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The Most Sustainable Niche Principles of Social Media Education in A Higher Education Contracting Era

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Abstract: In view of recent higher education contracting because of a declining birth rate and an explosive forming of technology, this research systematically cross-employed a technology acceptance model (TAM) and rational decision-making model (RDM) methodology to discuss from an interdisciplinary perspective the co-relationships between the assessed criteria and evaluated weights of four famous and accredited World University Rankings, the most promising features of massive open online courses (MOOCs), and the sustainable development goals (SDGs) of university social responsibility (USR) principles based on students', faculties' and government officers' interviewee appraised perspectives. Statistically, the weight-questionnaires of random students and professional experts were cross-measured by a factor analysis (FA) of quantitative analysis and an analytical network process (ANP) method of qualitative analysis. As a result, the aggregation technology function (ATF) is the most sustainable niche principle of social media education, not only fulfilling the Making Education More Equitable (MEME), Diminishing Poverty (DP), and Making Gender More Equality (MGME) initiatives of the institution's USR principles but also increasing the Industry Income (II) of the Times Higher Education (THE) World University Rankings in order to attract, trigger, and drive the students to make a decision to sincerely register in institutions in a higher education contracting era.

Keywords: social media education; university's international rankings reputation; institution's social media education functions; university social responsibility of social impression

1. Introduction

Due to the severely declining birth rate of new generations and the rapidly over-booming rate of higher education institutions, the number of Taiwanese higher education institutions has decreased to 157, compared with 162 institutions in 2019, and the percentage of higher-education-registered students in Taiwan in 2018 was only 85.6%, which means that these students decreased to 55,524 in 2018, according to the latest annual analytical freshman registration report by the Ministry of Education in 2019. In order to overcome this issue, the majority of Taiwanese higher education institutions have commenced creating a series of diversified social media education digital lecturing platforms to effectively increase the freshman registration rate. Specifically, the total number of higher-education-registered students in 2018 decreased by up to 47,000 compared with the number of registered students in 2008. Furthermore, according to the official annual report of the Ministry of Education in Taiwan, the declining birth rate has resulted in a rapid reduction of approximately 90,000 senior high school graduates from 2018 to 2028. Empirically, the number of senior high school graduates (24,349) decreased in 2019. Momentously, this number will decrease by approximately 10,000 and 12,000 in 2020 and 2021, which means that around 50,000 senior high school graduates will

be cut from 2019 to 2021; however, the total number of recruited freshmen will only increase to 24,530 for 50 Taiwanese higher education institutions, which means approximately 50–60 Taiwanese higher education institutions have been forced to close. Therefore, a rivalry in the recruitment for talented students has started between Taiwanese higher education institutions. The number of Taiwanese foreign higher education students has increased up to 44,993, including 13,091 from Malaysia, 9006 from China, 7854 from Vietnam, 7695 from Hong Kong, 7347 from Indonesia, and some from the Middle East countries, such as Jordan, Israel, Yemen, Palestine, and so on. Specifically, in order to attract more talented foreign students to replenish the decreased registration gap due to the declining birth rate, the majority of Taiwanese higher education institutions have to set up a series of niche and sustainable development strategies in order to survive. Significantly, the characteristics of these strategies are not only the highest registration revenues but also the lowest operating costs. Subsequently, according to the rapid development of wireless and telecommunication technologies, an institution's social media education functions have been the core determinants for contemporary hyper-technology generations in selecting higher education institutions. In succession, choosing a higher education institution is the most critical decision for each senior high school graduate. With the rapid development of social media technology in education, there are many technological 3C (computer, communication and consumer electronic) devices (such as computers, tablets, 3D devices (three-dimension printers), and platforms (such as Facebook, Apps (Digital Applications), etc.) that can be utilized in higher education institutions; especially, a bulk of contemporary Taiwanese students use many diversified technological 3C devices and platforms [1]. For this reason, the five user's essential elements of the technology acceptance model ("TAM") are necessary when assaying this research topic. These elements are perceived usefulness, perceived ease of use, attitude toward using, behavioral intentions to use, and external variables [2]. TAM was induced to discover users' behavior patterns by appraising each technological influence factor in operating new social media technology [3]. Therefore, in order to analyze the external circumstances of an institution's social media education functions, TAM was utilized to detect the hyper-competitive technological generation's accepted concepts, attitudes, and actions of a social media education institution [4,5].

Moreover, the basic concept of corporate social responsibility (CSR), after 2000, was addressed in the World Business Council for Sustainable Development report by Lord Holme and Richard Watts. Corporate operation is not only to contribute to the economy but also to improve the life quality of numerous employees and serve communities and society [6]. Subsequently, after promoting CSR, university social responsibility (USR) commenced to encourage and advocate increased social benefits since the majority of higher education institutions in the USA, Canada, and Europe. Significantly, American and Canadian governments have concentrated on developed sustainability for their higher education institutions. The most excellent higher education institutions, including Harvard University, Yale University, University of Cambridge, University of London, etc., have started to develop a series of Green Energy Plans on campus in their environment research center in order to stimulate the students' and faculties' attention to environment protection [7,8]. According to the cities and regions in the new learning economy of the Organization for Economic Cooperation and Development (OECD), regional economy development comes from global participation and the connection between local knowledge and the economic co-relationship with regional universities. Therefore, the regional learning economy indeed needs regional universities to drive learning regions and learning cities toward regional economic development. In Europe, the European Union University Social Responsibility (EU-USR) states that European higher education institutions have responsibilities for constructing a series of public transparency strategies and actions to positively influence the environment and the entire society. These strategies and actions are as follows: (1) higher education institutions are able to cultivate in students the competencies for strengthening justice and fairness, democratic participation, and developmental sustainability [9], (2) higher education institutions are able to continuously promote health and welfare [10], (3) higher education institutions are able to take responsibility for stakeholders [11], (4) higher education institutions are able to match the action

standards of international USR rules and regulations [12], and (5) higher education institutions are able to match the action standards of international USR rules, and regulations are conform to the responsible standards of public transparency and performance [13].

The traditional research question: “do current Taiwanese senior high school graduates pay close attention to these assessed criteria and evaluate the weights of the four famous and accredited World University Rankings in selecting higher education institutions in an era of declining birth rates?” has been expounded as follows: “how can a university achieve an international rankings reputation to attract senior high school graduates to register?” [14], “how can high-quality technological curriculums be supplied to attract senior high school graduates to register?” [15], and “how can universities give the impression they engage in USR in order to attract senior high school graduates to register?” [16]. In multidisciplinary associations, there are three influencing dimensions (the university’s international reputation, the institution’s social media education functions, and the USR impression), and students are choosing higher education institutions. These three core research questions not only directly determine students’ original decisive motivation-driven factors to register higher education institutions but also positively identify the niche principles of survived sustainability in the higher education era from three aspects: the university’s international rankings reputation, the institution’s social media education functions, and the USR impression, as described in Figure 1.



Figure 1. Research main framework.

However, by making a comprehensive survey on the relative research, it is evident that no one research was able to completely assay the co-relationships and interdependences among three influencing dimensions: university’s rankings international reputation, institution’s social media education functions and USR social impression. Therefore, this research not only systematically employed a Rational Decision-making Model (“RDM”) and TAM to interactively construct the most effective evaluation mode but also statistically applied a Factor Analysis (“FA”) approach of quantitative analysis to verify the large-scale students’ weight-questionnaires but also a hierarchical Analytical Network Process (“ANP”) method of qualitative analysis to testify the professional experts’ weight-questionnaires with respect to higher research reliability and validity in order to explore from an interdisciplinary perspective the most sustainable niche principles of social media education in a higher education contracting era.

2. Literature Review

2.1. Research Interdisciplinarily Theories

In terms of exploring from an interdisciplinary perspective the most potential niche principles of survived sustainability in a higher education contracting era by means of exploring the three core research questions, the decision-making process model was employed to assay the personal

registration decision of higher education institutions. For this reason, “demand” is not only the original triggered source of cognition, concept and motivation of an individual’s actions and behaviors but also a significant impact on each path in six decision-making procedures: (1) know: each individual recognizes the “real-suitability” of decision-making that is necessary for his or her future, (2) realize: they are able to completely understand the various benefits of a decision, such as knowledge, experience and so on, (3) like: each individual identifies the effectiveness of a decision and is able to comprehensively satisfy them with diversified comparisons, (4) partial: each individual expands the satisfied impact of a decision on the relative items of a decision, (5) certitude: each individual has a positive decision-making desire by considering a “partial” as well as directly forcing themselves to fulfill this decisive-knowledge in a wise decision and (6) action: each individual is going to directly make a decision and the, always insists that this is a wise decision. In particular, there are six essential procedures in a decision-making model. These are producing a decisive demand, identifying various decisive criteria, allocating weights to each decisive criteria, developing various decisive alternatives, evaluating each decisive alternatives and selecting the best alternatives as expressed in Figure 2.

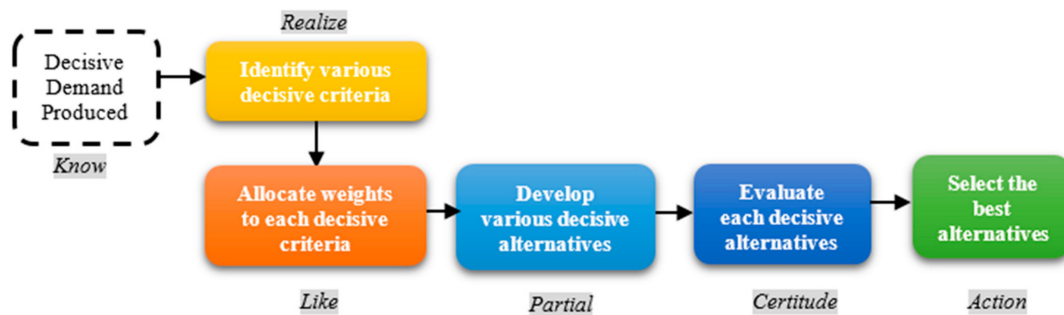


Figure 2. Decision-making process.

In order to increase the optimization and benefits as well as decrease the uncertainty and risks in a decision-making process, the five basic assumptions have been pioneered by the Rational Decision-Making Model (“RDM”) to effectively support decision-makers to reach the most suitable decision according to the Rational Behavior Theory (“RBT”) [17]. These basic assumptions are (1) a decision-maker has to do the best to recognize the entirety of valid information in the decision-making process, (2) a decision-maker has to find out the entirety of decisive alternatives in association with a decisive goal [18], (3) a decision-maker is able to identify and predict the decisive outcomes of each decisive alternative under complex objective conditions [19], (4) a decision-maker is able to understand direct self-value and indirect self-experience in the decision-making process [20] and (5) a decision-maker is able to select the most optimized alternatives for achieving the maximum decisive goal [21]. Therefore, Figure 2 was refined as a RDM process as expressed in Figure 3.

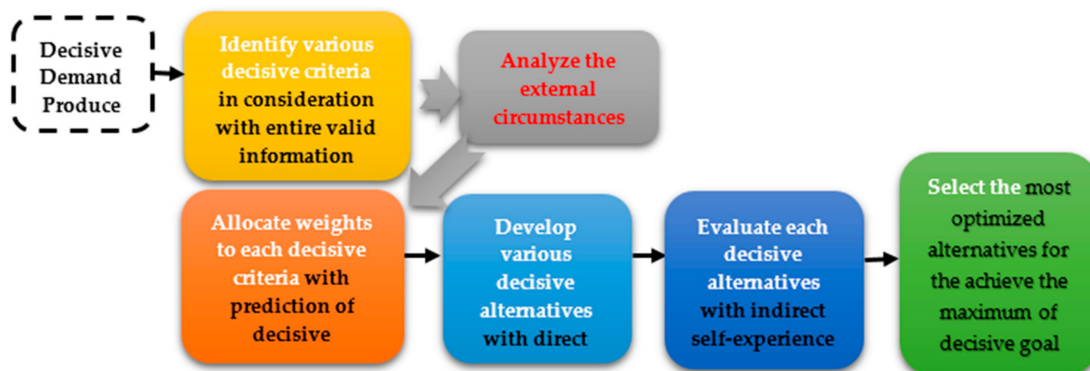


Figure 3. RDM process.

TAM supplied the theoretical fundamentals of not only understanding but also appraising the various impacts of outside environmental factors (external variables) on internal user's concepts, attitudes, and behaviors in manipulating the new technologies of computer relative technologies in order to explain or predict the most influential factors in user's manipulating technologies procedures. There is one external variable and five essential internal variables including two independent variables (perceived usefulness and perceived ease of use) and three dependent variables (attitude toward using, behavioral intention to use and actual system use). The theoretical assumption was that the two independent variables (perceived usefulness and perceived ease of use) were refined and firstly affected by external variables and then, the three dependent variables (attitude toward using, behavioral intention to use and actual system use) as described in Figure 4.

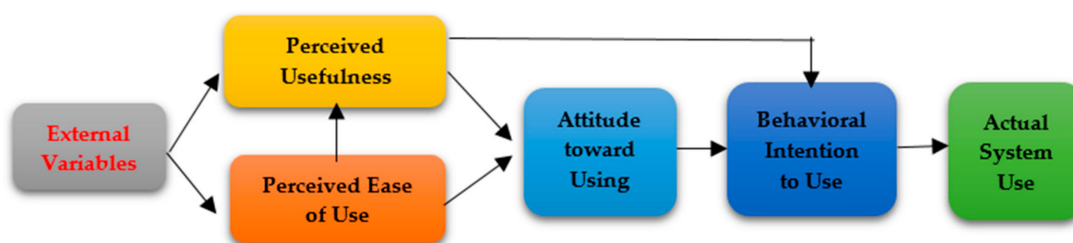


Figure 4. TAM mode structure.

In detail, perceived usefulness is a kind of subjective perception that the users positively believe that a new technological system is going to increase working performance or save working efforts. Furthermore, external variables include new technological interfaces and convenience, user's characteristics, self-efficiency, learning-style, organizational support and so on. Perceived ease of use in a new technological system is going to affect subjective perception of perceived usefulness. Significantly, there are deeply interactive influences between perceived usefulness and perceived ease of use [22]. Continuously, perceived ease of use is also a kind of confident perception that the users are able to more comfortably manipulate new technological systems and they will increase positive attitude levels toward new technological systems. In succession, attitude toward using is definitely and simultaneously influenced by perceived usefulness and perceived ease of use. Attitude toward using then directly impacts behavioral intentions to use as well as eventually and indirectly affects actual system use of new technology. Extensively, there are three theoretical significances in TAM: (1) the user's actual system use of a new technology is able to be predictably induced by means of evaluating their behavioral intention to use and attitudes toward using, (2) perceived usefulness is the main determinant for evaluating behavioral intention to use and attitude toward using, (3) perceived ease of use is the secondary determinant for evaluating behavioral intention to use and attitude toward using. Empirically, strengthening user's acceptance level of a technology system can be controlled by handling the various external variables in order to affect behavioral intention to use and attitude toward using. Ultimately, TAM was employed to explore and identify the most potential factors in user's new technology system acceptance procedures. Specifically, with respect to the relative search fields of contemporary social media education, Massive Open Online Courses ("MOOCs") have been the mainstream of social media education to be utilized and present the perceived usefulness and perceived ease of use of TAM on digital education platforms and systems [23]. For the reason, in view of the comprehensive acquirement of an institution's social media education functions, the most potential features of MOOCs were comprehensively considered as the assessed criteria for practically reflecting on social media education characteristics. The assessed sub-criteria of MOOCs are: "the User Completely Unrestricted Operation ("UCUO"), Convenience ("C"), Connectionization ("CZ"), Openness ("O") and Course Complete Rate ("CCR"), Feedback Technology Function ("FTF"), Course Evaluation Technology Function ("CETF"), Aggregation Technology Function ("ATF"), Course Professionalization Technology Function ("CPTF") and Re-purposing Technology Function ("RTF")" [24–27].

2.2. Research Brief Concepts

2.2.1. International Ranking of Higher Education Institutions

In order to achieve the highest number of registered students for gaining education subsidies from the Taiwanese government, the majority of higher education institutions must institute a series of regulations for discovering the most attractive recruiting strategies with the highest reputation and university ranking [28,29]. Therefore, “do current Taiwanese students pay close attention to these assessed criteria and evaluated weights of four famous and accredited world university rankings when selecting to register at a higher education institution in a declining birth rate higher education contracting era?” has been discussed traditionally and in-depth [30]. For this reason, the most famous and accredited four world university rankings are: 1. Quacquarelli Symonds World University Rankings (“QS rankings”), 2. Times Higher Education World University Rankings (“THE rankings”), 3. Academic Ranking of World Universities (“ARWU rankings”) and 4. CWTS Leiden Ranking (“CWTS rankings”). In detail, the assessed criteria and evaluated weights of these four famous and accredited world university rankings are integrated in Table 1.

Table 1. The assessed criteria and evaluated weights of four accredited world university rankings.

Four Famous and Accredited World University Rankings	Assessed Criteria and Evaluated Weights
QS rankings	<ul style="list-style-type: none"> ➤ Academic reputation (40%) ➤ Employer reputation (10%) ➤ Student-to-faculty ratio (20%) ➤ Citations per faculty (20%) ➤ International faculty ratio (5%) ➤ International student ratio (5%)
THE rankings	<ul style="list-style-type: none"> ➤ Teaching (30%) ➤ Research (30%) ➤ Citations (30%) ➤ International outlook (7.5%) ➤ Industry income (2.5%)
ARWU rankings	<ul style="list-style-type: none"> ➤ Academic reputation (40%) ➤ Employer reputation (10%) ➤ Student-to-faculty ratio (20%) ➤ Citations per faculty (20%) ➤ International faculty ratio (5%)
CWTS rankings	<ul style="list-style-type: none"> ➤ Impact indicators ➤ Collaboration indicators ➤ Core publications

According to the Table 1, academic reputation (40%) of QS rankings were collected from large-scale academic questionnaires of 63,700 global academic scholars; employer reputation (10%) of QS rankings surveyed form “the employed number of outstanding graduated students” of each higher education institution; student-to-faculty ratio (20%) of QS rankings were utilized to measure the “quality of teaching”, considered as a lower student-to-faculty ratio; citations per faculty (20%) of QS rankings were collected from “Scopus” academic database to appraise the current 5-year academic research influence of each higher education institution; international faculty ratio (5%) and international student ratio (5%) of QS rankings were employed to acknowledge the international attraction for others’ higher education scholars and students. Subsequently, the accessed criteria and evaluated weights of THE rankings does value in the academic institution’s publications based on the evaluated weights of Research and Citation up to 60%. Extensively, the accessed criteria and evaluated weights of ARWU rankings also obviously focus on “the research quality and quantity of academic publications in each higher education institution; specifically, Nobel awards or the quantity of publications in the most excellent international journals, such as “Science”, “Nature” and so on. Continuously, the accessed criteria and evaluated weights of CWTS rankings also takes account of the quantity of an institution’s publication to be referenced in various international journals [31]. The rankings, ARWU

rankings and CWTS rankings place extreme attention on the quality and quantity of higher education institutions that result in each higher education institution not only encouraging but even further also forcing institution's faculties to publish papers in international journals. Furthermore, not only the quantity of a professor's publications are the critical consideration of academic sponsors of Taiwanese educational government departments but higher education institutions also have been constructing a series of "promotion" and "evaluation" key performance indicators in association with the quantity of a faculty's publications [32]. Seriously, the majority of Taiwanese higher education professors, lecturers and faculties pay more attentions on "doing researches" for advancing the university's ranking or "making industry-university cooperative plans" for increasing the university's revenues than "lecturing students" to provide high-quality curriculums. Therefore, according to Table 1, the nine assessed criteria and evaluated weights of four famous and Accredited World University Rankings were able to considered as the appraised sub-criteria for evaluating the university's international rankings reputations aspects [33–35] and these are Academic Reputation ("AR"), Employer Reputation ("ER"), Student-to-faculty ratio ("SFR"), Citations Per Faculty ("CPF"), International Faculty Ratio ("IFR") and International Student Ratio ("ISR") of QS rankings; Teaching ("T") and Industry Income ("II") of THE rankings as well as Collaboration Indicators ("CI") of CWTS rankings. The main reason, a majority of Taiwanese professors, lecturers, faculties and even government officers generally consider the international ranking is able to not only directly and positively recruit the outstanding talented students but also indirectly and proactively attract the middle-level students to register [36,37].

2.2.2. University of Social Responsibility of Higher Education Institutions

Moreover, in light of the external impacted variables, not only assessed criteria and evaluated weights of four famous and accredited world university rankings but also the core sustainability development sustainable development goals ("SDGs") of USR [38] were considered as the external impacted variables in the RDM model. Therefore, in terms of the higher popularization of Taiwanese higher education, the majority of public private higher education institutions have been not only taking annual subsidies from the Taiwanese government but obtaining also research endorsement and cooperative allowances in the implementation of various science researches. In particular, the Taiwanese government has started to request that higher education institutions are supposed to take a couple of social responsibilities for the entirety of Taiwanese society in Taiwan under the mainstream marketization of Taiwanese higher education. This means that higher education institutions not only traditionally cultivate the students to be the talents but also additionally provide and serve contributions for located regions and the entire Taiwanese society. Significantly, there are three implemented perspectives in the University Promoting Social Responsibility Implementation Plan of the Center for University Social Responsibility of Ministry of Education in 2018. These implemented perspectives are (1) educational perspectives: in increments of "interdisciplinary learning" and "practical sharing" of higher education institution students; (2) industrial perspectives: in addition to the "industrial connection" and "talent cultivation" between higher education institutions and companies and (3) regional perspectives: in advance of the "localization practice" and "regional governance" between higher education institutions and local government. Currently, over 220 USR plans have been completed or implemented from 114 Taiwanese higher education institutions by the University Promoting Social Responsibility Implementation Plan by means of organizing interdisciplinary teams for playing the core-think-tank role in various regional developments. Hence, with respect to the official reports of the Center for USR of Ministry of Education in Taiwanese USR promotion and social operation situation, there are a series of five critical issues in USR for contemporary Taiwanese higher education institutions. Eventually, based on an official report of the Ministry of Education in Taiwan in 2019, there are 17 SDGs of USR that have been defined as the evaluated sub-criteria as Diminishing Poverty ("DP"), Promoting Food and Agriculture ("PFA"), Advancing Health and Wealth ("AHW"), Making Education More Equitable ("MEME"), Making Gender More Equality ("MGME"), Strengthening Water Quality and Hygiene ("SWQH"), Promoting Green Energy ("PGE"), Facilitating Employment and

Economy (“FEE”), Forcing Industrial Infrastructure Innovation (“FIII”) and Endeavoring Equity Rights (“EER”) [39–41].

2.3. Research Statistic Methods

In considering higher research reliability and validity in the appraised measurements in the comprehensive evaluation implementation [42,43], a systematic FA approach of quantitative analysis was applied to verify the large-scale students’ weight-questionnaires as well as the hierarchical ANP method of qualitative analysis being utilized to testify professional experts’ weight-questionnaires. First of all, the two essential appraised factors in the research operation were common factor (or latent factor) and unique factor to establish research validity into two typical factor analyses: exploratory factor analysis (“EFA”) and confirmatory factor analysis (“CFA”) [44] from the assayed correlation coefficient among each analytical variable in the form of the FA approach of quantitative analysis in order to assay a series of communalities (co-relationships) of each evaluated factor for refining and categorizing each appraised factor. Furthermore, EFA and CFA have been the mainstream methods in the FA approach because “the same set of measures might be taken on men and women, or on treatment and control groups and then, the question arises whether the two factor structures are the same” [45], another is two conditions or sets of variable in the one group, for example: “two test batteries might be given to a single group of subjects, and questions asked about how the two sets of scores differ. Or the same battery might be given under two different conditions” [46], the four research problem examples which can be measure by FA: “how many different factors are needed to explain the pattern of relationships among these variables, what is the nature of those factors, how well do the hypothesized factors explain the observed data and how much purely random or unique variance does each observed variable include” [47]. Therefore, in sight of the basic assumption of the FA approach, the direct observed impact-measured factors were defined as $Y (Y_1, Y_2, \dots, Y_k)$, direct unobserved influencing factors were presented as $X (X_1, X_2, \dots, X_k)$ and constants were outlined as $W (W_{ij})$ which explains the evaluated factor loading and factor-weights of overall appraised factors under linear combination Equation (1) [48] as

$$\begin{aligned}
 X_1 &= \lambda_{11}Y_1 + \lambda_{12}Y_2 + \dots + \lambda_{1k}Y_k \\
 \text{s.t. 1 : } Y_{\sim} &= P^1X_{\sim}, X_{\sim} = PY_{\sim} \\
 \text{s.t. 2 : } &\text{standardize intersection of variance to be 1 (max)} \\
 \text{If maximization : } &X_k - u_k = \lambda_{k1}Y_1 + \lambda_{k2}Y_2 + \dots + \lambda_{km}Y_m + e_k \\
 (\text{s.t. } X_{\sim kx1} - u_{\sim kx1} &= A_m f_{mx1} + e_{\sim kx1}) \\
 \text{Variance-covariance matrix presents as } &\Sigma = \Lambda\Phi\Lambda^1 + \Psi, \Psi = \text{diag}(\Psi_1, \Psi_2, \dots, \Psi_m) \\
 (\text{s.t. } \Phi &= I_{m \times m})
 \end{aligned} \tag{1}$$

In succession, taking the higher research validity and accuracy into account, the ANP method of qualitative analysis was going to be employed for classifying the measured results of the FA approach of quantitative analysis because the ANP method was created to hierarchically compare each analytical factor through a pairwise and super matrix comparing the Delphi and brainstorm method in professional expert’s weight-questionnaires [49]. Further circumscribed equations of the ANP method are

Consistency Index (“C.I.”, $C.I. = (\lambda_{\max} - n) / (n - 1)$) which was exactly considered in each pairwise matrix.

Consistency Ratio (“C.R.”, $C.R. = C.I. / R.I.$, $Rw_i = \lambda_{\max} w_i$, $w_i = \frac{\sum_{j=1}^n (R_{ij}) / \sum_{j=1}^n R_{ij}}{m}$) which was utilized as identification of each criterion and the two-stage algorithm. (2)

s.t. the pairwise comparison matrix can be accepted when the number of C.R. is equal or smaller than 0.01.

In order to efficiently decrease the surveyed errors in each 5-Likert's weight-scale of in data-collection, the synthetically weight-comparative measurement numbers ("SWMN") equation was able to be clearly refined the geometric mean as [50]

$$\sqrt[n]{\prod_{i=1}^n X_i} = \sqrt[n]{X_1 * X_2 * \dots * X_n}, X_i = \{X_i(k) | k = 1, 2, \dots, n\}, i = 1, 2, \dots, n \quad (3)$$

3. Research Design

3.1. Questionnaire Data Collection

As concerns the advancement of research reliability and representativeness, the 150 questionnaires were designed as 75 questionnaire's interviewees of senior high school graduates and the other 75 questionnaire's interviewees of higher education institution students. Specifically, these 150 questionnaires were randomly and in-person collected in Taipei railway station (Taiwanese northern region), Taichung railway station (Taiwanese western region), Kaohsiung railway station (Taiwanese southern region) and Hualien railway station (Taiwanese eastern region) for the systematic measurements of the FA approach of quantitative analysis. Significantly, in effective increments and the facilitation of research validity, 20 professional experts were collected as assessed weight-questionnaire interviewees for the hierarchical computation of the ANP method of qualitative analysis. The first 10 of 20 professional experts included five senior professors in social media education development related research fields with over 10-years experiences and then, another 5 senior scholars in USR tendency related research fields with over 5-year experience. The final 10 professional experts were senior administrators in higher education institutions with over 5 working-years of experience.

3.2. Main Research Process

Conclusively, Figure 5 comprehensively consolidated the three conceptual aspects of Figure 1, the theoretical model of the decision-making process in Figure 2, the RDM procedures in Figure 3 and the mode structure of TAM in Figure 4 in association with the nine appraised criteria of the assessed criteria and evaluated weights of four famous and accredited world university rankings, 10 assessed criteria of MOOCs of social media education and 17 SDGs of USR.

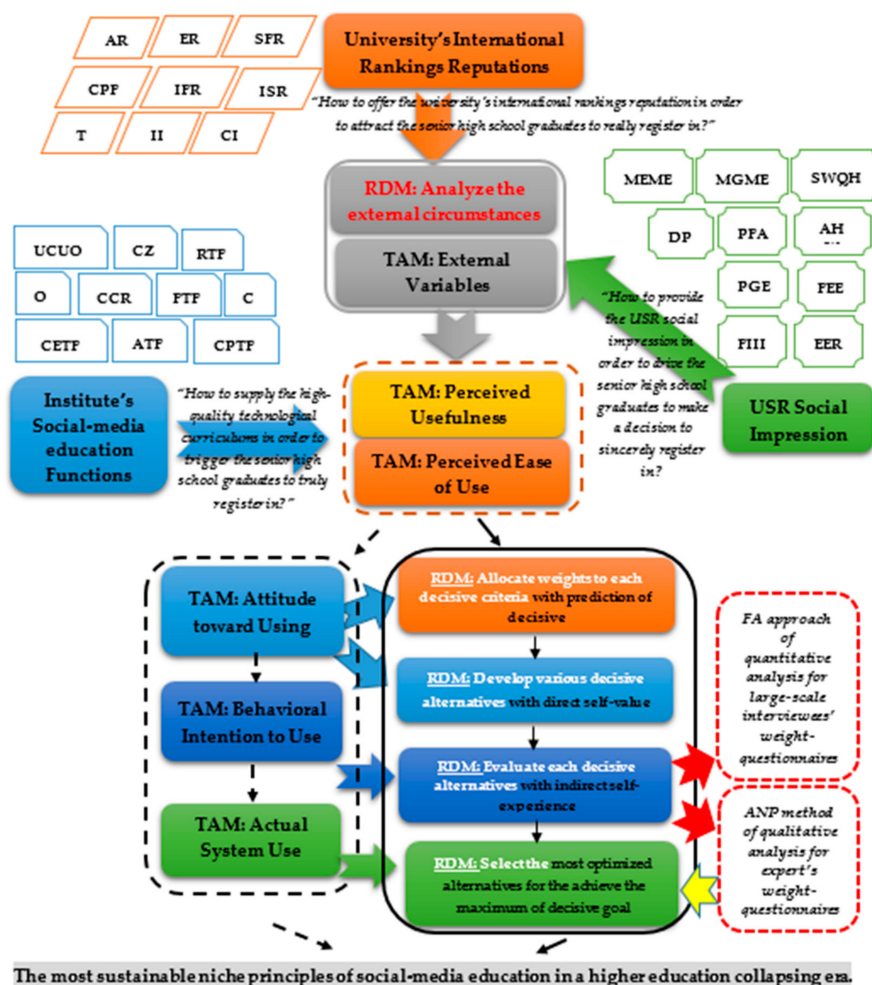


Figure 5. Main research design.

4. Research Measurements

4.1. FA Approach of Quantitative Analysis

First of all, the 150 weight-questionnaires were forwarded by random to 75 senior high school graduates and 75 higher education institution students, the valid retrieved weight-questionnaires were 142 questionnaires. The valid retrieved of random 150 weight-questionnaires were up to 94.67%. The descriptive statistics of these 142 valid weight-questionnaires is described in Table 2.

Table 2. The descriptive statistic of the FA approach.

Gender	Male: 78 (54.92%)	Female: 64 (45.08%)			
Geography	Northern Taiwan ¹ : 39 (27.46%)	Middle Taiwan ² : 51 (34.91%)	Southern Taiwan ³ : 37 (26.05%)	Eastern Taiwan ⁴ : 15 (11.58%)	
Use Internet hours/per day	Blow one hour and one hour: 13 (9.15%)	Two hours: 32 (22.53%)	Three hours: 64 (45.07%)	Four hours: 21 (14.78%)	Over four hours: 12 (8.47%)
Will you surf higher education institution's websites before selecting higher education websites?				Yes: 113 (79.57%)	No: 29 (20.43%)
Will you surf the international rankings of higher education institution's websites before selecting higher education websites?				Yes: 31 (92.18%)	No: 111 (7.82%)
Will you surf the USR of higher education institution's websites before selecting higher education websites?				Yes: 8 (5.63%)	No: 134 (94.37%)

¹ Chilung, Taipei, New Taipei, Taoyuan and Hsinchu cities. ² Miaoli county, Taichung city, Changhua, Nantou and Yunlin counties. ³ Chiayi city and county, Tainan and Kaohsiung cities, Pingtung and Penghu counties. ⁴ Hualien and Taitung counties.

According to Equation (1) of the FA approach of quantitative analysis, not only was the assessed numbers of the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.7 but the assessed numbers of the significance of the Kaiser-Meyer-Olkin measure and Barlett test was lower than 0.05 in Table 3. This apparently means that the FA approach was absolutely employed to measure these valid 142 weight-questionnaires.

Table 3. The Kaiser-Meyer-Olkin measure and Bartlett's test of the FA approach.

Kaiser-Meyer-Olkin measure of sampling adequacy		0.852
	Chi-squared test	1040.941
Bartlett test of sphericity	df	91
	Significance	0.000

In succession, Table 4 expresses the commonality of each assessed criterion in the FA approach and the numbers of commonality of AR (0.563), SWQH (0.432), PFA (0.544), AH (0.523), PGE (0.542), FEE (0.623), FIII (0.409) and EER (0.34) were lower than 0.7 which means that these appraised criteria were necessary to deduce because the common relationships of these appraised criteria were not positive and directly related with the research topic. Specifically, the numbers of commonality of ER (0.929), SFR (0.922), CPF (0.956), IFR (0.935), ISR (0.96), T (0.96), II (0.981), CI (0.928), UCUO (0.958), CZ (0.907), RT (0.929), O (0.94), CC (0.95), FT (0.945), C (0.961), CETF (0.956), ATF (0.976), CPTF (0.901), MEME (0.966) and MGME (0.917) were higher than 0.9 which means these assessed criteria had higher common relationships with the research topics. Significantly, these assessed criteria directly explained and clearly assayed the research goal.

Table 4. The commonality of each assessed criterion in the FA approach.

	Initial	Extraction
AR	1	0.563
ER	1	0.929
SFR	1	0.922
CPF	1	0.956
IFR	1	0.935
ISR	1	0.96
T	1	0.96
II	1	0.981
CI	1	0.928
UCUO	1	0.958
CZ	1	0.907
RT	1	0.929
O	1	0.94
CC	1	0.95
FT	1	0.945
C	1	0.961
CETF	1	0.956
ATF	1	0.976
CPTF	1	0.901
MEME	1	0.966
MGME	1	0.917
SWQH	1	0.432
DP	1	0.71
PFA	1	0.544
AH	1	0.523
PGE	1	0.542
FEE	1	0.623
FIII	1	0.409
EER	1	0.34

Therefore, the commonality of each valuated criterion of the FA approach of quantitative analysis has been a series of the multiply in the computation of the ANP method of qualitative analysis in order to arise research accuracy and reliability.

4.2. ANP Method of Qualitative Analysis

As for Figures 1 and 5, the evaluated hierarchies of the ANP method was able to be established in Figure 6 after implementation of the FA approach in Figure 6.

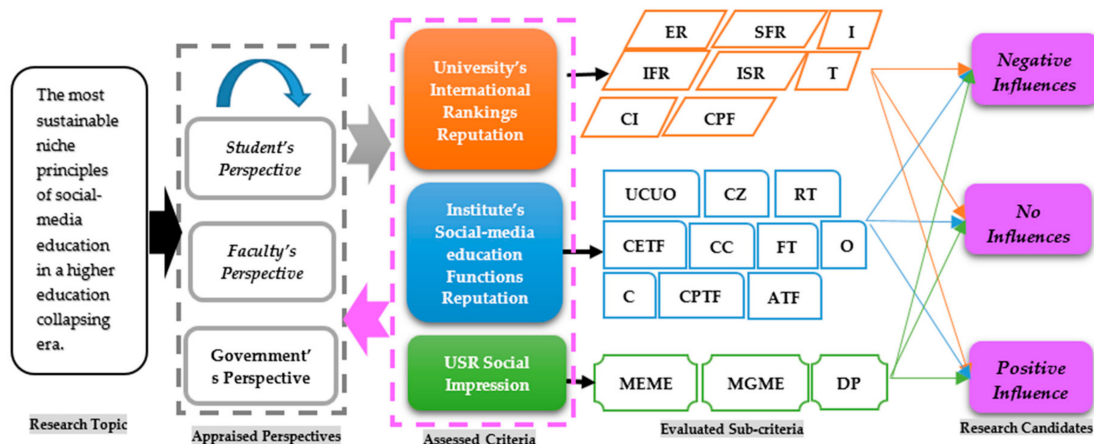


Figure 6. The evaluated hierarchies of the ANP method.

With referenced to Equations (1) and (2) of the ANP method and the evaluated hierarchies of Figure 6, the total numbers of the C.I. and C.R. of each sub-criteria pairwise matrix were lower than 0.1 which means the research validity of the weight-questionnaires of 20 professional experts were suitable in the evaluated measurements of the ANP method of qualitative analysis as described in Table 5.

Table 5. The C.I. and C.R. of each sub-criteria pairwise matrix in ANP method.

Sub-criteria Pairwise in ANP Method	C.I.	C.R.
ER	0.052	0.0896
SFR	0.0477	0.0822
CPF	0.0494	0.0851
IFR	0.0514	0.0886
ISR	0.0562	0.097
T	0.0539	0.0929
II	0.0518	0.0893
CI	0.0499	0.086
UCUO	0.0477	0.0823
CZ	0.0462	0.0797
RT	0.0534	0.0921
O	0.0562	0.0968
CC	0.043	0.0742
FT	0.0394	0.0679
C	0.041	0.0707
CETF	0.0539	0.0929
ATF	0.0481	0.0829
CPTF	0.0565	0.0974
MEME	0.0468	0.0806
MGME	0.0447	0.077
DP	0.054	0.0932

Conclusively, in order to increase research validity and accuracy, the evaluated results of the FA approach was necessary to be consolidated into the evaluated measurements of the ANP method in Table 6.

Table 6. The measurements of ANP method.

Criteria	Sub-criteria	Commonality (FA)	Super Matrix-Weights	Negative Influences		No Influences		Positive Influences	
				Weight	Evaluated Score	Weight	Evaluated Score	Weight	Evaluated Score
University's International Rankings Reputation	ER	0.929	0.0599	0.0589	0.0033	0.2119	0.0118	0.7292	0.0406
	SFR	0.922		0.0607	0.0034	0.2156	0.0119	0.7238	0.04
	CPF	0.956		0.0649	0.0037	0.224	0.0128	0.7111	0.0408
	IFR	0.935		0.0586	0.0033	0.2226	0.0125	0.7188	0.0403
	ISR	0.96		0.0612	0.0035	0.2214	0.0127	0.7174	0.0413
	T	0.96		0.0546	0.0031	0.2145	0.0123	0.7308	0.0421
	II	0.981		0.0597	0.0035	0.2089	0.0123	0.7315	0.043
CI	0.928	0.0589	0.0033	0.221	0.0123	0.7201	0.0401		
Institution's Social media education Functions	UCUO	0.958	0.2133	0.0577	0.0118	0.2199	0.0449	0.7224	0.1476
	CZ	0.907		0.0585	0.0113	0.221	0.0428	0.7204	0.1394
	RT	0.929		0.0595	0.0118	0.2222	0.044	0.7183	0.1423
	O	0.94		0.0613	0.0123	0.2211	0.0443	0.7176	0.1439
	CC	0.95		0.0584	0.0118	0.2174	0.0441	0.7242	0.1468
	FT	0.945		0.057	0.0115	0.2128	0.0429	0.7301	0.1472
	C	0.961		0.0561	0.0115	0.2083	0.0427	0.7356	0.1508
	CETF	0.956		0.0576	0.0118	0.2124	0.0433	0.73	0.1489
ATF	0.976	0.0567	0.0118	0.218	0.0454	0.7252	0.151		
CPTF	0.901	0.0589	0.0113	0.2164	0.0416	0.7247	0.1393		
USR Social Impression	MEME	0.966	0.7267	0.0547	0.0384	0.2094	0.147	0.7359	0.5166
	MGME	0.917		0.0541	0.036	0.2064	0.1376	0.7395	0.4928
	DP	0.966		0.0561	0.0394	0.2143	0.1504	0.7296	0.5122
Standardized SWMN					0.0569		0.2139		0.7293

In particular, the standardized SWCIN of three evaluated candidates was expressed in Table 6 and the highest evaluated scale was located into “positive influences” (0.7293). Beyond the entire evaluated measurements of “positive influences”, the most top evaluated scale of sub-criteria were MEME (0.5166), DP (0.5122) and MGME (0.4928) which were located at the “USR social impression”. Precisely, the top most evaluated scale of sub-criteria were ATF (0.151), C (0.1508) and CETF (0.1489) which were located at the “institution’s social media education functions” of evaluated criteria and the most top evaluated scale of sub-criteria were II (0.043), T (0.0421) and ISR (0.0413) which were located at the “University’s International Rankings Reputation” of evaluated criteria.

5. Conclusions and Recommendations

In view of recent higher education contracting because of the declining birth rate, explosive formation of social media technology and the swift development of higher education, the majority of higher education institutions have dedicated to explore the most sustainable niche principles of social media education in a higher education contracting era. Therefore, this research, from student’s, faculty’s and government’s appraised perspectives, not only systematically cross-employed TAM and RDM methodology to an in-depth discussion of the co-relationships among the assessed criteria and evaluated weights of four famous and accredited World University Rankings, the most potential features of MOOCs and SDGs of USR but also hierarchically cross-applied FA approach of quantitative analysis and ANP method of qualitative analysis to comprehensively assay the evaluated measurements of random large-scale weight-questionnaires of students and professional experts.

After a series of systematic and hierarchical evaluation-measurements, the four most valuable contributions were presented in consideration with three mainstream research questions, the most contributive conclusions for the three core research questions were:

1. Not only did “USR social impression” positively influence the “survived sustainability of higher education institutions” but also the Making Education More Equitable (MEME), Diminishing Poverty (DP) and Making Gender More Equality (MGME) initiatives are the most sustainable niche principles of social media education in a higher education contracting era during a hyper-technology generation when selecting higher education institution.
2. The top most evaluated scale of sub-criteria in the assessed criteria (University’s International Rankings Reputation) is industry income (II) (0.043) of THE (Times Higher Education) World University Rankings because the majority of hyper-technology generation students have paid more attention to the industrial impression of higher education institutions in order to strengthen employability after graduating from higher education institutions. Therefore, “the increment of industry income from higher education institutions” is the best answer for the research question: “how to offer university’s international rankings reputation in order to attract senior high school graduates to really register?”
3. The most top evaluated scale of sub-criteria in the assessed criteria (Institution’s social media education functions) is the aggregation technology function (ATF) (0.043) of the most potential features of MOOCs because the majority of hyper-technology generation students have diversified the aggregation of technology functions into the institution’s software and hardware in social media education in order to advance self-learning interests. For this reason, “the addition of the aggregation technology function (ATF) in various social media education software and hardware” is the best answer for research question: “how to supply high-quality technological curriculums in order to trigger senior high school graduates to truly register?”
4. The most top evaluated scale of sub-criteria in the assessed criteria (Institution’s social media education functions) is Making Education More Equitable (MEME) (0.5166) of SDGs of USR because the majority of hyper-technology generation students have focused on the USR in educational equitability of higher education institutions in order to facilitate educational popularization of entire society. Hence, “the facilitation of education equitability in USR”

is the best answer for research question: “how to provide the USR social impression in order to drive senior high school graduates to make a decision to sincerely register?”

As a result, the higher education institutions necessarily provide the aggregation technology function (ATF) in institution’s social media education for not only fulfilling Making Education More Equitable (MEME), Diminishing Poverty (DP) and Making Gender More Equality (MGME) of institution’s USR but also increasing the industry income (II) of THE (Times Higher Education) World University Rankings in order to attract, trigger and drive students to make a decision to sincerely register. Materially, the most valuable findings of this research are directly proving that the current higher education USR policies of “USR social impression” does positively assist in lowering the recruiting-rate and registering-rate of each higher education institutions as well as eventually accelerating the educational equitability of an entire society. Subsequently, in terms of research limitation, the more data-collection and methodologies are expected to be employed in future related research after the completion of this research although the random large-scale and professional questionnaire and quantitative and qualitative analyses have been executed in this research. However, the contributive conclusions and valuable findings do academically supply an interdisciplinary research gap among university’s rankings international reputation, institution’s social media education functions and USR social impression as well as empirically provide the most sustainable niche principles of social media education in a higher education contracting era.

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Abbreviations

QS rankings	Quacquarelli Symonds World University Rankings
THE rankings	Times Higher Education World University Rankings
ARWU rankings	Academic Ranking of World Universities
CWTS rankings	CWTS Leiden Ranking
AR	Academic Reputation
ER	Employer Reputation
SFR	Student-to-faculty ratio
CPF	Citations Per Faculty
IFR	International Faculty Ratio
ISR	International Student Ratio
T	Teaching
II	Industry Income
CI	Collaboration Indicators
TAM	Technology Acceptance Model
CSR	Corporate Social Responsibility
USR	University Social Responsibility
FA	Factor Analysis
ANP	Analytical Network Process
RDM	Rational Decision-making Model
RBT	Rational Behavior Theory
MOOCs	Massive Open Online Course
UCUO	User Completely Unrestricted Operation
C	Convenience
CZ	Connectionization
O	Openness
CCR	Course Complete Rate
FTF	Feedback Technology Function

CETF	Course Evaluation Technology Function
ATF	Aggregation Technology Function
CPTF	Course Professionalization Technology Function
RTF	Re-purposing Technology Function
DP	Diminishing Poverty
PFA	Promoting Food and Agriculture
AHW	Advancing Health and Wealth
MEME	Making Education More Equitable
MGME	Making Gender More Equality
SWQH	Strengthening Water Quality and Hygiene
PGE	Promoting Green Energy
FEE	Facilitating Employment and Economy
FIII	Forcing Industrial Infrastructure Innovation
EER	Endeavoring Equity Rights
EFA	Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
SDGs	Sustainable Development Goals

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