

Collaborative System: Higher Education Search Engine

Al- Abrar Abdul Wahid¹, abrar@nc.com.my, (MIT student at International Islamic University Malaysia)

Hissein Aboubakar Idriss, hissein.idriss@scicom.com.my (MIT student at International Islamic University Malaysia)

Muhanad Adam Labab Ali International Islamic University Malaysia zex444@yahoo.com

Abdul Rahman Ahmad Dahlan International Islamic University Malaysia, arad@iium.edu.my

ABSTRACT -

Malaysian universities or colleges has been one of the main attractive educational destinations to foreigners for the last decade. Malaysian educational institutions are recognized in opening doors of knowledge that fulfill student's lives with skills, awareness and enthusiasm. There are over 20 public universities and 60 private colleges that offer a complete range of programs leading to highly regarded and internationally recognized qualifications. Despite the vast information made available by these institutions on their websites, majority of potential students face challenges in choosing the right program, courses and university that suits their needs. This research study the innovative method which could be developed and leveraged by the educational industries, specifically the Ministry of Higher Education Malaysia (MOHE) in close collaboration with these universities and colleges, in using search engine comparator technology whereby assisting potential students in making selection. The study raises awareness of relevant collaboration initiatives that could be adopted and replicated to facilitate students and parents in making well-informed decision.

KEYWORDS : University and higher education institution, student decision making process, ecommerce comparison engine, bot analysis, search engine, collaboration.

I. INTRODUCTION

Muslim civilization was the pioneer in establishing the first university in the world which is University of Al Azhar at the city of Cairo, in 969 AD. The contribution of this civilization emerge together with the establishing of several higher learning education institutes in Al-Andalus (present day Spain), Morocco and Baghdad; yet since then institutions of learning specifically universities has grown thousands around the world with majority of it located at well developed countries such as United Kingdom, United States, Germany, Japan and France. It is estimated that some 135 million students are enrolled in an estimated 17 000 higher education institutions worldwide, twice the number a decade ago. [12]

Malaysia does not fall short on such efforts; various programs and incentive coordinated by Ministry of Higher Education were conducted to encourage the establishment of modern and world class learning institution either thru public funds or private organization. Among those incentive offered to private educational institution in Malaysia are [14] :

- Providing tax exemption and double tax reduction for expenses in relates to education in certain fields of specific areas out of 14 existing incentives available.
- Private colleges were encouraged to do twining program with public universities and offering higher degrees.
- Encouraging private funding corporate organization such as JPA, MARA, Petronas, Telekom, TNB and others to send the students they are sponsoring at local private universities
- Encouraging the merging of smaller private institution in becoming more competitiveness and financially strong.

As of Jun 2009 as reported during Malaysian Parliament sitting, there are around 34,344 foreign students studying in Malaysian public universities alone which calculated at about 8.6% from around 150 countries. [14]. The act of attracting foreign students into Malaysia has been seen as an effort to put Malaysia as the leading hub of higher learning center of excellence, while at the same time does contribute to the source of income for Malaysia.

It is however important to note that numbers sometime doesn't mean much, as more doesn't represent better quality or having a conducive environment for learning. In contrary, those numbers impact directly to students and parents as they are in dilemma to choose the right programs, the right course, and the right university out of thousands available in the world that claimed could suite their needs. This research paper try to discuss those context in Malaysia in which there are more than 20 public universities and 60 private colleges that offer a complete range of programs. What are the basic and normal questions from students and

parents in their attempt to discover what are the offering from university? Is the degree recognized and what if I transfer to a different university or move to another country? What could be the better way to assist them in choosing the right university? What role could Ministry of Higher Education together with the universities and colleges play in coordinating information dissemination to parents and students?

The objective of this paper is to present the concept solution in establishing a virtual comprehensive higher education search engine website which could address most of the difficulties of potential student and parents in choosing the right universities. It's a Decision Support System (DSS) that generally uses the existing technology being utilized by some modern ecommerce website in helping their users to choose the best product offering on the internet which has never been used yet for educational institution purposes.

This paper is organized as follows. After the introduction, section II shall discuss in detail the dilemma of parents, potential student and society in choosing the right university, and the similarity to the difficult situation for market consumer to make decision in purchasing products available in the market. Section III discusses some of the ecommerce technology which improvises consumer decision making. Section IV propose the technical design background for a virtual comprehensive higher education search engine website solution and Section V concludes this paper and highlight suggestion and further study.

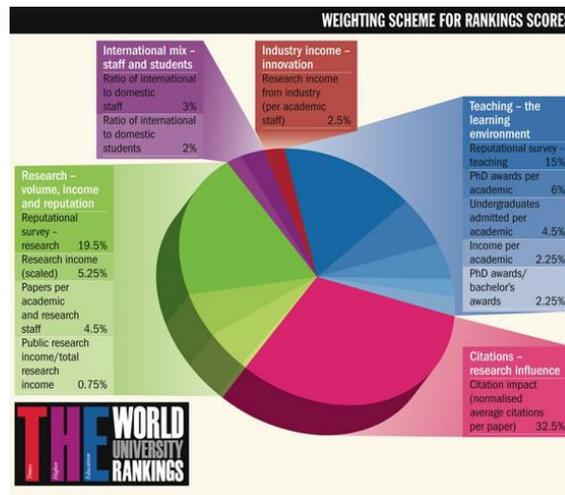
II. DILEMMA OF CHOICES

Higher education is a sector in which both governments and corporate invest significant contribution of their resources as it relates directly to the community and nation competitiveness, and thus higher education institutions need to assure quality education remain at the forefront of their establishment. Institutions themselves are very different in their style, mission and aspiration. Faced with such diversity, a student hardly knows where to turn when choosing a university. Current university rankings may do more harm than good because they largely ignore a key measure of quality, namely what goes on in the seminar rooms and lecture theatres.[13]

As competition to recruit university students intensifies the role of marketing within a university has grown significantly. In contemporary societies, educational institution is being marketed just like any other product or service. A student's decision to acquire advanced knowledge is, therefore, the culmination of a process of weighing cost against benefits, and this is similar to the process applied when a customer selects a product or service [19]. The decision making process of students with reference to university selection has been of increasing interest to marketers over recent years [17]. Students were targeted by various means of sales marketing, either via traditional hearsay or word of mouth, pamphlets, rankings made by various organization, institution websites, direct email or phone and others. All of which discussing on the similar topics but with different context of presentation, approach and intention.

Parents and students are usually confuse on what to evaluate university with, no apple to apple comparison of academic programs, research publications, facilities, aid funding, academic excellence, number of professors, political atmosphere, student life, course fees, campus activities, admission standards, number of students, university calendar and class room time table in which the students could rely on those information for such means. The presentations of such information to the end user are merely marketing statements which were segregated at each institution websites. University website was consistently shown to be an influential and reliable source of information for students during the information search stage. For many students this was the first port of call to obtain information regarding the university. [15]

There are several attempts by organization to assist users in making comparison by providing university ranking such as by Times Higher Education-Quacquarelli Symonds who gives preference to peer review with a 40% weightage; Shanghai Jiao Tong who gives a 40% weighting to research, which includes the number of faculty publications and citation rates in professional journals, and another 40% to high-profile faculty those who have won a Nobel Prize or other academic honor [13]; and MQA-SETARA a Malaysian own university ranking based on benchmarking with selected world class universities.



Nevertheless, it is assumed that the criteria have the same importance (weightage) for everybody. This is clearly not true as each person is different and has different preferences [2]. These type of ranking even thou are not less important and does have valuable indicators are targeted for university itself in identifying areas for improvement and the recognition within the educational communities but left behind one important aspect, does it provide the learning atmosphere needed as per the individual learning preferences. Would it be fair those determination weightages are being prioritized by the student or parents themself prior being force to make such selection.

Now we have a student who has a basic question of what would be the fees like in getting a master degree in IT, what are the language medium, or a question of what day and time is the classes as he preferred to have it during weekends as a part timers; none of those ranking system mention earlier work in helping him to list the university of his choice in addressing his conveniences. These are critical facts to the users and significantly impact in building the learning atmosphere needed for individual educational development. One for sure would not be able to conquer knowledge if he failed to understand due to language barriers or failure to attend morning class due to work commitment. In a traditional method, it is really a tedious and time-consuming process that users have to go through when doing selection over the Internet. The process might start with a search for a particular courses or program from which several links to universities are returned. The user typically must visit each website to check vital information such as tuition fees, location, entry restriction and terms. This could also involve considering alternate university from an online catalog or physical pamphlet; the university environment, facilities, language medium, or academic excellence. After all relevant information is gathered, only then the user is empowered with the knowledge to choose the right university that suite him.

Now let's discuss on how we approach the same scenario on a different context of an electronic commerce (EC). EC by definition is the process of buying, selling, transferring or exchange product, services and/or information via computer networks or internets. EC historically started in early 1970s with the introduction in financial institution for fund transfer, only in 1990s the application of EC widen with the introduction of World Wide Web and the booming of the so-called dot-coms companies. Ebusiness broaden the EC definition by expanding the scope to servicing customers, collaborating with business partners, conducting e-learning and conducting electronic transaction within an organization [11]. Ebusiness uses certain marketing strategy and reputation in building factors which could influence people for purchasing the services or product offered. It also consists of the exchange of data to facilitate the financing and payment aspects of the business transactions.[16]. Innovation on marketing assist these companies/institution to distinct their selling strategy to gain competitive advantage.

The basic principle of any business is supply and demand, either in the context of our first discussion referring to the supply of courses and class registration of a university and the demand of students who like to further their study; or in the context of ebusiness where there are products or services on sales towards demand of a consumer. There are several major characteristic of the digital economy which may influence both businesses, among them are globalization, speed, information overload, intelligent search, innovation and fraud [11]. Due to globalization, the competition of the market place are highly competitive, there are hundreds or thousands of companies that tend to sell a similar product or services and have the same advantage in the world wide web. Educational institutions tend to share this similar characteristic of utilizing their websites in promoting the courses offered. As for an example the establishment of various private educational intuitions with vast majority aiming in becoming a profitable business entity does create the tendency of fraud and cheating in this new EC marketing domain. Cybercons are something in which authorities find very difficult to prevent as it is now common everywhere.

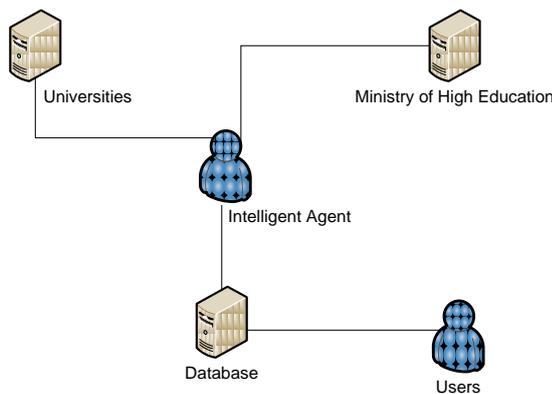
EC provides businesses efficiency, cost savings, productivity in their processes. With today’s enhancements in internet technology, online application has become more effective in the area of reliability, security, higher speeds and cheaper costs. EC over the web is quickly growing and now globally flourishing rapidly. It is helping transform businesses into an electronic network structure thus providing greater value for their products, with less costs and greater access to their customers. EC brings production and consumption closer, enterprises gain a wider and fairer competitive market while consumers gain more choices and more personalized services [7]. These situations bring us back to the question of how to assist user in making the correct decision. How does current modern ecommerce website handle this in which educational institution could also take advantage of it, and what are the technology being used for such.

III. ECOMMERCE WAYS

With the enhancement of EC techniques, there have been many tools available to assist in the decision making process. Among these tools are :

- Intelligent Agents (bot)
- Web Crawlers
- Semantic Web
- Text-analyzing
- Ranked list
- Scatterplot Filtering

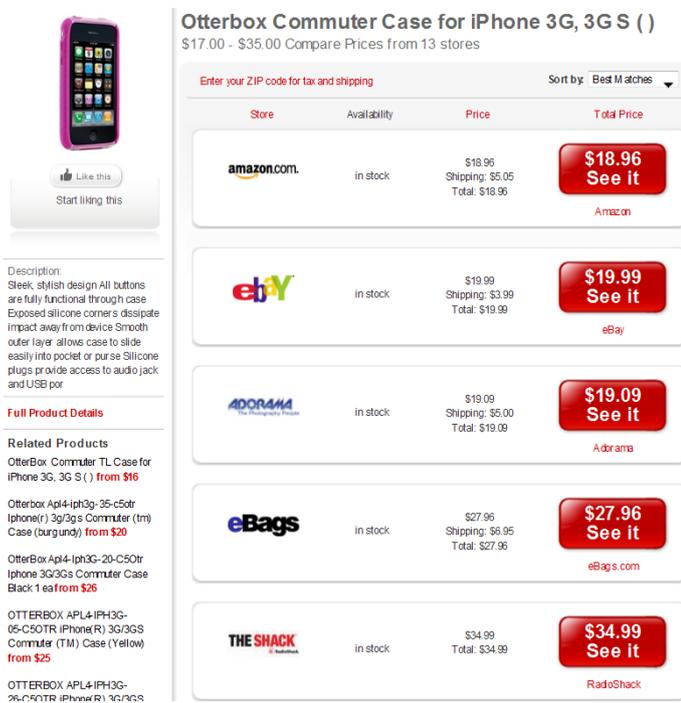
For the sake of this discussion we will only focus to one of the advanced tools in EC application which is the use of intelligent agent software. Intelligent software agents are programs that act on behalf of their human users and exhibit some aspects of intelligent behavior. Agent technology has emerged from the field of Artificial Intelligent (AI) research. The term 'agent' can be thought of as an umbrella under which many software applications may fall [3]. A term that is used interchangeably with intelligent agents is a bot. The word ‘bot’ is a short form for robot. A bot is a software tool for digging through data. You give a bot directions and it brings back answers. On the Web, robots have taken on a new form of life. Since all Web servers are connected, robot-like software is the perfect way to perform the methodical searches needed to find information [3].



Software agents are highly customizable and personalization enhances interactivity. Software agent technology is widely used in agent-based EC. These software agents have a certain degree of intelligence, i.e. they can make their own decisions. The agents interact with other agents to achieve certain goals. Also, it can interact with other software agents to achieve mutually agreeable terms and conditions of a business transaction [5]. Intelligent agents can be used to make many EC applications smarter, and may eventually become routine design components in a wide variety of ebusiness solutions. This technology is being used by verity of organization and for different purposes. Agents over the Internet probably from different organizations, often operate with different interfaces. Though contemporary agents, especially from large organizations, may be accessible through a standard application program interface (API), the majority of agents are only available through manual web pages, i.e., users need to use a browser to interact manually with the web-site in order to get the required information [7]. Hence, Software agents are of good use to reduce work and information overload and provide high quality services to humans.

With the use of software agent, we will be able to assist the users in identifying need information. Software agents are currently being used for information retrieval and for offering recommendations such as finding product information, comparing product prices, and offering suggestions on product and services based on customer's interest and preferences [4]. Routine electronic transactions can be automated to a certain extent and hence human involvement is reduced.

With the use of intelligent agent to gather information, users will be able to get reliable information from verify of sources. The implementation of intelligent software agent can be seen clearly from several EC website such as MySimon.com, Q-compare.com and PriceGrabber.com. These websites have a similar objective of helping consumers to make better decision in choosing the right and best offering from several sources of EC websites. MySimon for an example provide the comparison of a product being marketed at Amazon.com, ebay, Adorama, eBags and various others. The intelligent agent retrieves the information from those websites; segregate the data into a central repository hence allowing it to provide valuable fast and accurate comparison to the user. This allow user to gain better efficiency when dealing with ebusiness transactions.



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 ADORAMA <small>The Photography People</small>	in stock	\$19.09 Shipping: \$5.00 Total: \$19.09	\$19.09 See it <small>Adorama</small>
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Description:
 Sleek, stylish design. All buttons are fully functional through case. Exposed silicone corners dissipate impact away from device. Smooth outer layer allows case to slide easily into pocket or purse. Silicone plugs provide access to audio jack and USB port.

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The similar implementation could be done for universities and higher education, a EC website using intelligent agent would be able to retrieve need information from several of the universities available and provide comparison of certain topics which are in the interest of the users.

IV.SOLUTION DESIGN

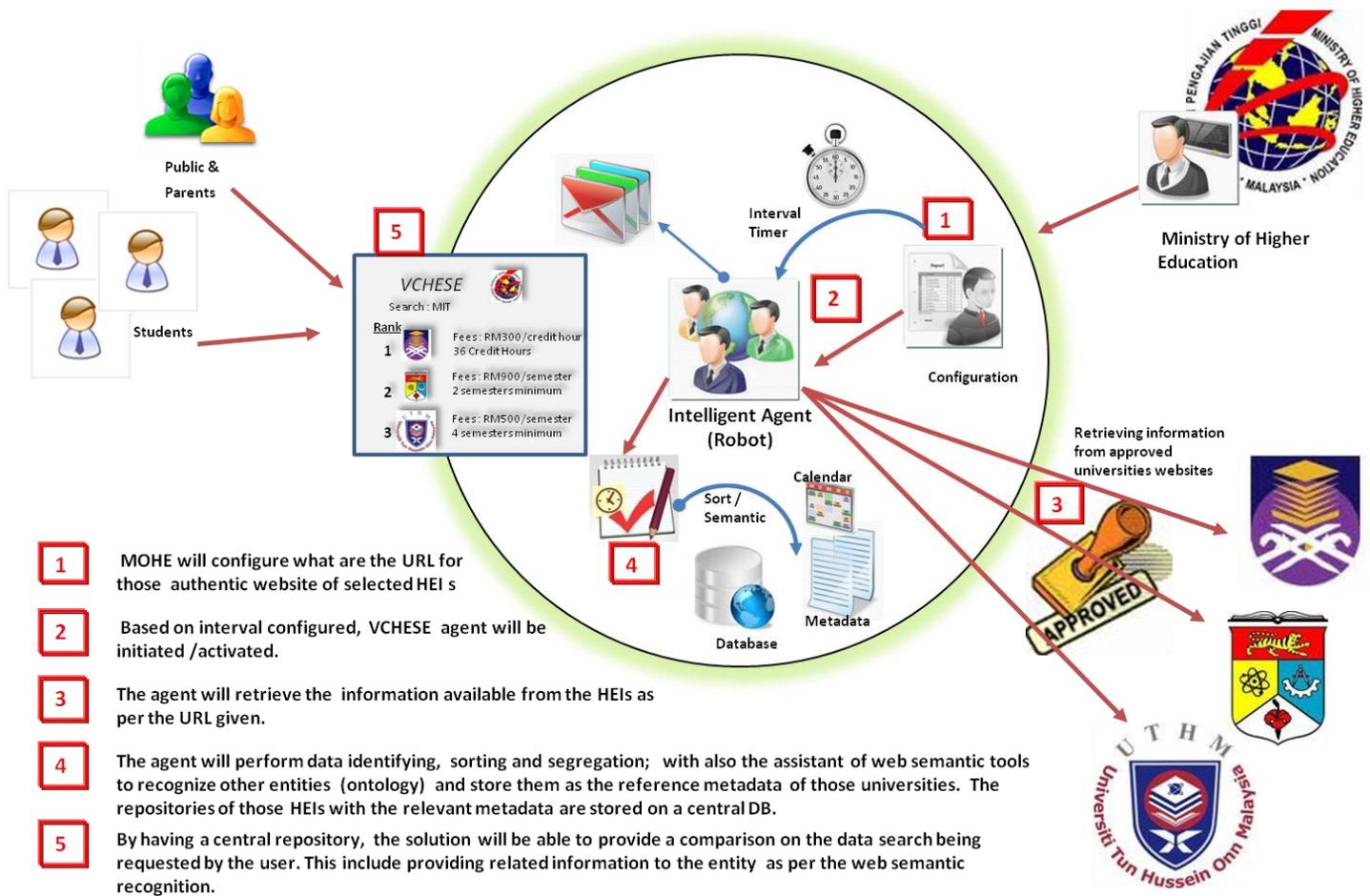
The solution we are proposing for Ministry of Higher Education of Malaysia is to establish a website which we refer as Virtual Comprehensive Higher Education Search Engine (VCHESE) which will allow the ministry to maximize the technology and benefits of EC for the educational purposes.

The VCHESE is not a typical search engine such as Google, Yahoo or Microsoft Bing in which their objective is to find the location of a specific information in the internet. It uses the word or phrases to find the information users are looking for by searching through the Web sites in its database and return a list of Web sites that match user searching criteria. The operation of each search engine varies. Most use automatic software programs known as spiders, worms, robots and gatherers, which roam the Web and collect URLs or addresses of Web sites to add to their database. Some examine a Web page and follow each link to other links. There are usually free, as they obtain their revenue from advertisers who pay to have their ads or services placed on the home page of the Web search engine [20]. VCHESE on the other hand is High Education Institution (HEI) information repository of selected universities which are exclusively selected by the Ministry of Higher Education in representing a reliable

source of central information gathered from the latest and updated information available on the HEIs websites. The gathering or retrieval process of those information are being conducted automatically the by VCHESE agent using the latest technology available in EC. Nevertheless, even thou the database repository are being built automatically, it is own and manage by the ministry, hence allow them to highlight or to play down certain information as per the ministry own assessment in achieving the ministerial objectives. The ranking mechanism is something that is subjective to what users are searching on, as per the combination ontologies available to the search target (word or phrases). Given example if someone search for MIT (Master in Information Technology) , the ranking mechanism is the combination of users click and personal vote for the MIT course as well as all those entities associated with it such as the course fees, the international recognition , the course semester period and others. These allow personalize results which could address the problems of identifying the learning atmosphere needed in fulfilling individual preferences as discussed earlier.

The overall design of the technological solution, involving a close collaboration as well as partnership between MOHE, universities and colleges, is as the diagram below:

Virtual Comprehensive Higher Education Search Engine (VCHESE) Solution Overview



The email agent available on the VCHESE could also be configured to trigger the ministry officers on certain information changes or made available by the HEIs website immediately, allowing them to gain fast vital information which earlier took ages to consolidate. Examples of that information are like new courses offered by the HEIs, new study calendar available or new fees introduce by the HEIs.

The non-technological solution for VCHESE needs to be addressed as well. Leavitt's [21] model of organizational change, proposes that change may focus on one of the four subsystems in an organization. According to Leavitt, the effectiveness of a program or solution depends on balance between the four organizational subsystems: technology, structure, tasks and people. The model shown in Figure 1 demonstrates how these four elements are interrelated. These four components are interdependent, where a change in one can result in change in others. When technological solution such as VCHESE is introduced to MOHE in close collaboration with universities and colleges, the other components often need to be adjusted and modified in order to reap the full benefits and maximize the impact of innovative VCHESE.

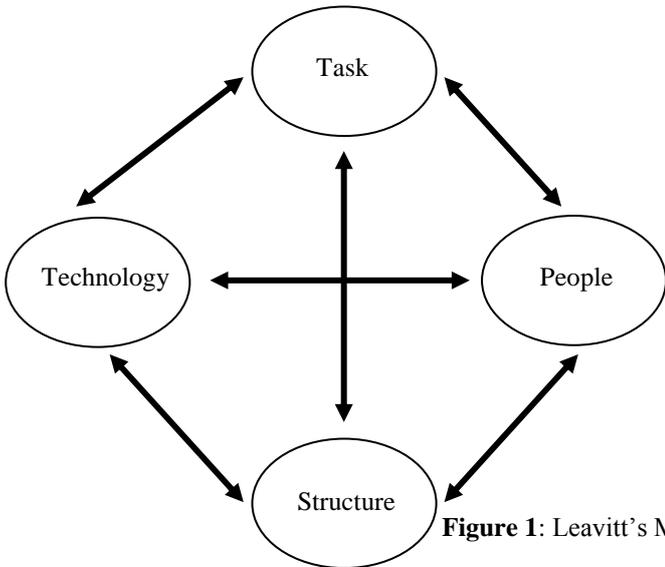


Figure 1: Leavitt's Model of Organizational Change

V.CONCLUSION

There are numerous research and efforts by various parties in trying to provide a balanced guide that could help students, parents and public at large in their roadmap for finding the right university; yet no single solution has attempted to address in the way we are proposing now which is by providing users with a capability to determine their own evaluation criteria for comparison which could include academic programs, professors, publication, characteristic of universities, facilities, student life and others within a single comparative analysis presentation.

The solution autonomously would be more efficient and objective in addressing the needs of the students, sponsors and parents, as well as the overall managerial advantage which the ministry could acquire. The innovative idea by ecommerce website in sustaining their competitive advantage could be tapped by the educational industry, hence help the community in general. This process will accelerate the well decision-making process and will guide students to the path that is most suitable for them. It is already generally tough for a student to face a lot of difficulties in their endeavor towards gaining knowledge, adapting to a new environment, sometime living alone apart from their families, while at the same time they need to get academic improvement. Hence such solution is important so that ministry could at least assist them to make the best decision of the right university that could cater their personal educational atmosphere.

We do hope in subsequent paper we could look into how to develop, enhance and utilize the central HEIs repository database own by the ministry; as well as addressing the common problems in retrieving information from a website such as no terminology standardization, obsolete information, and issues of credibility and reliability of it.

Currently the propose solution is still in early in the design and prototype phase, it does still require investment for a proper development in making it a reality.

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