Enterprise Data Warehouse Initiative

EDW Planning Project – Phase I

Final Report

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Presented by the

Data Stewardship Council

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PURPOSE

As an outgrowth of the Chancellor's initiative for data integration, the Vice Chancellor for Budget and Finance, the Data Stewardship Council and IST have undertaken the Enterprise Data Warehouse (EDW) Planning Project to assess the feasibility, challenges and potential benefits of developing a unified, comprehensive data utility that will serve the entire campus community as a tool for day-to-day operations, decision making and planning, helping us to account for, leverage and focus our resources more effectively.

The campus currently has several independent data warehouses in various stages of development that collect data in limited domains. In contrast, an EDW would integrate data from the broad spectrum of campus information systems and warehouses so that the data could be used to meet a wide variety of needs.

Schematic of UC Berkeley's Enterprise Data Warehouse
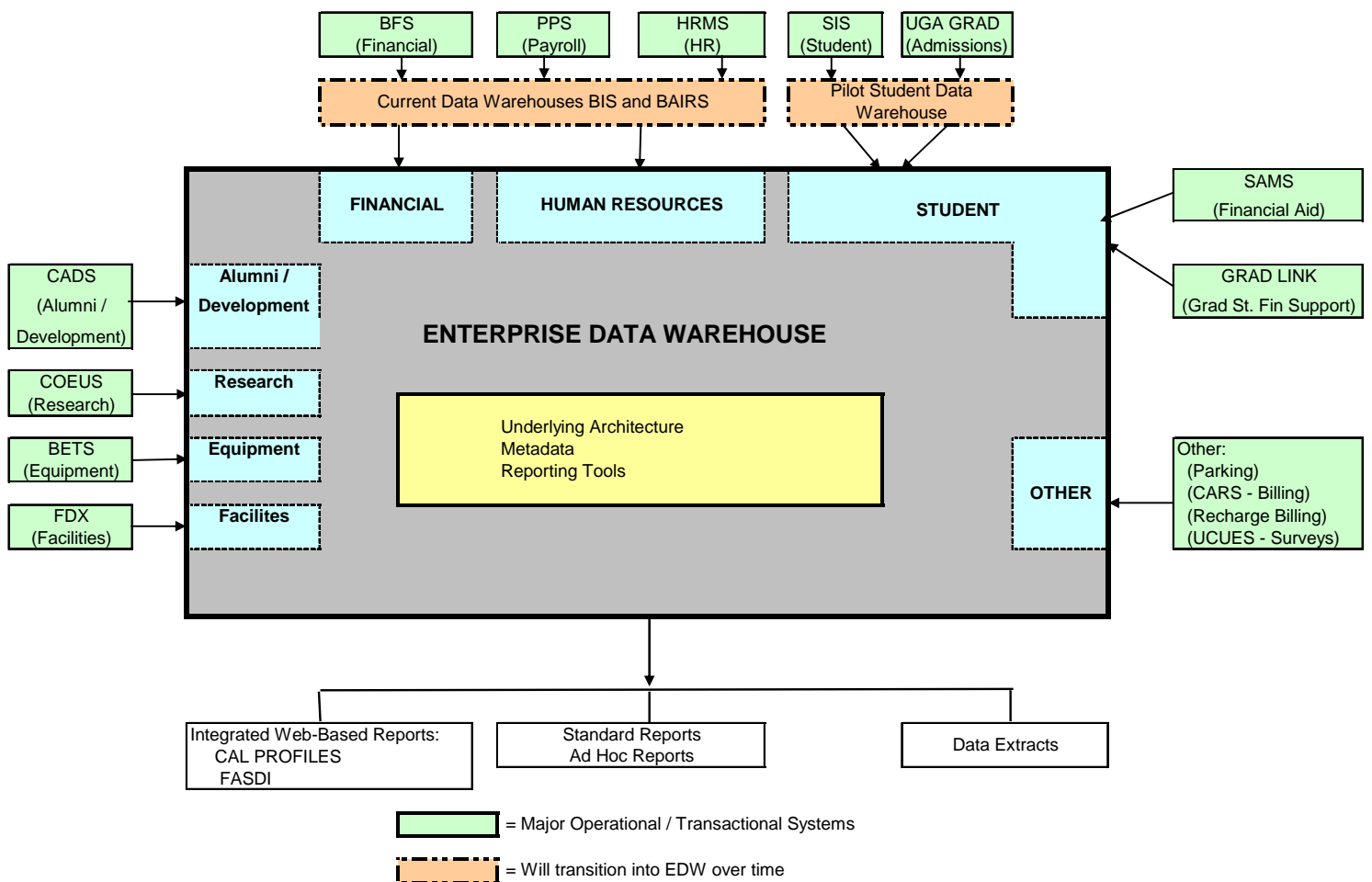
Phase I of the project has explored the institutional need for an EDW through interviews with over 55 campus leaders in all facets of campus operations (See list in Appendix). This report synthesizes the opportunities they have identified and the criteria by which they will measure the success of an EDW.

We present these findings as a tool for reaching consensus about the value of investing in an EDW. This document provides information about specific opportunities so that the campus can determine priorities for implementation of this shared campus resource over the next several years. Assuming we have continued approval to move ahead, the EDW planning team will develop an architecture framework for the EDW and an implementation strategy informed by the campus' priorities. The EDW will be implemented in stages over several years.

Building an enterprise data warehouse is a business initiative, not only nor even principally a technical initiative. Planning and delivering the EDW will require continued close partnership of campus functional and technical personnel, drawing skills and participation from across a variety of campus units. The EDW architecture needs to account not only for the required technical components, but also for the business processes of understanding and defining information and creating standard reports and other facilities for delivering it to the campus. Success will require collaboration of campus data experts, data proprietors and a variety of technical specialists. The authority to mandate this sort of cooperation resides with executive management and is needed in order to ensure that everyone involved in the process remains committed to moving ahead.

We know that this is both doable and of great benefit. Many major universities either have successfully implemented enterprise data warehouses or have current EDW initiatives. Some universities, among them MIT and Rennsalaer Polytechnic Institute, have mature enterprise data warehouse initiatives which have been growing and delivering value to their institutions for many years. Those warehouses naturally reflect the priorities of the respective institutions. However, there is substantial commonality in approach, architecture and content. As a result, these successful initiatives provide guidance for EDW implementation at UC Berkeley.

II

BACKGROUND

Unmet Needs: Recognizing that the campus has unmet data needs and that separate campus units have inconsistent and incompatible systems, the Chancellor's Cabinet in 2000 made data integration one of the top campus priorities. In response to the call for more and better information in every aspect of campus operations, the Vice Chancellor for Budget and Finance has commissioned this study to define our needs and to learn how and to what extent an EDW will help to meet those needs.

Vision for the EDW: The vision for the EDW is that it will provide information that is secure, accurate, timely, consistent, integrated, appropriately detailed, well-organized, and easy to obtain so that people throughout the campus—staff, faculty, researchers, and executive-level administrators—will be better able to assess their needs, set priorities, understand the impact of change and fulfill their programmatic responsibilities more efficiently.

Changing Operational Environment: Over the last several decades, campus operations have become extremely complex, as the traditional model of primary state support has been supplanted by one of funding from a multitude of sources, our regulatory obligations have significantly increased, and we have increasingly come to carry out our mission through cross-functional and interdisciplinary systems, units and activities, among other changes.

Our supporting information infrastructure has not kept pace. In the decentralized campus environment, individual units and organizations have met their own specific operational needs by developing their own information management systems, creating a plethora of systems that are duplicative in many ways, are not widely accessible, do not interact effectively, and contain data that are inconsistent and incompatible from one system to the next. As decision-making, planning and resource allocation have become increasingly cross-functional and interdependent, we have been hampered by the limitations of our technical environment.

In contrast, an EDW would enable decision makers throughout the campus—from those at the department level through those at the campus level—to pull data from disparate systems and analyze these data using tools and software (current and yet-to-be-developed) most suited to their needs. With the information an EDW would make available, for example, we could better evaluate how programs have performed in the past and predict how changes would affect these programs.

Current Systems: As mentioned above, the campus already has several data warehouses: BAIRS (Berkeley Administrative Initiatives Reporting System), BIS (Berkeley Information Systems), FASDI (Facilities and Spatial Data Integration), CalProfiles. BAIRS and BIS deliver information about general ledger, budget, payroll and human

resources. FASDI provides information about facilities and space management to support operations, decision-making and institutional reporting. CalProfiles provides aggregate data primarily to support resource allocation and program planning decisions.

Each of these data warehouses was developed independently. It isn't easy to combine data across them. Despite their limitations, these systems have demonstrated that it is both possible and desirable to make information available in ways that are valuable to business and academic units throughout the campus. They are used by more than 1,500 people in 300 departments.

The Student Data Warehouse (SDW), currently being piloted, also promises to deliver information effectively to a broad user base. This warehouse is under development with the expectation that it can become part of an EDW.

The success of the data warehouses now in operation has elicited a volume of requests for more such information from many levels of campus organization. Many feel that the campus will benefit from a broader, more versatile data warehouse.

A Shared Campus Resource: While the architecture is not yet defined, we anticipate that an EDW would provide an umbrella structure for linking and expanding information from existing systems to support reporting and analysis. Such a structure would be a shared campus resource that would increase the yield from existing systems and deliver integrated information in a form that would be useful for everything from day-to-day operational decision making to long-range strategic planning.

From a technical point of view, an EDW would be different from the data warehouses and information systems that we now have on the campus and would add new capacity, as follows:

- It would provide the underlying architecture to support any of our data warehouses or campus systems and to securely integrate data from different warehouses and systems.
- Its flexible underlying architecture would make it easier to add information from various systems, and incorporate new technology, thus increasing our operational flexibility.
- It would enable users to easily look not only at current data but also at data associated with selected points in time (e.g., census, monthly, year-end, etc.) to better understand how data has changed (trends, comparisons) for purposes of planning and analysis.
- It would deliver information faster by eliminating the time and effort required to reconcile differences in data or to merge data held in independent systems.

III

COMMON THEMES

Campus leaders offered abundant evidence of the need for an EDW, articulating the following common high-level themes:

Decision Making and Analysis: Few campus operational systems have been designed to support analysis, and it is difficult to gather and integrate data from these transactional systems for analytical purposes, because the data definitions and structures are inconsistent. Having a campuswide data warehouse that we carefully maintain, with consistent definitions and business rules for the data, would reduce the wasteful effort we must spend to gain access to and reconcile data. For example, one of the responsibilities of the Vice Chancellor—Budget and Finance is to negotiate budget allocations with the UC Office of the President (UCOP). The Vice Chancellor spends a considerable amount of time reconciling and understanding differences between data derived at the system office versus campus numbers. Developing an EDW with data that all parties understand, trust and use would enable us to focus more on the implications and the impact of the data rather than on reconciling our findings.

Planning: Incremental changes can have significant consequences for the campus, and financial changes affect our ability to serve students and maintain excellence. Units need longitudinal data to calculate trends in order to project and plan for their coming needs. In the College of Letters and Science, for example, deans need to be able to track and understand trends in majors so that they can predict how many undeclared students will choose a major in their schools. An EDW can provide historical data from a variety of sources that would not otherwise be available to support planning and analysis.

Operations: For managers throughout the campus, an EDW can improve operations by providing information in a timely manner for day-to-day decision-making. For example, an EDW could help a department monitor course enrollments (e.g., number of drops/adds, and on wait-lists) compared to previous days and semesters, to determine if additional sections of a course need to be added. Also an EDW would allow departments to identify students who have not completed certain requirements (e.g., Subject A). An EDW can help managers drive change and can support the evolution of more effective processes. More examples of how an EDW can positively impact operations appear below (Section 4. Specific Opportunities for an EDW).

Security: In the absence of a robust, integrated data warehouse, people develop and maintain local shadow systems and store information on laptops, workstations, etc., putting the campus at risk for loss of confidential information, should the local systems be compromised or the equipment stolen. Having an EDW that is easy to use would reduce the need for people to store data locally and would enable us to provide physical security for servers and better control of access to data.

Institutional memory: The campus is heavily loaded with people reaching the age of retirement. Tenure in key executive positions is about five years. Often the definitions of data and the understanding of their use are kept by individual staff, many of whom will take that knowledge with them when they leave the campus. UC Berkeley needs a reliable data repository in order to maintain and effectively transfer institutional memory.

OPPORTUNITIES PRESENTED BY AN EDW

Our interviews identified 11 specific opportunities for improving campus operations by investing in an EDW. (See chart of these opportunities and their related campus constituencies, below.) These opportunities reflect the higher level themes addressed in Section 3, above, and speak to the need for an EDW to support the evolution of more effective processes. They represent areas in which an integrated data warehouse would meet substantial business needs. In many cases, some subset of these needs can be met today with existing reporting facilities. However, what is needed is a greater degree of integration among different sets of data, expanded and easier access, or both. Campus constituents want more and better information so that they can optimize planning, management and use of resources. An EDW would support operational reporting needs (day-to-day decision making) and analyses for strategic decision making and planning. In addition, the interviews identified the need for forecasting tools closely related to the data warehouse.

CONSTITUENCIES

BUSINESS PROCESSES	Academic Planning & Facilities	Academic Administration & Faculty	Budget & Finance	Business & Administrative Services	Administrative Departments	Student Affairs	Graduate Division	Research	University Relations	Facilities Services	Info Systems & Technology (IST)
Analysis of Core Operations	x	x	x			x	x	x			
Financial Analysis of Research Activity		x	x				x	x			
Curriculum & Enrollment Analysis	x	x	x			x					
Student Lifecycle Analysis	x	x	x	x		x	x		x		
Student Support Analysis		x	x			x	x	x			
Alumni & Donor Analysis		x							x		
Gift Analysis		x	x				x	x	x		
Workforce Analysis		x	x	x	x			x			x
Absenteeism Analysis			x	x	x						
Purchasing Analysis		x	x	x	x						
Recharge Analysis		x	x					x		x	x

Academic Administration includes: College/School/ORU directors, managers, analysts, and individual faculty
Budget & Finance includes: VC B&F, Budget Office, Budget & Finance IT, Office of Planning and Analysis, Financial Services, General Accounting
Business and Administrative Services includes: VC BAS, CTO BAS, Human Resources, Business Services

Summaries of opportunities presented by an EDW appear below. Full descriptions of each opportunity may be found in the Appendix. We anticipate that these findings will serve as the basis for setting action priorities. It is important to note that there are likely to be more opportunities as yet uncovered, and as time goes on, we will identify new opportunities.

1. **Analysis of Core Operations**

    An EDW will improve financial planning and management of core operations by integrating data from many campus sources – financial, instructional, human resources and student data - so that we can better analyze how resources are used in delivering core instructional, research, and public service activities. Integrated analysis will also enable us to allocate limited resources more strategically to meet core goals.

2. **Financial Analysis Of Research Activity**

    Research is one of the core functions of the campus; it represents close to a third of the economic activity of the campus. An EDW will improve our ability to:

    - Provide current information for analysis and reporting of research spending, grants awarded and grant applications.
    - Provide for day-to-day decision needs for managing multiple projects supported by multiple sources of funds.
    - Report all research activity, whether funded by grants, gifts or central funding. Account for interdisciplinary issues so that academic units can see real research results for their area.
    - Understand the grant and gift pipeline and forecast resources available to support research.

3. **Curriculum And Enrollment Analysis**

    Departments have a critical need to understand and analyze course offerings, enrollments (including the demographic characteristics of the students enrolled), and faculty teaching assignments. They must also accurately estimate future course needs. An EDW can help them accomplish these tasks with greater ease and confidence than they can now. It can also help academic units and administrators optimize the use of resources, better understand educational outcomes and adapt the instructional program to meet changing demands as our student population changes. It can provide the ability to understand and analyze the curriculum, class activity, and educational outcomes to better plan for future course offerings, faculty teaching workload, and the design of the curriculum.

4. **Student Lifecycle Analysis (Admissions to Alumni Continuum)**

    Attracting, selecting, and enrolling the right students are central to meeting the campus's primary mission. A comprehensive understanding of our students and their experience is integral to supporting this mission. Today, understanding the

student population and the student lifecycle is difficult. It requires pulling together data from various systems and usually requires help from experts. An EDW would provide the ability to better analyze the overall student experience and to track an individual student's status from application through enrollment, registration and on through graduation and beyond. With a comprehensive understanding of our students and their experience, we are best positioned to attract and retain the quality of students that we want and to keep them involved as supporters of the University after graduation.

5. **Student Support Analysis**

As state support declines and tuition costs increase, most students depend on the University for financial support. This support is provided through a myriad of channels, including fellowships, scholarships, fee remissions, academic employment as GSIs, GSRs, readers, etc., other UC employment (including work study), and student loans. Many different campus functions need to understand how these channels combine to provide aggregate support for individual students. Today, analyzing student support requires information from disparate sources that are difficult to aggregate. An EDW would allow for easy and timely analysis of this type across the campus, thus enabling us to make the best use of resources.

6. **Alumni & Donor Analysis**

The University's relationship with alumni and donors is highly valued. An EDW could provide a single source of integrated data to enable campus advancement staff performing work related to fundraising and/or alumni relations to develop and implement strategies for communication with and cultivation of alumni and donors based on in-depth information about their interest, involvement and connection with the University.

Currently, information about alumni and donors is maintained in the Campuswide Alumni/Development System (CADS) as well as multiple systems within the decentralized advancement community. In order to best understand alumni and donor activity, information is needed from disparate sources such as Student Affairs, campus departments and the California Alumni Association. This disparate data may vary in quality and accuracy, impacting the University's communication and relationships with alumni and donors. Additionally, particular information about donors and prospective donors' capacity and inclination to give can be very sensitive. This data should be restricted through more robust identity management tools to those advancement staff whose work requires access. An EDW can deliver reliable data with the appropriate security standards.

7. **Gift Analysis**

The University is becoming increasingly dependant on funding from private sources. Fundraisers and benefiting units need to track gifts from receipt to expenditure and report to donors on the impact of their gift. An EDW will

provide an integrated source of information to enable campus organizations to have a greater understanding of gifts designated to their unit or departmental accounts.

8. Workforce Analysis

An Enterprise Data Warehouse will support planning for major changes in our workforce, due, for example, to the retirement of "baby boomers" and the advent of new technologies requiring new skills. An EDW will improve our capacity to:

- Analyze the existing workforce at a macro level, including actual costs, staffing trends, likelihood of retirement, and competition in the marketplace.
- Study the progress of a given employee from recruitment to separation, including current status, relevant history and nearness to retirement.
- Target segments of the workforce for analysis and communication (e.g., all graduate student instructors, all researchers with an interest in nanotechnology).
- Determine emerging gaps in workforce skills to guide development and recruiting initiatives

9. Absenteeism Analysis

The total cost of absenteeism, direct and indirect, is believed to be very high. However, it is difficult to understand both total absenteeism and its associated costs. An EDW would provide an ability to view all absences as well as costs attributable to absenteeism.

10. Purchasing Analysis

The Strategic Sourcing Initiative has the potential to save the campus up to $100 million/year. To achieve this potential, the campus must have a far more detailed understanding of spending than is now available. An EDW would provide information at this level of detail. Such a granular understanding would help to ensure that we:
- Negotiate and enter into appropriate contracts
- Identify strategic value contract opportunities
- Improve our understanding of bluCard (the campus' procurement card) usage
- Improve analysis of spending for small-business and other special vendor categories
- Improve analysis of departmental purchasing and improve management of contract and policy compliance
- Improve reporting of UC Berkeley's economic impact on the local economy

11. Recharge Analysis

Campus units spend over $100 million annually purchasing services from providers on campus. An EDW can provide consistent tools for presenting and analyzing the details of the charges for these services. Some examples include communications charges from CNS and project charges from Facilities Services. The detailed billing information that an EDW would provide could be analyzed or aggregated many different ways by both providers and consumers of campus recharge services. This would allow consumers of recharge services to better plan expenses, find billing errors, and the providers of recharge services to adjust their services to better meet the needs of their customers. Ultimately, the EDW could provide a one-stop-shop resource for detailed billing information of all campus recharge service providers.

Related business intelligence application opportunity

The campus does not currently have an effective tool to reflect commitments, especially salaries, on financial reports. This makes it challenging for financial managers, including principal investigators to know their true available balance. We also do not have an effective tool currently in use to build forecasting scenarios ("what ifs") and then compare spending to them. Additionally, central campus analysts and planners would benefit from such a tool when evaluating the impact of major changes, such as budget or enrollment changes. Multiple interview participants described the need for such a tool. These needs cannot be met directly with the data warehouse. An application tool is required. However, this application is enabled by a capable data warehouse and depends on working together with the data warehouse to analyze past plans, to make projections, and to track projections against actual events. Therefore, the future use of such a tool must be considered when designing and implementing the EDW architecture.

V

SUCCESS CRITERIA

Interview participants were asked what criteria would be critical to the success of the EDW. The following criteria were mentioned most frequently:

A. Campuswide Involvement and Executive-Level Support

Successful development of the EDW will require top-level executive support and sponsorship. To assure that the EDW meets the needs of the whole campus community, constituents throughout the campus must be actively engaged in setting priorities for its use, directing its development and providing subject-matter knowledge. Planning and delivering the EDW will require continued close partnership of campus functional and technical personnel, drawing skills and participation from across a variety of campus units. Success will require collaboration of campus data experts, data proprietors and a variety of technical specialists. The authority to mandate this sort of cooperation resides with executive management and is needed in order to ensure that everyone involved in the process remains committed to moving ahead.

B. Consistent, Accurate, Timely Data, Integrated across Subject Areas

The EDW must deliver consistent, accurate and timely information that is integrated across subject areas. Users in different functional areas must be able to use the same data successfully for different purposes and easily combine data from a variety of functional areas (e.g., research grants, HR, student). The EDW should make it easy for users to identify, understand and reconcile data (e.g., UCB has one Chart of Accounts; UCOP has another) and work with these data in different ways. Related criteria include:
   a. *Broad availability.* Data in the warehouse should be broadly available and easily accessible to campus users, with appropriate security.
   b. *Incorporation of subject-matter expertise.* The EDW should incorporate in its structure, content and documentation the knowledge of experts in the areas it encompasses, for example, experts accustomed to working with various data sets, such as the Office of Planning and Analysis and student data experts.
   c. *Standardized definitions.* Where possible, data definitions should reflect a consensus of providers and users. Definitions should be clear so that users understand what the data encompass (e.g., faculty FTE—budgeted vs. actual; total, permanent, and/or temporary; faculty on leave--includes or excludes leave; ladder versus permanent--includes lecturers with security of appointment; etc.)
   d. *Transparency.* The methodology for integrating or combining various data sets and/or data elements should be explicit in the documentation of the EDW. (e.g, how a data element is calculated).

e. *Contextual Information:* It should be possible to add contextual information to data sets so that users can understand anomalies.

C. Security

Access to EDW information needs to be controlled based on the roles of the users and the context in which they are using the information. Data access needs to be under the control of the data proprietor (the person responsible for the function, e.g., the Registrar, for student records).

In addition, the EDW's functionality should be designed to encourage people to use the data "in place" [in the EDW] rather than downloading the data, thereby jeopardizing its security.

D. Ease of Use

The EDW must serve the needs of different kinds of users—personnel who need information to support routine operational decisions and personnel who need to explore information to discover opportunities or needs. The campus has a diverse set of data users and analysts on the campus with varying needs and skill levels. The EDW must be easy for everyone to use.

To this end, the EDW should provide:

a. Standard reports, customizable, as needed, to deliver operational information to users who might not understand the intricacies of the data.
b. Good documentation, available at the point of use, explaining their purpose and the information being delivered.
c. Timely and accurate information.

For those users who require flexible support for doing their own analyses, the EDW should:

a. Make it easy to slice and dice data in many different ways so that users can pose questions from many different angles.
b. Make documentation explaining the data, the structure of the data, and definitions of the data elements available at the point of use in a digestible form. Documentation should communicate clearly to non-specialists.
c. Retain enough history to enable users to do a meaningful analysis of trends. Many analyses of enrollment or student data require five years or more of history.
d. Make it possible to reconcile alternative views of the same information. For example, users should be able to look at financial data according to the campus COA or the UCOP chart of accounts. Users should also be able to obtain "snapshots" of information at various points in time; for example, information as it currently exists as well as what it was on a given reporting date (census).

E. Training, User Support and Communications

Similar to today's Financial and HRMS BAIRS implementations, ongoing campuswide training, support and communications are key to the success of an EDW. An EDW outreach effort would require not only training and support for the application tools, but would also focus on enhancing data analytical skills and knowledge of the campus workforce. Given that the EDW is a constantly evolving and growing initiative, this effort will be continuous.

VI

CHALLENGES, INHIBITORS, CAVEATS:

Some people may be concerned that a centrally implemented system will be a behemoth that will lack agility and inhibit individual flexibility and functionality. To address this potentiality, it will be important to maximize the flexibility of the EDW's architecture.

Another concern is that units will be unwilling to give up their shadow systems. The current overhead associated with using multiple shadow systems is obviously very high. Experience has shown that departments are willing to move to an EDW environment if they stand to realize benefits in costs, data access, and/or data security.

There is a great deal of detailed business analysis needed in order to implement any one of the identified EDW opportunities. Fully implementing some of them may require changes to business processes and source systems. This could result in increased or changed workloads for individuals across the campus.

BAIRS, CalProfiles and the pilot SDW are all successful data warehouses that have been created with careful planning, strong sponsorship and creative insight. It would be wise and efficient to use the lessons that the staffs of these databases have learned and to build on what they have produced.

As the EDW reaches a broader base of users, it carries the risk that data may be misinterpreted by novice or first-time users of the data. Anomalies exist in all data sets (e.g., Katrina students, GRE scores for student from departments not requiring the GRE, new faculty reported in the HRMS system for fall, although their appointment does not officially start until the following January). The risk of misinterpretation can be addressed through clearer definitions, better metadata and use of standard reports.

Having an EDW will not guarantee improved decision-making. Its utility for analytical tasks will be limited by:

a. The varying levels of analytical skills available across campus. Skills for interpreting and analyzing integrated data will need to be further developed, requiring a large outreach, education and training component to this initiative.
b. The data available—it will only deliver information that has already been collected by campus systems. In many cases, we have the data we need, and, where we don't, working with an EDW will help us to identify gaps and inconsistencies. If carefully planned and developed, an EDW will provide well-organized information that decision makers throughout the campus can use to better define problems and identify opportunities.

VII

CONCLUSION

Information is a valuable asset to the campus. We need to derive the most from it just as we seek to derive the most from our capital and financial assets. An EDW will enable us to make better, wider, more productive use of the information we already have, and it will provide a robust infrastructure for incorporating new data. By improving our capacity for timely decision making and strategic analysis, it will help us position the campus for the future.

The capabilities provided by the campus' existing data warehouses have been used with great success across the campus. We are now ready to take the next step – implementing a more robust and tightly integrated data warehouse which will provide enhanced reporting and analytical capability. Users of the current data warehouses are eager to see the next evolution of reporting and the new capabilities it will bring, as outlined in the opportunities. This improved access to information will facilitate better decision-making in the rapidly changing world that is UC Berkeley.

Implementing an EDW is a broad initiative with a set of incremental projects over time. Providing this resource to the campus requires a long-term commitment, with dedicated funds for development, maintenance, training and user support. Although funding is necessarily limited, beginning now in incremental stages, with a focus on our highest priority needs and opportunities, will be beneficial both in the short-term and the long-term.

Our next steps are to prioritize the opportunities outlined here and to complete an overall design of the technical architecture to support the EDW. Additionally, we have an ongoing task of identifying further opportunities, including those we have not yet been able to explore and new opportunities that may arise due environmental changes. The implementation of the newly designed architecture will be tailored to the priorities. We hope to realize at least one opportunity as soon as we begin the implementation of the architecture; however, the timeline for the other opportunities will depend on the funding and priority assigned to the EDW project by the campus.

VIII

APPENDICES

APPENDIX A

Title: Analysis of Core Operations (Teaching, Research, and Public Service)

Assessment:

- Importance: High
- Feasibility: Moderate

Description:

An EDW will improve planning and management of core operations by integrating data from many campus sources – financial, instructional, human resources and student data - so that we can better analyze how resources are used in delivering core instructional, research, and public service activities. Integrated analysis will also enable us to allocate limited resources more strategically to meet core goals.

Analytical needs

- Analyze instructional activities (e.g., courses offered, course enrollments, degrees earned) in relationship to resources available and used (e.g. budget allocations, expenditures, faculty and staff FTE and salaries).

- Prepare reports for UCOP

- Analyze research activity (measured by spending on research projects) in relationship to resources available and used (e.g. budget allocations, expenditures, faculty and staff FTE and salaries).

- How effectively and efficiently are resources used? (E.g. how are monies being used to produce results? How much does, e.g., Chemistry spend to train six graduate students vs. Physics)

- What does college A spend vs. college B for courses offered, degrees conferred, etc? (Financial/actuals data exists in campus' schedules 1B by UAS [OP defined code] and 1C by ARC [partially defined by OP and partially defined by central campus units], combinations of program and org codes used in BFS, but data is not generally available).

- How can we accommodate changing needs (e.g. a department accommodating for Tidal Wave II increase in students) relative to budget and resources available?

- How should resources be allocated to meet program objectives?

- How are operating needs mapped to funding sources?

- Is there redundant funding? Are there gaps in funding?

- How do revenue changes influence activities? (E.g., how do diminished revenues translate into reduced budget support by activity?)

- What is the causal relationship between revenue and activities?

- What are the overhead needs associated with self-supporting programs and how

much of the cost is the campus absorbing?

- How do Summer and UC Extension programs contribute to their three-fold goals of public service, continuation of the regular academic program, and financial support for the rest of the academic program? Which offerings subsidize the others? Which offerings appear to be subsidized themselves?

Potential Benefit:

- The integration of financial, instructional, human resources and student data allows us to conduct the analysis of core operations as outlined above. This is either not doable or very cumbersome today.
- Valuable for adjusting budgets to accommodate changes, especially decreases, in revenues.
- Impact of not being able to do this analysis puts the university at risk of not wisely allocating available resources to meet core goals.
- Delivering consistent information through a single, consistent data warehouse will obviate the disagreement about numbers which forestalls many analyses and puts the University at risk.

Information needs:

- Statistical details of instructional activities, such as courses offered, course enrollments, majors, student semester enrollments.
- Research activity: spending on research. Research grants. Research grant applications.
- Budget allocations. Spending. Recharge income and charges.
- Staffing and staffing costs, both permanently-funded and temporary.
- Identifying trends requires that information be available for several years.
- Consistent coding of expenditure data in a decentralized environment

Feasibility issues/summary:

- Requires integration of several data sets, Complex logic and possible system/process changes required to integrate this data.
- Requires an enormous functional analysis effort.
- Information about instructional activity available from student systems. Some delivered by pilot student data warehouse; however, that pilot is not yet complete. (See Warehouse Opportunity "Enrollment Analysis").
- Information that we need regarding research spending is already available through BAIRS and BIS but would need to be coded for integration.
- Information about staff is available in HRMS and staffing costs in PPS and BFS. However, FTE information reported for temporary faculty is not always accurate.
- This financial analysis of operations is supported today by Cal Profiles. However, annual refresh cycle and aggregate level reporting limit the number of questions which can be asked and answered.
- Sophisticated security and access model is required for detailed drill-down analysis.

- We are limited by the existing student systems, which are aging and may not contain all the detail required (e.g. Summer Session data).
- Requires prior development of at least enrollment analysis components of student data.
- "Project" is inconsistently captured by departments. "Research project" would need to be defined and practices for capturing it standardized across campus. Use of flexfields isn't standardized. Data Warehouse will not solve this.
- Analytical needs must be refined in more detail.
- This is a large analytical and technical undertaking, requiring us to examine how we do business. As a result, it will take a long time, or may in fact be impossible, to reach agreement on how to report against data that is captured in many different ways across the campus.

Constituency/interview source:

- Academic Planning & Facilities
- Budget Office
- Office of Planning and Analysis
- Academic departments
- Budget and Finance
- Student Affairs
- Graduate Division
- Research

APPENDIX B

Title: Financial Analysis of Research Activity

Assessment:

- Importance: High.
- Feasibility: Moderate. Most needed data is available for the data warehouse. However, this opportunity requires development of a planning-forecasting/salary encumbrance tool.

Description:

Research is one of the core functions of the campus; it represents close to a third of the economic activity of the campus. An EDW will improve our ability to:

- Provide current information for analysis and reporting of research spending, grants awarded and grant applications.
- Provide for day-to-day decision needs for managing multiple projects supported by multiple sources of funds.
- Report all research activity, whether funded by grants, gifts or central funding. Account for interdisciplinary issues so that academic units can see real research results for their area.
- Understand the grant and gift pipeline and forecast resources available to support research.

Analytical needs:

- What is aggregate research activity? By school? Department? Faculty? Research center?
- Where are we on the contract? How much have we spent?
- How much is left? Do we have enough dollars to support this graduate student?
- How are post docs supported? How many are federally supported, how many by private foundations? How many postdocs have to supplement their appointments with additional work to make up for income deficiencies?
- Does a particular professor have adequate funding?
- What is an individual faculty member's spend rate? Vs. the amount he has available to spend?
- How will graduate students and post-docs be paid on a set of research projects to best complete the projects and support the post-docs and graduate students?
- How does research activity (as measured by spending) compare to prior periods? Are we meeting our research goals?
- How does our aggregate research activity compare to that of our peer institutions?
- How does current research activity (spending) compare to staffing? Do we have the staff we need to continue at current activity levels?
- What research areas are under funded? What are trends?
- What are current spending levels by sponsor?

Potential Benefit:

- Research is one of the core functions of the campus; it represents close to a third of the economic activity of the campus. Measuring and understanding that activity is essential to meeting the University's research goals. Responsibility for managing research grants is usually entrusted to principal investigators. Today many grants are spent into deficit, creating a serious funding exposure for the university. Analysis of past and active grants will provide a reservoir of information critical to managing this important part of the campus' mission.

Information needs:

- Current research expenditures
- Budgeted and planned spending, including planned allocation of salaries to research projects and grants (see below)
- Tuition- and fee-remission arrangements for student research assistants.
- Grants and gifts made to support research activities
- Grant applications; related status information
- For grants: principal investigators and assigned departments.
- Staffing assignments to grants: post-docs, GSRs and RAs.
- Human resources information about investigators and other personnel who work on research projects.

Feasibility issues/summary:

- Most of the information needed to support this opportunity is readily available.
    - Expenditure information is recorded in BFS and available through BAIRS.
    - Grant and grant application information is available from COEUS.
    - Information about personnel—faculty researchers, post-docs, etc., is available in HRMS and PPS.
- A challenge to consistent reporting about research is the inconsistency in the business process for research administration. For example, some but not all units use the GL "Project Number" identifier to aggregate entries for a given project across funding sources.
- We do not currently have an effective tool to reflect commitments, especially salaries on financial reports. This makes it challenging for financial managers, including principal investigators to know their true available balance. We also do not have an effective tool currently in use to build forecasting scenarios ("what ifs") and then compare spending to them.

Constituency/interview source:

- Research
- Budget Office
- Academic Departments
- Graduate Division

Title: Curriculum and Enrollment Analysis

Assessment:

- Importance: High
- Feasibility: Moderate - High

Description:

> Departments have a critical need to understand and analyze course offerings, enrollments (including the demographic characteristics of the students enrolled), and faculty teaching assignments. They must also accurately estimate future course needs. An EDW can help them accomplish these tasks with greater ease and confidence than they can now. It can also help academic units and administrators optimize the use of resources, better understand educational outcomes and adapt the instructional program to meet changing demands as our student population changes. It can provide the ability to understand and analyze the curriculum, class activity, and educational outcomes to better plan for future course offerings, faculty teaching workload, and the design of the curriculum.

Analytical needs:

Curriculum
- How often do students try unsuccessfully to enroll in classes? How long are students on wait lists?   Are students on wait-lists because extra sessions are not being offered or not offered at a convenient time?
- Are students finding the courses they need in order to complete their degrees? What courses are in high demand? By majors? By the general population?
- How many students drop out for a semester or more? Which students are they? What courses did they take and what were their grades in those courses? How many appear to be participating in other schools' "education abroad" programs?
- How many new course offerings should department X plan? How many new majors should department X expect? What will be the impact for faculty workload?
- What courses and sections are offered by a given department? How often is the same course taught?
- Are there patterns of enrollment related to student demographics?
- Who enrolls in the summer session? What courses are in heavy demand for summer? How do their educational outcomes compare with students who don't?
- To what extent are students in self-supporting programs and/or high fee professional school fee programs enrolled in other general campus courses? Who's enrolling in those offerings?
- What is the profile of students adding and dropping courses? What are the patterns of add and drop activity (e.g., do certain courses/instructors experience more add/drops)?

Faculty Workload
- What is the faculty workload by type of instructor (ladder, lecturers)? How has faculty workload changed over time? What is the workload for lecturers and GSIs relative to collective bargaining agreements (e.g., number and percentage of lecturers teaching large enrollment classes)?
- How many graduate students are GSIs, GSRs or have other university employment? How many undergraduates serve as GSIs or Readers/Tutors?

Outcomes / Student Experience
- What is the effect on educational outcomes of curriculum changes? For example, for all the students who took Reading and Composition in fall, 2005, what was their grades in subsequent courses? average GPA three years later? How does that compare with students who took that subject during the previous five years?
- Patterns of student enrollment; e.g., how many students who took course "x" in a semester also took course "y" the same semester? How do their grades compare with those of students who took "x" and "y" in different semesters?
- How are students progressing academically?
- How long does it take to get a degree in a given major? How does that vary from major to major?
- What is the relationship between course enrollments and hours that students are employed? How many students work? What type of jobs and where do they work?
- What secondary characteristics appear to influence educational outcomes? Student employment? Residence? Extra-curricular activities?
- How many graduate students have taken their qualifying exams? How many are on probation? What is the profile of students who take longer to graduate?
- What were patterns of student course evaluations for given courses or sections? For given instructors?
- What did student surveys indicate about course content? About instructors?

Potential Benefit:

- The ability to do this analysis easily and confidently helps academic units and administrators with the core job of adapting the instructional program to meet changing demographics and student demands. It supports the institution in its work to always improve educational outcomes and it helps departments optimize resources.

Information needs:

- Student demographic information
- Semester enrollments
- Course offerings
- Course enrollments
- Faculty assignments
- Wait-list information
- Grades

- Test results
- Trend analysis requires extensive history—from a minimum of three to ten years or more for some studies
- Student course evaluations
- Student surveys (e.g., UCUES)

Feasibility issues/summary:

- Almost all the data needed to support this opportunity is collected by existing operational systems.
- Many of these needs can be addressed as the pilot student data warehouse is further developed into the EDW.
- Core student records are retained indefinitely.
- Because enrollment information changes over the course of a term, reporting on enrollments is sensitive to effective dates. That is, it is important to be able to look at enrollment information two ways—first, as it was recorded or reported as of a certain date (such as the "census date"); second, as that information was ultimately recorded (after any subsequent or retroactive changes).
- Departments manage course demand in a variety of ways. Some cap course enrollments and others don't, some use wait lists while others don't, some have more enrollment restrictions than others, etc.

Constituency/interview source:

- Academic departments
- Office of Planning and Analysis
- Vice Provost, Academic Planning
- Admissions & Enrollment – Policy, Planning and Analysis
- Budget Office

Title: Student Lifecycle Analysis

Assessment:

- Importance: Moderate
- Feasibility: Moderate

Description:

> Attracting, selecting, and enrolling the right students are central to meeting the campus's primary mission. A comprehensive understanding of our students and their experience is integral to supporting this mission. Today, understanding the student population and the student lifecycle is difficult. It requires pulling together data from various systems and usually requires help from experts An EDW would provide the ability to better analyze the overall student experience and to track an individual student's status from application through enrollment, registration and on through graduation and beyond. With a comprehensive understanding of our students and their experience, we are best positioned to attract and retain the quality of students that we want and to keep them involved as supporters of the University after graduation.

Analytical needs:

- Sourcing:
    - Where do applicants come from? What schools furnish us the best candidates? Which schools need help in preparing students for Cal?
    - How many transfer applicants are there? How qualified are they?
- Undergraduate applicant pool:
    - What is the profile of the applicant pool?
    - How many students in the applicant pool have special needs?
    - How has the applicant pool changed over time?
    - How do this year's applicants differ from previous years? Are foreign students meeting their special visa requirements?
- Graduate admissions:
    - Who are the most qualified graduate applicants? Where do they come from? Which schools and recommenders provide the best applicants?
    - What are the financial needs of graduate applicants?
- Residency:
    - How many students are California residents?
    - How many graduate students have petitioned to be declared residents? How many appear to be eligible to petition for residency and therefore are likely to do so before the end of the term?
- Admissions process:
    - Are students successfully navigating and completing the application process? How many graduate students are still pending recommendations or transcripts?

- o Are foreign students meeting their special visa requirements?
- Success with admissions:
  - o What is the profile of matriculating students versus non-matriculating admitted to the university? Which admitted students ultimately decide not to accept? What are their reasons? Where do they ultimately go?
- Performance while enrolled:
  - o Academic progress. Involvement in support programs. Involvement in student activities, clubs, sports, etc. Time to degree.
  - o How does academic performance relate to whether students worked what their living arrangements are, whether they commute or live in dorms, etc.?
- Student surveys:
  - o How do subjective evaluations relate to who the students are and what activities they participate in? (e.g., where students lived? Did student work or not? What classes did they take? What student programs were they involved in?)
- Post graduation:
  - o Graduate School enrollment? Where? What?
  - o Employment? Where? What?
- Continuing involvement with the university.
  - o How many students continue to be involved in campus programs? Sports events? Development activities?
  - o What students of faculty member X would like to help celebrate his recent Nobel prize? Congratulate him on his retirement?

Potential Benefit:

- Attracting, selecting and enrolling the right students is central to meeting the campus' primary mission. The campus expends considerable effort in identifying and selecting students; this work needs to be guided by metrics to identify where it is succeeding and where it needs tuning. With better integrated information, the campus can know how successful we are in meeting our diversity targets and know whether we are attracting the graduate students who will contribute to Berkeley's preeminence in research and instruction.
- Students and applicants become some of the campus' most enthusiastic supporters as their careers develop: they provide direct support through gifts and also indirect support through sponsorship and referrals. Keeping track of "where they are now" allows many campus personnel to reach out to those supporters. It also helps curriculum planners evaluate long-term educational outcomes.

Information needs:

- California High School Information
- Academic Preparedness Programs Information
- Applications (graduate and undergraduate)
- Application status information
- Acceptances; Enrollments

- Financial Aid Information
- Student records
- Alumni/Donor information
- Student cohort membership (see "feasibility", below)

Feasibility issues/summary:

- Much of the information required for this analysis is confidential to a greater or lesser extent. Delivering it for analysis will require capable access-control mechanisms.
- Most of the information needed to support this opportunity for the undergraduate student population is contained within the scope of the pilot student data warehouse project.
- Most of the remaining data required by this opportunity is collected in other campus systems, including graduate admissions.
- Analysis of trends requires several years of history: three years is minimum, ten years or more is desirable.
- It is often useful to identify a cohort of students for special study. Doing this would require a tool to allow a given user to identify a student cohort for tracking.

Constituency/interview source:

- Student Affairs
- Admissions & Enrollments
- Graduate Division
- Academic Planning & Facilities
- Office of Planning and Analysis
- University Relations
- Academic Departments
- Business & Administrative Services

APPENDIX E

Title: <u>Student Support Analysis</u>

Assessment:

- Importance: High to moderate
- Feasibility: Moderate to high

Description:

As state support declines and tuition costs increase, most students depend on the University for financial support. This support is provided through a myriad of channels, including fellowships, scholarships, fee remissions, academic employment as GSIs, GSRs, readers, etc., other UC employment (including work study), and student loans. Many different campus functions need to understand how these channels combine to provide aggregate support for individual students. Today, analyzing student support requires information from disparate sources that are difficult to aggregate. An EDW would allow for easy and timely analysis of this type across the campus, thus enabling us to make the best use of resources.

Analytical needs:

- What is this graduate student's total support from the university? Can he or she afford to continue without additional support?
- What is the effective cost of graduate education at Berkeley; i.e., tuition minus support? How does we compare with peer institutions?
- What is the average graduate student support "package"? By department? By degree goal?
- This graduate student does not have a teaching job in his major department. Is working as a GSI in another department?
- What are support trends? Are some kinds of students better supported? More in need?
- What is debt load Cal students are incurring? What are trends? Are students in some programs more heavily indebted? How does student debt relate to other university support?
- How much work-study support does this student have left?
- Do work-study earnings stay within guidelines?

Potential Benefit:

- The campus' ability to attract and retain the graduate students we want depends on our being able to offer a competitive cost package with peer institutions.
- As tuition and fees become a more important source of funding for the campus, it becomes very important to understand the affordability barriers which may be created and to know whether support programs are successful in helping students manage those barriers.

- The campus spends hundreds of millions of dollars yearly on student support. It is important to be able to analyze patterns of use of that support money and to recognize any opportunities to use it more effectively.

Information needs:
- Undergraduate scholarships
- Graduate fellowships
- Fee remissions
- Payroll information for students
- Student loans

Feasibility issues/summary:
- Basic information needed by this opportunity is available in campus and university systems.
- Much of this information is highly confidential and will require capable access control.
- Understanding financial support by program—e.g., by major or degree—will require student enrollment information (see "curriculum and enrollment analysis" opportunity).
- Analyzing effect of financial support on enrollment yield (graduate or undergraduate) will likewise require student enrollment information.

Constituency/interview source:

- Research
- Student Affairs
- Graduate Division
- Office of Planning and Analysis
- Academic Departments

APPENDIX F

Title: Alumni and Donor Analysis

Feasibility:

- Importance: High
- Feasibility: Moderate

Description: The University's relationship with alumni and donors is highly valued. An EDW could provide a single source of integrated data to enable campus advancement staff performing work related to fundraising and/or alumni relations to develop and implement strategies for communication with and cultivation of alumni and donors based on in-depth information about their interest, involvement and connection with the University.

Currently, information about alumni and donors is maintained in the Campuswide Alumni/Development System (CADS) as well as multiple systems within the decentralized advancement community. In order to best understand alumni and donor activity, information is needed from disparate sources such as Student Affairs, campus departments and the California Alumni Association. This disparate data may vary in quality and accuracy, impacting the University's communication and relationships with alumni and donors. Additionally, particular information about donors and prospective donors' capacity and inclination to give can be very sensitive. This data should be restricted through more robust identity management tools to those advancement staff whose work requires access. An EDW can deliver reliable data with the appropriate security standards.

Analytical needs:

- Where do alumni and donors live and work? What degree(s) did alumni receive from UC Berkeley? What is the best way to communicate with alumni?

- What is the University's relationship with alumni and donors? Which campus units or organizations have the closest relationships with alumni? How are they connected to departments, organizations, individuals? What activities and interests were pursued by alumni as students? How do alumni continue to engaged by and involved with the University after graduation?

- What interests in donation to the University do donors and prospective donors have? What capacity for giving a high level gift do prospective donors have? Which campus staff need to have access to sensitive information about donors or prospective donors?

- Which data elements are necessary for staff work?

Potential Benefits:

- With integrated information, the most accurate and detailed information about alumni and donors can be consolidated. Advancement offices across campus would be able

to more effectively coordinate fundraising and engagement efforts when constituents have multiple affinities or interests on campus.

- With a single, integrated source of data and a robust identity management tool, the most accurate data can be made available to the decentralized advancement community and can be restricted to the appropriate staff/work.

Information needs:

- Comprehensive biographic student, alumni and donor data
  - Major/program/degree information to relate student to school/college
  - Involvement on campus, *e.g*., membership in Student Life Organizations, Athletics, Cal Band, etc.
  - Personal (identification) information, e.g., name(s), addresses, other contact information, preferences, etc.
  - Demographic information
  - Employment/professional information
  - Relationship information, e.g., marriage, parental (particularly for alumni parents of current students at UC Berkeley), family or social relationships, etc.

- Information about engagement and involvement
  - Membership, e.g., California Alumni Association, alumni association(s) with school or college, @cal online alumni community, BAM/PFA, Botanical Garden, etc.
  - Student involvement, i.e., volunteer or work-study assignments, with patron organizations, e.g., Cal Performances, Berkeley Art Museum/Pacific Film Archives, Lawrence Hall of Science, California Alumni Association, etc.
  - Academic relationships, e.g., faculty advisors or PIs, mentors, departmental academic organizations, etc.
  - Student support, e.g., scholarship or fellowship awards, work-study assignments, etc.
  - Awards/honoraria, e.g., Berkeley Medal, Haas Leadership Award, CAA Alumni of the Year, professional or academic awards, etc.

- Information about donors/prospective donors
  - Information about wealth, i.e., information from public sources about personal holdings that indicate a donor/prospective donor's capacity to give
  - Information about donors' gifts to campus including giving history details, preferences related to solicitation or communication, etc. that indicate a donor/prospective donor's inclination to give
  - Information about prospective donors' interests in support of the University, e.g., interests in genetic research, athletics, nanotechnology, public policy, etc.
  - Information about donors' relationships within the campus community, e.g., friendships and associations, activities, etc. that indicate a donor/prospective donor's inclination to give
  - Codes that indicate an academic unit or organization's intent to cultivate prospective donors or actively solicit new gifts

- o Notes or comments from fundraisers/alumni relations staff about contacts made with prospective donors

Feasibility issues/summary:

- A robust identity management tool is not yet available to facilitate restriction of the data at a granular level
- Many campus departments maintain local systems with alumni and donor information in addition to CADS. These disparate systems contain information varying in quality and accuracy.

Constituency/interview source:

- University Relations
- Academic Departments
- Donors

APPENDIX G

Title: Gift Analysis

Assessment:

- Importance: High
- Feasability: Moderate

Description: The University is becoming increasingly dependant on funding from private sources. Fundraisers and benefiting units need to track gifts from receipt to expenditure and report to donors on the impact of their gift. An EDW will provide an integrated source of information to enable campus organizations to have a greater understanding of gifts designated to their unit or departmental accounts.

Analytical needs:

- What gifts have been donated
  - what type of gift was donated, e.g., outright gift, pledge, pledge payment, gift-in-kind, bequest, etc.?
  - what is the value of the gift, e.g., cash amount, value of stocks, value of gifts-in-kind, etc?
  - if a pledge, what is the payment schedule?
  - If this was an endowed gift, what is the payout?
  - what administrative fees (gift fees) were assessed on the gift?
  - to what fund/purpose was the gift designated?
  - which control unit/division/department/program/organization was the beneficiary?
- Who donated the gift?
- How was the gift solicited?
  - is the gift associated with a campaign
  - which fundraiser or fundraising program solicited the gift
  - what unit/department/program received and processed the gift
- How was the gift receipted and acknowledged, e.g., was the gift anonymous, can the gift be reported in honor rolls, etc.
- How was the gift used or spent?
- How many gifts have been promised or made to department X? How many of them have been accepted? How many are in the pipeline of acceptance and appropriation?

Potential Benefit:

- This will allow fundraisers and benefiting units to track gifts from receipt to expenditure.
- Fundraising programs will be able to track campaign achievements or status.

- Access to a data warehouse where information about contributions and gift expectancies can be combined with information about other sources of revenue and expenditures would allow units a 360° view of budget(s).
- A comprehensive source of revenue and gift expectancy information would enable units to make realistic projections for planning.
- An enterprise data warehouse that includes comprehensive contribution and distribution information, as well as donor or recipient information would facilitate better donor reporting and stewardship.
- Access to contribution, expectancy and expenditure information from a single, comprehensive source would relieve cumbersome reporting and projections for capital projects.

Information needs:

- Comprehensive gift and pledge information
- Endowment value and payout information
- Fundraising campaign goals
- Donor information
- Gift utilization information

Feasibility issues/summary:

- In order to present a complete picture of gift activity data from CADS, BFS and UCOP would have to be integrated. This could require changes to operational systems and/or business procedures.
- UC Berkeley Foundation accounting is being migrated to BFS, but until that happens all gifts to the Foundation are maintained in a separate system which would be difficult to integrate.
- Information about endowments managed by UCOP would not be as easily accessible.

Constituency/interview source:

- University Relations
- Budget & Finance
- Graduate Division
- Research
- Academic Departments

Title: Workforce Analysis

Assessment:

- Impact: High
- Feasibility: Moderate - High

Description:

An Enterprise Data Warehouse will support planning for major changes in our workforce, due, for example, to the retirement of "baby boomers" and the advent of new technologies requiring new skills. An EDW will improve our capacity to:

- Analyze the existing workforce at a macro level, including actual costs, staffing trends, likelihood of retirement, and competition in the marketplace.
- Study the progress of a given employee from recruitment to separation, including current status, relevant history and nearness to retirement.
- Target segments of the workforce for analysis and communication (e.g., all graduate student instructors, all researchers with an interest in nanotechnology).
- Determine emerging gaps in workforce skills to guide development and recruiting initiatives

Potential Benefit:

- Sustains the Staff Infrastructure Steering Committee Initiative - Being able to analyze, plan and evolve the workforce can contribute very substantially to the overall mission and also provide leverage on some of the campus' greatest costs.
- Supports institutional planning to accommodate major workforce shifts, e.g. "baby boomer" retirement and changes due to new technology.
- Respond in agile fashion to new policies and regulations.
- Integrates existing data. It is currently possible but very difficult to do workforce analysis, because data, when available, resides in disparate systems, making it onerous and uncertain to integrate.
- Data can be more easily shared with multiple users outside Office of Human Resources.
- Reduces the need for shadow systems that departments maintain to track workforce information.
- Enables us to more easily reconcile employee counts with several points of view, including UCOP.

Analytical needs:

- Characterize existing workforce:
    - Who works at UCB?

- o How many people (headcount and FTE)?
- o What are their demographic characteristics?
- o What jobs do they do?
- o Where did they come from?
- Succession Planning:
  - o Who is likely to retire and when?
  - o Who is leaving and who's staying? Why are they leaving? What are the trends?
  - o Skills development - How are we developing our staff?
  - o How are we growing our staff? How many from new hires? How many from training?

- Skills Requirements and Development:
  - o What skills do we need?
  - o Inventory of skills
  - o Training taken
  - o Credentials acquired
  - o Which employees are moving up? How successfully do we move people up? Who is qualified to do leadership jobs? Which job classifications do employees tend to move up from? Where do managers come from? Is supervision an important factor in employees' moving up?

- Workforce Sourcing:
  - o What is the resource pool in the community?
  - o What are competitive salaries?
  - o How good a job are we doing in our recruitment?

- Role assignments (e.g. Supervisors, Building Coordinators, Buyers):
  - o Who has what role on campus?
  - o What units do they serve?

- Faculty development:
  - o Where are faculty members in their progress toward tenure?
  - o What are their current advising and committee appointments?
  - o What are the faculty's credentials? Where have they taught? When did they first join UCB? As a faculty member?

- Faculty expertise:
  - o What are faculty specialties? Research interests?
  - o What are their publications? Research awards? Other honors and awards?
  - o Who is qualified to speak on important topical issues?

Information needs:
- University title and pay plan, classifications, positions, job codes, etc.
- Current faculty and staff, their classifications and skills, demographic and ethnic characteristics, etc.

- Personnel actions, e.g. Promotions, raises, terminations, hirings, reinstatements, etc.
- Faculty credentials, publications, awards, research interests, progress through academic ladder
- Faculty committee and advising assignments, current and historical
- Non-employees who are part of the workforce, e.g. affiliates, visiting scholars, volunteers, etc.
- Historical information ample to study retention, career history, etc., e.g., the academic personnel system has 30 years of history about faculty career progress
- Succession needs (employees likely to retire)
- Recruitment data, e.g. time to recruit, number and skills of candidates, offers
- Retention data
- Skills availability in the marketplace (third party sources)
- Competitive salaries (third party sources)

Feasibility issues:

- Many requested analyses can be done with data currently collected in source systems. However, some of these analyses cannot be accomplished until changes are made in the HR system. For example, ability to track skills using more accurate job codes and ability to track absences both would require changes to the HR system. Ability to utilize third-party market information requires adoption of job codes that are more closely aligned with common industry job descriptions.
- Job codes must be revamped to clarify skills requirements and correspond better to marketplace definitions of particular jobs, as is planned in SISC. Without this change, it will be difficult to assess skills requirements or understand the labor pool.
- Information about training taken is not uniformly collected. ICE collects enrollments in campus provided training but does not capture all employee training on campus. We don't collect information about training taken off-campus. CDOP training information is available but is of uneven quality.
- Information about benefits and retirement service credit is collected by UCOP; access would have to be negotiated for the EDW.
- Some faculty biographic information is collected today by Bio/Bib, but it is inconsistent across campus. Other information (e.g. training and individual skills data) is self-reported.
- Privacy and sensitivity of the data requires a high level of security.
- There may be some costs associated with acquiring third party data for analysis.
- Roles information is collected in a variety of systems.

Constituency/interview source:

- Business & Administrative Services
- Office of Human Resources and Academic Personnel Office
- Research
- Office of Planning and Analysis

- Financial Services, Budget and Finance
- Audit & Advisory Services
- IS&T
- Academic Departments
- Administrative Departments

APPENDIX I

Title: <u>Absenteeism Analysis</u>

Description:

The total cost of absenteeism, direct and indirect, is believed to be very high. However, it is difficult to understand both total absenteeism and its associated costs. An EDW would provide an ability to view all absences as well as costs attributable to absenteeism.

Assessment:

- Impact: High
- Feasibility: Moderate

Analytical needs:

- Who is absent, for what reasons, cumulative amount of absence and total cost to institution, not just dollar cost, but what opportunities are lost. How do we respond to absence?
- How do we manage absences? (E.g. funding temporary faculty to backfill for faculty on leave.)
- How much is absenteeism costing a department or the University?
- Who is on approved extended leave?
- What resources are allocated to employees who are on leave?

Potential Benefit:

- Possible reduction in the cost of absences. With better information we can better manage our workforce.
- The ability to review trends for absences over the years enables a manager to plan work more effectively.
- More effective analysis can be performed on data integrated from many systems such as PPS, Workers' Compensations, HRMS, Kronos etc.
- Data will be more available to multiple users across campus allowing departments to analyze the impact of absenteeism themselves.
- More agile, ability to do adhoc analysis as requested by management in areas such as Workers' Compensation.

Information needs:

- Leave time taken
    - Sick time, Workers' Compensation, Disability, Family Leave
    - Vacation, leave without pay, jury duty
- Leave Accrual
- Current leave arrangements; e.g., sabbaticals
- Employee space and other resource assignments

- Employee backfill/substitution arrangements
- Temporary services utilization

Feasibility issues/summary:

- Leave time is tracked in a variety of systems. PPS tracks vacation and sick leave accruals (through the OPTRS module), but more detailed information may be available in local time tracking systems such as Kronos or eTime.
- Central Payroll system can track absences, however, in our decentralized environment there is some inconsistency as to how the data is captured.
- Absence Management Module in HRMS is not currently implemented, but status change leaves are recorded in HRMS.
- Faculty leave (sabbaticals, etc.) may be an available subset of absence information.
- Privacy and Policy issues.

Constituency/interview source:

- Business & Administrative Services
- Office of Planning and Analysis
- Administrative Departments

APPENDIX J

Title: Purchasing Analysis

Assessment:

- Impact: Moderate - High
- Feasibility: Moderate

Description:

The Strategic Sourcing Initiative has the potential to save the campus up to $100 million/year. To achieve this potential, the campus must have a far more detailed understanding of spending than is now available. An EDW could provide information at this level of detail. Such a granular understanding would help to ensure that we:
- Negotiate and enter into appropriate contracts
- Monitor our supplier performance
- Identify strategic value contract opportunities
- Improve our understanding of bluCard (the campus' procurement card) usage
- Target spending to meet policy requirements for small-business and other special vendor categories
- Improve analysis of departmental purchasing and improve management of contract and policy compliance
- Improve reporting of UC Berkeley's economic impact on the local economy

Analytical needs:

- Analysis by commodity e.g. the ability to see how much is spent across campus in a year on laptops. This data can then be used to inform contract negotiations with vendors.
- Look at spending by account and fund in areas with strategic value sourcing available. (Why is the spending being done and who is paying for it?)
- Are vendors meeting their contract obligations for price and time to delivery?
- What vendors is the campus using? Where are they located? (Berkeley? East Bay?)
- What is the economic impact of UC Berkeley on the local economy? How many dollars are spent with local vendors?
- Analyses of bluCard usage (campus' procurement card) for identifying risk and compliance
- Provide ability for departments to self-assess card usage

Potential Benefit:

- Sustains the Strategic Sourcing Initiative which may have the opportunity to save the campus up to $100 million/year. This is based on the campus's total spend of

$500 million annually, with possible savings of 5-15 percent through strategic sourcing
- Supports us in becoming better stewards of our campus financial resources
- Data can be more easily available to multiple users outside Purchasing
- May reduce the use of shadow systems that departments maintain to track purchasing detail.

Information Needed:

- Line item details of purchase orders and bluCard transactions.
- Information about vendors: vendor ownership (what vendors are subsidiaries of others); locations (Berkeley and East Bay); target characteristics (minority-owned, etc).

Feasibility issues/summary:

- There is line item capability in BFS. However its use is inconsistent across campus. Implementation would require a large analytical effort and business process change to the campus.
- Commodity codes are not currently available in purchasing, but will be implemented shortly within central purchasing. However, in our decentralized environment, adoption of their use will be inconsistent.
- No central repository of contracts. Limits ability to automate analysis of contract compliance.
- UCOP does much of the strategic sourcing; however, UCOP uses a different Chart of Accounts than UC Berkeley. This may limit UCOP's ability to analyze UCB purchasing in combination with purchasing from other campuses.
- Information currently collected by BFS is adequate to support some high-level analysis. However, in our decentralized environment there is some inconsistency as to how the data is captured. For example, purchasing line item detail is not required in BFS, vendor characteristics are not consistently captured when vendors are created, nor is time to delivery as many purchase orders are issued after the fact.
- Quality of coding for small-business, etc., is mediocre; limits effectiveness of this analysis.

Constituency/interview source:

- Business Services - Purchasing
- Financial Services - Disbursements
- Budget and Finance User Support
- Office of Planning and Analysis
- Academic Departments
- Administrative Departments

APPENDIX K

Title: Recharge Analysis

Assessment:

- Importance: Moderate - High
- Feasibility: Moderate - High

Description:

Campus units spend over $100 million annually purchasing services from providers on campus. An EDW can provide consistent tools for presenting and analyzing the details of the charges for these services. Some examples include communications charges from CNS and project charges from Facilities Services. The detailed billing information that an EDW would provide could be analyzed or aggregated many different ways by both providers and consumers of campus recharge services. This would allow, for example, consumers of recharge services to plan expenses and find billing errors, and providers of recharge services to adjust their services to better meet the needs of their customers.

Analytical needs:

- What is driving costs? What services are being used? By whom?

- Increased ability to drill down from summary charges in General Ledger to detailed billing information for all recharge services consumed by a department.
- What are usage patterns and do they appear appropriate?
- How does usage compare with previous periods? Among similar organizational units?
- How do recharge costs compare with market rates for similar services.

Potential Benefit:

- There is value in implementing this incrementally e.g. MIT has implemented this in their Data Warehouse for telecom charges only.
- Would support operational units in better understanding and managing consumption of recharged services by providing consistency in billing information detail.
- Ultimately, would increase efficiency by providing one-stop-shopping for all financial recharge activity.
- Could reduce cost to recharge units who currently must provide detailed billing information themselves.
- Would speed development of recharge bills by units whose own service costs include recharged services from other units. Increased transparency expected to improve billing accuracy.
- Would help recharge units evaluate their performance compared to external service providers.

Information needs:

- Allocated charges for services (e.g., phone charges per call by telephone number)
- Service identifiers (e.g., telephone numbers, telephone users, locations)
- Associated accounting codes (chartstrings)
- Identifiers of associated service agreements
- External service provider information

Feasibility issues/summary:

- High achievability for certain providers, e.g. CNS already collects all the data required to meet information requirements for its bills.
- Availability of allocated charges for other recharge units would need to be assessed unit by unit.
- This capability is available in PeopleSoft (done for AP/CARS/Payroll) but UCB has elected not to include usage level detail for recharge units in General Ledger reporting.

Constituency/interview source:

- IS&T
- Financial Services
- Academic Departments
- Administrative Departments
- Facilities Services

APPENDIX L

Project Approach, Process and Participants & Staff

A.   Project Approach

The purpose of the Enterprise Data Warehouse (EDW) project is to assess the feasibility, challenges and potential benefits of developing a unified, comprehensive data utility that will serve the entire campus community as a tool for day-to-day operations, decision making and planning, helping us to account for, leverage and focus our resources more effectively.

In order to meet this objective, a team was assembled to conduct a business requirements analysis to identify campus data warehouse requirements, opportunities, and success criteria. The objectives of this effort were to:

- Identify and document the campus' high priority analytical requirements and information needs
- Gain organizational consensus regarding the value of an Enterprise Data Warehouse

B. Process and Participants

30 interviews were conducted with 55 individuals representing a wide variety of campus constituencies. The interviewees also represented a vertical span of campus functionality, from day-to-day business operations managers to Vice Chancellors. The interviews focused on the participants' vision and goals, and on their analytical and information requirements. In addition, participants were asked to comment on their criteria for the success of an EDW and any issues they were aware of that could impact the feasibility of building an EDW.

The complete interview listing is detailed in the following table.

Executive Vice Chancellor and Provost	
Academic Planning & Facilities	
Catherine Koshland	September 9
Academic Administration & Faculty	
Cathy Jen	December 8
Darrell Erickson	December 8
Claudia Lopez	October 17
Robert Price	September 2
Andrew Shogun	November 29
Timothy White	November 22
Graduate Division	
Chris Hoffman	September 14
Betsy Livak	August 2

Judi Sui	September 14, 19
Andrew Szeri	September 14
Budget & Finance	
William Webster	August 31
John Ellis	October 7
Faye Fields	September 8
Paul Jenny	September 8
Elaine Meckenstock	August 16
Lisa Vanderfin	November 16
Planning and Analysis	
Russ Acker	August 19
Pamela Brown	August 19
Loris Davanzo	August 19
Dennis Hengstler	August 14, 19
Business and Administrative Services	
Steven Lustig	September 6
Tessa Michaels	September 6, 8
Jeremy Lapidus	September 8
Stephanie Siri	September 8
Human Resources	
Patrick Ellis	September 8
Patty Owen	September 8
David Scronce	September 8
Business Services	
Emily Billings	September 6
Denise Cronin	September 6
Lila Mauro	September 6
Student Affairs	
Susie Castillo-Robson	September 14
Herbert Diaz-Flores	September 14, 19
Greg Dubrow	September 14, 19
Cheryl Resh	September 14, 19
Research	
Neil Maxwell	September 2
Robert Price	September 2
University Relations	
Susan Chrysler	August 3
Rosemary Kim	
Julian Martinez	
Patrick O'Leary	August 30
Sri Renganathan	August 30
Facilities Services	
Patty Mead	September 12, November 28

Information Systems and Technology (IST)	
Cliff Frost	September 9
Kelly Haberer	August 16
Penelope Halpern	August 30
JR Schulden	August 30
Shel Waggener	September 9
Pilot Student Data Warehouse Committee	September 19
Peter Cava	
Pamela Drake	
Walt Heggemier	
Paul Hoch	
Russill Low	
Charles Stoup	
Derrick Van Rheenen	

The interview schedule was impacted by time and availability. As a consequence, the team was unable to complete some initially-planned interviews and follow-up interviews. For example, if an individual was not able to attend a scheduled group interview, the EDW team was not able to follow-up with a one-on-one interview with that person. Nonetheless, the EDW project team is confident that the information captured in those interviews conducted comprehensively represents the campus.

Following the interviews, the findings were consolidated and the opportunities presented by an EDW were identified. These opportunities were reviewed for accuracy, impact and feasibility by select Data Stewardship Council members and other campus individuals acting as subject matter experts from their respective areas.

C. Project Staff

Staff members for the Enterprise Data Warehouse Project include:

- Susan Chrysler, Director, Advancement Information & Technology, University Relations
- Dennis Hengstler, Executive Director - Office of Planning & Analysis
- Thomas King, Data Architect, IST-CCS
- Betsy Livak, Director, Special Projects and Training, Graduate Division
- Jill Martin, Principal Analyst, BFIT-Budget & Finance Information Systems
- Patrick McGrath, Associate Director—Reporting, Analysis & Program Office, IST-CCS
- Helen Norris, Executive Director, BFIT-Budget & Finance Information Systems, and Project Director
- Shelton Waggener, Associate Vice Chancellor - IST and CIO