

# Career Master: A Decision Support System (DSS) for Guidance and Counseling in Nigeria.

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## ABSTRACT

The rate of students entering inappropriate disciplines in our tertiary institutions, especially Nigeria, is soaring. This invariably has caused the nation many unproductive and frustrated graduates. In view of this, there is a need to enhance the quality of service of the Guidance and Counseling Unit in Nigeria. This paper presents the development of a knowledge assistant (Decision Support System - DSS) for counselors to assist students in selecting the right discipline as they enter tertiary institutions, having considered the appropriate factors necessary for taking such decisions. Thus, the work which was carried out at the Department of Computer Science, Federal University of Technology, Akure, Nigeria was proposed for Secondary School "leaving students" who are likely to have a problem with their choice of carriers as they intend to study in at tertiary institutions of their choice.

The deployment of this work was discovered to have a high correlation with that of the conventional method of (using a human counselor) career counseling. It has the prospects of creating an unlimited accessibility to career guides for students and validated information on career suggestion by human counselors.

(Keywords: student counseling, counselors, academic discipline, DSS, career, guidance counseling)

## INTRODUCTION

Modern psychological therapies trace their history back to the work of Sigmund Freud in Vienna in the 1880s, when he developed a method of working with hysterical patients which he called

'psychoanalysis'. Alfred Adler, Sador Ferenczi, Karl Abraham, and Otto Rank were trained by him. In response to the US prejudice against lay therapists, Carl Rogers adopted the word 'counseling', which was originally used by social activist Frank Parsons in 1908 (Mulhauser, 2005).

The difference between counseling and psychotherapy is largely academic. Individuals from psychodynamic traditions sometimes liken 'psychoanalysis' and 'psychotherapy'. The two terms are commonly used interchangeably in the US, with the understandable exception of 'guidance counseling', which is often provided in educational settings and focuses on career and social issues.

People's reasons for seeing counselors are as diverse as people themselves. Often, clients have encountered upsetting experiences or situations, which they would like to talk about in a safe setting. These might include present circumstances of bereavement, separation, or other major life transitions, or experiences from the past, such as in childhood. Others seek help in dealing with specific psychological or behavioral traits, which they would like to amend, such as uncontrollable thoughts or difficulties relating to people.

Some people seek counseling to help them discover a general feeling that their lives are not quite right, or to deal with feelings of depression or anxiety. Still others look to counseling as part of their endeavor to realize or make meaning in their lives. Many people are attracted to counseling as a prospect to undertake personal development in a safe and encouraging environment. To crown it all, an individual does not necessarily need to have a 'problem' to find counseling useful.

Any individual that is not achieving set goals, irrespective of the level he has attained in the tertiary institution, may have been making wrong choices. Perhaps the student has allowed himself to be ruled by external forces (either parental or peer), or their set goals have not been high enough. Pragmatically, goals should be something a person passionately wants to realize. However, finding one in such a fix where set goals are not attained does not bring the world to an end; rather, the attention of a third party may be needed to resolve this situation.

Students need all facets of the career planning process including: finding ways to pursue passions, coming to understand interests and abilities, exploring financial and other types of post-secondary information, having help and support from trusting individuals, and obtaining detailed information about vocations and professions. Because students view school relationships as “quite or very helpful” to making career plans, educators who work with students in the area of career development (counselors, classroom teachers) need to continue to explore best practice related to career planning for their students.

A Counselor is usually the third party to be notified of a frustrating dilemma, for positive advice and consolation. Counselors help students identify their strengths and weaknesses by testing their Intelligence Quotient (I.Q.), skills, and ability and also identify their threats and opportunities, by analyzing their hobbies and background. The cumulative result assists the counselor in identifying a list of disciplines that will be appropriate for the student.

## **CAREER GUIDANCE AND COUNSELING: AN OVERVIEW**

The importance of addressing the career- and life-planning needs of children and adolescents has emerged as a prominent theme in studies over the years (Hiebert and Bezanson, 1995; Levin, 1995; Powlette and Young, 1996). Because of changes in the economy, in technology, and in attitudes of employers and employees, career development and career guidance are receiving increased attention.

Bimrose et al. (2004) assert that changes in the labor market (like globalization and the development of information technology) have

challenged the relevance of the established, narrow view of career transition as a one-off event at an early stage of an individual's development, replacing it with a broader understanding of how transitions into education, training, and employment are more complex, more prolonged, and often span lifetimes.

Contemporary definitions try to capture the implications of these changes for guidance. Two examples are those proposed both by the Organization for Economic Co-operation and Development (OECD, 2004) and the Council of the European Union (2004). Both emphasize the need for guidance to support multiple transitions over a prolonged time-span and neither make particular distinctions about the type of activities guidance involves. The OECD (2004) notes how terms like information, advice, and guidance, vocational guidance, vocational counseling, career counseling, and career development are used to refer to a range of activities, which they include within the term ‘career guidance’ (p.18) and defined as:

*Services intended to assist people of any age and at any point throughout their lives to make educational, training and occupational choices to manage their careers. Career guidance helps people to reflect on their ambitions, interests, qualifications and abilities. It helps them to understand the labour market and education systems, and to relate this to what they know about themselves.*

Comprehensive career guidance tries to teach people to plan and make decisions about work and learning. Career guidance makes information about the labor market and about educational opportunities more accessible by organizing it, systematizing it, and making it available when and where people need it (OECD, 2004, p.19). The Draft Resolution of the Council of the European Union (2004) defines guidance in the context of lifelong learning, referring to it as:

*...a range of activities that enables citizens of any age and at any point in their lives to identify their capacities, competences and interests, to make educational, training and occupations decisions and to manage their individual life paths in learning, work and other*

*settings in which these capacities and competences are learned and/or used.*

In contrast, a discussion document from the Department for Education and Skills in the UK on information, advice and guidance (DfES, 2003), distinguishes four separate levels of service provision: information, advice, guidance, and personal support. Within this framework of differentiated provision, information, and advice are distinguished from guidance and personal support. Guidance is defined as helping clients to: understand their own needs relating to learning and work; set and review goals/objectives for learning and work; understand their barriers to learning and work; overcome barriers/obstacles to learning and work; and to produce learning and career action plans (p.15).

In our world today, a successful career is an important component of a happy life. Gone are the days when jobs just meant a way to earn a living. Nowadays, people work not only for money but for the satisfaction that field of employment can bring. Hence, counselors are needed to advising secondary school leavers on the career, which suits their persons, with a key focus on their interests, capabilities and hobbies.

Peterson and Gonzalez (2000) emphasize the new relationship of work to the global economy, the interdependence of social, political and economic systems and the issues of multiculturalism and diversity. Similarly, within our high technology and information age, Hughey and Hughey (1999) assert that students need help in preparing for entry into the changing labor market.

Several authors (Herr, 2000; Watts, 1996) indicate that the new role of schools in advanced industrialized societies is to provide the foundation for lifelong career development. In fact, Herr (2000) concludes that there is a need to make all schooling more career relevant. In summary, the chief assertion of these authors is that students must be prepared to meet the challenges of the changing labor market and therefore career development must be a priority.

The ongoing rate of change and uncertainty that awaits students as they enter the working world requires that they be prepared for the new realities of the competitive labor market and reduced post secondary education options. As Van Esbroeck (2000) cautions, "without life-long

career counseling and guidance, there is a risk that many individuals will respond in a reactive rather than proactive way to the changes they face" (p. 52). The findings from studies conducted with students in their final year of high school until eighteen months after graduation suggest that the post high school transition is a time of personal stress and career turmoil (Borgen and Amundson, 2000). The data also support the assertion that individual career issues are important in the late-high school transition period.

Because the career aspects of the lives of high school graduates are no longer certain and cannot be taken for granted, adolescents who are navigating the perilous path of the transition to adulthood may also experience stress and disappointment related to career. Therefore career planning in schools must be a priority and there is a need to provide a system that is available 24 hours a day, 7 days a week for confused or desperate students at a cross-roads as well as a system that aids in the early submission of University Matriculation Examination (UME) forms.

Since expert counselors are scarce and unavailable all the time, a knowledge assistant (intelligent computer program) that operates as a Decision Support System (DSS) could be a right step in the right direction towards solving this global quandary.

## **THE DECISION SUPPORT SYSTEM (DSS)**

Decision-makers receive and analyze information using many different media, including traditional print, group and interpersonal information exchanges, and computer-based tools. One set of computer-based tools has been termed Decision Support Systems. For more than 30 years, researchers and Information Systems specialists have built and studied a wide variety of systems for supporting and informing decision-makers that they have called Decision Support Systems or Management Decision Systems (Scott Morton, 1971, Power, 2001).

The concept involved in Decision Support System (DSS) was first articulated in the early 1970's by Scott-Morton under the term management decision system. It was meant to be an adjunct to decision makers, to extend their capabilities but not to replace their judgments. They were aimed at decision where judgment was required, or at

decisions that could not be completely supported by algorithm. Sprague and Carlson (1982) defined DSS broadly as interactive computer based systems that help decision-makers use data and models to solve ill-structured, unstructured or semi-structured problems. A DSS could further be defined as an interactive computer-based systems, which help decision makers utilize data and models to solve unstructured problems (Gorry and Scott-Morton, 1971). Bonczek et al. (1981) argued that the "system must possess an interactive query facility, with a query language that is easy to learn and use ". Various types of DSS help decision-makers use and manipulate very large databases; some help managers apply checklists and rules; others make extensive use of mathematical models (Power, 1997).

Little (1970) also alleged that in order to be successful, such a system must be (1) simple, (2) robust, (3) easy to control, (4) adaptive, (5) complete on important issues, and (6) easy to communicate with. Many DDS are used to support an individual decision maker. However, many DSS researchers and practitioners (e.g., Keen (1980)) point out that the fundamental model of DSS – the lonely decision maker striding down the hall at high noon to make a decision – is true only for minor decisions. In most organizations, be they public or private, Japanese, European, or American, most major decisions are made collectively.

In making decisions collectively, one introduces a new dimension, namely the manner in which the group works together, communicates, and eventually arrives at a decision. This is a complicated process and it can be supported by computers. This is basically what is called group DSS. From those early days, it was recognized that DSS could be designed to support decision-makers at any level in an organization. DSS could support operations, financial management and strategic decision-making. DSS could use spatial data in a system like Geodata Analysis and Display System (GADS) (Grace, 1976), structured multidimensional data and unstructured documents (Swanson and Culnan, 1978).

Meador et al. (1984) asserted that many of the earlier DSS developed were institutionalized in nature, mainly owing to the high cost of developing a DSS for nonrecurring use. However, with the increased availability of general purpose DSS tools, with their steadily

decreasing costs and increasing capabilities, and with the appearance of DSS software for microcomputers, it is possible to build *ad hoc* DSS in an economically justifiable manner. Beginning in about 1990, Bill Inmon and Ralph Kimball actively promoted DSS built using relational database technologies. In 1995, data warehousing and the World Wide Web began to impact practitioners and academics interested in decision support technologies. Web-based and web-enabled DSS became feasible in about 1995 (Power, 2000; Bhargava and Power, 2001).

## **CONVENTIONAL SYSTEM OF CAREER COUNSELING**

Every counselor has a point of consultation: an office under an institution or a private owned office probably located in a section of his home. On visiting the counselor in any of these locations, the student is attended to, on the following scrutiny: (1) Collection of information from his/her personal data, (2) Determination of the students IQ strength, and (3) Consideration of external factors such as parental influence and peer pressure.

### **Collection of information from personal data.**

The content of this personal data include:

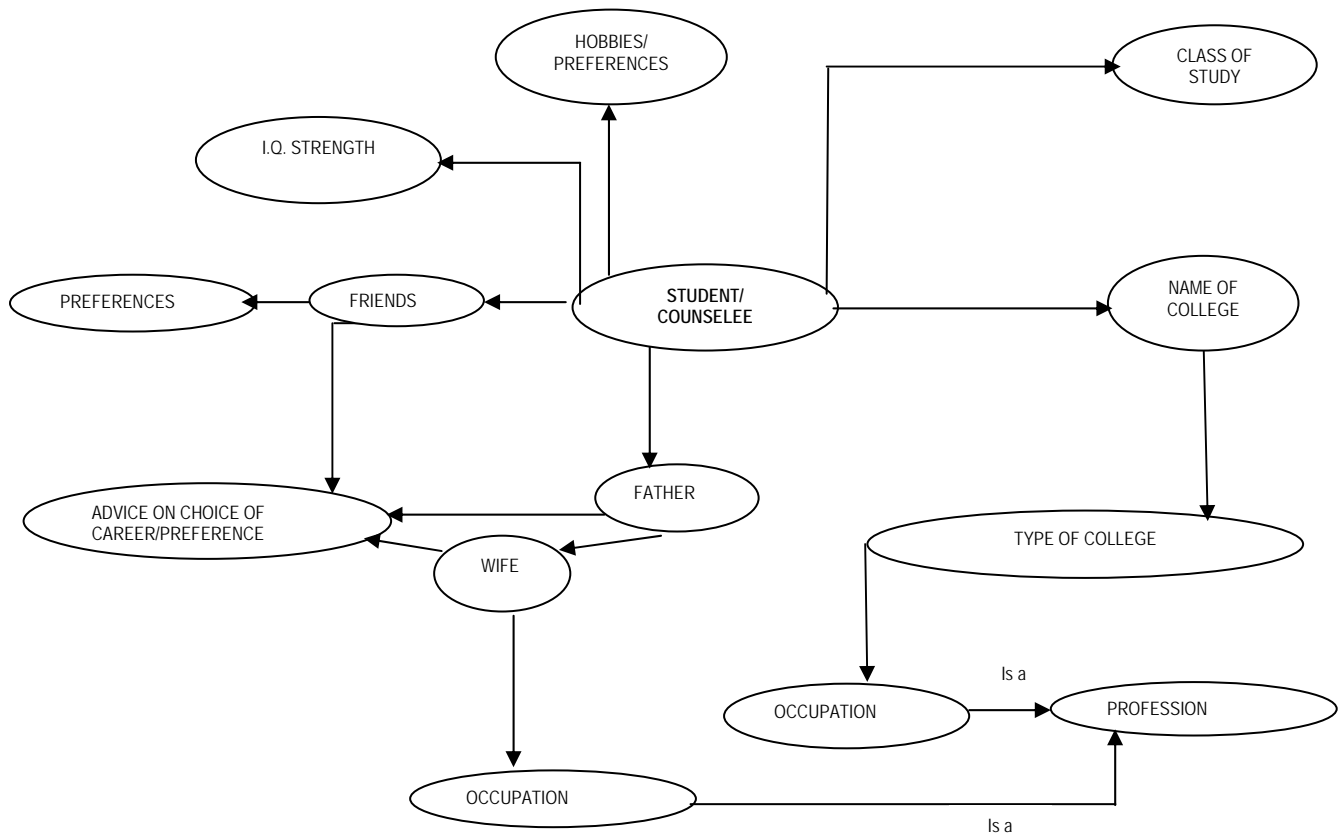
- a) Name of student
- b) Secondary school attended
- c) Level of study – either above or below SS3
- d) Class of study – Science, Art or Commercial

### **Determination of IQ strength.**

This is carried out by going through the student's academic record and asking him/her to honestly access his/her academic strength. A conclusion is then reached based on this analysis.

### **Consideration of External Factors.**

Eternal factors affecting a student's in decision should not be out looked to avoid tarnishing the image of the counseling unit. The process through which a student is guided to take decision on the choice of a career is hereby represented in Figure 1 by a semantic network which is the knowledge representation technique used for the implementation of this research.



**Figure 1: Semantic Network Diagram.**

## SYSTEM DEVELOPMENT APPROACH

The construction of a DSS, especially a large one, is a complicated process. It involves issues ranging from technical, such as hardware selection and networking, to behavioral, such as person – machine interfaces and the potential impact of DSS method on individuals and groups.

A comparative study of the various DSS development methodologies was compiled by Saxena (1992). He identified 32 different approaches, and discussed their major features and usability. Another surveyor, Arinza (1991) surveys the major methodologies used for DSS development. He analyzes them by structure in the decision making environment (see Figure 2). This structure serves as the architecture on which the project is modeled after.

## THE DATA MANAGEMENT SYSTEM

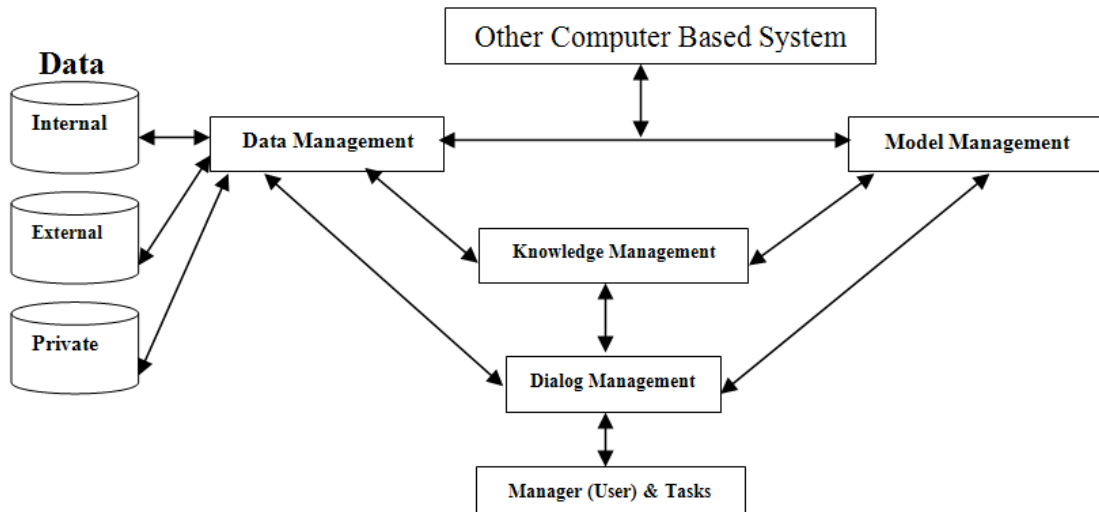
The Data management System is composed of the following elements:

- DSS database
- Database Management System
- Database directory
- Query facility

### Database

A database is a collection of interrelated data organized in such a way that it corresponds to the needs and structure of an organization and can be used by more than one person for more than one application.

The DSS (Career Master) system consists of four databases with table names: subject table, study table, pass table and course table. The subject table consists of all Art, Commercial, and Science subjects studied in Secondary schools. The study table consists of all the Study test questions used for the I.Q. assessment of the student. This table also contains the answers to those questions. The Pass table consists of the Password of the Administrator Form.



**Figure 2:** Conceptual Model of the DSS.

This enables the user to view, delete or update the courses or disciplines, O'Level subjects, and English comprehension for the study test. Changing the password is also made possible. The Course table consists of all courses studied in the Universities along side their explanation, or the services such disciplines render. It also consists of seven possible O'Level subject combinations, which match each course or discipline.

- Class\_Study [art, science, commercial]
- I.Q.\_Status [maths\_testresult, literature\_testresult]
- Personal\_Interest [favorite\_subjects, hobbies]
- Parents'\_Suggestions [field\_study, personal\_interest]
- Friends'\_Suggestions [field\_study, personal\_interest]

### Database Management System

The Data Management Subsystem of the proposed DSS is composed of the database, DBMS, data dictionary, and query facility. The data in the database comes from three generalized sources: internal data, which is mainly from within the Guidance and Counseling Unit; the external data, which is mainly from outside the unit or organization; and the private data, which comes as a guideline used by the human counselor to access specific data and situations.

However, a Relational Data Base Management System (RDBMS) is better suited for DSS because their records contain pre-defined links to associated records in other files. This provides greater flexibility in retrieval of data. The relational database supported by this system includes:

- Bio\_Data [personal\_id, name, school, level\_study]

### The Query Facility

The query facility element provides the basis for access to data. It accepts requests for data, determine how these request can be filled, formulates the detailed requests and returns the results to the issues of the request. The query facility includes a special query language. In the system, the query facility works with Expert System's Production Rules to return the DSS suggestions of possible disciplines to clients. An example of this rule is:

```

IF student's I.Q. Test is poor or fair
Collect all the courses suggested by DSS
From initially selected O'Level subjects
Else
IF student's I.Q. Test result is excellent or good
Go to the Knowledgebase and
  
```

Select Art, Science or Commercial-inclined courses

Then DISPLAY

### **The Directory**

The data directory is a catalog of all the data in the database. It contains the data definitions and its main function is to answer questions about the availability of data items, their source, or their exact meaning. The directory is especially appropriate for supporting the intelligence phase of the decision making process by helping to scan data and identify problem areas or opportunities. The directory supports the addition of new entries, deletion of entries and retrieval of information on specific object.

### **THE MODEL MANAGEMENT SUBSYSTEM**

The model management subsystem of the DSS is composed of the model base, model base management system, modeling language, model directory and model execution, integration and command processor. Model base contains routine and special statistical, counseling models, management, science, and other quantitative models that provide the analysis capabilities for the DSS. The model supported by this DSS is analyzed as follows:

Domain Set

Class = {art, science, commercial}

Age (years) = {18, 19, 20, 21, 22, ...}

I.Q. Test = {mathematics, literature}

Hobby = {talent, skill, interest}

Friends' suggestions = {field of study, personal interest}

Parents' suggestions = {field of study, personal interest}

A student  $S_{i,j}$  finishes secondary school at age  $i$  and in about  $j$  years later, the student  $S_{i,j}$  wants to fill his or her JAMB form. Thus, he or she needs a discipline of study. It is therefore the duty of the Counselor to consider basically the I.Q. strength and parents' suggestions.

Let  $\lambda_n$  represent the I.Q. strength of  $S_{i,j}$

$\theta_n$  represent the parents' suggestion for  $S_{i,j}$

If  $S_{i,j}$  has a high  $\lambda_n$  and  $\theta_n$  correlates with  $\lambda_n$ ,

Then  $\lambda_n \equiv \theta_n$

If  $S_{i,j}$  has a low  $\lambda_n$  and  $\theta_n$  does not correlate with  $\lambda_n$ ,

Then  $\lambda_n \neq \theta_n$

Considering other factors such as hobby and friends' suggestions for  $S_{i,j}$ :

Let  $\alpha$  represent the hobby of  $S_{i,j}$

$\beta$  represent the friends' suggestions for  $S_{i,j}$

If  $\lambda_n$  correlates with  $\alpha$ ,

Then  $\lambda_n \equiv \alpha$  and  $\alpha$  can thus be included in DSS suggestions

If  $\lambda_n$  does not correlate with  $\alpha$ ,

Then  $\lambda_n \neq \alpha$  and  $\alpha$  will be discarded from DSS suggestions

If  $\lambda_n$  correlates with  $\beta$ ,

Then  $\lambda_n \equiv \beta$  and  $\beta$  can thus be included in DSS suggestions

If  $\lambda_n$  does not correlate with  $\beta$ ,

Then  $\lambda_n \neq \beta$

Therefore, the Matrix  $K_{i,j}$  can be generated as :

$$K_{i,j} = \begin{pmatrix} \lambda_{1,1} & \theta_{1,2} \\ \lambda_{2,1} & \theta_{2,2} \\ \dots & \\ \dots & \\ \lambda_{x,n} & \theta_{x,n+1} \end{pmatrix}$$

The Matrix  $P_{i,j}$  can then be generated as follows:

$$P_{i,j} = \begin{pmatrix} \lambda_{1,1} & \alpha_{1,2} & \beta_{1,3} \\ \lambda_{2,1} & \alpha_{2,2} & \beta_{2,3} \\ \lambda_{3,1} & \alpha_{3,2} & \beta_{3,3} \\ \dots & & \\ \dots & & \\ \lambda_{x,n} & \alpha_{x,n+1} & \beta_{x,n+1} \end{pmatrix}$$

### The Knowledge Subsystem

Many unstructured and semi-structured problems are so complex that they require expertise for their solution in addition to the regular DSS capabilities. Such an expertise can be provided by an expert system. Therefore, the more advanced DSS are equipped with a component that we call knowledge management.

To solve complex problems of clients with clashing subject combinations, hobbies, friends' and parents' suggestions, this system makes use of certain production rules in its rule base. Among which are:

- *IF student's I.Q. Test is poor or fair*  
*Collect all the courses suggested by DSS*  
*From initially selected O'Level subjects*  
*Else*  
*IF student's I.Q. Test result is excellent or good*  
*Go to the Knowledgebase and*  
*Select Art, Science or Commercial-inclined courses*  
*Then DISPLAY*

Using parents' suggestion as (p) and friends' suggestions as (f):

- *IF p is in DSS I.Q. result*  
*Then Select and print p.corelated*  
*And discard the other courses*  
*Else*  
*Print suggested by p*  
*And keep DSS I.Q. result*

- *IF Maths result is fair or poor*

*Keep DSS subject result*

*Else*

*Search for Maths inclined Art,*

*Science or Commercial courses*

*And DISPLAY*

- *IF English result is fair or poor*

*Keep DSS subject result*

*Else*

*Search for English inclined Art,*

*Science or Commercial courses*

*And DISPLAY*

### The Dialog Subsystem

The dialog component of a DSS is the software and hardware that provides the user interface for DSS. The term user interface covers all aspects of the communications between a user and the DSS. It includes not only the hardware and software, but also factors that deal with ease of use, accessibility, and human-machine interactions.

In this work, the dialogue components include: the text boxes for input of client's name and school; option buttons for client's class and level of study; list boxes for displaying course lists to clients; and command buttons for knowing client's selection, asking the DSS for reasons for asking questions and adding selections to list of courses for comparison by the DSS. A pictorial representation is shown in Figure 3.

### **HIERARCHICAL DESIGN OF THE SYSTEM**

The main processing activities of the system were identified during the analysis of the existing system. Activities such as student registration and development processing were explicit in the exiting system. These activities were refined and broken down into modules as depicted in Figure 4.



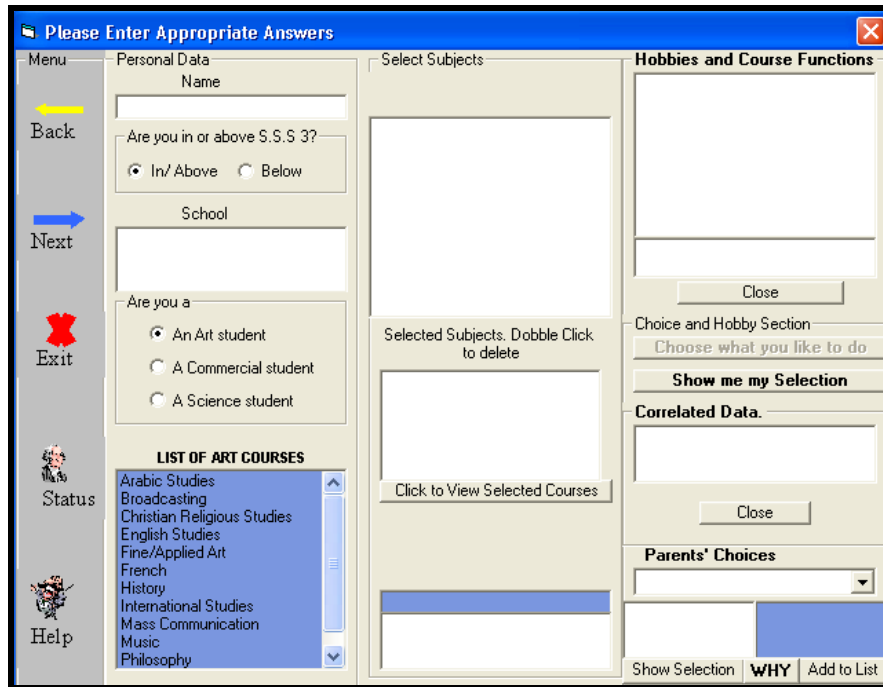


Figure 3: DSS User Interface Subsystem.

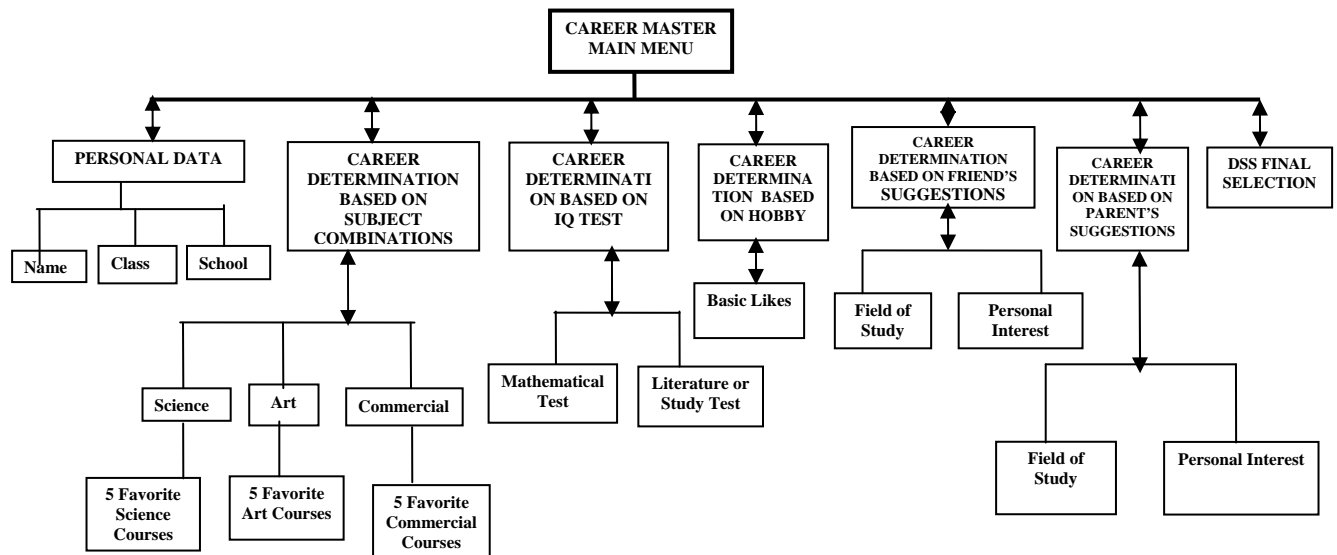


Figure 4: Hierarchical Design of Career Master.

### LANGUAGE OF IMPLEMENTATION

The system is implemented on the platform of Visual Basic (Version 6.0), an object-oriented programming language. Visual Basic is an easy-to-use programming language with enhanced human-computer interface. This interface is

similar to that provided by window application and thus any user already familiar with windows can easily handle Visual Basic applications. Database manipulation is another powerful feature of Visual Basic that makes it suitable for this paper. Visual Basic also allows for scalability, a feature which supports incremental delivery. The purpose of this

paper is to produce a prototype copy of the software, which will later evolve to the final product. Scalability therefore, satisfies this need as additions to modules can be made without destroying the structure of the application. With scalability many versions of the software can be released at different times.

### FEATURES OF THE SOFTWARE PRODUCT

The following qualities are inherent in the software product:

i. **Anticipation of Change:** the fact that the Human Counseling scheme is dynamic calls for the need for software that can accommodate changes over time. The principle of anticipation of change allows identifying areas where changes are likely to occur. To deal with these changes, the database structure used allows the system administrator to constantly update items like available subjects, disciplines, hobbies, etc. The software recognizes the different criteria for deciding on a suitable discipline of study for the student.

- ii. **Data Validity:** this is the level of acceptability of data by a system. Codes that check for errors were built into the module that gets user's input. For example, the system validates the student's number of favorite subjects to ensure that they do not exceed the specified amount.
- iii. **End-user Interface:** the system is user friendly as users can click on various options representing what they want to do. More so, a help facility for each step is provided.
- iv. **Controlled Data Access:** Access to data is controlled throughout the system. There is need to identify people using such information to prevent unauthorized users from tampering with the data and knowledge bases. Hence the system identifies the Administrator as the only authorized user, using a password.

**Starting the System:** To use the system, after reading the instructions on the Welcome Screen, the user clicks on the "Next" button, which takes him to the Personal Data Form. This is depicted in Figure 5.

Figure 5: Filling the Forms.

This phase is achieved by clicking the “Next” button on the left side of the form.

On clicking the “Next” button, the user is taken to the test environment as depicted in Figure 6. When the radio button for the Mathematical test is checked, the test form appears. The user clicks the “Start” button to start the test; supplies the answers and clicks on the “Mark” button to determine his score. The user clicks on the “Next” button to proceed to another phase where he answers the questions and clicks on the “Mark” button to view the results.

After the study test, the DSS takes its client to the next phase to determine his hobbies, friends’ and parents’ suggestions. These windows are however enabled when the client closes the correlated data window which appears on the form as shown in Figure 7.

On closing the correlated data window (which shows DSS’ suggestion so far), the other questions become enabled. On subsequent filling of the form, that is, after filling the Parents’ suggestion column, the user is expected to click the ADD TO LIST button as done in the Friends’ suggestion column. This is the final result form which is depicted in Figure 8.

Another part of the output of the DSS is the explanation capability or justifier, which gives reasons for questions asked and decisions arrived at. A screenshot is also shown in Figure 9. The dialog box beside figure 9 was displayed as a result of the user clicking on the **WHY** button beside “Your Mathematical Ability”. It portrayed the inference rule used by DSS in taking its decision.

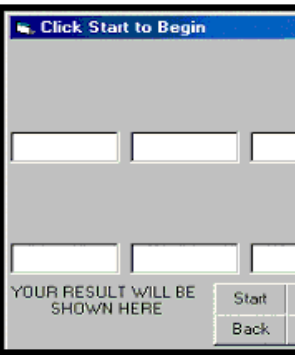
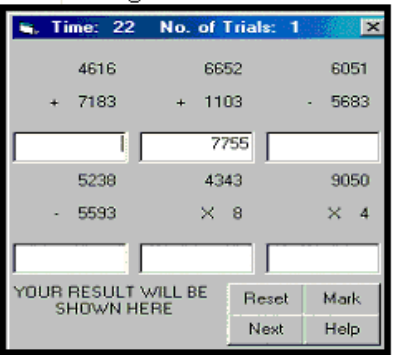
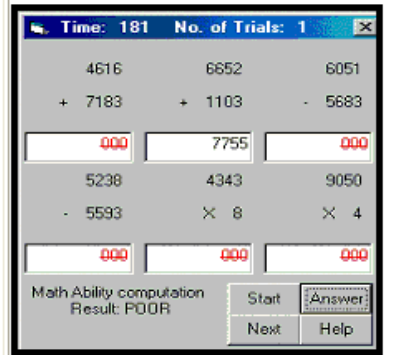
<b>MATHS TEST FORM</b>		
<b>This is the section where the user will be tested mathematically in order to find out if he has a mathematically inclined brain or not.</b>		
Form before activation	Form During Execution	Form after it has been marked
		
<input type="button" value="Back to Main Form"/>	<input type="button" value="End"/>	<input type="button" value="To English Form"/>
<p>Immediately you Access the Maths Section, the form will be presented to in the format shown above. Click the <b>START</b> button to display your questions. This questions will be changed each time you access this form.</p>	<p>Clicking the <b>START</b> button will enable the <b>MARK</b> button, Change the <b>START</b> button to <b>RESET</b> and the <b>BACK</b> button to <b>NEXT</b> or <b>NEXT2</b> as the case maybe</p> <p>Clicking on the <b>RESET</b> button will Reset the Questions, thus giving you another Opportunity but reducing the possibility of having an <b>EXCELLENT</b></p>	<p>Click on the <b>MARK</b> button to mark the answer you have entered.</p> <p>Clicking on thge <b>MARK</b> button will change it's Caption <b>ANSWER</b>. Click on it to display the correct answers, most especially if you are disputing the system's result</p> <p><b>NEXT</b> will take you to the <b>ENGLISH</b> section i.e it has not been</p>

Figure 6: The Mathematical Test Form.

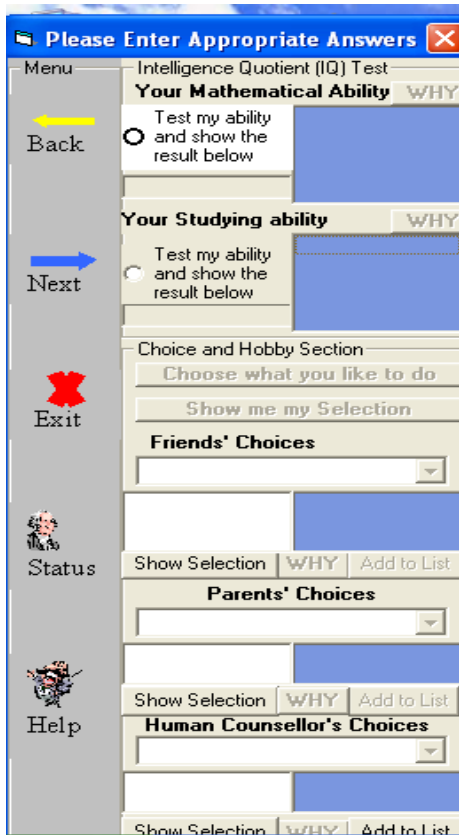


Figure 7: Determining Hobbies, Friends', Parents', and Human Counselor's Suggestions.

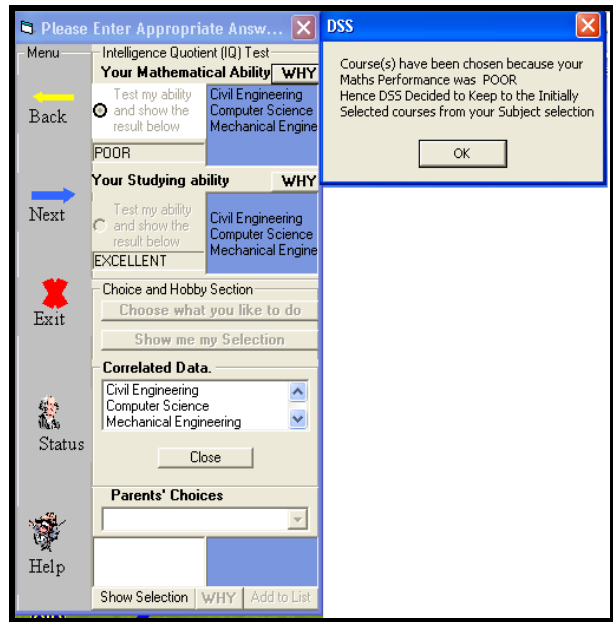


Figure 9: Justifier View.

## RESULTS AND FINDINGS

The analysis of results from the implementation of the DSS compared with the findings from the output generated as a result of interactions with human counselors are hereby presented in the table below.

DECISION SUPPORT SYSTEM USER STATUS			
CLICK HERE TO VIEW DSS FINAL RESULT HELP SECTION			
<b>Name</b> Ada  <b>Class</b> Below S.S.S 3  <b>School</b> I.S.L  <b>Class Type</b> COMMERCIAL	<b>Selected Subjects</b> Commerce Accouts Government Literaure Christian Religious Knowledge	<b>Mathematics Result</b> FAIR  <b>DSS Maths Selected Subjects</b> Accountacy/Accounting Public Administration	<b>My Selection</b> Public Administration  <b>Friend Selection</b> Accountacy/Accounting  <b>Parent Selection</b> Public Administration  <b>Result</b> Public Administration MY SELECTION Electrical Engineering FRIENDS' SELECTION Accountacy/Accounting  PARENTS' SELECTION Public Administration
<b>Class Type Selected courses</b> Accountacy/Accounting Actural Science Banking/Finance Business Administration Mana Hotel Administration Insurance International Relations Management Information Sys Marketing Personnel Management Public Administration Secretarial Administration	<b>Subject Selected Courses</b> Accountacy/Accounting Public Administration	<b>English Result</b> EXCELLENT  <b>DSS English Selected Subjects</b> Public Administration	

Figure 8: Final Results Form.

**Table 1: Analysis Results.**

Individual Student Reference Number	Class Category	Maths Result	Parental Choice	Friends Choice	Students Interest Choice	Human Counselor Choice	DSS Selected Course	Correlation Btwn Student Human Counselor	Correlation Btwn Human Counselor Career Master Choice
1	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
2	ART	FAIR	Law	Law	Commerce, Law	Law	Accountancy/Accounting, Banking/Finance, Insurance	Very High	Low
3	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
4	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
5	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Electrical Engineering	Civil Engineering, Computer Science, Mechanical Engineering	Vey High	High
6	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	Low	Low
7	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	Low	Low
8	ART	POOR	Law	Theatre Arts	Commerce, Law	Law	Accountancy/Accounting, Banking/Finance, Insurance	Very High	Very High
9	SCIENCE	FAIR	Civil Engineering	Electrical Engineering	Medicine and Surgery	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	High	Low
10	ART	POOR	Law	Theatre Arts	Commerce, Law	Law	Accountancy/Accounting, Banking/Finance, Insurance	Very High	Very High
11	SCIENCE	POOR	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Biochemistry	Computer Science, Petro-Chemical Engineering, Biochemistry	Average	Very High
12	SCIENCE	FAIR	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Biochemistry	Computer Science, Petro-Chemical Engineering, Biochemistry	Average	Very High
13	SCIENCE	POOR	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Biochemistry	Computer Science, Petro-Chemical Engineering, Biochemistry	Average	Very High
14	SCIENCE	EXCELLENT	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Biochemistry	Computer Science, Petro-Chemical Engineering, Biochemistry	Average	Very High
15	SCIENCE	EXCELLENT	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Biochemistry	Computer Science, Petro-Chemical Engineering, Biochemistry	Average	Very High
16	SCIENCE	FAIR	Medicine and Surgery	Architecture,	Quantity Surveying	Architecture	Quantity Surveying	High	Average
17	ART	POOR	Law	Law	Commerce, Law	English Studies	Accountancy/Accounting, Banking/Finance, Insurance	High	Average
18	ART	POOR	Law	Law	Commerce, Law	English Studies	Accountancy/Accounting, Banking/Finance, Insurance	High	Average
19	ART	FAIR	Law	Law	Commerce, Law	English Studies	Accountancy/Accounting, Banking/Finance, Insurance	High	Average
20	SCIENCE	FAIR	Estate Management	Biochemistry	Quantity Surveying	Estate Management	Architecture, Quantity Surveying	High	High
21	SCIENCE	POOR	Architecture	Biochemistry	Quantity Surveying	Estate Management	Architecture, Quantity Surveying	High	High
22	SCIENCE	POOR	Estate Management	Biochemistry	Quantity Surveying	Estate Management	Architecture, Quantity Surveying	High	High
23	ART	POOR	Law	Law	Mass Comm.	English Studies	Personnel Management, English Studies, Public Administration	High	Very High
24	SCIENCE	FAIR	Estate Management	Biochemistry	Quantity Surveying	Estate Management	Architecture, Quantity Surveying	High	High
25	SCIENCE	FAIR	Medicine and Surgery	Medicine and Surgery	Medicine and Surgery	Pharmacy,	Civil Engineering, Computer Science, Mechanical Engineering	High	Low
26	ART	POOR	Mechanical Engineering,,	Mechanical Engineering,,	Quantity Surveying,	Estate Management	Management Information System, Personnel Management	High	Low

Individual Student Reference Number	Class Category	Maths Result	Parental Choice	Friends Choice	Students Interest Choice	Human Counselor Choice	DSS Selected Course	Correlation Btwn Student Human Counselor	Correlation Btwn Human Counselor Career Master Choice
27	SCIENCE	POOR	Medicine and Surgery	Applied Geology	Applied Geophysics, Applied Geology	Actuarial Science	Architecture, Computer Science, Mechanical Engineering	Low	Low
28	SCIENCE	FAIR	Electrical Engineering, Medicine and Surgery	Electrical Engineering	Medicine and Surgery	Medicine and Surgery	Civil Engineering, Computer Science, Mechanical Engineering	Very High	Very High
29	ART	FAIR	Law	Law	Mass Comm.	Insurance, International Studies	Christian Religious Studies, Law, Public Administration	High	Very High
30	ART	FAIR	Law	Law	Mass Comm.	Law	Accountancy/Accounting, Banking/Finance, Insurance	High	Very High
31	SCIENCE	FAIR	Electrical Engineering	Applied Geology	Electrical Engineering	Applied Geology	Applied Geology, Computer Science, Mechanical Engineering	Low	Very High
32	ART	POOR	Fine/Applied Art,	Accountancy/Accounting,	Computer Science,	Accountancy/Accounting,	Accountancy/Accounting, Banking/Finance, Insurance	Low	Very High
33	SCIENCE	FAIR	Electrical Engineering	Applied Geology	Electrical Engineering	Applied Geology	Applied Geology, Civil Engineering, Mechanical Engineering	Low	Very High
34	SCIENCE	FAIR	Electrical Engineering	Applied Geophysics	Electrical Engineering	Applied Geology	Applied Geology, Civil Engineering, Mechanical Engineering	Low	Very High
35	ART	POOR	Fine/Applied Art	Accountancy/Accounting	Computer Science	Accountancy/Accounting	Accountancy/Accounting, Banking/Finance, Insurance	Low	Very High
36	SCIENCE	FAIR	Electrical Engineering	Applied Geology	Electrical Engineering	Applied Geology	Applied Geology, Civil Engineering, Computer Science	Low	Very High
37	SCIENCE	FAIR	Electrical Engineering	Applied Geology	Electrical Engineering	Applied Geology	Applied Geology, Civil Engineering, Mechanical Engineering	Low	Very High
38	ART	FAIR	Fine/Applied Art	Accountancy/Accounting	Computer Science	Accountancy/Accounting	Accountancy/Accounting, Banking/Finance, Insurance	Low	Very High
39	ART	FAIR	Law	Law	Mass Comm.	Insurance, International Studies	Christian Religious Studies, Law, Public Administration,	High	Very High
40	ART	FAIR	Law	Law	Mass Comm.	Insurance, International Studies	Accountancy/Accounting, Christian Religious Studies, Public Administration	High	Very High
41	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
42	ART	FAIR	Law	Law	Commerce, Law	Law	Accountancy/Accounting, Banking/Finance, Insurance	Very High	Low
43	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
44	SCIENCE	FAIR	Mechanical Engineering	Civil Engineering	Electrical Engineering	Computer Science	Civil Engineering, Computer Science, Mechanical Engineering	Low	Very High
45	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Electrical Engineering	Civil Engineering, Computer Science, Mechanical Engineering	Vey High	High
46	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	Low	Low
47	SCIENCE	GOOD	Applied Geology	Medicine and Surgery	Electrical Engineering	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	Low	Low
48	ART	POOR	Law	Theatre Arts	Commerce, Law	Law	Accountancy/Accounting, Personnel Management, Public Administration	Very High	Very High
49	SCIENCE	FAIR	Civil Engineering	Electrical Engineering	Medicine and Surgery	Pharmacy	Civil Engineering, Computer Science, Mechanical Engineering	High	Low
50	ART	POOR	Law	Theatre Arts	Commerce, Law	Law	Accountancy/Accounting, Personnel Management, Public Administration	Very High	Very High

The Federal University of Technology, Secondary Staff Secondary School was used as a case study with the DSS.

The students were writing their final and National Secondary School Examination for 2006/2007 academic session. Applying the Set Theory to the result of the table, the following were the correlation outcomes .

**Correlations:**

Very High Implies if DSS or Student Interest  
 ≡ Human Counselor Choice

High Implies if DSS or Student Interest  
 € Human Counselor Choice

Average Implies if DSS or Student Interest are in the same category with Human Counselor

Low Implies if DSS or Student Interest  
 ≠ Human Counselor Choice

**CHECKING THE DEGREE OF CORRELATION**

The following values are assumed because the “Choices” cannot be quantified.

- Low ≡ 5 for x and y
- Average ≡ 10 for x and y
- High ≡ 15 for x and y
- Very High ≡ 20 for x and y

Using the Correlation formula:

$$R = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{(N\sum x^2 - (\sum x)^2)(N\sum y^2 - (\sum y)^2)}}$$

x	y	xy	x <sup>2</sup>	y <sup>2</sup>
5	5	25	25	25
10	10	100	100	100
15	15	225	225	225
20	20	400	400	400
50	50	750	750	750

Correlation should be 1 ≤ R ≤ -1

Where, N = population/samples } Student/Human Counselor Correlation  
 X = Student Interest Choice }  
 Y = Human Counselor Choice }  
 x = Human Counselor Choice } DSS/Human Counselor Correlation  
 y = DSS Choice }

Thus,

$$R = \frac{50 \times 750 - 50 \times 50}{\sqrt{(50 \times 750 - (50)^2)(50 \times 750 - (50)^2)}}$$

$$R = \frac{37500 - 2500}{\sqrt{(37500 - 2500)(37500 - 2500)}}$$

$$R = \frac{37500}{\sqrt{(37500)(37500)}}$$

$$R = 1$$

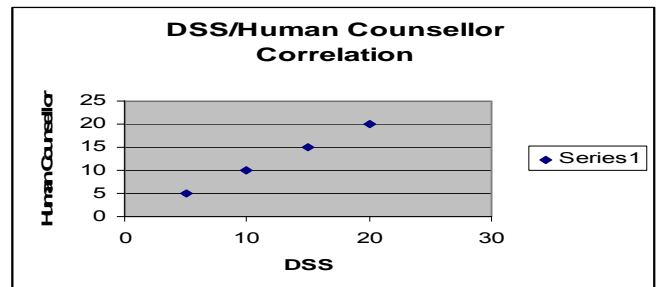
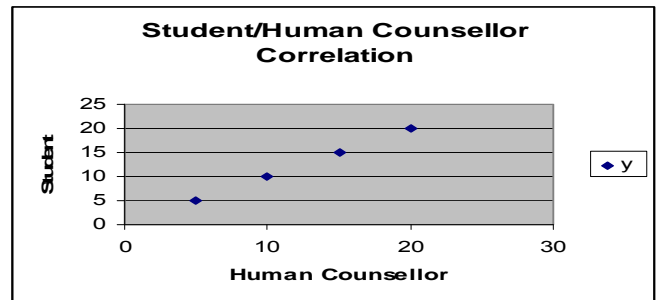


Figure 10 a and b: Correlation Data.

**CONCLUSION AND FURTHER RESEARCH DIRECTION**

In Nigeria and most countries of the world, statistics have shown that many students in higher education institutions are in the wrong academic choice. The reasons for this are not far-fetched; some of these are poor advisement by counselors, advice and wishes of parents, peer pressure from colleagues, and a host of other reasons.

This paper thus discussed the design and the result of implementation of a Decision Support System for proper guidance and counseling of students, especially those leaving the secondary

school, to guide and suggest a list of best courses that could be pursued in the tertiary institution. These suggestions are however based on some basic parameters used by human counselors such as: Intelligence Quotient, hobbies, parents' and friends' influences, etc.

The system is at present designed for the desktop of the counselors to enhance the duty of choosing the best and most appropriate discipline for clients. The development of the system suffered some setbacks in the acquisition pre-requisite data needed for justification, but eventually a particular model was chosen and used for the work.

We also present an appraisal of the implementation of this research by comparing it with the conventional method of caring out career counseling. The observed high correlation between the two thus justifies the study. We hope to expand this work so that it could be used by students themselves as well as been deployed over the Internet so as to allow students all over the world assess themselves and come out with the best choice of career before getting into higher institutions. This is consistent with the fact that "to derive the educational benefit, students must do the self assessment, reflection, and analysis themselves" (Blustein, 1997).

Teachers and counselors in turn play the role of facilitator, guide, mentor, and collaborator as they lead the students through the process, not make the choice for them. This will enhance a change from the teacher-centered/counselor-centered approach of career counseling to the career development model that emphasizes self-exploration and the development of lifelong exploratory attitudes.

## REFERENCES

1. Arinza, B. 1991. "A Contingency Model of DSS Development Methodology". *Journal of MIS*. 15: 503-522.
2. Bhargava, H. and D. J. 2001. "Power. Decision Support Systems and Web Technologies: A Status Report". Proceedings of the 2001 Americas Conference on Information Systems, Boston, MA, August 3 - 5, 2001.
3. Bimrose, J., Barnes, S., Hughes, D., and Orton M. 2004. "What is Effective Guidance? Evidence from Longitudinal Case Studies in England". Institute for Employment Research, University of Warwick: Warwick, UK.
4. Blustein, D. 1997. "A Context-Rich Perspective of Career Exploration Across the Life Roles". *The Career Development Quarterly*. 45:260-274.
5. Bonczek, R.H., C.W. Holsapple, and A.B. Whinston. 1981. "The Evolving Roles of Models in Decision Support Systems". *Decision Sciences*. 11(2).
6. Borgen, W. and Amundson, N. 2000. "Youth Unemployment and the Transition from High School". *Educational and Vocational Guidance*. 24: 32-43.
7. Council of the European Union. 2004. "Draft Resolution of the Council on the Representatives of the Governments of the Member States meeting within the Council on Strengthening Policies, Systems and Practices in their field of Guidance throughout life in Europe". CEU: Brussels, Belgium.
8. DfES. 2003. "Information, Advice and Guidance for Adults. Towards a National Policy Framework: Discussion Document". DfES: Sheffield.
9. Gorry, G.A. and M.S. Scott-Morton. 1971. "A Framework for Management Information Systems". *Sloan Management Review*. 13(1).
10. Grace, B.F. 1976. "Training Users of a Decision Support System". IBM Research Report RJ1790, IBM Thomas J. Watson Research Laboratory, May 31, 1976.
11. Herr, E. 2000. Preparation for the World of Work. Paper presented at the International symposium for Career development and Public Policy, Ottawa, Can. Available online:<http://www.contactpoint.ca>.
12. Hiebert, B. and Bezanson, L. 1995. "On the Horizon: Important Future Directions for Career Development". In: B. Hiebert (ed.). *Exemplary Career Development Programs & Practices: The Best from Canada*. ERIC/CASS:Greensboro, NC.
13. Hughey, K. and Hughey, J. 1999. "Preparing Students for the Future: Making Career Development a Priority". *Journal of Career Development*. 25: 203-216.
14. Keen, P.G.W. 1980. "Adaptive Design for Decision Support Systems." *Data Base*. 12(1 and 2).
15. Levin, B. 1995. "How Can Schools Respond to Changes in Work?" *Canadian Vocational Journal*, 69-81.



16. Little, J.D.C. 1970. "Models and Managers: The Concept of a Decision Calculus". *Management Science*. 16(8).
17. Meador, C.L., et al. 1984. "Setting Priorities for DSS Development." *MIS Quarterly*. June.
18. Mulhauser, G. 2005. "Counseling & Psychotherapy Bibliography – Part Four". Retrieved September 1, 2006, from <http://counsellingresource.com/bibliography/biblio-4.html>
19. OECD. 2004. "Career Guidance and Public Policy: Bridging the Gap". OECD. Graduate School of Business Administration, Harvard University: Boston, MA.
20. Peterson, N. and Gonzalez, R. 2000. *The Role of Work in People's Lives: Applied Career Counseling and Vocational Psychology*. Wadsworth/Thompson Learning: Belmont, CA.
21. Power, D.J. 1997. "What is a DSS?" *DS\*Star, The On-Line Executive Journal for Data-Intensive Decision Support*. 1(3). <http://dssresources.com/papers/whatisadss>
22. Power, D.J. 2000. "Web-Based and Model-Driven Decision Support Systems: Concepts and Issues". *Proceedings of the 2000 Americas Conference on Information Systems*. Long Beach, CA. August 10-13, 2000.
23. Power, D.J. 2001. "Supporting Decision-Makers: An Expanded Framework". *Informing Science*. 431-436.
24. Powlette, N. and Young, D. 1996. "Career and Other Factors Influencing Postsecondary Decisions: Survey of high school students in Alberta, Canada:." <http://www.scholar.lib.vt.edu/ejournals/JTS?Summer-Fall-1996/PDF/6-Powlette-Young.pdf>
25. Scott Morton, M.S. 1971. *Management Decision Systems: Computer-Based Support for Decision Making*. Division Publishing: Boston, MA.
26. Saxena, K.B.C. 1992. "A DSS Development Methodologies: A Comparative Review". *Proceeding of the Twenty-Fifth Annual Hawaii International Conference on System Science*. IEE Computer Society Press: Los Alamitos, CA.
27. Sprague, R.H. and E.D. Carlson. 1982. *Building Effective Decision Support Systems*. Prentice-Hall: Englewood Cliffs, NJ.
28. Swanson, E.B. and Culnan, M.J. 1978. "Document-Based Systems for Management Planning and Control: A Classification, Survey, and Assessment". *MIS Quarterly*. 2(4) December: 31-46.
29. Van Esbroeck, R. 2000. "Career Guidance and Counseling for Lifelong Learning in a Global Economy". In: B. Hiebert and W. Borgen (eds.), *Technical and Vocational Education and Training in the Twenty-First Century: New Roles and Challenges for Guidance and Counseling*". United Nations Educational, Scientific and Cultural Organization: Paris, France.
30. Watts, A. 1996. "Toward a Policy for Lifelong Career Development: A Transatlantic Perspective". *The Career Development Quarterly*. 45: 41-53.

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