

Information Systems Performance: The Role of Individual Efficacy Factors

Dean Achmad and Mudaray Marimuthu

College of Law and Management Studies, University of KwaZulu-Natal, Durban, South Africa

KEYWORDS Information Systems Development. Information Systems Course Design. Information Systems Confidence. Information System Career-Interest. Information System Activity-Interest

ABSTRACT Information Systems Development (ISD) projects are the vehicle for delivering information systems (IS) in organizations. However, the low success rate of ISD industry projects indicates that project performance warrants further investigation. The Social Cognitive Theory by Bandura has indicated self-efficacy to be an important predictor of performance where behavioral actions can lead to improvements. There was substantial evidence to support the role of self-efficacy in predicting performance; hence the objective of this study was to examine self-efficacy in ISD group projects. The research process of measuring student efficacy to performance achievement is expected to provide insights into understanding the proposed theory of ISD Efficacy. The knowledge gained can support the development of theories that contribute to understanding system development difficulties in the software industry. In this census survey respondents were third level IS major students at the University of KwaZulu-Natal, South Africa. This research has highlighted the significance of IS Confidence to individual performance.

INTRODUCTION

Business should remain effective in order to maintain its competitive advantage in its operational environment. The information about the organization's operations and processes is at least one asset of strategic value and significance. An effective and efficient Information System (IS) is key to providing such information. Implementing IS will promote the organization's decision-making capacity and opportunities for success. It is reasonably and naturally expected that an effective team (Sawyer 2004) should be able to deliver an effective IS solution. Therefore, the role of the individual and their contribution to this IS team is of great significance.

This study examines the effect of self-efficacy on performance in ISD projects. Cherian and Jacob (2013) have researched the link between efficacy and performance, and in their survey of the related literature have found evidence to support that high self-efficacy does indeed contribute to good performance. Their research aimed to assess the influence of efficacy on performance and they found that efficacy is an appropriate factor for assessing employee performance. They suggest that although people might have high self-efficacy, this is moderated by the complexity of the work tasks. The relatively complex (Sawyer 2004) 'socio-technical' nature of ISD

projects makes achieving effective solutions difficult and could impact project completion and/or lead to failure.

Frese and Sauter (2003, 2014) reported on various factors that could lead to project failure. Their findings indicate that the major reason for this problem of project failure is that ISD field projects are complex by nature, which accounts for the variation and inaccuracies in project planning and the variation in project decisions. A dearth of precise causes of failure has been documented (Dodson et al. 2012; Goldfinch 2007; Heeks 2006; Nauman et al. 2005; SIMPL/NZIER 2000; Wright and Capps III 2010; Xia and Lee 2004). The research by Frese and Sauter (2003) has also identified individual interactions as an area of concern in which they purport the importance of the capacity of the individual in delivering the expected solution.

In an effort to avoid the negative influence of the task complexity, Frese and Sauter (2003) suggested that managers should put interventions in place where the employee, in this case the ISD professional, is "prepared" and supported in terms of both the physiological and psychological aspects of the task and environment. This can be accomplished through education, training and the fostering of a supportive environment. The meta-analysis by Cherian and Jacob (2013) revealed that there is a scarcity of knowledge about the practical application

of efficacy theory on performance in the workplace. Similarly, there is limited research on self-efficacy in ISD projects.

Blumberg et al. (2012) purport that the influence of people's 'perceptions and thoughts' significantly impacts the variation in their interactions and behavior. Therefore, from an academic standpoint, educating students with more effective skills, as supported by Vora and Markóczy (2012), is vital for success. The construction of knowledge on how to improve the effectiveness of social cognitive processes in IS development projects would be a valuable contribution to academia as well as to IS field projects, since there has been no identified panacea for success. Bandura's idea about individual confidence and its impact on striving for performance success is however worth considering in understanding IS individual performance. In particular, the Social Cognitive Theory (SCT) provides an efficacy factor that represents a potentially strong determinant of performance, which can be obtained from measuring self-reported perceptions of ability and interest factors of the respondents (Bandura 1989b). The importance of understanding ISD project learning and the variables that influence individual performance are expected to produce tangible and practical artifacts that can be used to produce reliable and predictable results.

Literature Review and Theoretical Framework

This section explores the various definitions of self-efficacy, a framework for categorizing the types of instruments used to assess self-efficacy, as well as prior research on self-efficacy.

End User Efficacy and Career Choice Models as Information Systems Theories

The exploration of efficacy measures to predict or influence performance for Information Systems (IS), and Information Technology (IT) is not an entirely new occurrence, as it has been applied to measure end user self-efficacy of computer usage (Petter et al. 2013; Doyle et al. 2005; Compeau et al. 1999). Petter et al. (2013) had focused on IS success from the perspective of the user of the information system and not that of the developer and those involved in the development processes. They did, however, identify that self-efficacy was an important characteris-

tic to measure IS success and that managers could play a role in influencing an individual's self-efficacy. Here users with strong efficacy beliefs, in particular confidence, had stronger intentions to use computers. The precursor research by Compeau et al. (1999) had postulated that IS research had demonstrated strong linkages between self-efficacy and individual reactions to computing technology. This was both in terms of adoption and use of computers and the respondent's self-efficacy scores. These theories do demonstrate strong links between success and self-efficacy, however they are not appropriate to be applied to measure ISD performance as these merely measure the attitudes of end users to computers in general and not specifically that of performance during ISD activities. An ISD team would at least include the developers, testers, analysts, project managers and team leaders. An Efficacy Theory, unlike one applicable for end users only, should measure the interactions of IS producers with more depth, more comprehension and with more focused inquiry.

Another theory by Joshi and Kuhn (2011) called the Theory of Reasoned Action (TRA) was developed to measure student's intentions to pursue a career in IS, referred to as a career choice model that indicates factors that create interest in an IS career. This theory, although being more focused on IS producers, is still too generic. It is not focused on providing an understanding of the problems associated with individual and group interaction. The focus is targeted to the reasoning about particular career choices in IS (Joshi and Kuhn 2011). Although being complementary, it is not particular to the problem at hand. In contrast, the Social Cognitive Theory is expected to describe the factors that can lead to predicting performance and for identifying any particular factors for success, which are important for the field of ISD.

Individual or Self-efficacy for ISD

Self-efficacy is investigated for its impact on student performance, its role in predicting performance, particularly for IS group software development projects and for the expected outcome of producing practical artifacts that can be applied to enhance the opportunities for success. A number of interpretations for the term "self-efficacy" are found in literature. According to Pajares (2003), "individuals are under-

stood to possess self-beliefs that enable them to exercise a measure of control over their thoughts, feelings, and actions” in which the “beliefs that people have about their capabilities are critical elements”. Van Der Roest et al. (2011) identified self-efficacy as a degree of confidence directly associated with motivation. According to Bandura (1989a, 1989b) and others, self-efficacy is a more established predictor of performance (Tømte and Hatlevik 2011; Ferrari et al. 2010; van Dolen et al. 2006; Seijts et al. 2000; Bandura 1977; Bandura 1989 b).

Brown et al. (2008) applied self-efficacy measures in their study and found that “the motivational properties of having robust academic self-efficacy are important to academic attainment”. Brown et al. (2008) stated, “self-efficacy refers to confidence in one’s ability to accomplish academic tasks successfully” and “that such efforts will lead to valued outcomes”. They also found that “the effect of self-efficacy on academic performance appeared to be more direct than being mediated by” other factors (Brown et al. 2008). Their Social Cognitive Career Theory (SCCT), “speculates that self-efficacy affects performance and students with stronger self-efficacy beliefs will tend to set and work towards more challenging academic goals than will those with weaker efficacy beliefs”. This suggests that students with a strong sense of academic self-efficacy willingly undertake challenging tasks. In the study by Brown et al. (2008), career self-efficacy was measured and compared to student college performance averages. Interest is a factor that according to Brown et al. (2008) has “a direct relation to choices”, which is a central tenet of self-efficacy and is used to assess a student’s perceptions of their ability to “accomplish academic tasks successfully”.

Framework of Self Efficacy for IS Development

While higher self-efficacy has been found to impact behavior (French 2013), the currently available standard, more generic, self-efficacy theories and computer self-efficacy theories do not provide for a self-efficacy theory that is particularly focused on measuring individual factors in the area of ISD. The objective of the current study was to identify and establish an individual IS performance efficacy. The value of a predictor of individual IS performance is significant for making enhancements to IS courses,

for planning of interventions, for bringing the concepts of teaching and learning closer together as well as providing insights of how self-efficacy can influence the success of industry projects. This research represents a framework for conceptualizing IS individual or self-efficacy and its impact on IS performance (Fig. 1).

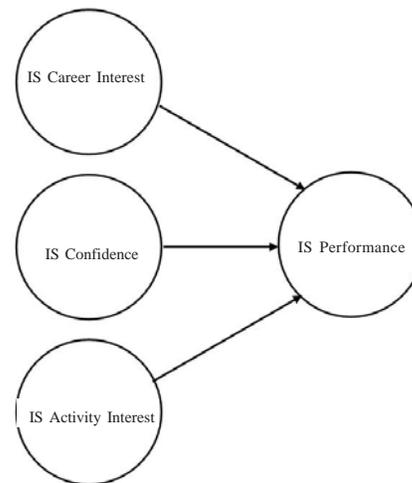


Fig. 1. Efficacy factors affecting Information Systems Development Performance

The following ISD self-efficacy factors are considered as the basis for this theory. First, IS-Career Interest, which is the assessment of the individual’s interest in pursuing a career in IS. Second, IS-Confidence, which is the assessment of the individual’s confidence in their ability to succeed in the current and the next level study objectives. Third, IS-Activity-Interest, which is an assessment of the individuals perceived value of performing work tasks that are directly related to the field of IS (Brown et al. 2008). These factors have been reiterated in other research (French 2013) as a value-intention relationship where each self-efficacy factor is only effective if the person values their involvement in the process, in this case ISD.

Motivation for the Study

The major motivating factor and focus of this study, was the contribution to determining methods and techniques for improving individual student efficacy. This was expected to contribute towards the improvement of the individual’s ca-

capacity to participate in project group work allowing work tasks to be performed in a more meaningful and productive manner. An area already identified by the CIDR (2006) and Vora and Markóczy (2012) that needs attention is one where organizations rely more on teams and groups to solve problems and to synthesize knowledge. Important characteristics and skills like project management, performance success and accountability are vital for each student to develop.

Studying the efficacy dynamics of IS students to gain insights into what motivates them and what sustains their desire to succeed may contribute to the body of knowledge on ISD project performance. The likelihood of discovering important processes and procedures, which could be used in providing guidance on ISD with social cognitive awareness in mind, will be a worthwhile outcome. This knowledge could reinforce the role of IS academia in imparting real world IS solutions in order to remain pertinent as suggested by Lang (2003). Hence, the response by academics has been to conduct research to establish student self-efficacy factors in ISD.

Objectives of the Study

The following objective was set for this research study:

To determine which individual efficacy factors predict information systems project performance.

For the purposes of this study, performance predicted by individual or self-efficacy measures are to be explored to establish individual efficacy as a suitable medium to determine ISD project performance. This is determined by examining individual decisions and interaction preferences.

Hypothesis

Based on the findings in the literature survey and the objectives of the study, the following hypotheses (Table 1) were established to

Table 1: Hypothesis

H0	The variables are not related.
H1	There is a relationship between IS-Career-Interest and Individual IS Performance.
H2	There is a relationship between IS-Confidence and Individual IS Performance.
H3	There is a relationship between IS-Activity-Interest and Individual IS Performance.

evaluate the relationship of IS self-efficacy on student project performance.

METHODOLOGY

The purpose of this research was to investigate the influence of the social cognitive factor of individual efficacy on Information Systems performance. This study used a survey-based method to gather primary data using Likert-type scales to assess student self-efficacy. Data represented a quantitative assessment of the self-reported perceptions of IS student ability to attain various levels of success and achievements in their academic journey to the IT industry.

Using the artifact by Brown et al. (2008), a research questionnaire was formulated to measure social cognitive factors. IS-Career-Interest, IS-Confidence and IS-Activity-Interest are the constructs that are defined by the research instrument to measure individual self-efficacy. The data gathered using the instrument was analyzed to identify areas that indicated relationships between the independent (IS-Career-Interest, IS-Confidence and IS-Activity-Interest) and the dependent (performance) variables in the study.

Participants

In this study, the population comprised of subjects who were students in the age group of 18-24 years. A census study of this population (N=140) of respondents consisted of male and female participants taking the third-year Information Systems and Technology major in the Discipline of Information Systems at the University of KwaZulu-Natal, Durban and Pietermaritzburg. The class group was composed of students registered for the Computer Science and the Bachelor of Commerce, majoring in Information Systems and Technology, degree programs. For the purposes of reporting, student information was kept anonymous and any identifying information of each student was replaced systematically by a corresponding number.

Instrument

Individual IS Efficacy is a composite construct conceptualized as three sub-scales including IS-Career-Interest, IS-Confidence and IS-Activity-Interest. The three sub-scales were constructed as per the guidelines in the study

by Brown et al. (2008). In order to gather the primary data for the study the instrument used for this purpose is a questionnaire, which was not anonymous, as it required the respondents to provide their student number. The student number was requested only to lookup the respective student records to determine their individual performance mark in the IS courses for which they were registered. A pilot test for the questionnaire was conducted where fifteen questionnaires were administered to fourth level (honors) IS students studying software engineering. The purpose of the pilot test was to identify any shortcomings or misunderstandings embedded in any items in the questionnaire.

In an effort to provide clarity to the respondents, the questionnaire, called the Information Systems Self-Efficacy (IS-SE) Questionnaire, provided a brief overview of the purpose to the intended audience of the survey. Likert scale questions were used to establish the respondents' perceptions of their confidence in their ability to succeed in a career in ISD, assessing their interest in such a career and their perceptions of performing ISD activities. In the questionnaire, the respondents indicated how much they agreed with each item on a scale from one to five. Each number notes a certain measurement such as: (1) strongly disagree, (2) disagree, (3) undecided, (4) agree, and (5) strongly agree. A high score on the scale indicated a positive opinion and vice versa, a low score on the scale indicated a negative opinion.

Validity and Reliability

As per recommendations by Lent and Brown (2006), the questions were revised and refined for measuring IS self-efficacy for ISD to provide a suitable and valid design. The completed questionnaire had a good internal consistency as indicated by a Cronbach's alpha value of 0.806, which indicates that the scales are acceptable and can be used to interpret the data (Cronbach, 1951).

Data Analysis

The data received from the questionnaire was coded and entered onto the SPSS statistical program (SPSS Version 21.0 for Windows). The data, which was collected through the IS-SE Ques-

tionnaire, was subjected to descriptive statistics and Spearman's Rho Correlation. Only face validity can be claimed for the research instrument, which was designed by taking into account the applicable literature outlined above. Ethical clearance was obtained from the University of KwaZulu-Natal.

RESULTS AND DISCUSSION

Results are discussed in terms of the descriptive and correlational analysis of self-efficacy factors on performance. The null hypothesis for each hypothesis test is that the variables are not related. Whereas, the alternate hypothesis for each hypothesis test is that the variables are related and can account for variance in student academic performance. The following results were obtained.

Descriptive Statistics

Of the original population of 140, only 61 respondents participated in the survey. The target age group of respondents for this study was between the ages of 18 and 24 years. The demographics of the respondents per campus reflect that 13.11 percent and 86.89 percent were from the Pietermaritzburg and Westville campuses, respectively.

Figure 2 represents the relationship between IS student interest (individual efficacy) and their mean test performance (mark) for the semester. Individual IS Interest Self-efficacy is represented on a scale, from 1 being the lowest to 5 being the highest. It is evident from the chart that students who perform well have an equally high interest in performing IS related tasks. It could be that students feel very positive about performing tasks that emulate those of real world development teams. This confidence seems to have an impact on the students' motivation to perform these tasks (Bandura 1989b; French 2013). The chart also reflects the existence of outliers. In one case, there is a student who although had performed well (60%) had a low (2) Individual IS Interest Self-efficacy. This situation is often encountered where students find themselves pursuing the IS degree not as a matter of choice but rather as a result of another degree not materializing, for various reasons. This could be as a result of the student not gaining entry to the preferred degree of choice or

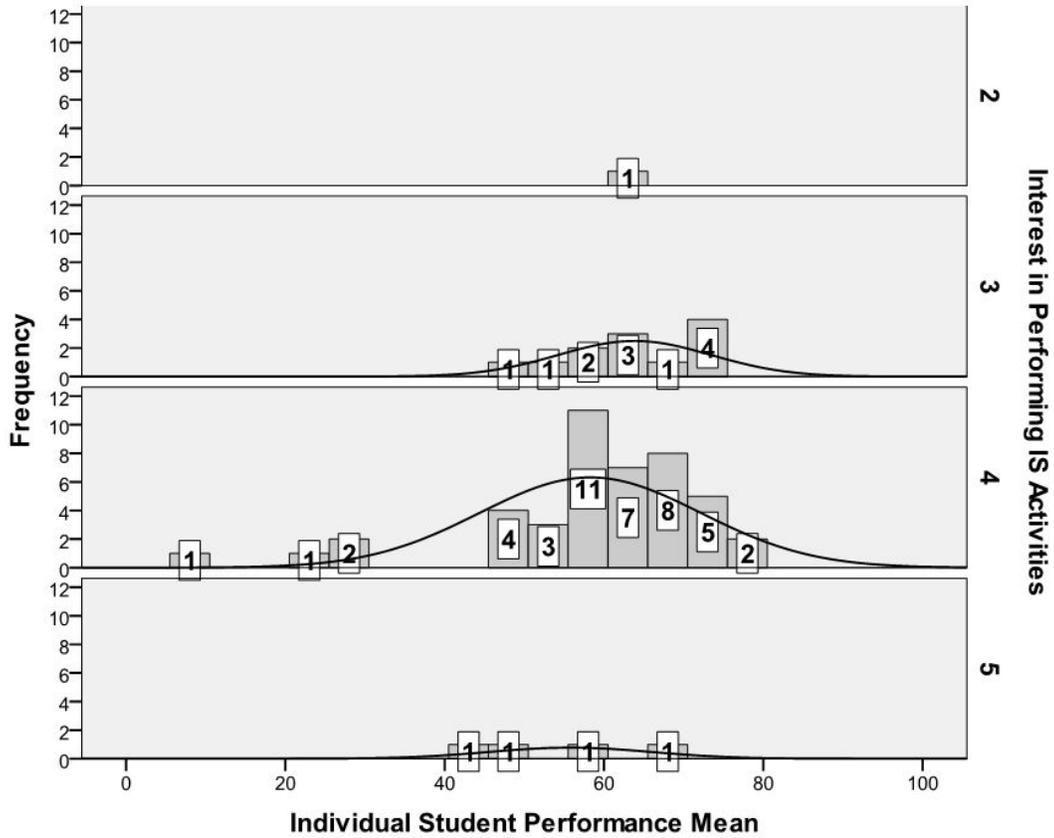


Fig. 2. Relationship of IS activity interest to performance mean

having to exit that degree program early because of poor performance. Hence, the low Interest Self-efficacy in their alternate choice. In another case, there are students who had both low performance and Individual IS Interest Self-efficacy (Bandura 1989b; Brown et al. 2008). This could be an indicator of students who may not be suitable for a career in ISD or students whom might be experiencing some form of difficulty with IS concepts (Brown et al. 2008).

Table 2 represents the subjects’ preferred method/mode of meeting and interaction. It reflects that more students prefer the combined methods of both the online and face-to-face approaches when engaging to conduct their project work tasks. The next highest option is that of face-to-face interaction which although is in line with the findings from the study by Eccles et al

(2010) where they found that collocated software development teams, which would be of a face-to-face nature, is the preferred method of engagement, is not the favored choice in the current study. The last option, online only, shows that very few students prefer to work in a context where there is no face-to-face engagement. This social learning context shows that a combined mode could be appropriate for optimal learning and that the extremes of either face-to-

Table 2: Preferred meeting (interaction) mode

Mode	Percentage
Face-to-face only	26.23
Online only	1.64
Combined approaches	72.13

Table 3: Performance to efficacy correlation matrix

<i>Spearman's rho Correlations</i>		(1)	(2)	(3)	(4)
(1) IS-Performance	R	1.000	.403**	.090	-.142
	Sig. (2-tailed)	.	.004	.539	.330
(2) IS-Confidence	R	.403**	1.000	.045	.140
	Sig. (2-tailed)	.004	.	.757	.338
(3) IS-Career	R	.090	.045	1.000	.321*
	Sig. (2-tailed)	.539	.757	.	.024
(4) IS-Activity	R	-.142	.140	.321*	1.000
	Sig. (2-tailed)	.330	.338	.024	.

face only or online-only might not be appropriate for optimal learning.

Inferential Statistics

An inferential analysis of the data was conducted in order to advise on the strength and significance of the relationships between the variables identified in the study. The study purported to identify relationships between the identified IS self-efficacy variables and student IS performance. Prior research indicated strong positive correlations of self-efficacy to student performance (French 2013; Petter et al. 2013; Brown et al. 2008; Coffee and Rees 2011).

The findings indicate that there is no significant relationship between IS-Career-Interest and Student Performance (Table 3). The coefficient of correlation, r (0.090) should be at a value ranging from 0.500 to 1. At the significance level of 0.539, that is $P > 0.05$, there is no relationship observed and the researchers fail to reject the null hypothesis (see H1, Table 4).

The current findings for IS self-efficacy indicates that only IS Confidence represent a positive relationship to performance. A positive correlation between IS-Confidence and Student

Performance (Table 3) has been identified. It is expected that when IS-Confidence increases, so does the related Information Systems Performance (Petter et al. 2013; French 2013). The reported value r (the coefficient of correlation of 0.403) is fairly weak but represents a significant relationship at level 0.004, that is $P < 0.05$. Hence, the null hypothesis is rejected in favor of the alternative (see H2, Table 4).

The last hypothesized relationship was also found not to be significant (Table 3). There is no observed relationship between IS-Activity-Interest and Student Performance, the reported r value of $-.142$, is less than zero and the significance level is at 0.330, that is $P > 0.05$, which has not shown any significant relationship, hence the researchers fail to reject the null hypothesis (see H3, Table 4).

Self-efficacy in the current study is measured from self-reported perceptions of the factors that contribute to the individual student's success. Limitations for this study included a low response rate of forty-four percent (61 responses out of 140), which indicates that no generalizations of the findings may be made. Also, the geographic distribution of the study was limited, as questionnaires were only administered to

Table 4: Hypothesis conclusion

<i>No</i>	<i>Hypothesis</i>	<i>Conclusion</i>
H1	There is a linear relationship between IS-Career-Interest and IS Performance.	Fail to reject the Null Hypothesis in favor of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Career-Interest and the response IS Performance.
H2	There is a linear relationship between IS-Confidence and IS Performance.	Reject the Null Hypothesis in favor of the alternate. There is sufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Confidence and the response IS Performance.
H3	There is a linear relationship between IS-Activity-Interest and IS Performance.	Fail to reject the Null Hypothesis in favor of the alternate. There is insufficient evidence to conclude that there is a linear relationship in the population between the predictor variable IS-Activity-Interest and the response IS Performance.

students of the Information Systems and Technology courses, at UKZN on the Durban and Pietermaritzburg campuses.

The IS-Activity-Interest and IS-Career-Interest to Student Performance relationships findings are in contrast with research that previously found strong causal links between a person's interest and their performance (French 2013; Petter et al. 2013). Further investigation into this incongruity is worth pursuing taking into consideration the limitations identified above.

CONCLUSION

The objective of trying to determine which individual factors impact ISD performance has been partially realized. Individual efficacy as a whole has not been identified as a predictor of ISD performance. Hence, it has been found in this study that not all social cognitive factors accurately predict ISD performance, but they do provide some insights that can lead to performance improvements. This study has revealed that there is no significant relationship between self-efficacy as a whole on performance in the academic context. The variable of IS-Confidence on its own is significant and has been established as a predictor of individual ISD performance. A longitudinal study is advised to enhance the predictive value of IS-Confidence as well as try to strengthen the other variables identified in this current study. IS-Career-Interest and IS-Activity-Interest will need to be further examined to establish what, if any, are the intervening or mediating variables in their relationship to performance. The study has highlighted the importance of IS-Confidence as an area worthy of further investigation in an effort to improve a student's potential to succeed and build the necessary skills and capacity towards a successful career in ISD. This is a significant factor that can aid academics in their role of developing IS students. The objective of this study has hence been partially achieved.

RECOMMENDATIONS

The strength of the relationship between IS-confidence and performance indicates that considerable effort is required into developing exercises that build confidence for IS individuals. This confidence can only be maintained by providing people with a nurturing environment to

sustain high self-efficacy for continued performance success. Also, where tasks are complex in nature, particular attention needs to be given to enable support of both the physical and emotional factors of managing that task. Providing constructive feedback on performance of the various activities should be conducted in preparation for successive tasks. Courses should be designed to encourage confidence building in order to maintain the relationship of IS-Confidence to efficacy. Activities like pair programming where students work together to solve problems and online quizzes could help to provide more practice and build confidence.

In situations where students who have already graduated and progressed to the field could act as mentors to students to help to reinforce the ideas that success is conceivable and achievable which could thereby promote confidence building. Knowledge gained from the current study could be applied to the IS course curriculum design practices with a focus on enhancing opportunities for increasing and/or maintaining learner IS-Confidence levels. Hence, by developing more confident students, industry ready students will enter the workforce and help alleviate the problem of low ISD project success. In situations where students are found to have low individual efficacy together with correspondingly low performance, the educators should investigate these cases and intervene.

The fact that the majority of students prefer a mixed mode of engagement has implications for the method of teaching and learning as it seems that students are comfortable with spending time both online and face-to-face to complete their work tasks. Future research could include research designs, which include both quantitative and qualitative methods, which is a mixed method design that is effective for understanding complex educational questions such as teaching and learning in ISD. This approach to inquiry could add value and provide more useful insights into strengthening the IS-Confidence efficacy construct. Also, computer science students and commerce students should be researched separately with regards to the ISD project efficacy. One reason for distinguishing between these groups of students is because computer science students have a more technical perspective whereas the commerce students have a more business perspective.

REFERENCES

- Bandura A 1977. Self-efficacy - Toward a unifying theory of behavioral change. *Psychological Review*, 84(2): 191-215.
- Bandura A 1989a. Human agency in Social Cognitive Theory. *American Psychologist*, 44(9): 1175-1184.
- Bandura A 1989b. Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology*, 25(5): 729-735.
- Blumberg H, Kent MV, Hare AP, Davies MF 2012. Group dynamics and social cognition. *Peace Psychology Book Series - Small Group Research*, 3: 55-84.
- Brown SD, Tramayne S, Hoxha D, Telander K, Fan X, Lent RW 2008. Social cognitive predictors of college students' academic performance and persistence: A meta-analytic path analysis. *Journal of Vocational Behavior*, 72(3): 98-308.
- Cherian J, Jacob J 2013. Impact of self-efficacy on motivation and performance of employees. *International Journal of Business and Management*, 8(1): 80-88.
- CIDR 2006. Planning Group Projects. *Teaching and Learning Bulletin*, 10(1): 1-2.
- Coffee P, Rees T 2011. When the chips are down: Effects of attributional feedback on self-efficacy and task performance following initial and repeated failure. *Journal of Sports Sciences*, 29(3): 235-245.
- Compeau D, Higgins CA, Huff S 1999. Social Cognitive Theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*, 23(2): 145-158.
- Cronbach L 1951. Coefficient alpha and the internal structure of tests. *Psychometrika*, 16: 297-333.
- Dodson LL, Sterling RS, Bennett JK 2012. *Considering Failure: Eight Years of ITID Research*. ICTD'12 - ACM. New York, USA, ACM Digital Library.
- Doyle E, Stamouli I, Huggard M 2005. Computer Anxiety, Self-Efficacy, Computer Experience: An Investigation throughout a Computer Science Degree. *IEEE - Frontiers in Education Conference*. Indianapolis, USA.
- Eccles M, Smith J, Van Belle JP, Van der Watt S 2010. Collocation impact on team effectiveness. *South African Computer Journal*, 46: 3-13.
- Ferrari M, Robinson DK, Yasnitsky A 2010. Wundt, Vygotsky and Bandura: A cultural-historical science of consciousness in three acts. *History of the Human Sciences*, 23(3): 95-118.
- French DP 2013. The role of self-efficacy in changing health-related behaviour: Cause, effect or spurious association? *British Journal of Health Psychology*, 18: 237-243.
- Frese R, Sauter V 2003. *Project Success and Failure: What is Success, What is Failure, and How Can You Improve the Odds for Success? ITEC495 Resources*. St. Louis, Missouri, USA, University of Missouri.
- Frese R, Sauter V. 2014. Improving your odds for software project success. *Engineering Management Review, IEEE Fourth Quarter*, 42(4): 25-131.
- Goldfinch S 2007. Pessimism, computer failure, and information systems development in the public sector. *Public Administration Review, Perspectives on Performance and Accountability in Public Administration*, 917-929.
- Heeks R 2006. Health information systems: Failure, success and improvisation. *Int J Med Inform*, 75(2): 125-137.
- Joshi KD, Kuhn K 2011. What determines interest in an IS career? An application of the theory of reasoned action. *Communications of the Association for Information Systems*, 29(8): 133-158.
- Lang M 2003. Communicating academic research findings to IS professionals: An analysis of problems. *Informing Science*, 6(Special Series: Informing Each Other): 21-29.
- Lent RW, Brown SD 2006. On conceptualizing and assessing social cognitive constructs in career research: A measurement guide. *Journal of Career Assessment*, 14(1): 12-35.
- Nauman AB, Aziz R, Ishaq AFM 2005. Information Systems Development Failure: A Case Study to Highlight the IS Development Complexities in Simple, Low Risk Projects. *The Second International Conference on Innovations in Information Technology*, United Arab Emirates University, Dubai, United Arab Emirates.
- Pajares F 2003. Self-efficacy beliefs, motivation, and achievement in writing: A review of the literature. *Reading and Writing Quarterly*, 19(2): 139-158.
- Petter S, Delone W, Mclean ER 2013. Information systems success: The quest for the independent variable. *Journal of Management Information Systems*, 29(4): 7-61.
- Seijts GH, Latham GP, Whyte G 2000. Effect of self- and group efficacy on group performance in a mixed motive situation. *Human Performance*, 13(3): 279-298.
- Sawyer S 2004. Software development teams. *Communications of the ACM*, 47(12): 95-99.
- SIMPL/NZIER 2000. Information Technology Projects: Performance of the New Zealand Public Sector in Perspective. *Report to the Department of the Prime Minister and Cabinet*. Thorndon, Wellington, New Zealand. The SIMPL Group, New Zealand Institute of Economic Research Inc.
- Tømte C, Hatlevik OE 2011. Gender-differences in self-efficacy ICT related to various ICT-user profiles in Finland and Norway. How do self-efficacy, gender and ICT-user profiles relate to findings from PISA 2006. *Computers and Education*, 57(1): 1416-1424.
- Van Der Roest D, Kleiner K, Kleiner B 2011. Self-efficacy: The Biology of Confidence. *Journal of International Diversity*, 4: 49-56.
- van Dolen W, de Ruyter K, Carman J 2006. The role of self- and group-efficacy in moderated group chat. *Journal of Economic Psychology*, 27(3): 324-343.
- Vora D, Markóczy L 2012. Group learning and performance: The role of communication and faultlines. *The International Journal of Human Resource Management*, 23(11): 2374-2392.
- Wright MK, Capps III CJ 2010. Information systems development project performance in the 21st century. *ACM SIGSOFT Software Engineering Notes*, 35(2): 12.
- Xia W, Lee G 2004. Grasping the complexity of IS development projects. *Communications of the ACM*, 47(5): 68-74.