Practical Campus Business Intelligence

UB Office of Institutional Analysis (OIA)

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www.buffalo.edu/reachingothers

Practical Campus Business Intelligence Agenda

- Introduction
- IR *Mission* at UB
- Translation
- IR *Impact* on UB
- Case Studies
  - The PeopleSoft 'Mod
  - Data Quality Implementation
  - University Factbook
- Questions

Introduction

- BI tool deployment is often one in a series of steps required to respond to campus information needs.
- Understanding the foundation processes of your systems and the data they create are often the real roadblocks to delivering trusted information products.
- Effective BI needs to intelligently fuse both executive need and *practical* "in the weeds" knowledge of your data.
- Executing the IR mission at UB has provided us with the background to meet this challenge.

IR *Mission* at UB

"The Office of Institutional Analysis (OIA) has the primary institutional responsibility for the collection and analysis of quantitative and qualitative information on the institution, its students, its faculty, its programs, its publics, its practices and its services."

"The office provides analytic support for the planning, evaluation and policy initiatives of the Provost and senior leadership and acts as the institution's reporting agent."

Translation

- Create official data for campus, local, state and federal use.
- *Develop and maintain structure to fuse information across the institution.*
- Provide functional and contextual intelligence.
- Deliver quantitative support to a variety of audiences.
- Architect custom reporting solutions.
- *Provide design, test and support services for core campus systems.*
- *Create key university data models.*

Translation (cont.)

- Lead the discussion to advance campus analytics and reporting.
- Design, implement and analyze standard and customized surveys.
- Complete and coordinate UB's response to external survey requests.
- Service ad-hoc analytic and reporting requests.
- *Deliver process, functional, and technical support for key UB initiatives.*
- Provide administrative, process, and technical support for program review.

IR *Impact* on UB

- We provide intelligent campus-wide information solutions based on extensive policy, data and processing experience.

- We have become the single point of contact for campus users of all levels seeking answers to complex questions.

Case Study – The PeopleSoft 'Mod

- The Challenge:

  Count the number students enrolled in on-line majors.

  - Details:
    - No structure or process to identify on-line majors.
    - No PeopleSoft customizations will be permitted.
    - Need results ASAP.

Case Study – The PeopleSoft 'Mod

- IR Leverage
  - Involvement in the system (*Entity/Hierarchy*) that creates, organizes and integrates officially recognized elements required by the university to conduct its operations.
  - Involvement in the maintenance of codes used by our PeopleSoft student system ("The HUB") to represent departments, majors and courses (*Academic Structure*).
  - *Effective working relationships with personnel from the Registrar's office and academic units to correctly utilize existing and planned coding.*

Case Study – The PeopleSoft 'Mod

- IR Leverage (cont.)
  - PeopleSoft *Academic Structure* is the foundation for all components of the system and defines both the physical and logical structure of the institution.
  - *Academic Organization* is one of many PeopleSoft structural elements and uniquely identifies a department affiliated with a particular major.
  - The PeopleSoft *Academic Organization* code is actually the department's 4-digit identification number from the *Entity/Hierarchy* system. By coordinating these two systems, we benefit both the enterprise and our own capacity for integrated reporting.

Case Study – The PeopleSoft 'Mod

- The Solution
  - Validate majors with on-line components.
  - Create identifiers to reference on-line majors.
  - Locate unused major-related PeopleSoft fields to house the identifiers.
  - Populate unused fields with new identifiers for each major.
  - Propagate data to our warehouse environment for BI tool access.
  - Create a process to support on-line major identification moving forward.

Case Study – The PeopleSoft 'Mod

- The Solution – Validate majors with on-line components.
  - Leveraged office involvement with enrollment, financial, and operational communities to identify programs for on-line majors.
  - Cross-checked program list with SED and SUNY official records.
  - Created new data models within our *Entity/Hierarchy* system to house validated program information.

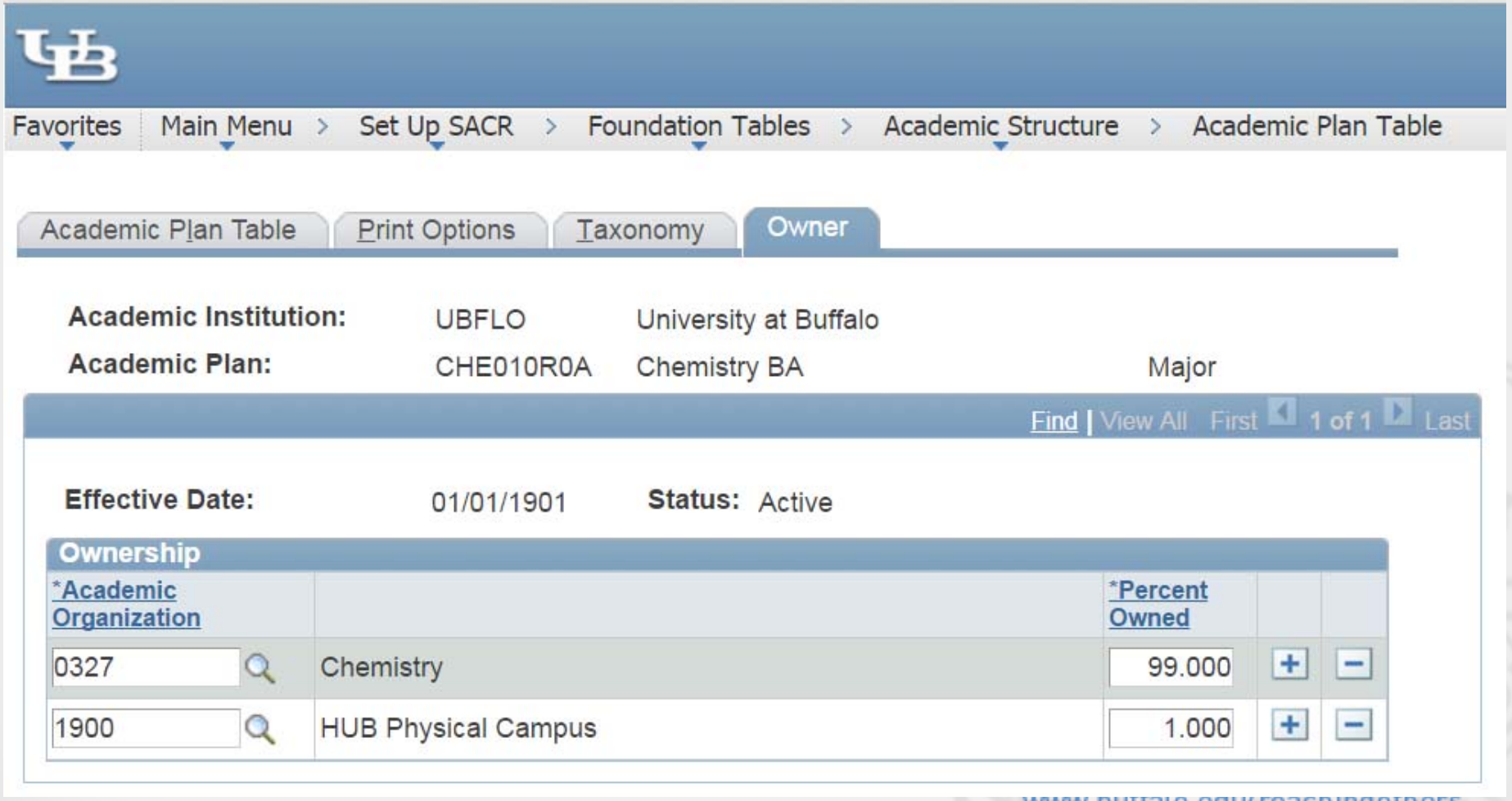
Case Study – The PeopleSoft 'Mod

- The Solution – On-Line Major Identifiers
  - Advance the concept that each major will have shared ownership between its parent academic and "Physical" or "Virtual" campus organizations.
    - Parent organization = academic unit with admin responsibility.
    - Physical organization – major has *No* on-line component.
    - Virtual organization - fully or partially on-line majors.
  - Create new *Entities* to identify Physical or Virtual organizations:
    - 1900 = Physical Campus – major has no on-line component.
    - 1901 = Virtual Campus Full – major can be earned fully on-line.
    - 1902 = Virtual Campus Part – major can be earned partially on-line.

Case Study – The PeopleSoft 'Mod

- The Solution – Identify and Populate an Unused PeopleSoft Field
  - Academic Plan Owner field is not used in our PeopleSoft student system ("The HUB").
  - Each major (Plan) needed to have both parent and virtual owners assigned.
  - Manual process was used due to critical nature of the data.
  - Over 2,000 plans were updated.

Case Study – The PeopleSoft 'Mod



Case Study – The PeopleSoft 'Mod

University at Buffalo The State University of New York

NEW HUB PLAN CODE REQUEST FORM

Date of request: _____

Entity Number: _____

Plan Description:* (limit of 30 characters) _____

Degree: _____ Degree Code: _____

SED Degree Title Name: _____

SED Program Code: _____

Term Required: _____

Program Length Type: ☐ Months ☐ Weeks ☐ Years

Program Length: _____

Online program: ☐ Yes ☐ No

If yes, is online program: ☐ Full ☐ Partial

Comments: _____

Case Study – The PeopleSoft 'Mod

ACAD_ORG	ACAD_ORG_DESCRIPTION	ACAD_PLAN	PLANDESCRIPTION
0327	Chemistry	CHE030R0	Chemistry MA
1900	HUB Physical Campus	CHE030R0	Chemistry MA
0665	Electrical Engineering	EE9042R0	Electrical Engineering ME
1902	HUB Virtual Campus - Part	EE9042R0	Electrical Engineering ME
0309	Industrial and Systems Engineering	IEO042R0	Industrial Eng Online ME
1901	HUB Virtual Campus - Full	IEO042R0	Industrial Eng Online ME

Case Study – The PeopleSoft 'Mod

ACAD_ORG	ACAD_ORG_DESCRIPTION	ACAD_PLAN	PLANDESCRIPTION
1902	HUB Virtual Campus - Part	AEO035R0	Eng Ed Adol Prof Online EDM
1902	HUB Virtual Campus - Part	EDN035R0	Education & Tech Online EDM
1902	HUB Virtual Campus - Part	EE9042R0	Electrical Engineering ME
1902	HUB Virtual Campus - Part	GED035R0	Education Studies EDM
1902	HUB Virtual Campus - Part	GES035R0	Education Studies (CSEP)
1902	HUB Virtual Campus - Part	LIS034R0	Library & Information Sci CERT
1902	HUB Virtual Campus - Part	LMS037R0	Library Media Spec-On Line MLS
1902	HUB Virtual Campus - Part	MLO034R0	Music Lrning Theory Online CAS
1902	HUB Virtual Campus - Part	MOP035R0	Music Educ: Prof Online EDM
1902	HUB Virtual Campus - Part	NAH120R0	Adult Gerontology DNP
1902	HUB Virtual Campus - Part	NAN120R0	Nurse Anesthetist DNP
1902	HUB Virtual Campus - Part	NCH120R0	Child Health Nurs DNP
1902	HUB Virtual Campus - Part	NCS120R0	Adult Gerontology CNS DNP
1902	HUB Virtual Campus - Part	NFN120R0	Family Nursing DNP
1902	HUB Virtual Campus - Part	NLH032R0	Nurs Ldrshp in Hlthcare Sys MS
1902	HUB Virtual Campus - Part	NMW120R0	Maternal Hlth Nurs DNP
1902	HUB Virtual Campus - Part	NPM120R0	Psychiatric/Mntl Hlth Nur DNP
1902	HUB Virtual Campus - Part	RCD032R0	Rehab Counseling - Dist Ed
1902	HUB Virtual Campus - Part	RCD034R0	Rehab Counseling-Online CAS
1902	HUB Virtual Campus - Part	SBH034R0	School Business And HR Adm CAS
1902	HUB Virtual Campus - Part	SWC033R0	Social Wrk AdvSt PT Online MSW
1902	HUB Virtual Campus - Part	SWD033R0	Social Work Trad PT Online MSW

Case Study – Data Quality Implementation

- The Challenge

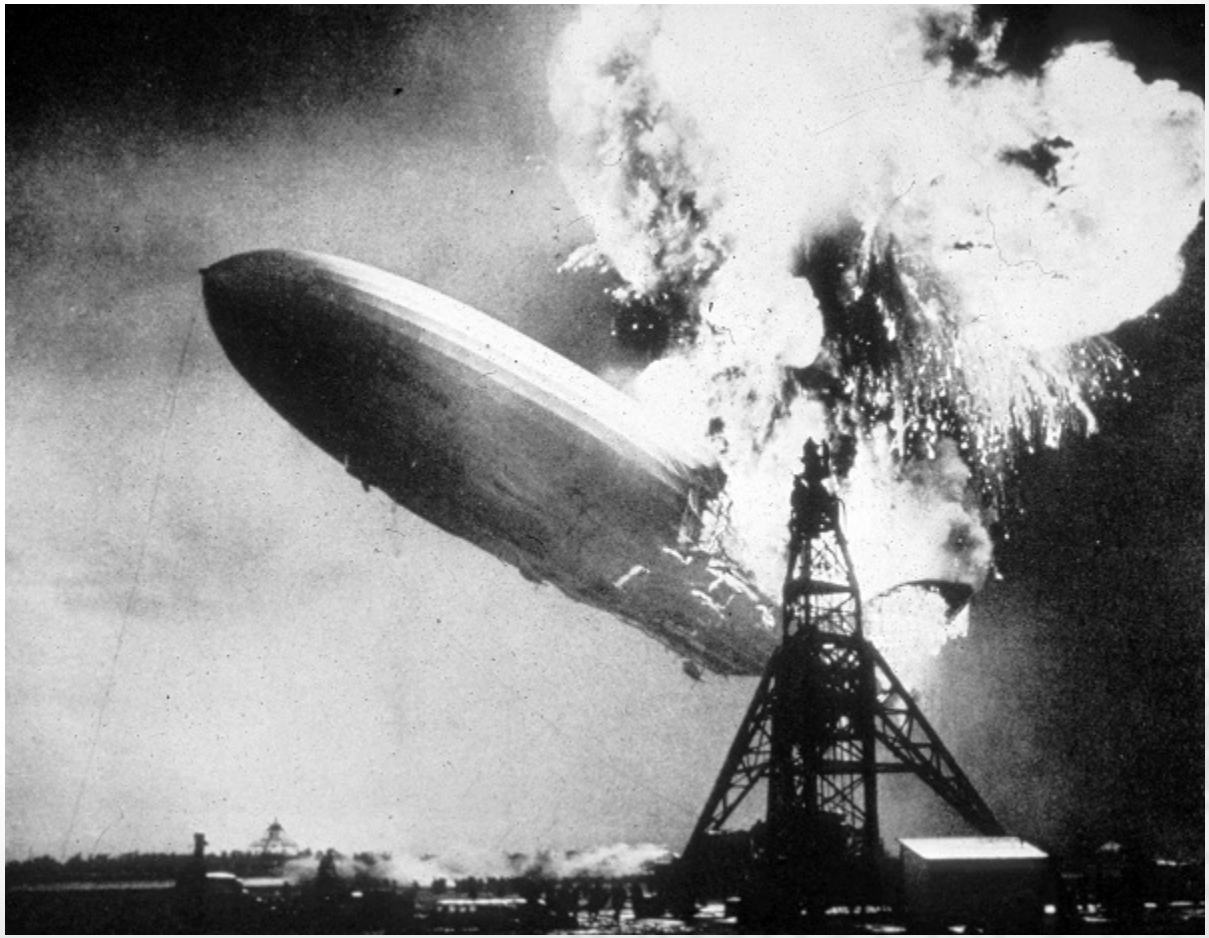
New York State and Federal Government (IPEDS) Reporting

Custom ETL extracts data from the HUB and transforms it to meet the requirements of state and federal reporting.

Local PeopleSoft Student Information System ("The HUB")

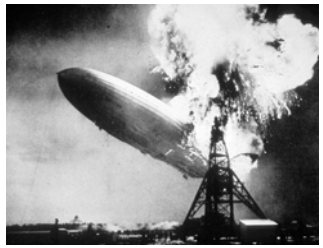
Case Study – Data Quality Implementation

- The Reality



Case Study – Data Quality Implementation

- The Reality

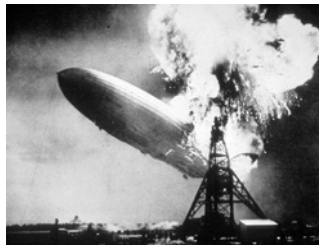


The code for the ETL expects system data to be maintained a particular way.

For example, students should not be in degree-granting and non-degree-granting programs at the same degree level.

Case Study – Data Quality Implementation

- The Reality



At UB, students who are admitted to a major may have previously been in a plain vanilla "Undecided Program".

The plain vanilla program needs to be discontinued when the "real" program replaces it. However, there is no impact to system functionality if this does not happen.

Case Study – Data Quality Implementation

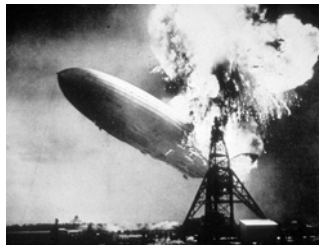
- The Reality

The data we upload to SUNY looks strange in these cases:

SUNY_PROCESS	HUB_EMPLID	HUB_PLN1_TRN	HUB_PLN2_TRN	SUNY_PGM1	SUNY_PGM1_TRN	SUNY_PGM2	SUNY_PGM2_TRN
CENSUS-2141 (SPR 2014)	[redacted]	Undecided Bachelor	Civil Engineering BS			1397	CIVIL ENGINEERING
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Mathematics INT BA			1464	MATHEMATICS
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BA			1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BA			1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BA	????		1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BA			1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BA			1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Mathematics BS			1193	MATHEMATICS
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Soc Sci Interdisc BA			5939	SOCIAL SCIENCE-INTERDISCIPLINARY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BS	????		4081	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Spanish BA			1429	SPANISH
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BS			4081	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Mathematics INT BA			1464	MATHEMATICS
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology BS			4081	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Music BA	????		1418	MUSIC
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology INT BA			1475	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Psychology INT BS			4081	PSYCHOLOGY
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Mathematics INT BS			1193	MATHEMATICS
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Music BA			1418	MUSIC
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Biomedical Engr BS			10658	BIOMEDICAL ENGINEERING
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Spanish BA			1429	SPANISH
CENSUS-2141 (SPR 2014)		Undecided Bachelor	Mathematics INT BS			1193	MATHEMATICS

Case Study – Data Quality Implementation

- The Reality

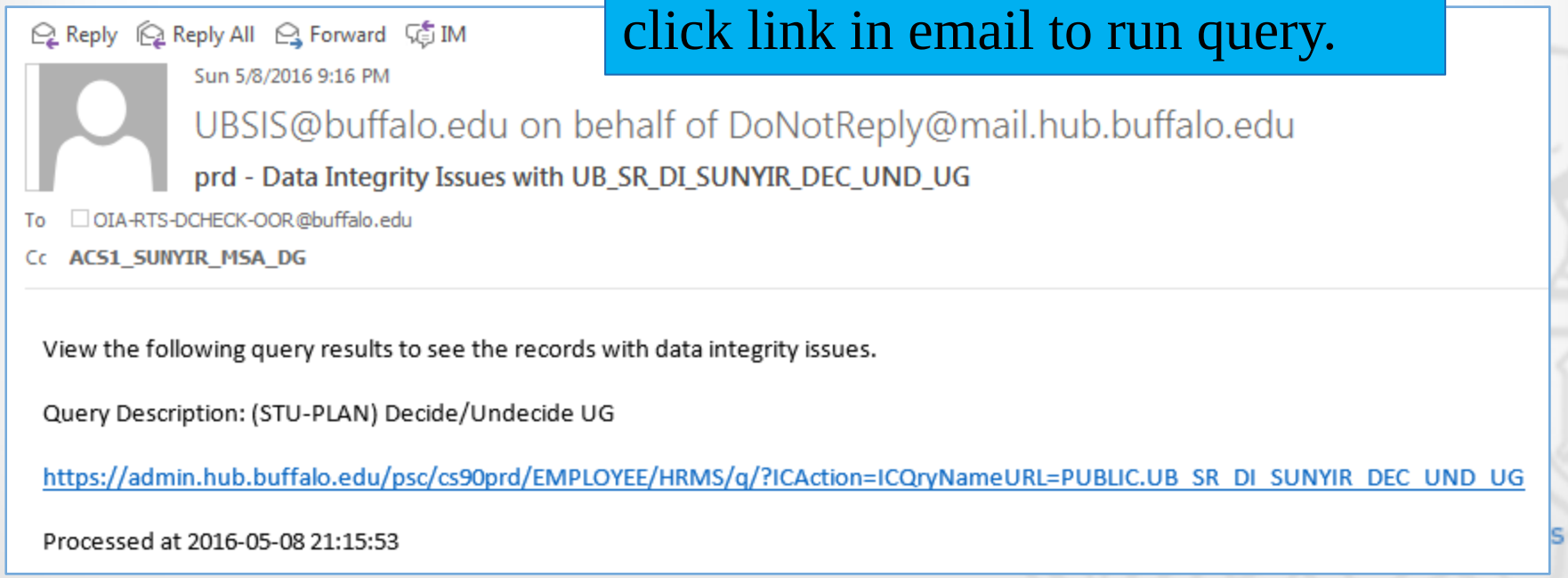


Sometimes the ETL needs to be recoded to accommodate unanticipated data entry practices, but many times the solution is to maintain records to "help" the ETL do its job, whether or not that makes any difference to functional users.

Case Study – Data Quality Implementation

- The Reality

Nightly "Real-time Scrub" process runs a query to check for these records. If results are returned, an email is generated. Recipient(s) click link in email to run query.



Reply Reply All Forward IM

Sun 5/8/2016 9:16 PM

UBSIS@buffalo.edu on behalf of DoNotReply@mail.hub.buffalo.edu

prd - Data Integrity Issues with UB_SR_DI_SUNYIR_DEC_UND_UG

To OIA-RTS-DCHECK-OOR@buffalo.edu

Cc ACS1_SUNYIR_MSA_DG

View the following query results to see the records with data integrity issues.

Query Description: (STU-PLAN) Decide/Undecide UG

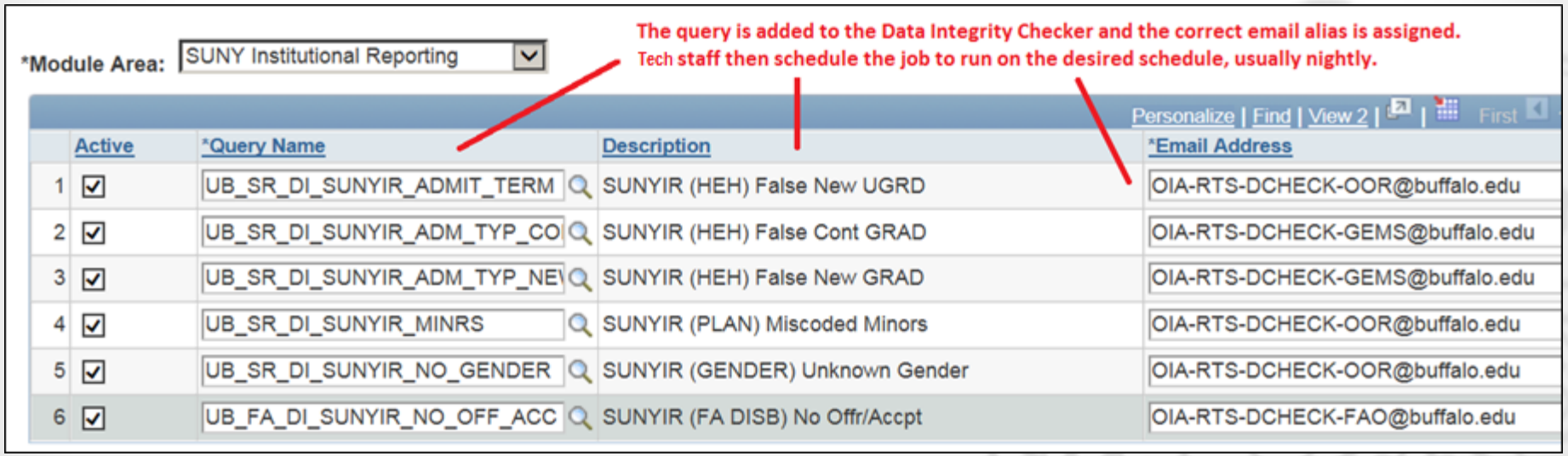
https://admin.hub.buffalo.edu/psc/cs90prd/EMPLOYEE/HRMS/q/?ICAction=ICQryNameURL=PUBLIC.UB_SR_DI_SUNYIR_DEC_UND_UG

Processed at 2016-05-08 21:15:53

Case Study – Data Quality Implementation

- The Reality

RTS is performed by our Data Integrity Checker tool.



Case Study – Data Quality Implementation

- The Reality

The use of the Data Integrity Checker, combined with a Data Governance initiative being documented in Data Cookbook, will help UB keep its ETL for State and Federal reporting flying smoothly as intended.

Case Study – University Factbook

- The Challenge

  Create a University Factbook

  - Details:
    - Tables across multiple systems. (PeopleSoft, Space, Research…etc.)
    - Tables are not structured properly for reporting.
    - Missing data elements from existing tables. (Data Integrity Checker implemented)
    - User community is heavily invested in Microsoft Access (size limitation 2GB).
    - Visualizations and Analyzing data is requested by upper management in addition to traditional reporting.

Case Study – University Factbook

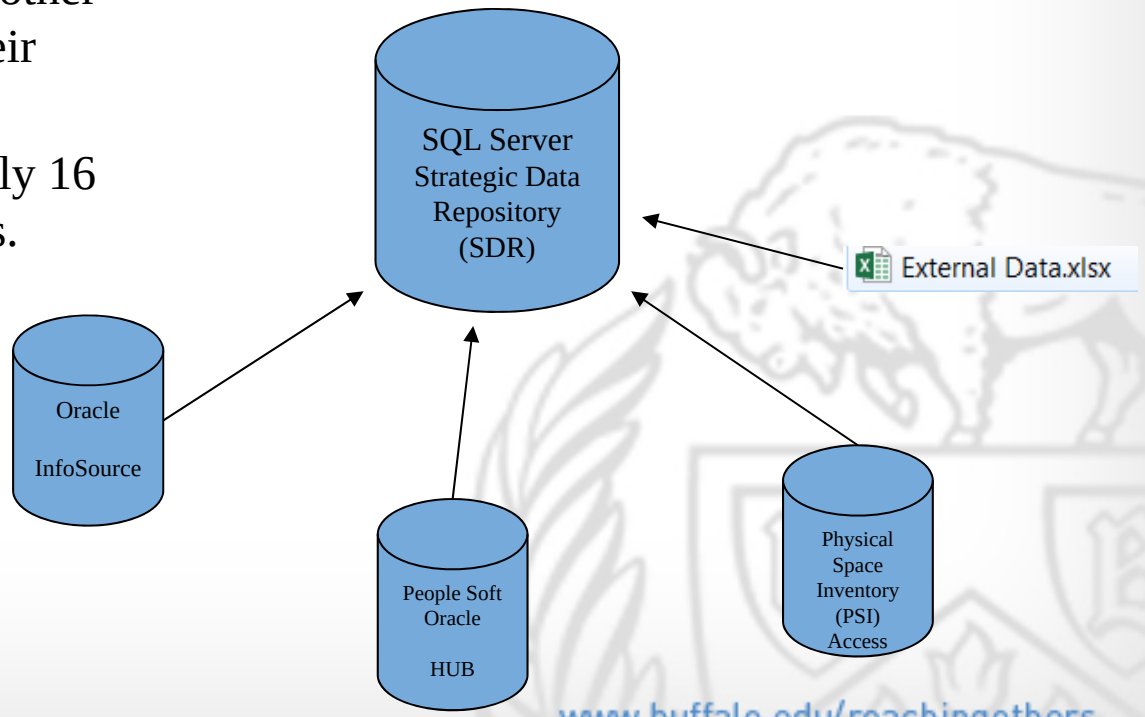
The Solution

- Reorganize transactional data to facilitate analytics and reporting (Strategic Data Repository - SDR)
  - SDR created in Microsoft SQL Server.
  - New models provide better access to timely information.
  - Size limitations have been mitigated.
  - Using the SQL Server Management Studio, we can now import tables from multiple sources, create new tables or views, and derive new data elements.
- Deploy a New BI Tool - Tableau
  - Tool produces visualizations to complement traditional reporting.

Case Study – University Factbook

January 2010 – We began to explore existing tables and build relationships with other stakeholders to bring their data into our (SDR).

Spring 2016 – Approximately 16 databases and 487 tables.



Case Study – University Factbook

December 2012 we invested in a New BI Tool - Tableau

- Factbook dashboards become a reality.
- Visualizations facilitate policy discussion and exploration.

Case Study - University Factbook

- With tools in hand, we were now able to engineer models to maximize functionality with respect to Tableau operations and related analytics.
- Adjusted the *Entity/Hierarchy* structure discussed earlier to facilitate Unit level reporting.
- Utilized new structure and process to visualize enrollment for on-line programs.

Case Study - University Factbook

- Currently, we have created 10 Dashboards hosted by Tableau Public using data extracted from the SDR.
  - Applications, Admitted and Enrolled
  - Enrollment
  - Credit Hours
  - Retention
  - Degrees
  - Graduation Rate
  - Faculty and Staff
  - Research
  - Tuition and Fees
  - University and Libraries

Case Study - University Factbook

Dashboard – Enrollment at a Glance

Headcount

At a Glance | By Degree Level | By Higher Ed History | By Race/Ethnicity

University at Buffalo
The State University of New York

Student Enrollment by Unit at a Glance
Majors Attributed to Unit of Interest (Current Major)

Term: Fall 2015

Select Unit: (All)

Department: (All)

Funding	Academic Full/Part	Undergraduate	Graduate	Total
Regular	Full Time	17,658	6,283	*23,941*
	Part Time	921	3,257	*4,178*
External	Full Time	794	119	*913*
	Part Time	578	196	*774*
Total		*19,951*	*9,855*	*29,806*

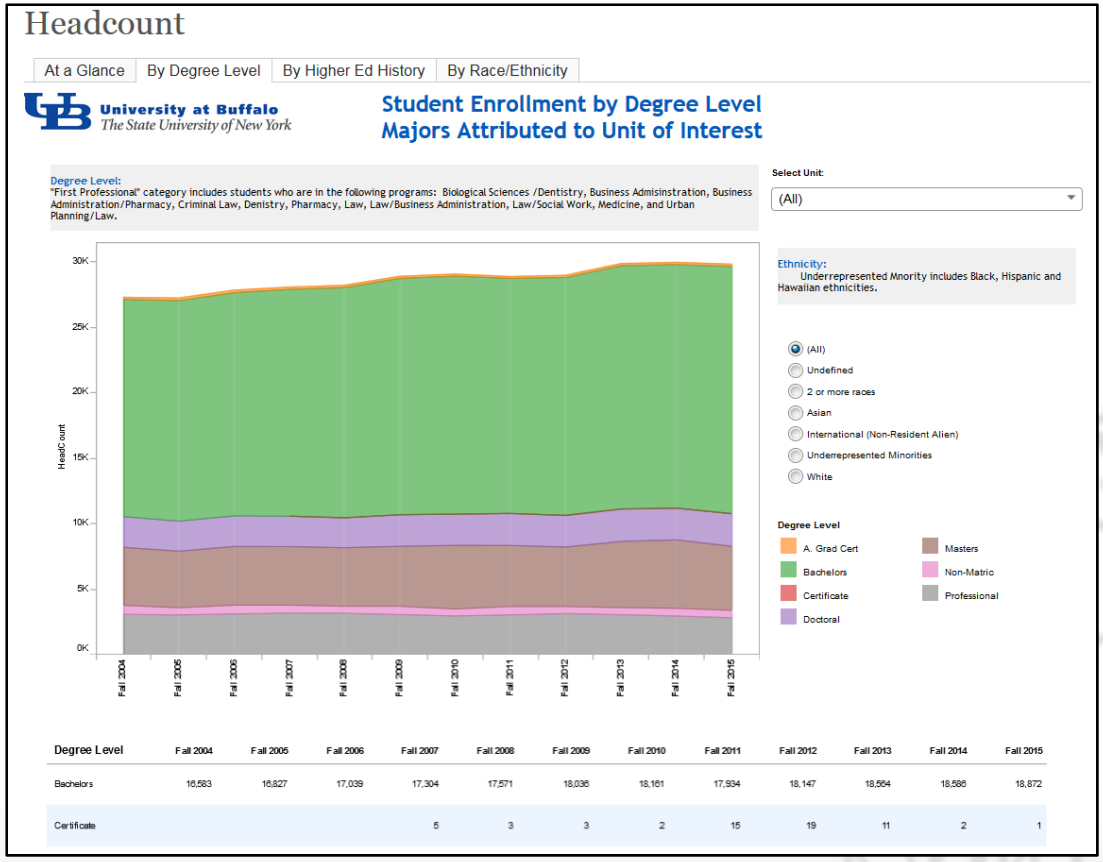
Current Major includes both approved and intended majors. Regular Enrollment: enrollments that exist within the framework of the negotiated enrollment plan between UB and SUNY, funded by State tax appropriation prescribed from a tuition price specified in State education Law that is charged to collect from UB students under the auspices of the university's enrollment plan. These enrollment generate state tax support and externally funded do not.

Gender and Ethnicity:
Underrepresented Mnority includes Black, Hispanic and Hawaiian ethnicities.

Gender	Ethnicity Group	Undergraduate	Graduate	Total
Female	2 or more races	220	60	*280*
	Asian	1,236	365	*1,601*
	International (Non-Resident Alien)	1,717	1,143	*2,860*
	Undefined	442	393	*835*
	Underrepresented Minorities	1,330	394	*1,724*
	White	3,881	2,664	*6,545*
	Total	***8,826***	***5,019***	*13,845*
Male	2 or more races	263	49	*312*
	Asian	1,585	275	*1,860*
	International (Non-Resident Alien)	1,567	1,882	*3,449*
	Undefined	633	325	*958*
	Underrepresented Minorities	1,475	271	*1,746*
	White	5,602	2,034	*7,636*
	Total	***11,125***	***4,836***	*15,961*
Grand Total		*19,951*	*9,855*	*29,806*

Case Study - University Factbook

Dashboard – Enrollment by Degree Level



Headcount

At a Glance | By Degree Level | By Higher Ed History | By Race/Ethnicity

University at Buffalo The State University of New York

Student Enrollment by Degree Level
Majors Attributed to Unit of Interest

Degree Level:
"First Professional" category includes students who are in the following programs: Biological Sciences /Dentistry, Business Admisinstration, Business Administration/Pharmacy, Criminal Law, Denistry, Pharmacy, Law, Law/Business Administration, Law/Social Work, Medicine, and Urban Planning/Law.

Select Unit: (All)

Ethnicity:
Underrepresented Mnority includes Black, Hispanic and Hawaiian ethnicities.

(All)
Undefined
2 or more races
Asian
International (Non-Resident Alien)
Underrepresented Minorities
White

Degree Level
A. Grad Cert
Bachelors
Certificate
Doctoral
Masters
Non-Matric
Professional

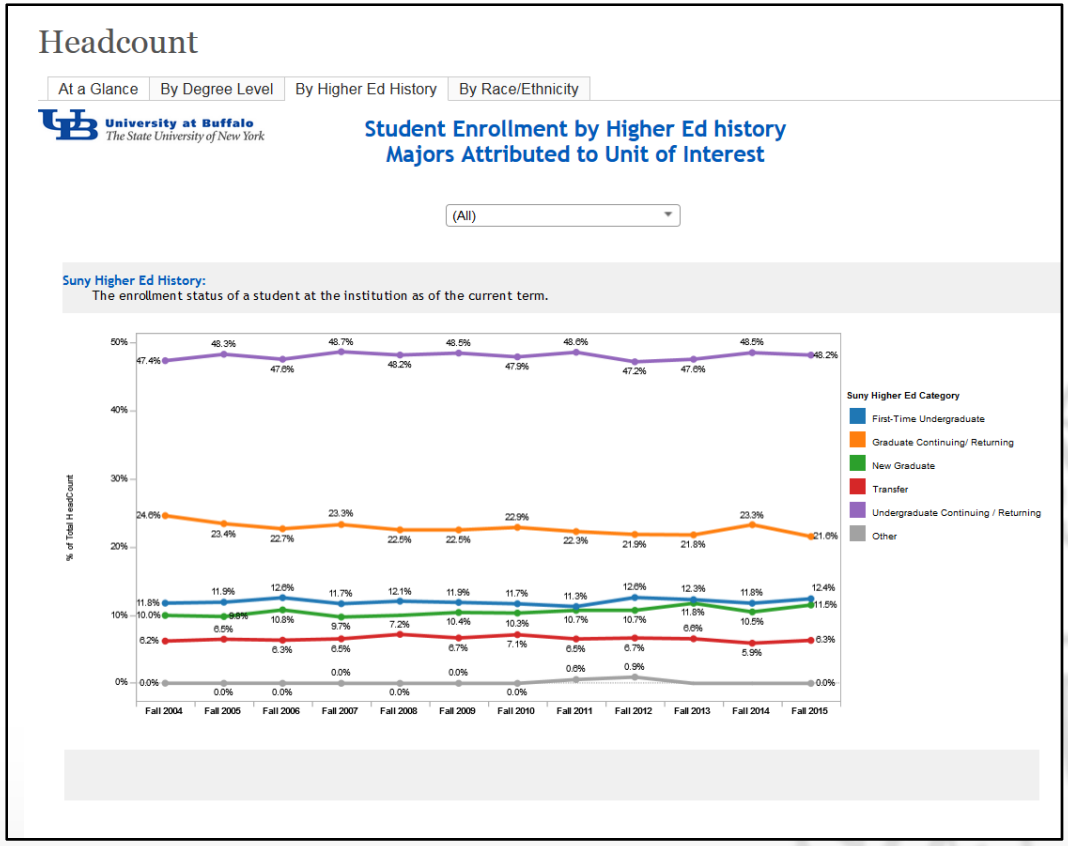
HeadCount: 0K, 5K, 10K, 15K, 20K, 25K, 30K

Fall 2004 Fall 2005 Fall 2006 Fall 2007 Fall 2008 Fall 2009 Fall 2010 Fall 2011 Fall 2012 Fall 2013 Fall 2014 Fall 2015

Degree Level	Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015
Bachelors	16,583	16,827	17,039	17,304	17,571	18,036	18,161	17,934	18,147	18,564	18,586	18,872
Certificate				5	3	3	2	15	19	11	2	1

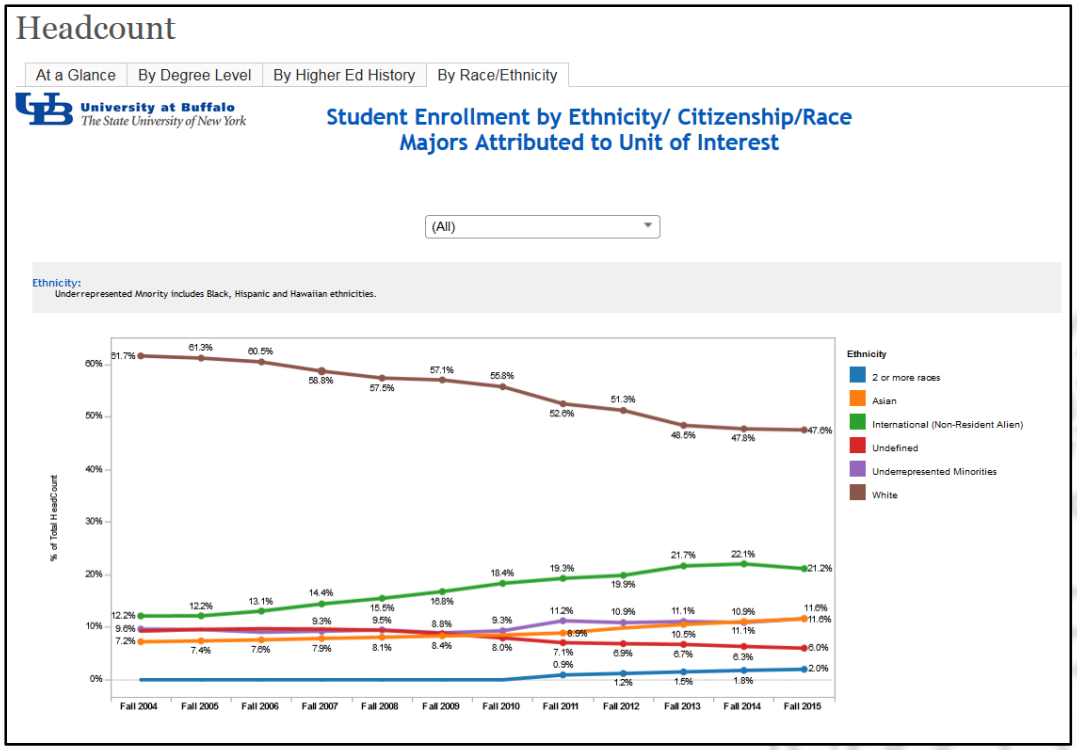
Case Study - University Factbook

Dashboard – Enrollment by Higher Ed History



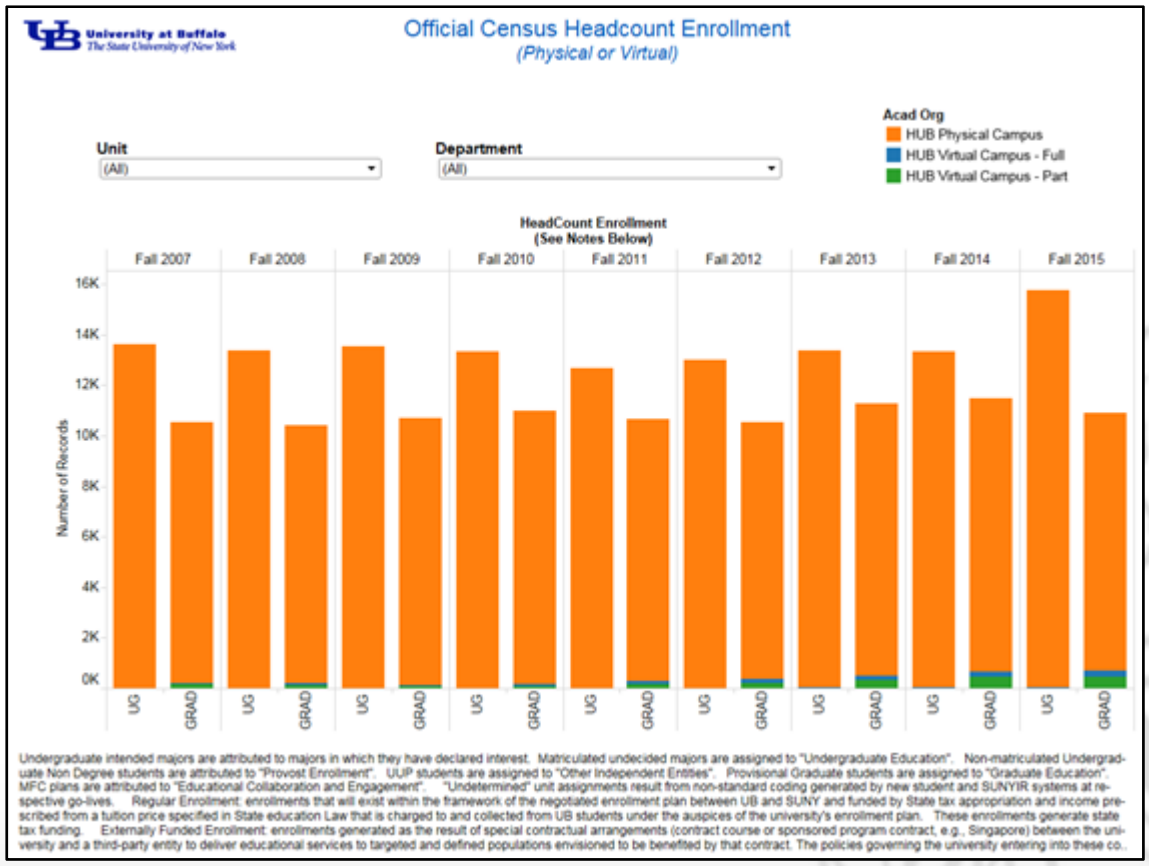
Case Study - University Factbook

Dashboard - Enrollment by Ethnicity



Case Study - University Factbook

Requests- Physical or Virtual Campus



Overview

Infrastructure ⟷ Visible "Products"

Administering

Entity/Hierarchy System

- Identifiers for each campus structural and functional element
- Referenced in all transactional systems

UB's IR Office is at the Nexus of Campus Information

State and Federal Reporting

Dashboards of Official Enrollment

Analyses in Support of Strategic Initiatives

Collaborating

Transactional Systems

- Student
- Personnel
- Early Alert

Leading

Data Governance

- Student
- Personnel
- Space

Spearheading

Data Quality

- Daily or weekly scrub
- Began with student system
- Data elements for official reporting

Questions?

Let's Eat!