AI-Driven System for University Information Provision: Preliminary Lessons Learned from a University in Poland

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Abstract

Traditional repositories, such as university knowledge resources, present challenges for students accustomed to instant answers. To improve information delivery at university, we propose an AI-Driven System for University Information Provision (UnIPro). By analyzing 4551 student posts over 18 months, we classified 20 key categories of student questions. These insights formed the basis for developing a system that assists students in accessing relevant information. The system will be helpful in meeting genuine student information needs and could yield functional and operational improvements within universities, facilitating communication between students and administrative bodies.

Keywords: Action Research, Artificial Intelligence, Information Provision, Smart University, SWOT.

1. Introduction

This approach aims to address the challenges faced by students in accessing information. By leveraging innovative technologies, such as Generative AI (Gen-AI) and Natural Language Processing (NLP), universities can enhance the information retrieval process. The research gap can be identified as the search for methods of effective information provision. In particular, we would like to answer the following research questions:

- RQ1: How to identify and categorize information sought by students?
- RQ2: How to improve the efficiency of university information provision?

To answer these questions, a study on the way information is delivered to students was conducted at the Krakow University of Economics (KUE), Poland. The next section contains the research background and methodology. Then the proposed solution is described followed by a description of the expected results. Finally, the plan for the system evaluation, and the impact of the research on theory and practice are presented.

2. Research Background and Methods

Smart Universities (SU) leverage technological innovations to fulfill their educational mission [6]. Key aspects of SU encompass smart learning, smart classrooms, pedagogical enhancements, big data, and technology integration. Adopting SU solutions universities can enhance accessibility, achieve economic efficiency, and optimize operational

performance [3]. Several critical SU components include automated decision-making, enhancements to student registration and admission procedures, and robust communication and support systems that grant students access to essential study-related information and resources.

Action Research (AR) is a widely employed methodology in social sciences [8] and education [4]. As our research concerns the design of a new system in response to perceived problems and resulting needs, we chose the AR method as it consists of three phases: (1) problem diagnosis, (2) intervention proposal, and (3) impact observation. This will also be the way we plan to work. In this paper, we present a diagnosis of the problem and a proposal for its solution. In the future work, we plan to implement the proposed system and observe its impact on the university community.

To assess the proposed system, a preliminary evaluation is essential. For this purpose, we employed a SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis [7]. We used this method to minimise the risks associated with preparation and implementation of a new system for solving the identified problems.

3. Research Results

Students frequently seek information pertaining to their studies. Typically, this information is disseminated by the university across multiple servers and is available in various formats. As a result, students often resort to posting inquiries on forums or contacting university departments for clarification. To improve information accessibility, we propose the AI-Driven System for University Information Provision (UnIPro), which leverages Gen-AI [2] and NLP [1]. The system enables students to formulate queries using natural language and provides effective access to information. Prior to implementing UnIPro, a preliminary assessment of its impact on university processes was conducted through a SWOT analysis, the findings of which are summarized in Table 1. The results of the SWOT analysis indicate that the proposed system is favorable due to the prevalence of strengths and opportunities, which outweigh the weaknesses and threats.

Table 1. SWOT analysis of the proposed UnIPro system.

Strengths	Weaknesses
Everything in one place – easy and fast navigation through information required by students	Tools which are currently used are scattered but still have all the information which the new solution will offer
Actual information without misunderstandings due to a considerable number of knowledge sources	Additional costs for creation and maintenance of application – hidden costs risk
Reliable information based on verified sources	Risk of low efficiency
Possibility of using technologically advanced applications	Risk of difficulties with data identification and migration
Easy way for information delivery – better transparency of rules, unified and simplified information processes	Risk of lack of widespread use
Young people are open to new, advanced solutions	
Relatively low creation and maintenance costs	
Opportunities	**Threats**
Stereotype of backwardness of public universities – positive influence on university reputation as scientific institution	Aversion to new things and tendency to use existing tools (e.g. Facebook to find necessary information)
Conscious that new solutions are rather necessity of prestige being on the university market	Cultural and behavioural barriers which may contribute to the application not being widely used
Better organization of information accessibility will increase good reputation across students	Out of up-to-date data – incorrect creation or actualization of data risk. Creation of huge, correct and accurate database is really challenging
Dynamic data and channels growth cause tendency for minimalizing data sources	Risk that competitive applications will appear

To compile a repository of topics for implementation in the proposed solution, we opted to collect posts from a prominent Facebook group dedicated to KUE students. A total of 4551 posts were acquired in the period from October 2022 to March 2024. Employing the MD5 algorithm to eliminate duplicates, we obtained 2508 distinct posts for subsequent analysis. Afterwards, artificial intelligence techniques were employed to classify the posts [3]. To

achieve this, we developed an application that integrates with the OpenAI API. The outcomes of the posts' classification, including brief descriptions and the corresponding post counts per category, are summarized in Table 2.

The categories of questions encountered by students served as the foundation for determining the most pertinent functionalities of the proposed system, designed to assist students in accessing relevant information. The proposed solution comprises five distinct layers (see Fig. 1): (1) Data Sources, (2) Domain-Specific Knowledge Databases, (3) Application Programming Interfaces (APIs), (4) Functionalities, and (5) User Profiles.

1. Data Sources: Encompass resources such as databases, websites, timetables, documents, and learning management systems (LMSs). These sources contribute to the creation of a comprehensive knowledge base for the system.
2. Domain-Specific Knowledge Databases: Contain information that underpins the functionalities offered by the system, ensuring that it remains current and up-to-date.
3. APIs: Provide access to data stored in various repositories.
4. Functionalities: Encompass four types of functionalities identified through an analysis of the categorized posts (see Table 2): Dynamically Selected Messages, Electronic Guides, Everyday Assistant, and Chats/Chatbots.
5. User Profiles: Contain personal data provided by users and used by the system to select relevant information.

Table 2. Identified post categories based on the students' posts.

No.	Category	Description	Posts no.
1	Events at universities and colleges	Various events organized at the university	528
2	Exams and assessments	University exams, exam preparation, instructor reviews	420
3	Shopping and classifieds	Advertisements, shopping, ticket sales, book sales	317
4	Scientific research	Scientific research, survey research, surveys, surveying	206
5	Events and recruitment	Student events, meetings, parties, recruitment	203
6	Study organization	Student group organization, exams	149
7	Education and higher education	University education, higher education	105
8	Academic assistance and tutoring	Tutoring, academic assistance, seeking help with studies	88
9	Jobs and employment	Job offers, seeking employees, job postings	86
10	Internships and traineeships	Internship offers, traineeship offers	63
11	Surveys and market research	Inquiry about scientific surveys	55
12	Student life and community	Student organizations, student community, social events	47
13	Student events	Events organised by/for students	37
14	Online events and conferences	Online events, startup conferences	36
15	Language education	Language education, language textbooks, tutoring	35
16	Career development and career	Career development, job offers, professional career	26
17	Sports and recreation	Sports and recreation, gym organization	15
18	Volunteering and charitable activities	Volunteering events, charitable initiatives	14
19	Culture and entertainment	Cultural events, music events/concerts	11
20	Other	No description provided	67

The Dynamically Selected Messages module extracts and delivers information about events and job offers that may be of interest to the user, with preferences derived from the User Profiles. The users have the autonomy to determine the personal data they wish to disclose and the type of information they expect to receive. Additionally, the AI solution dynamically adjusts the content based on the user's interactions within the system.

The Electronic Guides module offers targeted information based on users' preferences. This information is influenced by the user's profile but can also be dynamically generated in response to specific inquiries. Additionally, this module encompasses other resources: (1) Campus Map: a tool directing users to specific locations within the university (e.g., lecture theaters, dean's offices, or the cafeteria), (2) *ad hoc* Guide: assists users in unforeseen situations, offering context-specific advice, (3) Timetable: supports users in accessing schedules for a chosen day or period, (4) Course Information: provides details about courses, participation formats, and enrollment procedures, (5) Educational Services: delivers information on additional educational services available to interested students.

The Everyday Assistant encompasses functionalities designed to support users in daily university life. Leveraging student data, it identifies documents and facilitates their handling by assisting with completion and delivery to relevant recipients. Another key

functionality within this module is the What Is to Be Done feature, which informs users about tasks or preparations required for upcoming classes. Additionally, the module provides a calendar and generates alerts informing about requiring rapid response actions.
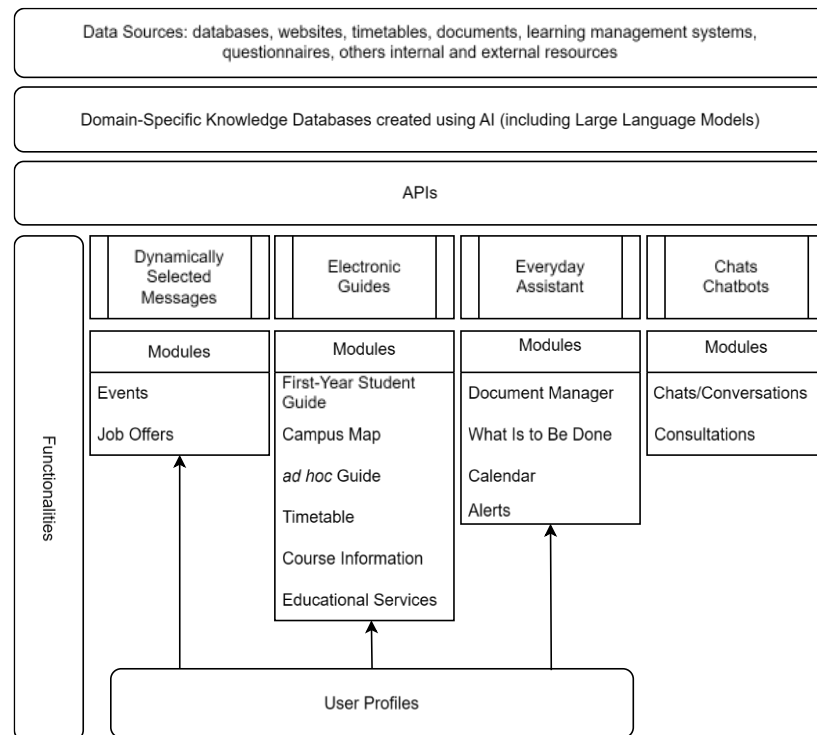

Fig. 1. The schema of the UnIPro system.

The Chats/Chatbots module enables students to engage in conversations with their peers and teachers. This module allows users to schedule consultations with lecturers. These interactions may occur either verbally or via text-based communication.

As the designed solution is scalable, the number of proposed modules and functionalities may expand in the future. New modules and features will be developed based on emerging needs or in response to user interactions within the system.

4.   Conclusions and Implications for Research and Practice

Every product must undergo verification and validation processes. The initial measure of success for the UnIPro system involves gathering feedback from students. A critical consideration in this context is the timing of validation, as the initial learning curve associated with using the solution can significantly influence users' opinions. Therefore, the analysis of responses should commence after a period of three months from the system's implementation. This approach adheres to the standard procedure for applications and typically employs a Likert scale.

An additional validation approach involves assessing the number of users. Key Performance Indicators (KPIs) should be established at the project level. Notably, one of the communication channels for students, where they currently seek information, is the Facebook group dedicated to the KUE community. The evaluation can be based on the volume of questions posted within this group. For instance, during the initial month of the new system usage, the number of searches conducted should constitute 10% of the total questions posed in the Facebook group. Subsequently, this percentage should progressively increase [5].

Furthermore, a valuable method entails deploying a dedicated team responsible for constant verification of the accuracy and correctness of responses. This proactive approach ensures that the application remains updated and enhanced. The implementation of this method can span one year, after which only two components will persist: feedback from students and KPIs related to user numbers.

In contemporary society, rapid access to information has become a defining feature. However, traditional repositories of knowledge, such as books and documents, pose challenges for today's youth, who are accustomed to instant answers. Empirical evidence, as demonstrated by the statistical data presented here, reveals that students often turn to communal resources when immediate information is elusive. These observations underscore the need for developing an application to enhance the educational landscape.

The expected benefits of the proposed solution are: (1) reduction in the number of students' enquiries to the university administration, (2) streamlining and automating the provision of information, (3) reducing the feeling of confusion especially among first year students, (4) providing adequate information to students in response to their inquiries, (5) improving communication with teachers/instructors, (6) better organisation of students' time, (7) streamlining the job search processes.

The novelty of the proposed solution lies in the use of artificial intelligence to automate the delivery of information to students. The proposed application holds the potential to address genuine student needs. Beyond its immediate utility, it could yield functional and operational improvements within universities, facilitating better communication between students and administrative bodies. Furthermore, this application's principles can be applied wherever the integration of individuals into a functioning collective is necessary.

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