COMPETENCY MODEL FOR INFORMATION SYSTEMS' SPECIALIZATION TRACK UTILIZING RIASEC AND VALUES SEARCH MODELS

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ABSTRACT

This paper introduces the competency models for Operations Manager, User Interface Designer, and Application Developers. It will serve as a guide for Information Systems students to identify which among the three of the offered tracks would be most suited for them to pursue according to their knowledge, skills, values and interests. The Holland's RIASEC model and the Values Search model of Bronwyn and Holt were utilized to determine the most dominant interest and most dominant values of the industry computing experts. Survey assessment forms were sent to IT Operations Manager, User Interface Designer, and Application Developer. Most dominant values and interests of industry computing experts were determined as well as the knowledge and skills which are mostly required by the industry in their particular area. Based on the result of the survey, it shows that application developer and user interface designer have a closely related values. Thus a second round of a survey would be needed to come up with the most exclusive dominant values for the particular information systems specialization track.

KEYWORDS

e-learning, career assessment, profile matching, competency model

1. INTRODUCTION

Many factors are rarely considered in determining a student's career options which starts from choosing their college program and even in selecting elective courses. Selecting a field of specialization has never been a big deal for many students. Usually, students select those courses which they think are easy and require less paper works or projects. A fourth year irregular student said, "*Honestly, I just follow my friends when taking elective courses. If that would mean they will be my classmates, then I would definitely take up those elective courses they have enrolled provided that the schedule will not give me long vacant hours...*" Another student said, "*When I am choosing free elective courses my friends and I choose only 1 section to have fun in every vacant hour.*" Moreover, students choose a college program that they think is cool, trending, or easy to pass courses to earn a degree. Sometimes, they choose tracks based from the strong influence of their parents and peers. Most often they do not completely realize the impact of their career choice in their career.

One alumna said, "*Other alumnus who didn't like IT/IS/CS but was able to finish the program was due to the fact that they felt they needed to finish the course just to earn a degree. It's just a matter of formality by all means. As long as they earn a degree and get any job. I know someone who is underemployed. She is not confident enough to apply for any programming position because she is not confident of her programming skills.*"Often, students would only realize the importance of choosing the right track once they get into the real job or even from the start of sending applications to the prospective companies and desired positions where there is tight competition. Thus, many graduates end up getting jobs that are far from their field of specialization contributing to the perennial problem of job mismatching. Some may easily find jobs which seemingly are related to their field, but promotions or career growth takes longer compared to others who are competent in their field. As a result, underemployment rate increases.

According to National statistics Office of the Philippines, the underemployment rate last 2nd and 3rd quarters of 2012 was 19.2. Underemployment means a situation in which a worker is employed but not in the desired capacity, whether in terms of compensation, hours, or level of skills and experience. [11] Moreover, [9] "Underemployment and unemployment varies a great deal depending on the major when there's a skills mismatch. With regards to compensation, [9] underemployed and unemployed graduates earn as much as 10 percent less over their careers compared to their fully employed peers. However, despite of the compensation struggle, some graduates would better be underemployed rather than unemployed.

Therefore, helping students determine the track of specialization according to their values, interests, knowledge, and skills would lead them to a more successful career. With the new curriculum of Information Systems program in Technological Institute of the Philippines (TIP), three tracks are now offered aside from elective courses it has been offering. These tracks are Application Development, Operations Management, and User interface designing.

This study focuses on constructing a competency model for Information Systems Program of TIP which would help students to decide on which track of the Information Systems Program they would consider.

2. CONCEPTUAL FRAMEWORK

Career counselling in Technological Institute of the Philippines was not so active yet compared with other universities until the institution implemented the student advising system. Based on the Information Systems, TIP Quezon City Self Survey Report (IS TIPQC SSR) [3] new advising scheme is intended to provide students with knowledge and guidance on academic policies, plan of study progression, career options, instructional support, and job opportunities, among others, and to monitor the attainment of relevant student outcomes." It is also intended to support students in maintaining and completing their particular plan of study on time and thus improve the institutional retention and completion rates. One motivation in conceptualizing the proposed competency model is the school's advising scheme. Having clear background of students' competencies could help faculty advisers in advising the students. The implementation of the competency model proposed by [5] focusing on a more specific engineering skills resulted to excellent performance of their students. This paper aimed to construct a model that would help to determine not just knowledge and skills of the students but as well as their values and interests.
Figure 1 represents the conceptual framework of this study. Skills and knowledge regarding the computing tools and theories from the aligned courses of Information Systems Program of TIP were identified to design a survey. While the RIASEC interest test of John Holland and value search test of Bronwyn and Holt were utilized to determine the values and interests of industry computing experts in the field related to the Information Systems three tracks. The expected

output of this paper is the competency model of Information Systems' Specialization tracks which was based on the results of survey.

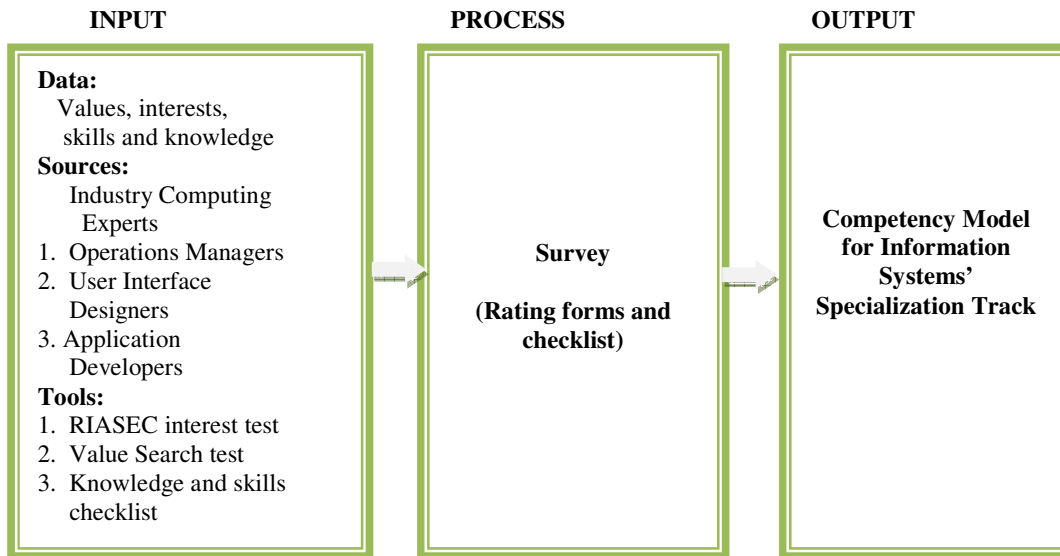| INPUT	PROCESS	OUTPUT

Data:
    Values, interests,
    skills and knowledge
Sources:
    Industry Computing
    Experts
1. Operations Managers
2. User Interface
    Designers
3. Application
    Developers
Tools:
1. RIASEC interest test
2. Value Search test
3. Knowledge and skills
    checklist
	Survey
	
	(Rating forms and checklist)
		Competency Model for Information Systems' Specialization Track

Figure 1. Conceptual Framework of the study

The Information Systems track of the College of Information Technology Education of Technological Institute of the Philippines and the aligned courses of each track are shown on the following tables below.

Table 2 shows Information Systems Track 1 - IT Operations Management, where students concentrate on business operations related to computing processes; Track 2 (table 3): User Interface Designing, where students are trained to create interfaces that organize information for users; and Track 3(table 4): Application Development, where students are trained to simplify the tasks of the end user or resolve recurring problems through process automation.

Table 1. Fundamental And Aligned Courses Of The Information Systems Program Tracks.

TRACK 1 Operation Management	TRACK 2 User Interface Designing	TRACK 3 Application Development
BP(IS100)	OOP (ITE003)	DS(DS201)
MIS(101)	OOP (ITE004)	Deployment & Maintenance (IS400)
Evaluation of Buss. Performance (IS200)		IT Infrastructure (IT001)
PPM(IT203)		
IT QA (IT303)		
SAD(IT202)		
DB(ITE006)		
DB Oracle (ITE007)		

Table 1 shows fundamental courses mapped in each Information Systems track. The knowledge and skills listed on the rating form used in the survey were based from these aligned courses.

Table 2. Information Sytems Track 1 - Operations Management

Course	Description
IT401	Data Mining & warehousing
IS403	Business Process Management
IS404	Enterprise Systems
SAP501	Business Analytics Using SAP BW

Table 3. Information Sysetms Track 2 - User Interface Design

Course	Description
ITE010	Fundamentals of HCI
IS405	Knowledge Management System
IT504	GUI System Development
IT200	Multimedia System Development

Table 4. Informations Systems Track 3 - Application Developer

Course	Description
ITE505	Application Development
CS305	Computer Security
IS503	IT audit and control
IS504	IT Security & Risk Mgt.

Figure 2 shows the Framework on the Assessment of Students' Competency for Information Systems Specialization Tracks. The competency model, which is the focus of this paper, is constructed based on result of the evaluations conducted from the industry computing experts. The model could then be used to determine which Information Systems track is the most appropriate for the student to pursue. The same rating tests would be sent to students to determine the student's most dominant and identified values, interest, knowledge, and skills.
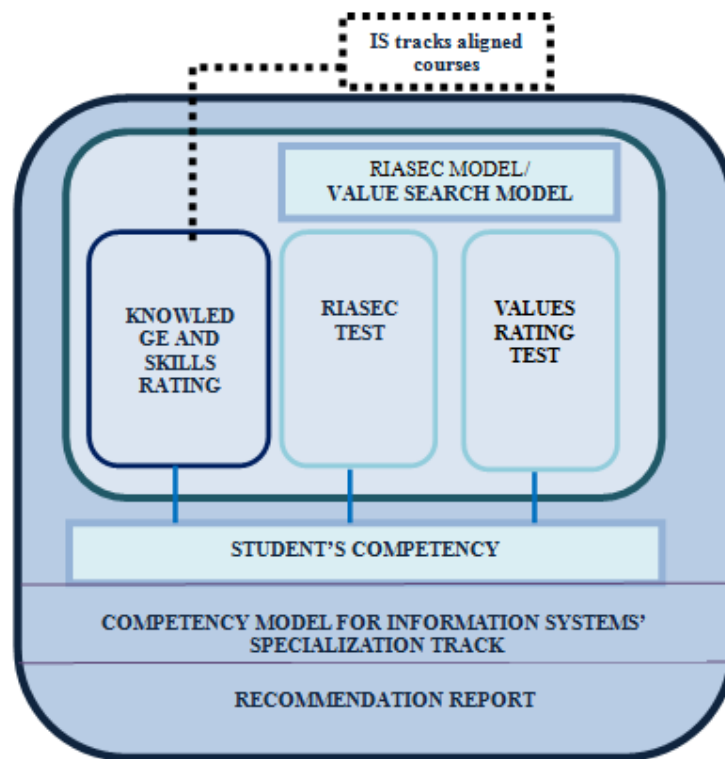
Figure 2. The Framework on the Assessment of Students' Competency for Information Systems Specialization Tracks

3. METHODS, TECHNIQUES, MODE OF INQUIRY

The assessment forms shown on the appendices were used to collect data from the industry computing experts particularly from the IT Operations Manager, User Interface Designer, and Application Developers.

The table shown in appendix 4 is the assessment rating form with regards to the interests expected from the aspiring operations manager, user interface designer, and application developer. This form is based from the RIASEC test designed by the Career Educational Center of University of Hawaii. [4] The RIASEC Holland Code, which stands for: R- ealistic, I-nvestigative, A-rtistic, S-ocial, E-nterprising, C-onventional was used in this study to determine the interest of industry computing experts.

Knowledge and skills listed on the appendix 1, 2, and 3 are based on the aligned courses for each track offered in the Information Systems' curriculum which would be the possible competencies acquired by the students during their training in the institution. Assessment checklist of Knowledge and skills for user interface designer composed mainly of programming languages and tools used in the courses offered in the Information Systems curriculum is shown in appendix 2. Programming languages, database systems, and other application development tools are listed on the knowledge and skills checklist for application developer as shown in appendix 3 while for the expected skills and knowledge from operations manager are shown in appendix 1. With the revision of the Information Systems' curriculum industry experts were already considered as the program formed an advisory board composed of alumni, faculty, institution's officers, and practitioners so the initial list were all based on the updated curriculum.

The Value Search Test found in appendix 6 was used in determining the most dominant values of the industry computing experts. The Value Search Map of Bronwyn and Holt, please refer to figure 3, were utilized to categorize the values. It has eight value categories namely, Understanding, benevolence, tradition, security, power, excitement, achievement, and self-direction. *The mapping of values can help you better understand how your values can influence and motivate your career decisions. The values test is one necessary input to best determine the Information systems specialization track of the student wherein it would help in evaluating on how well the values are integrated in the work. [6]*
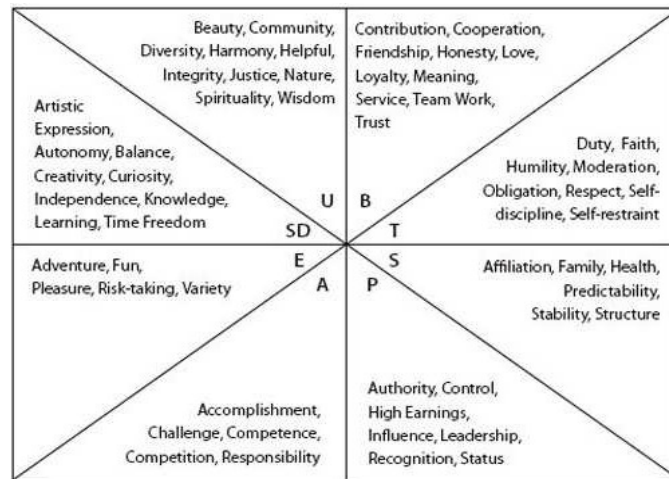

Figure 3. The Value Search Map of Bronwyn and Holt

These value search tests were sent to at least ten of the experienced operations managers, user interface designers, and application developers from the industry computing expert. At least five years of experience in the related field was considered. Determining the minimum years in service, which is five years, is based on the most common requirement of recruitment process in the computing industry.

The same assessment ratings forms will be used when the competency model is utilized in the identification of the most suitable Information Systems' track for the student to pursue.

Table 5. Profile of Respondents

PROFESSION	Number of respondents	Minimum of years in service
(Track1). Operations Manager	10	5
(Track 2). User Interface Designer	10	5
(Track 3). Application Developer	10	5

4. RESULTS AND ANALYSIS

The summation of the most required knowledge and skills of the industry computing experts were computed. The same computation was used in coming up with the top ten most dominant values. Values are then categorized using the Values Search Map [6]. Meanwhile, for the computation of the most dominant interest of the expert, each category in the assessment form was first added and categorized. Finally, results of all forms were summed up and categorized to come up with the top three most dominant interests of computing expert in each track of specialization.

Table6. Result Of Values Survey Based On The Values Search Framework

Types of Values	Application Developer	User interface Designer	Operations Manager
Openness to change: self direction, excitement	24	33	16
Self-enhancement achievement and power	24	29	35
Self-transcendence universality and benevolence	19	26	15
Conformity Traditions and security	21	17	15

Table 6 shows the result of the survey that was conducted to determine the most dominant values of experts from application developers, user interface designers, and operations manager. The user interface designers' most dominating value is the openness to change which scored 33 points. While the top values of operations manager falls under the category of self-enhancement with a score of 35 points, which means achievement and power are their highest concerns.

On the other hand, basic knowledge on programming languages and in operating systems is necessary but not required in IT operations manager. Most of the listed knowledge and skills required from application developers and user interface designers were confirmed. Please refer to table 7 and assessment rating form appendix 1, 2, and 3.

Finally, with regard to the top three interests: Operations Manager has Social, Investigative, and Conventional; User Interface Design-Artistic, Social, and Enterprise; Application Developer – Realistic, Investigative, and Conventional. With regard to the dominating values of the computing experts, openness to change and self enhancement are the top values of application developer which both values got the highest score of 24 points as shown in Table 8.

Table 7. Most Required Skills And Knowledge

	Operations Manager	User Interface Designer	Application Developer
1	Business process	HCI	VB.net
2	PPM	CSS	MySQL
3	Accounting management	Photoshop	PHP
4	Economic and accounting principles	Javascript	SqLite
5	Knowledge on Server side technologies	Understanding on difffrent mobile/desktop/web applications	Java
6	Knowledge on usabililty issues	Java	Oracle
7	CMS	Typography	Javascript
8	Interface design	Layouting	Design and efficiency evaluation and Q.A tools
9	Basic knowledge of Programming languages	Flash	ASP
10	Basic knowledge of operating systems	Correl draw /illustrator	Postgre

Table 8. The Top Three Interests Of Operations Manager, Application Developer, And User Interface Designer

Operations Manager		Applications Developer		User Interface Design	
Interest	Total	Interest	Total	Interest	Total
S	27	I	40	S	29
C	25	C	31	E	28
I	20	R	27	A	25

Top three interests of operations manager as shown on table 8 are Social, Conventional, and Investigative. While for the applications developer top three interests are investigative, conventional, and realistic. User interface designer's top three interests are, social, enterprise, and artistic.

5. COMPETENCY MODELS FOR INFORMATION SYSTEMS SPECIALIZATION TRACKS

The most dominant values of operations manager is under the category of self-enhancement. Among the three tracks it got the highest score of 35 which is 13% higher than that of user interface designer and 8% higher than the application developer as shown in table

Table 9. Operations Manager Competency Model

Values	Interests	Knowledge and Skills
Self-enhancement		
Achievement (A)àAccomplishment, Challenge, Competence, Competition, Responsibility	Social, Conventional, Investigative	BPM, PPM, Economic & Actg. Principles, Client/Server Side technology, Usability Issues, CMS, Interface Designs/HCI, Basic knowledge on operating systems.
Power (P)àAuthority, control, High earnings, Influence, leadership, recognition, Status		

Table 10. Applications Developer Competency Model

Values	Interests	Knowledge and Skills
Openness to Change		
- Self-Direction (SD): Pursues independent thought or action. Enjoys the ability to choose, create, and explore - Excitement (E): Seeks pleasure or sensuous gratification. Enjoys unpredictability and variety in life.	Investigative, Conventional, Realistic	VB.net, query language, PHP, SQlite, Java, Oracle, Javascript, ASP, Design and efficiency evaluation and Q.A tools
Conformity		
• Tradition (T)→ Respect, commitment, and acceptance of the customs and ideas that one's culture or religion expects of individuals. • Security (S)→ Desire for safety, harmony, and stability of society, relationships, and self.		

Application developer's most dominant values are under the categories of openness to change and self-enhancement which got the score of 24 each respectively. However, the conformity category

got the highest score of 21 compared with the scores of operations manager, and user interface designer.

Table 11. User Interface Designer Competency Model

Values	Interests	Knowledge and Skills
Self-transcendence		
Universality (U): Understanding, appreciation, tolerance, and protection for the welfare of people and nature.	Social, Enterprise, Artistic	HCI, CSS, Photoshop, JavaScript, Understanding on diffrent mobile/desktop/web applications,Java, Typography, layouting, Flash
Benevolence (B): Concern for the protection and enhancement of the welfare of people with whom one is in frequent contact.		
Openness to Change		
Self-Direction (SD): Pursues independent thought or action. Enjoys the ability to choose, create, and explore		
Excitement (E): Seeks pleasure or sensuous gratification. Enjoys unpredictability and variety in life.		

The most dominant values of user interface designer falls under the category of openness to change. While the values under self- transcendence got higher scores compared with other tracks.

6. CONLCUSION AND FUTURE WORKS

Based on the result of the survey, it shows that application developer and user interface designer have closely related values. Thus, another round of conducting a survey would be needed to come up with the most exclusive dominant values for the particular information systems specialization track.

For future works, the competency models can be implemented to a computer application that will cater the processing of the identification of Information Systems track to be recommended to the information systems students according to their competency.

REFERENCES

[1]   Philippines National Statistics Office Website.www. Census.gov.ph/statistics/survey/labor-force. Retrieved on   October 18, 2013.
[2]   TIP Quezon City IS ABET SSR. Technological Institute of the Philippines. Quezon City, Philippines
[3]   Singh, Raghav. Generation U. Too Many Underemployed CollegeGrads. http://www.ere.net/2013/07/19/generation-u-too-many-underemployed-college-grads/
[4]   Quiang, Li and Shiyan, Wen. A competency Model for Civil Engineering
[5]   Career and Technical Education Center. www.hawaii.edu/cte/publications/RIASEC.pdf
[6]   Bronwyn, Llewellyn and Holt, Robin. Values test. http://www.netplaces.com/career-tests/values-and-your-career/values-test.htm. retrieved on october 16, 2013.

APPENDICES

APPENDIX 1

Assessment Rating Form For Operations Manager – Knowledge And Skills

CHECK THE KNOWLEDGE/SKILLS WHICH ARE REQUIRED FOR USER OPERATIONS MANAGER		
KNOWLEDGE & SKILLS	**Required**	
	Y	**N**
Management (people, time, resources)		
Colour skills and design knowledge		
Expert on different operating systems		
Microsoft office applications		
Coding languages: HTML, XHTML css		
Basic knowledge: PHP, MySQL, JavaScript, JQuery, AJAX		
Content Management Systems(CMS)		
Streaming formats: flash, QuickTime, Windows media,		
Business Process		
In-depth knowledge of usability issues		
Project and planning management		
Economic and accounting principles		
Understanding of server side technologies		
Understanding of Interface design		
Other Application Or Tools, Skills,knowledge (Pls. Indicate: On The Blank Cells Below)		

APPENDIX 2

Assessment Rating Form For User Interface Designer – Knowledge And Skills

CHECK THE KNOWLEDGE/SKILLS WHICH ARE REQUIRED FOR USER INTERFACE DESIGNERS		
KNOWLEDGE & SKILLS	**Required**	
	Y	**N**
Cascading Sytle Sheet(Css)/CS5		
Photoshop		
Java		
Javascript		
Flash/illustrator		
Design and Efficiency Evaluation/Q.A Tools		
Layouting		
Color Scheme/Color Theory		
CorelDraw		
HUMAN COMPUTER INTERACTION Principles (HCI)		
Understanding/Knowledge Regarding Differences Of Web/Mobile/Desktop Applications		
Typography		
Multimedia		
Communication Skills		
Leadership Skills		
Other Application Or Tools, Skills, knowledge (pls. indicate: on the blank cells)		

APPENDIX 3

Assessment Rating Form For Application Developer –Knowledge And Skills

CHECK THE KNOWLEDGE/SKILLS WHICH ARE REQUIRED FOR AN APPLICATION DEVELOPER		
KNOWLEDGE & SKILLS	**Required**	
	Y	**N**
VB.net		
Sqlite		
Oracle		
MySQL		
Postgre		
PHP		
MSSQL		
Java		
ASP		
JavaScript		
Design and Efficiency Evaluation/Q.A Tools		
Other Application Or Tools, Skills, knowledge (Pls. Indicate: On The Blank Cells Below)		

APPENDIX 4

Interests Assessment Rating Form For Operations Manager, User Interface Designer, And Application Developer

APPENDIX 5

Value Assessment Rating Form For Operations Manager, User Interface Designer, And Application Developer

CHECK THE OTHER TOP 10 VALUES THAT WOULD BE CRITICAL TO JOB SATISFACTION FOR AN APPLICATION DEVELOPER			
accomplishment		Curiosity	
adventure		Diversity	
affiliation		Duty	
Artistic expression		Faith/ spirituality	
authority		Family	
balance		Friendship	
beauty		Fun	
challenge		Harmony	
community		Health	
control		Helpfulness	
contribution		High earnings	
cooperation		Honesty	
Humility		Independence	
influence		Integrity	
justice		Knowledge	
leadership		Learning	
love		Loyalty	
meaning		Moderation	
pleasure		Obligation	
predictability		Recognition	
respect		Responsibility	
Risk taking		Self discipline	
Self restraint		Service	
wisdom		Stability	
structure		Team work	
status		Time freedom	
trust		Variety	
Pls. write other values you think is critical or required:			