

EXPLORATION OF RECOMMENDER GENERATOR SYSTEM TO SUPPORT SOCIAL LEARNING PLATFORM OF HIGHER EDUCATION INSTITUTION

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ABSTRACT. *The growth of Internet technology creates many possibilities for collaboration between people in many areas, especially in the education field. Nowadays in a higher education institution, learning has become a complex social activity that needs more understanding of up to date trend of industries' practice because when university students graduated, they are expected to meet the standard qualification of industry. To find suitable learning partner from industry or other higher education institution is not easy. it requires connection with many partners, and the competency of learning partners must match with learning topics so that they can collaborate in the learning process. This study focuses on exploring how to make learning partner recommender generators that can provide suggestions for higher education institutions according to courses and course topics using information gathered from the social media platform. The results of this study are modules of a recommender system that can gather required information on learning partners from social media platforms. The modules are important for the information of learning partner's experience and skill use for making the recommender system grouping according to courses and course topics in the social learning platform of higher education institutions.*

Keywords: Recommender, LinkedIn, Social media, Social learning, Higher education

1. Introduction. Nowadays learners have different needs and characteristics to be fulfilled [1] because they come from the millennial generation. This condition drives higher education institutions to face significant changes according to social, economic, and technology which substantially change learning experience [2]. Therefore, higher education institutions have to change their learning process following the shifting of their students' characteristics and behaviors. One recent technology trend that has been particularly popular for students as a communication channel to be implemented in the learning process is social media. Social media enables users to correlate by creating personal profiles, inviting friends, sending emails or messages between each other [3]. Social media adoption by organizations has seen exponential growth with technology particularly in the education field [4].

The growth of social network services allows for social relations in or mediated in cyberspace [5]. Social interaction within many communication channels can help higher education institutions to share and collaborate experiences with more people from the industry that are relevant to topics of learning. Since social networks or social media can be used as a technology to enhance knowledge capital, many new concepts arise that integrating social media with the learning platform, one of them is social learning. The social learning approach promotes a tailored learning system blended with social media

functionalities and helps participants communicate and collaborate interactively with each other without any limitation [6]. The system is connected with personalization, social community, and recommendation learning systems, in order to build interactive learning and active learning. In addition to the connection between students and lecturers, the learning process also needs to involve other learning partners such as industries as a stakeholder that will be recruiting the graduate as their employee, or other educational institution which can be benchmark institution that can provide suggestion to improve the learning process. Technology innovation never stops, so higher education institutions have to prepare their students with new industry requirements for their graduate qualifications to catch up. This can be measured by the employment rate; when the competency met the industry qualification standard then the employment rate will be high. This fact shows us that the learning process does not only involve student and lecturer but also need to involve learning partner to complete the learning process, and also the learning material needs to add study case implementation in the real world. Moreover, the industry will be a partner for higher education institutions that give insight into the curriculum to be more applied rather than conceptual from the book.

The process to involve other participants as a partner of learning is difficult to be identified because higher education institutions need to have a connection to the professionals that are relevant to the learning subjects, and also they must make an agreement with the partner. Using social media this problem can be solved. LinkedIn as a professional social networking system can help to identify the appropriate person that can be involved in a learning process based on network connection or endorsement rating from others. This media offers recommendations of persons that are in the professional fields rather than educational ones. Recommendation systems can augment and assist the natural expertise in locating behavior in organizations [7]. Most of the previous studies about recommender systems are based on expert and item categories that are defined directly by the user [8,9]. In this study, we focused to identify the expert based on the learning topic.

The main challenges for implementing social learning are collaborating with outside participants on how to identify a suitable learning partner that can collaborate in the learning process. Therefore, this study will research the recommender system to identify a suitable learning partner. This system will use social media's Application Programming Interface (API) that can be connected to a social learning platform. For this study, we specifically use LinkedIn as a media partner, which has been known as a media that has professional profiles from around the world that can be used as referral media to bring suggestion about the expert that can join as a partner for the learning process.

2. Theoretical Framework.

2.1. Social media. Recently, the rise of social media has attracted ever-increasing attention interest for academics and practitioners [10]. Social media, such as Facebook, Twitter are platforms to which users interact with their connection. This platform has transformed the way people are accessing information [11]. One of the definitions of social media described them as social software sites that supported people to have public profiles, lists of the user that showed common connections, and the ability to navigate those lists within one system [12]. Social software has led to entirely new ways of communication, interaction, and engagement [13]. Social software as a media can be used to support various purposes including social, business, and education. Higher education institution takes the view that they need to provide a specialized, proprietary community for social interaction and knowledge sharing. Social media as part of social software systems offers many valuable functions to support higher education, even they can be used to facilitate interaction and communication synchronous and asynchronous [14].

Apart from higher education institutions, there is a multitude of personal or organization who can involve in the learning platform as an expert to enrich the learning process so that it can become comprehensive and align with business requirements toward graduates' competencies. Therefore, the higher institution needs to identify who is a suitable expert on the learning topics, so they can collaborate in the learning process. To get the expert recommendation, this study uses LinkedIn as one of the social media channels that provide professional profiles from around the world that can be selected to be higher education's partner.

LinkedIn is a social media for professional use [15]. This platform can set up a group and subgroups, where members can engage in discussions and share resources [16]. LinkedIn applies a referral system so the user can be introduced through a network of friends-of-friends, to the person they intended to meet so that they can interact with the person/organization they would like to connect directly without any limitation [17].

2.2. Social learning. The development of the education learning platform increases as technology becomes robust and easier to use [18], one of them is social learning. Social learning refers to the tendency learning involving associate or social groups. This system can use many channels as mediators through group or people from groups by connecting directly to each other [5]. Most higher education institutions already adopted new channels, such as social media to support the implementation of social learning in many of their courses to interact with students. Social media platforms support the publishing, indexing, and tracking of user-generated media, provide collaboration spaces, and enable social networking [19].

The idea of social learning comes out of the successful learning communities powered by web 2.0 technology and social network services. Learners can establish a link with each other, attend user groups, receive and send messages, update profile or status, get automatic notification about users' updates, etc. Essentially, social learning provides a means for learners with a shared interest to interact over the Internet on a variety of topics learning [20]. The social learning community has become an important place due to the prevalence of online social networking services during the past few years [21]. Yet with the continuously increasing participants within the learning communities, it is still challenging to search an appropriate expert as learning peers to support the learning process. By using social media we can build social contact opportunities for internal and external communications, as interpersonal interaction without distance restriction [22]. Thus, the concept of social information processing is giving way to an extended information processing perspective that recognizes new capabilities of processing social information from social media [23].

2.3. Recommender system. Currently, many technologies and systems have appeared since the emergence of Internet technology. Moreover, this situation drives collaboration among parties, leading to numerous of data generated. Because of this, it is necessary to rely on technologies that are capable of filtering available data and allow the search for valuable information [24], one of them is the recommender system. The recommender system can assist in items selection that can locate relevant to an object preference [21]. This system can be treated as an algorithm that could predict the pattern behavior of users based on available options. Researchers have come up with real-world recommender system in almost every domain such as tourism, entertainment, matchmaking, e-commerce [22]. There are two types of recommender system: the first one is collaborative filtering based on the user's preferences; the second content-based filtering based primarily on the properties or content of each item. Moreover, most recommender systems are mixed with both collaborative and content-based filtering methods, for example, recommender systems for recommending relevant movies, advertising, and for recommending social network followers [23].

Recently, the explosion of social media fosters the trust of recommender systems [21]. In addition to supporting the involvement of learning partners such as professionals from industry and higher education, social information is applied by the social recommender as input to improving the accuracy of the suggestion. The common example of a social recommender system is that the system is influenced by the user's relation with her most trusted friends. Currently, social recommender usually uses the user's connection. These systems drive the general assumption that the preferences of a user are similar to one another. This study researches a recommender system that is built based on data from social media LinkedIn that will suggest learning partners from industry or other higher education institutions based on keyword matching people, jobs, experience with learning subjects or topics.

3. Methodology. To get data for the recommender systems, we use two types of scraper (Figure 1): the first one is search export which is used to get a list of learning partner according to specific keywords and the second one is profile scraper which is used to get detail of learning partner from the list gotten from the first scraper. The scrapers used in the experience are LinkedIn profile scrapper and LinkedIn search export provided by Phantombuster's API, the data from the scrapper are in JSON format, and the data then will be imported to the system and saved in database relational format.

The profile data that will be saved are the job, skill, and experience. The job, skill, and experience data will be mapped to the courses and course topics in the recommender system. The mapped data will be used in the existing learning management system of higher education institutions. The recommender system is made in a web system that provided web API that can be accessed by existing higher education institution's learning management systems.

The flow of the process can be seen in Figure 1.

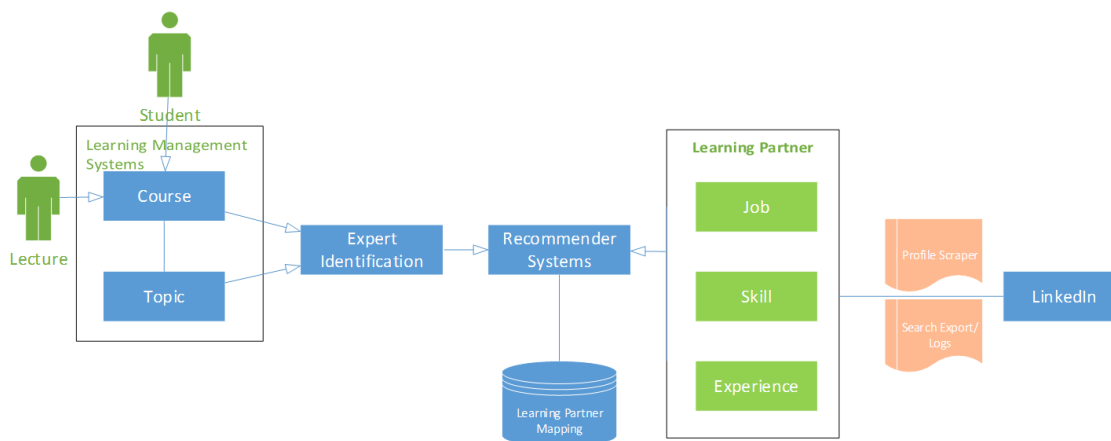


FIGURE 1. Recommender systems workflow

4. Result. This study develops a social referral recommender system to enable the discovery of learning partners that are relevant to the content per learning topic in the existing learning management system of higher education institutions. This system ingests the user query and reformulates user queries by combining user credibility and user rating. The social recommender system can deliver suggestions, such as learning partner recommendation and domain expert's recommendation who align with learning context and they can collaborate with students and lecturers in the learning process. The recommendation goes through an evaluation and decides by the lecturer in the class based on learning partner profiles and relations. Furthermore, in this study, we focus on LinkedIn as a media channel to leverage the searching process. This social media will filter the

recommendation so that the results that are most likely related to the topic preferences of the community are promoted.

Because LinkedIn has numerous professional profile data from around the world, it is necessary to be able to filter available data to allow searching for valuable information, such as people’s jobs, and content that can be seen in Figure 2. LinkedIn provides searches by:

- 1) People. We can type a user’s name to search for people using this feature.
- 2) Jobs. If we want to search the user’s position/job, we can type the job or position that we want to check.
- 3) Content. If we want to show all articles or user’s content that contain based on the keyword user’s type, we can use this feature.

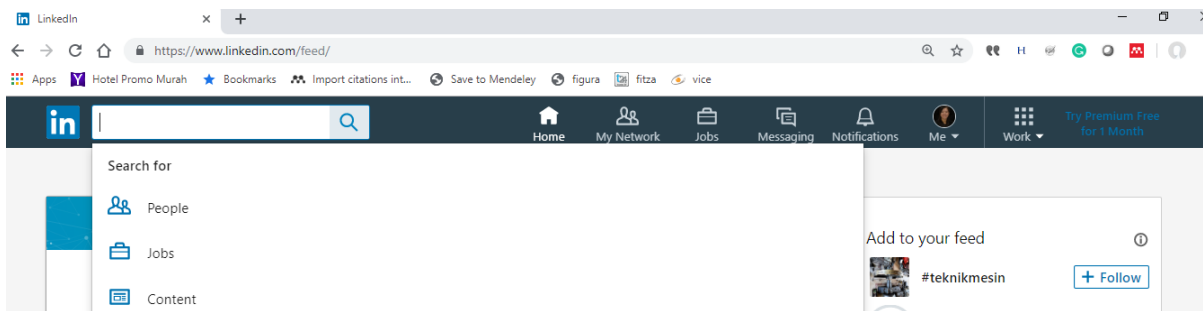


FIGURE 2. LinkedIn search page

In order to extract the profile data from LinkedIn as a recommender system for social learning, we identify how to build the function to provide a suggestion for learning partners that can be involved in the learning process. To simplify the process in this exploration we used a generator. This website provides the generator script that can be used in our program. The step to generate the appropriate profile which is suitable with the requirement can be defined as follows.

1) LinkedIn Search Export/Logs

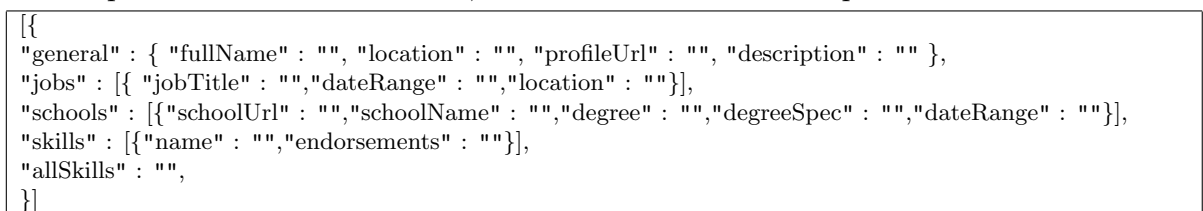
This function will import LinkedIn data (URL, current job, name, first name, last name, job, location, query, category) into the database. Figure 3 shows the user’s LinkedIn data that will be saved.



FIGURE 3. LinkedIn search export/logs

2) LinkedIn Profile Scraper

LinkedIn profile scraper takes LinkedIn profile URLs data as the source and gets user profile data from LinkedIn, and the data that will be processed are:



The proposed architecture of mechanism recommender generator based on our exploration is described in Figure 4. First, the social learning or learning management systems will upload the topic for the learning process for one period, so the student and lecturer can access full all the material. During the learning process, a lecturer can propose the learning partner chosen from outside higher education institution based on the qualification and an appropriate competency with the learning context. To define the parameter, we can use a script to generate a LinkedIn profile based on job qualifications and experience (1, 2). After that, the generator from LinkedIn will generate the recommendation and keep it into the database (3). The script generator will read the data from a database (4) and show it to the learning management system as a recommendation to choose a suitable partner (5).

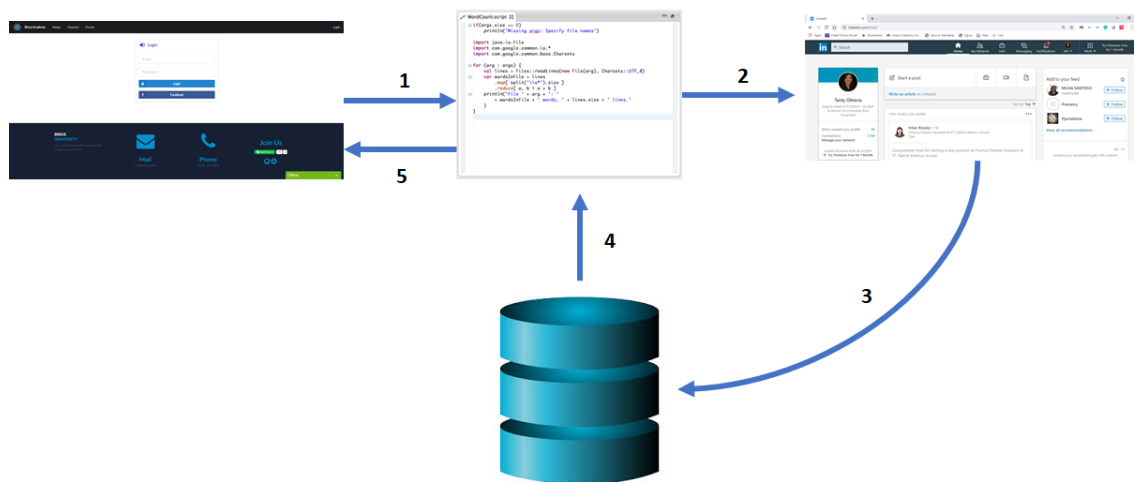


FIGURE 4. Architecture of generator recommender

With this architecture, we can build recommender system that can support collaboration between internal learning process (student and lecturer) with other learning partners from outside higher education institutions, so the learning process can be enriched with industry or other higher education institution insights in term to prepare the students to face the required qualification from industry when they graduate.

5. Conclusion. Huge information, the global economy, and the emergence of learning culture have shifted the learning process to become more interactive. The learning process is not limited to the classroom, but also placing some session virtually that involved other parties to enrich the learning process.

The novelty of this research sets a description of analyzing the interconnections of social learning which connected between students, lectures, and the appropriate learning partner using recommender systems. The portrait of this research finding is followed by the appropriate ontology to create learners' social learning environment and activities according to their learning outcomes by using social media, particularly LinkedIn. LinkedIn is used to utilize direct and indirect social relations to construct user rating credibility based on their expertise. According to this social recommender, the mechanism will help the learners to find suitable partners according to their learning topics and vice versa. With the adoption of LinkedIn into social learning systems for higher educational purposes, it is incumbent upon learner, lecturer, and industry to recognize the industry's need for graduate competency.

The proposed model architecture of recommender systems is still in the early stage and more study is to be explored in the future. Further research should construct the system

integrated into the social learning process and apply in a learning environment setting, and then the proposed model should be validated based on the learning outcome.

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