

## **CAREER GUIDANCE WEB-BASED EXPERT SYSTEM FOR VOCATIONAL STUDENTS**

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### **Abstract**

This study aims to develop a web-based student career guidance expert system namely ESGuiscar-web as a career guidance service for students of vocational high schools. Both software and hardware are needed in developing the application; the software used is a database system and the hardware used are laptops, PCs, or notebooks. The study dwelt on the possibilities of readiness and successfulness of vocational school graduates whether to have a job, continue to college, or build entrepreneurship using the expert system. Using this system, students can guide themselves in deciding what to do they finish vocational high school. Navigated through the system, they responded to career items. Those items were designed to enable them to reach specific conclusions and recommendations on their career path, which were validated by the experts. The ESGuiscar-web has been tested and proven to work as expected. The results of career guidance services by ESGuiscar-web can be used as reinforcement when consulting with school career teachers and parents.

Keywords: Career guidance, College study, Entrepreneur, Expert systems, Vocational students, Work.

## 1. Introduction

Vocational high school graduates have three choices to make before they complete their training or immediately after they complete their study. They should decide on whether to have further training, to apply for a job, or to start an enterprise depending on the availability of financial resources. Making a career choice is a decisive stage in the life of each student because they have to consider several factors before drawing any decision [1]. Among the several factors that contribute to career selection decisions are student grades, personality, talents, skills, preferences, subjects, and career interests and parents' financial status [2, 3]. Determining careers is one of the difficult tasks faced by students when leaving secondary schools. Many students have chosen their career paths without getting detailed information about their career choices [4-6] and appropriate advice from professional services [7]. Ehigbor and Akinlosotu [8] proposed that at this stage, it is very important for vocational students to seek adequate career information because making an inappropriate career selection will certainly affect their future plans and happiness of someone in their career lives [9].

The role of assisting vocational students in career guidance can be supported by the use of information and technology-based applications in an effort to facilitate students' access to career information as well as to access independent career guidance services complementing career guidance sought from parents and career counsellors. Ansari [10] explained that ICT applications do not only function as a medium of information and communication but can also be used as a reference system that acts as an expert in the vocational pathway that supports decision making and is known as an expert system. The ability to solve problems from expert system applications is a part of artificial intelligence, which in its design is adjusted to expert knowledge and is supported by the analysis and design of the developer [11, 12]. For optimal results, the function of an expert system application can be integrated with an online website application where users will be faced directly with the application system interface in the form of web pages.

The implementation of expert systems in supporting career choice decisions does not only limited to determining the further education option or job searching but also informs vocational students on entrepreneurship. The application of expert systems in the vocational education field provide convenience to students: in determining the choice of majors in academic education based on the factors of academic interest and personal potential [13, 14], career selection, which will inform the selection of academic majors and supporting subjects in the chosen career field [15], making decisions about the choice of courses based on academic status [16].

The application of expert systems in the area of job career guidance makes it easy for students when deciding, which career (job) is the best and a priority [10], obtaining career guidance in the form of career information guidance helps students to decide on the educational pathway [3], conduct advanced vocational counselling in an integrated manner in choosing a career based on personality, talent, ability, motivation and preference [17]. Application in the field of expert system entrepreneurship proposes and analyses the extent to which, a prospective entrepreneur's readiness and the possibility of success of the effort to be made [18]. Another research study by Gimenez-Figueroa et al. [19] also developed business intelligence knowledge systems to study business opportunities and prospects associated with the technological competencies of employees and company leaders.

This research aimed to develop an expert guidance system for vocational students in forwarding chaining models as a medium to assist students in independent career guidance services. In this study, career guidance web-based expert system for vocational students is abbreviated as ESGuiscar-web. The ESGuiscar-web was designed to provide independent career guidance services concerning future jobs, areas for further study and entrepreneurial opportunities. The development of the ESGuiscar-web comprises the following stages; problem identification and analysis, application designing, the application implementation, and improvement stage and ultimately the testing and evaluation stage. It is expected that the ESGuiscar-web application can help students make career decisions effectively and efficiently when students want to work, continue their study to college, or become entrepreneurs.

## 2. Materials and Methods

### 2.1. Materials needs

Materials required in this study included both software and hardware. The software was necessary for the development of a database system since ESGuiscar-web ruled based on designing website applications. The hardware was in the form of PC units or laptops and notebooks, which possessed certain specifications. The analysis of the needs of knowledge domain data from expert career counselling experts was also conducted to determine the planned database acquisition expert system model forward chaining application. The analysis was carried out by conducting interviews with career counselling experts in discussing students' interest in the field of working careers, higher education, and entrepreneurship.

The result was a statement instrument that had been validated by career guidance experts, which would become information data on forwarding chaining expert systems. Forward chaining rule method in the expert system is a method of inference engine to start tracking data from facts entered by users with rules that have been stored in the system so that conclusions can be drawn. In ESGuiscar-web forward chaining expert system application, inference engines do reasoning using the contents of a list of rules based on certain sequences and patterns. If the first fact is true, the search for the next fact is carried out on the same rule. However, if there are facts that are false, another rule is searched. The rule has the same true facts on the previous rules. This is where the importance of the involvement of career counselling experts and media experts in developing quality expert systems takes place [20].

### 2.2. Method

The development of ESGuiscar-web passed through several stages, namely: 1. Identification and analysis of problems; 2. ESGuiscar-web application designing; 3. Implementation of the ESGuiscar-web application and its improvements; 4. Testing and evaluation. The development of the ESGuiscar-web is shown in Fig. 1.

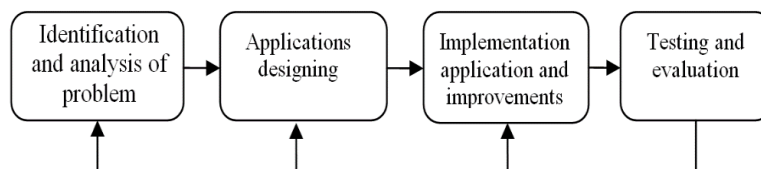


Fig. 1. Stage of development ESGuiscar-web.

### 2.2.1. Problem identification and analysis

In this initial stage of the research, the researchers identify and analyse the problems to be investigated, starting from the background of the problem to the planned solution for the problem. The analysis carried out at this stage was limited to hardware and software requirements and the development of application designs that were to be developed both on the relational database design plan used, the end user interface design (GUI), and the desired website design. The next phase is the collection of knowledge domains from career counselling experts as supporters in building the planned knowledge base of the ESGuiscar-web system in the form of career field names and indicators. The knowledge acquisition process consisted of (1) gathering career information from experts who already have substantial knowledge on careers, tertiary education and entrepreneurship; and (2) collecting the domain knowledge information; (3) documenting the information; and (4) developing the forward chaining expert systems. The data in the form of information required from the experts are the basis of knowledge in designing forward chaining rules for the proposed ESGuiscar-web application system.

### 2.2.2. Application designing

The selection of expert domains is one of the most important components of an expert system development. Domain experts must be knowledgeable and have sufficient (theoretical, practical, or combination of both) experience in their fields. The second stage determines the hardware model and application design development that will be developed. Below is the description of the stage.

- The developer chose the required hardware in the form of one unit of a Personal Computer (PC), intel dual core 2.9 GHz Pentium, 1 GB Ram, 500 GB HDD.
- The development of a relational database system using the mySQL program followed. The construction of a knowledge base system was carried out by acquiring knowledge of career counselling experts, which was then embedded in the rule base system in the mySQL program, a proprietary, non-standard entry-level SQL program that is very easily accessible for users with minimal expertise in data management. The development of expert systems is to gain knowledge from experts and turn it into a system rule carried out by inference machines. Inference machines process data information from the knowledge base, integrate it and consider it to get conclusions. The base model of the inference engine rule used is the forward chaining model. The success of an expert system does not always depend on the sophistication of inference or reasoning strategy, but also on the amount of information it has, which can support decision making [21]. For this reason, the development of expert systems must be well designed so that they can meet the requirements for software, namely storing knowledge, explaining problems, and recommending solutions. Therefore, the involvement of experts in developing statement indicators in expert systems will greatly determine the quality of application systems built.
- The next process is web development as a container of expert system applications whose developments using such programming languages as PHP, HTML, CSS and Dreamwaver 5. The user interface is designed for simplicity and ease of use. For the initial testing of system development, expert career guidance for students to use localhost. After the ESGuiscar-web application runs properly on localhost, it is then hosted with the following domain <http://www.bimkasis.site>.

**2.2.3. Design testing and evaluation**

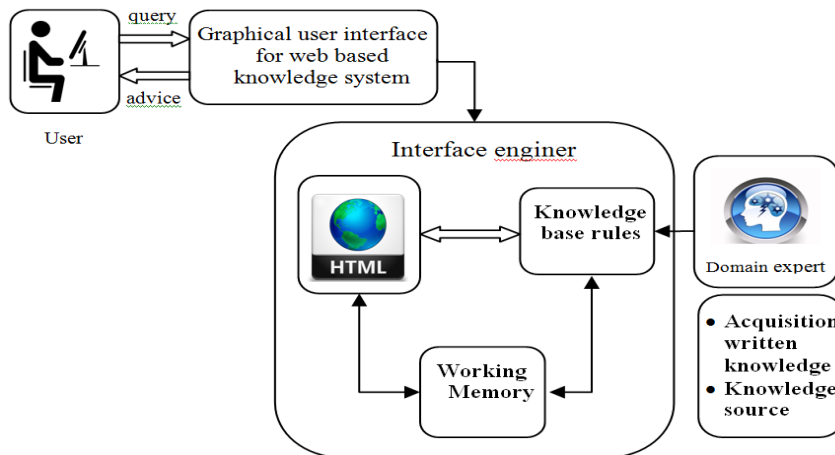
Application tests were carried out repeatedly. Repairs and evaluations took place up to the point where the application had no operation hick-ups. System application trials were carried out on localhost and also on the online network at address <http://www.bimkasis.site>. Evaluations and improvements continuously made during the trial process to obtain application products that were readily implemented. The next step was to test the functionality by media experts to see the extent of the functioning of the online ESGuiscar-web application.

**3. Results and Discussion**

**3.1. Implementation**

The prototype structure of ESGuiscar-web is shown in Fig. 2. Consisting of relationships between the main components of an expert system with working memory, inference engine, knowledge base, and user interface. The two main parts of the ESGuiscar-web are described as follows.

- The development environment is used to input expert knowledge into the expert system environment.
- The consulting environment used by non-expert users to gain knowledge.



**Fig. 2. Architecture of ESGuiscar-web.**

Figure 3 shows the performance process of the ESGuiscar-web application. When starting the application, users go to a login page. The users should then fill their registered username and password to be able to enter the main page. If the username and password do not match, the application will return to the login menu. If the login is successful, the main menu page, which contains choices of the menu list, will appear. On the menu page, the users can choose a list of existing services. For service changes and updates on the database system, the program user admin must log in first by filling in his or her username and password. For online testing of applications (ESGuiscar-web), functional testing is carried out by media experts, where the results are shown in Table 1.

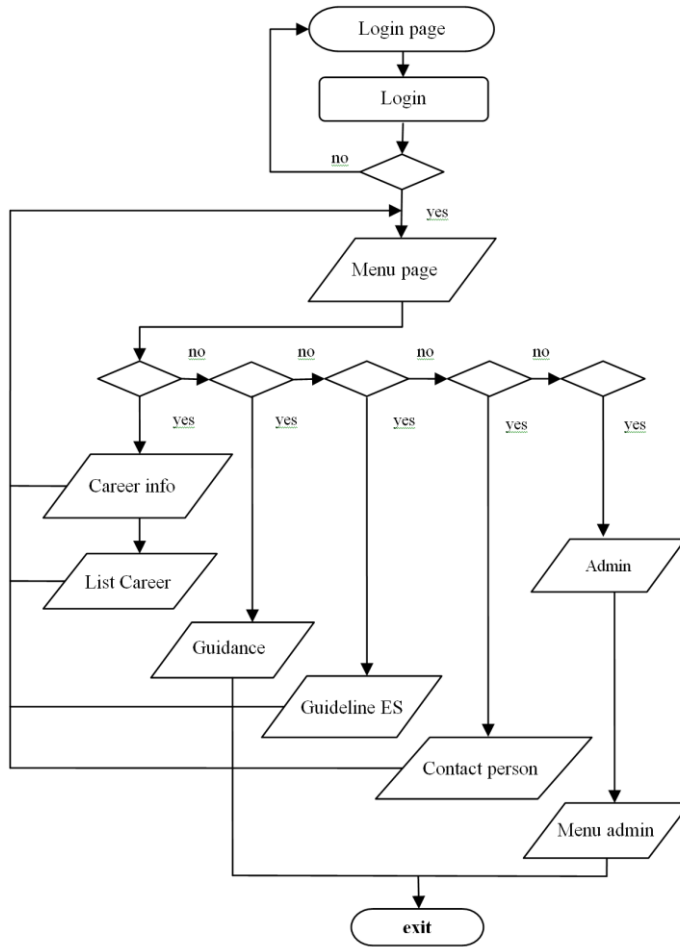


Fig. 3. Navigation/user flow chart diagram.

Table 1. Application testing results of ESGuiscar-web.

No	Test	Expected results	Test results	Ratification
1	ESGuiscar-web connection	User login page appears	Confirmed	✓
2	User login access	If working, going to the main page, if something wrong, going back on the login page	Confirmed	✓
3	Access career Info	Linked to the pages of career info menu	Confirmed	✓
4	Access career guidance	Connected to the pages of career guidance	Confirmed	✓
5	Access guideline ES	Connected to the guideline ES page	Confirmed	✓
6	Access contact person	Connected to the contact person page	Confirmed	✓
7	Admin access	Connected to database menu page	Confirmed	✓
<b>Conclusion</b>			Confirmed	Legitimate

Figure 4 shows the user login page where users enter a username and password. If successful, it will go to the main menu page and if it fails, the system will redirect to the login page. If the users want to leave the application, they can click the exit icon.

On the login page, the title “Expert System Bimbingan Karir Siswa” is an expert system of student career guidance.



Fig. 4. User login page.

### 3.2. Main navigation page

On the main menu, a page consisting of a list of choices is available. The list consists of daftar informasi karir (career information list), bimbingan (training), panduan ES (guidance), kontak person (contact person), and masuk admin (admin login) as shown in Fig. 5. Access to daftar informasi karir lists contains information on the three types of career: work, study, and entrepreneur, as shown in Fig. 6. Access to guidance as shown in Fig. 7 will serve the users in terms of independent career guidance. In this menu, the users should register to be able to enter the career guidance services option. After the users’ register, the system will display questions related to career interest. Their responses to the questions will be the references for the system to give them recommendations for career choices relevant to their interests. The results of the conclusions and recommendations are shown in Fig. 8.

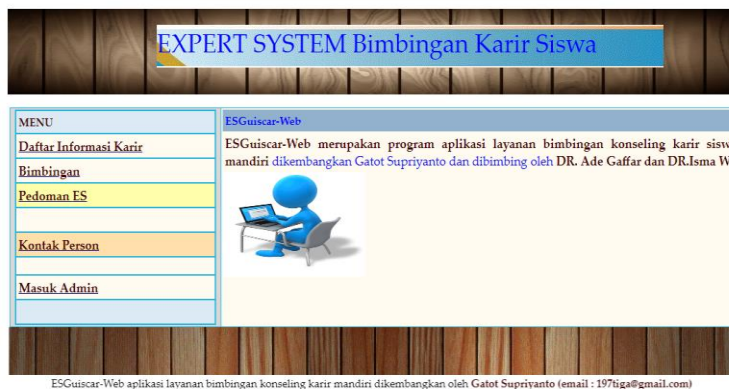


Fig. 5. Main menu.



Fig. 6. List of career information.



Fig. 7. User data fields.

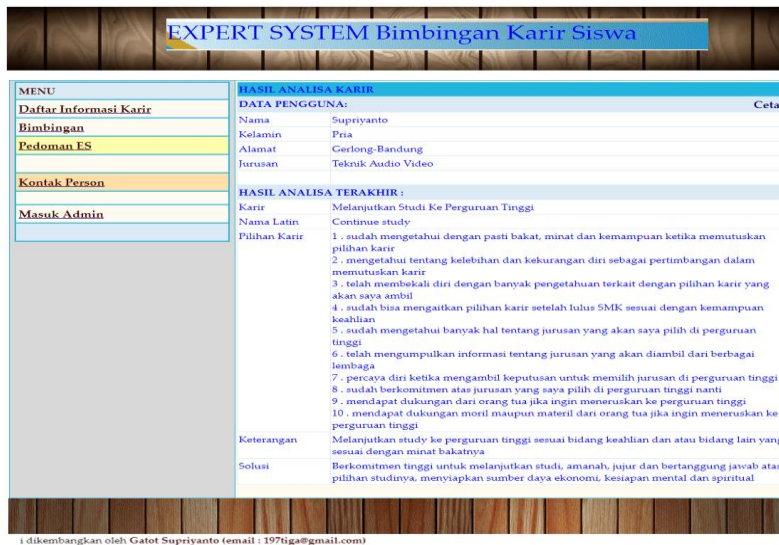


Fig. 8. Results of conclusions and system recommendations.

On the main menu page of the expert system title, bimbingan karir siswa is an expert system for student career guidance. List of daftar informasi karir is a list of career information, bimbingan is guidance, pedoman ES are Expert System



guidelines, kontak person functions as a user connects with a career guide and masuk admin is admin login. "ESGuiscar-Web merupakan aplikasi layanan bimbingan karir konseling siswa mandiri dikembangkan oleh Gatot Supriyanto" means the ESGuiscar-Web is an application for independent career guidance services, which is developed by Gatot Supriyanto.

On the career information list page, the title of daftar info karir is a list of career info. The halaman depan is a link to the main menu page, bekerja is the link to the working info page. The studi di PT links to the college information page and wirausaha is the link to the entrepreneur info page. All information on the bekerja, studi di PT, and wirausaha pages is in the form of display images related to their respective career fields.

Next access is the panduan ES, which contains the usage guide or the ESGuiscar-web tutorial as shown in Fig. 9. Kontak person functions as a user connection with a career guide as shown in Fig. 10. For admin access, the admin needs to log in using a username and password as well. After the login matches, the database page will appear. On this page, the admin user can add, subtract, and update new information that needs to be included in the ESGuiscar-web database system. After completing this process, the admin user can immediately exit (exit). Figure 11 shows the admin user login page and Fig. 12 shows the database main page.

On the panduan ES page, users can first read the user's guide to have a better understanding of the functions of ESGuiscar-Web. After that, the user can immediately take advantage of the ESGuiscar-Web application facility based on a list of available menu options. On the contact person page, halaman kontak is a contact page that can be used by users to contact career counsellors. Contacts that can be accessed are e-mails, blogs, and phones.



Fig. 9. User guide.

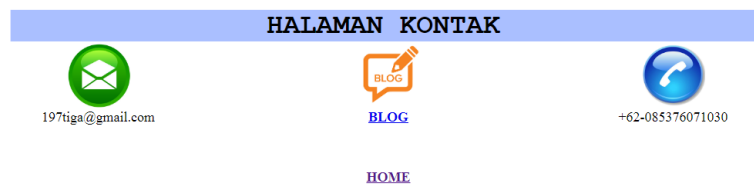


Fig. 10. Contact person.

LOGIN PAKAR	
Login User	: <input type="text"/>
Login Password	: <input type="password"/>
<input type="button" value="Login"/>	

[www.audiovideo-gt.blogspot.com](http://www.audiovideo-gt.blogspot.com)

**Fig. 11. Admin user login page.**

[ [Input Karir](#) | [Input Pilihan Karir](#) | [Input Relasi](#) ] [ [Ubah Karir](#) | [Ubah Pilihan Karir](#) ] [ [Lap Karir](#) | [Lap Pilihan Karir](#) ] [ [Logout](#) ]

DAFTAR SEMUA PILIHAN KARIR			
No	Nama Karir	Nama Latin	Pilihan
1	Bekerja	Work	<a href="#">Ubah</a>   <a href="#">Hapus</a>
2	Melanjutkan Studi Ke Perguruan Tinggi	Continue study	<a href="#">Ubah</a>   <a href="#">Hapus</a>
3	Berwirausaha	enterprenuer	<a href="#">Ubah</a>   <a href="#">Hapus</a>
			<a href="#">Tambah</a>

**Fig. 12. Main database menu page.**

The main database menu page consists of input karir, which serves to add desired career field data. Input pilihan karir is to see indicators of student career interest that function as questions that will be responded by students. Input relasi functions to design rules in advanced systems. Ubah karir is to edit career names and ubah pilihan karir is to edit career choices. Lap. karir contains information on career fields and lap pilihan karir consists of career field information relevant to indicators of student interests. Log out is a link to the admin user login page.

In this study, the importance of developing the software is highlighted. The reason behind the selection of web-based media is due to its practicality and friendliness. Almost all students today have access to the internet via both PC and smartphones. This makes it easy for them to be career guided by the expert system from anywhere because technology is presently ubiquitous. In addition, this type of technology is user-friendly to both teachers and students. All prospective users can adapt to the software. This goes a long way in motivating students to engage in independent career guidance. It is known that motivation is one of the important factors in independent career guidance [22].

The ESGuiscar-web application buttresses or strengthens career guidance that might be obtained from career experts at school and parents. According to Lent et al. [23], the ESGuiscar-web seeks to help students get the much-needed career guidance necessary for them to decide on, which career choices are suitable for their interests and potential.

One of the advantages of ESGuiscar-web is that students can access independent career guidance and see the extent to which, their interest is relevant to the fields of working, pursuing higher education, and building entrepreneurship. The results of independent career guidance carried out by students can then be used as material for further consultation with interested parties such as parents and school career counselling teachers. Students, teachers, and other people can access the ESGuiscar-web application anywhere and anytime as long as there is internet

connection. On the other hand, this advantage is also a weakness of the application because ESGuiscar-web is not a device that can guarantee the correctness of guidance services to the fullest. However, this system acts as a tool for students to explore their interests [24-26]. Gysbers and Henderson [27] mentioned that it is important for students to bring the results of their own career guidance to be consulted with parents and career guidance teachers at school.

## 5. Conclusion

The ESGuiscar-web application has been successfully developed. Its design utilizes several software builder applications such as: PHP, MySQL, Dreamwaver, CSS, Notepad ++, xampp. The ESGuiscar-web contains several menus, which contain career information list, guidance, ES guideline, contact person and login admin. The ESGuiscar-web tool has been tested and proven to work as planned. The results of career guidance services by ESGuiscar-web can be used as reinforcement when consulting with school career teachers and parents.

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