Using PLS-SEM algorithm for Choice of University in Vietnam

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Abstract. The paper tested the factors which influenced the choice of university. Survey data were gathered from 318 students studying at Ho Chi Minh City Industrial University, Vietnam. In the sense of education in Vietnam, the study model was suggested from the university choice studies. We used the PLS-SEM algorithm in Adanco software for analyzing statistics. PLS-SEM algorithm shows that university choice (LC) has been influenced by the University's five components including Future career expectation (DU), University Reputation, Enroll opportunity (CH), Individual capacity (NL), and Group references (NTK). University Characteristics (DD) and Communication (TT) at university were not influenced University Choice of Student.

1. Introduction

Today, universities operate in a highly competitive environment [1]-[2], Where attracting resources as students have become a complicated task. The university is no longer a monopoly of knowledge but now has to fulfill its role, which is to inspire learners to have a good attitude to study, as well as to train them, capable of self-training and a lifelong learning spirit. In the opposite direction, learners have a lot of choices both in terms of locations and methods to equip themselves with knowledge. Most students face the problem of choosing a university after graduating from high school to continue their studies [3] to seek opportunities in the future. So what should schools do? A clear understanding of a student's reasons for choosing a university is essential to developing a university brand.

Kasap et al. [4] proposed a conceptual framework model of factors influencing students' decision to choose universities in Malaysia. The research results have shown that the student's decision to choose a university is influenced by the factors group of fixed characteristics of the university including location, training program, reputation, institution materials, study costs, financial aid, job opportunities, and the group of factors of student communication efforts includes: advertising, admissions agents, school exchanges, visit the university campus. Our article uses the PLS-SEM algorithms for data analysis method, adds new variables, and emphasizes solutions to enhance the factors that influence the student's decision to choose the university. We proposed some suggested solutions from research results to attract students in the future to support enrollment.

2. Hypotheses

Research by Rocca and Washburn [5] indicates that the reputation of the program, in this case, is the combination of the reputation of the university and that of the curriculum itself. In particular, in addition to the general reputation factor, the reputation of the program is also reflected through the positive assessment of the employer, the quality of the faculty, the reputation of students who are studying and graduated. Kasap et al. [3] has proposed a decision-making model that helps students...
choose the best university-based on university reputation. Based on the reputation factor of a university, hypothesis H1 is stated as follows:

**H1: The university reputation (DT) has a positive impact on university choice (LC).**

Research by Cabrera and La Nasa [6] emphasizes that in addition to expectations about future learning opportunities, students' expectations for future work are also an important group of factors that influence decisions. Perna's research [7] shows that they tend to choose a university-based on job opportunities available to college graduates. Therefore, this is a predictor that significantly affects a candidate's decision to choose a university.

In short, job opportunities after graduation affect a student's decision to choose a university and this is also a kind of benefit to learners, but often separated into separate groups [7]. Job opportunities are shown through many levels such as easy to find jobs, easy to find jobs with the right expertise, jobs with high income, and high social status. Therefore, Adom [8] and Kasap et al. [3] has shown that future career opportunity expectations are associated with university choice. Based on the expected future career opportunities, hypothesis H2 is stated as follows:

**H2: The future career opportunity (DU) has a positive impact on university choice (LC).**

Chapman's [9] study suggests that university choice is influenced by a set of individual character factors in association with a variety of external influences. The first external impact comes from family, friends, and experienced people. They are strongly influenced by persuasion from their family, relatives, and friends. Parents, siblings are the ones who go ahead, understand who you are, know what is good for you. Besides, it can be seen that quite a lot of people are influenced by family traditions.

This influence follows 3 schools: Firstly, the opinion of relatives (father, mother, brothers, sisters, relatives ...) how specific expectations about the university are. In the following aspects: Parents are more interested in their children, the more likely they are to interfere with their children's career choices. The higher the level of parents, the stronger the level of interest and impact on the child's career orientation, the parents' occupation also affects the children's choice of career, the family's economic status also affects affect the student's career choice. Second, suggestions, advice, and direct direction for students to choose a university. Third, in the case of a close friend, the university where my best friend is applying is likely to be the same place I will be applying to. Next, the study by Andrews et al. [10] asserted that in addition to the strong influence of parents and friends according to Chapman, the individual orientation at high school also had a significant influence on students' decision to choose a university.

Considering the current educational conditions in Vietnam, the individual who has a great influence on a student's decision is the student's teachers at high schools. Kasap et al [3] have shown that the decision to help students choose the best university is based on family reasons and reasons from friends and relatives. Therefore, the reference group factors including parents, relatives, friends, and high school teachers are factors that influence the freshman's decision to choose a school. Based on that, the hypothesis H3 is as follows:

**H3: The larger the reference group (NTK) of a student has a positive impact on a university choice (LC).**

Chapman [9] and Cabrera and La Nasa [6] examined the effects of learning conditions at the university in the future decide to choose their school. The study of Absher and Crawford [11] suggests that educational facilities such as classrooms, practice rooms, libraries ... play a very important role in the student's selection process for a university. Finally, the study of Chew et al. [12] found that the characteristic factor of the university such as the financial aid provided by the university: scholarships, grants ... was the key factor affecting the decision to choose a school. Based on the above evidence, hypothesis H4, H5, H6, and H7 is stated as follows:

**H4: University characteristics (DD) have a positive impact on university choice (LC).**

**H5: Individual capacity (NL) has a positive impact on university choice (LC).**

**H6: The university's communication (TT) has a positive impact on university choice (LC).**

**H7: The enrollment (CH) has a positive impact on the university choice (LC).**
3. Methodology

Characteristics of the official sample with n = 318 students in IUH, Vietnam of which 110 males account for 34.6% and 208 females account for 65.4%, 1st year 264 students account for another year 54 students account for 17%, classified by discipline. We applied the PLS-SEM algorithms with Adanco software to test the proposed research model. Partial least squares (PLS) path modeling is a variance-based structural equation modeling (SEM) algorithm that is broadly implemented in business and social sciences. It is a new statistical tool for the research method [13]. Testing the proposed research model and hypotheses were performed through two stages: (1) Assessment of the measurement model and (2) Assessment of the structural model [14]. The measurement items of the constructs from previous studies were revised and adjusted to accommodate the study context. We used a five-point Likert scale to measure the variables.

4. Results and Discussion

4.1. Estimation and Evaluation of the Structural Model

Table 1. Outer loadings (OL)

| Unit   | Indicator                                                                                     | OL   |
|--------|----------------------------------------------------------------------------------------------|------|
| NTK1   | Refer from my family for university orientation choice                                        | 0.7329|
| NTK2   | Refer from high school friends enrolled in university                                        | 0.6807|
| NTK3   | Refer from teachers/homeroom teachers, vocational teachers in high school                    | 0.6457|
| NTK4   | Refer from the advisor, admission representative                                              | 0.7405|
| CH1    | Input benchmarks match the student's ability                                                 | 0.6863|
| CH2    | The fighting rate matches the student's ability                                               | 0.7867|
| CH3    | Scores differ from those of other schools with appropriate consideration                      | 0.7436|
| CH4    | Provides full information about enrollment benchmarks                                         | 0.7784|
| NL1    | Affordability to pay tuition fees                                                             | 0.5543|
| NL2    | Favorite major selected                                                                       | 0.5564|
| NL3    | The adequate score for enrollment                                                             | 0.7771|
| NL4    | Meet the output standards                                                                     | 0.5679|
| DT1    | My university has high prestige in the community                                              | 0.7149|
| DT2    | My university is a respected university                                                       | 0.8032|
| DT3    | The reputation of my university positively affects the value of my degree                     | 0.7289|
| DT4    | My university reputation is reflected in the positive reviews from employers                  | 0.4959|
| TT1    | Orientation organization, meeting grade 12 students at high schools                           | 0.6783|
| TT2    | The school's communication channel quickly answers questions (Website, fan page, faculty group)| 0.8553|
| TT3    | Organize tours, introduce schools to high school students                                     | 0.8709|
| DD1    | Good teaching quality                                                                       | 0.8281|
| DD2    | Appropriate curriculum                                                                       | 0.8085|
| DD3    | Spacious facilities: Canteen, practice room, classroom...                                     | 0.8804|
| DD4    | Many scholarships to support students                                                         | 0.8020|
| DD5    | Fees are stable                                                                              | 0.4240|
| DU1    | Opportunities to graduate with high jobs                                                      | 0.6399|
| DU2    | Give students soft skills when they graduate                                                  | 0.7069|
| DU3    | Facilitate student internships in large enterprises                                           | 0.7259|
| DU4    | Create students who have full knowledge and experience in the chosen major                   | 0.8271|
| LC1    | My university is a suitable choice for my strengths when choosing to study                    | 0.7416|
| LC2    | I have trust in my university choice                                                         | 0.8195|
| LC3    | I have identified my needs, searched for information, assessed, and chose to study at this university. | 0.8657|

Table 1 shows that the reliable OL value is 0.4959 and the highest OL value is 0.8804. Some indicators are not accepted. Concerning internal consistency and convergent validity (Table 2),
composite reliability exceeds. Nunnally and Bernstein [15] suggested a value of 0.7 as an adequate standard for reasonable reliability.

**Table 2. Reliability and validity**

| Construct | CR   | AVE  | LC    | DT    | DU    | NTK   | DD    | NL    | TT    | CH    |
|-----------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| LC        | 0.8513 | 0.6570 | 0.6570 |       |       |       |       |       |       |       |
| DT        | 0.7845 | 0.4833 | 0.3636 | 0.4833 |       |       |       |       |       |       |
| DU        | 0.8173 | 0.5300 | 0.3697 | 0.2931 | 0.5300 |       |       |       |       |       |
| NTK       | 0.7940 | 0.4914 | 0.0971 | 0.0935 | 0.0294 | 0.4914 |       |       |       |       |
| DD        | 0.8717 | 0.5875 | 0.0517 | 0.0535 | 0.0376 | 0.0072 | 0.5875 |       |       |       |
| NL        | 0.7105 | 0.3858 | 0.1904 | 0.2122 | 0.1172 | 0.0371 | 0.0045 | 0.3858 |       |       |
| TT        | 0.8463 | 0.6500 | 0.0194 | 0.0562 | 0.0225 | 0.0048 | 0.1022 | 0.0001 | 0.6500 |       |
| CH        | 0.8367 | 0.5622 | 0.435  | 0.483  | 0.466  | 0.575  | 0.583  | 0.587  | 0.752  | 0.814 |

Regarding convergent validity, by overcoming the cut-off of 0.5, all the constructs meet the AVE criterion suggested by Fornell and Larcker [16]; that is, each construct explains at least 50 percent of the variance of the indicators assigned. The criterion of discriminant validity is also met, as the square root of the variance between the construct and its indicators (AVE) shown in the main diagonal values (in bold) is greater than the correlations between each construct and any other construct (the rest of the matrix).

**Figure 1. PLS-SEM algorithm**

Figure 1 demonstrates the structural model's estimate and validation. After confirmation of the absence of multicollinearity (VIF <5 for all indicators), a 5000-sample bootstrap procedure was performed to estimate the parameters; they were important in all cases (p < 0.05) except for the direction between the parameters.

**4.2. Hypothesis Testing**

| Path      | Coefficients | SE    | t value | P-value |
|-----------|--------------|-------|---------|---------|
| DT -> LC  | 0.2953       | 0.0601| 4.9112  | 0.0000  |
| DU -> LC  | 0.3345       | 0.0543| 6.1579  | 0.0000  |
| NTK -> LC | 0.1281       | 0.0394| 3.2516  | 0.0012  |
| DD -> LC  | 0.0619       | 0.0411| 1.5067  | 0.1322  |
| NL -> LC  | 0.1352       | 0.0528| 2.5605  | 0.0106  |
| TT -> LC  | -0.0811      | 0.0447| -1.8129 | 0.0701  |
| CH -> LC  | 0.1391       | 0.0459| 3.0310  | 0.0025  |
The university choice (LC) by the respondents has a positive influence (Table 3) both on five factors ($\beta = 0.3345, 0.2953, 0.13910.1352, 0.1281; p < 0.05$) and do not impact two elements ($\beta = 0.0619, -0.0811; p >0.05$). As these five paths are positive and statistically significant, both hypothesis 4 and hypothesis 6 can be unaccepted.

5. Conclusion
This study aims to explore and test the relationship of factors that influence the decision to choose a university for students of the University of Technology in Ho Chi Minh City. Based on past studies, derived from the practical context of education in Vietnam in the current period, the author has made the hypotheses. To test these hypotheses, the author has surveyed 318 students studying at the Industrial University of Ho Chi Minh City to better understand the choice of university as a place to hone students' knowledge. In general, at the same time to find solutions to attract more students to enroll in the school later.

This result is also a signal that the representativeness of the study sample can be used as a whole. The main view of students going to university stems from a good goal towards finding a job in the future and improving knowledge. In particular, the main reason for choosing a certain university is a school with a "hot" discipline, highly capable of applying for a job after graduation, and having a high ability to gain admission. Students consider information sources from parents, friends, high school teachers, online newspapers, and students to be the most useful sources of information. Analysis by PLS-SEM algorithms with the measurement model and critical model shows that the research concepts used are measured by the factors that are compatible with actual data. Concepts reach convergent value and distinctive value. This shows that the research concepts used have been shaped for students when surveying or in other words the scales used for research are appropriate and reliable.

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References
[1] C. Del-Castillo-Feito, A. Blanco-González, and R. Delgado-Alemany, "The Relationship between Image, Legitimacy, and Reputation as a Sustainable Strategy: Students’ Versus Professors’ Perceptions in the Higher Education Sector," *Sustainability*, vol. 12, p. 1189, 2020.
[2] A. Lafuente-Ruiz-de-Sabando, P. Zorrilla, and J. Forcada, "A review of higher education image and reputation literature: Knowledge gaps and a research agenda," *European research on management and business economics*, vol. 24, pp. 8-16, 2018.
[3] S. Kasap, D. Abbas, M. Khajah, and M. Ashkarni, "Developing a Knowledge-Driven Decision Support System for University/College Selection Problem in Kuwait," *International Journal of Information and Education Technology*, vol. 10, 2020.
[4] J. S. K. Ming, "Institutional factors influencing students' college choice decision in Malaysia: A conceptual framework," *International Journal of Business and Social Science*, vol. 1, 2010.
[5] S. J. Rocca and S. G. Washburn, "Factors Influencing College Choice of High School and Transfer Matriculants into a College of Agriculture," *NACTA journal*, pp. 32-38, 2005.
[6] A. F. Cabrera and S. M. La Nasa, "Understanding the college-choice process," *New directions for institutional research*, vol. 2000, pp. 5-22, 2000.
[7] L. W. Perna, "Studying college access and choice: A proposed conceptual model," in *HIGHER EDUCATION*.; ed: Springer, 2006, pp. 99-157.
[8] A. Y. Adom, "Students’ factors preference of choosing private university in Sarawak, Malaysia," in *Proceedings of the Asia Pacific Conference on Business and Social Sciences*, 2015, pp. 206-218.
[9] D. W. Chapman, "A model of student college choice," *The Journal of Higher Education*, vol. 52, pp. 490-505, 1981.
[10] R. W. Andrews, J. Herman, and J. L. Osit, "choice: A three-phase model and the implications for policymakers," *College and university*, vol. 62, pp. 207-221, 1987.
[11] K. Absher and G. Crawford, "Marketing the community college starts with understanding students' perspectives," *Community College Review*, vol. 23, pp. 59-68, 1996.

[12] F. C. Chew, R. Ismail, and H. E. Lim, "Factors affecting choice for education destination: A case study of international students at Universiti Utara Malaysia," 2010.

[13] J. Henseler, G. Hubona, and P. A. Ray, "Using PLS path modeling in new technology research: updated guidelines," *Industrial management & data systems*, vol. 116, pp. 2-20, 2016.

[14] J. F. Hair, G. T. M. Hult, C. M. Ringle, M. Sarstedt, and K. O. Thiele, "Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods," *Journal of the Academy of Marketing Science*, pp. 1-17, 2017.

[15] J. C. Nunnally and I. Bernstein, "The assessment of reliability," *Psychometric theory*, vol. 3, pp. 248-292, 1994.

[16] C. Fornell and D. F. Larcker, "Structural equation models with unobservable variables and measurement error: Algebra and statistics," *Journal of marketing research*, pp. 382-388, 1981.