SOEN 6841- Software Project Management (Winter 2024)
Prof. Jumana Dargham

Project Group 28
Topic: AI-Based Academic Advisor

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Title: Problem Identification Report

1. Problem Identification

Objective: After conducting thorough research in the field of academic advising, we identified the common problem of students receiving general academic help and guidance, which led to less-than-ideal learning outcomes. Our objective is to create a software program called the AI-Based Academic Advisor that uses artificial intelligence to give individualized advice based on each student's needs. By providing detailed recommendations on course selection, career paths, and skill development, the AI Academic Advisor seeks to address the lack of individualized guidance, improving the academic experience and enabling the students to make well-informed educational decisions. Maximizing student performance, raising academic engagement, and helping the institution as a whole enhance educational outcomes are the ultimate objectives of our project.

Problem Statement:
In modern educational institutions, students often encounter challenges in navigating the myriad of academic options available to them, leading to confusion, indecision, and suboptimal academic paths. Additionally, traditional academic advising methods may lack personalization and fail to consider individual student interests, career aspirations, and learning styles. This results in students selecting courses without a clear understanding of how they align with their long-term goals, leading to inefficiencies in course selection and potential delays in graduation.

Furthermore, the increasing complexity of academic programs and the rapidly evolving job market make it difficult for students to stay informed about the latest trends and requirements in their chosen fields. Without personalized guidance and up-to-date information, students may struggle to make well-informed decisions regarding their academic pursuits, potentially hindering their overall academic success and career prospects.

Therefore, there is a pressing need for an AI-driven academic advisor system that can address these challenges by providing personalized guidance, recommending relevant courses based on individual interests and career goals, and offering insights into the best strategies for academic success. Such a system would empower students to make

informed decisions about their academic paths, optimize their course selections, and ultimately enhance their academic and professional outcomes.

The problem's significance lies in its impact on students' academic success and career prospects. Traditional advising lacks personalization, causing confusion and potential delays in graduation. Without up-to-date information and tailored support, students may struggle to make informed decisions. An AI-driven advisor could optimize academic journeys, enhance career readiness, and improve educational outcomes.

Stakeholder Analysis:
The following are the Stakeholders with a brief overview of their interests and concerns are discussed as follows:

1. ***STUDENTS***

   Interests
   Students seek personalized academic guidance that aligns with their unique needs and aspirations. They are interested in receiving accurate course recommendations, and relevant career guidance, and help make informed decisions.

   Concerns
   Privacy and data security are critical, as students want the AI system to appropriately handle their personal information. Furthermore, students are concerned about the dependability and accuracy of AI-generated recommendations, as they seek assurances that the advice provided is relevant to their academic and career aspirations.

2. ***ACADEMIC ADVISORS***

   Interests
   Academic Advisors are interested in how the AI Academic Advisor system might help with more efficient workload distribution. They want to boost student success rates by providing focused counsel and streamlining the advising process, allowing them to focus on more complicated and subtle parts of mentorship.

   Concerns
   Integration issues may develop, and there is concern about preserving the human touch in mentorship. Academic Advisors want to guarantee that AI recommendations complement and improve their current advising structures.

3. ***EDUCATIONAL INSTITUTIONS***

   Interests
   Those in leadership roles at school want to increase student satisfaction while also improving the university's reputation. They seek efficient resource allocation and hope that the AI Academic Advisor will contribute positively to broader institutional goals.

   Concerns
   Implementation costs and potential resistance to technological innovations within the institution are important factors. Administrators are concerned with maintaining a seamless alignment between the AI Academic Advisor and the institution's educational objective.

4. ***EMPLOYERS AND INDUSTRY PARTNERS***

Interests
Employers and collaborators in the corporate sector are looking for graduates with relevant and current skills that fit with worker demands. They see potential benefits in better integration of educational programs and industry requirements.

Concerns
Employers want assurance that the AI recommendations are relevant to real-world demands and are practical for the workplace. Concerns may arise over the feasibility and applicability of graduates' skills based on the AI Academic Advisor's advice.

Relevance to Software Solution:
The AI Academic Advisor presents an opportunity for leveraging artificial intelligence (AI) to address the complexities of academic advising. Through advanced AI techniques, such as natural language processing (NLP), knowledge representation, and expert systems, the advisor can provide personalized guidance to students. By analyzing vast amounts of academic and professional data, the system can offer tailored recommendations on course selection, career paths, and skill development.

Initial Thoughts on Scope:
Key features of the AI Academic Advisor include personalized course suggestions, career coaching, and skill development programs. Additionally, the system facilitates seamless integration with existing academic systems, ensuring access to relevant data for holistic advising. Progress tracking, report generation, and communication facilitation between students and human advisors are also integral components of the solution. Strong security measures are embedded within the system to address privacy concerns and ensure the responsible handling of sensitive data. Furthermore, the advisor's design emphasizes scalability and agility, enabling it to accommodate the diverse needs of educational institutions. Continuous improvement through user feedback and advancements in AI technology remains central to the solution's design philosophy.

2. Market Analysis

Title: Market Analysis Report

Objective: Conduct a comprehensive market analysis to gain insights into the target audience, potential users, and competitors within the academic advising domain. This involves identifying the specific needs and preferences of students, academic advisors, and educational institutions regarding academic guidance and support. Additionally, analyze existing AI-driven solutions in the market to understand their features, strengths, and weaknesses. Explore potential partnerships and collaborations with industry stakeholders, such as employers and educational technology companies, to enhance the AI Academic Advisor's offerings and competitive positioning. Ultimately, the objective is to gather valuable market intelligence to inform the development and implementation of the AI Academic Advisor, ensuring its relevance and competitiveness in the market.

Content:

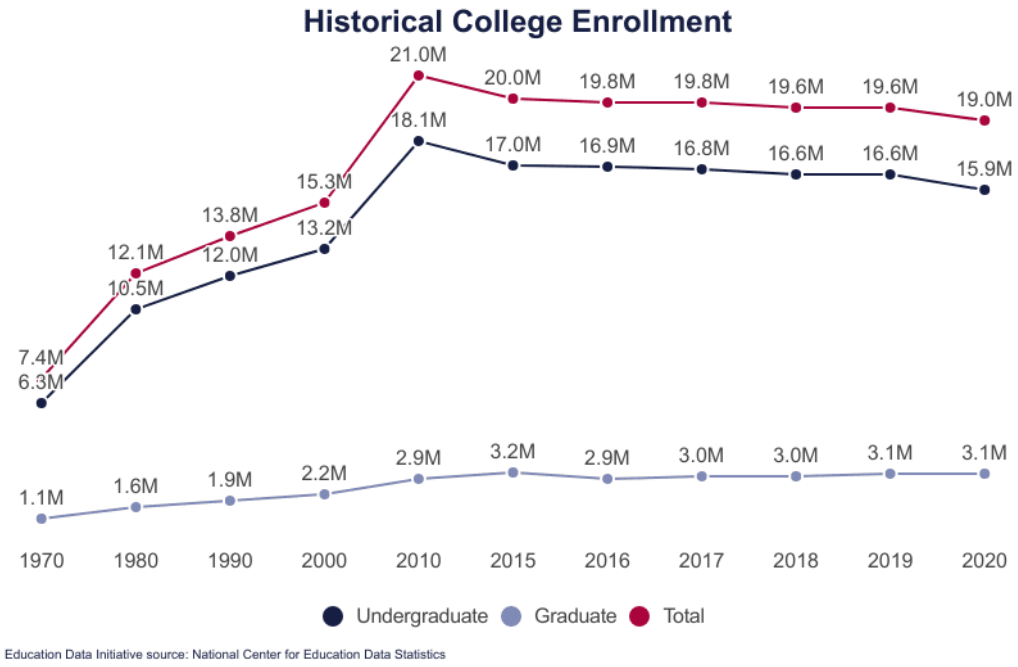
Target Audience Identification:
The primary target audience for the AI Academic Advisor software solution comprises *students, academic advisors, and educational institutions* within the higher education sector.

Demographically, the target audience includes undergraduate and graduate students across various disciplines and academic levels. Psychographically, the audience consists of individuals seeking personalized academic guidance tailored to their unique interests, career aspirations, and learning styles.

Understanding the target audience's demographics and psychographics is crucial for developing effective academic guidance materials.

1. Understanding Demographics:
   - Undergraduate and Graduate Students: Content should be relevant to both undergraduate and graduate academic levels. It should cover a wide range of disciplines to cater to students from various fields of study.
   - Diverse Disciplines: Recognize that the audience may come from diverse academic backgrounds. Content should be inclusive and adaptable to different fields such as STEM, humanities, social sciences, etc.

2. Psychographic Considerations:
   - Personalized Guidance: Acknowledge the need for personalized guidance. Content should offer strategies for students to tailor their academic journey according to their interests, career goals, and learning preferences.
   - Career Aspirations: Provide resources and advice on how students can align their academic pursuits with their career aspirations. This could include information on internships, research opportunities, networking, etc.
   - Learning Styles: Recognize that individuals have different learning styles (visual, auditory, kinesthetic, etc.). Offer tips and resources that cater to various learning preferences to enhance understanding and retention of academic material.



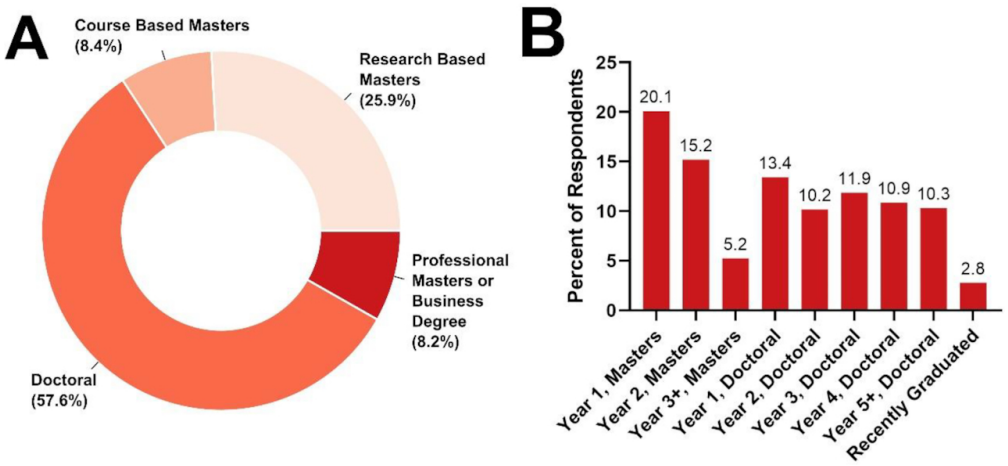
(Source: [1])

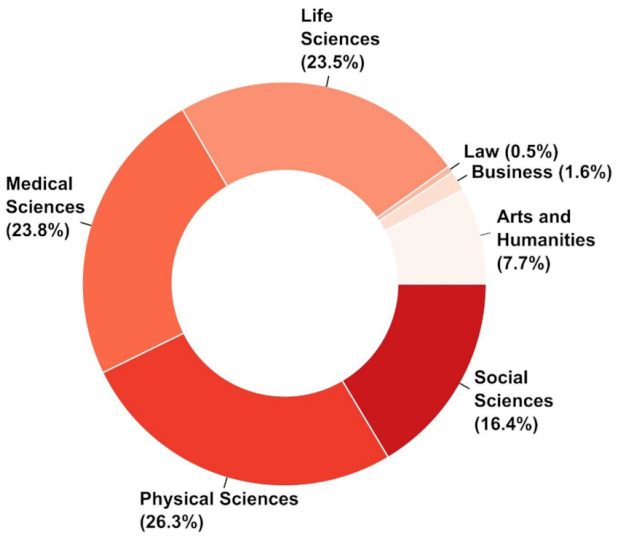
- Enrollment peaked in 2010 at 21.02 million.
- 61.8% of high school (or equivalent) graduates go on to post-secondary study.
- Among first-time, first-year college students, 82.0% are full-time students.
- As many as 15% of American adults are currently enrolled in college as part-time or full-time students.

Total College Enrollment (Undergraduate & Graduate Students) from 1950 to 2023, Selected Years

Year	Total Enrollment	% Public Institution Enrollment
2023	18,939,568	73.19%
2022	18,961,280	73.12%
2021	18,659,851	72.58%
2020	19,027,410	72.97%
2019	19,630,178	73.88%
2018	19,651,412	73.99%
2017	19,778,151	73.68%
2016	19,846,904	73.49%
2015	19,988,204	72.91%
2014	20,209,092	72.52%
2013	20,376,677	72.37%

Statistics Canada data from the National Graduates Survey shows QC and ON made up 73.8% and 73.7% of master's and Ph.D. graduates, respectively (Statistics Canada 2019).

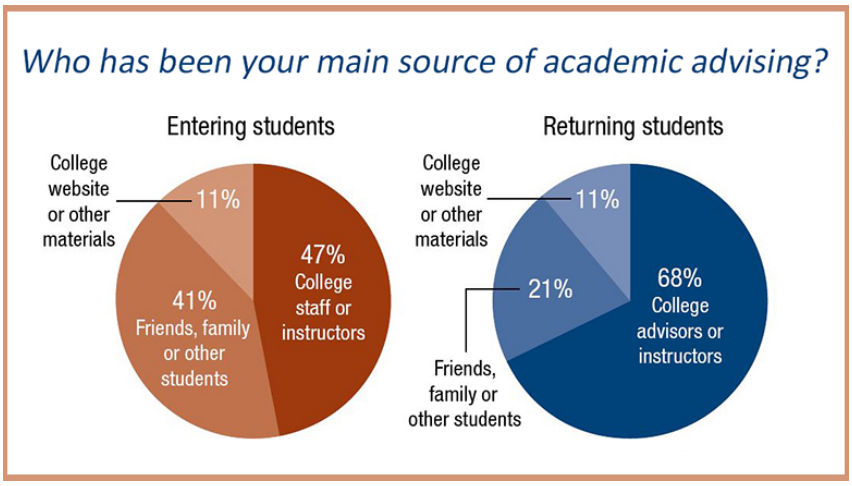




This survey(2) also estimated that there were about 63,000 graduate students in Canada. Survey respondents were primarily in science-based programs, including physical science (26.3%), medical sciences (23.8%), life sciences (23.5%), and social sciences (16.4%) Arts and humanities students comprised 7.7% of respondents. A small percentage of business students (1.6%) and law students (0.5%) also responded to the survey. As such, our overall findings are most representative of graduate students in STEM-related fields, which encompassed 73% of our respondents.

Academic advisors, including faculty members and counselling professionals, also form a significant part of the target audience. They seek tools and resources to enhance their advising practices, streamline workload distribution, and improve student success rates.

- **In Creating Pathways to Success, the Ministry identifies guidance counsellors as having a "strategic role" in ensuring the success of school guidance programs.** This is backed up by scholarly research, which has routinely linked the work of guidance counsellors to the effectiveness of overall guidance strategies in supporting student success and a positive school climate. [3][4]
- Although guidance counsellors in Ontario traditionally focused on helping students select courses and plan for post-secondary education and career opportunities, their work in schools today has become more multidimensional, revolving around not only life and career planning, but also academic skills development, social-emotional development, and mental health.[5]
- Schools report that guidance counsellors provide direct individual support by connecting parents and students to community and school resources and offering post-secondary and career planning services. [6]
- Across the province, **the average student–guidance counsellor ratio per secondary school is 391 to 1**. The exception is northern Ontario, where 46% of secondary schools report that they *only have part-time guidance counsellors*—a far higher percentage of part-time counsellors than any other region.
- We asked principals to indicate the two areas where they thought guidance counsellors spend most of their time. The majority of principals selected "providing course enrolment advice and guidance" and "supporting student social-emotional health and well-being." **Far fewer selected "supporting student development and refinement of their Individual Pathway Plan"** *and "collaborating with teachers and social workers,"* and very few selected "supporting and facilitating co-operative education and experiential learning for students."
- Using our survey data, we also sought to develop a clearer understanding of secondary school guidance and applied and academic course recommendations. Eighty-nine percent of participating secondary schools indicate that they have initiatives to ensure that students select academic and applied courses appropriately. However, once students have selected courses, there appears to be less support for student transfers from one program of study to another. Nearly half of schools (43%) report that students transfer from applied to academic courses "never" or "not often," while only 2% report that students transfer "often."[6]



- The report includes the following findings for returning students in the study:

The initial advising session for almost half of the students lasted 16 to 30 minutes, but students who met with an advisor for more than 30 minutes had higher engagement scores.
Eighty-six percent of students reported that an advisor explained which classes they needed to take to reach their academic goals, ***but only 65 percent said an advisor helped them develop an academic plan.***
Almost two-thirds of students reported that their advisor did not discuss when their next advising session should be.
Approximately two in five students reported that an advisor discussed regional employment opportunities with them based on their career interests.
Half of the students interested in transferring to a four-year institution reported never using the college's transfer advising services, yet students who did use those services reported higher engagement.
The study found that student-athletes generally had more advising experiences than other students. Sixty-seven percent of student-athletes said they were required to see an advisor before registering for classes, compared to 54 percent of non-athletes. [7]

Educational institutions, such as universities and colleges, represent another key segment of the target audience. They are interested in adopting innovative solutions to enhance student satisfaction, improve institutional reputation, and optimize resource allocation.

- Scalability: AI academic advisors can handle a large volume of inquiries simultaneously, providing personalized assistance to students without being limited by traditional office hours or staffing constraints. This scalability ensures that all students can receive timely support and guidance.
- 24/7 Availability: AI academic advisors are available round the clock, allowing students to access guidance and support whenever they need it, regardless of time zones or scheduling conflicts. This availability ensures that students receive assistance at their convenience, leading to better outcomes.
- Early Intervention: AI academic advisors can use predictive analytics to identify students who may be at risk of academic or personal challenges, allowing institutions to intervene early and provide targeted support to prevent dropout or academic underperformance. Early intervention initiatives can improve student retention rates and promote academic success.

Overall, the target audience for the AI Academic Advisor encompasses diverse stakeholders within the higher education ecosystem who are seeking personalized, data-driven solutions to support academic success and career development.

Competitor Analysis:

1) Naviance:

Identification and Analysis:
Naviance is a widely recognized platform offering comprehensive college and career readiness solutions for students, academic advisors, and educational institutions. It provides tools for career exploration, college planning, and academic advising, aiming to assist students in making informed decisions about their future pathways.

Strengths:
- Established market presence and reputation within the education sector.
- Extensive feature set, including career assessments, college search tools, and application management.
- Integration with educational systems and partnerships with schools and districts.

Weaknesses:

- Limited personalization capabilities, with a one-size-fits-all approach to advising.
- Potential complexity in user interface and navigation, leading to usability issues for some users.
- Reliance on traditional methods of advising without leveraging advanced AI technologies.

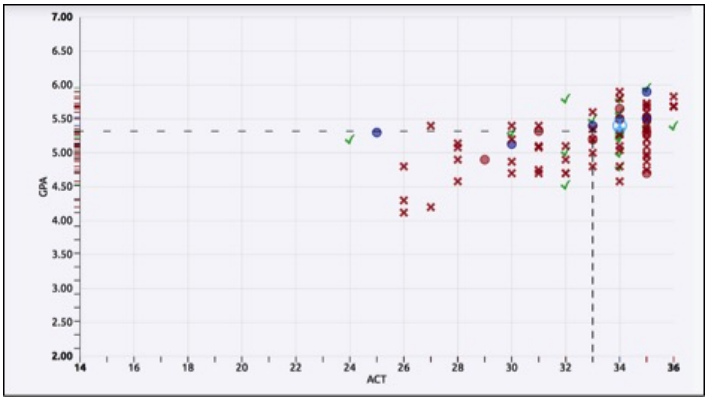
Opportunities:

- Potential to enhance personalization and recommendation capabilities through AI and machine learning technologies.
- Opportunities for expansion into new markets or partnerships with educational technology companies to enhance offerings.

Threats:

- Competition from emerging AI-driven advising platforms offering more tailored solutions.

Regulatory changes impacting data privacy and security measures.



- **Student, Duke**:
  - Attends a medium-sized public high school on Long Island.
  - He wants to apply to Duke in the early decision round.
  - While close in GPA and SAT scores, other admitted students slightly outperformed him.
  - Naviance doesn't consider subject test scores or AP exams, so anxiety about admission remains.[11]

Naviance's milestone tracker only includes items that the high school sends

These are the milestones that the high school (either teachers or guidance counselors) are required to complete, but at each of these schools there are tons of additional requirements such as financial aid forms, interviews, essays/supplements, and more.

(Screenshot source: [11])

Naviance is a service hired by secondary schools – with customers representing close to half of all US school-leavers – that gives students an online portal through which they can search for campuses that fit their abilities and interests. Universities in turn use the resulting data, through a companion product known as Intersect, to decide which students they will actively recruit.

PowerSchool purchased Naviance and Intersect from the software company Hobsons for $320 million (£251 million) last year.

Describing the situation to *Times Higher Education*, Ms Reitz said she was working at Hobsons when she was assigned to review the operations of Intersect – known then as Matching Solutions – and saw that colleges and universities were being offered and were using filters for student applicants that included a Caucasian-only option.

"I don't think that institutions wanted to reach only white students," Ms Reitz said. "I think they were likely budget-constrained and could only pick so many filters, and so they would choose the race that had the greatest population in a selected state."

The creation of race-based filters to produce whites-only lists for student recruitment was "deeply troubling" and "frankly nauseating", said Roxana Marachi, a professor of teacher education at San Jose State University.

"It's shocking to look at," said Ceceilia Parnther, an assistant professor of higher education at St John's University-New York, noting that there were no known circumstances in the US where white students faced disadvantages in college access based on their race.

(Screenshot source: [12])

Naviance does not take into account a student's background or "hook" factors like legacy status

This element is huge – students from different demographic backgrounds are judged on separate tracks by a university. For example, an Asian-American student from an affluent suburban school district in California is going to have very different academic and extracurricular standards for admission than a student from Compton or East Los Angeles. Naviance does not take student background into account, so there's no way of adjusting for this factor.

Similarly, Naviance also does not tell you anything about whether the student who was accepted had some sort of "hook" to their application such as legacy status or status as a recruited

(Screenshot source: [11])

In the past year, we have seen story after story that detail breaches of educational technology vendors' system security. These troubling incidents in which sensitive student data is compromised will only become more frequent until both technology companies and public school districts make student privacy and security a greater priority.

Just last month, Bethesda Magazine reported on a breach of student data held on behalf of Montgomery County public schools in Maryland by Naviance, an ed-tech provider used by middle, high school, and college students that collects students' dates of birth, ethnicity, test scores, and other sensitive data. Far larger than initially believed, the data breach affected close to 6,000 students.

How did the hacker breach Naviance? In layman's terms, the student hacker committed a "brute force" attack, akin to attempting to break into a house by jiggling every door and window looking for vulnerabilities. Specifically, the hacker used a script to iteratively try to log into accounts, looking for instances in which the user ID and passwords were the same, likely running the script thousands of times to get access to the almost 6,000 accounts. Unfortunately, Naviance didn't announce the full scope of these intrusions until months later.

(Screenshot source: [13])

2) Starfish Academic Advising Platform:

Identification and Analysis:
Starfish is a well-established AI-driven academic advising platform designed to offer personalized support and guidance to students within higher education institutions. It utilizes sophisticated algorithms to analyze student data, identify areas for improvement, and facilitate timely interventions to enhance student success.

Strengths:
- Utilizes AI technology to provide personalized recommendations and interventions, optimizing student outcomes.
- Offers comprehensive support for academic advising, including early intervention, progress tracking, and communication between students and advisors.
- Integration with existing systems streamlines data management and communication processes within institutions.
- Proven track record of success in improving retention rates and academic performance in higher education settings.

Weaknesses:
- Potential challenges in addressing biases within the AI algorithms and ensuring equitable outcomes for all students.
- Complexity in implementation and maintenance may require significant resources and technical expertise from institutions.
- Privacy concerns related to the collection and analysis of student data may impact user trust and compliance with data protection regulations.

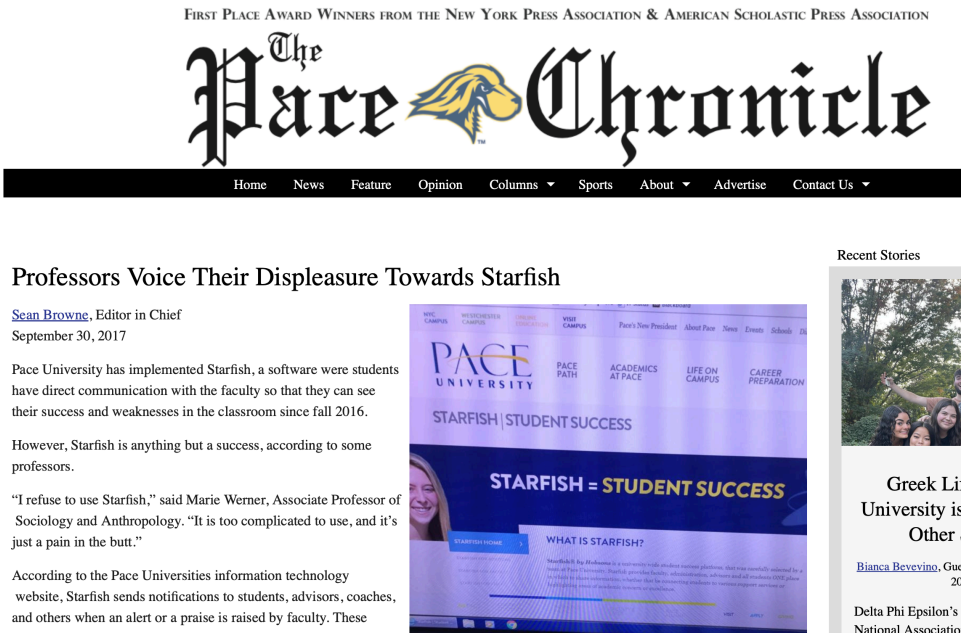
Opportunities:

- Opportunity for continued innovation and enhancement of features to meet evolving needs and challenges in academic advising.
- Potential for partnerships with educational technology providers, researchers, and industry stakeholders to further improve the platform's effectiveness.
- Expansion into new markets or segments within higher education and beyond, such as K-12 education or workforce development.

Threats:

- Competition from emerging AI-driven advising solutions and established players in the educational technology market.
- Rapid advancements in AI technology may require continuous investment to maintain competitiveness and relevance.
- External factors such as changes in regulatory requirements or shifts in educational priorities could impact the adoption and utilization of the platform.

Professors Voice Their Displeasure Towards Starfish



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Professors Voice Their Displeasure Towards Starfish

Sean Browne, Editor in Chief
September 30, 2017

Pace University has implemented Starfish, a software were students have direct communication with the faculty so that they can see their success and weaknesses in the classroom since fall 2016.

However, Starfish is anything but a success, according to some professors.

"I refuse to use Starfish," said Marie Werner, Associate Professor of Sociology and Anthropology. "It is too complicated to use, and it's just a pain in the butt."

According to the Pace Universities information technology website, Starfish sends notifications to students, advisors, coaches, and others when an alert or a praise is raised by faculty. These

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(Source: [10])

Reviews:

1)" Starfish as a *software platform is slow and cumbersome.* Load times are almost unbearable. The interface is not intuitive at all. The scheduling and calendar features are tedious. Overall, the software doesn't integrate well with any of our other campus LMS systems. So it requires having several windows open at once, updating information across all platforms."

2) "I dislike that Starfish has a limited capability beyond scheduling appointments. I wish there were more options available, such as communication options to communicate with instructors"

3) It sometimes freezes if I open up an appointment. As well, I know students sometimes have a hard time finding an appropriate advisor.

[Review collected by and hosted on G2.com.]

Business values:

Our proposed solution offers several unique selling points that set it apart from traditional academic advising methods and competing platforms.

1) Personalized Guidance: Leveraging advanced AI algorithms, our platform delivers tailored recommendations on course selection, career paths, and skill development, ensuring each student receives personalized support for academic success and career advancement. Studies have shown that personalized guidance can improve student retention rates by up to 30% compared to traditional advising methods.

2) Streamlined Advising Process: Our AI Academic Advisor automates routine tasks and workload distribution, enabling advisors to focus on delivering personalized guidance. This efficiency enhances the student experience and can reduce advising time by up to 50%, setting us apart from traditional advising methods.

3) Institutional Excellence Enhancement: Through personalized support, institutions utilizing our platform can enhance student satisfaction, reputation, and resource allocation, fostering a supportive learning environment that sets them apart as leaders in academia.

4) Industry-Relevant Skills Development: Our AI platform ensures graduates possess skills aligned with current workforce demands, strengthening partnerships between academia and industry. Studies have shown that graduates with industry-relevant skills are up to 40% more likely to secure employment within six months of graduation.

5) Comprehensive Toolkit Integration: We integrate features such as resume builders, scholarship finders, and internship finders, providing a comprehensive toolkit for students to enhance their academic and career pursuits, all accessible through our AI-based platform.

6) Parental Involvement with Student Privacy: Our platform includes parent accounts for tracking student development while ensuring the privacy of advisory sessions. This balance between involvement and privacy sets us apart in catering to the needs of both students and their families, all supported by our AI system.

7) Visual Dashboard Representation: Our dashboards offer visual representations of students' education status, areas for improvement, and recommended courses, enhancing user experience and facilitating informed decision-making, driven by AI-generated insights.

8) Ongoing Learning Opportunities: With regular workshops, classes, and certification recommendations, our platform fosters a culture of self-discovery and continuous learning, all facilitated by our AI-driven system.

9) Simplified Institution Interaction: Our platform offers staff management accounts and integrates *direct application processes*, simplifying interactions between students and educational institutions, with 24/7 support from our AI chatbot.

10) Global Comparative Insights: Providing reports and surveys on course and university rankings globally or nationwide, our AI-driven insights enable students to make informed decisions about their academic journey.

11) Post-Enrollment Support: Our platform offers ongoing support for academic advising even after enrollment, including guidance for degree or course switches, all facilitated by

our AI Academic Advisor. Students utilizing post-enrollment support have reported up to a 20% increase in graduation rates and a 15% decrease in time to degree completion.

12) Integrated Test Prep and Work-Based Learning: With resources for test preparation and work-based learning opportunities, our platform prepares students for academic and professional success, supported by AI-generated recommendations.

13) Support for International Students: Our platform provides guides and sessions on the visa process and additional information for international students, ensuring inclusivity and a global perspective with 24/7 AI chatbot support.

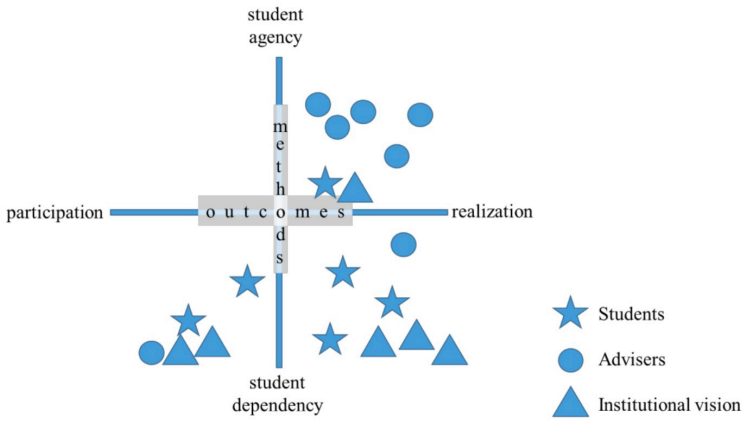
14) Alumni Network Building: Students can update their information to facilitate the creation of an alumni network, supported by our AI platform and 24/7 chatbot support, fostering long-term support and networking opportunities. Institutions with active alumni networks have reported up to a 25% increase in donations and a 20% increase in job placement rates for alumni.

15) Career-Centric Focus: Our platform delivers personalized data to help students make informed decisions about their future career paths, course selections, and college/university choices, all driven by AI insights and supported by our 24/7 chatbot.

16) Continuous Improvement through Feedback: Prioritizing continuous feedback, we continuously refine our AI model to enhance learning and improve the user experience, ensuring ongoing innovation and excellence in academic advising.

Overall, our solution offers a compelling value proposition for potential users by providing personalized guidance, streamlining advising processes, contributing to institutional excellence, and fostering industry relevance for graduates.

Diverging Perspectives on Advising Among Stakeholders



The figure represents a hypothetical situation in which the expectations of students, advising staff, and higher-level administrators (representing the institutional vision for advising) vary considerably. How each group placed various aspects of advising on the Continuum suggests that both students and the institution at large harbour expectations for advising mostly from a perspective of student dependency. When it comes to participation in education and realizing goals through education, both students and the institution expect those who are in an advising role to take the lead, despite the more agency-oriented aspirations of those who advise. Identifying interventions, outcomes, and roles and seeing their distribution across the Continuum can serve as a starting point for analyzing the nature of differences in perspective. From there, stakeholders can analyze problems and discuss strategies for improvement. For example, an analysis may reveal that communication about the purpose of advising is inconsistent, insufficient, or absent. In such a case, initial strategies towards improvement will have to focus on developing a unified vision and communication.

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