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# AC 2012-2989: ASSESSING THE ECONOMIC IMPACT ON ACADEMIC CREDENTIALS OF INCOMING WORKING PROFESSIONAL STUDENTS

## **Dr. Mitchell L. Springer PMP, SPHR, Purdue University, West Lafayette**

Mitchel Springer is an Associate Professor in technology leadership and innovation and currently serves as the Director of the Purdue University College of Technology, Academic Center for Professional Studies in Technology and Applied Research (ProSTAR), located in West Lafayette, Ind. He possesses more than 30 years of theoretical and industry-based practical experience from four disciplines software engineering, systems engineering, program management, and human resources. He sits on many university and community boards and advisory committees. Springer is internationally recognized, has authored numerous books and articles, and lectured on software development methodologies, management practices and program management. Springer received his bachelor's of science in computer science from Purdue University, his M.B.A. and doctorate in adult and community education with a cognate in executive development from Ball State University. He is certified as both a Project Management Professional (PMP) and a Senior Professional in Human Resources (SPHR).

## **Dr. Michael J. Dyrenfurth, Purdue University, West Lafayette**

Michael J. Dyrenfurth is a professor of industrial technology in the College of Technology at Purdue University. He is a member of the ASEE and he has served on the Board of the ETD and as Program Chair for the CIEC in New Orleans (2008). Previously, he completed a four year term as Assistant Dean for Graduate Studies in Purdue University's College of Technology. He is Co-PI of two international EU-FIPSE funded grants. His scholarship agenda focuses on technological innovation, technological literacy, workforce development, and international dimensions of these fields. Increasingly, he has turned his attention to the assessment of technological capability and understanding. He received his Ph.D. from Bowling Green State University and his master's and bachelor's degrees at the University of Alberta in Edmonton, Alberta, Canada. Immediately before coming to Purdue, he served as graduate coordinator for the Industrial Education and Technology Department at Iowa State University. Previously, for 20 years, he was on the faculty of the University of Missouri's Department of Practical Arts and Vocational Technical Education in various professorial, coordinator, and leadership roles. Internationally, he has worked in Germany, South Africa, Poland, the USSR, Saudi Arabia, Canada, Ireland, Scotland, England, France, Czech and Slovak Republics, Finland, the Netherlands, Switzerland, and Taiwan. His early experience involved teaching in Alberta and at universities in North Dakota and New Jersey.

## **Dr. Erin E. Bowen, Purdue University, West Lafayette**

Erin Bowen's areas of expertise include human factors and performance in organizational technology integration, organizational system factors impacting high-technology organizations, and aviation psychology. She provides training and education in the application of advanced statistical and methodological techniques to organizational settings, particularly survey design and analysis, advanced confirmatory factor analysis, and structural equation modeling. Bowen holds a Ph.D. in industrial/organizational psychology and an advanced minor in research methodology and is a member of the Association for Aviation Psychology, the Human Factors and Ergonomics Society, Applied Experimental and Engineering Psychology, the Society for Industrial & Organizational Psychology, and the American Psychological Association.

## **Mr. Mark T. Schuver, Purdue University, West Lafayette**

Mark Schuver is the Associate Director for the Center for Professional Studies in Technology and Applied Research (ProSTAR) in the College of Technology at Purdue University in West Lafayette, Ind. He is responsible for the development and administration of the Weekend Master's Degree programs, the Rolls-Royce Master's Degree programs, and the growth of Professional Education programs in the College of Technology. Prior to joining Purdue in 2002, Schuver was employed by Caterpillar, Inc., for 35 years, with assignments in Product Design, Research and Development, Supplier Management, Quality Management, Logistics Management and various leadership positions. He holds an associate's degree in drafting technology from North Iowa Area Community College (1967), a B.S. in Business Administration (1990), and a M.S. in management (1992) from Indiana Wesleyan University. Schuver is a member of the American Society for Engineering Education and serves on the Executive Board of the Continuing

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Professional Development Division. He is also a member of College/Industry Partnerships, Engineering Technology and Graduate Studies Divisions of ASEE. Schuver is a member of the National Collaborative Task Force for Engineering Education Reform and is a Lifetime Certified Purchasing Manager with the Institute of Supply Management (formerly NAPM).

## **Assessing the Economic Impact on Academic Credentials of Incoming Working Professional Students**

Overview -

This paper assesses the impact of previous and current period economic recessions on the characteristics and performance of incoming working professional adult students in a distance hybrid weekend format Masters in Technology program.

Since 1950 there have been eleven documented and agreed upon U.S. economic recessions<sup>1</sup>, including the current recession which began in December 2007. Each recession lasted from approximately six months to a maximum of 18 months; the most recent 2007 recession lasted 18 months<sup>2</sup>. There exist varied predictions as to the probable duration and severity of this most recent recession not to mention the nature of its impact on U.S. gross domestic product, employment recovery or other key characteristics of our economy.

In academe, it is conventional wisdom that as the economy enters into a recessionary period, more people go back to school to complete degrees or pursue advanced education. There is sufficient literature to suggest that during downward economic spirals people feel less secure about their current employment and less confident about the likelihood of being able to secure alternative employment should company downsizing take place<sup>3</sup>. To this end, adult working professionals tend to see additional training and education as a means to enhance their personal and professional value in this highly competitive economic downturn.

This paper maps the two most recent U.S. economic recessions, March 2011 – November 2001, and, December 2007 – June 2009, to incoming professional student demographics in an effort to ascertain if there are observable consequences of these difficult economic conditions. Incoming student demographics were evaluated for breadth of company participation, undergraduate GPA, gender, incoming chronological age, years of work experience, state of residence, breadth of undergraduate major, breadth of job titles and geographical distance from on-campus distance hybrid cohort-based programs.

This paper's demographics come from a longitudinal follow-up study of nearly 300 adult business and industrial professionals who graduated from Purdue University's College of Technology cohort-based distance hybrid weekend Master of Technology program as well as from the College's current 100% distance programs<sup>4</sup>. Additionally this paper interprets the findings against the benchmark of a previously conducted (2002) evaluation of prior weekend cohort-based programs<sup>5</sup>. Since the initial 1999 Master of Technology program offerings, there have been 19 unique offerings of the cohort-based distance hybrid programs, some with minor variation for company-specific interests in areas of concentration. Not all cohort-based programs were available for public enrollment. Some programs were created specifically for companies

who wished to fund an entire cohort themselves and subsequently make basic underlying modifications in delivery methodology and to create program concentrations more directly applicable to their company.

#### Recessions -

There are no strict definitions of a “recession”. Different groups define recessions differently, based on varying economic, social and political factors. The National Bureau of Economic Research (NBER) has been identified as the official organization relied on to determine the beginning and ending of a recession. The NBER is a private organization that works to assist in our understanding of the U.S. economy; it is not an official government agency. A recession is typically declared based on a series of highly interrelated economic conditions. These conditions are generally related to consumer confidence, goods purchased, corporate hiring practices, unemployment claims, investment and stock market valuations. Contractions or expansions in the above, and other criteria, over a period of time, is frequently seen as a marker of a recessionary period.

*The point where a recession begins is known as a peak. The point where a recession ends is known as a trough. Following the trough, the economy expands again towards another peak. Economists call the period of time between two peaks a business cycle<sup>6</sup>.*

In an expanding economic cycle, the business spiral is upward. The logic is as follows:

1. Consumers feel confident in the current state of the economy – they feel they are safe in their jobs or other employment is readily available
2. Confidence in the economy fuels increased consumer buying
3. To meet the consumer demand, companies need to produce more product
4. To produce more product, companies buy more raw materials and ultimately hire more people, who participate in the upward spiral through more buying
5. Investors see the increased production as a sign of a healthy organization and are more willing to invest in the company
6. In response to increases in stock purchases, the stock market goes up pushing company stock prices upward in relation to stock buyer supply and demand
7. The cycle continues as the market rises and more profits are made

In a contracting economic cycle, the cycle reverses itself. The above steps are the same, but the effects are reversed. The hinge on direction is premised in consumer confidence. The downward spiral follows the following logic:

1. Consumers do not feel confident about the economy – there is fear of losing their jobs or having a period of unemployment causing potential financial hardship
2. A lack of confidence causes a slowing of purchasing
3. A slowdown in purchasing, causes companies to slow production

4. Slower production slows the purchases of raw materials and slows hiring, or, may cause layoffs
5. Fearing a company's growth is slowing, investors seek other havens for their investments, therefore reducing the amount of investment going into companies
6. As investors sit on the sidelines and do not invest, or seek alternative places for their money, the stock market spirals downward producing overall lower returns on investments, again, in relation to stock buyer supply and demand

Although these given expansion and contraction scenarios are short in description, with many micro-steps in between, the general description and concept is historically solid.

#### Recessionary Periods Since 2000 -

There is no agreed to number of total recessions in the U.S. The NBER suggests the existence of 32 U.S. economic recessions dating back to 1857. Others have suggested we have had 47 economic recessions dating back to 1790. Unfortunately, data recording methods and record maintenance has not been consistent, such that naming an exact number of recessions is hard to do.

According to the NBER, the average length of the 32 recorded recessions has been 16 months. NBER has reported the following average lengths for recessionary periods.

- ❑ 1854 – 1919 (16 cycles) – 22 months in duration
- ❑ 1919 – 1945 (6 cycles) – 18 months in duration
- ❑ 1945 – 2009 (11 cycles) – 11 months in duration

The two recessions that fell within the time period targeted by the authors' study occurred from March 2001 to November 2001 and from December 2007 to June 2009. The latter period is the last recorded and declared recession in the U.S.

#### Consequences of an Economic Recession -

The authors' review of the literature validated the suggestion that during downward economic spirals people feel less secure about their current employment and the chances of their being able to find another suitable job if they needed to. To increase their prospects for retaining their current work and/or to increase the likelihood for securing advancement or even another position if needed, adult working professionals tend to see additional training and education as a means to enhance their personal and professional value in a highly competitive economy. But, what are the consequences of such feelings? Have they been differentially acted upon when considering significant differences such as the demographics and performance profiles of potential adult students during recessionary and non-recessionary periods.

This paper examined the differentiation of the demographics and characteristics of new entrants into a Master of Technology hybrid distance cohort-based program during the two most recent NBER-defined recessionary periods. The authors rationale was that if indeed characteristics and behavior of students entering professional education programs during recessionary periods are substantially different from those students who join during non-recessionary times, then the approaches for educating, marketing, managing, supporting, and fostering student success in these programs may necessitate an approach more tailored to the unique characteristics of these periods. If no such distinctions can not be identified, then perhaps too much has been made of the socially-constructed “myth” of the recessionary student, at least on an aggregate scale.

#### Research Method -

The methodology employed in this study is outlined in the following points:

1. Data on new entrants to a professional master’s degree program in Technology, collected over a ten-year period (2001-2011), was analyzed. Students participated in a hybrid educational format, in which classes met on-campus three weekends per semester with the remainder of the course being completed via distance-mediated education. This target period included student data from the two recessionary periods previously discussed as well as data from non-recessionary periods.
2. A factorial multivariate analysis of variance (MANOVA) procedure was used to assess the relationship of demographic and other characteristics, such as bulleted below, on enrollment during recessionary and non-recessionary periods:
  - Gender
  - Age
  - Amount of previous work experience
  - Distance traveled to attend class
  - Undergraduate grade point average (input GPA)
  - Output GPA at completion (as earned during the hybrid program).

After removing any student whose file was missing more than 50% of the requisite data points, 153 student profiles were available for comparison; of these, 63 students entered during the two identified recessionary periods, and 90 entered during non-recessionary times. In addition, there were 123 male (81.0%) and 30 female students (19.0%) in the hybrid Masters Degree programs that were offered during the time period of this study.

#### Findings and Research Questions –

The two research questions addressed by this study were:

- Research Question #1 – Are students enrolling during periods of recession different, in terms of their input and output characteristics, from students enrolling during non-recessionary periods?

- Research Question #2 – Did the cohort programs of this study meet the needs of the participants?

The Table 1 summarizes the basic data of the study.

Table 1. Student Demographic Data by Cohort

Cohort #	Begin Date	Applicable Recessionary Period	Student Headcount	Undergraduate GPA; Ave/Std Dev	Age; Ave/Std Dev	Distance to Campus; Ave/Std Dev	# Unique Undergrad Majors	# Unique Companies Represented
1	Fall 1998	N/A	17	3.24/.47	35/7.5	33/58	9	8
2	Fall 1999	N/A	10	3.60/.43	38/7.1	113/64	10	9
3	Fall 2000	N/A	16	3.19/.52	35/6.3	69/50	8	6
4	Fall 2001	1	5	3.19/.51	36/8.4	118/142	4	5
5	Fall 2002	N/A	13	2.90/.38	38/7.2	90/52	9	12
6	Fall 2004	N/A	21	2.73/.39	33/5.7	265/624	14	12
7	Fall 2005	N/A	19	3.07/.40	34/9.8	82/80	8	17
8	Fall 2006	N/A	18	3.36/.37	33/8.1	223/310	13	14
9	Fall 2007	N/A	21	3.05/.47	35/7.7	164/512	18	18
10	Fall 2008	2	15	2.98/.47	34/6.4	96/108	10	14
11	Fall 2009	N/A	9	3.22/.42	37/12.1	306/437	8	8
12	Fall 2010	N/A	24	3.12/.59	36/8.8	130/138	16	22
13	Fall 2009	N/A	13	3.11/.51	36/10.3	16/13	11	12
14	Fall 2008	2	16	3.14/.38	39/8.0	27/40	10	7
15	Fall 2010	N/A	38	2.99/.47	33/7.4	93/278	23	26
16	Fall 2011	N/A	28	3.25/.52	38/11.2	N/A	14	22

The mapping of recessionary periods to cohort programs is reflected below and depicted in the column titled *Applicable Recessionary Period*.

Recession #1; March 1, 2001 – Nov 1, 2001  
Cohort #4 – began Fall 2001

Recession #2; Dec 2007 – June 2009  
Cohort #10 – began Fall 2008  
Cohort #14 (C1) – began Fall 2008

The column titled *Undergraduate GPA* depicts the average undergraduate GPA across all students in a given cohort as well as the standard deviation within the cohort. The column titled *Age* depicts the average age (at time of entry) of the student by cohort as well as the standard deviation of the age characteristic by cohort. The column titled *Distance to Campus* depicts miles traveled from a student’s home city to the campus where the program is hosted. The *# of Unique Undergraduates* is a reflection of the number of unique undergraduate degrees reported by student by cohort; examples being engineering, technology, psychology, etc. The *undergraduate degree*, reflected in the *# of Unique Undergraduates* is the most recent

undergraduate degree achieved, if multiple undergraduate degrees had been earned. The *# of Unique Companies Represented* is a reflection of the number of different companies represented in the cohort as indicated by the place of employment shown on each student's application.

Findings -

Research question #1 - Are students enrolling during periods of recession different, in terms of their input and output characteristics, from students enrolling during non-recessionary periods?

The MANOVA results initially indicated a significant effect for recessionary status (whether beginning the program during a recessionary or non-recessionary period),  $F_{4,146} = 2.960$ ,  $p = 0.022$ . No significant effect for gender or an interaction effect was present; while the gender imbalance may have impacted the lack of findings in this area, visual analysis of gender data indicated no substantial discrepancies being masked by the lack of parity.

Subsequent univariate tests identified only one area in which recessionary students were significantly different from non-recessionary students. This difference was in their overall GPA upon completion of their master's program,  $F_{1,149} = 9.144$ ,  $p < 0.01$ . Descriptive statistics indicate that students entering their program during a non-recessionary period had a mean graduating GPA of 3.687,  $\sigma = 0.287$ , while students who entered their program during an identified recessionary period had a mean graduating GPA of 3.804,  $\sigma = 0.192$ .

Although the number of miles students drove to attend class was not found to be statistically significant via effects testing, the raw values should be discussed as they suggest a potentially intriguing variation worthy of further investigation. During non-recessionary periods, the mean number of miles traveled by students to attend the on-campus sessions was 92 miles ( $\sigma = 123.088$ ); during recessionary periods, students averaged 66 miles to attend class ( $\sigma = 85.406$ ). While the high degree of variation in the travel times inhibited the ability to delineate these distances as statistically unusual, they should be noted for future research. In addition, while the average distance men traveled for class attendance was 99 miles during non-recessionary periods and 71 miles during recessionary times, the average female travel distance only moved from 58 miles in non-recessionary to 48 miles in recessionary times. Attempts to use these patterns to predict performance in the master's program were unsuccessful with the available sample; regression analysis using recessionary period status, gender, and distance traveled to predict graduating GPA could explain only 10.2% of the variance in the sample GPAs.

The unexpected nature of the findings regarding the distance traveled by participating students and the potential moderating effect of gender on travel distance warrant additional investigation using a larger sample and additional data gathering; however, it is important that these preliminary findings be shared in the hope that other researchers may suggest additional contributing factors or pursue ongoing analyses in their own professional student samples.



No significant differences were present in the ages, amount of previous work experience, or undergraduate GPAs of students who entered the hybrid Masters Technology programs in recessionary and non-recessionary periods. At least some of these findings may fly in the face of conventional wisdom that suggests students who enter professional programs in times of recession are somehow different from non-recessionary applicants, and therefore might be better reached and subsequently served by different marketing and educational approaches.

Research question #2 - Did the cohort programs of this study meet the needs of the participants?

There were two prior longitudinal studies of the cohorts applicable to this study. In comparing the findings from the previous benchmarked studies of 2002<sup>5</sup> and 2010<sup>4</sup> the conclusions reached by the researchers were that the:

- ❑ ProSTAR administered weekend format Master's program received an increasingly positive assessment over time,
- ❑ Participation in ProSTAR programs enhanced the cohort members' skill portfolio,
- ❑ Both the programs and students benefited from quality improvements to assess, assimilate and apply learned content,
- ❑ The required Directed Project was important to the student and perceived as an important part of the Weekend Master's Program,
- ❑ Successful Weekend Master's Program participation yielded a positive impact on the student's career, opportunities, job responsibilities and salary, and,
- ❑ Employers of the student's were generally supportive both with time release and financial assistance.

In comparing the findings from the previous benchmarked studies, both studies found the program enhanced the personal portfolio of student skills, improved student ability to assess, assimilate and subsequently apply learned content. In both studies, the student employers were supportive of the programs.

In neither of two previous longitudinal studies was there evidence to suggest the findings of this study could be negatively impacted or the statistical analysis skewed.

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