Building Next Generation Data Marts at Cornell University

Presented by:

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Cornell University

- Main Campus is in Ithaca, NY
- Founded 1865
- Both a State & Private Institution

- Undergrad enrollment is 13,515
- Graduate enrollment is 5,932
- Faculty members = 2,633
- Staff employees = 11,236

Phytorion

- Full enterprise data warehouses
- Area-specific data marts
- Operational & Strategic content
- Integration of any source systems
- Fully custom approach as well as packaged data marts

The Cornell Enterprise Data Warehouse

A collection of data that can be defined and shared across the whole University by using common definitions.

began ~ August 2006

Cornell University

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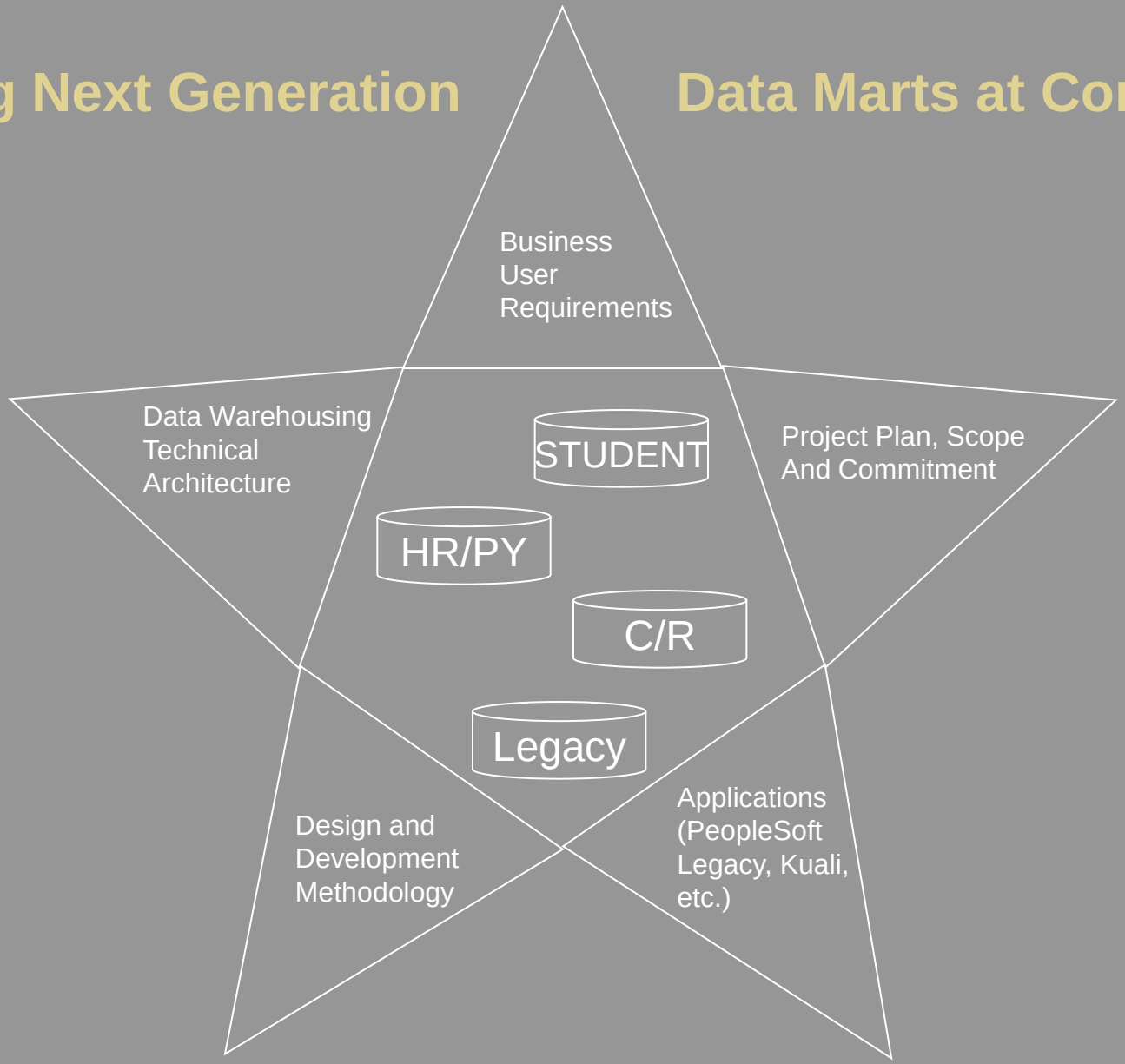


Cornell University
is implementing a path towards an Enterprise Data Warehousing solution.

This strategy involves:

- Using the Kimball Methodology to manage the project lifecycle along with developing Dimensional Models (Star Schemas) for new Data Marts,
- Utilizing the mature infrastructure and resource with Cornell Information Technology,
- Utilizing both Internal Resources and an External Data Warehousing Company, Phytorion for new data marts and when re-engineering existing data stores;
- Delivering data marts in support of new Operational Application roll-outs.

Current EDW Strategy

Design and build new datamarts and re-engineer existing data-stores using:

- A *"business questions to be answered"* approach. Focusing on Customer Needs and Data Requirements.
- Keep requirement sessions open to all development efforts / teams.
  - Meetings
  - Documentation
  - Models
  - Training
  - Data Governance
- Keep design strategies / implementation open to all development efforts / teams. (for example)
  - Incremental loading
  - Security
  - Metadata Management

Stay on Schedule, or modify schedule when needed.

Teaming Partner Phytorion

Success Criteria:

- Custom solution to meet full reporting need
- Custom solution to integrate with existing infrastructure
- Understood the Key Deliverables and Time Frames
- Partnered with our Internal Resources
  - Analysis
  - Design
  - Delivery
- Phytorion as a Partner
  - Expertise and experience
  - Trust (very high profile project, we had trust in Phytorion's ability to make it a success)

Phytorion and the Cornell Experience

- Successful Partnership
- Flexible
- Easy to work with
- Focused on Delivery

Dimensional Marts in Production

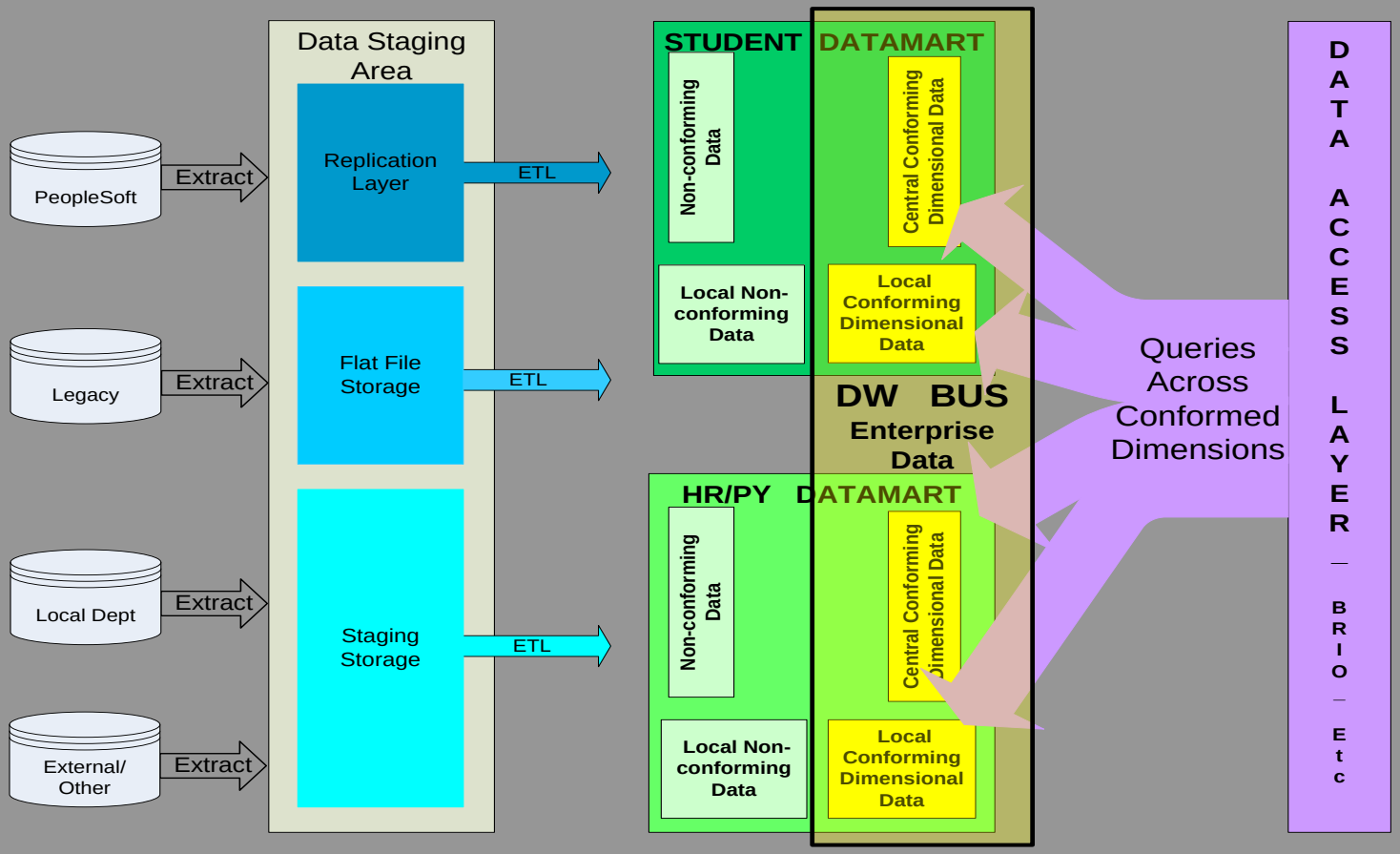
- CR
- Student
  - Prospect
  - Admissions
  - Financial Aid
  - Campus Community
  - Student Records

Dimensional Marts in Development

- Student Financials (May 2008)
- Human Resources (July 2008)
- Payroll (Sept 2008)
- Benefits (December 2008)
- Human Resources / Payroll – Non-PS (Jan 2009)
- Kuali / ADW (Accounting Data Warehouse) (2009+)

Riding the Bus at Cornell

Basic Elements of BUS Data Warehouse Proposed for Cornell



Project Plan, Scope and Commitment

- Set High-level Scope and Plan,
- Identify Sub-Project,
- Get Sub-Project Sponsor,
- Set Milestone Dates;
- Assign Project Manager.

Project Management

- Uses the Cornell Project Management Methodology (CPMM).
- Follows the Cornell Project Initiation Process (PIP) for getting an approved University Project / Sub-Project.

Current Warehouse Environment

- Servers: Solaris & Windows
- RDBMS: Oracle 10g R2 using RAC
- ETL Tool:
  - DataManager used for PeopleSoft based marts
  - Legacy marts using PL/SQL, Korn Shell Scripts, etc.

Current Warehouse Environment

continued

- Reporting Tools: Hyperion Brio
  - Brio v8 – Insight & Explorer
  - Custom Web interfaces written in Cold Fusion
- Peoplesoft RDS (Reporting Data Service)
  - HR / Payroll & Contributor Relations
- Phytorion Dimensional Marts
  - Student & new HR / Payroll
- Legacy: GL, Budget, Sponsored Programs

Data Warehouse Technical Architecture

- Cornell Warehouse Environment,
- Consistent and Reliable Source,
- High Data Availability,
- Load Monitoring and Notification,
- High Database Availability,
- System Availability Monitoring,
- Performance Monitoring and Tuning;
- Security Management.

High Data Availability

- A copy of the warehouse data is available to the users at all times.
- Warehouse is fully available during load processes.
- Warehouse administrator may rollback load process in the event of faulty load.

High Data Availability-DM Tools

DMTools is a Data Warehousing infrastructure management tool developed and in use by Cornell University.

- Allows high data availability – 24X7 access
- Repository driven
- Manages loads
- Toolbox written in Oracle PL/SQL (O.S. independent)
- GUI console to manage load related metadata;
- Available, as a free download, through JA-SIG Clearinghouse http://www.ja-sig.org

Security Management

- Automation of user & role management
- Peoplesoft Based Marts
  - Role, & Row and Column, and Field Level Security defined in Peoplesoft database
- Non-Peoplesoft Based Marts security mgt.
  - Account creation & removal
  - Role management

Business User Requirements

Requirements are gathered through many sources and ways. Engaging the right Customer is Key.

Examples include:

- Interviews
- Reports
- Existing Applications / Documentation

Business Areas (Student)

- Undergraduate and Graduate Admissions
- Institutional Research and Planning
- Student Services
- Bursar
- Continuing Education
- Accounting
- Financial Aid

Colleges We Met With

- Engineering
- Law
- Business
- Natural Resources
- Veterinary
- Hotel Management
- Library Science

What We Deliver

- Prospects and Admissions
  - Application
  - Athletic Participation
  - Academic Interests
  - External Academic Data
  - Honors and Awards
  - Prior Work Experience
  - Prospect Data
  - Test Scores

What We Deliver

- Student Records
  - Advisors
  - Courses and Classes
  - Enrollment and Grades
  - Enrollment Appointments
  - Milestones
  - Programs and Plans
  - Student Degrees
  - Student Groups
  - Transfers and Test Credits

What We Deliver

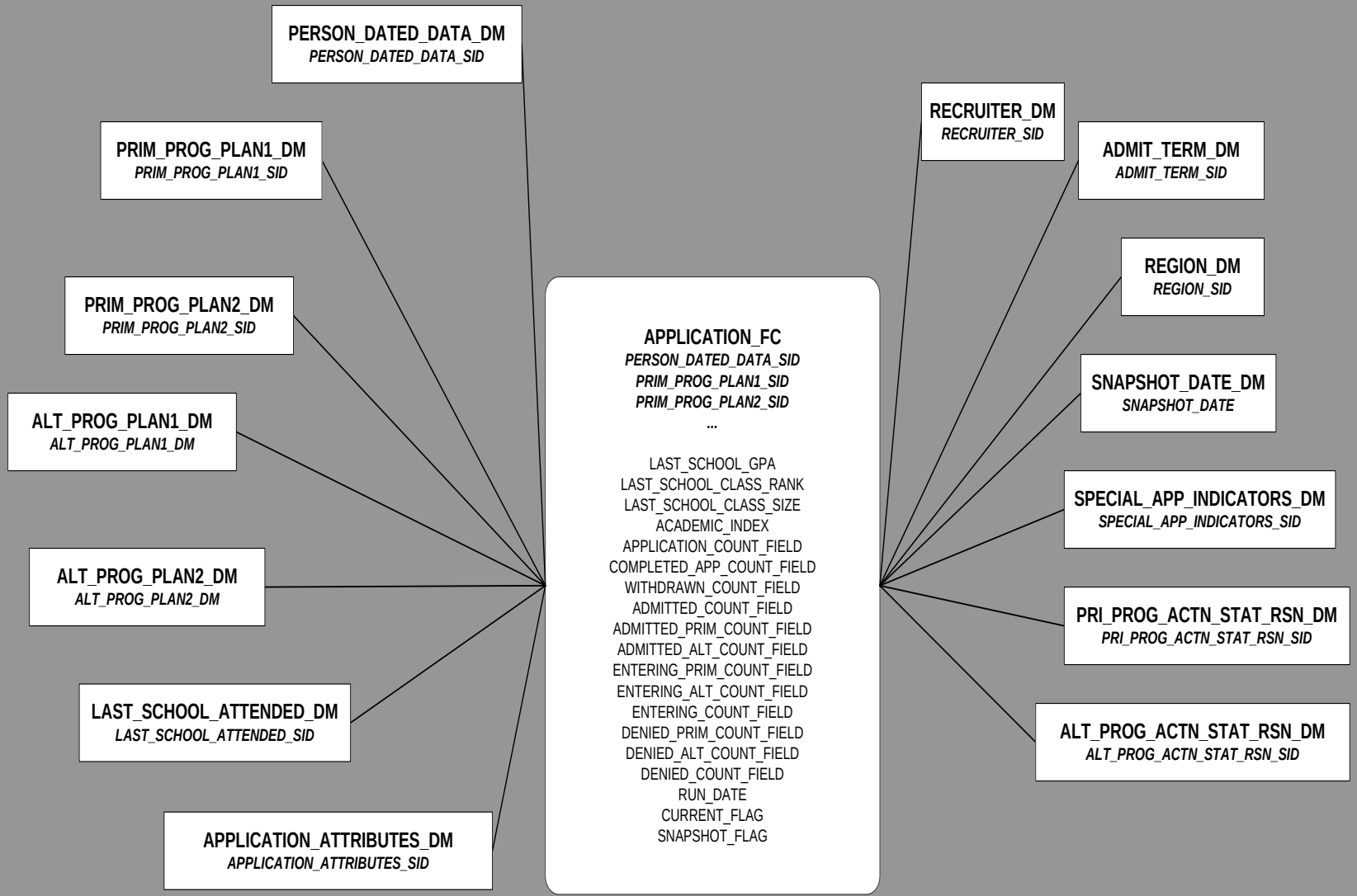
- Student Financials
  - Accounting Line
  - Credit History
  - General Ledger
  - Financial Items
  - Student Accounts
  - Tax Data

What We Deliver

- Campus Community
  - Checklists
  - Comments
  - Communications
  - Bio Demo Data
  - External Organizations
  - Events and Meetings
  - Service Indicators

What We Deliver

- Financial Aid
  - Financial Aid Applications
  - ISIR
  - Awards and Disbursements
  - Item Types
  - Student Budgets
  - Promissory Notes
  - Loans
  - Pell Grants


PERSON_DATED_DATA_DM
PERSON_DATED_DATA_SID
PRIM_PROG_PLAN1_DM
PRIM_PROG_PLAN1_SID
PRIM_PROG_PLAN2_DM
PRIM_PROG_PLAN2_SID
ALT_PROG_PLAN1_DM
ALT_PROG_PLAN1_DM
ALT_PROG_PLAN2_DM
ALT_PROG_PLAN2_DM
LAST_SCHOOL_ATTENDED_DM
LAST_SCHOOL_ATTENDED_SID
APPLICATION_ATTRIBUTES_DM
APPLICATION_ATTRIBUTES_SID
APPLICATION_FC
PERSON_DATED_DATA_SID
PRIM_PROG_PLAN1_SID
PRIM_PROG_PLAN2_SID
...
LAST_SCHOOL_GPA
LAST_SCHOOL_CLASS_RANK
LAST_SCHOOL_CLASS_SIZE
ACADEMIC_INDEX
APPLICATION_COUNT_FIELD
COMPLETED_APP_COUNT_FIELD
WITHDRAWN_COUNT_FIELD
ADMITTED_COUNT_FIELD
ADMITTED_PRIM_COUNT_FIELD
ADMITTED_ALT_COUNT_FIELD
ENTERING_PRIM_COUNT_FIELD
ENTERING_ALT_COUNT_FIELD
ENTERING_COUNT_FIELD
DENIED_PRIM_COUNT_FIELD
DENIED_ALT_COUNT_FIELD
DENIED_COUNT_FIELD
RUN_DATE
CURRENT_FLAG
SNAPSHOT_FLAG
RECRUITER_DM
RECRUITER_SID
ADMIT_TERM_DM
ADMIT_TERM_SID
REGION_DM
REGION_SID
SNAPSHOT_DATE_DM
SNAPSHOT_DATE
SPECIAL_APP_INDICATORS_DM
SPECIAL_APP_INDICATORS_SID
PRI_PROG_ACTN_STAT_RSN_DM
PRI_PROG_ACTN_STAT_RSN_SID
ALT_PROG_ACTN_STAT_RSN_DM
ALT_PROG_ACTN_STAT_RSN_SID

Design and Development Methodology

- Data Modeling – Designing a STAR,
- ETL Delivery Techniques;
- Data Delivery - Brio.

Data Modeling - Designing a STAR

For Dimensional Data Modeling Activity:

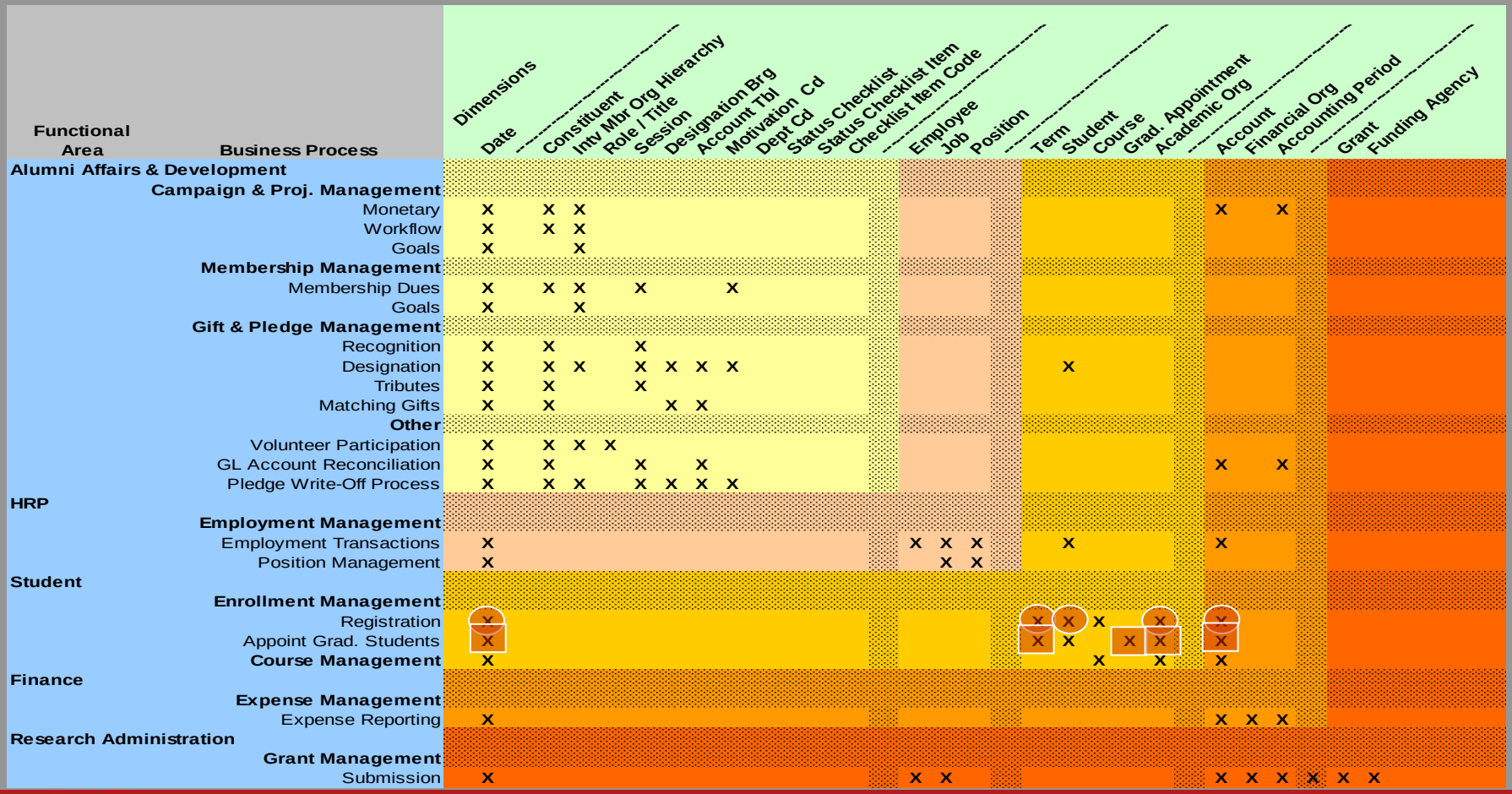
- Decision Matrix
- Bus Matrix
- Object Definition Document (Dimensions / Facts)
- Source Data Model

Decision Matrix (Applicant Example)

Cornell University -- Applicant Decision Matrix

Objectives	Decisions	Type of Info	Grad/Pr	CESS	Colleges	Questions	Associated To-Be(s)	Readiness	Description	In Scope/ Out Scope	Priority
	Waive Requirements	List				Which international applicants should have TOEFL waived	Create Applica	now			
	Determine if we are	Count/%	X		X	Application Funnel: Application	Create Applicants	now	Note: multiple business us		
		Count/List/%	X		X	What is the ethnicity breakdown of the applicant pool?	Create Applicants (all	now			
		Count/List	X		X	What is the international applicant breakdown (based on visa type, citizenship) by region?	Create Applicants (all careers)	now			
		Count/List	X		X	What are the admissions decisions for all applicants?	Create Applicants (all careers)	now			

Bus Matrix (Partial Example)



Dimension Documentation

This dimension describes ethnic background. It includes descriptions for multi-ethnicity (both under-represented and non-under-represented). History is not maintained on this dimension.

Table Type : Dimension Security:
Shared Dimensions

Technical Notes: **Change History** 30 July 2006 – Created

Add the following static values to the dimension: MLT_URM, Mult URM, Multi-ethnic Underrepresented Minority
MLT_NURM, Mult NonUR, Mult-ethnic Not Underrepresented Minority

ETHNICITY_DM

Attribute	SourceTable	SourceColumn	Sourcing Instructions	Description
ETHNICITY_SID			Populated by the ETL	
ETHNICITY	PS_ETHNIC_GRP_TBL	ETHNIC_GRP_CD	IGNORE SETID KEY, MAX(EFFDT), EFF_STATUS = 'A'. See technical notes above.	8-character code for the ethnicity
ETHNICITY_SDESCR	PS_ETHNIC_GRP_TBL	DESCRSHORT		10-character description of ethnicity
ETHNICITY_LDESCR	PS_ETHNIC_GRP_TBL	DESCR50		50-character description of ethnicity

ETL / Delivery Techniques

- Development / Migration Strategy
- Metadata used for:
    - Object Definition Document(s)
    - ETL Code/Build (DataManager)
    - Business Metadata Definitions
    - Unit Testing

Data Delivery - Brio

- Standard reports
- Dashboard
- Ad-hoc Reports

Brio Models:

- Single Fact
- Non-fact
- Galaxies and Constellations (monster model)

Questions ?

Thank You:

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