

NADEOSA - 2011

Predictive Analytics and the Future of Distance Education

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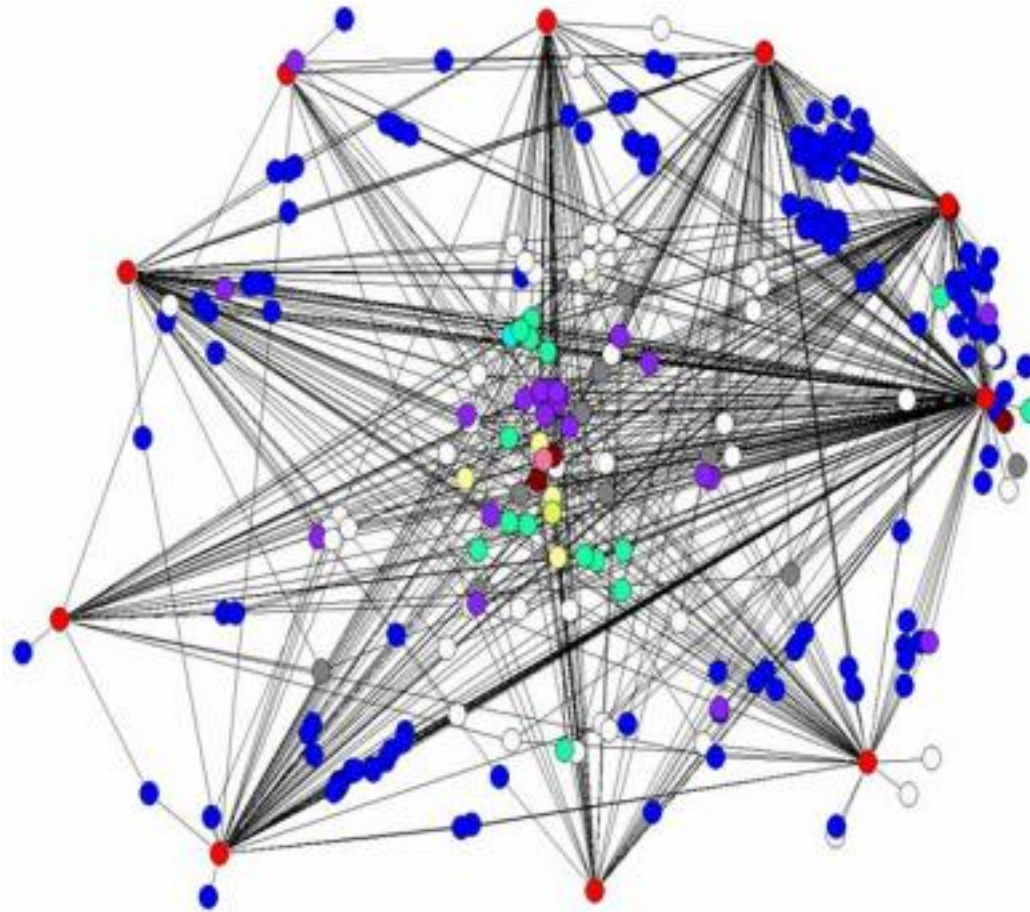


Why are we here?

- Introductions
- What is learning analytics?
- Where is the field headed?
- What do we need to know to be successful?
- How is this workshop structured?



**All analyses and stakeholders
are interrelated**



An Administrative Perspective

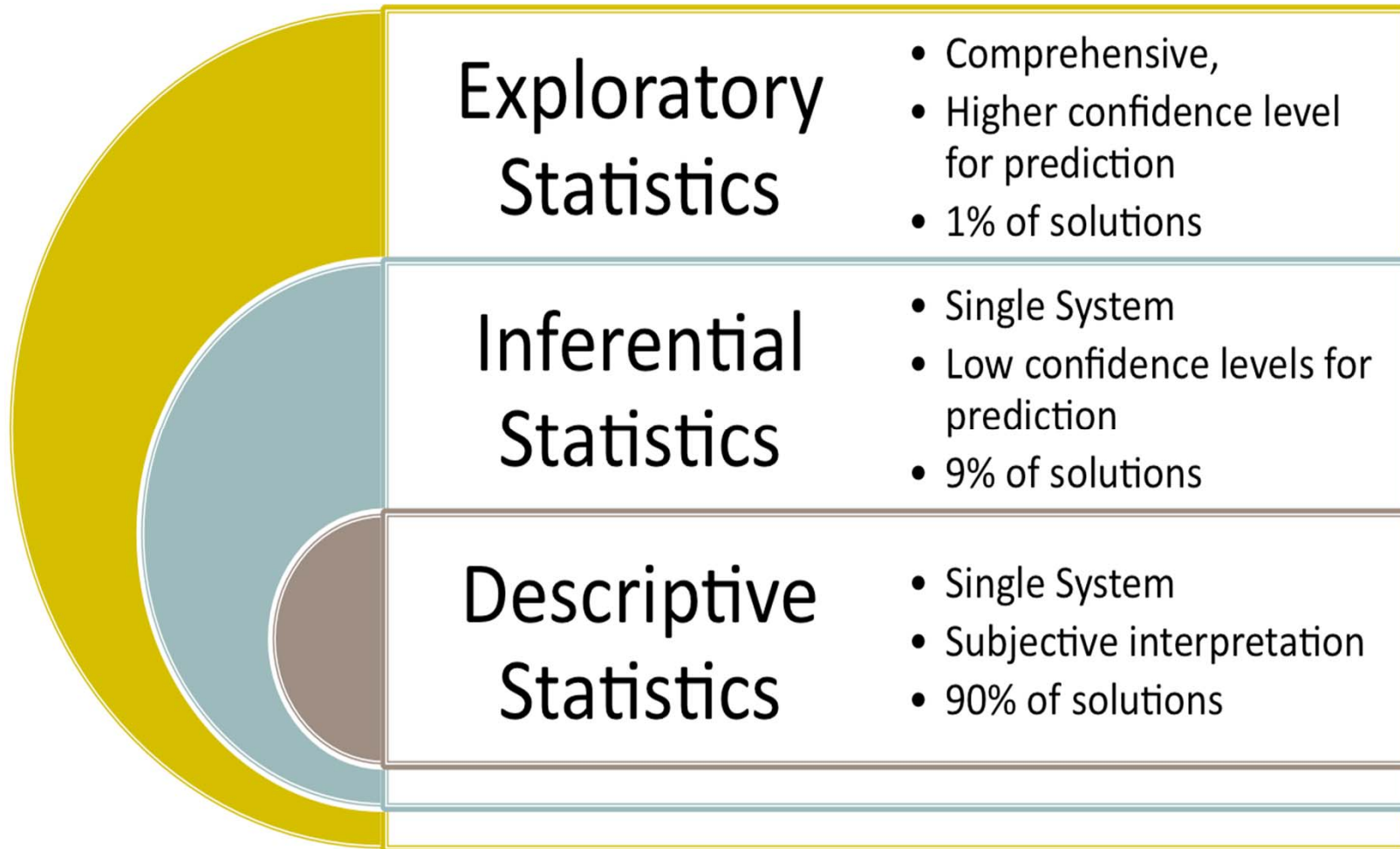
- Success and decision making are predicated on access to data
- Understanding strengths and weaknesses is dependent on having access to all data within the institution
- Data tells us what has happened and improves strategic planning moving forward



A D3M Culture



A range of approaches are required to satisfy stakeholder needs



Organizational Capacity

- Data must have a “home”
- Top down dissemination of analytics
- Actionable reporting
- In CONJUNCTION with other academic initiatives



Major Data Repositories

- Student Information System
 - Demographics
 - Institutional level transactions
- Learning Management System
 - Learning transactions
 - Learning outcomes
 - Latent data
- End of Course Survey
 - Perceptual data



Secondary Repositories (maybe)

- Student Services
- Financial Aid
- Faculty Records
- Other – there's always an "other"



Centralization

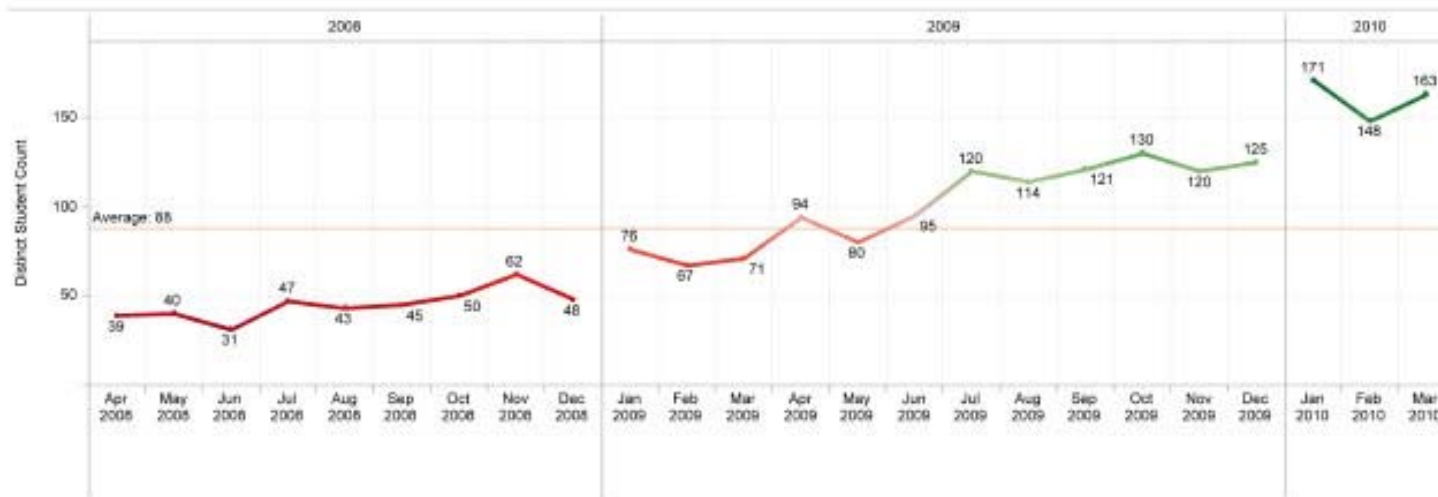
- Creation of a middleware database should be a priority for all institutions
- SQL is a popular choice
- Aggregate multiple data sources
- Federation
- Normalization



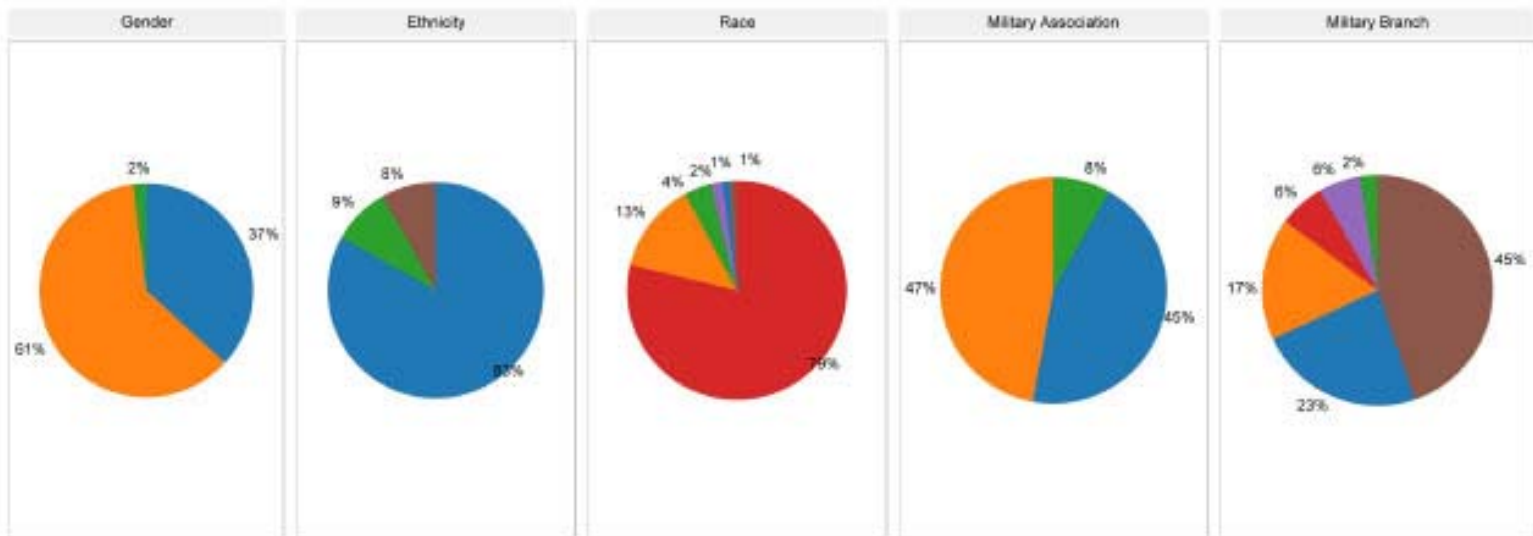
What is enough?

- Just as there are different levels of analysis there are different levels of stakeholders
- Engaging in overkill is the worst mistake you can make





■ Net Registration Count
 ■ Net Registered Students
 ■ Avg Net Registrations per Student



Student Gender

M	212
F	353
Gender Unknown	11



Ethnicity

Not Hispanic or Latino	479
Hispanic or Latino	50
Ethnicity Unknown	47



Race

White	430
Black or African American	73
Multiple	22
Asian	9
American Indian or Alaskan Na.	6
Native Hawaiian or Other Pacif.	6



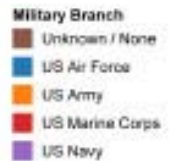
Military Classification

Military	271
Civilian	258
Military Affiliated	47



Military Branch

Unknown / None	258
US Air Force	134
US Army	99
US Marine Corps	37
US Navy	34
US Coast Guard	14



	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F	Withdraw (All)
	68.3%	7.3%	4.9%	2.4%	2.4%		4.9%					4.9%	4.9%
	55.1%	14.3%	6.1%		4.1%	2.0%	2.0%	6.1%				10.2%	
	44.4%	13.9%	11.1%		5.3%		5.6%	5.6%				2.6%	8.3%
	65.4%	3.8%	11.6%	3.8%	3.8%	3.8%							7.7%
	33.3%	22.2%	11.1%	3.7%	7.4%	3.7%	3.7%			3.7%		11.1%	
	78.0%		4.0%				4.0%					4.0%	12.0%
	17.9%	21.4%	10.7%	3.6%	14.3%	7.1%		3.6%				10.7%	10.7%
	78.1%	3.1%	3.1%			3.1%		6.3%				6.3%	
	35.0%	20.0%	10.0%	10.0%	5.0%	5.0%						10.0%	5.0%
	51.4%	11.4%	14.3%	2.9%	5.7%			2.9%				11.4%	

Grades by Core Courses (All Students): %

	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F	Withdraw (All)
	53.4%	14.8%	6.6%	6.2%	3.4%	1.8%	1.1%	0.4%	0.1%	0.5%	0.4%	6.8%	4.5%
	50.0%	13.8%	6.9%	5.2%	3.4%	1.7%	1.7%	5.2%				12.1%	
	27.0%	19.7%	10.4%	5.2%	7.6%	3.8%	2.8%	1.7%	1.7%	1.0%		5.5%	13.5%
	28.9%	16.4%	8.8%	5.2%	6.0%	3.9%	3.4%	2.2%	1.7%	1.3%	1.7%	9.1%	11.6%
	24.3%	18.9%	8.1%	2.7%	5.4%	2.7%	5.4%			2.7%		21.6%	8.1%
	75.0%		7.1%				3.6%					3.6%	10.7%
	18.2%	18.2%	15.2%	6.1%	12.1%	9.1%		3.0%				9.1%	9.1%
	72.5%	2.5%	5.0%			2.5%	2.5%	5.0%				10.0%	
	30.4%	21.7%	8.7%	8.7%	4.3%	4.3%			4.3%			13.0%	4.3%
	50.0%	11.1%	13.9%	2.8%	5.3%			2.8%				11.1%	

Grades by Core Courses (In Program): Count

	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F	With.
	28	3	2	1	1		2					2	2
	27	7	3		2	1	1	3				5	
	16	5	4		3		2	2				1	3
	17	1	3	1	1	1							2
	9	6	3	1	2	1	1			1		3	
	19		1				1					1	3
	5	6	3	1	4	2		1				3	3
	25	1	1			1		2				2	
	7	4	2	2	1	1						2	1
	18	4	5	1	2			1				4	

Grades by Core Courses (All Students): Count

	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F	With.
	250	108	48	45	25	13	8	3	1	4	3	50	33
	29	8	4	3	2	1	1	3				7	
	78	57	30	15	22	11	8	5	5	3		16	39
	67	38	20	12	14	9	8	5	4	3	4	21	27
	9	7	3	1	2	1	2			1		8	3
	21		2				1					1	3
	6	6	6	2	4	3		1				3	3
	29	1	2			1	1	2				4	
	7	5	2	2	1	1				1		3	1
	18	4	5	1	3			1				4	

Initial Retention Study

- 21,521 undergraduates completed at least one courses at APUS in 2007. 20,569 records selected.
- 10,064 active (49%) at 12/31/2009.
- 6,858 disenrolled (33%) at 12/31/2009.
- 3,647 graduated (18%) at 12/31/2009.
- First pass analysis used regression with forward entry.
- Independent variables selected of Transfer Credits Received, Age, Gender, Ethnicity, Cumulative GPA, Last Course Grade Received, Military / Civilian Status, Degree Program, Course Duration, Time Since Last Course
- Categorical variables reduced to binary dummy variables and some variables collapsed into buckets
- Non relevant data removed from model and re-run.



Classification Schemes - sample

- Age bucketed into IPEDs classification
- Plus and minus grades collapsed into single variable
- 15 hour transfer credit blocks defined as binary dummy variables with no transfer credit a separate entry



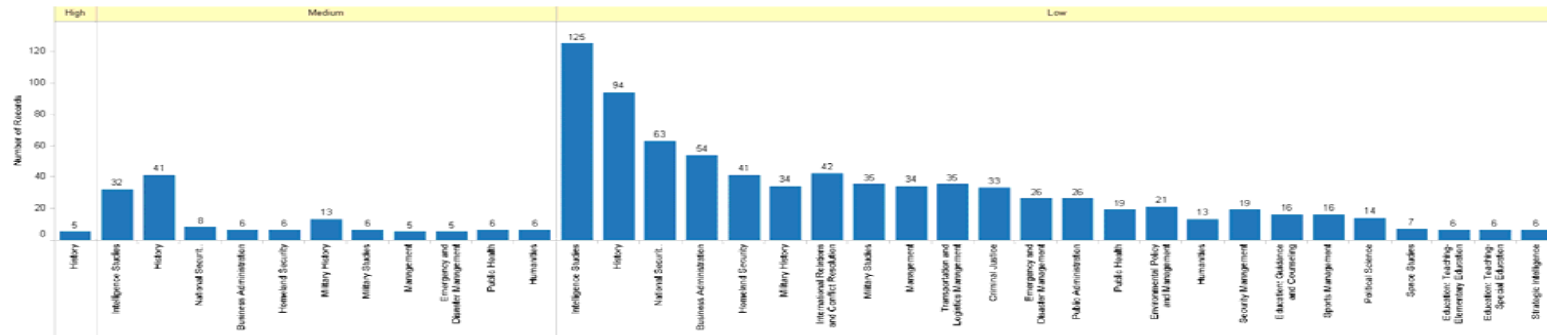
Regression Analysis

- ❖ 45 variables were found to be significant predictors of retention
- ❖ 32.8% of variance accounted for by the model
- ❖ No transfer credits – 15.8%
- ❖ No of Courses completed in 2007 – 4.5%
- ❖ Last Grade Received of F – 3.8%
- ❖ Last Grade Received of W (Course Withdrawal) – 2.7%
- ❖ Cumulative 4.00 GPA – 1.4%
- ❖ No other variable over 0.6%
- ❖ No difference in regression outcomes in segregating active duty military students from civilian students.
- ❖ Race and gender were insignificant variables in this analysis.



Federation of multiple demographic and transactional data sets

At-Risk Students by Program



Student Attrition Confidence Levels

StudentID	Program	Confidence Level
4132767	Masters in History	0.764
4096740	Masters in Intelligence Studies	0.727
4074524	Masters in History	0.707
4132951	Masters in Military Studies	0.703
4057236	Masters in History	0.700
4088549	Masters in History	0.700
4052003	Masters in Military History	0.714
4065031	Masters in Education: Teaching-Reading and Literacy	0.711
4061981	Masters in Education: Teaching-Elementary Education	0.708
3089027	Masters in Military Studies	0.708
4063389	Masters in History	0.708
4096526	Masters in Education: Teaching-Instructional Leadership	0.696
4088071	Masters in Intelligence Studies	0.687
4077041	Masters in Intelligence Studies	0.684

Risk Groups

- High
- Low
- Medium

Program Type

- Associates
- Bachelors
- Masters

Program Name

- Business Administration
- Criminal Justice
- Education: Guidance and Counseling
- Education: Teaching-Elementary Education
- Education: Teaching-Special Education
- Emergency and Disaster Management
- History
- Environmental Policy and Management
- Homeland Security
- Humanities
- Intelligence Studies
- Management
- International Relations and Conflict Resolution
- Management
- Military History
- Military Studies
- National Security Studies
- Political Science
- Public Administration

The top chart displays the number of students by program and academic level that are at-risk of its enrolling. For display purposes, the minimum number of records shown is 5.

The bottom chart displays all students by program and academic level that are at-risk of its enrolling.

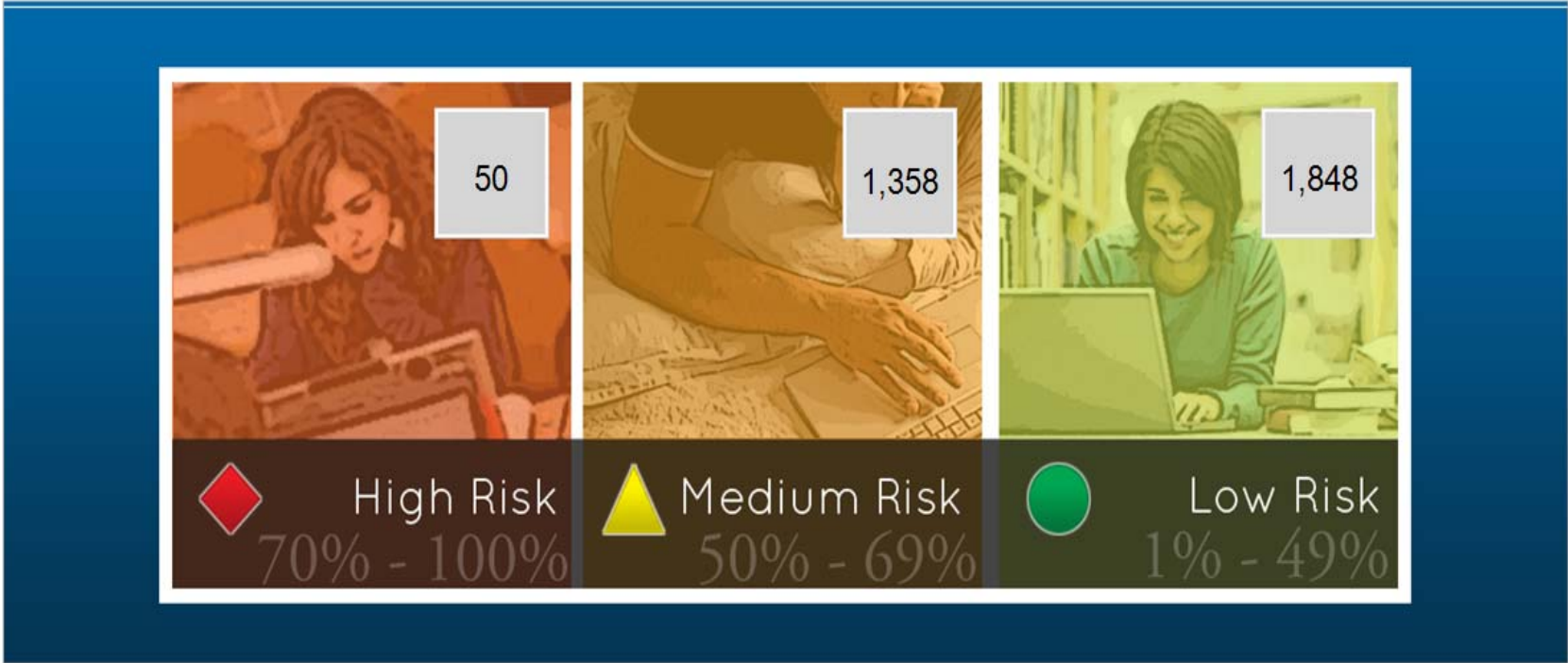
Visual Appeal and Ease of Navigation Data is NOT Enough

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TRACE - Advisor



ProgramType

Bachelors



Multi-Institutional Initiative

- May 2011 – Bill and Melinda Gates Foundation provided a \$1million grant to WCET
- Six institutions aggregating data to look for trends in retention
- Development of a POC to demonstrate multi-institutional federation and analysis
- Development of a model for future work



Early Outcomes

- Gender and Ethnicity are significant predictors at some institutions
- Mean age of 25 – 31 is most successful category
- Collaborative strategies negatively impact part time undergraduates
- Hierarchical effects are present – certain institutions do a better job with different student profiles



Implications

- Certain institutions may be a better fit for different student profiles
- OR
- Strategies for successful course construction need to be normalized
- OR
- There may be a faculty effect



Moving Forward

- Addition of 24 more institutions in early 2012 – at least 2 international institutions
- Creation of a national data processing center in late 2012
- Addition of multiple international institutions in late 2012 / early 2013
- Internationalization of data processing center in 2013



EOC Survey Data

- End of course survey data is a very powerful tool for programmatic improvement
- Requires thorough understanding of student demographics
- Demographic mix can alter outcomes
- Multiple iterations of courses are possible if there are large variances in student characteristics
 - Remedial courses
 - Traditional vs. non-traditional learners



EOC Survey Problems

- The vast majority of online course surveys are derivative of face-to-face courses
- Online surveys must account for unique pedagogies
- Institutional inertia makes life difficult for instructional designers
 - ID efforts not measured effectively
 - ID / faculty roles are intertwined in most surveys



Measurement Needs

- Effectiveness of media and layout
- Instructor role in discussion and interaction with students
- Student interaction with other students
- Effectiveness of activities
- Cognitive engagement – inform instructional design



Faculty Improvement

- Informs strengths and weaknesses among individual faculty member
- Used in conjunction with drop rates, grade distributions and third party observations
- Informs support NOT punishment



Combining descriptives, regression and factor analysis

	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F	Withdraw (All)
	68.3%	7.3%	4.9%	2.4%	2.4%		4.9%					4.9%	4.9%
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	44.4%	13.9%	11.1%		8.3%		5.6%	5.6%				2.8%	8.3%
	66.4%	3.8%	11.6%	3.8%	3.8%	3.8%							7.7%
	33.3%	22.2%	11.1%	3.7%	7.4%	3.7%	3.7%			3.7%		11.1%	
	78.0%		4.0%				4.0%					4.0%	12.0%
	17.9%	21.4%	10.7%	3.6%	14.3%	7.1%		3.6%				10.7%	10.7%
	78.1%	3.1%	3.1%			3.1%		6.3%				6.3%	
	35.0%	20.0%	10.0%	10.0%	5.0%	5.0%						10.0%	5.0%
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	28.9%	16.4%	8.8%	5.2%	6.0%	3.9%	3.4%	2.2%	1.7%	1.3%	1.7%	9.1%	11.6%
	24.3%	18.9%	8.1%	2.7%	5.4%	2.7%	5.4%			2.7%		21.6%	8.1%
	75.0%		7.1%				3.6%					3.6%	10.7%
	18.2%	18.2%	15.2%	6.1%	12.1%	9.1%		3.0%				9.1%	9.1%
	72.5%	2.5%	5.0%			2.5%	2.5%	5.0%				10.0%	
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	16	5	4		3		2	2					1	78	57	30	15	22	11	8	5	5	3			16	39	
	17	1	3	1	1	1							2	67	38	20	12	14	9	8	5	4	3	4	21	27		
	9	6	3	1	2	1	1			1			3	9	7	3	1	2	1	2			1		8	3		
	19		1				1						3	21		2				1						1	3	
	5	6	3	1	4	2		1					3	6	6	5	2	4	3		1					3	3	
	25	1	1			1		2					2	29	1	2			1	1	2					4		
	7	4	2	2	1	1							2	7	5	2	2	1	1				1			3	1	
	18	4	5	1	2			1					4	18	4	5	1	3			1						4	

Semantic Applications

- Content when developed, should consider the lowest level of granularity and highest level of reuse
- Collaborative teams in traditional Instructional Design (ID) processes (ID, SME, Producer) can offer insights and additional meta-information that makes the system more self-aware
- Enables future individualized and cohort learning profiles
- Accelerate and insure the integrity of accreditation processes



Federation, Disaggregation, Relational Mapping, Ontological Ordering

Granularity Model





Objectives

The course currently uses the following objectives.

3 Objective

Title

Employ and demonstrate the application of key accounting theories, concepts and terms such as Accounts Receivable, Inventories, Fixed Assets, Intangible Assets, Liabilities, and Stockholders' Equity to name but a few terms covered by the course.

Resource Title	Resource Type
Principals of Finance	Power Point

Examine and provide examples of the role of accounting in business.

This objective is not fulfilled by any resources currently used in the course.

Demonstrate how accounting systems provide reports needed to assist in making managerial decisions and controlling the financial aspects of operations.

Resource Title	Resource Type
FIN202_Chapter_Review_Ch_01.doc	Word Document
Fortune.com - Risk analysis in web futures	Website

Resources

Resources used in this course are listed below.

3 Resources are currently used in FINC400

Resource Title	Resource Type
Principals of Finance.ppt	Power Point
FIN202_Chapter_Review_CH_01.doc	Word Document
Financial Forecasting.pdf	PDF

GAP ANALYSIS

WIRE FRAME: Gap - Choose Course (home)

Instructions

1. Make a selection in the Subject and Course menu and click SEARCH.
2. An objectives overview will appear below. This overview will show the objectives total unfulfilled for each course.
3. Click on one of the courses to see its objective alignment detail.

Subject: Course:

All Subjects

Accounting

Business

Economics

Finance

All Courses

ACCT101

ACCT600

ACCT601

ACCT605

ACCT620

BUSN100

BUSN310

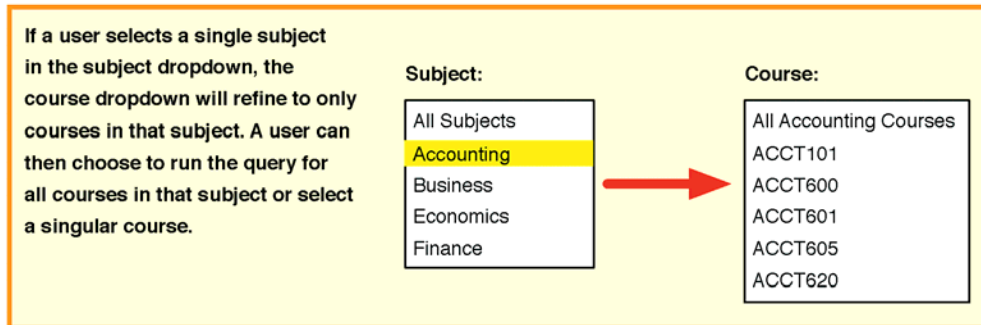
BUSN311

BUSN601

BUSN602

NOTES

User can choose to run a gap analysis for a singular course or set of courses.



The LMS Problem

- LMS's have messy data bases
- The primary function was not data collection
- Years of additions have created the equivalent of a bowl of "data spaghetti"
- Significant abstraction work is needed to draw out anything more than cursory data



Solutions

- Web analytics tools (Google Analytics, CoreMetrics, Omniture) are the future
- Inserting Java code on pages and portions of pages
- Highly granular transactional data can be derived
- Not all web analytics tools are created equal





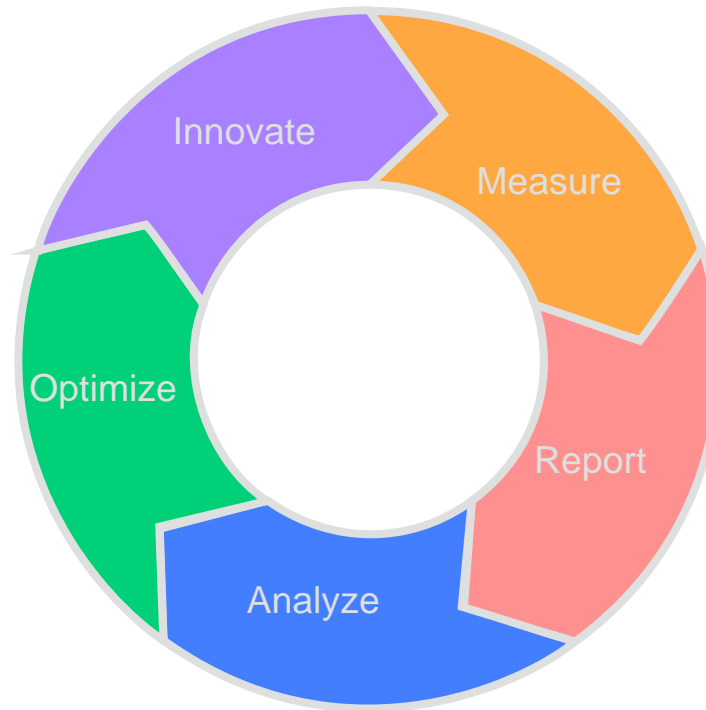
Converting Business to Education

5. Innovate:

Experiment with new ideas to drive value
A/B testing and multi-screen delivery of individualized learning environments

4. Optimize:

Test and enhance effectiveness
Evaluate learning behaviors enhance content / pedagogical pathways



3. Analyze:

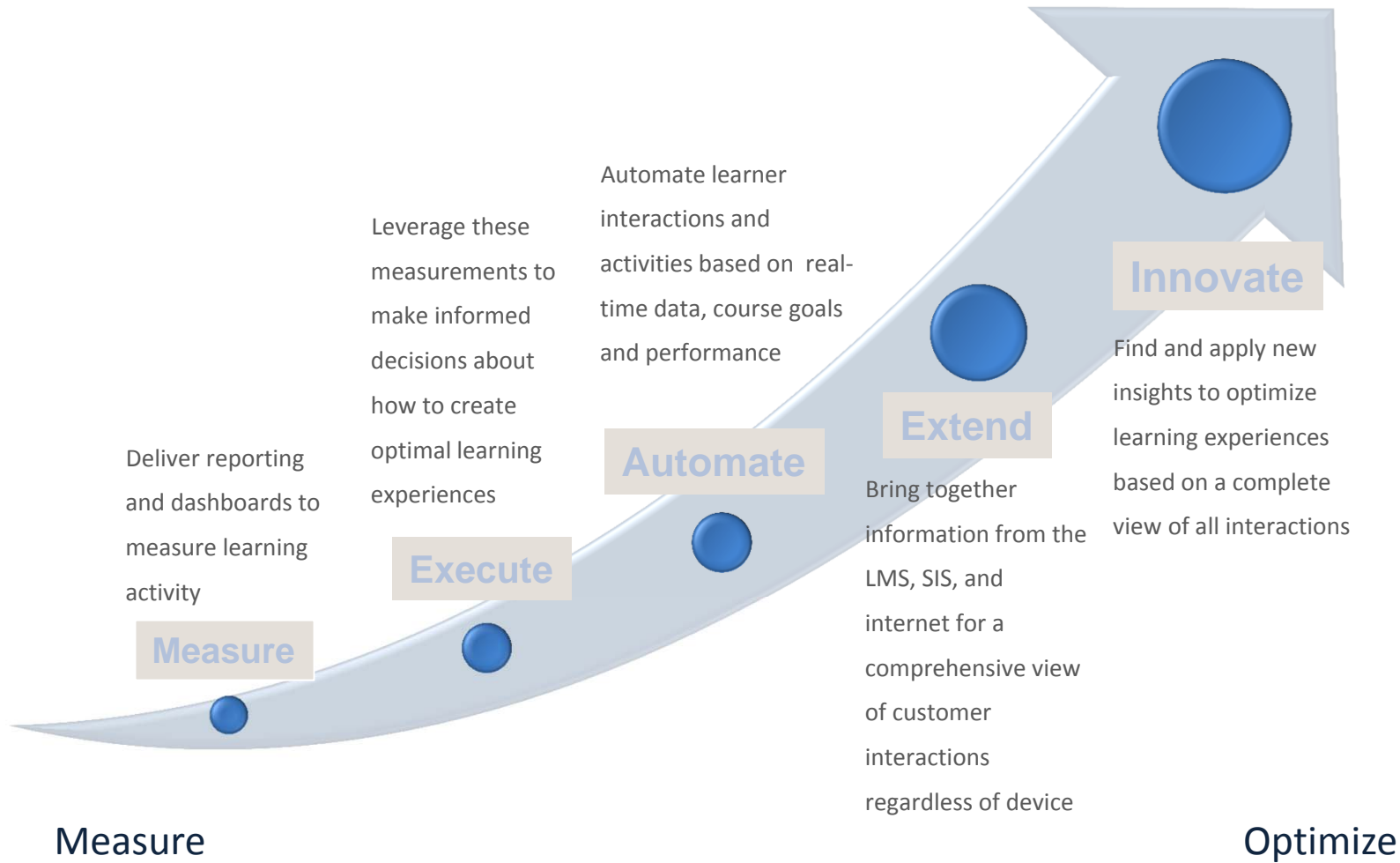
Evaluate site performance

1. Identify & Measure:

Capture KPIs and other metrics
Capture learner interactions and demographic information

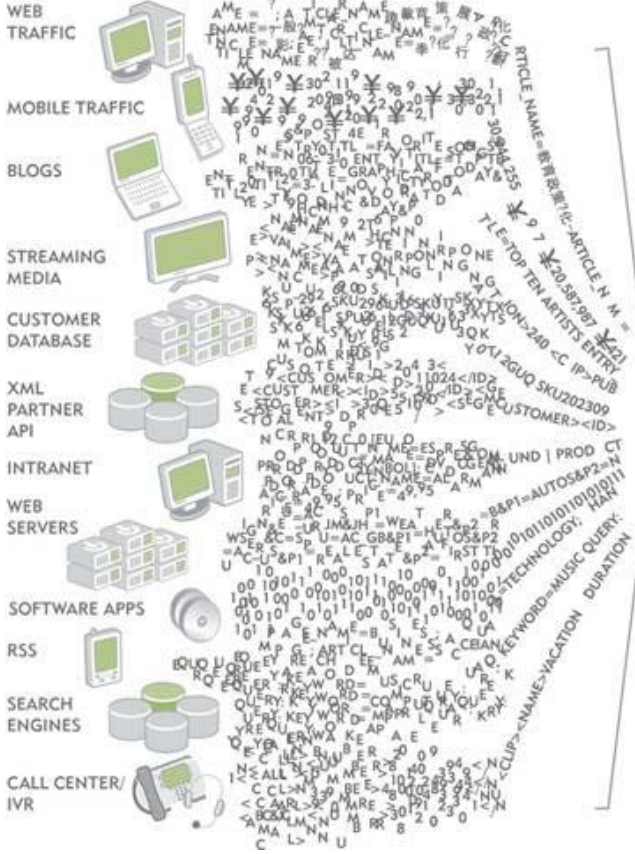
2. Report:

Generate reports on collected data



Business Models Provide Guidance

Any Information Source



Comprehensive Analytics



Online Business Optimization



Convergence

- Federation of Institutional Systems
- Web Analytics
- Quantification of Semantics
- Round-Tripping Data Across the Enterprise
- Multi-Institutional Comparisons
- Programatic Globalization
- Successful implementations will require multiple institutions for comparisons and cost effectiveness



NADEOSA - 2011

Thank You!

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