

Development and Application of Web-based Software ESPT to Predict the Performance of Engineering Students

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Abstract

In this paper the development and application process of web-based software ESPT (Engineering Students' Performance Test) has been discussed. In previous researches, it is proved that there are number of factors like students' individual characteristics, learning behaviour, previous educational background, family background, college environment etc. which influence directly or indirectly the students' performance in their university examination. The influencing factors were identified by studying the previous work carried out by different researchers all over the world and also included some other relevant factors which were investigated by considering the opinions of the students and teaching faculties. Descriptive analysis and one way ANOVA technique were used for identifying the important influencing factors. Finally 22 influencing factors were identified as important by analyzing the results of statistical methods and discussion with the experts. These identified factors were further used to develop a mathematical model by using binary logistic regression method to predict students' performance in university examination. Pass/fail result in university examination was used as performing factor. On the basis of this model, web-based software ESPT was developed and made freely available for the engineering students so that they can use and predict their performance in university examination in advance.

Index Terms: Student Performance, Influencing Factors, Performing Factors, University Students, Binary Logistic Regression, Web-based Software ESPT

1. INTRODUCTION

There are certain parameters like family background, students' individual characteristics, previous educational background, college environment etc. which have significant impact on the performance of university students in their annual examination. In previous studies, it is proved that students' university results can be improved by predicting and controlling the influencing factors which affect their academic performance [1]. The academic performance of the students is not only influenced by their own individual characteristics but also various other factors [2]. There are some models available which were developed to predict students' performance or success at the university level. Most of the studies are focused on students' performance in the foreign universities, which may not be suitable for Indian universities due to the differences in their academic, social and cultural environment. So there was need to develop such a model which would be more useful and suitable for the students of Indian universities [3]. Binary

logistic regression model was developed to predict the performance of engineering students in Indian university examination [4]. This model was validated by using ANN and conformed by using new samples of fourth semester engineering students. This model has given an accuracy of 80.95 % which is a very good accuracy for such types of models. This model is used to develop web-based software ESPT to predict the performance of engineering students. It will help to the engineering students to improve their performance in university examination by predicting their result in advance. It is freely available online on www.checkmyperformance.com.

2. METHODOLOGY

2.1 Tools and Technologies

Engineering Students' Performance Test (ESPT), web-based software is developed by using the following programming languages, tools and technologies:

- a. Bootstrap
- b. JavaServer Pages
- c. MySQL
- d. WordPress
- e. JavaScript
- f. PHP

- a. **Bootstrap** is a free and open-source front-end web framework (toolkit) for designing websites and web applications. It contains HTML and CSS-based design templates for typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions [5].
- b. **JavaServer Pages (JSP)** is a technology that helps software developers create dynamically generated web pages based on HTML, XML, or other document types. JSP is similar to PHP and ASP, but it uses the Java programming language [6].
- c. **MySQL** is an open-source relational database management system (RDBMS). It is the world's most popular open source database. Its name is a combination of "My", the name of co-founder, Michael Widenius's daughter, and "SQL", the abbreviation for Structured Query Language [7].
- d. **WordPress** is a free and open-source content management system (CMS) based on PHP and MySQL. To function, WordPress has to be installed on a web server, which would either be part of an Internet hosting service or a network host in its own right [8].
- e. **JavaScript (JS)** is a high-level, dynamic, weakly typed, object-based, multi-paradigm, and interpreted programming language. Alongside HTML and CSS, JavaScript is one of the three core technologies of World Wide Web content production. It is used to make webpages interactive and provide online programs, including video games [9].
- f. **PHP** (PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML [10].

In this software, user interface is created by using Bootstrap technology. JSP is used for server side programming. Data base is created in MySQL. The website is designed by using WordPress. The report is displayed by using JavaScript and PHP programming.

2.2 List of Influencing Factors

For performance evaluation of engineering students in their university examination, overall 22 factors are included in the questionnaire [11] [12], which are further classified into four groups for simplification of model formulation as shown in table 1.

Table-1: List of Influencing Factors Classified into Four Groups

Main Factors/ Categories	Sr. No.	Independent Factors
Personal Factors	1	Family Support & Financial Condition
	2	Time Management
	3	Numerical Problems Solving Ability
	4	Concentration on Study
	5	Self-motivation
	6	Positive Attitude
	7	Dedication to Career Goal
	8	Hardworking
	9	Stress Management
	10	Stay during Study
Pre-admission Factors	11	Use of Cell Phone & Internet
	12	Percentages in PCM (12th)
	13	Examination Board
Institutional Factors	14	Engg. Entrance Exam. Score
	15	Location of School
	16	Activeness in the Class
	17	Academic Environment in the College
Self-learning Factors	18	Sincerity in the Class
	19	Class Attendance
	20	Self & Regular Study
	21	Written Communication Skill in English
	22	Revision at the last moment

2.3 Application Steps

The steps, which are to be followed to use this software, are well elaborated with the help of flow chart as shown in figure 1.

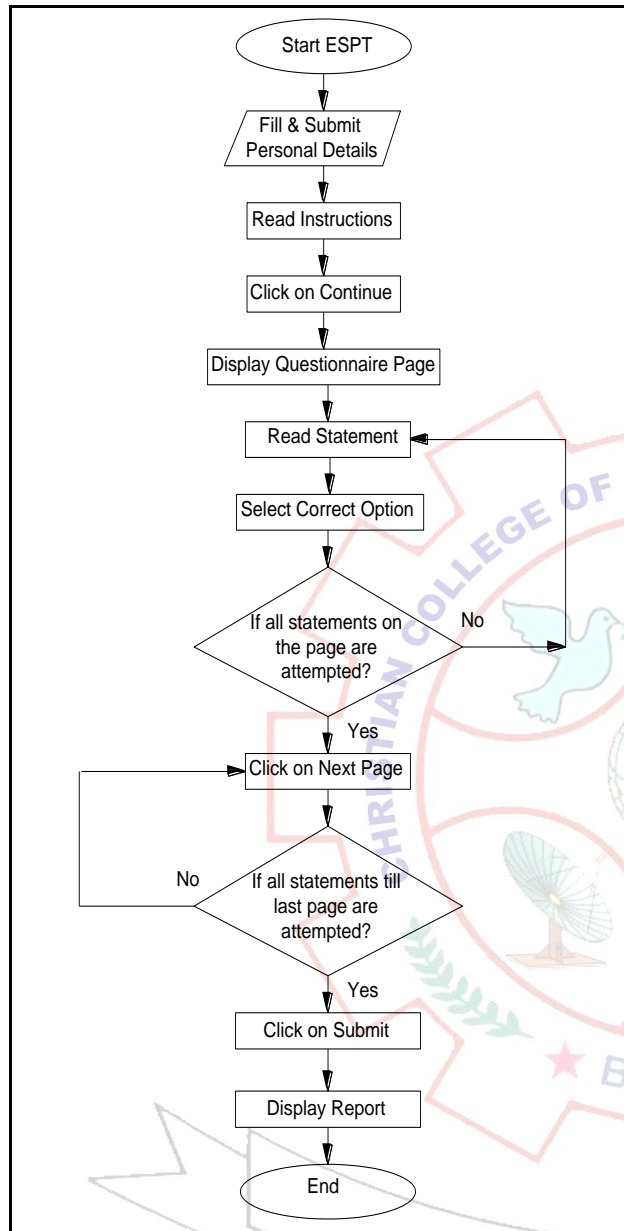


Fig-1: Flow Chart for Application of Web-based Software ESPT

3. RESULTS AND DISCUSSION

3.1 Illustrations with an Example

Let us assume that a student's average scores on Personal (X_1), Pre-admission (X_2), Institutional (X_3) and Self-learning (X_4) factors are 3.80, 2.75, 3.73 and 3.80 respectively. How online platform will support to engineering student to predict his/her performance is discussed below.

Probability of this student is calculated by using established relation based on Binary Logistic Regression Model [4] as shown below,

$$P(Y) = \frac{e^{(-63.934 + 10.484X_1 + 1.929X_2 + 2.948X_3 + 2.225X_4)}}{1 + e^{(-63.934 + 10.484X_1 + 1.929X_2 + 2.948X_3 + 2.225X_4)}}$$

$$P(Y) = 0.6718$$

Probability of passing in university examination of this student is found as 0.6718 which is more than the cut-off value of this model i.e. 0.65 [4]. So this student has more chances of getting pass in university examination.

3.2 Gap Calculation

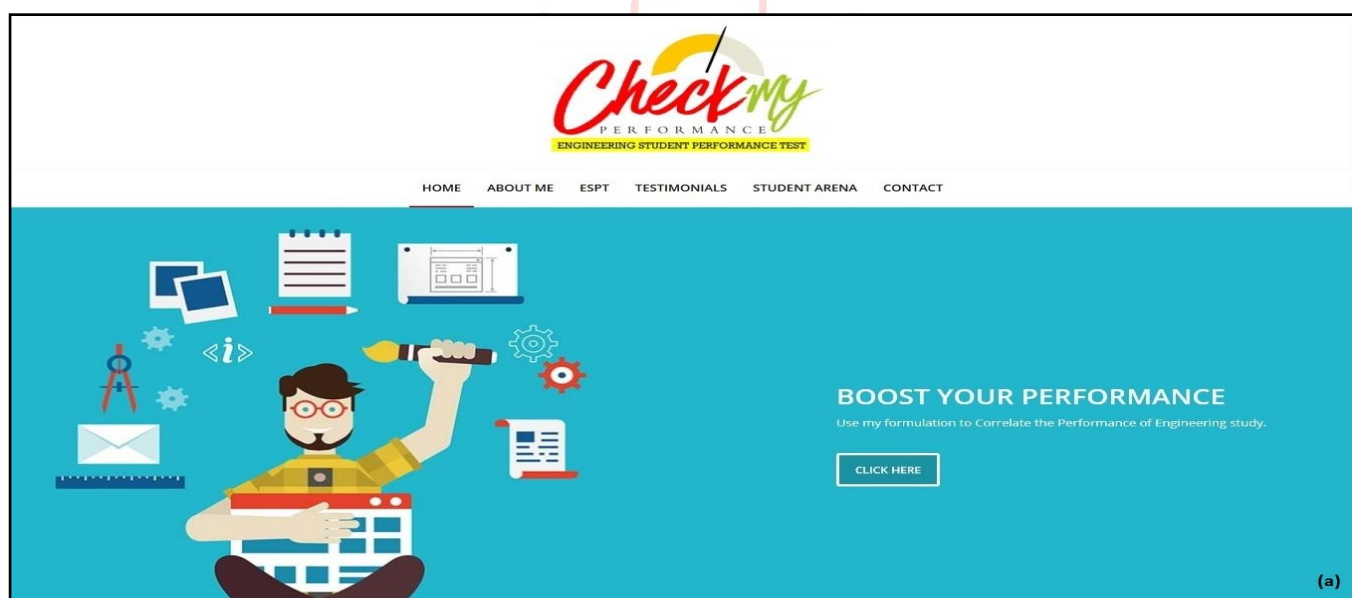
The actual performance of this student is compared with optimum values of personal (X_1), pre-admission (X_2), institutional (X_3) and self-learning (X_4) factors to find out the gap as shown in table 2.

Table 2 shows the maximum gap in pre-admission factors and minimum gap in personal factors. So according to gap analysis this student need to focus more on pre-admission factors and less on personal factors to increase his/her chances of passing in university examination. But most of the pre-admission factors can't be changed so he/she has to focus more on second highest gap i.e. institutional factors to improve his/her performance.

If the coefficients of these factors are also considered, a personal factor is having the largest coefficient i.e. 10.48 which shows the most important factor to improve students' performance. Similarly the coefficients of institutional, self-learning and pre-admission factors are 2.948, 2.225 and 1.929 respectively. So while reducing this gap to increase the chances of passing the students in university examination, the coefficient of these factors are to be considered and given proper weightage. The screenshots of this software are shown in figure 2.

Table-2: Gap Calculation of Influencing Factors for a Student

Influencing Factors ➡	Personal	Pre-admin	Institutional	Self-learning	Calculated Prob. of Passing
Actual Score of a Student	3.80	2.75	3.73	3.80	0.6718
Optimum Score for approx. 100 % Prob. of Passing	4.01	3.16	4.12	4.04	0.9951
Gap between Pass & Fail Students	0.21	0.41	0.39	0.24	
Gap in %	5.24 %	12.97 %	10.46 %	5.94 %	
Ranking	4	1	2	3	



Dear Engineering Students,

I am very happy to inform you that I have completed my research work on "*Formulation of a Model to Correlate the Performance of Engineering Students in University Examination*" under the guidance of **Dr. C. C. Handa**, Professor & Head, Mech. Engg. Dept., K.D.K. College of Engineering, Nagpur and **Dr. R. L. Himte**, Professor & Head, Mech. Engg. Dept., Priyadarshini Institute of Engineering & Technology, Nagpur. The objective of this research work was to correlate the performance of engineering students in their university examination with some influencing factors well in advance so that they can prepare themselves before starting the examination.

I would like to invite you on this online platform to participate and measure your probability of passing in university examination. As a part of social commitment of an engineering teacher, I have developed this software for engineering students to predict their probability of passing before the actual examination conducted. The research study was conducted on the samples of engineering students of engineering colleges affiliated to Chhattisgarh Swami Vivekananda Technical University, Bhilai.

I am very much thankful to my both guides for their Valuable Guidance, Support and Motivation. I am thankful to the Managements, Principals, Teaching Faculties and Students of participating colleges for their cooperation and support. Also I would like to thank each and every person who have directly or indirectly helped me to complete my research work and develop this website.

I am sure that this tool will be very helpful to the institutes, teachers and student counselors to guide their students. The government apex bodies like AICTE, UGC, and Technical Universities may find this approach to enhance the performance of their students which will result in improvement of technical knowledge and hence increase employability of their students.

• Radheshyam H. Gajghat

Take this ESPT and Check Your Performance


(b)

Registration

Name.	<input type="text" value="Name"/>	Gender.	<input type="text" value="Select Any One"/>
Email	<input type="text" value="Email"/>	Mobile	<input type="text" value="Mobile"/>
College	<input type="text" value="College"/>	Branch	<input type="text" value="Branch"/>
University Roll No	<input type="text" value="University Roll No"/>	University	<input type="text" value="University"/>

(c)

ESPT
You are here: Home / ESPT



Begin Test


General Instructions

1. This is a multi-choice test based on 5 points Linkert scale.
2. There are total 75 statements for which you have to select the option best suited to you.
3. It is compulsory to mark the option for all the statements.
4. There is no time limit.
5. Before starting the test, you should ensure that you have PCM, Maths, English and Aggregate Percentages obtained in HSC examination. You will also require the score of engineering entrance exam.
6. Take sufficient time for filling the correct options.
7. The accuracy of result of this test will depend on how honestly and sincerely you have selected the options.
8. Do not press back button or refresh the page during the test.
9. The probability of passing in university examination is calculated by using Binary Logistic Regression Model.
10. Cut-off value of this model is 0.65. Hence if the probability of passing is equal to or more than 0.65 (i.e. 65 %), it is to be considered as pass candidate otherwise fail.
11. It is advised to check your probability of passing at mid of the semester or at least one month before appearing in the final theory examination so that you will get sufficient time for preparation as per the ESPT result.

Begin Test

(d)

Survey System
User PANEL



Search...

☐ Survey

Survey

Family Support & Financial Condition

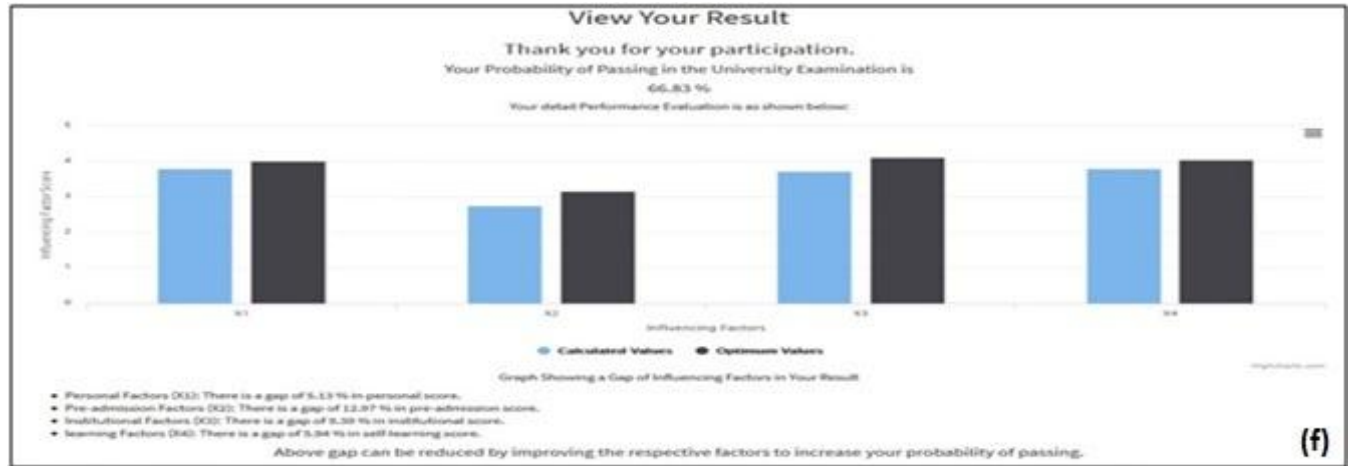
Question 1) My parents and family members always encourage and motivate me for my education. (मेरे माता-पिता और परिवार के सदस्य मुझे मेरे पढ़ाई के लिये हमेशा प्रोत्साहित तथा प्रेरित करते हैं।)

☐ Strongly Disagree
☐ Disagree
☐ Neither
☐ Agree
☐ Strongly Agree

Question 2) My family income is so enough that I need not to be worried about my college tuition fees and monthly expenses. (मेरे परिवार की कमाई इतनी है की मुझे मेरी कॉलेज की टयूशन फीस और मासिक व्यय के लिये चिंता करने की आवश्यकता नहीं पड़ती।)

☐ Strongly Disagree
☐ Disagree
☐ Neither
☐ Agree
☐ Strongly Agree

(e)



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E-mail *

Message *

Please prove that you are human by solving the equation *

3 + 1 = ?

Submit

ABOUT ME

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I have completed my Graduation in Production Engineering from Manoharabhai Patel Institute of Engineering & Technology (Nagpur University), Gondia in 1994 and Post Graduation in Production Engineering from Motilal Nehru National Institute of Technology (Deemed University), Allahabad in 2003. Also I have done Diploma in Business Management from Nagpur University. Recently, I have completed my research work and submitted my PhD thesis to RTM Nagpur University. I had scored 91.76 percentile in GATE-2001 with All India Rank 78 (PI).

I am basically a spiritual person who strongly believes in the existence of Almighty God. I equally believe in Spirituality and Science. Both are the two sides of a coin which are incomplete without each other. Yoga, Meditation and Social Involvement are the most important parts of my active life. I also believe that this Unhappy World can be changed into Happy and Prosperous World with the help of Spirituality and Science.

At present, I am working as an Associate Professor in Mechanical Engineering Department, Christian College of Engineering and Technology, Bhilai. I have 17 years teaching experience, 3 years industrial experience and 5 years research experience. My area of interest in research is Performance Evaluation, Model Formulation, Optimization of Manufacturing Processes and Computer Integrated Manufacturing. I have published three papers in international Journals and presented six papers in International/National Conferences. I have the expertise in Design of Academic Monitoring System and innovative Teaching-Learning Methodology.

As an Engineering Teacher, I wanted to contribute through my research work to enhance the academic performance of engineering students. This software (Engineering Students Performance Test – ESPT) has been developed to help the engineering students to predict their probability of passing in University Examination. It will also help them to improve their technical knowledge and hence increase their Employability by identifying the gap between their actual and optimum values of influencing factors. This software is based on my research work which was carried out among the engineering students of technical institutions affiliated to Chhattisgarh Swami Vivekananda Technical University, Bhilai. All the faculties, student counselors and the management of technical institutions are requested to motivate their students to use this software which is freely available online. Also students are requested to take the advantages of this software to improve their academic performance by predicting their probability of passing well in advance. Kindly share your experience and suggestions on radhegaj@gmail.com or through this website.

Thanking you.

Fig-2: Screenshots of Engineering Student Performance Test - ESPT (a) & (b) Home Page, (c) Registration, (d) General Instructions, (e) Survey Questions, (f) Result Display, (g) Contact Form, (h) About Me

4. CONCLUSION

Web-based software ESPT has been developed by using programming languages, tools and technologies like Bootstrap, JavaServer Pages, MySQL, WordPress, JavaScript, PHP. Overall 22 influencing factors were included for developing the model by using binary logistic regression method. Pass/fail result in university examination was taken as performing factor. The required steps for application of this software are well elaborated with the help of given flow chart. By using this software students can predict their probability of passing in university examination. Also they can know the gap between optimum values and actual values of the factors. It will help them to make proper study planning and schedule to enhance their performance in university examination.

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