= −0.01) and number of edges (r = −0.05), suggesting that click counts capture a distinct aspect of navigation behavior. Time on prompt showed a moderate positive correlation with the number of clicks (r = 0.61), but weak correlations with the number of pages and edges, suggesting that time reflects temporal effort rather than structural navigation.

Standardization of Continuous Predictors
Because the navigation metrics were measured on different scales (e.g., page counts versus time in seconds), all continuous predictors were z-standardized before model estimation.
Standardization was used to improve numerical stability, facilitate model convergence, and allow effect sizes to be interpreted as one-standard-deviation changes in the predictors [32]. Standardized coefficients, therefore, reflect the relative association between each navigation metric and the likelihood of task success.

Mixed-Effects Logistic Regression
To account for multiple task observations completed by the same participant, a mixed-effects logistic regression model with a random participant intercept was estimated. This approach accounts for non-independence among observations arising from individual-level differences in baseline success rates, while estimating fixed effects for navigation behavior, prompts, and institutional context [33, 34].

The final model included standardized navigation metrics (number of pages visited, number of clicks, and time on task), task type, and institution as fixed effects, with a random intercept for participant. The model took the following general form:

$$\begin{aligned} logit(Success_{ij}) \\ &= \beta_0 + \beta_1(Pages_{ij}) + \beta_2(Clicks_{ij}) + \beta_3(Time_{ij}) + \beta_4(Prompt_{ij}) \\ &+ \beta_5(Institution_{ij}) + u_j \end{aligned}$$

where u_j represents a participant-specific random intercept capturing unobserved individual differences.

Models were estimated using maximum likelihood with a Laplace approximation as implemented in the lme4 package in R [34]. Model convergence, scaled residuals, and variance components were examined to assess model fit. Fixed-effect estimates were interpreted using odds ratios derived from the standardized coefficients, and statistical significance was evaluated using Wald tests.

Results

Descriptive Overview of Navigation Behavior
Descriptive statistics for navigation behavior across prompts are presented in **Table 1**. Across all tasks, students exhibited substantial variability in the number of pages visited, number of clicks, and time spent on each prompt. Tasks associated with locating general or structural information, such as general admissions and degree requirements, were characterized by fewer pages visited, fewer clicks, and shorter time on task on average. In contrast, tasks involving institutional policies or transfer-specific processes, such as major requirements, required greater navigational effort, reflected in higher average click counts.

Table 1: Descriptive Statistic Results by Prompt

		Number of pages visited			Number of clicks			Time on prompt		
Prompt	***n***	**M**	**SD**	**Med**	**M**	**SD**	**Med**	**M**	**SD**	**Med**
Admissions-General	31	7	3.52	6	9.68	5.85	10	258	176	213
Admissions-Major	21	9.1	5.08	8	12.38	9.2	9	372	330	312
Credit Evaluation Timing	18	5.61	2.45	5	10	6.1	8.5	279	283	234
Degree Requirements	10	6.7	3.47	6.5	8	3.06	8	245	131	192
Equivalencies	27	7	2.87	6	9.56	8.01	7	247	143	217
GPA Calculation	29	6.1	2.43	6	12.1	7.22	9	338	245	248

Notably, the GPA calculation and admissions major tasks had among the highest average time-on-task values, suggesting that students spent considerable effort searching, reading, and revisiting pages to find this information. These descriptive patterns indicate that not all transfer-related information is equally accessible through institutional websites and provide important context for the inferential analyses reported below.

Task Completion Outcomes

Task completion rates by prompt are summarized in **Table 2**. Overall, students successfully located the requested transfer-related information in approximately 45% of task attempts.
However, success rates varied substantially by task type. Students were most successful when completing general admissions tasks (approximately 78%) and degree requirements (approximately 76%). In contrast, success rates were markedly lower for GPA calculation (21%), equivalencies (29%), and credit evaluation timing (21%) tasks.

Table 2: Success Rate by Prompt

Prompt	n	Success (%)
Admissions – General	31	77
Admissions – Major	21	52
Credit Evaluation Timing	18	22
Degree Requirements	10	80
Equivalencies	27	30
GPA Calculation	29	21

These differences suggest that tasks requiring interpretation of transfer policies or cross-referencing multiple institutional resources present greater challenges for students than tasks involving more general or prominently labeled information. The alignment between higher navigational effort and lower success rates (**Table 2**) motivates further examination of how navigation behavior predicts task success.

Logistic Regression Analysis of Prompt Success

A mixed-effects logistic regression model was estimated to examine the relationship between navigation behavior and the likelihood of successfully locating transfer-related information. The model included standardized navigation metrics (number of pages visited, number of clicks, and time on prompt) and prompts, with a random intercept for participants to account for multiple prompt observations nested within individuals. Fixed-effect estimates, standard errors, odds ratios, and Wald test p-values are reported in **Table 3**.

As shown in **Table 3**, the number of pages visited was a significant predictor of task success ($\beta = -0.516$, $p = .024$). A one–standard–deviation increase in the number of unique pages visited was associated with a 40.3% decrease in the odds of success (OR = 0.597), indicating that broader exploration was associated with a lower likelihood of finding the correct information. This finding suggests that less efficient navigation patterns, characterized by frequent visits to distinct pages, were associated with greater difficulty retrieving transfer-related information.

Table 3: Logistic Regression Result

Predictor	β	SE	Odds Ratio	p-value
(Intercept)	1.387	0.492	4.003	.005 **
Number of Pages (z)	−0.516	0.229	0.597	.024 *
Number of Clicks (z)	0.290	0.279	1.337	.298
Time on Prompt (z)	−0.222	0.280	0.801	.427
Admissions – Major	−0.958	0.700	0.384	.171
Degree Requirements	0.015	0.961	1.015	.988
Equivalencies	−2.401	0.693	0.091	<.001 ***
GPA Calculation	−3.024	0.733	0.049	<.001 ***
Credit Evaluation Timing	−3.020	0.833	0.049	<.001 ***

In contrast, the number of clicks ($\beta = 0.290$, $p = .298$) and time on prompt ($\beta = -0.222$, $p = .427$) were not statistically significant predictors after accounting for navigation structure and task type. These results indicate that raw behavioral effort, as measured by clicks or time spent, did not independently predict task success after accounting for structural aspects of navigation.

Prompts emerged as a strong predictor of success. Relative to the reference category (general admissions), students were significantly less likely to locate information successfully for equivalencies ($\beta = -2.401$, OR = 0.091, $p < .001$), GPA calculation ($\beta = -3.024$, OR = 0.049, $p < .001$), and credit evaluation timing tasks ($\beta = -3.020$, OR = 0.049, $p < .001$). These coefficients correspond to reductions of more than 90% in the odds of success, even after controlling for navigation behavior. In contrast, admissions–major and degree requirements did not differ significantly from general admissions tasks. These results indicate that prompts involving policy interpretation and cross-referencing multiple requirements posed substantially greater challenges than tasks involving more prominently labeled or structurally straightforward information.

Summary of Findings

Overall, the regression results indicate that navigation structure, rather than raw effort, was most strongly associated with successful information retrieval. Visiting more unique pages significantly reduced the likelihood of success, whereas the number of clicks and time spent were not critical in predicting outcomes. Task type exerted a dominant influence on success, with policy-oriented tasks, such as GPA calculation and credit evaluation timing, showing substantially lower odds of completion. These findings highlight persistent challenges in accessing complex transfer-related information and underscore the importance of how such information is structured and presented on institutional websites.

Discussion

This study examined how community college engineering students' navigation behavior on institutional websites relates to their ability to successfully locate transfer-related information. By modeling task success using navigation metrics and task type, the findings provide quantitative evidence of how informational complexity manifests during students' interactions with institutional websites.

Navigation Structure versus Navigation Effort

A central finding of this study is that the number of unique pages visited was a significant negative predictor of task success. In contrast, the number of clicks and time on task were not statistically significant after accounting for navigation structure and task type. This result aligns with prior research in information foraging and usability, which demonstrates that broader exploration across many pages often reflects weak navigational cues or poorly structured information environments rather than productive engagement [25]. Usability research further emphasizes that while time and clicks are commonly used metrics, they do not, by themselves, predict success unless interpreted in conjunction with structural navigation patterns [17]. In the context of transfer information, visiting many distinct pages may indicate that relevant content is dispersed across multiple locations or embedded within unclear hierarchies, increasing the likelihood of unsuccessful searches.

Task Type Dominates Success Outcomes

Task type, the prompts participants were asked to complete during the session, emerged as a strong predictor of success, with equivalencies, GPA calculation, and credit evaluation timing tasks showing substantially lower odds of success compared to general admissions tasks. These effects remained large and statistically significant even after controlling for navigation behavior and institution, indicating that certain categories of transfer-related information are inherently more difficult to locate.

Prior research suggests that policy-oriented transfer information represents a major source of information asymmetry, as it is often conditional, institution-specific, and communicated in specialized terminology [14]. Rosenberg [7] similarly found that students struggle more with interpreting institutional policies than with locating general admissions information. In engineering contexts, variation in transfer policies and requirements across institutions further compounds these challenges, increasing the likelihood of confusion and misalignment [11]. The persistence of strong task effects in the regression model indicates that these difficulties are not simply a function of navigation effort, but reflect deeper structural issues in how transfer policies are communicated.

Implications

Interpreted through the lens of information asymmetry, the findings provide empirical evidence that students' difficulty in locating transfer-related information is shaped by how information is structured and communicated on institutional websites. Inefficient navigation patterns—characterized by broader exploration across many pages—are consistent with environments in which critical information is not clearly signposted or consolidated [12, 14].

From a practical standpoint, these findings highlight the need for institutions to improve the structural organization of transfer-related information, particularly for policy-oriented tasks such as GPA calculation and credit evaluation timing. Providing information online is insufficient if students must navigate numerous pages to find it. Consolidating policy information, using more transparent labels, and reducing the need for cross-referencing across multiple webpages may improve students' ability to navigate transfer requirements successfully.

Given the complexity of engineering programs for both first-time-in-college [35] and transfer students [36, 37], where curricular rigidity amplifies the consequences of misinterpretation, clearer communication of transfer policies is especially critical. Improving website structure may help reduce unnecessary exploration and support more informed decision-making earlier in the transfer process.

Conclusion and Future Work

This study quantitatively examined how community college engineering students' navigation behavior on institutional websites relates to their ability to locate transfer-related information successfully. By modeling task success using navigation metrics and task type, the findings provide empirical evidence that navigation structure—specifically, the number of unique pages visited—plays a more consequential role in successful information retrieval than raw behavioral effort such as clicks or time on task. In addition, task type exerted a dominant influence on outcomes: policy-oriented tasks, including GPA calculation, equivalencies, and credit evaluation timing, were substantially less likely to be completed successfully than general admissions tasks, even after accounting for navigation behavior and institutional context.

Together, these results suggest that difficulties in accessing transfer-related information are driven less by students' willingness to search and more by how information is structured and communicated on institutional websites. The absence of significant institutional effects after accounting for navigation behavior further indicates that these challenges may be systemic rather than site-specific. From an information asymmetry perspective, the findings highlight how complex and fragmented policy information can constrain students' access to actionable transfer knowledge, particularly in engineering contexts where curricular rigidity amplifies the consequences of misinterpretation.

Several limitations should be acknowledged. First, the sample size was modest, and participants interacted with a limited number of institutional websites, which may constrain generalizability. Second, although think-aloud sessions were used to generate authentic navigation traces, the present analysis focused exclusively on quantitative navigation metrics and did not analyze verbalizations. Finally, although the interview protocol was designed to simulate a student searching for information authentically, we still need to consider the Hawthorne effect, in which participants change their behavior simply by being observed. As such, students potentially could have put in more effort than usual to find the requested information.

Future work can extend this research in several ways. Larger, multi-institutional studies could examine whether the observed relationships between navigation structure and task success persist across a broader range of institutional contexts and website designs. Integrating qualitative analysis of think-aloud verbalizations may provide deeper insight into how students interpret navigational cues and respond to informational barriers, which will be conducted in a follow-up study.

Overall, this study demonstrates the value of applying quantitative navigation metrics and logistic regression to understand access to transfer-related information in engineering education. By linking observable navigation behavior to task success, the findings offer actionable insights for institutions seeking to reduce informational barriers and support more equitable engineering transfer pathways.

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