

## Recruitment Tracking System and Education Analytics for Strategic Enrollment Management

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**Abstract** - Strategic Enrollment Management (SEM) is a strategic integration of student recruitment for educational institutions. SEM roles have dispersed into various departments and this dispersion resulted in inefficient recruitment management. Our research reported in this paper is in 2 parts: 1) we carry out an analysis of important elements of the recruitment tracking system for SEM which can develop an information technology system to integrate and support the operations of the involved recruitment departments in order to achieve maximum efficiency in marketing, recruitment, guidance, registration, fee payment, orientation, graduation and conversion from students to graduates, and 2) we develop SEM education analytics which form the means of accomplishing the goal by tracking the performance and success of the SEM process.

**Keywords** - Recruitment Tracking System, SEM Education Analytics, Student Enrollment Management.

### I. INTRODUCTION

The process of recruiting students and completing the registration or enrollment management involves various departments. This enrollment management is an extremely important mission because student recruitment is a means to earn income for an educational institution. Such management of student recruitment in the highly competitive education market, strategic planning process which is required for management in the marketing, recruitment, registration, class attendance until graduation is called Strategic Enrollment Management or SEM. Dolence, M. G. defined SEM as " a comprehensive process which incorporates various agencies to capacitate an educational institute to recruit an appropriate number of students, keep them, and facilitate them to fulfill their study at a specified time ".[1] SEM began around 1972. Later in the 1980s, the student recruitment and marketing department started using the SEM concept and available incentives to formulate student recruitment plan. The plan was successfully and widely adopted by educational institutions in 1990s with the use of various methods to provide tuition fees and an enrollment management unit was then initiated to recruit new students systematically.

In the 2000s, public universities in the United States began to adopt and use the SEM concept widely. SEM has played a more vital role in this era since higher education institutions face these challenges: the number of high school students decreases and the students, who work as well as study, begin to decrease; the student loans for education and tuition fees decrease so the number of impoverished students who fully rely on the student loans are on the decrease; the students become "customers" or consumers so they expect to receive quality of services, products, prices and results according to what they pay; educational institutions have not fully used the information in the

management and operations and, as a result, it is impossible to define a strategic operation plan.

For Thailand, universities have not operated the SEM systematically. SEM-related process is embedded in various departments, each of which operates its job separately while some of which partially operated under connected data systems. This job segregation results in low operational efficiency, indicating neither enrollment management nor strategic plan document for implementation. All these inefficiencies result in the universities' inability to reach their goals of student recruitment in terms of numbers of new students. In addition, the lack of SEM affects students who encounter numerous problems regarding registration, selection of subjects and poor academic performances which may result in resignation, dropping out and lower graduation rates. Moreover, the quality of graduates may not reach the level that employers expect.

This research therefore investigated the various procedures of SEM process which consists of marketing, student recruitment, registration guidance and payment of tuition, orientation and completion of courses, and alumni) incorporating with the support of education analytics which consists of consisting of Prospect to Student Conversion Analytics (PSCA), Student to Alumni Conversion Analytics (SACA), Student to Alumni Conversion Analytics (SACA) and SEM Success Analytics (SSA) with a primary purpose to develop a workflow information technology system for tracking and notifying the status of the involved parties of the SEM operations, with the specific purpose to increase the efficiency of recruitment management and data analysis to support executives' decisions which are especially important to determine the SEM plan and improve the student recruitment process. All these aimed at the

increasing numbers of new students as specified in the SEM plan which are vital for the survival of the university.

Our paper is organized as follows: literature review which includes concepts, theories and prior study on SEM and education analytics will be presented in the second section. In sections III, IV and V, we describe SEM process, SEM workflow system, and system development. SEM education analytics is given in section VI and is then followed by results of the study in section VII. This article is closed with conclusions and an outlook to further work in section VIII.

## II. LITERATURE REVIEWS

### A. Concepts, Theories and Prior Research on SEM

Strategic concepts on recruitment management (SEM) and registration in higher education have been developed over the past three decades (1988-2018). But over the last decade (2008-2018), SEM has played an increasingly important role in higher educational institutions in Canada and the United States, due to the decreasing number of registration rate which is a result of the decrease in numbers of high school graduates and the decrease in the importance of academic degrees in business and industrial sectors which pay more attention to skills needed for work which everyone can learn through various MOOC systems such as Coursera, Udemy, Khan Academy, etc. In addition, a higher increase in competition among numerous educational institutions in both the public and private sectors was another important factor that resulted in the decreasing number of registration rate. SEM Transition Model which consists of five stages of admission (namely denial, nominal, structural, tactical and strategic), an approach which the universities in the American Association of Collegiate Registrars and Admissions Officers (AACRAO) group have adopted for evaluating the status of SEM management.

Effective strategic and financial planning is an important factor for the success of educational institutions. This finding is consistent with that of Bontrager, B. [2] The study revealed that the key elements of financial planning are based on pricing, goal setting, strategic investment and improved financial assistance efficiency. Similarly, the study of Hanover R. [3] on Trends in Higher Education Marketing, Recruitment and Technology reinforced that marketing is increasingly important in this era. Therefore, strategic planning and brand management are more involved in marketing in this new era than before. In this new experience and modern environment, educational institutions that focus on holistic brand management and communication will gain more competitive advantages in student recruitment and student retention because they can create pride in the university and brand loyalty in the

students, parents, professors, alumni and donors more successfully than other competitive universities. Nandeshwar, A. and Chaudhari, S. [4] proposed data mining models for predicting the numbers of student enrollment by using information of student enrollment acceptance. This model used learning machine called Weke that is used for data mining. The result of this study revealed that the most important factor to attract students to a university mostly relied on financial aids. The students, regardless of their high or low GPA, make their decisions based on financial aids.

Prior study on models involves modeling success indicated these successful best practices: pre-enrollment data to identify academically at-risk students [5], aligning competencies with success [6], successful practices and models of enrollment management [7], a conceptual management model of strategic enrollment [8] and effectiveness and usage at member institutions [9]. In addition, a review of literature revealed that successful enrollment management gets engaged with numerous factors and conditions regarding administrators' perceptions of factors related to student retention [10], strategic enrollment management in the age of austerity and changing demographics: managing recruitment, leveraging, revenue, and access in challenging economic times [11], the interrelationships between self-concept, motivation, and university experience among students of self-financing higher education institutions in Hong Kong [12], understanding the admissions experience of admitted students who fail to enroll [13], decision making with data [14] effective academic advising [15], and early alert and intervention systems and student persistence. [16]

A survey of theories and concepts regarding SEM can be concluded that SEM is a process that involves various departments, all of which can help educational institutions for recruiting students to the appropriate amount, maintaining the students, and facilitating them to complete their studies within the specified time frame to create comprehensive satisfying results. Although various agencies that involve in SEM operations are well linked, the process is still run by manual operations. Also, although there is an implementation of SEM in determining the goals and activities which enable various student recruitment departments to reach the desirable numbers of students, the university must have strengths to "sell" to those who might not be interested in it.

Therefore, a university needs to create a reputation for itself in any areas, invest in that area, and communicate the invested work so that people can perceive and remember the university. If the university carries on this operation continuously for several years, this operation will place the university in a position that is outstanding and different from other competitive universities. This newly created position of the university will impress the perceived people as a university of quality. When students enroll, the reputation

and quality of the university will also lead the students to another factor, i.e. retention. In this respect, Alexander Astin [17] points out that students must be allowed to participate in activities that help create reputation and quality of the university. Similarly, Vincent Tinto [18] confirmed that the students must have opportunity to get involved in both academic and social activities. On the other hand, in terms of student retention support, Alan Seidman [19] concluded that problems should be identified from the outset and solutions to the problems should be called into actions in effective, continuous and earnest manners to enable the students to graduate at designated time. This will create a good impression to the present students and, as a result, this impression creates a good reputation which will also be one of the SEM tools for new student recruitment in this era. In addition, Lynda Wallace-Hulecki and Alan T. Seagre [20] reinforced the importance of creating a student-centered learning culture as a vital factor be integrated with the university' academic activities and duties, where the university plays a leading role to facilitate SEM for success and its survival.

SEM incorporates various agencies of an institute, which lacks systematic information technology support and, as a result, disintegrates information essential for marketing, therefore, making it difficult for big data analysis or education analytics. Education analytics is therefore incorporated into the SEM process for a more effective operation as described in the next section.

### *B. Concepts, Theories and Prior Research on Education Analytics*

Education analytics is the application of educational data for statistical analysis and model explanation which can predict the facts and depth of issues relating to any academic studies. The report of Bichsel J. [21] which was published in EDUCAUSE on the application of analytics in higher education, educational institutions have currently gathered students' data to be applied for processing Enrollment Management data and monitoring their academic progress as well as the financial management of educational institutes. Many executives, however, devalues analytics as an expense, not an investment. The educational data, in fact, indicates that the major obstacle is a lack of analytic specialists who are skillful at initiating strategies and plans from the numbers and data. The study of Bichsel which focused on the areas and benefits of the analytics were used in educational institutions. The result of the study could be concluded that the educational institutions considered analytics as an essential device for the success of higher education. Its current usage applies for EM, students' academic progress and resource management. The application of the device restricts to the price of and the

limited number of specialists. Bichsel therefore suggests analytics as an effective solution for budget savings and provide equivalent quality services.

Education analytics increasingly plays a vital role in the era of Big Data for the reason that an institute is an essential source of educational information and has accumulated all educational information such as academic behaviors and learning analytics. Van Barneveld et al [22] have proposed an education analytics framework, which can be classified into 7 forms, according to the application guidelines which focus on the institute, lecturers, the department or students. The criteria for evaluation include the following: 1) analytics which evaluates effectiveness, 2) business analytics which evaluates administrative performances, 3) academic analytics which evaluates students' academic problems or needs, 4) learning analytics-academia which evaluates students' learning progress, 5) learning analytics-industry which evaluates the training process for trainees, 6) predictive analytics which predicts the students' academic results or the effects of new technology on the students, and 7) action analytics which evaluates efficiency and effectiveness in both management and academic areas.

This article also presents the SEM education analytics, which incorporates the marketing and student enrollment procedures and, according to the framework of Van Barneveld et al., can be classified as business analytics. This study has proposed a study on the development of the SEM administration system, which includes eleven main procedures, incorporating all involved departments into the SEM process. This paper first presents the SEM education analytics and the notification and follow-up techniques for the SEM process. Second, it discusses literature reviews of education analytics in brief. Third and lastly, it considers SEM education analytics, especially the details of the SEM process which extends from originally eleven to twenty procedures for calculating the proposed analytics.

### III. THE ENROLLMENT MANAGEMENT, EM, PROCESS

SEM is a marketing process which aims at closing sales, ending with student's registration and orientation. Therefore, the design of information systems to support SEM must include the concept of marketing and sales. In this design, the student recruitment is considered as a funnel which aims at changing the "prospects" to the potential "customers."

The SEM funnel is a pipe that demonstrates how to recruit prospects who are interested in enrolling at a university. Effective marketing and sales occur when the interested prospects become customers who decide to enroll, study, graduate and change their status to alumni. This SEM

process begins with finding the prospects, or the high school students who are interested in enrolling at the university, and tracking their status, from prospects to its students and alumni as shown in Figure 1, which consists of these procedures:

- (1) Traditional Marketing (UI1)
- (2) Digital Marketing (UI2)
- (3) Marketing Lead (ML), a procedure combining name lists from traditional marketing and digital marketing in which the prospective students give their names and addresses (UI3)
- (4) Qualified Market Lead (QML), a procedure which interested students request information after visiting the university's website or receiving additional information from the student recruitment or marketing department (UI4)
- (5) Sale Lead (SL), a procedure which the marketing department sends the list of interested students to the sales department (UI5)
- (6) Qualified Sale Lead (QSL), a procedure which the students participate in university activities, visit the university and fill in the application form (UI6)
- (7) Guidance, a procedure which the students submit their application form, meet their advisors who give suggestions regarding the subjects for registration (UI7)
- (8) Close sale, a procedure which the students clearly assure to study and receive guidance on the study program (UI8)
- (9) Registration, a procedure which the students have registered the subjects as suggested by their advisors already (UI9)
- (10) Payment, a procedure which the students have already paid for the tuition fees (UI10)
- (11) Commencement orientation, a procedure which the students attend the orientation (UI11)
- (12) Graduation, a procedure which tracks and reports the students' graduation in each study program (UI12)
- (13) Alumni, a procedure which alumni recommend new students to study at the university and follow them up till graduation. (UI13)

However, during the passage from commencement until graduation, the students will be tracked, followed, and maintained by the SSS system (Student Support Service). After graduation, alumni will be further incubated so that they become the brand ambassadors for the university marketing in the future.

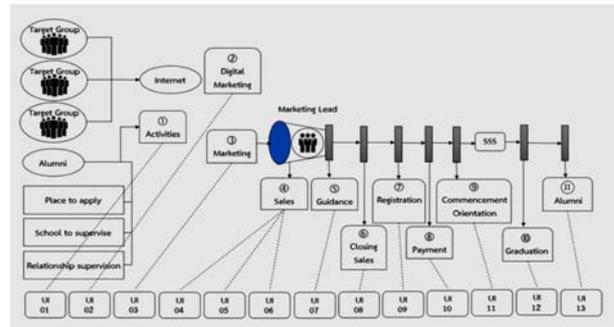


Figure 1. SEM Process and 11 Procedures, and 13 major user interfaces

#### IV. SEM WORKFLOW SYSTEM

Supporting the implementation of SEM is the most important factor to increase the survival of the university that relies on student enrollment. But due to the current conditions, there are fewer students enrolled at the undergraduate level and, as a result, it was difficult for small universities or private universities in Thailand to find new students for enrollment. Even public universities in the groups of Rajabhat and Rajamangala Universities also face this hardship.

To increase the efficiency of student recruitment by the use of SEM approach, it is necessary to understand that students in this era use mobile devices and, thus, a university must have the contents that serve the preferences of the prospect students who are interested in the university to support its marketing system. At the same time, SEM must have its information system to monitor marketing and sales activities efficiently. To achieve this goal, the SEM workflow system - a comprehensive information system which includes marketing and tracking systems from prospects to enrollment - provides the overall process as shown in Figure 1, consisting of total eleven business procedures as follows:

##### Procedure 1: Normal Marketing

This procedure consists of these activities: 1( establishing supervision and guidance on the target schools, 2( participating in the exhibition for accepting students, 3( setting up a recruitment unit in the target district or province, 4( inviting guidance teachers when the target students visit the university, 5( organizing competition, guidance activities and seminars at the university and inviting target students to participate in the events, and 6( organizing activities for the alumni so that they can persuade the target students.

##### Procedure 2: Digital Marketing

Digital marketing is a modern mechanism to reach the target market. The various activities that are operating must be monitored, especially results or outcomes of the activities. The operations are in the form of a group or Nicker marking, consisting of )1( target groups )namely

target schools, social and academic target group characteristics, and other target groups such as the vocational education groups and the first year student groups who wish to transfer to educational institutions( and )2( digital marketing activities and the budget.

### **Procedure 3: Overall Marketing**

Procedures 1 and 2 aim at interested students who are referred to as Marketing Lead (ML). From ML, Procedure 3 then scrutinizes the truly interested students who are referred to as Qualified Marketing Lead (QML) and will then be forwarded to the sales (namely recruitment teachers, admission department or development department) who are referred to in this research as the admissions, which will accept QML to proceed to another procedure.

### **Procedure 4: Sales**

Sales activities are responsible for closing the initial sales and they are then called Sales Lead (SL) after receiving QML but, in this research, they are called Student Lead (SL). QML will go through a refining procedure to be converted to Qualified Student Lead (QSL) who has a high chance to study at the university

### **Procedure 5: Closing Sales**

This procedure focuses on organizing activities that provides the QSL students to visit the university or talk to the guidance department, which then leads to sales closing.

### **Procedure 6: Guidance**

Guidance activities will turn QSL to a student of the university. This activity invites interested QSL to visit the university to get advice from the guidance department on the following issues: appropriateness of the university and the strength of this procedure (i.e. the closing of sales), administrative conditions, financial terms and housing conditions.

### **Procedure 7: Registration Tracking**

After guidance on the subjects to be registered, conditions of QSL are declared. The students then begin the registration process.

### **Procedure 8: Financial Monitoring**

At this stage, the students pay the registration fees. During the registration and payment, financial difficulties might arise so the system will be set to monitor to prevent the students from changing their minds.

### **Procedure 9: Orientation Tracking**

When QSL have paid the fees, they become students of the university who will then be put into an incubation activity and invited to attend an orientation, an activity which arouses the students' pride in themselves and love for their institution. This orientation will also allow them an opportunity to start a meaningful relationship with other students on the basis of mutual benefits in the future.

### **Procedure 10: Tracking Graduation**

After becoming a student, SSS follow-up activities must be provided. The notification will send the information from the SSS system to the SEM system when the students move to another institution or when the students graduate and receive degrees. At this point, Enrollment Management activities enter graduate follow-up to provide information to the alumni.

### **Procedure 11: Alumni**

This procedure provides incubation activities for alumni to promote reputation for the university which is beneficial to student recruitment and support student funding. The alumni must be provided up-to-date information about the university's achievement and activities so that the alumni feel proud of their university and motivated to persuade others to study at the university from which they graduated.

## V. SYSTEM DEVELOPMENT

SEM Process Management System for all eleven procedures contains eleven main screens of data entry and display. The software system for SEM management uses a mechanism to alert the parties who are responsible for the activities whether the activities are implemented or not and what next scheduled activities will be. The rules of the notification follow these frameworks and procedures.

- **Notifications**

= +, respectively,

is the duration of the activity.

=+ is the point of warning whether the activity has been accomplished or ended or not.

- **Notifications Rules for Executives**

Notify days before the activity. When the activity has not started, notify after the time of the days. While the activity has not accomplished, notify after the time of the days.

- **Activity Notification Rules**

At the specified time of notify to start the activity as scheduled. If the activity is unable to start at the time, notify the delay days or cancel the activity (before starting).

At the specified time of notify the end of the activity as scheduled. If the activity needs to continue, notify days or cancel the activity (that has already started).

Where E stands for SEM executives, M stands for the marketing activity executives.

For each activity, where time is - days, notify M.

Where time is, the activity, notify E; the activity notify M; the activity notify E. During to + starts, notify EM and update when the activity starts, when the activity + starts.

Where time is +, the activity

the activity the activity is +

Where time is+, the activity the activity is still in progress, notify E; the activity ended before the time, notify E; the activity is cancelled midway, notify E.

SEM software was developed as a web-based client server software with eleven main screens, ten secondary screens, excluding the management screen (administrative functions). The prototype of the system has been evaluated by samples consisting of forty SEM-related staffs. The research instrument for data elicitation was a questionnaire and the samples consisted of thirty-six SEM-related staffs who completed the questionnaire after the demonstration of the system. The results of questionnaires revealed a high level of satisfaction.

VI. ‘SEM’ EDUCATION ANALYTICS

The information system for SEM requires follow-up information management of the students who plan to study at an educational institute, developing from prospects to Marketing Leads (ML), Qualified Market Leads (QML), Sale Leads (SL) and eventually converting to Qualified Sale Leads (QSL). The numbers of interested prospects, who are also QSL, will eventually become students of the institute. The conversion rate of interested prospects therefore makes analytics interesting. Though interesting, analytics has not yet been studied in the area of SEM.

This section summarizes the details of the elaborate twenty procedures regarding the SEM Workflow System which alerts the operators by sending notification of activities which have been accomplished or not yet operated as shown below.

A. Definition of SEM Data

**)1( Set goals**

Since  $N$  is the numbers of students to be accepted in this academic year,  $x_i$  is the target numbers of students to be accepted and  $i$  is  $1..f$ , where  $f$  is the numbers of faculty. While  $m_j$  is the goal in terms of the numbers of students to be accepted in the region )area(  $j$ ,  $j$  is  $1 \dots n$ .

Therefore, the goal is

$$N_{Target}; x_i, i = 1..f; m_j, j = 1 \dots n$$

$$N_{Target} = \sum_{i=1}^f x_i = \sum_{i=1}^f \sum_{j=1}^n m_{ij}$$

**)2( Define original activities**

Since  $a_i$  is the original activity,  $i, i$  is  $1 \dots v$ . While  $v$  is the number of original activities used for student recruitment, the original activities that will be performed are  $A$  and  $a_i$  is the activity to be achieved.

$$A = \{a_i | i \in \{1, 2, \dots, v\}, a_i\}$$

**)3( Follow up the activities**

$t_{a_i}$  equals to 1 or the activity  $a_i$  has been accomplished.

$t_{a_i}$  equals to 0 or the activity  $a_i$  has not been accomplished.

**)4( Marketing Lead**

Where  $ML )a_i($  is Marketing Lead which was a result of the accomplished activity,

$a_i$  is the list of interested students.

**) 5( Designate digital marketing activities ) Digital Marketing : DM(**

Where  $d_i$  is digital marketing activities in  $i, i$  is  $1 \dots w$

**)6( Follow the DM activity**

$t_{d_j}$  equals to 1 or the activity  $a_i$  has been accomplished.

$t_{d_j}$  equals to 0 or the activity  $a_i$  has not been accomplished.

**(7( Digital Marketing Lead ) DML( on digital marketing**

$DML(d_j)$  is Marketing Lead obtained from the activities of  $d_j$

**)8( Inclusive Marketing Lead )ML(**

$ML )inclusive($  is  $ML(d_i) + DML(d_j), for all a_i, d_j$

**)9( Quality ML )Qualified ML: QML(**

Interested students participate in activities or contact the staff, indicating a higher level of prospective. These prospects are likely to be a quality targets that are truly interested in the institute.

QML is an ML that furthers more contacts or indicates a higher level of interest in the institute as exposed by the staff from the original activities or ML that send additional contacts of agreement to participate in webpage activities with the marketing department. This QML is the subset of inclusive ML.

**)10( Incubate total ML - total QML**

An invitation e-mail to attend activities should be sent to the groups that are not included in QML. These QML-excluded group may be interested in filling out additional information or apply later.

**)11( Forward QML to Sales Lead )SL(**

QML that participated in the activities will then be forwarded by the marketing department to the admission

department as a Sale Lead )SL(. It is highly likely that this SL will become a student of the institute. SL equals to QML.

$$SL = QML$$

#### )12( Qualified Sale Lead )QSL(

QSL is a list that the admission department received from SL. An invitation to visit the campus or participate in activities at the campus will increase the confidence of the admission department in an attempt to convince QSL to keep contact or visit the campus.

QSL equals to SL - SL )defined as those who show no response or ignore contact(

$$QSL = SL - SL$$

#### )13( Close sales activities

$P$  is defined as a set of activities that are accomplished by the admission department.

$$P \text{ equals to } \{ p_i | i = 1 \dots u \}$$

$$P = \{ p_i | i = 1 \dots u \}$$

#### )14( Guidance

When there are interested students, the guidance department will provide them necessary details such as field of study, department, faculty, study plan, graduation conditions, student activities and all expenses. Such details also include academic, social and financial information and scholarships for individual students' needs. All these lead to sales closing.

#### )15( Registration

The sales closing which occurs after the activities in procedures 1 to 14 have been completed effectively will result in students' decisions to register at the institute. Step-by-step information used for registration will then be provided.

#### )16( Incubation

After registration, the prospects need to earn the amount of money, whether from an education loan or private capital, to pay for tuition fees. This period of time is risky and might lead to the loss of the students. Therefore, the system continues to monitor them closely in order to keep them from financial restrictions.

#### )17( Payment

The payment process depends on the amount of payment and other financial supports such as payment mechanism, education loans and scholarships.

$N_{PT}$  is defined as the numbers of students who have already made the payment of their tuition fees )Pay Tuition represents PT(, which requires  $QSL - N_{PT} \rightarrow 0$  or the lowest numbers of students who agreed to register or have already registered but encountered financial difficulties and, as a result, been unable to pay for the tuition fees.

#### )18( Orientation

This is the initial step to higher education. The system will notify whether the students participate in orientation activities or not.

#### )19( Conferring a degree

The system tracks whether the students graduate within the specified period or not. The students' status will then be converted to alumni. The system will also track whether they attend the graduation ceremony (Diploma: DIP( or not. The numbers of graduating students to be conferred a degree equals to  $N_{DIP}$ . These numbers will convert the numbers of alumni.

#### )20( Alumni

This step incubates the converted alumni as if they were the "ambassadors" of the institute who take responsibility in disseminating information about the institute to new prospects and inviting them to apply for study.

#### B. Definition of SEM Education Analytics (SEA)

SEM Education Analytics is an evaluation and indicator of SEM performance and success, which can be classified into four analytics:

##### (1) Prospect to Student Conversion (PSCA)

$$PSCA \text{ equals to } N_{ML} - N_{PT}$$

$$PSCA = N_{ML} - N_{PT}$$

$N_{ML}$  is the numbers of prospects who are interested in the Marketing Leads

##### (2) Student to Alumni Conversion (SACA)

$$SACA \text{ equals to } N_{PT} - N_{DIP}$$

$$SACA = N_{PT} - N_{DIP}$$

##### (3) QML to QSL Conversion Analytics (QQCA)

$$QQCA \text{ equals to } N_{QML} - N_{QSL}$$

$$QQCA = N_{QML} - N_{QSL}$$

$N_{QML}$  refers to the numbers of people in QML

$N_{QSL}$  refers to the numbers of people in QSL

##### (4) SEM Success Analytics (SSA)

SSA indicates that the results of the SEM in that year and how close  $N_{PT}$  is to the target  $N_{Target}$

$$SSA \text{ equals to } 100 * (N_{PT} - N_{Target}) / N_{Target}$$

$$SSA = 100 * (N_{PT} - N_{Target}) / N_{Target}$$

Where  $N_{PT} > N_{Target}$  indicates the success of the operation

But if  $N_{PT} < N_{Target}$ , the value is negative, indicating that the operation is below the target.

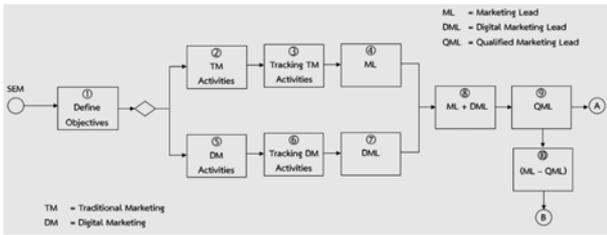


Figure 2. SEM Process Workflow (1)

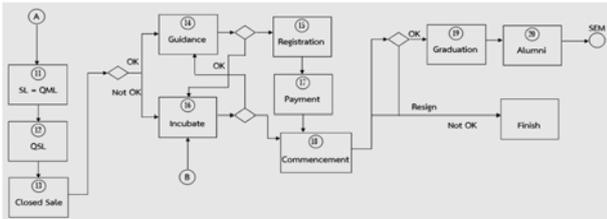


Figure 3. SEM Process Workflow (2)

VII. RESULTS AND DISCUSSION

The development of SEM management system increases the efficiency of marketing for student recruitment, follow-up management, guidance, registration, payment, orientation, graduation and conversion of status from students to alumni. The SEM system provides beneficial information for tracking performance and improving the SEM strategic plan each year. This study proposes Education Analytics for SEM, which includes four efficient analytics: ) 1( Prospect to Student Conversion Analytics ) PSCA( , ) 2( Student to Alumni Conversion Analytics ) SACA( , ) 3( QML to QSL Conversion Analytics and ) 4( SEM Success Analytics ) SSA(. These analytics can be used for tracking and evaluating the results of the SEM strategic plan. In addition, they can also be used for determining the effectiveness of team work and indicating the work that needs to be improved, especially when considering the marketing funnel that involves the number of people at each step since prospects, ML, QML, SL, QSL, the number of referrals, the number of registrants, the number of tuition fees, the number of orientation attendees, and the number of graduates. All these numbers will enable the institute to spot the point where the interested student is missing from the system. The system therefore helps realize problems of any particular activities. This insightful realization of the problems will lead to improvement. In conclusion, Education Analytics for SEM is the key to success of SEM management.

VIII. CONCLUSION AND FUTURE WORK

SEM Workflow Notification System is an innovation that expedites strategic operations in marketing, recruiting students, guidance on registration, payment of tuition fees, orientation and graduation as well as converted alumni who are monitored closely. The relevant procedures are operated

in a manual process that includes an information technology system for data processing. The efficiency of the manual process can be increased by workflow system to help perform various steps by notifying the work status before and after the scheduled operations. The system will enable all parties comprehend an overview of the actual events that have occurred and resolve various problems immediately. It also provides a way for all involved departments which perform their duties in the process more efficiently. The SEM workflow system that has been evaluated its duties and responsibilities could help the SEM system efficiently a level of satisfaction of 95%. In the future, the system will be developed to operate more intelligently and efficiently by using Deep Learning which will help understand the limitations of the system and conditions that help shift the process more efficiently, including linking to the academic database, student database, alumni database and university calendar. All these will help the main operations of the SEM workflow system to be more flexible and more efficient.

The development of SEM management system increases the efficiency of marketing for student recruitment, follow-up management, guidance, registration, payment, orientation, graduation and conversion of status from students to alumni. The SEM system provides beneficial information for tracking performance and improving the SEM strategic plan each year. This study proposes Education Analytics for SEM, which includes four efficient analytics: ) 1( Prospect to Student Conversion Analytics ) PSCA( , ) 2( Student to Alumni Conversion Analytics ) SACA( , ) 3( QML to QSL Conversion Analytics and ) 4( SEM Success Analytics ) SSA(. These analytics can be used for tracking and evaluating the results of the SEM strategic plan. In addition, they can also be used for determining the effectiveness of team work and indicating the work that needs to be improved, especially when considering the marketing funnel that involves the number of people at each step since prospects, ML, QML, SL, QSL, the number of referrals, the number of registrants, the number of tuition fees, the number of orientation attendees, and the number of graduates. All these numbers will enable the institute to spot the point where the interested student is missing from the system. The system therefore helps realize problems of any particular activities. This insightful realization of the problems will lead to improvement. In conclusion, education analytics for SEM is the key to success of SEM management.

Future research and development should implement the system through a variety of portable devices to support management on various platforms.

REFERENCES

[1] Dolence, M. G. (1993, 1997). Strategic Enrollment Management: A primer for campus administrators. (2nd ed.). Washington, DC: American Association of Collegiate Registrars and Admissions Officers.)

- [2] Bontrager, B. (2004). Strategic Enrollment Management: Core Strategies and Best Practices. *College and University Journal*, 79(4), 9-15.
- [3] Hanover R. (2014). Trends in Higher Education Marketing, Recruitment, and Technology (Research report).DC: Author.
- [4] Nandeshwar, A., & Chaudhari, S. (2009) Enrollment Prediction Models Using Data Mining. Retrieved March 18, 2017 from [http://nandeshwar.info/wp-content/uploads/2008/11/DMWVU\\_Project.pdf](http://nandeshwar.info/wp-content/uploads/2008/11/DMWVU_Project.pdf)
- [5] Gansemer-Topf, A. M., Compton, J., Wohlgemuth, D., Forbes, G., & Ralston, E. (2015). Modeling success: Using pre-enrollment data to identify academically at - risk students. *Strategic Enrollment Management Quarterly*, 3(2), 109-131.
- [6] Gansemer-Topf, A. M., Von Haden, K., & Peggarr, E. (2015). Aligning competencies with success: what does it take to be an effective admissions counselor. *College and University Journal*, 90(1), 14.
- [7] Lehmacher, A. (2012). Successful practices and models of enrollment management in Illinois community colleges: An explanatory mixed-methods research case study. (Doctor of Education). Benedictine University, IL.
- [8] Ng, P., Chan, J., Wong, P., & Mak, C. (2014). A conceptual management model of strategic enrollment (No. 1). Working paper series. Retrieved from <http://weblib.cpepolyu.edu.hk/apps/wps/assets/pdf/w20140105.pdf>
- [9] Schuttinga, B. J. (2011). Enrollment management strategies: Effectiveness and usage at member institutions of the Council for Christian Colleges and Universities. (Doctor of Philosophy). IA: Iowa State University.
- [10] Wilson, W. B. (2013). Administrators' perceptions of factors related to student Retention at colleges with a significant black student enrollment affiliated with the association for biblical higher education. South Carolina: Columbia International University.
- [11] Langston, R., & Scheid, J. (2014). Strategic enrollment management in the age of austerity and changing demographics: managing recruitment, leveraging revenue, and access in challenging economic times. *Strategic Enrollment Management Quarterly*, 2(3),191-210.
- [12] Wong, P., Mak, C., Ng, P. M. L., & Zhao, J. (2017). Mapping the interrelationships between self-concept, motivation, and university experience among students of self-financing higher education institutions in Hong Kong. *Asia Pacific Education Review*, 18(1), 1-11.
- [13] Hudnett, R. (2015). Understanding the admissions experience of admitted Students Who fail to enroll: a multiple case study. (Doctor of Education) <https://core.ac.uk/download/pdf/51078792.pdf>
- [14] McClintock, P. J., & Snider, K. J. (2008). Driving decision making with data. *New Directions for Institutional Research*, 137, 15-40.
- [15] Floyd-Peoples, B. (2016). Effective academic advising and African American first year students: A qualitative study. Capella University.
- [16] Asby, S. B. (2015). Early alert and intervention systems and student persistence: An exploration of student perceptions. *Associations of International Educators*. (2012, May). Comprehensive strategic international enrollment management: recruitment, retention, and reentry. NAFSA Conference, Houston, TX.
- [17] Alexander W. Astin (1984). "A Developmental Theory for higher Education" University of California, Los Angeles. Angela van Barneveld, Kimberly E. Arnold, and John.
- [18] Tinto, V. (1997). "Classrooms as Communities: Exploring The Educational Character of Student Persistence" *Journal of Higher Education*. 68, 6 (November/December): 599-623.
- [19] Alan Seidman (2016). "College Student Retention: Formula for Student Success & Minority Student Retention". Walden University, USA.
- [20] Lynda Wallace-Hulecki and Alan T. Seagren. (2014). *Managing Change with Strategic Enrollment Management (SEM)*. Proceeding of The Chair Academy Conference. Arizona, USA.
- [21] Bichsel, J. (2012). *Analytics in Higher Education: Benefits, Barriers, Progress, and Recommendations* (Research report). CO: EDUCAUSE Center for Applied Research.
- [22] Van Barneveld, A., Arnold, K. E., & Campbell, J. P. (2012). *Analytics in higher education: Establishing a common language*. EDUCAUSE learning initiative, 1(1), I-II.