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ANXIETY AND PERFORMANCE IN ONLINE LEARNING

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ABSTRACT

Aim/Purpose	To investigate the state of anxiety and associated expected performance in online courses at the undergraduate level.
Background	Online courses continue to increase dramatically. Computer related anxieties remain an important issue, and, in this context, it has evolved to online learning anxieties with deeper psychological states involved. Consequently, performance is compromised.
Methodology	A first semester online course in information technology was used for the study. A survey methodology approach was used for the anxiety scale measurements. A sample of 1377 participants was obtained.
Contribution	Although there are many technology and internet related anxieties studies, they are relatively scarce. Characteristics of educational performance as they relate to anxiety have not matured and are still controversial. We contribute to this body of literature.
Findings	30% of students seem to experience some sort of anxiety with online courses. Female students are more anxious about taking online courses than male.
Recommendations for Practitioners	Through successive iterations between design and measuring the experience of anxiety, it is important to identify and mitigate sources of anxieties and to design course with greater distribution of marks on more tasks.
Recommendation for Researchers	Anxiety in online learning should take front stage as it represents an underlying stream of influence on all research in the field.

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Impact on Society	It has been shown that the progress of nations depends on the academic performance of its students. As such, studies have also shown that anxiety in learning affects performance. Ultimately this impacts the nation's progress and quality of life.
Future Research	Pedagogy for efficient and effective online courses to reduce anxieties and enhance performance.
Keywords	anxiety, elearning, performance, online, gender, age

INTRODUCTION

Online learning today continues to experience an explosive growth rate. More researchers, practitioners, and institutions are getting on board in increasing numbers realizing reduction in operational overhead. This growth is not expected to slow down or drop off in the foreseeable future (Bolliger & Halupa, 2012). Nevertheless, the online learning paradigm remains dubious with a lot of work being done on technology usage, effectiveness, and satisfaction. It seems that we are still in the beginning stages of making sense of online learning as many of its other complex dimensions are yet to be understood (Saadé, Nebebe, & Kira, 2015).

It seems that despite today's digital age and associated technological advancement, technophobia is still persistent (Yunus, Wahid, Omar, & Ab Rashid, 2016) in a wide range of situations, most importantly in the context of online learning. Modern information technology devices and methods are increasingly being used for elearning, which has been embedded in curriculum and syllabuses with the aim of making teaching and learning more interactive and interesting.

Continuing in the same vein of online learning anxiety research, we contribute to the relatively small body of work by studying anxiety (ANX) as it relates to student performance. Following Saadé and Kira (2009) and Saadé et al. (2015), we find that anxiety is treated as the emotions of fearfulness, apprehension, and uneasiness. In our research, we view anxiety in online learning as "*a feeling of fear from misuse of information technology compromising course performance*."

Considering this definition, anxiety in the present context would not be about generalized uneasiness and apprehension of using information technology, but more specifically about the interaction with the content and process which may incur errors in judgment, in logic, in understanding resulting in a poor performance (lower grades).

LITERATURE REVIEW

Research work that studies the relationship between anxiety and academic achievement in online learning is scarce. Students experiencing general technophobia or specific online courses anxieties, experience learning difficulties, postpone taking online courses or examinations, delay assignments, and show overall lower academic achievement – this was reported specifically with statistics anxiety and performance (Macher, Paechter, Papousek, & Ruggeri, 2012). To the best of our knowledge, little is known about the relationship between online learning anxieties and online course performance.

There is a lot of research that investigated the relationship between general trait anxiety and academic performance that typically shows significant, but moderate negative correlation (Chamorro & Furnham, 2003). Moreover, studies have shown a direct negative influence of anxiety on performance in an examination due to the division of attention between non-relevant and relevant thoughts. This anxiety induced reduction in cognitive efficiency entails thoughts such as self-evaluation, general worry (Mathews, 2000), thinking about performance in course assignments, strategizing on what to with missed assignments, calculating grade scenarios, and meeting deadlines of final assignments. Adding to this reduced efficiency in attention is lack of sleep, improper food habits and other social and behavioral factors.

Therefore, anxiety plays a negative role in the processing capacity required for effective and efficient task performance because it consumes a part of it. Although there are some studies about anxiety and performance, most of them focus on overall academic achievement, examinations, and specific subject matter such as statistics. However, to the best of our knowledge, we did not find any research on the impact of anxiety on performance in online learning environments.

This study makes a first step towards some understanding of anxiety and performance in online learning courses.

METHODOLOGY

A survey methodology approach was used. The context and process, including participants and procedure, and the questionnaire are elaborated.

CONTEXT OF STUDY

Students from the John Molson School of Business, Concordia University, enrolled in an introductory undergraduate course "Fundamentals of Information Technology and Business Productivity" were asked to complete a survey, which includes demographic information, anxiety items, and online course performance and expectations. Out of 1446 students enrolled during the fall semester, one thousand three hundred and seventy-seven (1377) students completed the survey with usable data. Around 32% of the students were asked to take this course as part of their admission requirements. In other words, the students have to take the course and pass it as a condition to their acceptance to their program of choice in the business school. Sixty-eight percent of the students take the course as an elective. Therefore, for 32% of the students, this is a high-stakes course and a barrier to their academic success.

THE LEARNING MANAGEMENT SYSTEM

The online course uses a web-based learning management system name "learning lab" (LL) designed as a project management tool for the sequencing of the tasks associated with the course. LL allows the course tasks/activities to be mapped to the learning goals. Figure 1 shows a snapshot of a typical student view in LL. Figure 1 depicts the tasks sequenced from top to bottom indicating the visits that the student made for each task, the weight of the task, the deadline, the status, and the score obtained. At the bottom, there is a real time progress performance bar and at the top right-hand side, the student has the option to view his/her performance from a learning goal perspective.

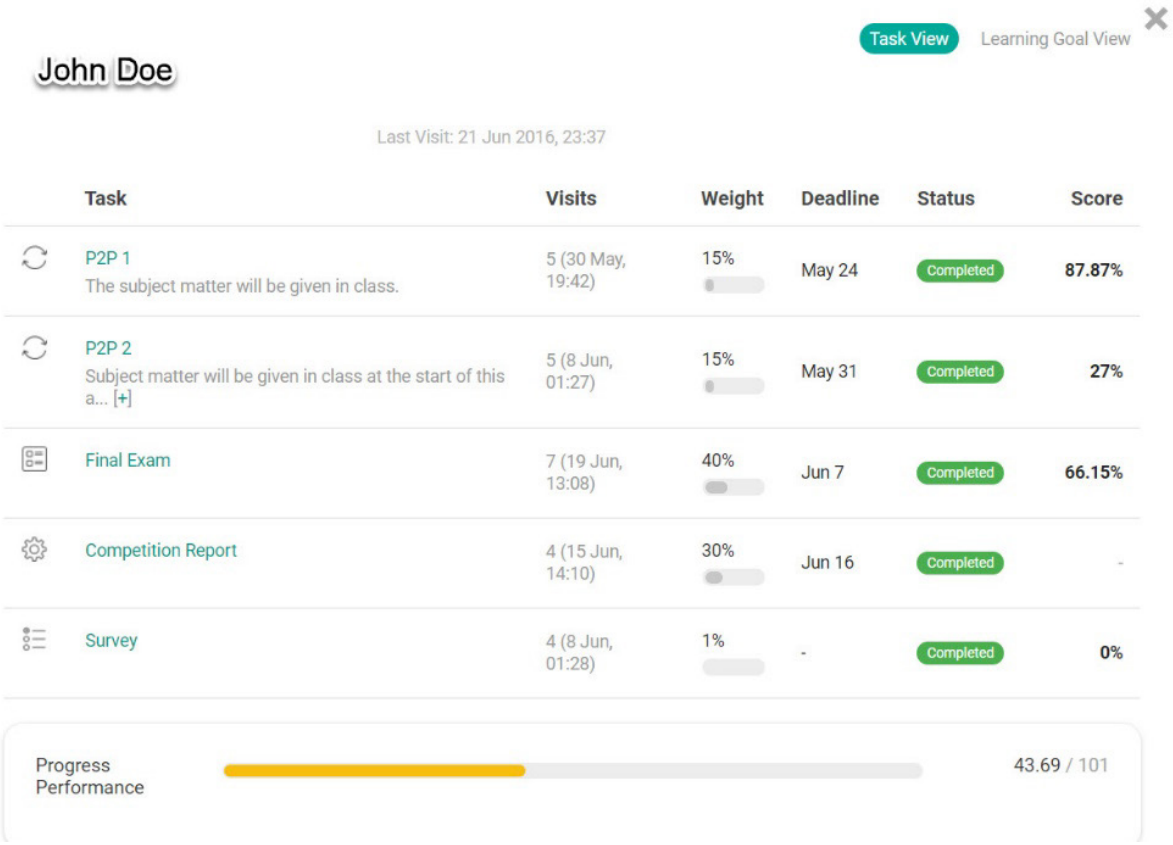

Figure 1. Student view of Learning Lab used in online course

At the end of the semester the link to the survey was enabled and students were given a period of time to complete it online. They were assured that the information they provided will be strictly confidential and used only for statistical purposes, only the results of the statistical analysis will be used for academic and research purposes, and that the aim of the analysis is to help the online course team refine the course elements regularly and every semester.

Learning Lab provides the professor and teaching assistants with dashboards to monitor the students' activities and performance. A question center is also integrated to eliminate emails and allow students to browse others' questions and answers. Communication with the students is done through an integrated communication module that can be automated or made adhoc. All communications are sent to the student's emails and also remain in the student's dashboard for proper storage and future reference. The system indicates which messages were read by the student and which were not.

THE PEDAGOGY

The pedagogical design of the course includes the following: skill-based activities to learn spreadsheet and databases using Microsoft Excel and Access respectively; small quizzes to ensure students do the chapter readings assigned; a problem-based mini case to be solved (such that the tool in learning lab provides a guided approach to solve it); a pre- and post-knowledge test to measure impact of pedagogy on student's learning of course material; and a summative exam that covers all subject matter.

SURVEY

A survey methodology was used for data collection. The course was offered completely online without any face-to-face interaction with the professor or the teaching assistant. One thousand three hundred and seventy (1377) usable questionnaires were retained out of 1436 students enrolled in the course. At the end of the semester, students were asked to complete the survey as candidly as possible and to the best of their knowledge. Students used LL to complete the survey and, therefore, had to login first. However, the data that was exported for analysis was made anonymous. They were instructed that there were no right or wrong answers, and they were given participation points towards the course grade. Table 1 presents the survey used in this study.

Items (presented in Table 1) used to measure the constructs of anxiety (ANX) were adopted from prior research work (Saadé et al., 2015). We adapted the validated items where some wording was changed to account for the context of Learning Lab. All items were measured using a five-point Likert-type scale with anchors from "Strongly disagree = 1" to "Strongly agree = 5".

Table1. Items and constructs used in the study.

Construct	Item	Measure
Anxiety (ANX)	ANX1	Online courses scare me.
	ANX2	I have a lot of confidence when it comes to studying online.
	ANX3	I got a bad feeling when I think of taking an online course.
	ANX4	I am anxious while taking an online course.
Demographics: Gender ○ Male ○ Female Age: [entered in textbox] Where do you frequently use a computer for the online course: ☐ Home ☐ Work ☐ School ☐ Café ☐ Other		
Performance/Expectations: What grade do you want in this course? [A+ to D-] What grade do you expect to get in this course? [A+ to D-] What grade do you realistically think you will get in this course? [A+ to D-] What grade did you get in another online course 1: [A+ to D-] What grade did you get in another online course 2: [A+ to D-] What grade did you get in another online course 3: [A+ to D-]		

Since the inception of this course nine years ago, students in general showed openness to using different methods to help them learn the course content. They were motivated to do extra work to enhance their chances for a better grade. This is especially true due the nature/context of our university in Montreal, Cana-

da where our student population is very international and diverse. The composition of the course entailed a diverse group of students:

- With a diverse mother tongue from English, French, Chinese, Arabic, Spanish, including others presenting a more complex language environment (note that the course was delivered in English),
- Many students work part-time and even full-time,
- A significant number of students have to commute from urban areas to the campus downtown, and
- A large number of students taking the course have not made up their mind on what to major in.

Running the course for over eight years now, we continue to see students having anxieties while taking the course. It was not evident whether this is generalized anxiety and which portion of it is contributed by the online environment. Motivated by this we decided to get insight into the students' experiences of anxiety in relation to an online learning environment and how this influences their performance in the course. Moreover, our aim of the study is to understand how these anxieties differ across various student groups.

It is important to note that learning lab was used in a mandatory setting where the student activities and associated scores counted towards the course final grade. Learning lab was also used to proctor the final exam worth 60% of the grade.

ANALYSIS AND DISCUSSION OF RESULTS

The survey data of 1377 participants were analyzed using SPSS. Our analysis includes demographic data (gender and age group), location of study for the course, the four anxiety items, reported grades and grades expectations, and gender differences in relation to anxiety.

DEMOGRAPHICS

Fifty three percent (53%) of the participants were male and 47% female. Table 2 presents the age group distribution of the sample used for analysis. Seventy four percent of the participants were between the age of 19 and 22, with 48% being 19 or 20 years old.

Table 2. Age group distribution.

	Frequency	Percent	Cum. Percent
17-18	74	5.4	5.4
19-20	664	48.2	53.6
21-22	368	26.7	80.3
23-24	142	10.3	90.6
>=25	129	9.4	100.0
Total	1377	100.0	

In terms of students study behaviour, we captured information in relation to where do the students frequently spend their time studying for the course. Students were given the options of home, work, school, café, and other. They were allowed to select more than one. The following summarizes the results:

- 90% at home,
- 9% at work
- 39% at school, and
- 12% at café

ANXIETY

Analysis of the four anxiety items are presented in Tables 3, 4, 5, and 6 for ANX1, 2, 3, and 4 respectively. These tables represent a frequency analysis indicating percent and cumulative percent of the answers from strongly agree to strongly disagree (SA=Strongly Agree; A=Agree; N=Neutral; D=Disagree; and SD=Strongly Disagree).

Table 3 shows that 25.3% of students feel scared about taking an online course, while 39% of them felt otherwise reporting that online courses do not scare them. Note that the 'valid percent' column does not include missing data. For example, if we consider the SA row (first row), the percent is 6.5 of 1377 while that from the valid percent is 8.6 percent considering the sample of 1377-334=1043. All the tables that include valid percent are treated by SAS in the same fashion.

What is interesting is that close to 36% of the students were neutral, probably because they never reflected on how they feel about taking an online course.

Table 3. ANX1 – Online courses scare me

		Frequency	Percent	Valid Percent	Cumulative Percent
	SA	90	6.5	8.6	8.6
	A	174	12.6	16.7	25.3
	N	372	27.0	35.7	61.0
	D	244	17.7	23.4	84.4
	SD	163	11.8	15.6	100.0
	Total	1043	75.7	100.0	
Missing		334	24.3		
Total		1377	100.0		

In relation to student confidence with studying online (Table 4), and despite that around 25% felt scared taking an online course, about 36% of the students agreed with being confident when it comes to studying online. Around 25% felt less confident to studying online even though 39% of the students did not feel scared about taking the online course.

Table 4. ANX2 - I have a lot of confidence when it comes to studying online

		Frequency	Percent	Valid Percent	Cumulative Percent
	SA	98	7.1	9.4	9.4
	A	274	19.9	26.3	35.7
	N	414	30.1	39.7	75.4
	D	198	14.4	19.0	94.4
	SD	58	4.2	5.6	100.0
	Total	1042	75.7	100.0	
Missing		335	24.3		
Total		1377	100.0		

Consistent with being scared to take online courses, 26% of the students also felt that they have a bad feeling when they think of taking an online course (see Table 5).

Table 5. ANX3 - I got a bad feeling when I think of taking an online course.

		Frequency	Percent	Valid Percent	Cumulative Per-
	SA	85	6.2	8.1	8.1
	A	190	13.8	18.1	26.2
	N	390	28.3	37.2	63.5
	D	263	19.1	25.1	88.5
	SD	120	8.7	11.5	100.0
	Total	1048	76.1	100.0	
Missing		329	23.9		
Total		1377	100.0		

When it comes to asking the question of anxiety directly, 32.1% of the students reported that they are not anxious (see Table 6) while taking the online course, which is about 7% less that the 39% who reported that they are not scared in taking an online course. Table 6 also shows that close to 30% of the students are anxious with an equal number that do not feel anxious while taking an online course.

Table 6. ANX4 - I am anxious while taking an online course

		Frequency	Percent	Valid Percent	Cumulative Per-
	SA	79	5.7	7.6	7.6
	A	227	16.5	21.8	29.3
	N	402	29.2	38.5	67.9
	D	221	16.0	21.2	89.1
	SD	114	8.3	10.9	100.0
	Total	1043	75.7	100.0	
Missing		334	24.3		
Total		1377	100.0		

What is important to investigate further is the 38.5% of the students who reported neutral on their answer. Why did those students select neutral on the anxiety questions? Should we expect half to have anxieties and half not? Or neutral implies low levels of anxieties? Nevertheless, 30% of the students reporting to have anxieties with online courses is significant and requires further investigation.

Performance & Expectations

In this study, we also looked into performance in online courses that students have already taken as well as their grade expectations in this course in the following way: the grade they want; the grade they expect to get; and the grade they realistically think they will get. These questions are not trivial since they were asked at the end of the semester and provide an indication of self-evaluation and assessment of how their experience was in studying for the course.

Table 7. What grade do you want in this course?

	Frequency	Percent	Valid Percent	Cumulative Percent
A+	791	57.4	57.4	58.1
A	303	22.0	22.0	80.1
A-	102	7.4	7.4	87.5
B+	88	6.4	6.4	93.9
B	63	4.6	4.6	98.5
B-	10	.7	.7	99.2
C+	6	.4	.4	99.6
C	4	.3	.3	99.9
C-	1	.1	.1	100.0
Total	1377	100.0	100.0	

Table 7 shows that the majority (87.5%) of the students would like to receive a grade of A- or higher. Around 11.7% reported to want a grade in the B range.

When students are asked about what they expect to receive in the course (Table 8), approximately 45.3% of the students answered in the A range – a drop of around 40% from the previous "grade wanted" question. This change in the answer (of 42.2%) from the previous question was distributed over an increase to the B and C/D ranges by 31.5% and 10.8% respectively. It is interesting to note that 11.6% of the students reported to expect to receive less than B-.

Table 8. What grade do you expect to get in this course?

		Frequency	Percent	Valid Percent	Cumulative Percent
	A+	100	7.3	7.3	7.3
	A	248	18.0	18.1	25.5
	A-	271	19.7	19.8	45.3
	B+	272	19.8	19.9	65.2
	B	212	15.4	15.5	80.7
	B-	106	7.7	7.8	88.4
	C+	80	5.8	5.9	94.3
	C	46	3.3	3.4	97.7
	C-	12	.9	.9	98.5
	D+	8	.6	.6	99.1
	D	6	.4	.4	99.6
	D-	6	.4	.4	100.0
	Total	1367	99.3	100.0	
Missing		10	.7		
Total		1377	100.0		

Table 9 shows that there are some differences between what they expect to get realistically and what they expect to get at the higher grades (A- or better) but not too much differences are expressed at the lower grades. When students are pressed to realistically estimate what grade they will get in the course, the reporting on the A range grades drops yet again from 45.3% to 33.1%. Can this drop be linked to anxiety level of the students? In other words, it may be possible that students with higher anxiety level have less confidence in estimating their performance and will continue to assess lower grade expectation when pressed.

Table 9. What grade do you realistically think you will get in this course?

		Frequency	Percent	Valid Percent	Cumulative Percent
	A+	44	3.2	3.2	3.2
	A	141	10.2	10.4	13.6
	A-	265	19.2	19.5	33.1
	B+	250	18.2	18.4	51.4
	B	235	17.1	17.3	68.7
	B-	185	13.4	13.6	82.3
	C+	114	8.3	8.4	90.7
	C	62	4.5	4.6	95.2
	C-	31	2.3	2.3	97.5
	D+	18	1.3	1.3	98.8
	D	8	.6	.6	99.4
	D-	8	.6	.6	100.0
	Total	1361	98.8	100.0	
Missing		16	1.2		
Total		1377	100.0		

The following three tables (10, 11, and 12) are the reported grades students obtained in three other online courses.

Note in Table 10 that twenty-seven (27.1% = 8.6 +10.4 +8.1) percent of the students reported to have obtained an A level grade in the first online course they took; and only 6.5% of the students obtained less than a B-.

Table 10. Grade obtained in online course 1

	Frequency	Percent	Valid Percent
A+	119	8.6	**8.6**
A	143	10.4	**10.4**
A-	111	8.1	**8.1**
B+	115	8.4	8.4
B	86	6.2	6.2
B-	55	4.0	4.0
C+	30	2.2	2.2
C	19	1.4	1.4
C-	9	.7	.7
D+	9	.7	.7
D	8	.6	.6
D-	13	.9	.9
Total	717	100.0	100.0

Note in Table 11 that twenty-one (21% = 6.4+8.1+6.5) percent of the students reported to have obtained an A level grade in the second online course they took; and only 4.5% of the students obtained less than a B-.

Table 11. Grade obtained in online course 2.

	Frequency	Percent	Valid Percent	Cumulative Percent
A+	88	6.4	**6.4**	64.3
D+	6	.4	.4	64.8
D	6	.4	.4	65.2
D-	11	.8	.8	66.0
A	111	8.1	**8.1**	74.1
A-	90	6.5	**6.5**	80.6
B+	107	7.8	7.8	88.4
B	80	5.8	5.8	94.2
B-	40	2.9	2.9	97.1
C+	24	1.7	1.7	98.8
C	11	.8	.8	99.6
C-	5	.4	.4	100.0
Total	579	100.0	100.0	

Note that in Table 12 around 20% (6.4+7.5+5.8 =19.7%) of the students reported to have obtained an A level grade in the second online course they took; and only 3.8% of the students obtained less than a B-.

Table 12. Grade obtained in online course 3.

	Frequency	Percent	Valid Percent	Cumulative Percent
A+	88	6.4	**6.4**	67.9
D+	3	.2	.2	68.1
D	5	.4	.4	68.5
D-	9	.7	.7	69.1
A	103	7.5	**7.5**	76.6
A-	80	5.8	**5.8**	82.4
B+	84	6.1	6.1	88.5
B	85	6.2	6.2	94.7
B-	40	2.9	2.9	97.6
C+	20	1.5	1.5	99.1
C	8	.6	.6	99.6
C-	5	.4	.4	100.0
Total	530	100.0	100.0	

Tables 10, 11 and 12 show that 717, 579, and 530 students have taken one, two, and three online courses other than the present one. This means that out of 1377 students registered to the present online course, 729 students are taking this course as the first online course. This constitutes around 60% of the total.

It is worth noting that, on the average, close to 30% of the students have reported not being anxious with online courses which is close to the same percent of the students who have taken two or more online courses. While this is the first online course for 50% of the students, it may be possible that half of them contribute to the 27% on the average who have reported to being anxious. This definitely requires further investigation.

At this point we wanted to analyze any differences with anxiety levels across gender. We looked at the responses for strongly agree and agree in ANX1, ANX3 and ANX4 and strongly disagree and agree in ANX2 (related to confidence in taking an online course). On all anxiety items, more females reported to be more anxious than male students by 36% for ANX1, 42% for ANX2, 27% for ANX3 and 34% for ANX4. Although other research work has also found females to be more anxious than males in using information technology or the internet, but not in the case of our present context of online courses and not to the extent of close to 40% in general. These preliminary results indicate a need to further investigate the links and causes for this increase in anxiety in online courses/learning.

CONCLUSIONS

This paper presents preliminary results of study that looked into anxiety in online courses/learning. Students in an online course with 1446 students were asked to complete a survey at the end of the semester (1377 students submitted the survey) to measure some of their study habits, their anxieties in relation to online courses, performance in other online courses, and their performance expectations in this online course.

Initial findings tell us that students study for the course primarily from home (90%) and from school (around 40%). In general, close to 39% of the students feel some sort of anxiety with online courses where close to 35% of females in this group reported to be more anxious than males.

Moreover, we also did some analysis on anxiety based on age groups namely 17-18, 19-20, 21-22, 23-24 and 25+. It is evident from the results that students who are 21-22 years old report the most anxiety with online courses. Students within the age group 17-18 have the least with approximately 75% less students reporting anxiety as compared to the 21-22 age group.

We acknowledge that the analysis of the data presented herein is too preliminary to substantiate any conclusions, however the purpose of this study is to investigate the potential for further analysis and research. The study does answer the questions of whether anxiety exists in online learning context and points to important differences with experience.

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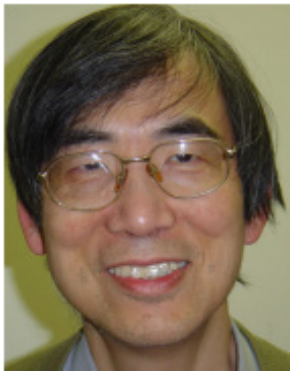
BIOGRAPHIES

Dr. Raafat George Saadé is an Associate Professor and Chair of the Department of Supply Chain and Business Technology Management. He has been teaching in the faculty since 1998. He obtained his Ph.D. in 1995 (Concordia University) after which he received the Canadian National Research Council postdoctoral fellowship, which he completed at McGill University in Montreal. Dr. Saade has published in journals such as Information & Management, Decision Sciences, Computers and Education, Computers in Human Behavior, Decision Support Systems, and Expert Systems with Applications. His research interests include the development and assessment of information systems, the supply chain of digital information products, The United Nations, IT-driven change and change management, and elearning.

Dr. Dennis Kira is a professor at the Department of Supply Chain and Business Technology Management, John Molson School of Business, Concordia University, Canada. He has been with the schoole since 1983. He obtained his Ph.D. from University of British Columbia. Dr. Kira teaches System design, decision support systems, data management, data mining, Internet related programming, and e-commerce His research activities include Ecommerce, web design, distance learning, decision making under uncertainty, neural networks, machine learning, and financial modeling. Dr. Kira has published in IEEE, ORQ and management science among other journals



With the John Molson School of Business, Concordia University since 1991, **Tak Mak** obtained his BSc degree in Mathematics from the Chinese University of Hong Kong. He also holds an MA in Mathematics from York University and a PhD in Statistics from the University of Western Ontario. Prior to joining Concordia University, he taught at the Hong Kong Polytechnic, the University of Hong Kong and the Memorial University of Newfoundland.
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