Data Management and Information Delivery at UNLV

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Contents

Executive Summary 3
Introduction 5
Background: iNtegrate 1 5
UNLV's Enterprise Data Infrastructure: iNtegrate 2 and Beyond 6
Enterprise Data Management 7
UNLV Enterprise Data Warehouse 8
Enterprise Information Delivery 10
Conclusions and Recommendations 12
Appendix A - UNLV Data Warehousing - Fundamental Principles 15
Appendix B - College Profiles Dashboard in UNLV Analytics 17
Appendix C - Example Data Definitions 18
Appendix D - Initial Staffing Recommendation 22
Appendix E - iNtegrate 2 Information Delivery Task Summary and Schedule 25
Task Summary 25
Track 1: Enterprise reporting 25
Track 2: HCM & Finance operational reporting 26
Task Schedule 27
Appendix F – Examples of Decision Support Organizations at Other Institutions 32
Notes and Citations 34

Executive Summary

Building upon the strategic vision for enterprise data management and information delivery set forth during the 2010 iNtegrate 1 implementation of the PeopleSoft Campus Solutions student system, this document addresses how UNLV will meet institutional information needs in the context of the iNtegrate 2 implementation of Workday as the new administrative system for Human Resources and Finance. This implementation is currently underway throughout NSHE, with a targeted go-live of October 2017.

The iNtegrate 1 vision involved developing a centralized information infrastructure as a resource for the whole campus, and included the implementation of UNLV's first enterprise data warehouse and business intelligence (BI) platform, *UNLV Analytics*. To achieve this work, the primary data functions of the campus were organizationally aligned in the Office of Decision Support. These functions have included: Institutional Research (IR), Data Governance, Enterprise Data Warehousing (EDW) and Business Intelligence (BI). While each of the functions is distinct, they overlap considerably. Their alignment is a growing trend, increasingly viewed as best practice across higher education, as it correlates with EDW/BI maturity, and results in improved distribution of information in support of decision-making.

Data Governance is a core function of institutional data management, which broadly covers many areas, including data quality, security and access. In alignment with the framework laid out in UNLV's *Institutional Data Governance and Management Policy*, the development and management of UNLV's data assets should be driven by informational needs and priorities of the institution. One key aspect of this work involves the identification and common definition of strategically important data elements and measures. Achieving this requires both oversight and cross-functional collaboration, and results in reliable data comparison and information consistency across the institution. Through the development of reporting tools that leverage a commonly understood data infrastructure, campus data users with varying skillsets—from people who are data experts, to those who lack technical skills and knowledge of operational data—can access consistent and reliable information pertaining to their colleges, departments and units, as well as institutional data more broadly.

With much foundational work to develop UNLV's student data infrastructure now completed, and with the implementation of Workday well underway, data sourced from the systems implemented in iNtegrate 1 and 2 need to come together in the UNLV Enterprise Data Warehouse. UNLV recently purchased and is presently implementing powerful new data replication and integration software, which will allow data from Workday and other sources to be loaded into the warehouse through accelerated and optimized processes.

Data integration across administrative systems is a key benefit of enterprise data warehousing because it reduces data redundancy and removes the limitations of separate informational silos, bringing all official data together in one place. This integration enables a seamless approach to data presentation, such as through dashboards, and other reporting and data visualization tools. Appendix B shows a simple example of how, when data are properly integrated, campus data users can view information about their area across multiple subject areas, all through a single online interface. Achieving data integration across systems is a major objective of institutional data management, and a critical reason why Data Governance oversight must be tightly aligned with EDW/BI development. The overarching goal is the delivery of timely and relevant information, allowing for the pursuit of better institutional knowledge.

Toward this goal, the following points summarize our key recommendations:

- Very recently, in April 2016, selected EDW/BI resources (4.0 FTE) were moved out of Decision Support and into the Office of Information Technology (OIT), resulting in a separation of functions that previously had been aligned. We recommend re-establishing the organizational alignment of the enterprise functions of data management and data warehousing (Enterprise Data Infrastructure), and business intelligence and institutional research (Enterprise Information Delivery) under the leadership of a chief data administrator with clear oversight and accountability for these functions. While specific unit labels and report-to structures vary across higher education, institutions that are leading these efforts are intentionally and increasingly structuring themselves with this kind of alignment in place. Some examples of how these functions are organized at other institutions are outlined in Appendix F.

- Conduct a national search for the permanent appointment of the AVP for Decision Support as soon as possible. This position has been staffed with an interim appointment since May 2016.

- Staff and reconstitute the Data Governance function, by expanding the scope of and filling the position of University Data Administrator, which has been vacant since 2009. The reduction of this FTE coincided with budget cuts during the Great Recession.

- Add 3.0 new FTE for dedicated BI development, training and support. The EDW/BI positions that recently moved to OIT were blended positions, two of which previously had been identified as participants for Workday report writing.

- In alignment with the *UNLV Data Warehousing Fundamental Principles* presented in Appendix A, develop a single enterprise data warehouse as the basis for executive planning and decision-making, as well as operational reporting at the enterprise level. Recent development of enterprise data warehousing and business intelligence initiatives outside of the Decision Support function stand apart from UNLV's Enterprise Data Warehouse and *UNLV Analytics.* This duplication of effort runs counter to EDW/BI best practices. Multiple enterprise information delivery systems pose the risks of competition for resources and information inconsistency across the institution.

- Leverage the significant investments made in the *UNLV Analytics* platform, and if necessary, secure ongoing licensing for enterprise use of OBIEE (Oracle Business Intelligence Enterprise Edition) at UNLV. Complete the build-out of college and department profile dashboards to present student data in *UNLV Analytics*, and to incorporate Workday HR and Finance data. Develop a plan and timeframe to upgrade to OBIEE to version 12c.

- Develop a "one-stop" website—http://data.unlv.edu—that provides campus audiences with clear information and instructions for accessing campus data resources.

- Adopt and proceed with the tasks outlined in the iNtegrate 2 Task Summary and Schedule provided in Appendix E.

Introduction

This document aims to articulate a vision for enterprise information delivery and data management at UNLV, and to put forth a plan toward achieving that vision. More specifically, this plan summarizes and builds upon progress made since the system-wide iNtegrate 1 implementation of PeopleSoft Campus Solutions as the institution's student information system of record in fall 2010, and to address the iNtegrate 2 implementation of Workday as the new system of record for Human Resources and Finance, which is currently underway and scheduled to go live in October 2017.

The statewide scope of both iNtegrate implementations carries implications for an institutional information management and delivery strategy. While the alignment of institutional objectives with the broader NSHE framework is critical, the focus here is to address the question of meeting institutional informational needs. How do we make sure that UNLV academic and business units get the information they need, post-implementation? What comprises this information? How will it be provided and accessed? How can we ensure that the information is reliable and secure?

Background: iNtegrate 1

This proposal builds upon the strategic vision for enterprise data management and information delivery set forth during the late stages of the iNtegrate 1 implementation. This vision involved developing a centralized information infrastructure as a resource for the whole campus, and included the implementation of UNLV's first enterprise data warehouse and business intelligence (BI) platform for delivering information to campus audiences through a variety of tools. This work was achieved through the purposeful organizational alignment of primary data functions of the campus into what is now the Office of Institutional Analysis and Decision Support. The functions include: Institutional Research (IR), Data Governance, Enterprise Data Warehousing (EDW) and Business Intelligence (BI).

While each is distinct, these functions overlap considerably, and their alignment has been a growing trend across higher education in the United States.[1] IR remains responsible for collecting, analyzing, and interpreting information to enhance the quality of decisions guiding the institution. Data governance applies rules, common definitions and standards to data, and protects data quality and security. Enterprise data warehousing is responsible for long-term data capture, storage and integration by structuring commonly defined data for the purpose of information delivery. BI is the application of a set of technologies, tools and practices that leverages the warehouse infrastructure to deliver and present data, to gain insights and support action on complex issues. The alignment of these functions positively correlates with the maturity of a successful enterprise information delivery program.[2] It facilitates collaboration with the academic and business units, and improves the distribution of information to the campus, to better support decision-making at all levels of the organization.

Early priorities for establishing the UNLV Enterprise Data Warehouse included developing a method for capturing historical data, meeting statutory reporting requirements, and structuring enrollment and admissions data so that key campus data users could reliably access these data as quickly as possible through the BI platform, Oracle Business Intelligence Enterprise Edition (OBIEE), which has been branded on campus as *UNLV Analytics*. These efforts included the development of a central metadata repository and the online UNLV Data Dictionary, which presents data definitions that include contextual

information needed to interpret the data for reporting and analysis. Through dedicated attention to developing data definitions and warehouse infrastructure, building reports and dashboards, and training campus data users, over 300 professionals across all areas of campus have leveraged data from UNLV Analytics since its initial implementation in spring 2011.[3] Although gaps remain, the scope and quality of student information that is now available to campus audiences is as great as it has ever been at UNLV.

To guide the implementation and development of UNLV's enterprise data infrastructure, which is the backbone of its broader enterprise information delivery strategy, the iNtegrate 1 Steering Committee adopted a set of *Fundamental Principles of Data Warehousing* that was widely vetted by approximately forty individuals from various areas of campus. These principles, which are provided in Appendix A, stipulate that the UNLV Enterprise Data Warehouse "consists of one official, comprehensive, centralized data repository providing information consistency and integration through a single, commonly defined view of institutional data." The warehouse "forms the basis for executive planning and decision-making, as well as operational reporting at the enterprise level. As data are needed to support these functions, they are incorporated and optimized in the institutional warehouse." So from the beginning, the longer term plan has been to bring data from new Human Resources and Finance systems (as well as other systems) into the warehouse, for integration with the existing student data infrastructure.

UNLV's Enterprise Data Infrastructure: iNtegrate 2 and Beyond

With much foundational work to develop UNLV's student data infrastructure now completed, and with the implementation of Workday well underway, data sourced from the systems implemented in iNtegrate 1 and 2 need to come together in the UNLV Enterprise Data Warehouse. Data integration across administrative systems is a key benefit of enterprise data warehousing because it reduces data redundancy and removes the limitations of separate informational silos, bringing all official data together in one place. The result is the delivery of timely and relevant information that spans the enterprise across individual functions and operations, allowing for the pursuit of better institutional knowledge. In alignment with institutional initiatives, the overarching goal continues to be the timely delivery of reliable and relevant information to University decision-makers, to improve the quality of those decisions through the use of data. However, informational needs are not generally confined to individual subject areas. This is especially true among executives leading the institution, but is also the case for any user who requires information from multiple source systems. Answering questions about, for example, faculty workload, cost of instruction, and internally funded research expenditures all require data integration across systems. Data integration also enables a seamless approach to data presentation, such as through dashboards and other data visualization tools. When data are properly integrated, for example, a college dean or department chair can view information about their unit that spans multiple subject areas, all through a single online interface. A simple example of this is shown in Appendix B.

The time and resources required for data integration to be performed manually can be quite prohibitive, and relying on manual, duplicative or *ad hoc* approaches to enterprise data integration does not position the institution well strategically. These limitations are generally not technical, in the sense that data can usually be readily exported from one system and imported into another system. Rather, how the data are stored and defined (or not defined) in one system may vary considerably from what is needed for

meaningful integration with data from another system. Achieving data conformance across systems is thus a major objective of institutional data management, and a critical reason why Data Governance oversight must be tightly aligned with EDW/BI development. The following sections describe how data management activities should align with warehouse development projects to integrate Workday data, toward the advancement of UNLV's enterprise data infrastructure.

Enterprise Data Management

Data Governance is a core function of institutional data management, which broadly covers many areas, including data quality, security and access.[4] In anticipation of the iNtegrate implementations, UNLV established a formal Data Governance program in 2006, with the creation of a University Data Administrator position housed in the Office of Decision Support. This position was staffed until 2009, when the person occupying it became the UNLV campus lead for the iNtegrate 1 project. This coincided with recessionary budget cuts, and the position has since been vacant. Having a position dedicated to this function significantly advanced UNLV's data management efforts, which included the development of UNLV's first institutional data policy and a two-tiered committee structure for managing and leveraging the institution's shared informational assets. This structure is now widely recognized as a best practice for data management in higher education.[5]

In alignment with the framework laid out in UNLV's most recent *Institutional Data Governance and Management Policy*,[6] the development and management of UNLV's data assets should be driven by informational needs and priorities of the institution. One key aspect of this work involves the identification and definition of important data elements and measures. Common, centrally documented definitions are a critical component of the institution's data infrastructure, and serve as a critical input to effective enterprise information delivery.[7] Appendix C shows examples of data definitions from the UNLV Data Dictionary, which may be accessed online at https://ir.unlv.edu/dd.

Arriving at commonly agreed upon definitions requires oversight and cross-functional collaboration. Led by an individual charged with establishing and managing the workflow process, operational data stewards collaborate with EDW/BI analyst/developers and those with technical knowledge of source transactional systems, to define informational data elements. Part of this process involves specifying how these elements are best derived from the source system, so that they may be and modeled and implemented in the warehouse. The definitions, along with other "data about data" are recorded in UNLV's central metadata repository and presented through the online UNLV Data Dictionary. Success in these efforts stems from inclusively bringing people together to achieve alignment, and organizing the conversations with clear and practical objectives, such that the limited time of busy professionals is well spent. Success also stems from an ongoing commitment to change management and communication. That is, processes by which data are maintained in transactional systems can change over time, and processes must be established for vetting changes to established definitions. Fortunately, there are now emergent best practices in higher education to help guide this work.[8]

When a campus data user is accessing information on dashboards, or is learning to build their own reports in UNLV Analytics, the ability to reference definitions through an easy-to-use, searchable, online data dictionary greatly enhances usability of these tools and proper understanding of the data. Definitions are intentionally written in terms that can be understood by less technical users, and provide

information needed for data interpretation and appropriate use.[9] That is, they provide context as transactional data are transformed and structured to support informational purposes, and thus serve as a resource to individuals using the data for reporting and analysis. Definitions also provide a framework for data classification, as appropriate for public, internal or restricted audiences,[10] and for securing the data while ensuring that campus employees have ready access to the information they need to perform their jobs.

Further, common data definitions inform key points of data integration in the enterprise warehouse, and thus enable information consistency across the organization. While data management activities establish a set of elements that are defined, more broadly these activities aim to resolve data issues and inconsistencies across functions, and maximize data conformance across the enterprise so that business entities (*e.g.*, person, account, academic department) are made to have commonly understood meaning across functions. This cannot be successfully addressed solely at the individual department/unit level, and this is why Data Governance is so often explicitly described as an *enterprise* endeavor.

UNLV Enterprise Data Warehouse

There are limitations on the extent to which data in complex transactional systems are structured to support querying and analysis, and integration across systems. Increasingly, products like Workday include built-in components for operational and analytical reporting of data housed within the system. This capacity as provided through Workday Reporting should be leveraged where possible to address informational needs. For needs that Workday Reporting does not meet, Workday data elements should be defined and incorporated into the UNLV Enterprise Data Warehouse. UNLV recently purchased and is presently implementing powerful new data replication and integration software, which will allow data from Workday to be brought into the UNLV Enterprise Data Warehouse through accelerated and optimized data loading processes.

Bringing data from source systems together into an integrated enterprise data warehouse provides the platform for business analysis to be applied consistently across the enterprise.[11] As discussed above, the value proposition of EDW/BI is ready access to consistent, reliable data in such a way that breaks down informational silos of separate systems, facilitates examining and predicting trends across time, and allows an organization to strategically leverage its information assets.

An enterprise data warehouse is not a product, a tool, a programming language, or a technology, but rather an *architecture*.[12] This architecture may be generally understood in three broad layers:

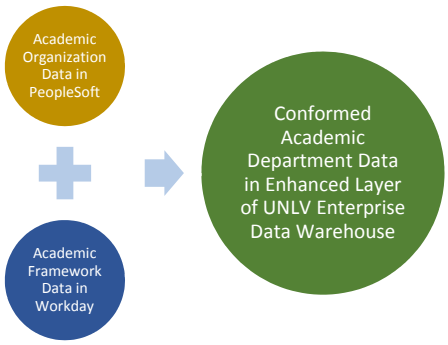
- *Staging layer*. Also known as an *Operational Data Store (ODS)*, the Staging layer of the enterprise data warehouse stores data that are copied from legacy and transaction source systems in their raw, source form. The process of staging data from disparate source systems results in a central repository conformed both in location and in technology. Staging data centrally is the first step toward a fully-integrated decision support system.

- *Enhanced layer*. Staged data in the enterprise data warehouse are transformed in a variety of ways, for a number of purposes that support enterprise information delivery:

- Data from source systems are usually optimized for daily transactions. Data in the Enhanced layer of the warehouse are transformed to be optimized for reporting and analysis. This broadens the accessibility of institutional data so it may be leveraged by campus professionals who would not have intimate knowledge of daily record-keeping.

- Institutional data definitions are implemented in the Enhanced layer of the warehouse. These are typically information elements that are not stored in any source system, but rather are *derived* through logic and interpretation. For example, "Weighted Student Credit Hours" is a critical measure of enrollment that impacts funding for UNLV. This element is not tracked through any source record-keeping system but has been derived in the warehouse with appropriate logic and interpretation of the data provided through source systems.

- Key elements existing across institutional functions are *conformed* into one unified representation. For example, as illustrated in the figure below, the concept of "academic department" may be represented differently in different source systems. Its meaning, as represented in the data, is unified in the Enhanced layer of the warehouse. This allows for integrated and cross-functional reporting.



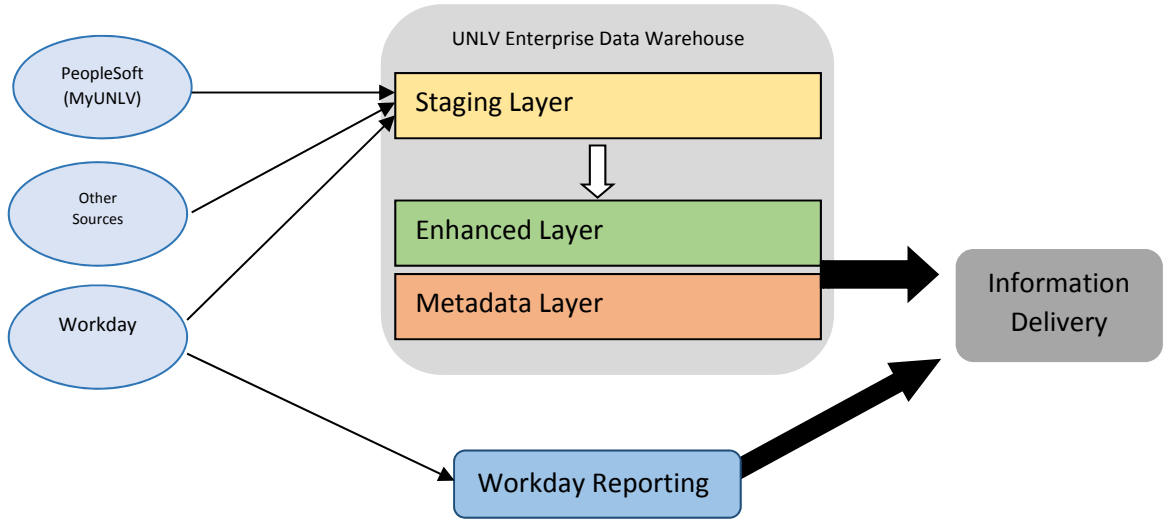
- For targeted reporting and analysis around specific questions and topics, *data marts* are built in the Enhanced layer of the warehouse. The data in data marts are structured to support optimal information delivery around a particular topic area. For example, the Student Tracking data mart in the UNLV Enterprise Data Warehouse structures student data for reporting and analyzing student retention, progression and graduation.

- Data errors are identified and inconsistencies resolved.

- *Metadata layer*. Information about the institution's informational needs, its data architecture, its information delivery platform, its data stewards and data operations, and how it defines critical information elements are all as important to track as the institutional data itself. This information is considered to be "data about data," and is therefore often referred to as *metadata*. Data definitions as described above are one type of metadata. Metadata provides

context for the institution's data assets and information systems, which improves both the meaningfulness of data assets and the ability to manage the enterprise business intelligence environment. These resources tracked in the Metadata layer of the enterprise data warehouse are leveraged for effective information delivery and understanding.

A simplified representation of this architecture is provided in the schematic below.



Enterprise Information Delivery

The purpose of Enterprise Information Delivery is to ensure that the UNLV Enterprise Data Warehouse and Business Intelligence platform are leveraged effectively to make meaningful information available to decision makers at all levels of the institution. This function includes Institutional Research (IR), as well as the broader administration and development of the enterprise BI platform.

Oversight of both Enterprise Information Delivery and Enterprise Data Infrastructure should incorporate the role of a high-level data administrator who coordinates discussion among UNLV's leaders toward defining and prioritizing informational needs in accordance with institutional initiatives and strategic priorities—and then directly leverages institutional data to meet those needs. When this individual is accountable for these areas, the path from strategic informational goals to implementation and delivery is direct.

While communication with executive leaders drives this process, identifying campus informational needs requires engagement with multiple audiences. For example, deans and associate deans, department chairs, and faculty provide knowledge of information needed to manage and monitor performance in their academic units—in alignment with broader UNLV initiatives, and in support of funding proposals and academic accreditations. Directors and managers of administrative units provide an understanding of the data and information that are most frequently requested from their units, and of report formats that are broadly useful in an enterprise context. IR staff provide expertise on both

nationally and locally defined performance metrics, reporting requirements, and data sets used for benchmarking and comparison with peer institutions.

The IR function has as its mission the collection and analysis of data about the University, to enhance the quality of the decision-making process for those leading the institution. While IR offices differ across institutions, the scope of IR work includes:[13]

- Reporting: statutory, external, internal, *ad hoc*, operational
- Statistical/theoretical research
- Predictive modeling
- Decision support, BI, analytics
- Creating and maintaining dashboards
- Data cleaning and auditing
- Measurement and evaluation
- Institutional effectiveness
- Providing data and information to multiple internal and external audiences

Individuals who staff the IR function are responsible for monitoring the accuracy and accessibility of data, and thus can play a critical role in identifying and clarifying informational needs and driving EDW/BI development.

Many informational needs are being/will be addressed through the development of institutional dashboards and other resources that present data through automated online interfaces. In addition to identifying informational priorities and developing UNLV's BI infrastructure accordingly, the Enterprise Information Delivery function manages a process for campus users to request data in an *ad hoc* capacity, and to coordinate appropriate responses. Strategies for addressing campus users' data requests may include: providing access to existing reports; custom report development; providing access to and training for the enterprise BI reporting platform; providing access to and training for querying operational data from the Enterprise Data Warehouse staging layer. Additional considerations for establishing such a process include the following:

- Requests for data are inherently different than other kinds of service or support requests. Context for data and data use is fundamental to a data request. Clarifying the needs of a data request requires a conversation, including individuals with an understanding of the underlying data such that appropriate questions may be asked, the context understood, and the request refined appropriately.
- It is expected that campus users broadly will not have access to the Report Writer role in Workday, and therefore will not have the ability to use Workday report writing tools to query for data in an *ad hoc* way.
- Campus data users would benefit from a "one-stop" website—http://data.unlv.edu—that provides campus audiences with clear information and instructions for accessing campus data resources, including where to bring *ad hoc* requests. Enterprise Information Delivery should also collaborate with campus data providers to develop the content for this website, as well as recommend a broader communication plan. These efforts should inform also a training strategy that adds Workday report viewing and creation to existing UNLV Analytics report training.

- Subject area experts are expected to support Enterprise Information Delivery with knowledge exchange as requests dictate.

Following the iNtegrate 1 implementation, the strategy of developing the UNLV Enterprise Data Warehouse and BI platform was adopted to serve information delivery needs broadly for campus. With iNtegrate 2, the Workday application brings additional reporting capacity to incorporate into the UNLV enterprise information delivery strategy. Categories of reporting to be addressed include *enterprise reporting* and *operational reporting.*

- Enterprise reporting is information delivery for broad campus use. It is expected that enterprise reporting will be accomplished through a combination of Workday reporting and the continued development UNLV Analytics, supported by the UNLV Enterprise Data Warehouse.
- Operational reporting is information delivery principally for central business units in pursuit of operational efficiency. It is expected that HCM and Finance reporting will be accomplished primarily through Workday reporting tools, supplemented with operational data querying from the UNLV Enterprise Data Warehouse.

The Enterprise Information Delivery function is an area of immediate need, as it comprises staff that should be directly involved in Workday report analysis and implementation. An initial staffing recommendation is provided in Appendix D. Tasks to support both Enterprise reporting and HCM/Finance operational reporting in the context of the Workday implementation are both summarized and detailed in Appendix E.

Conclusions and Recommendations

- Re-establish the organizational alignment of the enterprise functions of data management and data warehousing (Enterprise Data Infrastructure), and business intelligence and institutional research (Enterprise Information Delivery) under the leadership of a chief data administrator with clear oversight and accountability for these functions. Selected EDW/BI resources (4.0 FTE) were moved out of Decision Support and into the Office of Information Technology in April 2016, resulting in a separation of functions that previously had been aligned.

  While specific organizational structures vary across higher education in the U.S., institutions that are leading these efforts are intentionally and increasingly structuring themselves with this kind of alignment in place. More specifically, while unit labels and report-to structures vary, the alignment of these functions correlates with EDW/BI maturity.[14] Our initial staffing recommendation for re-aligning these functions is provided in Appendix D, and some examples of how these functions are organized at other institutions are outlined in Appendix F.

  At UNLV, the AVP for Decision Support has served this "chief data administrator" role, and responsibilities have included developing a University data infrastructure that supports the key informational needs of the executive administration, as well as decision-makers at all levels of campus. This requires collaboration across academic and administrative units—especially among Information Technology and the functional areas that steward data stored on

administrative systems of record (e.g., Enrollment and Student Services, the Graduate College, Human Resources, Finance areas, etc.). The objectives of this collaboration include identifying and prioritizing informational needs, managing and leveraging data assets to meet those needs, and effectively communicating about data resources to ensure that campus data users know what tools and information are available to them. The AVP position has been staffed with an interim appointment since May 2016. We recommend conducting a national search for a permanent appointment to this position as soon as possible.

- The *UNLV Data Warehousing Fundamental Principles,* initially adopted by the iNtegrate1 Steering Committee in 2009, remain relevant in the context of iNtegrate 2 and beyond. (See Appendix A.) The first principle stipulates that the UNLV Enterprise Data Warehouse "consists of one official, comprehensive, centralized data repository providing information consistency and integration through a single, commonly defined view of institutional data." In alignment with these principles, we recommend UNLV develop a single enterprise data warehouse as the basis for executive planning and decision-making, as well as operational reporting at the enterprise level.

- Staff and reconstitute the Data Governance function, by expanding the scope of and filling the position of University Data Administrator, which has been vacant since 2009. We recommend this position leads the Enterprise Data Infrastructure function. Duties include administering UNLV's Data Governance program in accordance with the *Institutional Data Governance and Management Policy.*[15] This role provides collaborative leadership toward the delivery of clear, common data definitions to help ensure the reliability of key data elements and measures, as well as alignment with NSHE data governance efforts. The individual in this position also oversees the development of the UNLV Enterprise Data Warehouse where those data elements and measures are implemented. Reporting to the AVP for Decision Support, this is a high-level position that will work to ensure that data management activities and development of the enterprise data warehouse are consistent with institutional initiatives and priorities. As the Data Governance program at UNLV matures, we recommend explicitly adding data stewardship responsibilities to formal job descriptions of operational data stewards. An initial staffing recommendation is provided in Appendix D.

- Leverage the significant investments made in the *UNLV Analytics* platform, and if necessary, secure ongoing licensing for enterprise use of OBIEE at UNLV. Complete the build-out of college and department profile dashboards that is already underway, so that this information delivery framework may be readily expanded to deliver HCM and Finance data housed in Workday to academic units. (See Appendix B.) Develop a project plan and timeframe for upgrading to OBIEE to version 12c, which is covered under the current NSHE license. Initial steps will be to assess the resources needed, and to determine when the upgrade would best fit within the iNtegrate 2 project timeframe.

- Develop a "one-stop" website—http://data.unlv.edu—that provides campus audiences with clear information and instructions for accessing campus data resources. Various office websites exist at UNLV that describe resources provided by those offices, but a single unified description

of data resources available across the institution does not yet exist. As a result, finding the answer to "Where do I get the data I need?" is too often unclear and confusing. We recommend that the Office of Decision Support take the lead in implementing and maintaining this website, in collaboration with other units having responsibility for delivering data and information the campus.

- Adopt and proceed with the tasks outlined in the Task Summary and Schedule provided in Appendix E.

Appendix A - UNLV Data Warehousing - Fundamental Principles

The following principles were developed by the UNLV Data Warehouse Implementation Team and approved by the UNLV iNtegrate Steering Committee in 2009.

1. Data Integrity
The UNLV Data Warehouse consists of one official, comprehensive, centralized data repository providing information consistency and integration through a single, commonly defined view of institutional data.

2. Operational Effectiveness
The UNLV Data Warehouse forms the basis for executive planning and decision-making, as well as operational reporting at the enterprise level. As data are needed to support these functions, they are incorporated and optimized in the institutional warehouse.

3. Access
Data in the UNLV Data Warehouse are accessible to any UNLV employee that needs them to perform the duties of their position. Documentation, interpretation, security and training are all strategies used at UNLV to enable access among a broad range of employees.

4. User Friendliness
The development, selection, and deployment of Data Warehouse querying tools, reporting tools, and custom applications will promote usability by a wide variety of campus users of varying skill-levels.

5. Implementation and Operational Efficiency
To meet the needs of the institution as early as possible and to minimize project costs, the UNLV Data Warehouse will be straightforward and efficient to implement. Once implemented it will be easy to support, facilitate rapid responses to business change requests and exceptions, and incur moderate support costs over the life of the data warehouse.

6. Institutional Consensus
Consistent with these principles, UNLV recognizes the fundamental roles of user input and collaborative stewardship among the following roles:

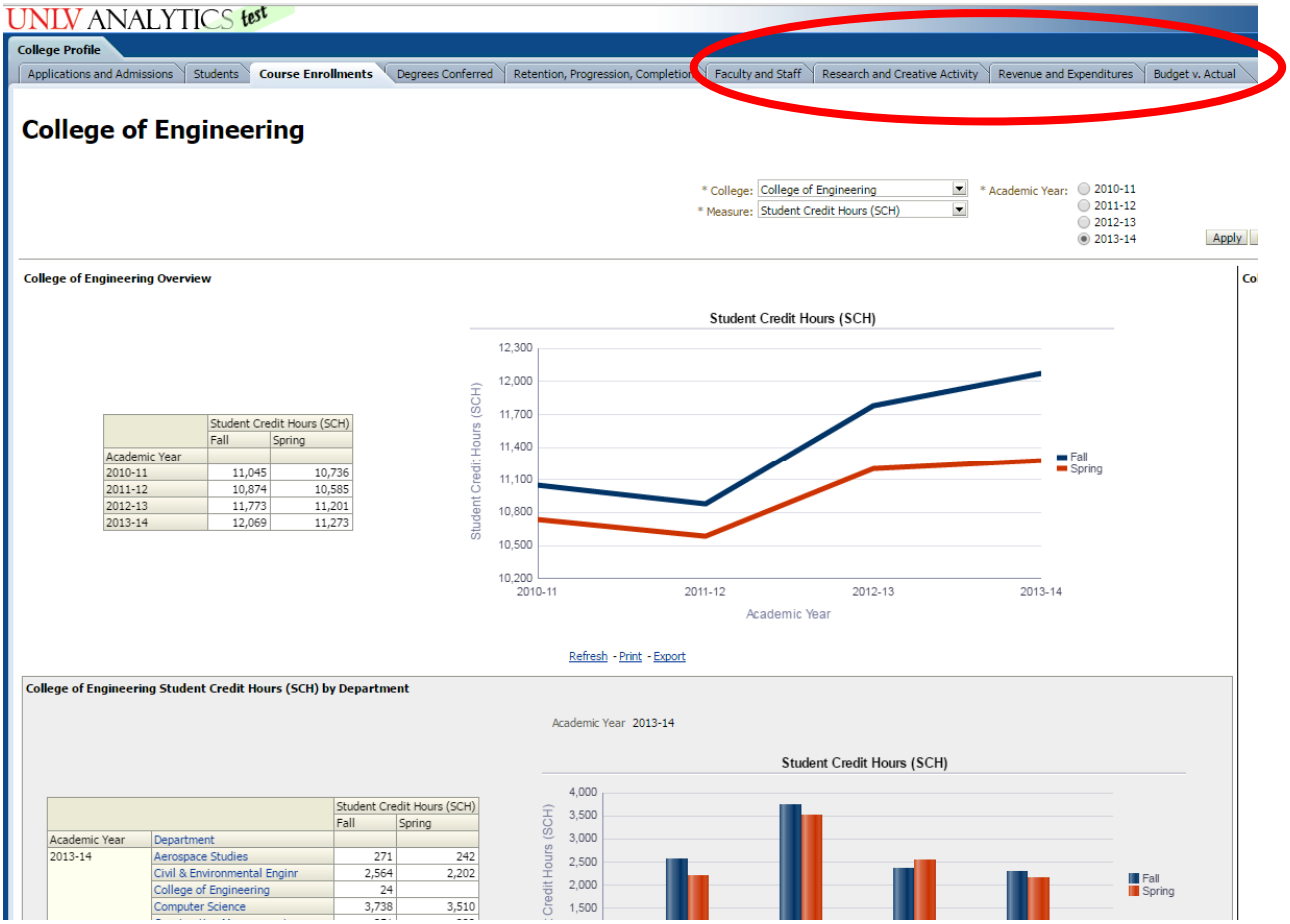
a. Institutional Warehouse Stewardship: Steward(s) of the UNLV Data Warehouse is (are) responsible for the logical design of the warehouse, assessing which data are included, and for achieving data quality through coordination among operational stewards, technical stewards, and the Data Governance Council. The Institutional Steward(s) structure data appropriately for querying, reporting, and analysis through the development and management of warehouse ETL (extract, transform, and load) processes.

b. Technical Warehouse Stewardship: Technical Stewards are responsible for managing and maintaining the UNLV Data Warehouse technical environment, including server administration, software updates, implementing backup and recovery strategies, and optimizing data storage and retrieval.

c. Operational Data Stewardship: Operational Stewards are responsible for providing documentation, training, and timely communication to support the proper interpretation of the data originating in the systems under their charge. They provide their expert opinions on which data should be included in the institutional warehouse and on how to structure warehoused data and build in interpretive value to ensure accessibility to UNLV employees.

Appendix B - College Profiles Dashboard in UNLV Analytics

The below image shows a screen capture of the College Profiles dashboard currently under development in the UNLV Analytics test environment. New dashboard page tabs, presently without content, have been added to illustrate how Workday data can be incorporated into this framework for information delivery at the college level. A similar Department Profiles dashboard is also under development.



Appendix C - Example Data Definitions

The below definitions are sourced from the UNLV Data Dictionary, which may be accessed online at https://ir.unlv.edu/dd.

Example 1 (Simple):

Age

The number of years a person has lived since birth.

Interpretation / Usage Notes

Age is computed as of the date that the data are captured (e.g., the snapshot or census date).

Potential Values

A positive integer, usually less than 100.

Source System

PeopleSoft Campus Solutions

Source Description

Age is computed as the number of months between the date of data capture and the Date of Birth (PS_PERSONAL_DATA.BIRTHDATE), divided by 12, disregarding the remainder.

See Also:

- Date of Birth

Example 2 (Complex):

Race/Ethnicity - IPEDS Reporting

A code or description associated with one of the mutually-exclusive IPEDS race/ethnicitiy reporting categories.

Interpretation / Usage Notes

In its central warehouse implementation, Race/Ethnicity - IPEDS Reporting is stored as a five-character code. In reporting implementations, the code may be translated and displayed as a corresponding description.

The National Center for Education Statistics, an agency of the U.S. Department of Education, provides definitions for each of the race/ethnicity codes as part of the Integrated Postsecondary Education Data System. Those definitions may be found at the following web page:

http://nces.ed.gov/ipeds/reic/definitions.asp

Potential Values

Codes and their corresponding descriptions are as follows:

AIAKN - American Indian or Alaska Native
ASIAN - Asian
BLACK - Black or African American
HISPA - Hispanic of any race
PACIF - Native Hawaiian or Other Pacific Islander
NONRS - Non-resident alien
MULTI - Two or more races
WHITE - White
UNKWN - Unknown race and ethnicity

Source System

PeopleSoft Campus Solutions

Source Description

Ethnicity assignments for people are operationally stored in the PS_DIVERS_ETHNIC table. One or more entries may be recorded for an individual (identified by EMPLID) in this table, each representing a different ethnicity assignment with the applicable ethnicity codes stored in the ETHNIC_GRP_CD field.

In addition, the IPEDs Ethnicity designation requires determining whether a person is a non-resident alien. Operationally, non-resident aliens are recorded as having an effective VISA permit in the PS_VISA_PMT_DATA table of a type identified by a VISA_PERMIT_CLASS value of "V" (which is found in the related PS_VISA_PERMIT_TBL table). Both tables are effective-dated. Excluded from this list are those people who are already marked as being a US citizen with the existence of a record in the PS_CITIZENSHIP table for their EMPLID values, in which the COUNTRY field is coded 'USA' and the CITIZENSHIP_STATUS field is coded '1'.

The following SQL demonstrates one way to query the transactional PS_VISA_PMT_DATA, PS_VISA_PERMIT_TBL, and PS_CITIZENSHIP tables to retrieve a listing of EMPLID values for individuals who are interpreted as non-resident aliens according to the IPEDS definition. Effective-dated coding is applied for PS_VISA_PMT_DATA and PS_VISA_PERMIT_TBL:

```
SELECT distinct v1.EMPLID
FROM
(Select *
from PS_VISA_PMT_DATA x
Where X.Effdt = (Select Max(X_Ed.Effdt) From Ps_Visa_Pmt_Data X_Ed
Where X.Emplid = X_Ed.Emplid
And X.Dependent_Id = X_Ed.Dependent_Id
And X.Country = X_Ed.Country
```

```
And X.Visa_Permit_Type = X_Ed.Visa_Permit_Type
And X_Ed.Effdt <= SYSDATE )
) V1
INNER JOIN
(
Select *
From Ps_Visa_Permit_Tbl X
Where Visa_Permit_Class = 'V'
And X.Effdt =(Select Max(X_Ed.Effdt) From Ps_Visa_Permit_Tbl X_Ed
Where X.Country = X_Ed.Country
And X.Visa_Permit_Type = X_Ed.Visa_Permit_Type
And X_Ed.Effdt <= SYSDATE )
) V2 On V1.Country = V2.Country
And V1.Visa_Permit_Type = V2.Visa_Permit_Type
WHERE
-- list only those visa holders who are not already marked as
-- being US citizens
V1.Emplid Not In
(Select Emplid
From Ps_Citizenship
Where Country = 'USA' And Citizenship_Status = '1'
)
```

With Ethnicity codes from the ETHNIC_GRP_CD field in the PS_DIVERS_ETHNIC table, and a determiniation of non-resident alien status, the following logic is applied in the order of the listed steps to determine the appropriate IPEDS race/ethnicity category:

1. If the person is identified as a non-resident alien, the individual is assigned the IPEDS category "Non-resident Alien".

2. If the person is recorded with the Hispanic ethnicity (the 'HISPA' code in the ETHNIC_GRP_CD field) the individual is assigned the IPEDS category "Hispanic". This assignment occurs regardless of other ethnicites for which the person may also be recorded.

3. If the person is recorded with more than one non-Hispanic ethnicity, the individual is assigned the IPEDS category "Two or more races".

4. If the person is recorded with a single ethnicity among the following, the respective IPEDs category is assigned:
'AIAKN' - "American Indian or Alaska Native"
'ASIAN' - "Asian"
'BLACK' - "Black or African American"
'PACIF' - "Native Hawaiian or Other Pacific Islander"
'WHITE' - "White"

5. If the person fits none of the above cases, the individual is assigned the IPEDS category "Unknown race and ethnicity".

See Also:

- Is Hawaiian/Pacific Islander
- Is White
- Number of Ethnicities
- Is Hispanic
- Is Black
- Is Asian
- Is Nonresident Alien
- Is American Indian/Alaskan Native
- Race/Ethnicity - IPEDS Reporting (without Non-resident Alien)
- Is US Citizen

Appendix D - Initial Staffing Recommendation

FTE	Position	Description	Existing Position(s)	New Position /Cost
1.0	AVP	Leads the institution's enterprise data management and information delivery program by overseeing the Decision Support function. The Decision Support function is responsible for: guiding decision makers at all levels of the institution to appropriate sources of data for informational needs; and developing a data management infrastructure that supports institutional informational needs.	1.0 AVP of Decision Support (Christina Drum, interim)	
1.0	Administrative Assistant	Administrative support for the enterprise data management and information delivery program.	1.0 Administrative Assistant 4 (Theresa Farmer)	
1.0	Application Developer	Programming support for applications supporting all Decision Support functions.	1.0 Decision Support Application Developer (Dmitrii Karaulanov)	
3.0	***Director-level positions*:** University Data Administrator Director, Enterprise Information Delivery Director, Institutional Research	The University Data Administrator leads the Enterprise Data Infrastructure function. This includes: administering the UNLV data governance program to ensure clarity and reliability of data elements and measures; and overseeing the development of the UNLV Enterprise Data Warehouse where those data elements and measures are implemented. The Enterprise Information Delivery director is responsible for ensuring that the UNLV Enterprise Data Warehouse is leveraged effectively to make data accessible for decision makers across campus. The director administers and oversees development of the Enterprise Information Delivery platform, with reports and dashboards built to help campus users access meaningful data. The Institutional Research director coordinates statutory and other external reporting, and supports university administrators and faculty with research, strategic planning, and analysis of institutional and comparative data, in support of institutional goals, decision-making, and policy formation.	1.0 University Data Administrator (Vacant since 2009). 1.0 Director of Enterprise Data Warehousing and Business Intelligence (formerly Mike Ellison/presently Viki Kazee). This position was moved from the Office of Decision Support to OIT in 4/2016. 1.0 Director, Institutional Research (Vacant – search underway) 1.0 Manager, IR Analytics and Metadata (Christina Drum, presently also serving as Interim AVP)	

FTE	Position	Description	Existing Position(s)	New Position /Cost
3.0 - 4.0	***Enterprise Data Infrastructure staff*:** Data Warehouse Manager Data Warehouse Modelers/Developers/ Architects	Reporting to the University Data Administrator, manager/developers work with campus information leaders and data stewards to: understand campus informational needs; define critical data elements and measures in support of campus informational needs; and implement those data elements and measures centrally in the UNLV Enterprise Data Warehouse.	1.0 Senior DW/BI Developer/Analyst (Jonathan Blake) 1.0 DW/BI Developer/Analyst (Sunita Patnaik) 1.0 DW/BI Developer/Analyst (Vacant) These positions were moved from the Office of Decision Support to OIT in 4/2016.	
2.0 – 4.0 0.0 – 2.0 2.0 – 3.0	***Enterprise Information Delivery and Institutional Research staff:*** BI Report/Dashboard Analyst/Developers BI Training/Support Professionals Institutional Research Professionals	Reporting to the Enterprise Information Delivery director, developers design and build institutional reports and dashboards. In addition to developing the Enterprise Information Delivery platform and decision support websites as campus resources, developers also use Workday reporting tools where appropriate. Trainers are accountable for designing and implementing a training and support program to ensure campus employees may leverage institutional reports, reporting tools, and dashboards effectively. Potential efficiencies in aligning training and support with existing organizational units should be investigated in determining the assignment of FTE. Institutional Research professionals conduct analysis and research, analyze trends, prepare forecasts to inform decisions and assess the effectiveness of strategic initiatives. IR staff work with the Director of IR to prepare statistical and analytical reports on faculty, staff, and students, develop innovative methods for conveying information, and disseminate official results to appropriate campus audiences.	1.0 BI Developer/Analyst (Ke Yu) 1.0 IR/BI Analyst (Vacant – search underway) 1.0 Research Analyst / Statistician (Vacant – formerly Tondra De) *Note: Current staff identified under Enterprise Data Infrastructure above were also engaged in report/dashboard development in Decision Support. The DW/BI position titles reflect the combined duties of these positions. The IR/BI Analyst position similarly reflects staffing efficiencies gained through the overlap with institutional research.*	Dedicated BI training and support resources do not presently exist. A minimal training and support effort has been maintained by current Decision Support staff. Recommended positions: Information Delivery Training/Support (1.0 fte, $85K) Two additional BI Developer/Analyst staff (2.0 fte @ $85K)

FTE	Position	Description	Existing Position(s)	New Position /Cost
	Technical Environment Administration/Support staff:	Reporting may either be to the University Data Administrator or central OIT.	Senior PeopleSoft Administrator (Jeff Chlebowy, OIT)	
0.5 – 1.0	Systems Administrator	The Systems Administrator maintains the application server environment supporting the UNLV Enterprise Data Warehouse and Enterprise Information Delivery platforms; and coordinates with other IT units on issues of security, network utilization and operations management. The Database Administrator (DBA): maintains the database server environment supporting the UNLV Enterprise Data Warehouse, working closely with data warehouse developers toward optimal performance; ensures database security and operations such as data backup and recovery.	Senior Database Administrator (Qinglan Zhao, OIT) *Note: At present, these are FTE positions not dedicated to UNLV Enterprise Data Warehouse/ Information Delivery support. The current professionals assist with technical environment support among their other duties. We recommend that a firm FTE amount dedicated to UNLV Enterprise Data Infrastructure/ Information Delivery support be assigned and recorded in PDQs.*	
0.5 – 1.0	DBA Administration			

Appendix E - iNtegrate 2 Information Delivery Task Summary and Schedule

Task Summary

This is a summary of tasks supporting enterprise information delivery and data infrastructure within the context of the Workday implementation. It is organized into two tracks: Track 1. Enterprise reporting, and Track 2. HCM & Finance operational reporting, which will take place concurrently.

The table following this summary associates tasks with schedule, and identifies responsible point persons and involved persons. The table in Appendix D describes recommended Enterprise Information Delivery and Enterprise Data Infrastructure staff.

Track 1: Enterprise reporting

- Identify Enterprise Information Delivery staff, and engage as soon as possible in the following:
    - Workday Report Writer training
    - Workday Standard Report analysis
    - Workday business processes and data analysis
    - Reporting lane meetings, and other Workday meetings relevant to data understanding
- Secure updated licensing and installation for OBIEE as UNLV's Enterprise Information Delivery platform
- Outline informational interests entailing HR, Finance, and Student data, aligned with strategic goals for UNLV. Prioritize and establish projects for each.
- For each project, Enterprise Information Delivery and Data Infrastructure staff conduct the following:
    - Identify the intended audience
    - Assess if Workday has a standard report that is suitable for the informational interest
    - If not, draft a prototype of a report/dashboard suitable for the informational interest
    - List elements and measures required and work with Workday staff to define and implement in the UNLV Enterprise Data Warehouse
    - Build, test, and deploy the report/dashboard using Workday Report Writer or the UNLV Business Intelligence platform, whichever is appropriate for the given project.
    - Assess and verify the appropriate access for the given audience

- Establish a sustainable process for campus users to request data and stewardship for coordinating a response.
- Establish a training and communication strategy.

Track 2: HCM & Finance operational reporting

- Enterprise Information Delivery, Enterprise Data Infrastructure, and IT Integrations staff work together to define, document, and build the HR and Finance subject areas in the staging layer of the UNLV Enterprise Data Warehouse. This collaboration is necessary to ensure that the staged operational data are well understood and support both information delivery and system-to-system data integrations. These operational data also directly support the integration of data across HR, Finance, and Student subject areas as well as elements and measures derived for Enterprise reporting.
- UNLV HCM and Finance report interest inventory has been established and categorized by subject area, informed primarily by central business units.
- Enterprise Information Delivery and the Workday reporting lead conduct interviews with current FOCUS users outside central business units to identify informational needs presently being addressed with HR and Finance data. Incorporate results into the UNLV HCM and Finance report interest inventory.
- Identify report development teams for each subject area among Enterprise Information Delivery staff and Workday subject matter experts as per the UNLV Workday Report Development Plan.
- With coordination from the Workday Reporting lead, report development teams engage to assess the reports from the UNLV report interest inventory in their subject area and determine how individual interests may be addressed: through a Workday standard report, a custom developed report, through Data Infrastructure development (e.g. a report requires integration with Student data), or whether a report for an interest is no longer needed.
- Report development teams develop custom reports and work with the Workday reporting lead (who works with NSHE) for deployment and access.

iNtegrate 2 Information Delivery Task Schedule

Ref	Schedule	Track	Point Person	Involved Persons	Task	Comments
10	Present – November 2016	Enterprise Reporting	AVP, Decision Support	University leadership; Workday project leadership; Enterprise Information Delivery; Workday reporting lead	Outline informational interests entailing HR, Finance, and Student data, aligned with strategic goals for UNLV. Prioritize interests and define projects to correspond with each.	Deliverables: a recorded list of prioritized reporting projects for development through the Workday go-live, maintained by the AVP.
20	Present – December 2016	Enterprise Reporting	AVP, Decision Support	Purchasing; Enterprise Information Delivery	Secure updated licensing for UNLV's Enterprise Information Delivery platform	
30	Present – February 2017	Enterprise Reporting	Enterprise Information Delivery; OIT	AVP, Decision Support; OIT staff; Enterprise Data Infrastructure staff	Secure updated installation for UNLV's Enterprise Information Delivery platform	If necessary; Licensing was originally managed by NSHE during the iNtegrate1 implementation.
40	Present – October 2016	HCM/Finance Reporting	Enterprise Information Delivery; Workday reporting lead	UNLV Subject Area experts	Conduct interviews with current FOCUS users outside central business units to identify informational needs presently being addressed with HR and Finance data. Incorporate results into the UNLV HCM and Finance report interest inventory.	
50	Present – October 2016	HCM/Finance Reporting	Workday reporting lead	UNLV Workday project leadership; Enterprise Information Delivery; AVP, Decision Support	Identify report development team participants among Enterprise Information Delivery and Data Infrastructure staff, and UNLV subject area experts	UNLV's HCM and Finance report interest inventory has been established and categorized by subject area. One HR subject matter expert has been identified for the HCM reporting area.

60	October – November 2016	Both	Workday reporting lead	Workday Report Development Teams	Assess means for addressing HCM/Finance report interests.	Report development teams engage to assess the reports in their subject area lists and determine how the report may be addressed: through a Workday standard report, a custom developed report, through Data Infrastructure development (Enterprise Data Warehouse), or whether the report is no longer needed. The Reporting Lead coordinates among the teams.
70	October 2016 – March 2017 *	HCM/Finance Reporting	Workday reporting lead	Workday Report Development Teams	Develop HCM/Finance reports as assessed.	Report development teams build custom reports using Workday reporting tools and coordinate with the Reporting Lead (who coordinates with NSHE) for deployment. The Reporting Lead tracks and communicates progress. *Note: The March 2017 completion target is intended to correspond with the P3 build. Deliverables: developed, tested, and deployed Workday reports.
80	November – December 2016	Enterprise Reporting	AVP, Decision Support, Enterprise Information Delivery	Enterprise Data Infrastructure staff; Workday reporting lead;	Assess prioritized enterprise reporting projects	Determine if a reporting project will be satisfied through Workday reporting tools, or requires Enterprise Data Warehouse support.

90	December 2016 – January 2017	Enterprise Reporting	Enterprise Information Delivery; University Data Administrator	Enterprise Data Infrastructure staff;	Prototype reports/dashboards and define dimensional models corresponding to information delivery projects selected for development.	This is applicable for information delivery projects that require the Enterprise Data Warehouse. Deliverables: a design and entity map to inform development.
100	December 2016 – January 2017	Enterprise Reporting	AVP, Decision Support; Enterprise Information Delivery	UNLV Subject Area experts; Workday Reporting lead	Prototype reports/dashboards for prioritized information delivery projects.	This is applicable for information delivery projects that can be satisfied through Workday reporting tools. Deliverables: sketches of intended reports and verification of reporting elements required.
110	Present – February 2017	Both	University Data Administrator; Workday Integrations lead;	Enterprise Data Infrastructure and Information Delivery staff; Workday Integrations staff; Workday Reporting lead; AVP, Decision Support; UNLV Subject Area experts	Define and document the HR and Finance staging layer of the UNLV Enterprise Data Warehouse.	Work is underway to identify elements that support integrations. Additional staging layer design should be informed by UNLV strategic informational goals, efforts to establish data definitions, and dimensional modeling requirements. Deliverables: staging layer data models for HCM and Finance data; recorded definitions in the UNLV data dictionary

120	Present – May 2017	Both	University Data Administrator; Workday Integrations lead	Enterprise Data Infrastructure and Information Delivery staff; Workday Integrations staff; Workday Reporting lead; UNLV Subject Area experts	Develop ETL processes to build the HR and Finance staging layer of the UNLV Enterprise Data Warehouse.	ETL stands for "Extract, Transform, and Load". ETLs are the data warehousing programs that copy and process data. Deliverables: developed, tested, and deployed ETL processes; populated HCM and Finance data structures in the staging layer of the UNLV Enterprise Data Warehouse
130	January - February 2017	Enterprise Reporting	AVP, Decision Support; Enterprise Information Delivery	Concierge office	Establish a sustainable process for campus users to request data (*ad hoc*) and stewardship for coordinating a response	The established process should clarify accountability for receiving and assessing requests, and responsible offices for supporting coordinated responses.
140	January – February 2017	Enterprise Reporting	Enterprise Information Delivery; AVP, Decision Support;	Concierge Office	Establish information delivery training and communication strategy	
150	January – June 2017	Enterprise Reporting	University Data Administrator	Enterprise Information Delivery and Data Infrastructure staff; UNLV Subject Area experts	Develop ETL processes to build the dimensional models in the Enhanced layer of the UNLV Enterprise Data Warehouse for selected information delivery projects.	This is applicable for information delivery projects that require the Enterprise Data Warehouse. Deliverables: developed, tested, and deployed ETL processes; populated dimensional models in the Enhanced layer of the UNLV Enterprise Data Warehouse

160	January – March* 2017	Enterprise Reporting	Enterprise Information Delivery	UNLV Subject Area experts; Workday Reporting lead; representatives from report Audiences	Develop Workday reports/dashboards for prioritized information delivery projects.	This is applicable for information delivery projects that can be satisfied through Workday reporting tools. Deliverables: developed, tested, and deployed Workday reports. *Note: The March 2017 completion target is intended to correspond with the P3 build.
170	January – September 2017	Enterprise Reporting	Enterprise Information Delivery	UNLV Subject Area experts; Workday Reporting lead; representatives from report Audiences; Enterprise Data Infrastructure staff	Develop reports/dashboards for prioritized information delivery projects through the Enterprise Business Intelligence reporting platform.	This is applicable for information delivery projects that require the Enterprise Data Warehouse. Deliverables: developed, tested, and deployed BI repositories, and BI reports/dashboards;

Appendix F – Examples of Decision Support Organizations at Other Institutions

Institution[16]	**Unit encompassing Decision Support Functions**	**Description**
University of Arizona	University Analytics and Institutional Research	Led by the Executive Director of UAIR, reporting to the Senior Vice President, Academic Affairs and Provost. Aligns University Analytics (enterprise data warehousing, business intelligence, and information delivery) and Institutional Research functions.
University of Central Florida	Division of Institutional Knowledge Management	Led by the Associate Provost, Academic Program Quality and Associate Vice President, reporting to the Provost and Executive Vice President. Aligns Institutional Research with Analytics, Strategic Planning, and Enterprise Decision Support, which includes responsibility for the enterprise data warehouse and university BI environment.
Georgia State University	Office of Institutional Effectiveness	Led by the Associate Provost of OIE, reporting to the Provost. Aligns Decision Support Services (enterprise data warehousing, enterprise business intelligence platform) and Institutional Research functions.
University of Washington	Division of Information Management	Led by the Associate Vice President for Information Management, reporting to the Vice President for UW Information Technology and Chief Information Officer. Aligns Enterprise Information, Integration, and Analytics (unit that maintains the UW Enterprise Data Warehouse, Enterprise Integration Platform, and central business intelligence products) with institutional data governance.

University of Notre Dame	Division of IT Service Delivery	Led by the Senior Director, reporting to the Vice President and Chief Information and Digital Officer. Aligns Data Stewardship (institutional data governance) with Metrics and Enterprise Architecture
Purdue University	Business Intelligence Competency Center	Led by the Director of BICC, reporting to the Associate Vice President for IT Application Services and Deputy Chief Information Officer. Aligns enterprise data warehousing, information delivery, and BI Governance (institutional data governance). Co- leads institutional data governance efforts together with the Chief Data Officer (head of the Office of Institutional Research, Assessment, and Effectiveness, reporting to the Vice President for Information Technology and System CIO).
Michigan State University	Enterprise Information Stewardship	Led by the Director of EIS, reporting to the Chief Information Officer. Aligns Data Stewardship (institutional data governance), Data Warehouse/Data Integration (enterprise data warehousing), and Business Intelligence & Analytics (enterprise information delivery).
University of Pennsylvania	Application & Information Services	Led by the Executive Director of Application & Information Services, reporting to the Vice President of Information Technology & University Chief Information Officer. Aligns Data Administration (data governance and enterprise data warehousing) with Data Analytics (enterprise information delivery)

Notes and Citations

[1] Whitaker, L. & McGuire, B. (2015) *Developing and Supporting Analytics Initiatives: Insights and Benchmarks for BI in Higher Education*. The Advisory Company (EAB).

[2] *Ibid.*

[3]During the past twelve months, UNLV Analytics has served 54,010 total queries to 165 distinct individuals, which translates to approximately 4,500 queries per month or 200 queries per day. These figures include data presented pre-defined reports on dashboards, as well as custom reports build using the querying tool, which supports data exploration and discovery at the unit level. To support this usage, in collaboration with operational data stewards, over *250* informational elements have been defined and recorded in the UNLV Data Dictionary.

[4] Mosley, M., Brackett, M., Earley, S. & Henderson, D. (2010) *The DAMA Guide to the Data Management Body of Knowledge, First Edition.* DAMA International, p. 7.

[5] Whitaker, L., Danchisko, K., and Nelson, C. (2015) *A Common Currency: Achieving Excellence in Data Governance and Adoption of Analytics.* The Advisory Company (EAB).

[6] UNLV's Institutional Data Governance and Management Policy may be referenced at https://ir.unlv.edu/IAP/Files/UNLV_Data_Governance_Policy.aspx.

[7] Whitaker, L. *A Common Currency*, p. 9.

[8] In particular, the University of Notre Dame has developed a useful opt-in model for managing conversations around data definitions. See Whitaker, L. *A Common Currency*, *pp. 38-41.*

[9] Where helpful, technical language and/or SQL code may be used to supplement the source description of a definition, for the benefit of more technical audiences.

[10] These classifications are further described in UNLV's Institutional Data Governance and Management Policy, which may be referenced at https://ir.unlv.edu/IAP/Files/UNLV_Data_Governance_Policy.aspx.

[11] Kimball, R., & Ross, M. (2010). *The Kimball Group Reader.* Indianapolis, IN: Wiley Publishing, Inc., p. 13.

[12] Inmon, W. H. (2005). *Building the Data Warehouse, Fourth Edition.* Indianapolis, IN: Wiley Publishing, INC., p. xxi.

[13] Barlow, L. (2016, April). *When Institutional Research Leads the Data Warehouse*. Presented at the Presented at the Higher Education Data Warehousing (HEDW) Conference, Rochester, NY.

[14] Whitaker, *Developing and Supporting Analytics Initiatives*, p. 18.

[15] UNLV's Institutional Data Governance and Management Policy may be referenced at https://ir.unlv.edu/IAP/Files/UNLV_Data_Governance_Policy.aspx.

[16] This is not intended to be a comprehensive listing. It is primarily sources from the Higher Education Data Warehousing (HEDW) Forum at http://hedw.org.