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Applying Human-Centered Design Thinking to Reduce Information Overload Among College Students: A Framework-Based Approach

Mentor: Mrs. ABIKAYIL AARTHI S
Dept of computer science and engineering
Kings college of engineering, Punalkulam, TN
aarthi.cse@kingsedu.in

YAZHINI A
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
yazhiniathithan23@gmail.com

PARKAVI B
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
parkaviparkavi310@gmail.com

PRIYADHARSHINI S
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
dharshinisuresh0612@gmail.com

SUBASRI B S
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
subavarathan238@gmail.com

SRI HARINI C
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
sriharinchitrarasu@gmail.com

RAMAKAVI S
Dept of Computer Science and Engineering
Kings College of Engineering, Punalkulam, TN
ramakavis2410@gmail.com

ABSTRACT

College students increasingly encounter academic information through a mixture of learning-management systems, messaging groups, email, digital notice boards, social platforms, shared documents, and informal peer channels. The problem is not simply the amount of information; it is the difficulty of deciding what deserves attention, when it should be acted upon, and where the authoritative version resides. This paper proposes a human-centered design thinking framework that treats information overload as a design problem rather than only a time-management problem. The framework combines contextual inquiry, information-source mapping, pain-point clustering, priority rules, low-fidelity prototyping, and user feedback. Unlike application-first approaches, the proposed method produces reusable design principles for organizing academic information across existing channels. A framework-based evaluation plan is also presented to assess perceived clarity, retrieval effort, attention switching, confidence in information, and task completion. The paper contributes a practical bridge between design thinking and student information management, with emphasis on transparency, user control, cognitive simplicity, and institutional feasibility.

Keywords—design thinking, human-centered design, information overload, higher education, student experience, information architecture, digital communication

I. *INTRODUCTION*

Higher education has moved from a small number of physical notice points toward a distributed communication environment. A student may receive one assignment update through a learning platform, a clarification through a messaging group, a deadline reminder by email, and a timetable change through a separate institutional channel. Each source may be useful in isolation, yet the combined environment can become difficult to navigate.

Existing research has linked information and communication overload with academic difficulties. For example, research on social-media overload among college students has reported relationships between overload and academic performance [1], while work on online communities in higher education has documented perceived communication overload among students and teachers [2]. More recent work has examined information overload, perceived control, and information anxiety in platform-based academic interaction [3].

This paper takes a different starting point. Instead of assuming that students simply need fewer notifications or stronger self-discipline, it asks how the information environment itself can be designed around students' goals, contexts, and decision needs. The proposed contribution is a framework for discovering overload patterns and translating them into human-centered design requirements.

II. *PROBLEM CONTEXT*

Information overload in a college setting has at least four interacting dimensions: volume, fragmentation, urgency ambiguity, and source uncertainty (Fig. 1). Volume refers to the number of messages or documents encountered. Fragmentation occurs when related information is scattered across channels. Urgency ambiguity arises when students cannot quickly distinguish an immediate action from background information. Source uncertainty occurs when multiple messages appear to describe the same matter without an obvious authoritative version.

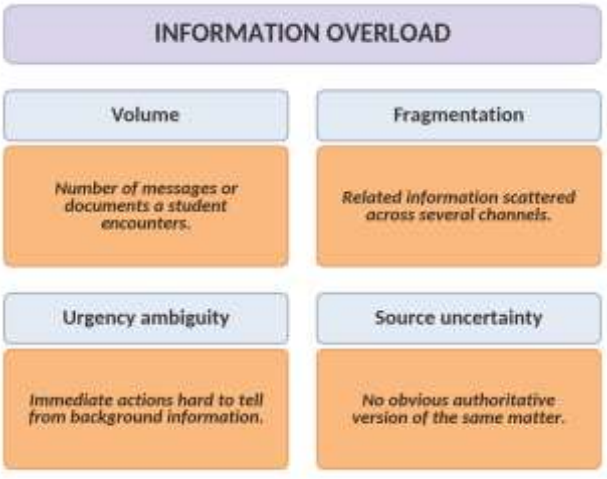


Figure 1. Main dimensions of academic information overload.

The design challenge is therefore not equivalent to deleting information. Removing too much can hide important opportunities or deadlines. The more useful objective is to reduce unnecessary cognitive work while preserving access, traceability, and student choice.

Recent literature also suggests that overload should not be treated as a single phenomenon. A 2026 study distinguishes information overload from communication overload through separate measurement models,

reinforcing the value of identifying the specific kind of demand a design intervention is addressing [4].

III. *RESEARCH GAP*

Much of the existing student-overload literature concentrates on relationships between technology use, overload, anxiety, self-regulation, or academic outcomes. For instance, prior studies have examined social-media overload, multitasking, notifications, and communication volume [1], [5], [6].

A complementary design question remains: how can the lived experience of overload be translated into actionable design requirements without forcing students into a new platform? The gap addressed here is the lack of a practical, framework-level pathway connecting student experience research to cross-channel information design.

Accordingly, this paper does not propose another notification application. It proposes a process for understanding where overload occurs, why it occurs, which information decisions become difficult, and which design principles can reduce avoidable effort.

IV. *OBJECTIVES*

- Identify the main situations in which college students experience academic information overload.
- Map the sources, transitions, interruptions, and ambiguities that contribute to overload.
- Translate observed pain points into human-centered design requirements.
- Develop a framework for prioritization, grouping, source transparency, and user control.
- Define a practical evaluation approach that can be applied to a prototype or existing communication workflow.

V. *RESEARCH QUESTIONS*

RQ1: What forms of information overload are most noticeable in students' academic routines?

RQ2: Which characteristics of the information environment make important information difficult to notice, retrieve, or trust?

RQ3: Which human-centered design principles can reduce avoidable information-processing effort?

RQ4: How can the proposed framework be evaluated without requiring development of a full software system?

VI. *RELATED WORK*

Studies of student technology use provide evidence that digital abundance can create competing attention demands. Research on multitasking among college students has associated heavy ICT multitasking with academic outcomes [6], while research on interruptive smartphone notifications has connected notification disruption with learning-related behaviors [5].

Research focused specifically on social-media overload has identified information, communication, and system-feature overload as related but distinguishable experiences. One study of 441 college students found that overload was associated with poorer academic performance in the studied context [1].

Communication overload has also been studied directly in higher education. A questionnaire study involving 570 students and 172 teachers reported perceived communication overload in online communication environments, with email highlighted as an important context [2].

Recent work strengthens the case for examining information manageability as a design issue. A 2026 study of platform-based academic interaction examined information overload alongside perceived control, information anxiety, and self-regulated learning among university students [3].

Design thinking provides a suitable methodological lens because it emphasizes human-centered framing, iterative inquiry, idea generation, prototyping, testing, and reflection. A recent systematic review in higher education identifies these recurring characteristics across design-thinking applications [7].

VII. *PROPOSED HUMAN-CENTERED FRAMEWORK*

The proposed framework, named the SIFT framework—Source mapping, Impact discovery, Filtering principles, and Trial—turns design thinking into a focused method for student information environments (Fig. 2). The name is intentionally descriptive: the framework asks researchers to understand where information comes from, discover how it affects student work, formulate filtering and presentation principles, and trial those principles with users.

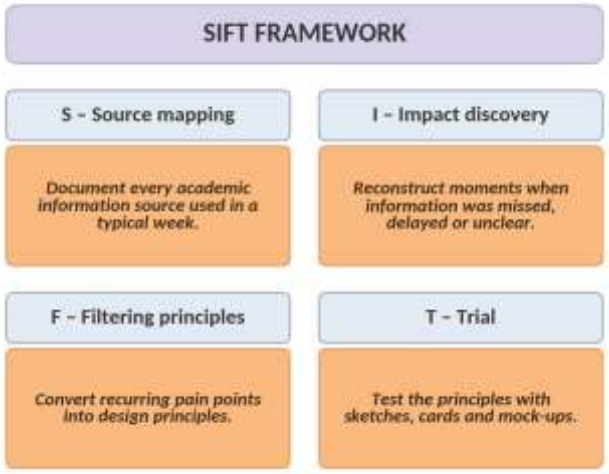


Figure 2. The SIFT framework for student information environments.

a) S — Source Mapping: Researchers first document every relevant academic information source used by participants during a typical week. Instead of counting messages alone, the map records source, content type, expected action, authority level, frequency, and whether the student must switch context to access it. This produces an information journey rather than a simple platform inventory.

b) I — Impact Discovery: Participants are asked to reconstruct recent moments when they missed, delayed, duplicated, or struggled to interpret information. Short interviews and diary prompts can reveal hidden costs such as searching old messages, checking several groups repeatedly, asking peers for confirmation, or keeping screenshots as personal records.

c) F — Filtering Principles: The research team converts recurring pain points into design principles. Examples include action-first presentation, visible source authority, deadline proximity cues, separation of announcement from discussion, stable naming of academic items, and user-controlled notification intensity. These are principles, not mandatory interface features.

d) T — Trial: The principles are represented through paper sketches, information cards, screen mock-ups, or revised communication templates. Students compare alternative arrangements and explain which version makes a task easier. The objective is to test the design logic before any technical implementation.

VIII. *DESIGN REQUIREMENTS DERIVED FROM USER EXPERIENCE*

Table I links each observed difficulty to a design requirement and to the signal used to evaluate it.

TABLE I. DESIGN REQUIREMENTS DERIVED FROM USER EXPERIENCE

Observed difficulty	*Design requirement*	*Evaluation signal*
Important messages disappear in long streams	Make action and deadline visible before supporting detail	Time to identify next action
Same information appears in several channels	Expose source and version status	Confidence in authoritative source
Students cannot tell what is urgent	Use consistent urgency language based on action window	Correct urgency classification

Observed difficulty	*Design requirement*	*Evaluation signal*
Academic and social discussion mix together	Separate task information from conversational traffic	Search/retrieval effort
Students fear missing updates	Provide a controllable summary without removing access	Perceived control

IX. *METHODOLOGY*

A mixed-method, human-centered study is proposed (Fig. 3). The first phase uses a short questionnaire to estimate the frequency of common overload situations. The second phase uses semi-structured interviews or contextual walkthroughs with a smaller group of students. The third phase synthesizes the findings into user journeys, pain-point clusters, and design requirements. The fourth phase tests low-fidelity representations of the proposed framework.

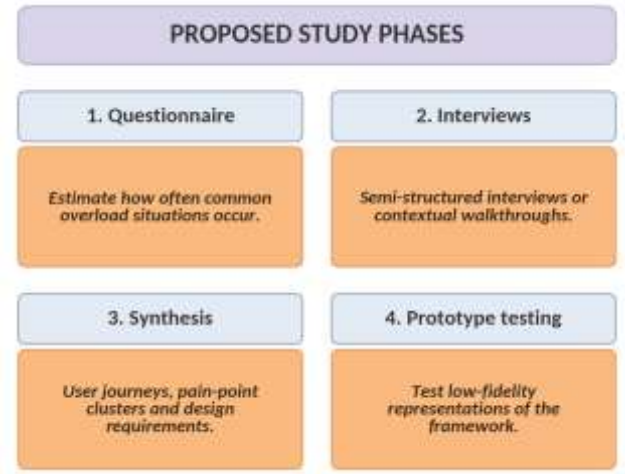


Figure 3. Phases of the proposed mixed-method study.

a) Participants: A feasible classroom-scale study could recruit undergraduate students from different years and departments. Sampling should deliberately include students with different patterns of digital communication use rather than relying only on one class. Participation should be voluntary, and the study should avoid collecting private message content unless explicit consent and appropriate safeguards are in place.

b) Instruments:

- Information-source diary: students record where academic information arrives and what action it requires.
- Overload questionnaire: Likert-scale items covering volume, fragmentation, urgency ambiguity, source uncertainty, and perceived control.
- Contextual interview guide: prompts about missed information, repeated checking, interruptions, and confirmation behavior.
- Prototype comparison sheet: students rate clarity, effort, confidence, and preference between alternative information arrangements.

c) Analysis: Quantitative responses can be summarized using descriptive statistics and cross-tabulation by year or study context. Interview data can be coded into recurring situations, triggers, consequences, and coping strategies. The final synthesis should triangulate what students report, what they demonstrate during a task, and what they prefer when comparing designs.

X. *EVALUATION MODEL*

The framework should be evaluated on outcomes that reflect information work rather than only aesthetic preference. Five measures are proposed: clarity of next action, retrieval effort, source confidence, perceived control, and attention switching. A simple task-based comparison can ask participants to locate an assignment deadline, identify the authoritative announcement, and state the required action using two alternative information arrangements.

For each task, researchers can record completion time and errors. Participants can then rate the perceived effort and confidence. A small pre/post or A/B comparison can provide evidence about whether the design principles improve information handling. The study should report limitations rather than treating a small classroom sample as representative of all college students.

XI. *EXPECTED FINDINGS AND CONTRIBUTION*

The expected contribution is a framework that reframes overload from an individual failure to a shared design responsibility. The framework is likely to reveal that students do not experience all information equally: the most disruptive situations are those where high volume combines with uncertainty about importance, action, or authority.

A second contribution is the separation of information reduction from information organization. The proposed approach does not assume that fewer messages automatically create a better experience. Instead, it asks whether students can quickly determine what matters, why it matters, where the original information lives, and what they should do next.

A third contribution is practical portability. The same principles can be applied to existing institutional workflows, paper notices, learning platforms, email practices, and messaging conventions. This makes the framework useful even where institutions cannot immediately replace their technology stack.

XII. *ETHICAL AND PRACTICAL CONSIDERATIONS*

Information overload studies can unintentionally collect sensitive communication data. Therefore, the proposed method prioritizes participant descriptions and task simulations over copying private messages. If screenshots or message excerpts are required, researchers should obtain informed consent, remove names and identifying details, and minimize the amount of content retained.

The framework should also avoid paternalistic filtering. Students should retain access to source information and control over optional notifications. Design decisions should be tested with users rather than assuming that researchers know which information is dispensable.

XIII. *LIMITATIONS*

A classroom-scale study may have a limited sample and may overrepresent students from a particular institution. Self-reported overload can also differ from behavior observed during real academic tasks. A short evaluation cannot establish long-term changes in academic performance. These limitations should be stated clearly. The proposed framework is intended as a design-research instrument, not as proof of a universal causal relationship.

The framework also does not attempt to solve every form of digital distraction. Its scope is academic information management: discovering, interpreting, prioritizing, and acting on information that students need for their educational work.

XIV. *CONCLUSION*

Information overload in higher education is partly a consequence of fragmented information environments. Students are often expected to adapt themselves to multiple channels, inconsistent conventions, and continuous updates. A human-centered design approach offers a different path: study the information journey, identify where cognitive and organizational effort accumulates, and redesign the experience around real student decisions.

This paper proposed the SIFT framework—Source mapping, Impact discovery, Filtering principles, and Trial—as a practical framework for applying design thinking to this problem. Its emphasis on user experience, source transparency, prioritization, control, and low-cost testing makes it suitable for a research-oriented Applied Design Thinking study without requiring development of a complete software product. Future work can validate the framework across institutions and examine which design principles have the greatest effect on retrieval effort, confidence, and perceived control.

APPENDIX A: SUGGESTED STUDENT STUDY ITEMS

The following items are original draft prompts for the proposed study and should be piloted before formal data collection. Each item is rated on a five-point scale (1 = Strongly disagree … 5 = Strongly agree).

1) I receive academic information through more channels than I can comfortably monitor.
2) I sometimes discover important academic information only after searching through older messages.
3) I am often unsure which source contains the most authoritative version of an announcement.
4) I spend time checking multiple channels because I am afraid of missing an important update.
5) When academic information is well organized, I can identify the next action quickly.
6) I would prefer a summary that helps me prioritize information while still allowing access to the original source.
7) I feel in control of how frequently academic information interrupts my study activities.

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