Association Supporting Computer Users in Education
"Our Second Quarter Century of Resource Sharing"

Proceedings of the 2016 ASCUE Summer Conference
49th Annual Conference
June 12 – 16, 2016
Myrtle Beach, South Carolina
Web: http://www.ascue.org

ABOUT ASCUE

ASCUE, the Association Supporting Computer Users in Education, is a group of people interested in small college computing issues. It is a blend of people from all over the country who use computers in their teaching, academic support, and administrative support functions. Begun in 1968 as CUETUG, the College and University Eleven-Thirty Users' Group, with an initial membership requirement of sharing at least one piece of software each year with other members, ASCUE has a strong tradition of bringing its members together to pool their resources to help each other. It no longer requires its members to share homegrown software, nor does it have ties to a particular hardware platform. However, ASCUE continues the tradition of sharing through its national conference held every year in June, its conference proceedings, and its newsletter. ASCUE proudly affirms this tradition in its motto: "Our Second Quarter Century of Resource Sharing"

ASCUE's LISTSERVE

Subscribe by visiting the site http://groups.google.com/a/ascue.org/group/members and follow the directions. To send an e-mail message to the Listserve, contact: members@ascue.org Please note that you must be a subscriber/member in order to send messages to the listserve.

NEED MORE INFORMATION

Direct questions about the contents of the 2015 Conference to Terri Austin, Program Chair, ASCUE 15, Roanoke College, 221 College Lane, Salem, VA 24153, 540-375-2395 austin@roanoke.edu, Web: http://www.ascue.org

Association of Small Computer Users in Education

ASCUE 2015-2016 Board Members

(years remaining in office including current year)

Table of Contents

Keynote Speaker

Randy Marchany is the University Information Security Officer at Virginia Tech. He is also the director of the VA Tech IT Security Lab. He is also one of the original members of the US Cyber Challenge (USCC) Project. He has spoken at many national and international conferences and the subject of articles in the Chronicle of Higher Ed.

Conference Workshops

These will be held in the late afternoon for 90 minutes during the conference.

Workshop 1
Tools for Assessment
Date: Monday, June 13, Water Oaks II
Time: 3:15pm - 4:45pm
Instructors: . Mathew Tyler and Jean Bennett, Coastal Carolina University

This workshop will provide a hands-on session with Kahoot, Plickers, and TEAMMATES. These three tools allow for assessment of students and/or by students. Bring your laptop or hand-held device. Session attendees will spend 30 minutes on each of the tools. This workshop is a follow-up to the session on Fighting "Learner Engagement Deficit Disorder" Via Formative Assessment Tech Tools that Mr. Tyler presented.Creating accounts, content, and practice.

About the Presenters

Matthew Tyler:
Matthew is a Graduate Assistant with CeTEAL at Coastal Carolina University where he is pursuing an Ed.S. in Instructional Technology. As a Graduate Assistant, he provides training on Moodle, online course design, and the integration of educational technology into face-to-face and online courses.

Jean Bennett:
Jean Bennett, Instructional Designer for CCU'ss CeTEAL has presented on several topics at prior ASCUE conferences. She works with faculty, and creates and provides sessions for faculty development. Jean's interest in digital badges lead her to pilot a digital badge program this past spring.

Workshop 2
Engaging Learners by Video
Date: Tuesday, June 14, Water Oaks II
Time: 3:00pm - 4:30pm
Instructor: Jacqueline Stephen, Mercer University

The use of video for teaching and learning can be much more engaging than simply posting a link to the video and then directing learners to a discussion. The purpose of this workshop is to explore two

free technology tools/services that could be used to enhance learner engagement with content through the use of video and to improve learner-to-learner discussion, highlighting key points throughout a video. Instructors can also utilize built-in features to gauge learner understanding of the video content and solicit learner feedback.

About the Presenter

Jacqueline Stephen is the Director of the Office of Distance Learning and the Instructional Designer at Penfield College of Mercer University in Atlanta, Georgia. She is also an Instructor in the Department of Leadership Studies.

Workshop 3
Office 365 Apps Workshop
Date: Wednesday, June 13, Water Oaks II
Time: 3:00pm - 4:30pm
Instructor: Tom Marcais, Washington and Lee University

Office 365 has a variety of Apps available for use. Some are paired-down versions of the traditional stand-alone Office Applications. Others, are completely new offerings. This hands-on workshop will give an overview of the following Office 365 apps:

Mail
Calendar
People
Yammer
Newsfeed
OneDrive
Sites
Tasks
Delve
Video
Word Online
Excel Online
PowerPoint Online
OneNote Online
Sway
Class Notebook
Staff Notebook

Workshop attendees are encouraged to have their own Office 365 accounts so they can participate in the activities, however attendees are also welcome to just follow along on the screen.

About the Presenter

Tom is a Technology Integration Specialist at Washington and Lee University. He facilitates the use of technology in academic offices, providing end-user support for staff and faculty. In this role, he analyzes workflows and specific job needs for departments and recommends technology solutions.

Organization for the Proceedings

ASCUE initiated a refereed track for paper submissions to the conference in 2008. In fact, at the 2008 business meeting, the membership approved three different presentation tracks: refereed with 3 blind reviews for each paper, session with paper where the author submits a paper but it is not reviewed, and session without paper where no paper is submitted and only the abstract is included in the proceedings. To reflect this division, we will divide the proceedings into three sections. The first section, up to page 39, will contain the refereed papers, the second section, from 40 to 61, will hold the papers from the sessions with paper, and the last section will list the abstracts for the other sessions.

ASCUE BOARD OF DIRECTORS FROM 1967 to 2016

At this conference we celebrate the 47th anniversary of the founding of ASCUE at a meeting in July, 1968, at Tarkio College in Missouri of representatives from schools which had received IBM 1130 computers to help them automate their business functions and teach students how to use computers. They decided to form a continuing organization and name it CUETUG, which stood for College and University Eleven-Thirty Users Group. By 1975, many of the member schools were no longer using the IBM 1130, and were requesting to be dropped from the membership lists. At the same time, other small schools were looking for an organization that could allow them to share knowledge and expertise with others in similar situations. The name was changed from CUETUG to ASCUE at the 1975 business meeting and we opened membership to all institutions that agreed with our statement of purpose. Our historian, Jack Cundiff, has collected the names and schools of the officers for ASCUE and its predecessor CUETUG for the last forty-five years and we have printed these names on the following pages.

ASCUE BOARD OF DIRCTORS FROM 1967 to 1972

	1967-68	1969-70	1970-71	1971-72
President	Ken Zawodny St. Joseph's College	Howard Buer Principia College	Jack Cundiff Muskingum College	Wally Roth Taylor University.
Program Chair	Wally Roth Taylor University	Jack Cundiff Muskingum College	Wally Roth Taylor University	James McDonald Morningside College
Past President	Al Malveaux Xavier, New Orleans	Ken Zawodny St. Joseph's College	Howard Buer Principia College	Jack Cundiff Muskingum College
Treasurer	Howard Buer Principia College	Al Malveaux Xavier University	Al Malveaux Xavier University	Al Malveaux Xavier University
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Board Members	James Folt Dennison University	James Folt Dennison University	James Foit Dennison University	John Orahood U. of Arkansas, LR
At Large	Don Glaser Christian Brothers C.	Don Glaser Christian Brothers	Don Glaser Christian Brothers	N. Vosburg Principia College
Public Relations				Dan Kinnard Arizona Western
Librarian				Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Tarkio College	Principia College	Muskingum College	Christian Brothers

ASCUE BOARD OF DIRCTORS FROM 1972 to 1976

	1972-73	1973-74	1974-75	1975-76
President	James McDonald Morningside College	Dan Kinnard Arizona Western	T. Ray Nanney Furman University	Larry Henson Berea College
Program Chair	Dan Kinnard Arizona Western	T. Ray Nanney Furman University	Larry Henson Berea College	Jack McElroy Oklahoma Christian
Past President	Wally Roth Taylor University	James McDonald Morningside College	Dan Kinnard Arizona Western	T. Ray Nanney Furman University
Treasurer	J. Westmoreland U. Tenn Martin	J. Westmoreland U. Tenn Martin	Jim Brandl Central College	Jim Brandl Central College
Secretary	Ron Anton Swathmore College	Ron Anton Swathmore College	Harry Humphries Albright College	Harry Humphries Albright College
Board Members	John Orahood U. of Arkansas, LR	Al Malveaux Xavier, New Orleans	Sister Keller Clarke College	Sister Keller Clarke College
At Large	N. Vosburg Principia College	Wally Roth Taylor University	Wally Roth Taylor University	Mike O'Heeron
Public Relations	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western	Dan Kinnard Arizona Western
Librarian	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Georgia Tech	Morningside	Furman	Berea

ASCUE BOARD OF DIRCTORS FROM 1976 to 1980

	1976-77	1977-78	1978-79	1979-80
President	Jack McElroy Oklahoma Christian	Harry Humphries Albright College	Fred Wenn Caspar College	Doug Hughes Dennison University
Program Chair	Harry Humphries Albright College	Fred Wenn Caspar College	Doug Hughes Dennison University	J. Westmoreland U. Tenn Martin
Past President	Larry Henson Berea College	Jack McElroy Oklahoma Christian	Harry Humphries Albright College	Fred Wenn Caspar College
Treasurer	William Roeske Houghton College	William Roeske Houghton College	James Foit Central Ohio Tech	James Foit Central Ohio Tech
Secretary	Doug Hughes Dennison University	Doug Hughes Dennison University	Dave Dayton Grove City College	John Jackobs Coe College
Board Members	Dave Dayton Grove City College	Dave Dayton Grove City College	Jan C. King Chatham College	Wally Roth Taylor University
At Large	Fred Wenn Casper College	John Jackobs Coe College	John Jackobs Coe College	Jan C. King Chatham College
Public Relations	Dan Kinnard Arizona Western	Sister Keller Clarke College	Sister Keller Clarke College	Sister Keller Clarke College
Librarian	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	OK Christian	Albright College	Casper College	Dennison University

ASCUE BOARD OF DIRCTORS FROM 1980 to 1984

	1980-81	1981-82	1982-83	1983-84
President				
	J. Westmoreland U. Tenn Martin	John Jackobs Coe College	Jan Carver Chatham College	Wally Roth Taylor University
Program Chair				
	John Jackobs Coe College	Jan Carver Chatham College	Wally Roth Taylor University	Dudley Bryant Western Kentucky
Past President				
	Doug Hughes Dennison University	J. Westmoreland U. Tenn Martin	John Jackobs Coe College	Jan Carver Chatham College
Treasurer				
	Ron Klausewitz W. Virginia Weslyan	Ron Klausewitz W. Virginia Weslyan	Harry Lykens Mary Institute, St L.	Harry Lykens Mary Institute, St. L.
Secretary				
	Jan Carver Chatham College	Ken Mendenhall Hutchinson CC, KS	Ken Mendenhall Hutchinson CC, KS	John Jackobs Coe College
Board Members				
	Dudley Bryant Western Kentucky	Dudley Bryant Western Kentucky	William Roeske Houghton University	William Roeske Houghton University
At Large				
	Wally Roth Taylor University	Chuck Mcintyre Berea College	Chuck Mcintyre Berea College	Bob Renners Kenyon College
Public Relations				
	Sister Keller Clarke College	Sister Keller Clarke College	Sister Keller Clarke College	Sister Keller Clarke College
Librarian				
	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	U. Tenn Martin	Coe College	Chatham College	Taylor University

ASCUE BOARD OF DIRCTORS FROM 1984 to 1988

	1984-85	1985-86	1986-87	1987-88
President	Dudley Bryant Western Kentucky	Paul Pascoe Vincennes University	Jack Cundiff Horry-Georgetown	Keith Pothoven Central College
Program Chair	Paul Pascoe Vincennes University	Jack Cundiff Horry-Georgetown	Keith Pothoven Central College	David Cossey Union College
Past President	Wally Roth Taylor University	Dudley Bryant Western Kentucky	Paul Pascoe Vincennes University	Jack Cundiff Horry-Georgetown
Treasurer	Harry Lykens Mary Institute, St. L	Harry Lykens Mary Institute, St. L	Maureen Eddins Hadley School Blind	Maureen Eddins Hadley School Blind
Secretary	John Jackobs Coe College	John Jackobs Coe College	John Jackobs Coe College	Dudley Bryant Western Kentucky
Board Members	Keith Pothoven Central College	Keith Pothoven Central College	Robert Hodge Taylor University	Robert Hodge Taylor University
At Large	Bob Renners Kenyon College	Carol Paris Goshen College	Carol Paris Goshen College	Ann Roskow Ister CC
Public Relations	Dough Hughes Dennison University	Wally Roth Taylor University	Wally Roth Taylor University	Wally Roth Taylor University
Librarian	Jack Cundiff Muskingum College	Jack Cundiff Muskingum College	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Location:	W. Kentucky	Vincennet	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1988 to 1992

	1988-89	1989-90	1990-91	1991-92
President				
	David Cossey Union College	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University	Bill Wilson Gettysburg College
Program Chair				
	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University	Bill Wilson Gettysburg College	Carl Singer DePauw University
Past President				
	Keith Pothoven Central College	David Cossey Union College	Tom Warger Bryn Mawr College	David Redlawsk Rudgers University
Treasurer				
	Maureen Eddins Hadley School Blind	Maureen Eddins Hadley School Blind	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
	Dudley Bryant Western Kentucky	Kathy Decker Clarke College	Kathy Decker Clarke College	Dagrun Bennett Franklin College
Board Members				
	Kathy Decker Clarke College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Mary Connolly Saint Mary's College
At Large				
	Ann Roskow Ister CC	Rick Huston South Caolina/Aiken	Rick Huston South Caolina/Aiken	Rick Huston South Caolina/Aiken
Public Relations				
	Wally Roth Taylor University	Wally Roth Taylor University	Wally Roth Taylor University	Wally Roth Taylor University
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1992 to 1996

	1992-93	1993-94	1994-95	1995-96
President	Carl Singer DePauw University	Rick Huston South Carolina/Aiken	Mary Connolly Saint Mary's College	Paul Tabor Clarke College
Program Chair	Rick Huston South Carolina/Aiken	Mary Connolly Saint Mary's College	Paul Tabor Clarke College	Carl Singer DePauw University
Past President	Bill Wilson Gettysburg College	Carl Singer DePauw University	Rick Huston South Carolina/Aiken	Mary Connolly Saint Mary's College
Treasurer	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College	Dagrun Bennett Franklin College
Board Members	Mary Connolly Saint Mary's College	Gerald Ball Mars Hill College	Gerald Ball Mars Hill College	Rick Huston South Carolina/Aiken
At Large	Tom Gusler Clarion University	Tom Gusler Clarion University	Tom Gusler Clarion University	Tom Gusler Clarion University
Public Relations	Don Armel Eastern Illinois U.	Don Armel Eastern Illinois U.	Don Armel Eastern Illinois U.	Peter Smith Saint Mary's College
Librarian	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 1996 to 2000

	1996-97	1997-98	1998-99	1999-2000
President	Carl Singer DePauw University	Carl Singer(acting) DePauw University	Bill Wilson Gettysburg College	Dagrun Bennett Franklin College
Program Chair	Chris Schwartz Ursuline College	Bill Wilson Gettysburg College	Dagrun Bennett Franklin College	Carol Smith DePauw University
Past President	Mary Connolly Saint Mary's College	Mary Connolly Saint Mary's College	Carl Singer DePauw University	Bill Wilson Gettysburg College
Treasurer	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary	Dagrun Bennett Franklin College	Dagrun Bennett Franklin college	Tom Gusler Clarion University	Nancy Thibeault Sinclair CC
Board Members	Richard Stewart Lutheran Theological	Richard Stewart Lutheran Theological	Nancy Thibeault Sinclair CC	Fred Jenny Grove City College
At Large	Rick Huston South Carolina/Aiken	Rick Rodger Horry-Georgetown	Rick Rodger Horry-Georgetown	George Pyo Saint Francis College
Public Relations	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				Rick Huston South Carolina/Aiken
Web Coordinator				
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2000 to 2004

	2000-01	2001-02	2002-03	2003-04
President				
	Carol Smith DePauw University	Fred Jenny Grove City College	Nancy Thibeault Sinclair CC	Barry Smith Baptist Bible College
Program Chair				
	Fred Jenny Grove City College	Nancy Thibeault Sinclair CC	Barry Smith Baptist Bible College	George Pyo Saint Francis College
Past President				
	Dagrun Bennett Franklin College	Carol Smith DePauw University	Fred Jenny Grove City College	Nancy Thibeault Sinclair CC
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	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
	Nancy Thibeault Sinclair CC	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College
Board Members				
	Barry Smith Baptist Bible College	Barry Smith Baptist Bible College	David Frace CC Baltimore County	David Frace CC Baltimore County
At Large				
	George Pyo Saint Francis College	George Pyo Saint Francis College	George Pyo Saint Francis College	Jim Workman Pikeville College
Public Relations				
	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
	Rick Huston South Carolina/Aiken	Hollis Townsend Young Harris College	Hollis Townsend Young Harris College	Hollis Townsend Young Harris College
Web Coordinator				
			Carol Smith DePauw University	Carol Smith DePauw University
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2004 to 2008

	2004-05	2005-06	2006-07	2007-08
President				
	George Pyo Saint Francis College	Jim Workman Pikeville College	Lisa Fears Franklin College	George Pyo Saint Francis College
Program Chair				
	Jim Workman Pikeville College	Lisa Fears Franklin College	George Pyo Saint Francis College	Fred Jenny Grove City College
Past President				
	Barry Smith Baptist Bible College	George Pyo Saint Francis College	Jim Workman Pikeville College	Lisa Fears Franklin College
Treasurer				
	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Tom Pollack Duquesne University
Secretary				
	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College
Board Members				
	Lisa Fears Franklin College	Blair Benjamin Philadelphia Bible	Blair Benjamin Philadelphia Bible	Janet Hurn Miami U. Middleton
At Large				
	David Frace CC Baltimore County	David Frace CC Baltimore County	David Fusco Juniata College	David Fusco Juniata College
Public Relations				
	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris
Web Coordinator				
	Carol Smith DePauw University	David Diedreich DePauw University	David Diedriech DePauw University	Blair Benjamin Philadelphia Bible
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2008 to 2012

	2008-09	2009-10	2010-2011	2011-2012
President				
	Fred Jenny Grove City College	Janet Hurn Miami U Middleton	Janet Hurn Miami U Middleton	Andrea Han U of British Columbia
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	Janet Hurn Miami U Middleton	Dave Fusco Juniata College	Andrea Han U of British Columbia	Tom Marcais Sweet Briar College
Past President				
	George Pyo Saint Francis College	Fred Jenny Grove City College	Fred Jenny Grove City College	Janet Hurn Miami U Middleton
Treasurer				
	Tom Pollack Duquesne University	Tom Pollack Duquesne University	Dave Fusco Juniata College	Dave Fusco Juniata College
Secretary				
	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College
Board Members				
	Dave Fusco Juniata College	Thomas Marcais Lee University	Thomas Marcais Lee University	Jeffery LeBlanc U of NW Ohio
At Large				
	Andrea Han Miami U Middleton	Andrea Han Miami U Middleton	Mark Poore Roanoke College	Mark Poore Roanoke College
Public Relations				
	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College
Librarian				
	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator				
	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris
Web Coordinator				
	Steve Weir	Steve Weir	Steve Weir	Steve Weir
Sponsor Relations Coordinator				
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

ASCUE BOARD OF DIRCTORS FROM 2012 to 2016

	2012-13	2013-14	2014-2015	2015-2016
President	Tom Marcais Sweet Briar College	George Pyo Saint Francis College	Jeffrey LeBlanc U of NW Ohio	Jeffrey LeBlanc U of NW Ohio
Program Chair	George Pyo Saint Francis College	Jeffrey LeBlanc U of NW Ohio	Terri Austin Roanoke College	Terri Austin Roanoke College
Past President	Andea Han U of British Columbia	Tom Marcais Sweet Briar College	George Pyo Saint Francis College	George Pyo Saint Francis College
Treasurer	Dave Fusco Juniata College	Dave Fusco University of Colorado	Mark Poore Roanoke College	Mark Poore Roanoke College
Secretary	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Kim Breighner Gettysburg College	Jean Bennett Coastal Carolina Univ.
Board Members	Jeffery LeBlanc U of NW Ohio	Luke VanWingerden USC Upstate	Bruce White The Apprentice School	Bruce White The Apprentice School
At Large	Mike Lehrfeld E. Tenn. State Univ.	Mike Lehrfeld E. Tenn. State Univ.	Mike Lehrfeld E. Tenn. State Univ.	Anthony Basham Berea College
Public Relations	Peter Smith Saint Mary's College	Peter Smith Saint Mary's College	Tom Marcais Sweet Briar College	Tom Marcais Washington & Lee Univ.
Librarian	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown	Jack Cundiff Horry-Georgetown
Equip. Coordinator	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris	Hollis Townsend Young Harris
Web Coordinator	Steve Weir	Steve Weir	Steve Weir	Blair Benjamin Cairn University
Sponsor Relations Coordinator	Mark Poore Roanoke College	Mark Poore Roanoke College	Berte Thompson Messiah College	Jeffrey Le Blanc U of NW Ohio
Location:	Myrtle Beach	Myrtle Beach	Myrtle Beach	Myrtle Beach

Breathing Life into Business Concepts: Utilizing Simulations in Management Information Systems

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Abstract

The Department of Computing at East Tennessee State University provides students exposure to the enterprise application SAP as a part of the Information Systems curriculum. Over the past two years, the use of SAP has expanded beyond the Department of Computing into the Management Information Systems course offered by the Department of Management and Marketing. By transforming the MIS course, students gain the opportunity to utilize the SAP environment through the business simulation ERPsim. This simulation emphasizes the importance of enterprise applications and the importance of data in a business. Furthermore, students learn to apply business concepts such as Porter's Generic Strategies as they attempt to develop a competitive advantage in the simulation. The purpose of this paper is to review the literature concerning educational simulations, to discuss the implementation of simulation use within the MIS course, and to highlight future growth opportunities within the course.

Introduction

In 2013, the Department of Computing at East Tennessee State University (ETSU) was presented with the unique opportunity to take over the instruction of Management 3220 – Management Information Systems. This course is a junior-level course for business students in the Department of Management and Marketing. Both the Department of Computing and the Department of Management and Marketing are a part of the College of Business and Technology at ETSU. This course can be taken any time during a student's junior or senior year as this course is not a prerequisite for another course at the University.

One of the primary reasons the Department of Computing was asked to develop the curriculum for this course was the success of implementing SAP into various courses. The use of SAP in the Information Systems concentration is utilized to provide students hands-on exposure in using, implementing, and developing for Enterprise Resource Planning (ERP) applications.

The challenge in the transformation of the course is to engage students within the Department of Management and Marketing to understand the critical importance of Management Information Systems, specifically in the areas of data and ERP. How can these concepts, coupled with business concepts such as Porter's Generic Strategies, become not only theory presented in textbooks and literature, but come to life and engage students in a deeper level of critical thinking and understanding? The goal of

this paper is to outline the transformation of the Management Information Systems course and how the use of business simulations can breathe life into the concepts discussed within the course.

Literature Review

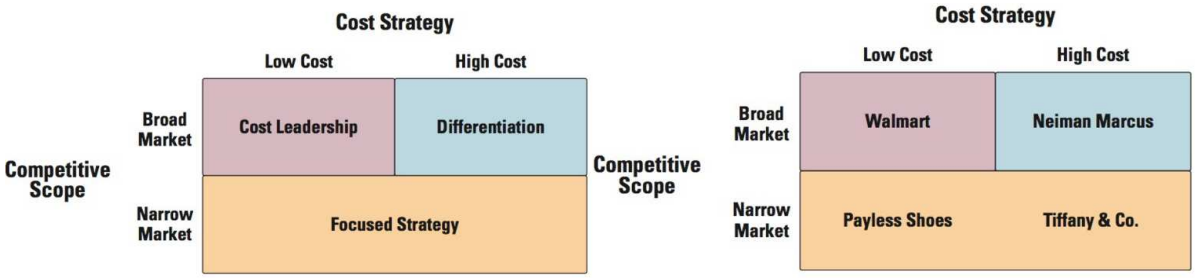
For any course considering the use of simulations as learning tool, it is important to understand which concepts from the course can be reinforced utilizing simulations. It is also important to understand how simulations are applied in education and the literature surrounding both the benefits and potential areas of concern. Finally, with different types of simulations available, researching and understanding the simulation needed to accomplish the goal of the course is critical.

The literature review will cover one of the concepts introduced to students in the MIS course, Porter's Generic Strategies. In addition, the literature review will identify various research articles in the area of simulations in education. To conclude, a review of ERPsim as a potential simulation for MIS courses will be presented.

Porter's Generic Strategies

Strategy is an important factor within a business. It is important to use and develop a strategy because "a company finds its industry niche and learns about its customers" (Allen & Helms, 2006, p. 434). Professor Porter, a Harvard Professor, published a framework that developed three generic competitive strategies that if pursued, a firm would be able to outperform competitors who did not follow one of the generic strategies (Ormanidhi & Stringa, 2008). The recommended strategies identified were cost leadership, differentiation, and focus. Allen and Helms (2006) note that "Porter's Generic Strategies remain the most commonly supported and identified in key strategic management textbooks and in the literature" (p. 434).

Baltzan (2015) notes in Figure 1 below, the intersection between competitive scope and cost strategy identifies each of the three strategies Porter identified for entering a new market. In addition, Baltzan provides examples of businesses that have been successful within each of the identified strategies by Porter.



Porter's Generic Strategies is just one of the many topics covered in the MIS course. While reading literature and research on this topic is important, practical application can help a student understand the concept and why this theory (and others discussed in a course) have practical business implications. In order to reinforce and provide practical application, students can apply their knowledge within a simulated environment.

Simulations in Education

Moratis, Hoff, and Reul (2006) identify two challenges facing management education. These challenges include relevance and development of innovative learning methods for educating students. Furthermore, business schools are criticized on the irrelevance of the management theory being taught as well as the outdated processes used to teach the students (Avramenko, 2012). One way to innovate a classroom is to use a simulation in order to allow students to see the relevance of the material in which they are learning throughout the course. This hands-on approach, as noted by Draijer and Schenk (2004), "motivates students and supports their understanding of business processes" (p. 265).

A benefit of using simulated environments in the classroom is that it encourages students to critically think through situations that may not have a simple solution. Springer and Borthick (2004) in their research discuss how students "need opportunities to learn to solve problems by constructing their own representation of the situation and creating their own understandings of what it means to develop and present acceptable solutions" (p. 278). In particular, the use of simulations could cause a developmental shift from knowing to thinking in a course by shifting from structured problems at the end of a chapter to unstructured scenarios that may generate interest in the concepts being discussed. Avramenko (2012) also argues that business simulation software should be utilized for decision making.

Avarmenko (2012) also denotes other benefits of computer-based business simulations. These benefits include risk-free environments, simplified real world scenarios, learning by comparison, and time management. In addition, Tanner, Stewart, Totaro, and Hargave (2012) discuss the benefits perceived by students as engaging, useful, effective learning tools, and effective in promoting teamwork.

A study conducted by Walters, Coalter, and Rasheed (1999) set out to determine if simulation games are an effective tool in business policy courses. The conclusion, determined from the research, showed that simulations are an effective tool in a classroom and allowed students in a business policy course to implement strategic concepts with some degree of realism. Furthermore, the study noted that "business games and simulations appear to be an effective pedagogical tool at the undergraduate level" (p. 174).
In order to maximize the use of simulations in the classroom, Walters, Coalter, and Rasheed (1999) provide some general guidelines for instructors who will be utilizing simulations within the course. In particular, their research notes that preparation by the student and the evaluation of their preparation is a major factor in performance in the simulation. The literature suggested to conduct random tests throughout the semester in order to determine an individual's awareness of the status of their team and their rivals.

ERPsim

One difficulty related specifically to the MIS course is the instruction of Enterprise Resource Planning. Léger (2006) identifies the lack of Information Technology (IT) experience as one of the major barriers

in teaching ERP concepts to business students. In addition, students struggle with the understanding of the importance of business integration utilizing ERP systems.

It is critical for business students to graduate from college with an understanding of ERP systems. Cronan and Douglas (2012) identified that students who graduate with ERP coursework receive an average salary of $4,056 more than students without ERP coursework.

In order to develop this understanding of ERP concepts, the business simulation ERPsim was developed. This simulations operates on the SAP ECC platform and was awarded the 2005 academic prize for the best use of a technology in teaching (Léger, 2006). Léger notes that the pedagogical objectives in the game are (p. 442):

1. Develop a hands-on understanding of the concepts underlying enterprise systems
2. Experience the benefits of enterprise integration
3. Develop technical skill at using ERP software

Manufacturing is one of the three simulated games available in ERPsim. In manufacturing, teams of three to four students operate a cash-to-cash cycle with the business processes of procurement, production, and sales (Léger, 2006). These teams are asked to operate a make-to-stock muesli manufacturing facility. The simulation operates in real time and tasks students with creating sales forecasts, procuring raw material, producing six variations of muesli, and selling the finished product in one of three various distribution channels to potential business customers. In this process, students analyze transactional data to make business decisions with the ultimate goal of being the most profitable company (as measured by net income) within the industry.

Charland, Léger, Cronan, and Robert (2015) explain that ERPsim was developed in 2004 and has been adopted by 832 various professors, lecturers, and professional trainers over 377 universities worldwide. The main appeal to this particular simulation is that students directly interact with the ERP software in order to make business decisions for their company allowing for students to "learn about the outcome and resultant consequences of their decisions and their effects on the company overall" (p. 34). Furthermore the ERP simulation

> Offers students the opportunity to reflect, test and find out what works and what does not, and gain insight into business processes, information systems, business strategy, managerial decision making, analytics and team dynamics. This game provides students with process guidelines and tools that enable realtime collaboration and collection of process data and incorporates disciplined reflection, a key requirement for deep learning (Seethamraju, 2011, p. 21).

Given the need to educate business students in ERP concepts, the Management Information Systems course began in the fall of 2013 utilizing ERPsim in order to provide students with hands-on engagement of SAP. After almost three years, the course has matured and developed to not only utilize the simulation to cover ERP concepts, but to begin to tie fundamental business concepts to the course to see the ramification of the decisions rendered for their businesses in the simulated environment.

Implementation

The Management Information Systems course is comprised of two components. The first component is a weekly lecture held on Wednesdays. It is during this lecture that we discuss the fundamental concepts of Management Information Systems. These topics include business specific concepts such as Porter's Generic Strategies as well as more technological concepts such as databases and networking. In addition to the weekly lectures, a lab is held each Friday for the three sections of the course. Up to 90 students between the three sections participate in the lab activity simultaneously. Figure 2 below outlines the weekly activities held during the lab session.

Week	Topic
Week 1	Introduction to SAP using Global Bike
Week 2	Introduction to ERPsim and ERPsim Sales
Week 3	ERPsim Production and Sales
Week 4	Data Visualization using Microsoft Excel and ERPsim Sales Data
Week 5	ERPsim Procurement through Material Requiremens Planning (MRP)
Week 6	Advertising, Depreciation, Loan Repayment, Facility Improvements
Week 7	Bill of Material (BOM)
Week 8	Data Warehouse
Week 9	Company Swap
Week 10-12	ERPsim Competition
Week 13-14	Erp sim Presentations

Figure 2: Simulation Timeline for MIS Course

Each semester the course begins with an introduction to SAP by having students interact and engage with a fictitious company Global Bike. Students go through the process of entering a standard order into the SAP environment. It is through this process that a student learns about the various components of SAP and a basic overview of how to use transaction codes in order to conduct business.

Once a student has become familiar with the SAP environment, the focus of the remainder of the labs will shift to using the SAP environment to participate in the ERPsim muesli manufacturing simulation. In muesli manufacturing, teams of three to four students operate a cash-to-cash make-to-stock manufacturing facility. They are tasked with planning, production, and sales of six muesli products. At the beginning of the simulation, each team has the same six 1KG products as noted in Figure 3 below. Throughout the semester, students can change the Bill of Material (BOM) in order to produce 0.5KG or 1KG boxes of Muesli, as well as produce either premium grade product or cost-effective muesli.

At the beginning of the simulation, each team has the same six 1KG products as noted in Figure 3 below. Throughout the semester, students can change the Bill of Material (BOM) in order to produce 0.5KG or 1KG boxes of Muesli, as well as produce either premium grade product or cost-effective muesli.

Figure 3: Muesli products

One of the first couple of concepts covered in ERPsim is sales and production. Students will use transaction code ZCK11 (Figure 4) to determine the variable and fixed costs for a particular product. They will then use VK32 (Figure 5) to change the price of products. Transactions ZVA05 (Figure 6) and ZMARKET are used to track sales within their company as well as sales within the market environment. For production, transaction CO41 is used to convert planned orders (production runs that could be produced) to production orders (production runs that materials are released and scheduled for production into a finished good).

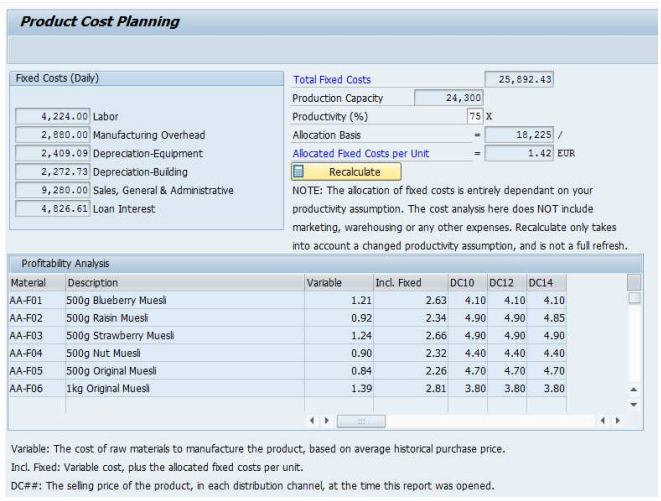


Figure 4: ZCK11

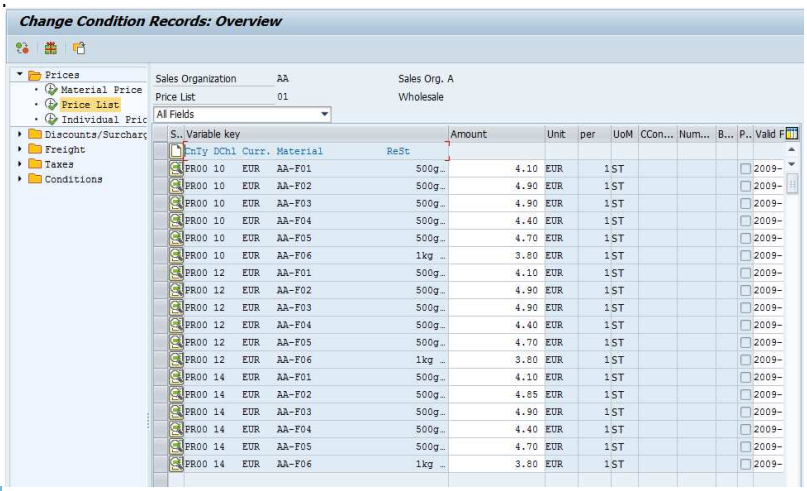


Figure 5: VK32

Detailed Sales Order Report

Detailed Sales Order Report: Round 6 Day 01

Rnd	Day	DChl	Area	Material Description	Sold-to pt	Price	Qty	Value	A/R Rnd	A/R Day
5	30	14	NO	500g Blueberry Muesli	80288	4.10	7,249	29,720.90	6	10
	29			500g Original Muesli	80279	4.70	6,525	30,667.50	6	06
			SO	500g Blueberry Muesli	80217	4.10	8,585	35,198.50	6	06
	28			500g Original Muesli	80212	4.70	6,608	31,057.60	6	09
	27			500g Nut Muesli	80177	4.40	7,038	30,967.20	6	08
				500g Strawberry Muesli	80178	4.90	6,291	30,825.90	6	03
				500g Nut Muesli	80209	4.40	6,232	27,420.80	6	07
	26			500g Original Muesli	80188	4.80	5,882	28,233.60	6	07
	25			500g Blueberry Muesli	80185	4.80	6,646	31,900.80	6	10
	24		NO	500g Nut Muesli	80219	4.40	6,109	26,879.60	6	01
			WE	500g Strawberry Muesli	80267	4.90	7,073	34,657.70	6	09
	23			500g Nut Muesli	80259	4.40	7,930	34,892.00	6	04
	22			500g Nut Muesli	80249	4.40	7,468	32,859.20	6	05
				500g Nut Muesli	80265	4.40	6,810	29,964.00	5	29
	21		SO	500g Blueberry Muesli	80191	4.95	5,331	26,388.45	6	06
	20	12		500g Nut Muesli	80138	4.40	14,476	63,694.40	6	05
		14	NO	500g Nut Muesli	80227	4.40	6,851	30,144.40	6	04
			WE	500g Nut Muesli	80258	4.40	6,418	28,239.20	6	04
	19			500g Strawberry Muesli	80241	4.90	7,158	35,074.20	6	01
	17			500g Raisin Muesli	80253	4.85	3,645	17,678.25	6	02
	16		SO	500g Raisin Muesli	80207	4.90	6,366	31,193.40	5	26
	15	12		1kg Original Muesli	80139	3.80	9,908	37,650.40	5	28

Figure 6: ZVA05

Figure 6 is a representation of transactional sales data for a team in the simulation. While this transactional data has value, it can be difficult to use this data for meaningful insight into a team's sales data. During week 4, students will use Microsoft Excel's PivotChart to create dynamic visualization charts of the transactional data represented in ZVA05. Figure 7 is an example chart that displays the number of units sold over each quarter.

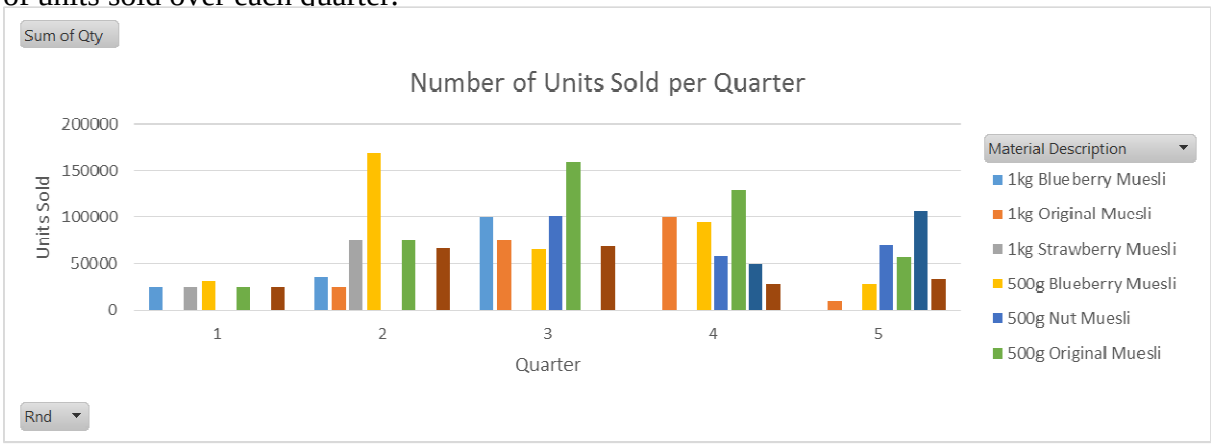


Figure 7: Example PivotChart using Transactional Sales Data in ZVA05

As the semester progresses, students have the opportunity to change the Bill of Material (BOM – the recipe for the creation of each product), increase the number of units that can be produced during a simulated day (they begin by being able to produce 24,000 units per day and can invest capital to increase production), and decrease the setup-time between product production (any time a factory switches product production, it takes 12 hours to reconfigure the factory and no products are produced during that time). It is during this time that the concept of Porter's Generic Strategy becomes important. For a business to be successful in the simulated environment, students need to understand which generic principle they wish to use for their factory and invest accordingly into facility improvements.

For example, a business that wishes to follow the broad-market, low-cost strategy must be able to produce large quantities of product with a small setup-time reduction in order to accommodate for the low margins acquired per sale. In contrast, a company utilizing narrow-market, high-cost differentiation must develop premium grade product and use advertising to encourage fictions customers to pay a premium price per product, resulting in less sales but higher margins per sale.

At the end of the term, the teams participate in a competition in order to use both their business concepts as well as ERP experience to manage their company for eight consecutive quarters. At the end of the eight quarter, the team that has the highest cumulative net income (an example is shown in Figure 8) will receive three points towards their final grade. This incentive encourages students to engage in the simulation as the value of the reward for winning is perceived as very beneficial for their success in the course.

FINANCIAL STATEMENTS - R5

Team	Credit ratings	Interest Rate (%)	Rank	Cumulative Net Income	Total sales	Gross Margin (%)	Net Margin (%)	ROE (%)	ROA (%)	D/E (%)	Mktg/S (%)
Q	AAA	5.000	1	6,916,632.04	13,024,200.60	70.696	53.106	46.369	26.207	76.931	0.016
I	AAA	5.000	2	5,268,551.05	11,572,987.35	69.722	45.525	39.707	20.764	91.232	0.000
H	AAA	5.000	3	5,178,312.48	13,158,622.34	56.847	39.353	39.294	20.411	92.516	0.000
E	AAA	5.000	4	4,352,410.36	11,287,600.40	58.381	38.559	35.235	17.402	102.477	0.368
B	AA-	5.750	5	4,127,666.94	11,673,454.05	56.733	35.359	34.035	18.015	88.932	0.000
O	AAA	5.000	6	4,037,806.40	11,259,006.75	55.779	35.863	33.543	16.798	99.686	0.413
A	AAA	5.000	7	3,076,074.67	8,775,710.28	61.953	35.052	27.772	13.407	107.140	0.018
C	AAA	5.000	8	2,612,258.60	10,122,313.46	52.168	25.807	24.615	12.087	103.654	0.014
L	AAA	5.000	9	2,553,293.29	11,457,505.66	44.684	22.285	24.194	9.676	150.048	0.871
G	AAA	5.000	10	2,297,594.23	11,309,395.90	40.199	20.316	22.312	9.512	134.567	0.467
P	AAA	5.000	11	1,761,414.75	9,548,542.00	51.732	18.447	18.045	8.266	118.312	0.013
N	AAA	5.000	12	1,369,752.98	9,094,429.35	39.126	15.061	14.619	6.426	127.499	0.000

Figure 8: Example of End of Round Financial Statements

After the conclusion of the competition, teams will prepare a seven to nine minute presentation reflecting on their experiences within the ERPsim competition. Students are required to generate charts to provide a visual description of their experiences. The charts are to have both an inward look into the company as well as a comparative look at their competition.

Conclusion

Over the past three years teaching this course, I have received positive feedback from students concerning the user of ERPsim and SAP in the course. Each semester, students are asked to complete a Student Assessment of Instruction (SAI) on each of their courses. This evaluation allows students to leave feedback concerning the course and the content of the course. Some SAI comments concerning the use of SAP and ERPsim in the course include:

- Of particular value is the training in SAP. This, I feel, is of tremendous value to business students when we enter the job market.

- Interest course. The experience with SAP is incredible!

- I actually learned a lot in this class. It was the most applicable to the business world because of the simulation competition.
- I think the lab section of this class is very helpful and allows students to grow their knowledge of the SAP system.
- I definitely learned a lot in this class. I think that the three SAP courses offered through the Department of Computing would be hugely helpful for business students also. If I weren't graduating this semester, I would take the other two classes so I could be SAP certified. Very helpful course.
- The labs were the most helpful part of this course. I learned so much through the SAP simulation.
- The aspect of this course that was most effective in helping me learn was the lab simulation each week. I learned more from this section of the course than I have in my four years of college.
- The lab was the most effective. I learn by doing things not just by reading a slide so having the time to put my knowledge into real life was a big help.
- The lab section of this course really helped expand my critical thinking skills.
- Being able to apply what was learned through projects was really helpful in the retention of what I learned during lecture time.
- It was nice to have a lab with this lecture. It broke up just reading about the material.

One of the primary goals of the reinvention of the Management Information Systems course was to breathe life into business concepts by utilizing the business-simulation ERPsim. Through this simulation, students are able to walk away from the course with valuable exposure to the ERP system SAP. In addition, students are able to understand the value of data and enterprise applications. Finally, students can put into practice fundamental business concepts such as Porter's Generic Principles as they operate their muesli manufacturing company.

In future iterations of this course, it is the intended goal to introduce students to concepts around logistics and logistics management using SAP and ERPsim. In addition, introduce students to additional data visualization tools and business analytical tools built on SAP's latest platform, SAP HANA.

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Keeping Up with Big Data - Designing an Introductory Data Analytics Class

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Abstract

Universities need to keep up with the demand of the business world when it comes to Big Data. The exponential increase in data has put additional demands on academia to meet the big gap in education. Business demand for Big Data has surpassed 1.9 million positions in 2015. Big Data, Business Intelligence, Data Analytics, and Data Mining are the four main branches of data analysis. These areas intertwine, overlap, and clearly depend on each other. This study endeavors to examine the concepts, tools, and techniques of these topics through an introductory class in Big Data. After serious efforts and examination, this study found Data Analytics to be the most suitable topic. One main reason for making this choice included the need to teach the students how to ask questions when they manipulate large amounts of data. The other reason is the availability of PowerPivot and DAX as an Add-In to MS Excel. Most students are familiar with MS Excel, since it is readily available to them. The tools, the techniques, the built-in functions, PivotTables, and DAX, as a formula language, will allow students to experiment with a million rows of data resulting in a rich and rewarding learning environment. The class will also cover the other areas of Big Data and their relationships. Students should become Big Data literate by the time they finish the class successfully.

Descriptors: Big Data, Data Analytics, MS Excel, PowerPivot, PivotTables, DAX, Class Design, Introductory, Learning, Business.

Introduction and Problem Statement

The exponential increase in data size is not a hidden fact in our daily activities. We can hardly measure the amount of data we capture, process and store every day. “The idea of data creating business value is not new; however, the effective use of data is becoming the basis of competition” (Insights, 2014). The author added that businesses have always wanted to derive some insights in order to make more informed, real time, factual, and smarter decisions. Big Data is hitting organizations from all directions, internally and externally. Data is not limited to machine data but also found as unstructured, online and on mobile as well. The Insights article added that statistical data (historical) and predictive (forward thinking) are needed to make helpful decisions. One of the problems that has been noticed, according to the Insight article, is that we are able to capture and store massive amount of data, but we still lack the technical capacity to aggregate and analyze unpredictable volumes of data.

Marr (2016) has summarized some intriguing facts with a full invitation for us to examine them closely. His intention is clearly to make us realize that Big Data is not only a problem but also a great oppor-

tunity, if we decide to take it seriously as educators and business people. Here are some facts that might help some of the hesitant business educators to think over and see why a class related to Big Data with data analytics is not only an option but a must have:

- Everything we do has a digital trace for us to analyze and use.
- Every two days we create as much data as we did from the beginning of our civilization until 2003.
- "Over 90% of all the data in the world was created in the past 2 years."
- "The total amount of data being captured and stored by industry doubles every 1.2 years."
- It will take 15 years to watch all the uploaded videos to YouTube every day.
- In the Big Data field, there were 1.9 million IT jobs created in the US by the year 2015. Knowing that every job needs 3 new jobs created outside of IT to support the one in Big Data. This will result in 6 million new jobs caused by Big Data.
- By the year 2020, the value of the Hadoop (the open source for big data technologies market) will soar from $2 billion in 2013 to $50 billion.

The above facts and findings do not require any additional proof in order to decide our need to offer additional classes in Big Data in the business curriculum. If we don't react accordingly, students will have to invest in additional trainings, seminars, and online classes to catch up with other peers in a very competitive market. The problem requires an immediate solution. It is clear that we need to incorporate the concepts and applications of Big Data in our academic curricula.

Why Teach Big Data Related Class?

These days when accountants were responsible for crunching historical data are behind us (Meyer, 2016). The world expects CPAs and accounting students to manipulate a much larger scale and volume of data, that is, Big Data. Meyer also quoted Wenger, an assistant professor at the University of Mississippi, who stated that data exploded in all sort of businesses. Future business students need to possess the ability to sift through massive amount of data by using different techniques and tools in order to evaluate data effectively. Students need "basic exposure to Big Data and data analytics" by adding this class to the accounting information systems degree curriculum. It is general belief that all students in business, especially information systems ones, need a deep understanding of Big Data concepts, techniques, and tools.

Deciding on the Best Approach to Offer an Introductory Data Analytics class

It is clear there are some differences in the areas we hear about everyday concerning Big Data. However, if we probe closely, a person could notice, regardless of the name of the area that they all intertwine, overlap, and clearly depend on each other. "The difference between Big Data & Business Intelligence (BI) is synonymous to fishing in the sea versus fishing in the lake. Your target is the same but the tools are decided by the scale" (Mohanasundaram, 2015). In addition to Big Data and BI, there are two fields related to Big Data. These are data analytics and data mining. Obviously, it is very hard to come up with a quick conclusion concerning which approach is best for your students. Having said that, we need to act to find a solution. There are factors we have to consider such as cost, size, and support. Junk (2015) discussed the lack of boundaries between all the areas of Big Data. To help us navigate the complexity of business data concepts, he discussed the most common terms in this field and their relationship:

1. Business Intelligence. Junk stated that BI is the broadest category that encompasses the three other areas according to how the business world uses them these days. BI is based on decision-making and concentrates on the generation, aggregation, analysis, and visualization of data. It is not only about the data and the tools but also about the policy and procedures that support all the activities that convert the data into actionable results.

2. Analytics. Junk stated if BI is about making decisions, then Analytics is about asking questions. Here you can break down the data, create an assessment over time, and compare one trend to another, just to name a few activities. You can compare sales from this month to other periods. Data Analytics is about opening a wide door to be inquisitive .Business today needs to use both historical and predictive data.

3. Big Data. Junk stated this typically refers to the incredible volumes of data from internal and external sources. In addition to volume, data usually is completely raw and in many cases unstructured. Usually businesses use Key Performance Indicators (KPIs) as the main key to turn their questions into answers. Junk added that "Big Data is the library you visit when the information to answer your questions isn't readily at hand. And like a real library it allows you to look for answers to questions you didn't even know you had."

4. Data Mining. Finding an answer to a question you never thought about is what data mining is (Junk). Data mining allows users to sift through lots of data to find unrecognized trends or patterns among the noise. Further, data mining works closely with Data Analytics. The difference is analytics is about measuring data while data mining is about sifting through data.

No matter which class would be taught, it should cover the four areas above conceptually. However, it would be impossible to cover the four areas in depth. For the sake of this paper, the decision was made, with multiple reasons in mind, to teach a Data Analytic class. Reasons to teach the class include affordability, portability, and more importantly the transferability of the gained skilled and knowledge by students to the business world. Regardless, the main reason is to prepare our students for the real world in order to enhance their chance to compete effectively in the job market.

Given that a limited budget is an issue in most academic institutions, there was a need to find the most affordable tools without jeopardizing the learning outcomes. In the process of deciding on which techniques and tools are the best options for this class, there were a few to consider. This study looked at these areas:

1. SAS sells proprietary software for data analysis and management, BI. It is robust data analytics and comes with machine learning, statistics, Econ, forecasting and others. SAS can work with Hadoop and R (Hall, n. d.), discussed below. The problem with SAS clearly is the cost associated with licensing the software for the academic area. It is not cost-effective at all, where the only price I was able to find at their website direct was a whooping tag price of $9200.00 for an individual license. In addition to the prohibitive price, educators need to worry about the learning curve students must go through to be effective in using the software, in addition to the learning of the tool for data analysis and predication. SAS is

very powerful and sophisticated software; however, it is more suitable for high-end data analysis for big corporations.

2. Hadoop. Hadoop is an open source system for processing massive amounts of data (Hall). In order to effectively use Hadoop, the students need to learn a programming language by the name of mapReduce. It is used for large computations and multimedia types of data. Hadoop would be the ideal choice if time is not a constraint. To go through the multiple technologies it encompasses, it requires a time consuming effort. To teach Hadoop effectively probably would require two consecutive classes. The recommendation is to look for a two additional elective classes for Big Data using Hadoop. If the reader wishes to know more about Hadoop, visit this website discussing the top 25 points about Hadoop: http://www.bigdataeducation.in/top-25-things-about-hadoop/.

3. R. R is an open source language used for machine learning and mainly used for statistical analysis (Hall). R is a computer language. A full class must be dedicated to it in order to benefit from its strong syntax. R is not the best choice for an introductory class in Data Analytics. The author of this paper has personally experimented with R and found that it requires a steep learning curve.

4. PowerPivot. PowerPivot is a Data Analytics/BI powerful extension to MS Excel. After exprimenting with PowerPivot, PowerView (the graphical side of PowerPivot), and Pivot Tables for over three weeks with different file sizes, it was decided this is the right tool to teach in an introductory Data Analytics class. Since the decision was made to use PowerPivot as the main tool, this paper will explore the reasons for making this decision in a separate heading below.

Why PowerPivot?

PowerPivot is added to MS Excel as an add-in feature. We Know that:

1. MS Excel is easily accessible and has been around for many years. The learning curve is minimal for most students. Most universities provide MS Office for free or minimal fee.

2. PowerPivot lets management use their reporting. Most users are familiar with PivotTables already. The combination of these powerful applications will result in a very effective outcome.

3. No special IT resources are needed, including servers or unique software.

4. PowerPivot works with Pivot Tables like magic. “As the name implies, PowerPivot is a PivotTable on steroids. With PowerPivot, you can pull into Excel large amounts of data from multiple database tables, databases or other sources of data, and sort and filter them almost instantly” (Jackson, 2010).

5. There are no limits on the numbers of the rows and column especially if PowerPivot works with an SQL server. Of course there is a limit to how large the number of records is before Excel starts to slow down.

6. PowerPivot allows the integration of multiple entities (tables) in a similar fashion to a traditional relational database. This is a great chance to explore with the students the concept of normalization and how to avoid data anomalies. Relational databases are not going to disappear tomorrow and it is more likely our students will have to handle some database normalization in the real world. PowerPivot requires students to understand how to link different tables based on their relations. Up to this point and, just like

MS Access, PowerPivot allows only for one-to-one and one-to-many relationships between two or more entities. This will encourage students to think ahead before they start to build their data model to avoid the pitfalls when they use Excel as a plain spreadsheet.

7. PowerPivot allows the use of Data Analysis Expression (DAX). DAX's functions use similar functions to EXCEL. In addition to these functions, DAX is not a programming language such as C or Java; rather it is a formula language. The most important aspects of DAX are its ability to work with relational data and perform dynamic aggregation. While Excel uses cell references and cell addresses such as G2=F2+C2, DAX deals with columns and tables. Additionally, Excel allows one to change the cells values, while DAX only allows refreshing the data. This means the students will learn how to be aware of the needed changes before modifying the data.

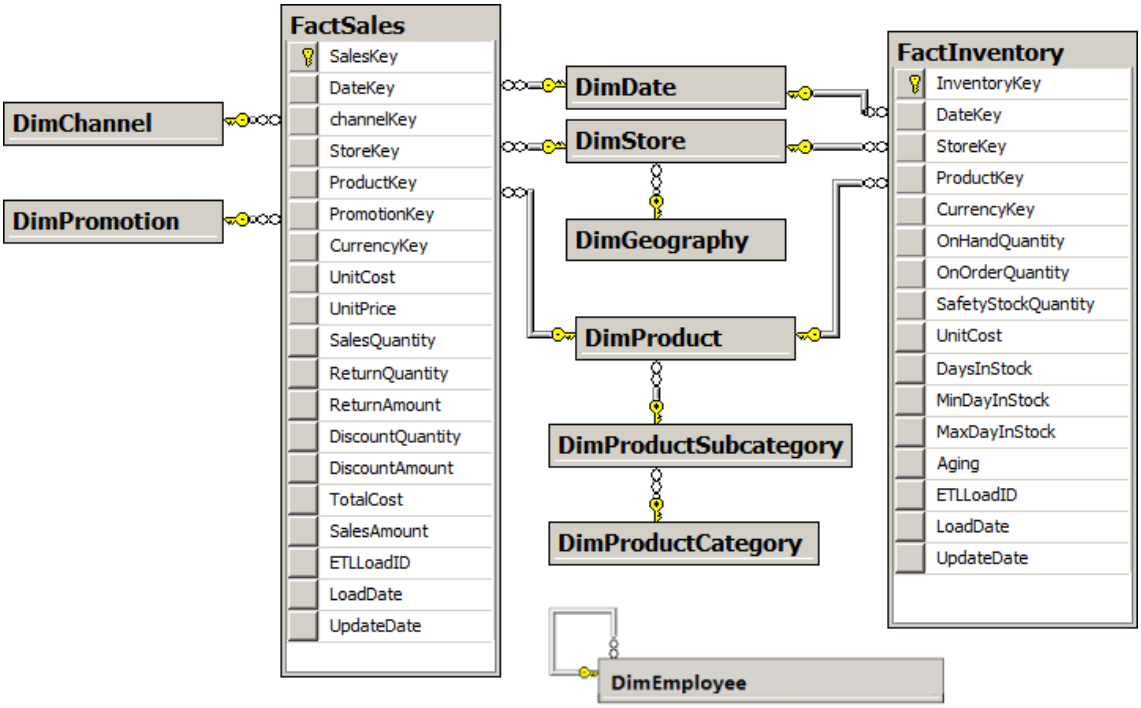
Experimenting with PowerPivot and DAX

In order to come to this conclusion, there was a need to seriously experiment with PowerPivot and DAX to see whether they are suitable for an introductory class on Data Analytics/BI. As usual, there were many useful sites and tutorials that offered excellent help. In addition to watching numerous videos and reading multiple whitepapers, I decided to test Contoso DAX formula Sample. It is a large file with 159.8 MB and the main spreadsheet contains over 3 million rows of data. Contoso file comes with comprehensive whitepaper, 69 pages of instructions and very useful external links, to walk a new learner through the different aspects of PowerPivot and DAX.

The first reading was ambiguous and hard to relate to, except for a few discussions of similar functions in Excel. The moment I decided to sit by my computer to read and follow the instructions in the manual, a whole new door of understanding was open. Learning about PowerPivot and DAX was interesting and rewarding.

Dickerman, H., & Myers, P. (2011) produced a friendly and easy to follow training paper. The authors use samples to illustrate the use of PowerPivot by importing a relational database from the "Contoso" SQL server, a relational database, where any reader can down download it from this URL: https://www.microsoft.com/en-us/download/details.aspx?id=28572 and it comes with a graphical representation of the data model as seen in the below graph. There two main transactional tables, FactSales (3.4 million sales) and FactInventory (8 million inventory) which are related to eight other tables. There is one standalone table by the name DimEmployee as seen in the graph 1.

Graph 1: All the tables with relationship in Contoso database, page 6



Having the ability to work with multiple tables within a PivotTable in Excel is a new experience. To manipulate much larger numbers than the typical 1,048,576 rows as the maximum number in Excel spreadsheet makes a better choice.

Dickerman & Myers stated that the goal from the tabular models is provided to ease the use of data analysis. Students will not be intimidated by this layout. Many students and business professionals will benefit from their previous experience with Excel. The difference between DAX and a typical Excel spreadsheet is that DAX works on columns and not ranges of cells. Columns have captions and are used as variables in calculation. For example, to create a new column by the name Margin based on subtracting totalCost from SalesAmount, the syntax would be = [SalesAmount] – [TotalCost]. The columns SalesAmount and TotalCost are already part of the table. It took less than 7 seconds to do the calculation for 3.4 million rows. Once the table moves into PowerPivot from Excel, it will be compressed and will reside in RAM, the main memory. This will result in slow calculations initially but in time, a user will feel the difference. Most of the calculations that were made took less than 7 seconds.

The intention of this section is not to offer an exhaustive discussion of PowerPivot and DAX, rather to give the reader a taste of the working environment. If you are interested in quick familiarity, I suggest the following link: https://support.office.com/en-us/article/QuickStart-Learn-DAX-Basics-in-30-Minutes-51744643-c2a5-436a-bdf6-c895762bec1a. Students will have no problems learning the many features that come with DAX in a regular, three credit class. Also, it should be noted that the list of functions below is a quick list and by no means will cover these functions in depth:

1. Simple DAX functions. These 80 functions resemble Excel functions such as ISBLANK, Average, AND, OR, etc. DAX uses FORMAT function instead of TEXT function. Also, DAX uses aggregate

functions such SUMX, COUNTX, and AVERAGEX since, as stated earlier, DAX works on columns and tables.

2. Some of the most powerful approaches to DAX are found in Row Context and Filter Context. Both require some serious applications in the classroom setting to understand them.
3. A Data Analytics must covers these functions in DAX:
    a. CALCULATE
    b. VALUES
    c. FILTER
    d. ALLEXCEPT
    e. RANKX
    f. RANK.EO
    g. TOPN
    h. LOOKVALUE
    i. Time intelligence functions
    j. Parent-Child Functions
    k. DAX Query

There is much more to PowerPivot and DAX than what was mentioned above. The whole purpose was to make sure that the materials in this section are substantial enough to cover an introductory class in Data Analytics. As the author of this paper, I completely believe this would be an informative class to break the barriers of my students' understanding to this timely topic. It will include the conceptual, logical, and the practical aspects of a new technology that is not accessible to all.

The Importance of the Study

This study attempts to show the impact of Big Data as an unavoidable phenomenon and the need to prepare our students to deal with the high demands of this field. This study admits the lack of clarity between four areas including Big Data, Business Intelligence, Data Analytics, and Data Mining. The finding of the study suggested the adaption of Data Analytics as an introductory topic to introduce business students to these areas. Selecting PowerPivot and DAX will provide students with the needed accessibility to practice and learning, since Excel is ubiquitous. PowerPivot has the strength to handle millions of rows with powerful filtering and manipulation functions. The new students to this area should be able to break the barriers in this field and build the needed self-confidence to pursue additional training, such as Hadoop technologies.

Conclusion

This study found that Big Data is a lasting and increasing phenomenon. As educators, we need to respond to the changes in the business world. After reviewing keys areas in this field, this research found that the best approach is to offer an introductory class in Data Analytics using PowerPivot found MS Excel. This Application software is accessible by all students and many are already familiar with it. The time saved initially can be used to learn additional functions found in DAX, a power formula language.

Adapting PowerPivot will invite the students to focus on their problem solving-skills. The main reason for a Data Analytic class is to ask the right questions and discuss the possibilities to answer them. As we know these days, it is easy to find the answer for almost everything, but still the hardest task is to come up with the right question.

The study shows an alarming rate of increase in data. However, this gives us the opportunity to respond positively to this increase and take advantage of the hidden treasures in the data by using PowerPivot to filter, calculate, and manage columns and tables very easily.

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The Cogs Are Coming: The Cognitive Augmentation Revolution

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ABSTRACT

We are at the beginning of a new era in human history–the cognitive augmentation era. Until now, humans have had to do all of the thinking. The future will make it possible for humans to partner with cognitive systems doing some of the thinking themselves and in many ways thinking that is superior to humans. Together, humans and "cogs" achieve a higher level of cognition than is possible by either working alone. Current cognitive systems are expensive large-scale pieces of technology affordable only to the biggest companies and government agencies. However, we foresee the evolution of less expensive cognitive systems tailored to individuals and available to the mass market. When these cogs become available, anyone will be able to achieve expert-level competence in any domain–something we call the democratization of expertise. The next few years will see a transformation of how we work, play, and socialize revolving around computer-augmented human cognition. In the coming era, cogs will be everywhere in our lives and become our teachers, co-workers, partners, advisors, counselors, pets, and even our friends. The cogs are coming.

INTRODUCTION

A new era, the cognitive augmentation era, is upon us. For the first time in human history we will soon be using tools capable of performing higher-order cognitive processes (thinking) we do throughout our daily personal and professional lives. A confluence of several technologies is bringing forth this new era including: cognitive systems, deep learning, digital assistants, voice recognition, and big data analytics. We call these thinking tools "cogs." The future will belong to those who can best work in partnership with cogs because their use amplifies the cognitive power of the individual.

Augmenting human activity with computer-like technology has been a goal for a long time although what "augmentation" means has changed. In the 1940s, Vannevar Bush envisioned a system called the Memex and discussed how employing associative linking could enhance a human's ability to store and retrieve information (Bush, 1945). The Memex made the human more efficient but did not actually do any of the thinking.

In the early 1960s, Engelbart and Licklider envisioned human/computer symbiosis. Licklider imagined humans and computers becoming mutually interdependent, each complementing the other (Licklider, 1960). However, Licklider envisioned artificial aids merely assisting with the preparation leading up to the actual thinking which the human would do themselves. Engelbart's H-LAM/T framework described the human as a part in a multicomponent human/computer system allowing human and artificial sys-

tems to work together to perform problem-solving tasks (Engelbart, 1962). Through the work of Engelbart's Augmentation Research Center, and other groups in the 1950s and 1960s, many of the devices we take for granted today were invented as "augmentation" tools including: the mouse, interactive graphical displays, keyboards, trackballs, WYSIWYG software, email, word processing, and the Internet. However, while making it easier for the human to think and perform, none of these actually do any of the thinking themselves.

Envisioned by O.K. Moore in the early 1960s, the talking typewriter sought to create an enjoyable learning environment to teach reading skills to students in K-3 grades (Sanderson & Kratochvil, 1972). This is an early example of human-computer engagement at the personal level but the talking typewriter was just an aid to stimulate thinking and learning by the human. The talking typewriter performed no cognition of its own. Alan Kay's vision of the DynaBook in the early 1970s was influenced by the talking typewriter (Kay, 1972). Kay envisioned the DynaBook as a way to augment human learning and imagined a portable device in use by every human. We recognize the DynaBook today as the tablet computer but in the early 1970s the idea of a handheld computer for personal use was far from mainstream thinking.

Fifteen years later in 1987, well into the personal computer revolution, Apple envisioned a personal digital assistant resembling Kay's DynaBook in a video. This device, called the Knowledge Navigator, was unique in that it interacted with the human user in spoken natural language and seemed able to perform tasks far exceeding the capabilities of software available at the time (Apple, 1987). The idea was so far ahead the video was largely dismissed as science fiction and some experts even joked about the fanciful imaginings. Apple was again ahead of the market in the early 1990s with the release of the Newton, the first handheld digital assistant. The Newton was too far ahead of the market and was not successful (Honan, 2013). It would take another fifteen years for Newton-type functionality to become successful in our cell phones and tablet computers.

Portable digital technology has become ubiquitous and woven into people's daily lives. We now think nothing of the concept of people using connected computers to augment human activity. Today's voice-activated personal assistants like Apple's Siri, Microsoft's Cortana, Google Now, Facebook's M, and Amazon Echo's Alexa accept natural-language requests from users, reply in natural language, and perform services on behalf of the user (Apple, 2015; Microsoft, 2015; Google 2015; Hempel, 2015; Colon & Greenwald, 2015). But these tools simply retrieve information, and perform minor clerical tasks such as creating appointment calendar items. The cog future will see these interfaces being able to think on their own as human experts think. They will become our virtual colleagues rather than mere tools.

If shown today's technology in the early 1960s, many would have claimed the technology as being artificially intelligent. However, today's expectation is different. We recognize the capabilities of today's technology as performing only the lowest form of cognitive processes. True human-cog partnerships of the future will go far beyond today's tools. Instead of just retrieving information, cogs will perform increasing amounts of cognition eventually achieving or exceeding the level of a human expert in a given domain. Recent advances in deep learning such as Google Brain, IBM Watson, and Microsoft's Adam represent early-stage technologies giving us a glimpse into the future (McMillan, 2014; Knight, 2015; Chansanchai, 2014). Cogs will be able to consume vast quantities of unstructured data and information

and deeply reason to arrive at novel conclusions and revelations, as well as, or better than, any human expert.

A sentinel in this revolution came in 2011, when a cognitive computing system built by IBM called Watson defeated two of the most successful human Jeopardy champions of all time. Watson understood clues given in written natural language and gave answers in spoken natural language. Watson's answers were the result of deep search and reasoning about millions of pieces of information and the aggregation of partial results to form a consensus (Jackson, 2011). Watson was not programmed to play Jeopardy. Instead, Watson was programmed to *learn* how to play Jeopardy, which it did in numerous training games with live human players before the match. In doing so, Watson achieved a performance at the level of an expert.

Watson represents a new kind of computer system—a cognitive system (IBM, 2015c). We use computers today as tools to gather and process information, however, humans still perform most of the thinking. Cognitive systems are capable of doing some of the thinking on their own. As such, cognitive systems promise a new kind of human/computer interaction. In the cog era, cognitive systems, *cogs*, as we call them will become our partners collaboratively working with us on a task.

John Kelly, Senior Vice President and Director of Research at IBM describes the initiative as follows (Wladawsky-Berger, 2013; Kelly & Hamm, 2013; Isaacson, 2014):

> *"The goal isn't to… replace human thinking with machine thinking. Rather, in the era of cognitive systems, humans and machines will collaborate to produce better results – each bringing their own superior skills to the partnership. The machines will be more rational and analytic – and, of course, possess encyclopedic memories and tremendous computational abilities. People will provide judgment, intuition, empathy, a moral compass and human creativity."*

IBM is actively commercializing Watson technology to serve (and in many ways create) the emerging multi-billion dollar cognitive computing market. Much of the commercialization effort to date revolves around the identification of a large store of information in a specific domain (such as medical diagnosis) and the customization of Watson technologies to work with employees in that domain (such as nurses and doctors). We call these types of systems *enterprise cogs.* In 2014, IBM announced the creation of two new groups. The Cognitive Business Solutions group acts as consultants helping companies create enterprise cogs. The Watson Health group's focus is to commercialize Watson technology for the health sector (IBM, 2014; 2015a; 2015b; 2015d Sweeney, 2015).

In her January 2016 keynote address at the Consumer Electronics Show, Chairwoman, President, and CEO of IBM Ginni Rometty announced more than 500 partnerships with companies and organizations across 17 industries each building new applications and services utilizing cognitive computing technology based on Watson (Gugliocciello & Doda, 2016; Rometty, 2016). In one of these partnerships, Under Armour is building a personal health consultant and cognitive coaching system based on Watson technology (Haswell & Pelkey, 2016). This cog will serve as a fitness trainer and assistant providing athletes with timely, evidence-based coaching, Based on consuming enormous quantities of unstructured data from the Internet and data from health monitoring appliances on and near the body, the cog

will offer expert-level help with sleep, fitness, activity, and nutrition, by matching your situation and condition with others like you. It will be as if the user has a professional trainer as a constant companion. Importantly, this cog will be available to anyone and everyone. It is not possible for millions of people to have the service of a human expert personal trainer, but this cog will bring that level of service to millions allowing the masses to perform at the level of an expert.

Another success of Watson commercialization is medical treatment suggestion at Memorial Sloan Kettering Cancer Center (Kelly & Hamm, 2013; Sloan Kettering, 2014). Watson was trained with hundreds of thousands of pieces of medical evidence, millions of pages of text, 25,000 training cases, and over 14,000 person-hours of fine-tuning with human experts. Watson's accuracy has reached 90%, vastly exceeding human accuracy of 50%. Watson has achieved expert-level performance in this field. 90% of the nurses and doctors use Watson's treatment suggestions (Upbin, 2013). Together, working in partnership, nurses, doctors, and Watson form a cognitively augmented ensemble that is exhibiting a higher level of performance in speed and accuracy (cognitive power) than either the humans or Watson could achieve on their own.

Over the next few years a cog will be constructed to operate at the level of an expert in any field humans are expert in. Partnering with these cogs will give average humans the ability to perform at the level of an expert in any domain—something we call the *democratization of expertise*. This will finally fulfill the dream of human cognitive augmentation originally envisioned decades ago. The coming era promises to forever change the way humans interact with and use computers. Yet we are at the very beginning of the cog revolution. But be sure, the cogs are coming.

COGNITIVE AUGMENTATION

Cogs represent incursion into a new domain, the cognitive domain. Cogs will perform some of our cognitive work for us and this will change everything. But what does "cognition" mean? When will we know when a cog is performing cognition? How do we measure the increase in cognition facilitated by partnering with a cog? To address these questions we must first identify what a cognitive process is. At the simplest, a *cognitive process* is anything that transforms data, information, or knowledge into a higher-value form. This transformation requires an amount of processing, therefore, we can define a cognitive process by the change in value of data, information, and knowledge. If we refer to data, information, and knowledge generically as *information stock, S*, we can view a cognitive process as the transformation of information stock from an input form to an output form requiring the expenditure of a quantity we call *cognitive work, W*, as given by

$$W = \left| \Psi(S_{out}) - \Psi(S_{\square}) \right| + W_{lost} \quad W = \left| \Psi(S_{out}) - \Psi(S_{\square}) \right| + W_{lost} \,,$$

Eq. 1

where $\Psi(x)$ is a function calculating the value of a piece of information stock. For brevity, we leave the nature of $\Psi(x)$ generic and the subject of future work. How one measures the value of information stock is a complex subject. There may very well be no one single metric to satisfy all contexts and such a discussion is the scope of a subsequent paper. For our discussion here, it is sufficient to simply recog-

nize that information stock has a value and that value can be increased or decreased by the performance of a cognitive process.

We use the absolute value in Eq. 1 because it is possible for $\Psi(S_{out})$ to be smaller than $\Psi(S_{\square})$ seemingly resulting in a nonsensical *negative* amount of cognitive work. Any kind of transformation involves a nonzero and positive amount of effort, so we desire cognitive work to always be a positive quantity. W_{lost} captures cognitive work that goes into producing S_{out} but is not represented in S_{out} directly. For example, a cognitive process may transform S_{in} into a number of intermediate forms before it produces the output. If the intermediate forms of S_{out} are never output to the outside world, they are not accessible to anyone or anything and therefore the cognitive work expended to generate them is not accounted for by simply calculating $S_{out} - S_{in}$. Instead, we account for this cognitive work via the W_{lost} term. W_{lost} here is similar to waste heat in the physics of a heat engine.

Cognitive work is expended over an amount of time. Expenditure of effort over time is generally regarded as *power* in science and engineering. In similar fashion, we define *cognitive power, P*, as the amount of cognitive work over time,

$$P = \frac{W}{T}$$

Eq. 2

where T is an arbitrary period of time, and W is cognitive work given in Eq. 1. P is a measure of *cognitive efficiency* with respect to time. Increasing the value of an amount of information stock over a short period of time (a larger P) can be viewed as more efficient than increasing the value over a longer period of time. Likewise, increasing the value by a greater amount even though it may require more time can also be viewed as more efficient.

Engelbart's H-LAM/T framework models an augmented human as part of a system consisting of: the human, language (concepts, symbols, representations), artifacts (physical objects), methodologies (procedures, know-how), and training (Englebart, 1962). We can now update Engebart's framework to include cogs. In the coming cog future, cogs will be the artifacts in Engelbart's framework. The human and the cog(s) will work together on a cognitive task. To perform the task, the system as a whole executes a series of cognitive processes with the human performing some of the processes, the cog performing some processes, and other processes performed by a combination of human and cog. At one extreme, a human operating in isolation without a cog performs all cognitive processes. At the other extreme, if all cognitive processes are performed by a cog we will have a truly independent artificial intelligence.

Cognitive augmentation lies somewhere between these two extremes. In the cog era, humans will be cognitively augmented by working in partnership with artificial systems capable of higher and higher levels of cognition. Most discussion of augmented cognition boils down to a matter of how the cognitive processes are distributed across the human and cog. Following Eq. 2, the amount of cognitive processing done by the human is P_{Human} and the amount performed by the cog is P_{Cog}. The expectation be-

hind human cognitive augmentation is humans and cogs working together as partners will achieve a cognitive power exceeding that of either the human or cog,

$$P^{\square} \geq \sum_{i} P^{i}_{cog} + \sum_{j} P^{j}_{human} \quad , \qquad \text{Eq. 3}$$

where P^{*} is the cognitive power of the human/cog system as a whole involving the individual contribution of i artificial systems, cogs, and j humans. The key characteristic of a human/cog partnership is how much cognitive work is done by the human and how much is done by the cog. We call this ratio the *augmentation characteristic* as given by

$$+¿\frac{P_{cog}}{P_{human}} \quad . \qquad \text{Eq. 4}$$
$$A^{\square}$$

A non-augmented human is characterized by $P_{cog} = 0$ meaning $A^{+} = 0$ (no augmentation at all). As long as A^{+} is non-zero but less than 1, the human is contributing the majority of the cognitive power. Indeed, this is the case today. However, when $A^{+} > 1$, we will have entered into a new realm in which an artificial construct will contribute more cognitive power than the human. Once we cross into that realm, there is no limit to A^{+} as it increases to infinity. Interestingly, if the human component falls to zero, A^{+} becomes undefined. This is appropriate because at that point we will have an independent artificial intelligence operating without human assistance—no longer human cognitive augmentation.

THE COG ERA

Democratization and Commoditization of Expertise

We predict the emergence of *specialty cogs* and *personal cogs* intended for the mass-market and anticipate the vertical development of cogs pertaining to a specific domain. We foresee a class of specialty cogs being developed for almost any subject matter for which exists a human expert. Unlike enterprise cogs, specialty cogs will be made available to the mass market. Anyone will be able to access, purchase, and rent specialty cogs from a variety of retail outlets via the Internet and brick-and-mortar stores. We foresee both the creation of new cognitive applications and modern-day apps evolving into ever-smarter versions gradually adding cognitive capability over time. These cogs will be bought and sold by average people through existing sales channels much in the same way apps, music, and books are sold now. These cogs will service us through voice-activated dialog and will be available to us via our handheld, portable devices. This will give every person access to professional-level expertise in any domain. This democratization of expertise will lead to changes similar in scope to the way the democratization of computing and information has changed us over the last few decades.

Because cogs work in partnership with humans, there will arise the need for experts in a field to work with cogs and develop their own unique store of knowledge, something we call a *cogbase*. Entities in industries such as financial services, investment services, legal, medical, news, politics, and technology will compete in offering access to their "superior" store of knowledge created through the interaction of

their experts and their cogs. In the cog era, *knowledge* and *expertise* will become an economic commodity.

Personal Cogs

We also foresee the development of another type of cog we call a *personal cog*. These cogs will certainly possess expert knowledge and ability in a given domain, like specialty cogs, but also will maintain a record of all interaction with the human and use that information to improve its cognitive services over time, even years or decades. Humans will form relationships with personal cogs growing and expanding over time much like with siblings, spouses, co-workers, and friends. Each human/personal cog relationship will evolve to be unique and produce a knowledge store of great value.

Teacher Cogs An interesting example of a personal cog are teacher cogs. A teacher cog will have access to everything that is knowable about a particular subject matter. Through customized and personalized interaction with a person, teacher cogs will impart this knowledge to the student in ways similar to the master/apprentice model of education. The best teacher cogs will be personal cogs able to remember every interaction with a person over an extended period of time, even years or decades. Imagine an algebra cog able to answer a question by a 35-year old user/owner who it has been working with since grade school. We anticipate teacher cogs to evolve for every subject taught in schools and beyond. There may even be *master cogs* developed incorporating the domains of several individual teacher cogs. One can imagine an engineering cog being comprised of an applied calculus cog, an algebra cog, and a differential equations cog. We think students of future generations will start using cogs all throughout their education and then retain the cogs, and years of interaction, through the rest of their lives. Again, we foresee vigorous competition arising from different teacher cog providers attempting to bring to the market the best teacher cog for a particular subject matter.

Advisor, Coach, Self-Help, and Pet Cogs Humans will interact with cogs using natural language and many other mechanisms. People will have conversations with cogs and the cogs will respond in creative, knowledgeable, and personalized ways. It is natural for humans to form emotional relationships with just about anything, biological or artificial, they can interact with. Indeed, people form emotional relationships with animals and technology today. We foresee cog technology giving personalities to artificial systems. Since cogs will be able to give expert-level advice in any domain, we predict the evolution of a host of self-help cogs ranging from relationship advice to life/work balance, to grief counseling, faith-based counseling and beyond. People will confide intimate details to these cogs and receive advice of great personal value and satisfaction. People will spend hours conversing with their personal self-help/companionship cogs. We can easily envision the development of virtual pets with cog-based personalities and communication abilities. In the cog era, we will love our cog pets. In fact, this is already happening. In China, millions of young people are chatting with an artificial intelligence bot, named Xiaoice, programmed to behave like a 17-year-old girl (Larson, 2016). Xiaoice was created by Microsoft's Application and Services Group East Asia and gives relationship advice, is empathetic, humorous, and sometimes divisive. Yet, Xiaoice is far from being a full-fledged cognitive system like IBM Watson. Though primitive still, Xiaoice portends the future. Another example of a primitive, but indicative, artificial entity is Microsoft's Tay (Deveau & Cao, 2016). Tay chats with humans on Twitter and other messaging platforms and learns by parroting comments and then generating its own answers and statements based on all of its interactions. Tay emulates the casual speech of a stereotypical millennial. Tay ran into trouble within a few days of launch when a concerted effort taught Tay to spew

offensive remarks. However, expect artificial entities to get smarter. We predict millions of people will soon be conversing with an artificial entity via social media and other means without even realizing it.

Productivity Cogs We predict every productivity application in use today will become enhanced by cog technology in the future. Indeed, applications like word processors, spreadsheets, presentation editors, Web browsers, entertainment apps, games, graphics editing, etc. may become a primary interface point for humans and cogs. Cog capabilities will both be built into the applications themselves and provide expert-level collaboration to the user and also evolve into stand-alone cogs for a particular task. For example, we can imagine a future version of Microsoft Word coming complete with embedded creative writing cog services. We can also imagine purchasing a creative writing cog from an app store operating independently of a specific word processor.

Personal productivity cogs will understand our recent context in a deep manner and use that to customize their assistance and interaction with us. Imagine, for example, a word processing cog that understands you are writing about the future of cognitive processing but also knows that you have communicated with several others via email on that and related topics and can also take into consideration every article or Web page you have accessed in recent months while researching the paper. Such a cog knows a lot about you personally and can combine that knowledge with its own searching and reasoning about the millions of documents it has searched on the Internet. Personal productivity cogs will become our intelligent virtual colleagues.

Collaborative Cognition In addition to enhancing current productivity applications, we expect an entirely new genre of cog-based productivity app to arise, collaborative cognition. We envision new kinds of problem solving, brainstorming, business/competitive/market analysis, and big data analysis. We foresee multi-cog "collaborative virtual team" applications being created. *Cogteams* will consist of several cogs, each with their own domain of expertise, engaged in discourse with one or more humans and offering advice, answering questions, and performing research and analysis as the meeting dictates. Collaborative cogs will become our artificial intelligent team members. Again, we see a vigorous and dynamic competitive market arising around the idea of collaborative cogs. By partnering with humans, cogs achieve ever-increasing levels of knowledge in a particular area. Therefore, considerable market value will be attached to collaborative cogs that have worked with the best experts in the field. The cog era will bring forth a new kind of virtual consultant.

Research Cogs We foresee future graduate students, entrepreneurs, scientists and any of us creative and inquisitive people conducting research by conversing with their research cog(s) instead of searching and reading scores of journal articles and technical papers. Today, I tell my graduate students the first step in their research is to go out and read as many articles, books, and papers as they can find about their topic and I try to give them guidance. My future research students' first action will be to sit down with his or her research cog and ask "So what is the current state of the art in <insert domain here>."

Cogs will be able to consume billions of articles, papers, books, Web pages, emails, text messages, and videos. This far exceeds the ability of any human. Even a person spending all of their professional life learning and researching a particular subject is not able to read and understand everything available about that subject. Yet, future researchers will be able to *start* their education from that vantage point

by the use of research cogs. In the cog era, the best new insights and discoveries will come from the interaction between researchers and their research cogs.

Here again we see evidence of knowledge becoming a commodity. Today, we may be able to learn a great deal from the notebooks of great inventors like Tesla, Edison, and DaVinci. In fact, notebooks of inventors like these are worth millions of dollars. But image how valuable it would be if we had access to Einstein's personal research cog he used for years while he was synthesizing the theory of relativity. In the cog era, not only will cogs assist us in coming up with great discoveries, they will also record and preserve that interaction for future generations. Such cogs will be enormously valuable economically, socially, and culturally. One can imagine cogs belonging to historically significant figures being accessible in future museums where patrons can have a discussion with a digital likeness of the person.

Discovery Engines Even though cogs are intended to partner with humans and improve their knowledge and ability over time as a result of this interaction with humans, cogs will evolve to be able to perform an enormous amount of cognitive work on their own. We fully expect cogs working semi-autonomously to discover significant new theories, laws, proofs, associations, correlations, etc.

In the cog era, the cumulative knowledge of the human race will increase by the combined effort of millions of cogs all over the world. In fact, we foresee an explosion of knowledge, an exponential growth, when cogs begin working with the knowledge generated by other cogs. This kind of cognitive work can proceed without the intervention of a human and therefore proceed at a dramatically accelerated rate. We can easily foresee the point in time where production of new knowledge by cogs exceeds, forever, the production of new knowledge by humans.

In fact, we anticipate a class of *discovery engine cogs* whose sole purpose is to reason about enormous stores of knowledge and continuously generate new knowledge of ever-increasing value resulting ultimately in new discoveries that would have never been discovered by humans or, at the very least, taken humans hundreds if not thousands of years to discover.

Cognitive Property Rights Today, intellectual property rights represent a significant value, as much as a third of the US gross domestic product (USPTO, 2012). The cog era will bring forth new questions, challenges, and opportunities in intellectual property rights. For example, if a discovery cog makes an important new discovery, who owns the intellectual property rights to that discovery? An easy answer might be "whoever owned the cog." But, as we have described, we anticipate cogs conferring with other cogs and using knowledge generated by other cogs. So a cog's work and results are far from being in isolation. We predict existing patent, copyright, trademark, and service mark laws will have to be extended to accommodate the explosion of knowledge in the cog era.

SUMMARY

Over the last fifty years, we have seen vast cultural, social, legal, and economic changes due to the information age, the computer age, the Internet age, and now the social media age. We are at the boundary of a new era, the cog era, and we will see similar upheavals as a result. For the first time in history, humans will be able to partner with artificial systems able to think as good as or better than they can. This will extend human capability into a new dimension. For millennia, humans have used tools like hammers, saws, and shovels to extend physical performance. In the cog era, cognitive systems, called

cogs, will extend human cognitive performance. Cognitively augmented humans will create a new standard of performance in which the successful ones will be the ones who can best partner with cogs and demonstrate superior mastery of a resource that does some of the thinking for them.

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Tools to use in an information technology class – and best of all they are FREE!

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Introduction

Purdue Polytechnic has several locations in the state of Indiana offering students a chance to get a Purdue degree. The Computer and Information Technology (CIT) department offers the CIT degree at three sites in Indiana: Anderson, Columbus and Kokomo. CIT offers several potential majors including Cybersecurity, Network Engineering, Systems Analysis. At the Columbus site we offer the Computer & Information Technology major. This major is a general degree that would have a variety of CIT offerings in all of the majors mentioned. Each statewide site of Purdue Polytechnic has multiple labs including approximately 30 throughout the state (including labs used for CIT and other programs) that must be maintained with an annual budget of approximately $200,000 for hardware and software. In the general CIT major, students take up to 15 courses that have lab component and require from general software like Microsoft Office to more specialized software such as Unity Pro and Autodesk Maya that are used in our game development class. Our classes focus on four areas: networking, programming, systems analysis and programming. We have purchased a variety of licenses to use in these tasks. With a limited budget we are always looking for viable alternatives. In this paper we will review some options that we have incorporated or plan to incorporate into our labs. In our search we were looking for low cost or no cost options. The best news is all of the options we will discuss in this paper are free. The following pages discuss the products we found.

VirtualBox

VirtualBox is a category of virtual machine software or VM that can provide the user an emulation of a particular computer that the user can manage and use. This can be a complete substitute of real machine in which the user can install operating systems and other software of choice. VirtualBox was initially offered by Innotek GmbH which was bought out by Sun Microsystems and subsequently by Oracle Corporation and rebranded by the official name of Oracle VM VirtualBox. VirtualBox is free Open Source Software. On their website Oracle describes VirtualBox as "a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use. VirtualBox is an extremely

feature rich, high performance product for enterprise customers. Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD as in Figure 1 shown with Fedora 21 running."

Purdue University's main campus has a site license for VMware which is also virtualization software. Both VMware and VirtualBox provide similar capabilities. In our case we are not looking to replace VMware but have VirtualBox as an additional option. There are several advantages for our students to use VirtualBox. The biggest advantage is that it is standalone, meaning that once installed the student does not need to be connected to the network to use. Although, connecting to a network is not generally a big issue it does make its use more portable. It does not require the student to set up a VPN or connect to a remote desktop as required by VMware. Another advantage is that with the Oracle purchase of VirtualBox they have provided pre-built virtual machines that already have the operating system and Oracle application software installed. Typically, these pre-built machines are tuned so that they run efficiently on a standalone PC. These pre-built virtual machines (appliances) are also free. There are several disadvantages of using VirtualBox. In order to run VirtualBox you need a reasonably powerful x86 hardware at least 2GB of RAM (more is better) and although VirtualBox does not require a lot of disk space (typically about 30MB) the virtual machines can grow significantly depending upon the operating system and software utilized. Finally, you need to be running one of the supported operating systems. Another negative of VirtualBox is that there is no local support if students have issues installing or using the software. Since VMware is located on Purdue servers, it does not require the student to have a powerful machine with any disk or memory requirements and is totally supported by the Purdue IT Support.

We currently use VirtualBox in CNIT 487 Database Administration. This is an upper level CIT class used as an introduction for students in the role of Database Administrator (DBA). The database software we us in the class is the Oracle DBMS. Virtualization is useful in this class because in order to manage an Oracle database students are required to have administrator privileges on the machine and Purdue support is justifiably unwilling to give students that capability in Purdue labs. Several years ago we started teaching and online version of this class. In the CNIT 487 course we use both VMware and VirtualBox for labs and class project. The VMware has Oracle installed in a Windows environment and VirtualBox utilizes a pre-built appliance that has been modified for the class using Linux. This has allowed students to use Oracle in multiple environments. In the time we have taught the class students have not had many real issues with using VirtualBox. I have created several tutorials including one on how to install VirtualBox and how to install an appliance that has eliminated some of the early issues we had in the class.

As mentioned VirtualBox is free and documentation and downloads can be accessed at : https://www.virtualbox.org/ .

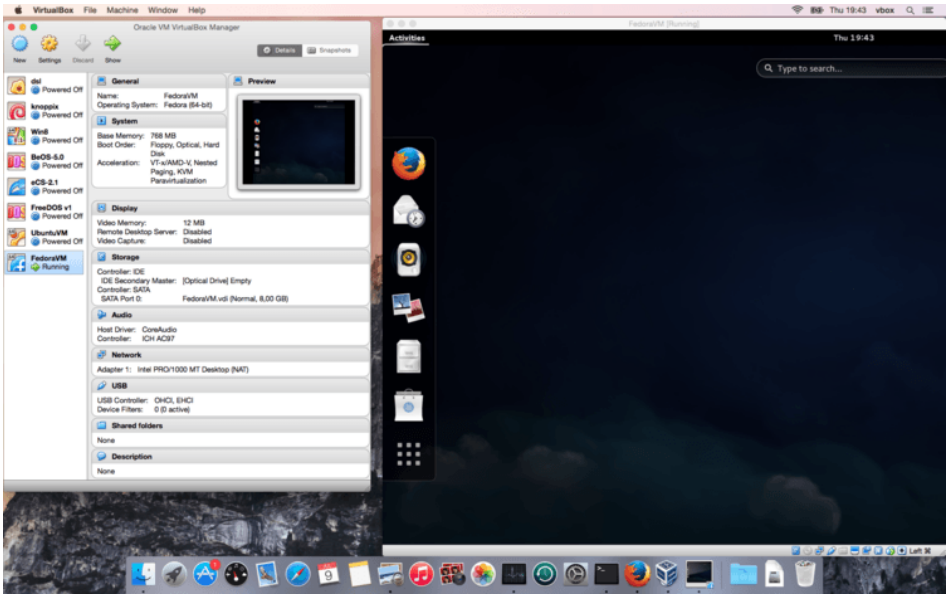

Figure 1. VirtualBox 5.0 for Mac OS X with VirtualBox Fedora 21 running

Oracle SQL Developer

SQL Developer is an Integrated Development Environment (IDE) that provides programmers and administrators with tools to automate many of the development functions. According to Oracle it can be used by developers, DBAs, Data Modelers and Web Application Developers and Administrators. It also has the capability to migrate many third party databases including Microsoft Access, SQL Server, Sybase ASE, DB2 or Teradata. The tool was developed by Oracle and is used on versions 10g, 11g, and 12c and can run on any operating system that runs Java. Specifically, SQL Developer provides an editor for working with SQL and PL/SQL allowing the developer to run queries and execute, debug and test program code. Newer versions of SQL Developer provide DBA capabilities to perform tasks such as backup/recovery, auditing, user management, and storage management. The tool is also compatible with the CASE tool SQL Developer Data Modeler (discussed later in the paper).

SQL Developer replaces SQL*Plus a command line interface from Oracle Corporation used to access Oracle databases from Oracle version 4 on up. It was shipped with the Oracle database until the release 11g when Oracle quit shipping the product with the Oracle database software. There are also third party products such as TOAD from Dell Software that is offered both freeware and commercial (running $975 a seat on up). Oracle SQL Developer has many advantages over the previous product SQL*Plus which was strictly a command-line interface as opposed to the GUI interface provided by SQL Developer. The tool supports not only command line execution of SQL commands but has an editor to support development using PL/SQL language as shown in Figure 2. The product is an .exe file and requires no installation as opposed to SQL*Plus that required the user to install the Oracle client. This is not particularly important for lab machines but made use of the tool easier for students at home. TOAD has an advantage of being able to access multiple databases, but this is not a problem since Oracle databases are used in all classes except the introductory

class that uses Microsoft Access. If you have a valid license for Oracle software (Purdue does), then you also access to Oracle support for SQL Developer issues.

Oracle SQL Developer is installed in all of the statewide labs that have CIT programs and used by most students that want to access the Oracle server with their personal computers. We use Oracle SQL Developer in three classes CNIT 272 Database Fundamentals, CNIT 372 Database Programming and CNIT 392 Enterprise Data Management. We have been using the product for several years now. Students using the product at home have said that it is easier to use than SQL*Plus. The only real issue we have had was a performance issue when we installed a newer version in our labs.

Oracle SQL Developer is a free product and can be accessed at: https://www.oracle.com/downloads/index.html.

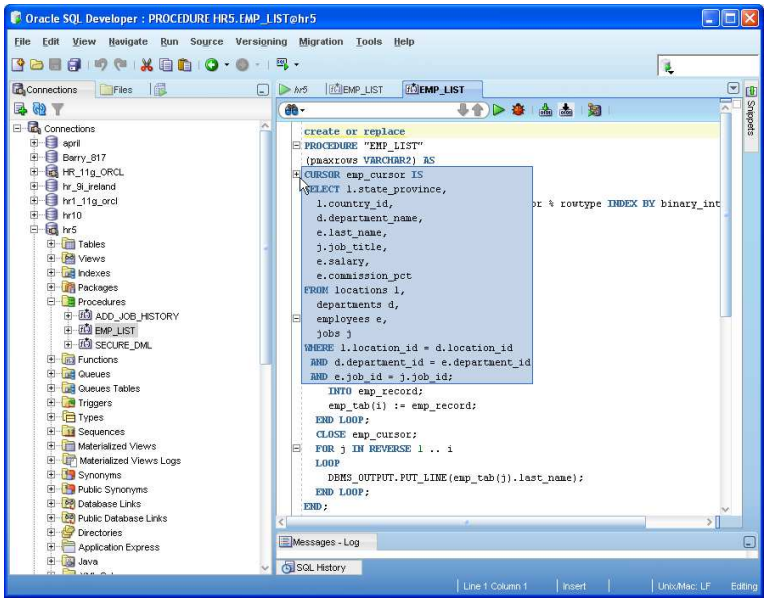

Figure 2. SQL Developer with PL/SQL code

Oracle SQL Developer Data Modeler

SQL Developer Data Modeler or Data Modeler is part of SQL Developer or a standalone product (what we will discuss in this paper). Data Modeler is a graphical tool that can be used to create and maintain logical, relational (as shown in Figure 3) and physical models. The main model used in database design is an Entity Relationship Diagram (ERD). Data Modeler supports development of ERDs using both the Bachman and Barker notation. Besides creating and maintaining Entity Relationship Diagrams (ERDs) the tool can be used to forward and reverse engineer databases. The tool can also be used to develop process models – Data Flow Diagrams (DFDs). Data Modeler can be used in a standalone and in Cloud environments.

Oracle SQL Developer Data Modeler replaces two tools Oracle Designer and Microsoft Visio. Oracle Designer was a tool from Oracle Corporation that contains many of the same features as Data

Modeler. Data Modeler like SQL Developer requires no installation because it is an .exe file that only requires an operating system that can use Java. That is the biggest advantage of Data Modeler over Designer. Designer was difficult to install in the labs and support and most students didn't bother to try and install it at home. It also tended to run very slow and if more than a few users were on it ran extremely slow. Visio is still used on lab machines (mainly in systems classes) because it has the advantage of including not only ERDs but also able to model in UML including Class Diagrams, Use Cases, Sequence Diagrams along with Data Flow Diagrams (DFDs). A disadvantage of Visio is that students have to buy it because it is not included in any agreements between Purdue and Microsoft Corporation, unlike Oracle Data Modeler which is free for students to download.

Oracle SQL Developer Data Modeler is installed in all of the statewide labs that have CIT programs and used by most students that want to access the Oracle server with their personal computers. We use Oracle SQL Developer Data Modeler in three classes CNIT 272 Database Fundamentals, CNIT 372 Database Programming and CNIT 392 Enterprise Data Management. Students have been using the product for several years and have not had any major complaints (which were common with Oracle Designer).

Oracle SQL Developer Data Modeler is a free product and can be accessed at: https://www.oracle.com/downloads/index.html.

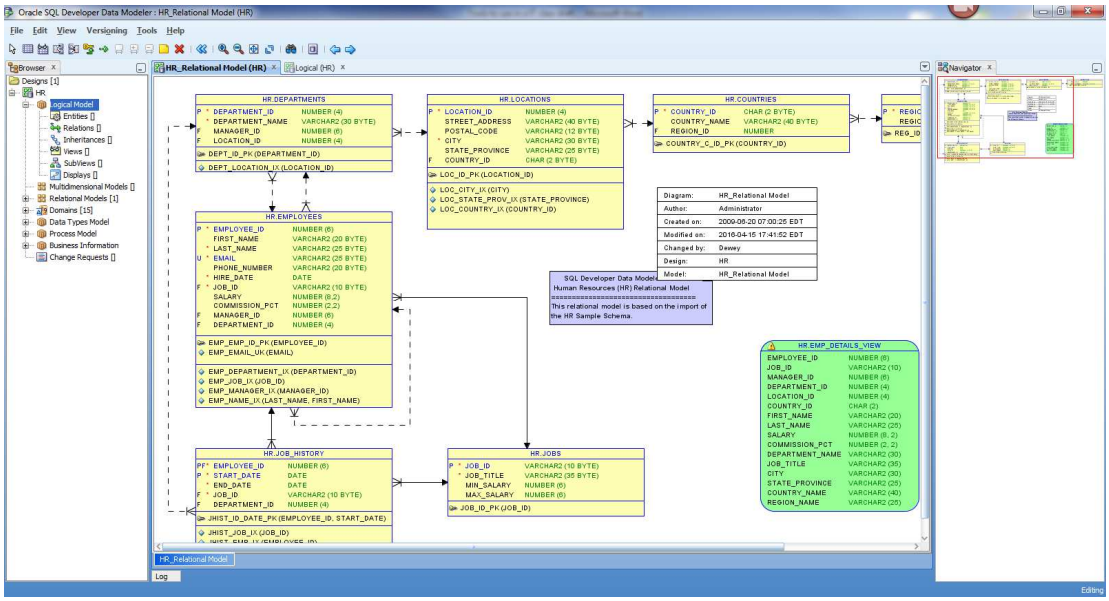

Figure 3. SQL Developer Data Modeler with relational model

GameMaker: Studio

GameMaker: Studio is a 2D game engine developed by YoYo Games, a company founded in Dundee, Scotland. In 2015, the company became a subsidiary of Playtech, a gambling software development company with headquarters on the Isle of Man. It was sold to PlayTech for £10.65 million, a sum approximately equivalent to $16.4 million at the time of the purchase. A screenshot of a simple 2D game

made using GameMaker: Studio and run in the debug mode under the auspices of the IDE is shown in Figure 4. The game took 45 minutes to make.

This tool can be used to replace the 2D game development functionality of Unity 5 in our pilot CNIT 399 Introduction to Game Development course that is scheduled to be offered for the second time in the Fall of 2016. (The course was taught for the first time by one of the authors in Spring 2015.) In addition to offering a free version, GameMaker: Studio has the advantage of providing an intuitive Drag and Drop system that makes the learning curve less steep and allows a student to quickly put together 2D games of such common genres as mazes and platformers. Presenting a mild disadvantage, the scripting for this game engine has to be done in a special scripting language called GML (GameMaker Language) based on C. Unity 5 allows scripting in C#, a language that our undergraduate students would have programmed in for at least two semesters prior to taking the pilot course. On the positive side, unlike C#, GML supports the aforementioned Drag and Drop system. GameMaker: Studio can be used to make games for a wide variety of platforms, including Windows, Mac OS X, Ubuntu Linux, Android, iOS, Windows Phone, and Xbox One.

GameMaker: Studio and the complementary GameMaker: Player is available at the YoYo Games company website, http://www.yoyogames.com/gamemaker. The Professional version of GameMaker: Studio can be purchased at https://www.yoyogames.com/get/studio_pro.

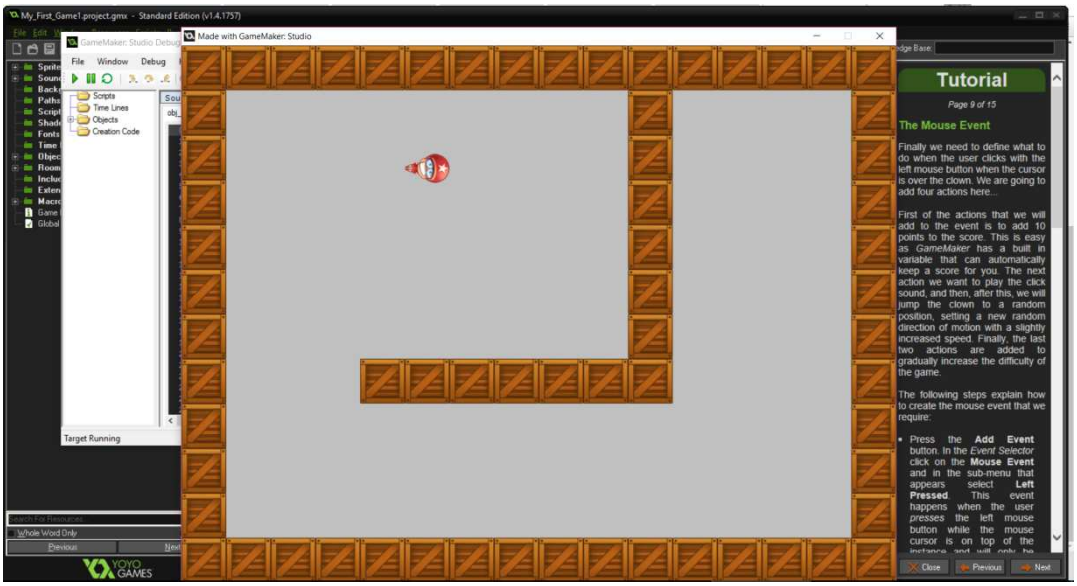

Figure 4. Running a simple 2D game made using GameMaker: Studio in the debug mode

Unreal Engine 4

Unreal Engine 4 is a 3D game engine manufactured and sold by Epic Games, a U.S. game development company headquartered in the city of Cary, North Carolina. The decision to make Unreal Engine 4 available for free to schools and universities, including personal copies for students enrolled in accredited programs, was announced by Epic on September 4, 2014. As of March 2, 2015, Unreal Engine 4 is free for everyone, and all future updates will be free as well. Unreal Engine 4.11 was released on March 31, 2016. Importantly for us, this version provides multiple new features for virtual reality (VR)

rendering. Figure 5 displays a screenshot of the installer package for Unreal Engine 4. The required storage space on a Windows PC is ~17 GB.

This tool can provide the 3D game and VR development functionality if substituted for Unity 5 in our CNIT 399 Introduction to Game Development course. In March 2014, Epic announced the switch from their proprietary UnrealScript to support for game scripting in C++. Numerous C++ project templates are available, provided that Microsoft Visual Studio 2015 is installed. Access to full C++ source code for UE4 is included. Also provided are sample projects, such as the Advanced Vehicle one shown in Figure 6. This way, the student does not have to necessarily start from a blank 3D space. While we prefer C# scripting of Unity 5, given that C# is the first programming language of our undergraduates, the schools that get their students started with C++ may favor Unreal 4.

Unreal Engine 4 can be acquired for free at https://www.unrealengine.com/. Commercial game developers have to pay a 5% royalty fee on gross product revenue after the first $3,000 per game per calendar quarter.

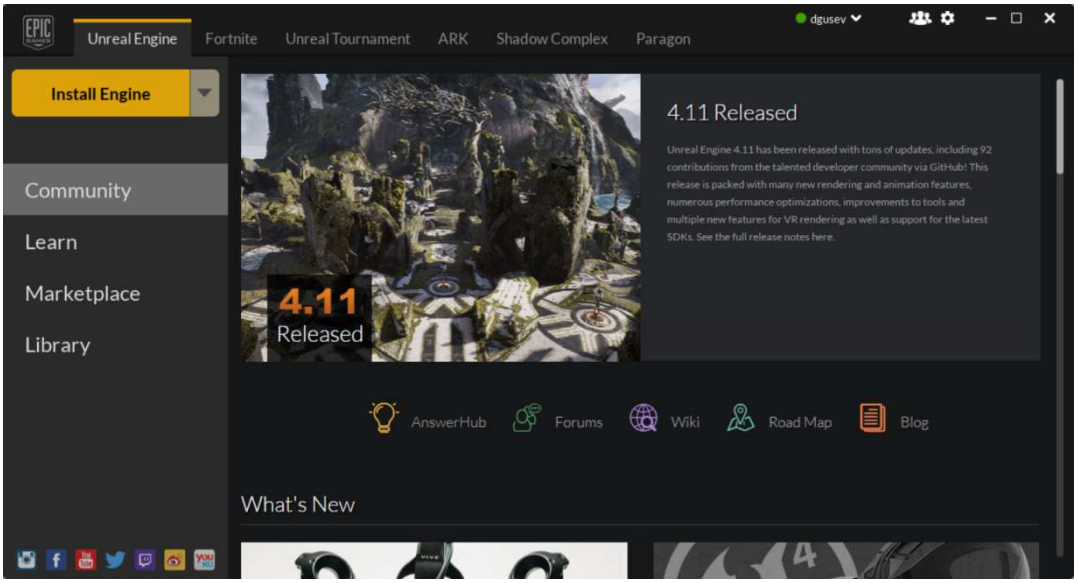

Figure 5. The installer package for Unreal Engine 4 in action

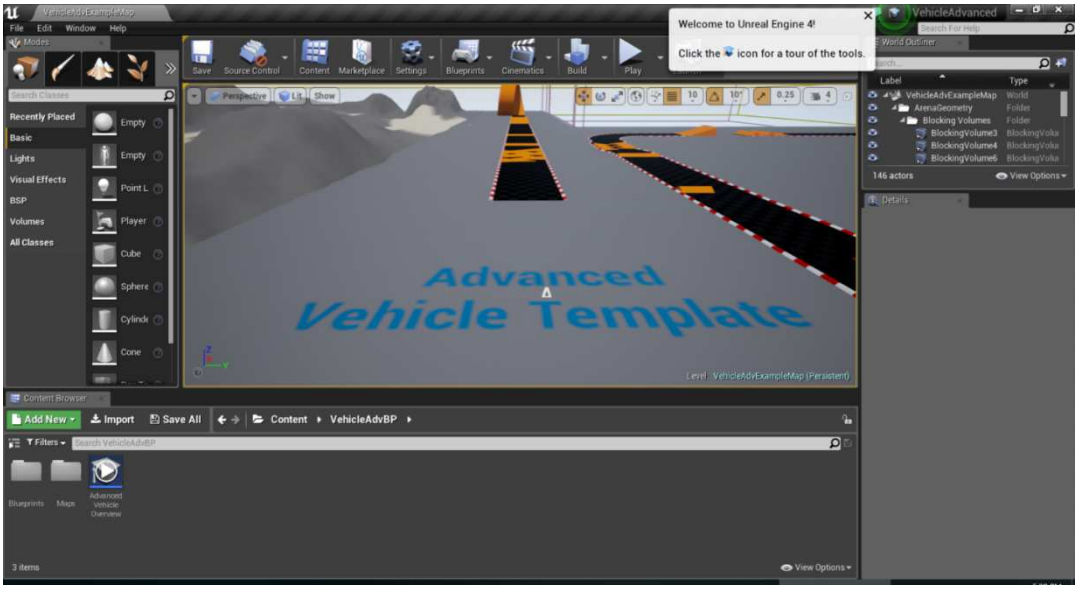

Figure 6.- The Advanced Vehicle sample project opened in the Unreal Engine 4 project editor

Microsoft Visual Studio 2015 Community Edition

The previously available free Express edition of Microsoft Visual Studio did not even have the tools needed to create 64-bit executables included by default, so an additional Windows Software Development Kit (SDK) had to be installed and configured with the IDE in order to enable that functionality. As a result of these and other limitations of the Express edition, we're currently using Microsoft Visual Studio 2013 Professional edition licensed by Purdue University to teach our programming courses — CNIT 155 Introduction to Software Development Concepts, CNIT 175 Visual Programming, and CNIT 255 Object-Oriented Programming Introduction.

However, the free *Microsoft Visual Studio 2015 Community* edition released July 20, 2015 contains so much more than the old Express! Included are the tools for cross-platform development, third-party (Xamarin) tools for C# development for Android and Windows phones, instruments for Profile Guided Optimization (PGO), 64-bit compilers, tools for Web development and advanced debugging, Visual Studio Tools for Unity, SQL Server Data Tools, etc. Multi-language support based on the .NET platform covers C#, Visual Basic, F#, C++, JavaScript, TypeScript, and Python. A screenshot of Microsoft Visual Studio 2015 Community is shown in Figure 7. Microsoft Visual Studio 2015 Community can be obtained for free at https://www.visualstudio.com/products/visual-studio-community-vs.

The reader may have already noticed the absence of Java, an immensely popular general-purpose programming language, from the options listed above. In another section of this paper we discuss a new free tool for Java development for Android, Android Studio.

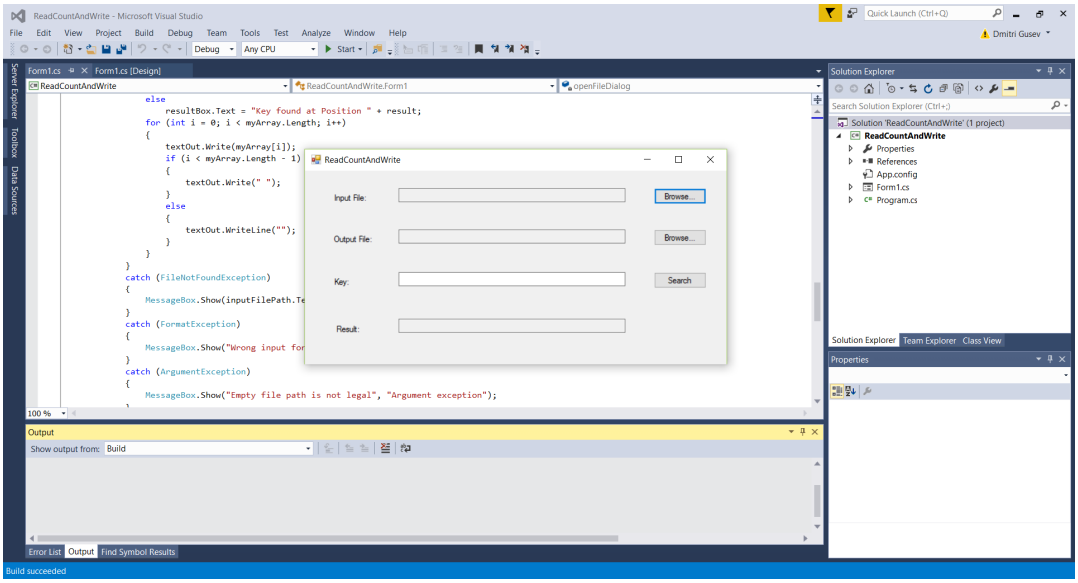

Figure 7 - A simple C# program is running in Microsoft Visual Studio 2015 Community

Android Studio

In our CNIT 355 Software Development for Mobile Computers course offered in the Fall of 2015, we replaced the Android Development Tools (ADT) bundle that included Eclipse, a well-known free IDE, with the new and similarly free *Android Studio* for app development, based on IntelliJ IDEA. A screen-shot of Android Studio is shown in Figure 8. The window of an Android emulator running a ToDoList app with SQLite database support is seen atop the Android Studio IDE window.

Android Studio was developed by Google. Its first stable build was released in December 2014. Android Studio officially replaced ADT as Google's primary IDE for native Android application development. We used it to teach programming for smart phones or tablets running Android 4.1+.

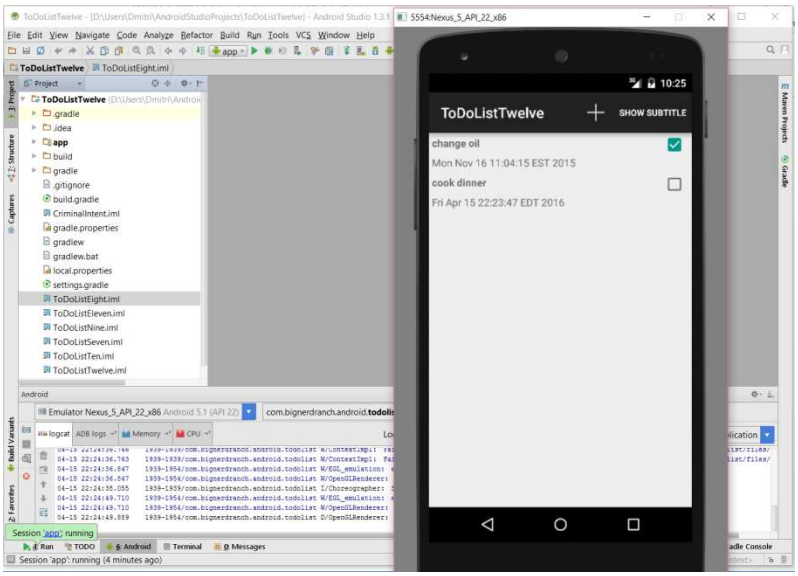

Figure 8. Android Studio with a running Android simulator

Conclusion

In this paper we have reviewed seven different products that we are either incorporating into our computer labs or are considering using in our labs. All of these are free. These products are replacing products that would in some cases replace very expensive products. Although the features may not be exactly the same as the software we are replacing, they are all have the functionality required for our CIT classes and in some cases are superior to previous products.

References

GameMaker, http://www.yoyogames.com/gamemaker

Microsoft Visual Studio Community Edition, https://www.visualstudio.com/products/visual-studio-community-vs

Oracle SQL Developer and Data Modeler, www.oracle.com

Unreal Engine 4, https://www.unrealengine.com

VirtualBox, www.virtualbox.org

So you are thinking about moving your LMS to the cloud

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Abstract:

Session Objective – Our objective is to share experiences with lessons and experience learned from migrating Moodle self-served server to a cloud-based host and the associated benefits to our faculty and students. We hope that others who might be interested in moving your LMS to the cloud for their faculty and students might find value in our shared experiences and examples of faculty and student use in innovative ways. This session could be valuable for instructional technologists, IT staff, and faculty.

Abstract – Description
I will briefly share lessons and experience learned from migrating Moodle self-served server to a cloud-based host. The challenges we faced with working with our own IT structure and providing our colleagues and students what they needed. Then I will share our process of discovery and upgrade to our current system, eThink Hosting support and expertise, and the benefits for proven training resources for faculty, students, and the administration of the system.

Presenter Bio:

Anthony Basham is the Projects Coordinator/Moodle Coordinator at Berea College. Anthony has many years' experience working with faculty using cutting edge educational technology with teaching and learning in the emerging and evolving classroom environment.

A Case Study in Google Cloud Printing on Campus

Shawn Beatie
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Abstract:

Augustana College moved to a managed printing environment two years ago, opening up the opportunity to leverage new printing technology. Google Cloud Print is a technology that allows mobile printing from nearly any device. This session will talk about the technology behind Google cloud print, how we provisioned it to students and staff, and how the service has been received.

Presenter Bio:

Shawn Beattie is Educational Technology Manager at Augustana College in Illinois. He earned his MS in Instructional Technology from Western Illinois University and has been attending ASCUE since 2000.

Digital Badges: Credentialing Professional Development

Jean Bennett
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Abstract:

Awards and certificates are useful in a promotion and tenure file or a professional development file. What about digital badges? Coastal Carolina University's CeTEAL (Center for Teaching Excellence to Advance Learning) piloted digital badges as a tool in professional development in the spring of 2016. What process and tools were used to create this program of badges? Will digital badges motivate the learner? This session will review the process and tools that were used in developing the badging program and give a preliminary report on the motivation.

Presenter' Bio:

Jean Bennett, Instructional Designer for CCU'ss CeTEAL has presented on several topics at prior ASCUE conferences. She works with faculty, and creates and provides sessions for faculty development. Jean's interest in digital badges lead her to pilot a digital badge program this past spring.

An ASCUE "Cool Tool" Comes Full Circle

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Abstract:

The ASCUE conference is an opportunity to share technology ideas and innovative teaching techniques, but what happens to this information when it is carried back to the classroom? In this presentation, we will discuss the full circle of a technology tool that was demonstrated in one of Janet Hurn's "Cool Tools" sessions. The session was attended by Tracy Gaskin, the training coordinator from Coastal Carolina University, who decided to demonstrate the tool for CCU faculty as part of a 3-in-30 session called "Tools for Encouraging Student Creativity and Engagement." The three tools presented in the 30-minute session were Weebly, Glogster and GoAnimate.

My name is David Doerring, and I teach a Management Information Systems course at CCU. I attended one of Ms. Gaskin's 3-in-30 sessions, in January of 2014. I was looking for a way to let students apply what we were learning about digital marketing. The answer to this need was Weebly. I have now instructed more 500 students on how to use W

Presenters' Bios

David P. Doerring is a lecturer of management and decision sciences in the Wall College of Business at Coastal Carolina University. He currently teaches management information systems and business integration using a simulation. David also brings over 25 years of professional experience.

Tracy Gaskin is the training coordinator in Coastal Carolina University's faculty development center. In addition she teach online biology courses for the University.

Evaluation of two audience response systems in the college classroom

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Abstract:

Four professors from Coastal Carolina University evaluated the adequacy of two audience response systems (Poll Everywhere and TurningPoint) in the classroom during two academic semesters (total of 17 classes). More than 300 students completed evaluation surveys; both quantitative and qualitative data were collected. Students preferred using the TurningPoint system more than the Poll Everywhere system for multiple reasons.

Presenters' Bios:

Dr. Stephen Firsing is a faculty member in the Department of Health Sciences at Coastal Carolina University.

Celina Po is an undergraduate student of public health at Coastal Carolina University. She plans to attend a graduate school of public health following graduation. Kaitlyn Brown is an undergraduate student of public health at Coastal Carolina University. She plans to attend a physician assistant program after graduation.

Building a Digital Humanities Community – a Collaboration between Library and IT

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Abstract:

With the assistance of a grant through the Virginia Foundation of Independent Colleges, representatives from the Bridgewater College IT Center and Library were able to create a Digital Humanities Working Group for faculty. The strong working relationship between the library and IT allowed us to create fertile ground for faculty interested in implementing DH strategies in their classrooms. This presentation will provide attendees with examples of how our unique backgrounds lead to a more successful experience for faculty. We will outline the programming provided to the group, along with the challenges that we faced along the way. We will also discuss our plan to extend the Digital Humanities group beyond the life of the grant, and to provide opportunities for faculty to share their knowledge with the rest of campus.

Presenters' Bios:

Emily Goodwin has been the Instructional Technologist at Bridgewater College since July 2014. Before going to Bridgewater College, she was a public school teacher for 10 years teaching. She has an undergraduate degree from JMU and a Masters from Virginia Tech and is a member of several committees.

Cori Strickler has been the Information Literacy Librarian at Bridgewater College since 2007. She provides course related research instruction and individual research consultations for students and faculty. She is also the Chair of the Virginia Library Association's Continuing Education Committee. She has her MSLS from Clarion University of Pennsylvania.

OER in the Classroom

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Abstract

Open Educational Resources (OER) provides access to free and shared online teaching and learning resources at no cost to students. These classes utilize a multitude of free materials from a variety of resources, including online open source textbooks written by professionals. This presentation will introduce participants to OER, provide information about its use in the higher education classroom, pros and cons of using OERs, and present valuable resources to develop, share, and locate OERs. The author has a grant from Affordable Learning Georgia, an organization dedicated to providing OER resources throughout the University System of Georgia, to develop OER resources for use in an Information Literacy core course.

Presenter's Bio:

Ru Story Huffman is the Dean of Library Services at Georgia Southwestern State University in Americus, Georgia. She has worked in libraries since 1978, when she had her first job typing card catalog cards. Ru has a Master's in Library Science and the M.Ed. in Instructional Technology.

eSports: The New Intercollegiate "Athlete"

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Abstract:

eSports, or organized competitive video gaming, has infiltrated higher education through intercollegiate athletics as three university athletic departments have made eSports an official varsity sport. “Gaming” scholarships are even provided to collegiate “eSports athletes.” This presentation will provide: 1) a brief history of eSports, 2) an overview of eSports in intercollegiate athletics to date, 3) discussion regarding whether eSports should be considered a “sport”, and 4) a summary of technology requirements needed to support an eSports team.

Presenters' Bios:

Dr. Seth Jenny is an assistant professor in the Department of PE, Sport and Human Performance at Winthrop University in Rock Hill, SC. He is well-published in the area of motion-based video gaming in PE. Dr. Jenny is a former K-12 health and PE teacher and U.S. Air Force exercise physiologist.

iPhone Photography Revisited

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803-323–4828

Abstract:

This is an update of a presentation that I did in an earlier year at ASCUE where I presented “iPhone Photography” Part 1, demonstrating the capabilities of the iPhone camera together with some of the myriad of photography apps available for my iPhone 4s. I now have an iPhone 6 and my son has one of my old iPhones. In this presentation we will review some of the best iPhone photography apps that we continue to use, and, of course, some of the new ones that have caught our attention. Remember, “the best camera you have is the one you have with you” --- for many of us, that’s our iPhone.

Presenters’ Bios:

Attendee of ASCUE since the mid '80's when the co-presenter, son Seth, was a rambunctious little boy! Taught 30 years at Grove City College after 14 years in public schools. Now in 2nd year of retirement and loving it: "every day is Saturday!"

Twice Program Chair & President of ASCUE.

Dr. Seth Jenny is an assistant professor in the Department of Physical Education, Sport and Human Performance (PESH) at Winthrop University. He is also the PESH Graduate Program Coordinator and faculty advisor to the Physical Education Majors (PEM) Club. Prior to joining the faculty at Winthrop, Dr. Jenny taught physical education teacher education and activity courses for three years within the University of New Mexico’s Department of Health, Exercise, and Sports Sciences. His additional work experience includes teaching elementary and middle school health and physical education, coaching high school, college, and elite-level cross country and track, and working as a U.S. Air Force exercise physiologist and fitness program manager.

Tying It All Together - How Young Harris integrated Open Options' DNA Fusion into the campus processes

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Abstract:

Two years ago Young Harris College started moving from one access control system to Open Options' DNA Fusion. This will cover the real experience of the conversion, with the benefits both expected and unexpected. How the databases were connected. Also, the future integrations that are planned.

Presenters' Bios:

Charles Johnson is a 20 year veteran of the electronic security industry who has worked on the installation, sales, software manufacturing and biometrics industry. Father of five children, spouse to a public school teacher, lover of hunting, fishing and tennis.

Hollis Townsend has been in the Office of Information Technology for Young Harris College since he started the department 21 years ago. In his 35 years in the IT field he has done everything from networking, system administration, and database administration, to phones, security and virtualization.

Components of an Effective Online Course

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Abstract

Online education continues to be critical to the long-term strategy of many academic institutions. As they offer more online courses and programs, the need for a comprehensive strategy to properly develop and deliver these courses is becoming a necessity. Having a process in place also helps ensure quality instruction and compliance with the various accreditation and government regulations.

In this session we will learn about a comprehensive strategy that we developed at our institution for the development of our online programs. We will also explore various course components such as resources, activities and other logistical tools to ensure quality online instruction.

Presenter's Bio

Sali has been serving as Director of Educational Technology and Distance Learning at Cairn University since February 2012. Prior to this position, he served as Manager of Academic Computing for the 14 years for the University.

Watson Analytics for End Users

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Abstract:

Released a little over one year ago, Watson Analytics from IBM has quickly grown to be one of the most popular analytics software packages. With built-in natural language processing, Watson Analytics provides end users with the ability to do much of their own analytics, including modules for:
1) refine – enrich and tune your datasets to discover patterns and get new perspectives on your business;
2) explore – ask questions and interact with the results to discover patterns and relationships that impact business;
3) predict – find predictive insights hidden in your data. Learn what drives each behavior and outcome;
4) assemble – create interactive and engaging dashboards and infographics and tell persuasive stories to share and communicate with others.
In this session, I will demonstrate and discuss how quickly a complete predictive analytics project can be developed with Watson Analytics software. This powerful, free software is utilized at UMUC in the online MSDA program.

Presenter Bio:

A faculty member, Steve develops and teaches graduate courses in data analytics at the University of Maryland University College. He has an extensive background in data analytics, artificial intelligence, emerging technologies, decision support systems, quantitative methods and decision-making.

What's an Embedded Librarian?

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Abstract:

While the practice of "embedding" librarians – and staff members providing student services such as tutoring and technology help – into online courses is becoming more common in higher education, many colleges and universities are still jumping on the bandwagon. This session will explain the basic concept and purpose of an embedded librarian program, review some of the established best practices widely published in library and information science professional literature, and briefly review data compiled by the Horry Georgetown Technical College reference and instruction librarians during their recent, yearlong pilot of such a program (specifically regarding time spent on the project and collaboration efforts with both teaching faculty and instructional technology staff).

Presenter Bio:

Amanda Kraft is the Electronic Resources Librarian at Horry Georgetown Technical College. In addition to ERM and mobile tech troubleshooting, she is in charge of reference and instructional services at HGTC's Grand Strand Campus Library and coordinates social media for all three library branches.

Teaching Information Literacy & Research With Everyday Technology

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Abstract:

While the word research might incite fear in a college student's mindset, it's actually something that is done, or a the least can be done daily. Merriam-Webster defines research as a "careful or diligent search." People search throughout the day on different devices, in different platforms, etc. But, are they using best practices for searching and evaluating that information? This session will cover the teaching of research and information literacy practices in everyday content - the "real-world" lives of the college student (technology they are using, social media platforms, news outlets, etc.). It will then transition into how that instruction of research and information literacy concepts in the "real-world" can be applied to academic research, projects, and papers.

Presenter Bio:

Derek Malone is an assistant professor and instructional services librarian at the University of North Alabama. He works with all first-year English courses for critical thinking and information literacy instruction, and teaches an FYE course.

Microsoft Office 365 Deployment

Tom Marcais
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Abstract:

Washington and Lee University is transitioning from Exchange to Office 365 for our faculty/staff accounts. This session will describe the user-centric approach we developed to facilitate this change. We will cover how we prepared our ITS staff, developed our deployment strategy and began the process of migrating our users. By communicating with departments and analyzing their workflow we were able to anticipate potential migration issues and make suggestions on how to adjust their workflow to take advantage of new functionality. .

Presenter's Bio:

Tom is a Technology Integration Specialist at Washington and Lee University. He facilitates the use of technology in academic offices, providing end-user support for staff and faculty. In this role, he analyzes workflows and specific job needs for departments and recommends technology solutions.

Microsoft Windows 10 Deployment

Tom Marcais
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Abstract:

By the time this conference is held, Windows 10 will have been released for 11 months. At Washington and Lee University, we have already started to deploy Windows 10 on select machines and plan to increase that number significantly over the summer. Since most new hardware will require Windows 10, we feel this is an area that we need to move forward with aggressively. This session will focus on how we have prepared for this change, what challenges we've faced, and how we plan to move forward. .

Presenter's Bio:

Tom is a Technology Integration Specialist at Washington and Lee University. He facilitates the use of technology in academic offices, providing end-user support for staff and faculty. In this role, he analyzes workflows and specific job needs for departments and recommends technology solutions.

Changes in Perspective: When Technology Does and Doesn't 'Fit

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Abstract:

This presentation questions assumptions surrounding technology in the classroom. I have long incorporated video assignments and group activities in my mathematics courses; but, as a result of a recent sabbatical investigating how other faculty implement active learning, I have returned to a 'partially' inverted, more traditional classroom. Students may be 'tech savvy' and open to using games, video and interactive assignments; nevertheless, these technologies do not equally shore up higher level learning. In my experience, more complex concepts explored in optimization problems in calculus do not seem to improve via the 'flipped classroom.' It is not that the 'inverted classroom' is inappropriate; rather the issue is to know when individualized intervention is required. Higher level evaluation and analysis skills often demand such individual attention from the instructor without, in many cases, a mediating technology. This presentation will discuss when and whether technology 'fits.'

Presenter's Bio:

Jack Pope is professor of Mathematics & Computer Science department at the University of San Diego. He was Director of Academic Technology Services for 25 years at the university before returning to full time teaching in 2007. He received his PhD from the University of North Carolina at Chapel Hill.

Engaging Learners Through Video

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Abstract:

The use of video for teaching and learning can be much more engaging than simply posting a link to the video and then directing learners to a discussion. The purpose of this workshop is to explore two free technology tools/services that could be used to enhance learner engagement with content through the use of video and to improve learner-to-learner discussion, highlighting key points throughout a video. Instructors can also utilize built-in features to gauge learner understanding of the video content and solicit learner feedback.

Presenter's Bio:

Jacqueline Stephen is the Director of the Office of Distance Learning and the Instructional Designer at Penfield College of Mercer University in Atlanta, Georgia. She is also an Instructor in the Department of Leadership Studies.

Going Textless

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Abstract:

Last August, the University of Maryland University College (UMUC) announced that they plan to go textless by the start of fall semester 2016. Other universities are taking note and considering similar steps in response to their students' concerns over the growing cost of a college education.

This presentation will examine the benefits as well as the concerns of going textless in a college course. I will share various ways emerging technologies have provided opportunities for capturing, sharing, and organizing free course content. I will also share faculty reviews of free textbooks, like those published by OpenStax, a nonprofit organization which publishes free textbooks (in digital formats) under an open-access license.

Presenter Bio:

Dr. Krista Stonerock has been teaching English for 23 years at Ohio Christian University, where she also serves as Chair of General Education.

SMART Wi-Fi that's classroom tested and dorm-proof

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Abstract:

Colleges and Universities are challenged by the proliferation of mobile devices on campus and the increasing expectations that students will be connected 24/7. Campus-wide mobility today is a part of student recruitment; it impacts occupancy rates in residence halls. Wireless is no longer an amenity for millenials, it is a utility. This presentation will discuss myths about campus wifi, best practices for deploying 802.11ac Wave 1 and Wave 2, as well as a smarter way to handle BYOD on your campus. Join us for a standards based discussion on 802.11 and tactics you can implement today. Connect your campus and improve student success.

Presenter's Bio:

For the better part of the past decade, Tripp Taylor has helped scores of organizations deliver better WIFI Networks driving a better client experience and higher levels of Security. Based in South Carolina, Tripp has helped local & national channel organizations expand their wireless knowledge base leading to better wireless solutions. Tripp received his Bachelors & Masters Degree from Clemson University & began his career with SYNNEX as a Networking Specialist eventually developing and leading an emerging technologies practice for Software Defined Networking within the ConvergeSolv business unit. He is currently the Regional Sales Manager with RUCKUS Wireless responsible for North & South Carolina.

Broadening Participation in Computing

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Abstract:

ASCUE attendees are familiar with the alarming statistics that indicate a critical shortage of women and minorities in computing. The underrepresentation of these populations creates both a troubling ethical dilemma and a looming industry shortage of qualified technical workers. The National Science Foundation, the Association for Computing Machinery, the National Center for Women & IT, the Coalition to Diversify Computing, and many other organizations and researchers seek to increase the participation of women and minorities in computing. Panel members will discuss promising practices developed by these organizations, colleges, and universities. Panelists also request that audience members share their own promising practices.

Presenter Bio:

Gloria Childress Townsend, Professor of Computer Science, has taught at DePauw University for thirty-six years and chaired her department for six years. She is a member of ACM's Council on Women in Computing. Her research interests lie in evolutionary computation and gender issues in computing.

Shaping Bandwidth learning to love Netflix on campus

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Abstract:

Young Harris College is mostly residential. As this is the home for students for the majority of the year, students expect to be allowed to do anything that they could do at home. Netflix, Amazon, Roku, and other streaming services consume bandwidth at an enormous rate. This presentation will cover how Young Harris College addresses these problems with a NetEqualizer. The benefits and cost savings that are received with our approach. Also, there will open discussions about what other problems schools are having with bandwidth and streaming for on campus and residential housing.

Presenter Bio:

Hollis Townsend has been in the Office of Information Technology for Young Harris College since he started the department 21 years ago. In his 35 years in the IT field he has done everything from net-working, system administration, and database administration, to phones, security and virtualization.

Fighting "Learner Engagement Deficit Disorder" Via Formative Assessment Tech Tools

Matthew Tyler
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Abstract:

When you are teaching in a face-to-face classroom environment, do you often wish that you could encourage class participation and attendance while also collecting formative assessment data in a quick and easy fashion? Such data would allow you to instantly modify your lessons based on the needs of the learners, thus preventing students from being "lost in the content" until the next exam. What if there were two popular tools that did such a thing? Would you be interested?

This presentation will encourage participants to recognize the importance of formative assessment, observe how to set up and navigate two free student response systems (Kahoot and Plickers) and determine ways to implement learner response systems in their classrooms.

Presenter Bio:

Matthew is a Graduate Assistant with CeTEAL at Coastal Carolina University where he is pursuing an Ed.S. in Instructional Technology. As a Graduate Assistant, he provides training on Moodle, online course design, and the integration of educational technology into face-to-face and online courses.

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