Deliverable #4

RFP 3.5.4

Project Number R95R8200361

Enterprise Resource Planning

Statement of Work

Baltimore City Community College

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Draft

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Chapter 1: Enterprise Resources Planning Systems

Overview

CampusWorks Inc. has prepared this document, referred to as the Enterprise Resource Planning (ERP) Statement of Work (SOW), as part of its deliverable requirements under Project Number R95R8200361.

As stated in the Request for Proposal document:

> Enterprise Resource Planning systems (ERPs) integrate (or attempt to integrate) all data and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules.
>
> The Consultant shall provide a Statement of Work for the Systems Development Life Cycle for the new ERP project. The statement of work will describe, in detail, all hardware and software involved and the exact nature of the work to be done to complete the project. The statement of work will also define the integration of new business processes and the ERP technology.

This document provides Baltimore City Community College (BCCC) with an analysis of key considerations required to plan for the evaluation, selection, acquisition and implementation of major components within an Integrated Administrative System (IAS). The IAS will consist of selected components from a commercially available Enterprise Resource Planning (ERP) system designed for Higher Education. These system components will replace much or all of the existing systems that now make up what is commonly described as the "student information system" at BCCC. Finally, information from these systems will be integrated with information contained in State mandated systems for Finance and Human Resources to provide information to support the administrative management needs of the College.

Criteria that will drive the decision-making process for the new system are based upon recently completed assessments and business process analysis which, when coupled with associated best practice recommendations, will facilitate an efficient and successful implementation.

Although hardware and software requirements cannot be fully analyzed prior to system selection, the architecture and requirements of each system are addressed. The College will be equipped to consider alternative solutions from all major vendors in the marketplace, with an emphasis on functionally rich systems that minimize technical complexity and staffing requirements.

The document includes an overview of the technical and functional components of a modern ERP system in Higher Education and some of the unique system needs of a community college, such as non-traditional and distance learning courses, and workforce development. It further addresses special considerations for selecting and implementing a system at BCCC as a comprehensive student system that can serve administrators in their duties and responsibilities but also provide the backbone for service delivery to students enrolled in the varied programs at the College.

Ancillary systems which integrate and extend the functionality of an ERP or student system, are itemized and classified for the purpose of understanding the landscape for administrative system needs. Comparisons are drawn between the functionality of the current environment and the top eight commercial systems in the marketplace. A profile of the required new system capability is developed, from which a requirements statement and preparatory roadmap is compiled using CampusWorks' best practices in selecting, planning and implementing an ERP, or Integrated Administrative System. Recommendations are made specifically to prepare BCCC for defining and facilitating the technology required to support BCCC's vision and strategic goals.

Baltimore City Community College has a unique opportunity to take advantage of the latest technology has to offer and consider innovative approaches to position itself competitively in the community. By leveraging this opportunity, the College can establish an excellent technology platform for student, staff and faculty services, and maximize the effectiveness of its human, physical and financial resources.

Community colleges such as Baltimore City Community College have particular needs for their student systems to be agile in the face of the dynamic nature of the populations served and changing program requirements. Any system under consideration must be capable of handling the unique needs of BCCC without extensive modification or ongoing maintenance.

To that end, it is imperative that the College address these recommended priorities:

- Use **common infrastructure** (such as the same operating system and same database environment) in order to minimize the staffing requirements to serve the entire College's administrative system needs.

- Minimize the amount of **data transfer among systems** – recognizing that graduating students need to be moved to the advancement/alumni system, for example – but one system should serve as the sole, authoritative system of record for student data.

- Provide service delivery integration – regardless of the underlying administrative systems – through a comprehensive and **dynamic portal environment.**

- Provide **management reporting** through a comprehensive and well-defined reporting infrastructure.

- Recognize that the student populations – and their associated business processes – require support from a variety of different systems but there must always be a single **authoritative system of record** for student data whether the student operates within the credit or non-credit environment, or both.

- Use a **common schema for identity of person** information regardless of the relationship of the person to the College.

- **Minimize the amount of physical/paper handling,** storage and transfer by defining **electronic mechanisms** for data collection, processing and distribution.

- Focus on gaining the greatest possible benefit from the most compatible ERP system while controlling the cost of expensive infrastructure and personnel resources over the life of the system. **Minimize the total cost of ownership.**

Enterprise Resource Planning Systems and Higher Education

Higher Education ERP systems have evolved over the past 40 years. This history provides a solid framework in Higher Education ERP systems since many vendors have developed software solutions that reflect best practices for administrative processing. For an institution considering the implementation of an ERP, having the ability to capitalize on the adoption of best practices can be a tremendous advantage. It encourages process improvements, problem resolution and enhanced compliance while utilizing internal knowledge within the specific organization and administrative unit. The process allows an institution to consciously consider current processes and leverage those delivered with the software to more efficiently manage college services.

The successful implementation of an integrated administrative system (or ERP) also integrates the key business processes of an institution. Implementing an ERP enables the College to consistently define, gather, access and manage data regardless of where the information was originally collected. This consistency provides a framework where proper data is available to appropriate users in a seamless fashion. An ERP is also designed to reduce/eliminate the redundancies that often exist with the use of multiple spreadsheets, shadow databases/systems and paper reports/files that are maintained for 'easy' access to data.

In order to achieve this result, an ERP uses a common repository (database) that is accessed by the various functional areas of an institution. The data is collected and managed through software modules that are specifically designed for the functional area responsible for the information. Once the data is entered, it can be used throughout the organization to maintain compliance, make financially sound decisions, improve student services and successfully manage human resources. A primary benefit of an ERP is the ability to establish an authoritative 'source', also known as the "system of record", for critical data used by the College.

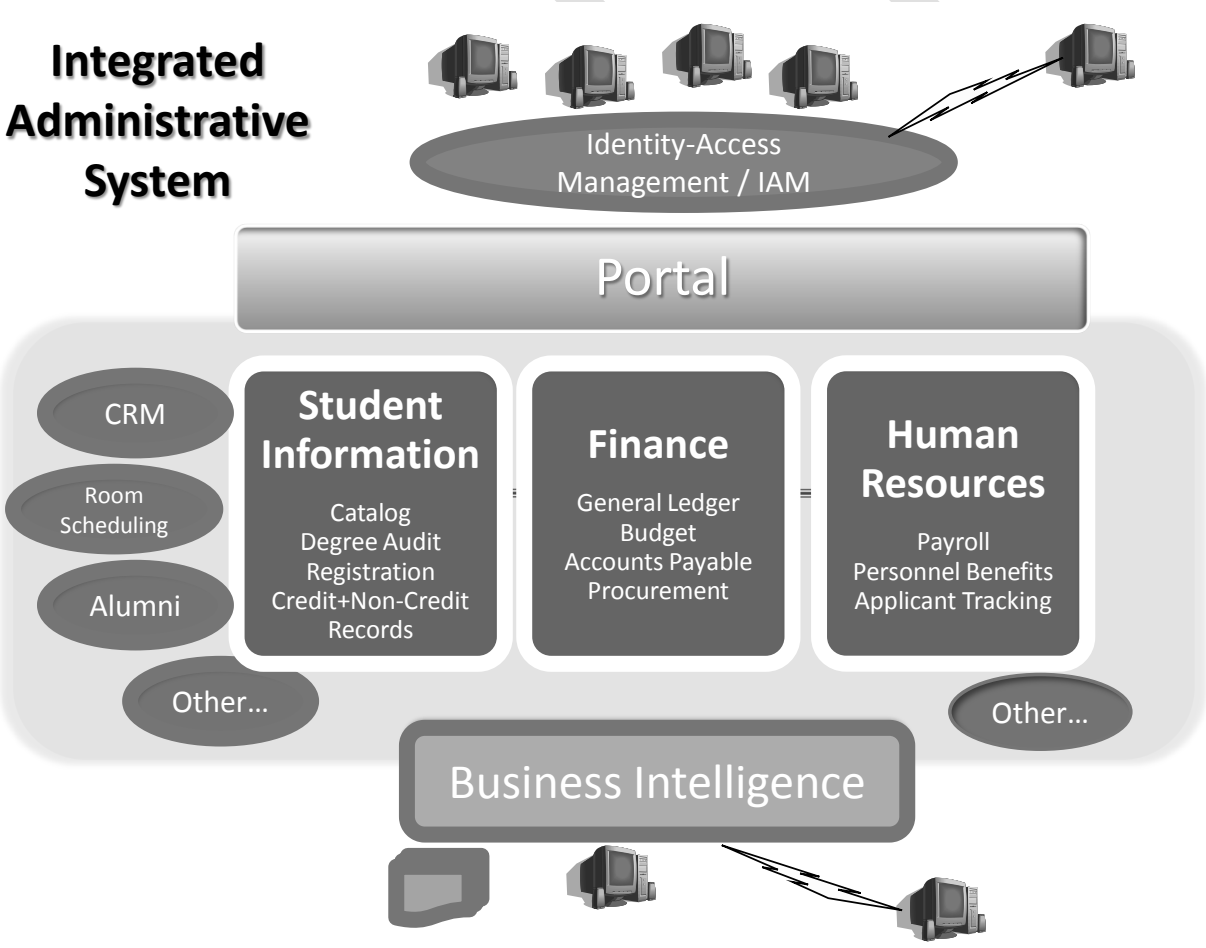
Establishing a system of record is a critical function within higher education because of the various roles that individuals may have with the College. One individual may be an applicant, student, employee, faculty, staff and alum at various times in their life. Alternatively, an individual may have multiple roles at the same time – such as an employee who is also taking classes. When each of these areas manages the relationship in a non-integrated environment, data integrity and consistent service levels are difficult to maintain and manage.

Additionally, best practices allow an institution to monitor and manage internal resources more effectively. By accessing all common data from a single system of record, administrators can better determine the needs of the organization and make accurate decisions regarding such things as class offerings, faculty load, staff hiring/retention and student services.

A comprehensive administrative systems environment would typically include the core ERP system, identity and access management (IAM) facilities, a data mart or warehouse with sophisticated extraction and reporting capabilities, data import/export facilities to share information with systems outside the ERP, and document imaging and management facilities to permit electronic storage and retrieval of materials related to students, personnel and financial records.

Integrated Administrative Systems

Commercial administrative systems for Higher Education continue to develop in complexity, with new and expanded functionality becoming integrated with the core functions of student records, human resources and financial management. These ERP systems often provide functionality such as financial aid, advancement, internet portal(s), workflow, and decision support, though there are also a number of independent vendors offering feature rich "ancillary" systems that interface with many of the mainstream ERP systems in the marketplace. The following diagram depicts the key components that can make up an institution's enterprise administrative system platform.



Finance

The Finance component, or "module", within an ERP exists to eliminate the costs and risks associated with myriad shadow systems. Having one system of record for financial data greatly improves governance and reduces administrative overhead. The finance module eliminates the need to maintain these silos of information which may have become 'indispensible' to daily operations.

Although colleges look for an intuitive, easy-to-use design because they realize this will simplify training and reduce the number of errors and other problems experienced by users, presentation is not usually a major consideration in deciding to implement an ERP's financial systems module. Far more important is the ability to make financial information both accessible and integrated.

Data transformation and report generation may take place outside the main system. Over time, providing financial data down through the organization in a streamlined fashion has become the expected approach for units to be more fiscally responsible. Without timely, accurate, and auditable financial information upon which to base decisions, management cannot effectively utilize current resources or plan for the future. Grant administrators need access to balances remaining in grant accounts. Academic department heads are charged with developing budgets that efficiently use available faculty and facilities. College Administration must set strategic financial direction and determine funding models for multi-year initiatives. It is essential that management at all levels and in all areas of the college have access to reliable financial data. For many colleges, the requirement for user friendly access to financial data is reason enough to consider implementing a financial systems module.

Human Resources

Human Resource (HR) systems are looked to as solutions to address inefficiencies and lack of communication throughout the college as it pertains to managing the human resource. The HR module of an ERP system developed for higher education usually has a best practice approach in dealing with HR functions that are specifically related to college administration. For example, multiple job roles can be managed with associated pay rates, ranks, titles, end dates, sources of funding and renewals without requiring customization by the institution.

In institutions that lack a central HR database, numerous files and shadow systems tend to develop to manage staff by their role in one area of the college and not as an employee of the institution. For example, HR may track adjunct faculty differently than full time or part time. In these situations, it becomes difficult to stay compliant with federal reporting requirements or effectively manage the human resources available to the institution.

From a service perspective, the benefits of an ERP HR module may include portals for recruiting, employee data maintenance, ability to appropriately updated biographic/demographic and contact data. At an institutional level, an ERP HR module would allow the institution to more readily recruit and retain talented staff by having appropriate information on positions, abilities, skills, competencies, training and other achievements. When this information is readily available, it also allows administrative staff to identify staff potential or training opportunities. This, in turn, leverages the most valuable asset the institution has – its employees.

Student Information Systems (SIS)

The decision to implement an ERP based student information system is driven by themes that are common throughout Higher Education. Today's technologically savvy students expect a seamless interface when accessing their data or to complete basic administrative tasks. They are becoming increasingly less tolerant of institutions that cannot deliver a streamlined experience. Colleges realize that they must present a strong image to these students and the community, as an institution that embraces technology and understands its vital role in students' learning experience.

With the myriad of systems used to manage student related information, identifying the main "system of record" is often difficult to determine. Each functional area may have data that relates to the student depending on the relationship the student has or had with the institution. This situation makes it difficult for the institution to provide comprehensive and cohesive student support. It also negatively impacts the institution's ability to successfully complete an audit or the accreditation process. Even the simplest requests, such as "How many more students were registered this semester compared to last semester?" can require tremendous effort to answer. The Student module within the ERP is able to capture the information once and store it in a single place, thereby becoming the College's system of record for student data. In this way, the system is able to support enhanced governance and streamlined administration for student processes. Additionally, the Student system has the advantage of enabling the appropriate sharing of student information to system users across the institution.

Many colleges have historically functioned with business areas acting as 'silos', making decisions independently of each other and impeding the flow of information throughout the organization. The nature of the ERP architecture encourages the cooperation of all administrative units because what one unit decides regarding data may impact other units in the institution. Organizationally, an ERP supports a comprehensive IT support model for systems upgrades, enhancements and support because all units who use data from the ERP need to be consulted prior to any changes to the system. ERP modules are designed to be tightly integrated with each other. In many cases, information maintained in one module is used as input into processes performed within another module, thereby automating the flow of data from one business area to

another. However, this means that before altering data in tables shared across modules, careful analysis must be performed to ensure there are no negative impacts.

Faculty and staff often maintain data in subsidiary databases, spreadsheets or files because current systems cannot accommodate the information they need to manage. This approach places the institution at risk regarding access and data security. Additionally, any approach to managing business continuity or disaster planning is inhibited because critical data may be stored in systems that are not directly supported by the institution.

The costs associated with creating and maintaining these shadow systems is significant. Besides the costs of the actual software/hardware needed to maintain the systems, there are intrinsic costs and risks incurred when this situation exists. The primary risks are: only selected individuals have access to the data; there usually is no backup processes in place; information is interpreted differently depending on which of the shadow systems is utilized and each system may have a piece of the necessary data but no one unit has a comprehensive understanding of the information the institution has for any one decision element.

ERP based student systems help drive best practices and common processing across the entire college while still accommodating its truly unique business needs. As the college makes the necessary adjustments to its existing business processes to more closely conform to higher education best practices, departments are able to collaborate more easily since they now have a common 'language' and common set of business rules. The level of functionality supported within any given SIS module varies by ERP vendor. Some of the areas in which colleges find a need to supplement the ERP modules are addressed in the following section on ancillary systems.

Functionality commonly found in the ERP based Student Information System:

- Academic history (transcripts)
- Application /Admissions processing
- Biographic/demographic information
- Course registration
- Course scheduling
- Degree auditing
- Enrollment reporting
- Faculty work load reporting
- Financial aid processing
- Grade reporting
- Graduation clearance
- International faculty/scholar/student tracking

- Recruiting
- State and federal reporting
- Student accounts receivable and billing
- Student advising and advising resources

Ancillary Systems

Commercially available ERP systems contain a wide range of functionality for the management of student information and it is likely that some areas where specialized functionality is required by the college will be lacking. To meet the college's needs, complementary "ancillary" applications may be required to augment or extend the basic ERP functionality. These applications are crucial to building and maintaining effective administrative systems architecture within the college. Most of the leading system vendors provide solutions for interfacing or interaction with leading ERP systems. It is critical to consider how existing ancillary systems that are not replaced by the new Student Information System will interact with it so as not to disrupt workflow. When possible, the same considerations need to be taken into account for anticipated future systems acquisitions.

Academic Catalog Management

Academic catalog management systems provide the college with a simplified process for managing catalog information as well as aid in producing printed or electronic catalogs. While the ERP will manage the catalog and schedule information for registration, a catalog management application allows for the collection and dissemination of the information in a user friendly manner. When integrated with the ERP, a catalog management system provides staff and students with the most accurate, up-to-date information needed for advising and student services.

Appointment Scheduling

Appointment scheduling systems extend ERP functionality by providing an easy-to-use appointment scheduling software system used to maintain counselor schedules. These systems are robust with capacity to meet the needs of multiple service sites within a College and are capable of scheduling individual appointments, tracking group appointments like student orientations and to process walk-ins. With a powerful scheduling tool that is well integrated with an ERP student system, areas including student activities, advising, tutoring and testing services can realize significant efficiencies. Even more important, the positive impact to a student's experience can increase enrollment and retention. Effective scheduling systems can also reduce costs by decreasing the need for staffing resources, minimizing unnecessary paperwork, and preventing scheduling conflicts.

Class Room / Physical Resource Scheduling

Managing the physical resources of an institution, particularly in the area of room scheduling, is often challenging in Higher Education. A separate application dedicated to class scheduling and event management is often added to an institution's ERP environment. To facilitate class scheduling and resource management, resource-scheduling applications often have predesigned extracts and uploads developed for the primary ERP vendors. The primary benefit of resource scheduling software that works with an institution's ERP is the ability to dynamically offer courses and schedule them in an appropriate resource for the course.

When considering a classroom / physical resource scheduling system, an important requirement is a clear understanding of the process between the two systems. When scheduling data changes in the ERP, it is important that the information be managed in a timely manner in the scheduling system as well.

Degree Audit

While some ERP Student systems include degree audit functionality as part of their core offering, institutions may find that their needs are better met by extending the delivered functionality with a "best of breed" degree audit system.

A degree audit system provides an automated way for students and advisors to track the progress the student has made toward degree completion. Robust degree audit systems offer real-time information through secure web access that students can login to whenever they wish. An additional functionality common with degree audit software is the ability for students to do 'what if' scenarios, which allows them to consider changing/adding degrees or majors, refine their course registration and determine time until graduation.

Non-Credit / Work Force Development

Administrative processes for non-credit, work-force development and continuing education program offerings differ significantly from credit offerings because these courses are often not semester or "term" based, have different entry criteria and outcomes are not measured similarly. Historically, SIS/ERP vendors did not put a lot of emphasis on managing non-traditional course offerings since they were perceived to be of secondary importance to the institution. Over time, many institutions, particularly community colleges, have placed increased emphasis on offering non-traditional courses and therefore have made greater demands on ERP systems to accommodate the management of the data.

This change in approach is particularly important for any institution in the State of Maryland where the state financially supports non-traditional course offerings. Maryland institutions are expected to provide a significant number of non-credit/workforce development offerings to the citizens of the state. The challenge for institutions is in complying with State regulations in order

to receive appropriate financial compensation for the courses offered and the number of students who complete each course.

Management of non-traditional offerings is critical to the financial health of the institution. In evaluating an ERP solution, equal attention should be paid to how non-traditional offerings are managed within the credit/traditional systems environment.

Institution-Wide Systems Components

Customer Relationship Management (CRM)

CRM systems can significantly extend ERP functionality by automating and streamlining the interaction between the institution and various constituent groups. CRMs are customer-centric and help organizations take information from the ERP system, formulate the data into appropriate contact approaches and then manage those contacts over a period of time. Regular contact and interaction with an individual improves the relationship with the institution and encourages greater participation in programs, courses and activities. Such relationships also translate into higher retention, alumni participation and donor commitment.

When a CRM approach is integrated with other technology, such as a portal, data in the ERP can be leveraged to target specific groups and create long-term relationships.

Identity and Access Management (IAM)

Identity and Access Management is the institutional approach to managing an individual's personal information, his/her relationship to the institution and the individual's ability to access specific resources based on his/her relationship with the institution.

ERP vendors are very sensitive to the challenges of identity and access management in Higher Education. To that end, all vendors have specific processes and security schema available to appropriately manage personal information. The challenge and risk for institutions is presented by the shadow systems, spreadsheets and files that contain this sensitive information.

The implementing an ERP presents an ideal opportunity to review identity management and the security of personal identifiable information. Often institutions find that they are out of compliance with federal or state regulations (i.e. FERPA) in managing this information. It is critical for an institution to stop using SSN for identity tracking (for instance) and move to an institutional ID as soon as possible. All ERPs generate random IDs for person records. While an ERP will assist in creating an identity and managing it, a comprehensive Identity and Access Management (IAM) solution is a fundamental requirement for managing person data across the enterprise. This system functionality will rely on data in the ERP but would also operate with other systems. When considering an ERP, a good understanding of how it will work with IAM institutional standards is required.

Portal Applications and Service Integration

An educational institution serves a broad range of constituents with varying interests, needs and access requirements. Web portal technology allows an institution to leverage the data collected in an ERP system and provide services based on the relationship the individual has with the institution. Because the data presented is based on information in the ERP, each user experience can be uniquely personalized, provide specific information to the user, reduce confusion, and aid in user support requests. Portals can also leverage the information in an Identity and Access Management (IAM) system and provide a single sign on to all appropriate application based on the individual's relationship with the institution.

When considering portal technology in relationship to an ERP solution, a college portal solution should support standard application programming interfaces (APIs) that define interaction with portlet technology, and pluggable user interface components that are managed and displayed in the portal. Portal solutions that incorporate portlet interoperability standards JSR168, JSRP268 would allow the college to create portlets that can be "plugged in" to any portal solution.

Reporting through Business Intelligence and Data Warehousing Applications

The importance of clean, consistent data for decision-making cannot be over stated. Poorly collected, maintained and distributed data results in decisions that are incorrect and can have the potential to create significant negative consequences to the institution. Daily decisions made at all levels of the institution require appropriate access to correct data at the point of need. The Higher Education decision environment requires a clearly defined repository of data from all systems of record – specifically the ERP and any other ancillary databases that reside within the institution's ERP framework. ERP solutions typically offer some level of standard and customizable reporting as part of their base functionality. These offerings are usually limited and do not ever meet the challenging demands for decision making within an institution. An ERP is a transaction database not a reporting repository and many institutions lose sight of the difference. In the selection process it is important that the College's needs for business intelligence and reporting are considered. A College-wide strategy for data management and reporting is essential. Sometimes the ERP vendor can provide that architecture and sometimes they cannot.

Business Intelligence

Higher Education metrics are often centered on providing service: "How well are we serving our students, faculty, and community?" Measuring people rather than dollars can provide many unique challenges to decision makers.

Business Intelligence (BI) refers to the tools and technologies that allow decision makers to obtain meaningful information about their institution and analyze its measurable aspects. The term Business Intelligence is generally used to encompass elements such as analytical tools, data visualization tools or dashboards, and query/reporting tools. Because the necessary information

is often not available in a user-friendly format directly from ERPs and administrative systems, a data warehouse is built to provide the back-room database to support these requests. Consequently, it is not uncommon to hear the terms “data warehousing” and “business intelligence” used interchangeably.

Business Intelligence tools can provide numerous benefits to users throughout the institution. Because BI tools are designed to be intuitive and user-friendly, users can often create their own reports and charts without the assistance of IT staff, allowing IT to concentrate on producing more complex, standardized reports for widespread usage. By utilizing the functionality offered by BI tools, users are able to compare data over periods of time, to identify relationships or trends, and to perform what-if analysis and forecasting. BI tools can be used to measure what actually occurred compared with budgets, forecasts, quotas, or some other types of metrics or key performance indicators used at the College.

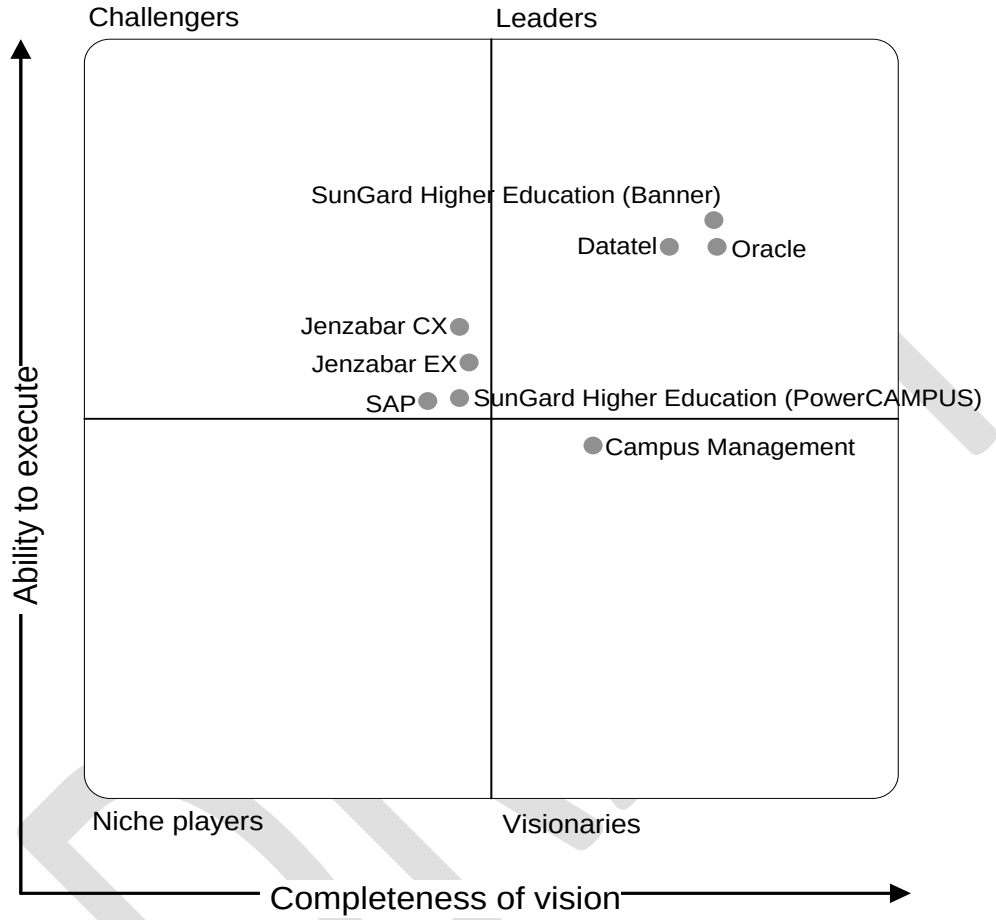
Operational Data Stores (ODSs) and Data Warehouses

Transactional ERP systems are designed so that individual transactions (for example, updating a student’s contact information or posting a payment received to an account) are completed as quickly as possible. Reports and queries, however, require aggregating data from many transactions, performing calculations, analysis or processing, and ultimately reformatting the results into an attractive layout for easy use and interpretation. Each activity can impact system performance. A best practice is to create a separate data repository to specifically support the reporting needs of the institution that is based on institution specific data definitions and reporting requirements.

Two components of an accurate reporting environment are a data store and a data warehouse. In general terms, an operational data store (ODS) contains current operational data extracted from the ERP and any other administrative systems of record. The data is then restructured specifically to support ad hoc reporting. A data warehouse contains detailed and aggregated historical data that has been restructured to support analytical reporting, trend analysis, and complex business decision making. Some ERP vendors have extended their core functionality to include one or both of these technologies.

Commercially Available ERP Solutions for Higher Education

The most recognized vendors in providing administrative suites for higher education as defined by Gartner *Magic Quadrant*[1] are displayed below. These will be the vendors considered by BCCC as potential offerors in the RFP process.



[1] Gartner Magic Quadrant for Higher Education Administrative Suites, Publication ID G00161549, October 10, 2008

Vendors in the **leaders** quadrant have the highest combined measures in their Ability to Execute and Completeness of Vision. They currently perform well, are prepared for the future, have strong customer bases and fully implemented suites. Each vendor in this quadrant has greater functionality above the minimum requirements for the suite. Additionally, they have strong partners, scalable products and ability to deliver all the key higher education administrative suite capabilities. Strong vision is reflected in a solid product and management vision for higher education.

Vendors in the **challengers** quadrant may have a substantial number of installations but do not have the vision of the leaders or may not own all the relevant components of an administrative suite for higher education. They leverage partnerships to provide broader based solutions.

Vendors noted as **visionaries** have a strong vision of the administrative suite but have not completely executed this vision in the market space. They may have leveraged partnerships to provide several core administrative components and/or may be still in the development stage of such components.

Vendors noted as **niche players** have successfully focused on a small segment of the market or may not have the focus to go beyond their modest horizons. These vendors may also be recent entrants to the market and have not established themselves fully within the higher education space.

Higher Education ERP Vendors

Campus Management

Campus Management's integrated student system (One Campus) provides a low-cost ERP environment for small to midsize institutions who seek a Microsoft-based architecture. Campus Management provides fast implementation timelines, tightly integrated modules, application program interfaces (APIs) and proven hosting options for institutions that do not wish to maintain the application on site. This solution has shown to be a solid performer in less complex institutions, including private for-profit schools, but it is unproven within more complex educational environments. It has become more visible in the small-to-midsized college market recently and has been courting this sector through some innovative new products and vendor relationships.

Datatel

Datatel's ERP system (Strategic Academic Enterprise) provides a mature solution in all core areas of an integrated administrative system. The incorporation of ActiveAdmissions and ActiveAlumni system components from a recent acquisition has allowed Datatel to expand the functionality of their product line and provide broader services to their clients. Datatel enjoys a high client retention rate and a loyal customer base. Their current relationship with Microsoft as a development partner will allow them to develop new solutions and other Microsoft-based offerings, such as their SharePoint based system portal.

Jenzabar CX (Unix)

Jenzabar's Internet Campus Solution (JICS) is a portal solution that provides an easy to use interface for the core areas of an integrated administrative system – Student, Finance and HR. Jenzabar CX is a Unix and java based system that is managed within the institutional technology infrastructure. Jenzabar has a large installed customer base and an active user community who favor CX because of its ease of use. Although Jenzabar is developing additional ancillary solutions, the core suite continues to be a strong focus of its customer base.

Jenzabar EX (Microsoft)

Jenzabar EX, continues to enjoy favorable ratings from its users, largely due to the company's JICS portal and CRM solutions. By providing out of the box integration, it is well positioned and a solid product for smaller Colleges who seek a completely Microsoft-based suite. Their partnership with Microsoft Dynamics GP and Microsoft SQL Server data base integration will provide opportunities to offer new functionality to their customer base. Jenzabar has recently made advances into the Continuing Educational arena with their "Jenzabar Non-Traditional System (Jenzabar NTS)", a unique offering that has appeal to both two and four year institutions. NTS, because of its ability to address the management of non-traditional curriculum offerings typical of distance learning, workforce development and continuing education, is worthy of consideration by colleges with significant penetration into these sectors.

Oracle

Oracle's PeopleSoft (Campus Solutions) consists of Human Capital Management, Finance, and Campus Solution modules. Oracle's PeopleSoft integrated suite for Higher Education is currently being used at many campuses worldwide. Campus Solutions is an adaptable solution serving all sizes and types of colleges including small, private universities, community colleges, research colleges, and large, public, multi-campus systems. Campus Solutions Release 9.0 was announced for general availability in December 2006 and the company continues to add expanded functionality to the system, allowing it to appeal to a broader market. Campus Solutions, unless hosted, is suited to mid – large size institutions due to the complexities of the interfaces, and demands for support and implementation.

SAP

SAPs (Business Suite) strengths lie in the HR and Finance modules of their ERP solution because of its' ability to leverage strong business processing practices within the Higher Education community. SAP is known globally for this strength and many Higher Education customers use part of the SAP application to run administrative tasks. SAP challenges, though, are in the lack of delivered modules in key areas of student systems – primarily financial aid. SAP is the only vendor that currently outsources a critical functional area to a third party within their integrated administrative suite.

SunGard Banner

The SunGard (Banner-Unified Digital Campus UDC) is a leader in the Higher Education ERP marketplace and benefits from strong leadership experience in Higher Education administrative systems. The UDC concept tightly integrates other fundamental components that are not usually found in an integrated suite – such as identity and access management, workflow and service-oriented architecture. An integrated portal provides self-service functionality for students and

employees. The Banner suite, unless hosted, is suited to mid – large size institutions due to the complexities of the interfaces, support and implementation requirements.

SunGard PowerCampus

The SunGard (PowerCampus Unified Digital Campus -UDC) provides smaller institutions many of the benefits offered through some of the other integrated suites in an easier to support and less expensive model. It has a broad user base in North America and a solid core of applications for student, finance and human resource functions. An integrated portal provides self-service functionality for students and employees. The PowerCampus product from SunGard is directed exclusively toward smaller institutions.

The following table depicts the operating systems, data bases and other factors that are significant to the environment in which these popular systems are most prevalent.

ENTERPRISE RESOURCE PLANNING (ERP) Environments

Vendor ERP System	Preferred Operating System	Preferred Database	Preferred Portals	Preferred BI System Rpt Writer	Comm Col Mkt Share % SIS	Hosting available:
Campus Management OneCampus	Microsoft Windows® Server	Microsoft SQL Server	CampusPortal	CampusQuery and CampusAnalytics	Not Available	Hosted (CampusNet)
Datatel Strategic Acad. Enterprise	HP-UX, AIX, Solaris™, Windows® Server, Linux®	Microsoft® SQL ServerTM Oracle® IBM® UniData	Campus Crusier portal	Business Objects	13%	On-site
Jenzabar EX (Microsoft)	Microsoft Windows® Server	Microsoft® SQL Server platform	HE Enterprise Information Portal.	Jenzabar's Institutional Intelligence	5.9% Total shared w Jenzabar CX	On-site
Jenzabar CX (UNIX)	UNIX®	IBM Informix database	HE Enterprise Information Portal.	Cognos	5.9% Total shared w Jenzabar EX	On-site
Oracle/ PeopleSoft Campus Solutions	UNIX®	Oracle	PeopleSoft Enterprise Information Portal	Oracle BI Suite Enterprise Edition	24.90%	Oracle On Demand hosting by cresh.net, cedar crestone
SAP Business Suite	UNIX® and Linux®	SAP DB	Netweaver portal	SAP BusinessObjects Edge	Not Available	SAP Hosting Svces SAP hosting partners
Sungard Banner	UNIX® Solaris™	Oracle	Banner Unified Digital Campus	Cognos	39.1% Total shared w PowerCampus	SunGard HE Application Hosting Service
Sungard PowerCAMPUS	Solaris™	Microsoft SQL Server	The PowerCAMPUS Portal	Cognos	39.1% Total shared w Banner	SunGard HE Application Hosting Service

COMPARATIVE ANALYSIS OF TOP EIGHT HIGHER EDUCATION ERP VENDORS AND ACADEMIC PROCESS FUNCTIONALITY

The table presented on the following pages depicts all of the major system processes and functionality currently supported by the systems at BCCC. The system " title" and administrative service area is included.

Adjacent to each of these processes is a matrix indicating whether or not each of the ERP vendors under consideration advertises to provide that function within their system. The information contained here for each vendor will be updated as a part of the RFP process. Processes are grouped based on their likelihood to be replaced by the new system.

BCCC Functions and ERP Vendor Functions												
No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
Replace by the new SIS/ERP												
1		Academic Progress	Degree Audit	SIMS - COLLEGE	Y	Y				Y	Y	
2		Academic Records	Registration	SIMS - COLLEGE SIMS - CERT	Y	Y	Y	Y	Y	Y	Y	Y
3		Add/Drop Processing	Registrar	SIMS - COLLEGE SIMS - CERT	Y	Y	Y	Y	Y	Y	Y	Y
4		Admissions	Admissions	SIMS	Y	Y	Y	Y	Y	Y	Y	Y
5		Alert and monitor at-risk students	Student Affairs	Early Alert Intervention System								
6		Automated grading	Registrar	SIMS - COLLEGE		Y	Y	Y	Y	Y	Y	Y
7		BCED - Non credit Reporting	BCED	SIMS - CERT			Y	Y	Y		Y	
8		Continuing Education Calculation	Student Affairs	SIMS - CERT								
9		Course Catalog	Student Affairs	SIMS - COLLEGE	Y	Y	Y	Y	Y	Y	Y	Y
10		Online Registration and Payments	Student Accounting	SIMS - COLLEGE	Y	Y	Y	Y	Y	Y	Y	Y
11		Schedule appointments for new and international students orientation	Student Affairs	Student Orientation System	Y	Y			Y		Y	Y
12		Scheduling for Testing appointments	Testing Center	Testing Appointment and Support System	Y	Y	Y	Y	Y	Y	Y	Y
13		Tracking of recruitment activities	Admissions	Recruitment Activities Systems	Y	Y			Y	Y	Y	Y

No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
14		Student Accounts and Billing	Student Accounting	SIMS - SOAR	Y	Y	Y	Y	Y	Y	Y	Y
15		Test monitoring	Student Affairs	SYNCHRONIZE								
16		Track advising appointments and data	Student Affairs	Student Advising System								
17		Track Students for Academic warning or dismissal	Student Affairs	Student Success Center System	Y	Y	Y	Y	Y	Y	Y	Y
18		Track testing appointments and results for LOEP tests		Levels Of English Proficiency (LOEP) test support database								
19		Transfer Transcripts	Registrar	SIMS - COLLEGE	Y	Y	Y	Y	Y	Y	Y	Y
Possible Replacement by the new SIS/ERP												
20		Access Authentication (LDAP)	Infrastructure	Active Directory								
21		Analytics and Reporting	Campus Wide	Cognos QUIZ *	Y	Y	Y	Y	Y	Y	Y	Y
22		Assess adult basic reading, math, listening, writing and speaking skills	Business and Continuing Education	CASAS (MD)								
23		Create queries and reports	Campus Wide	Super Tool	Y	Y	Y	Y	Y	Y	Y	Y
24		e-commerce transactions (online payments)	Finance	PayPal			Y	Y	Y	Y	Y	Y

No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
25		Financial Aid	Financial Aid	Regent Enterprise	Y	Y	Y	Y	Y	Y	Y	Y
26		Provide email, contact to mobile devices	Infrastructure	BES Server					Y			
27		Scholarship Management	Financial Aid	Regent Enterprise	Y	Y	Y	Y	Y	Y	Y	Y
28		Send Transcripts Electronically	Registration	Electronic Transcript System	Y	Y	Y	Y	Y	Y	Y	Y
29		Transmit Title IV Grant data to Department of education	Financial Aid	Common Origination and Disbursement (COD)								
30		Web Content Management	Campus Wide	SchoolWire	Y	Y	Y	Y	Y	Y	Y	Y
Systems that integrate/interact with new SIS/ERP												
31		Alumni Management	Advancement	The Raiser's Edge	Y	Y	Y	Y	Y	Y	Y	Y
32		Articulation System for Transfer Credits	Registration / Admissions	ARTSYS								
33		Bookstore transactions	Bookstore	Nebraska Bookstore POS								
34		Campaign Management	Campus Wide	The Raiser's Edge	Y	Y	Y	Y	Y		Y	Y
35		Career Guidance	Student Affairs	SIGI (System of Interactive Guidance and Information)	Y	Y	Y	Y	Y	Y	Y	Y

No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
36		Document Imaging enabled	Campus Wide	OTG, EMS	Y	Y	Y	Y	Y	Y	Y	Y
37		Electronic Academic Testing System	Testing Center	ACCUPLACER								
38		Emergency notification system	Campus Wide	e2Campus								
39		Event Management	Campus Wide	Resource 25 (Schedule25)					Y			Y
40		Fund Raising	Advancement	The Raiser's Edge	Y	Y	Y	Y	Y	Y	Y	Y
41		Identity Life Cycle Manager	Computer and Information Technology Systems	Identity Management System	Y				Y		Y	
42		Learning Management System Interface	Student Affairs	Blackboard	Y	Y	Y	Y	Y	Y	Y	Y
43		Maintain Dental Hygiene information	Medical	Dental (CDR) - Allied health								
44		Score CASAS tests and Students	Business and Continuing Education	TOPSpro								
45		Security System	Public Safety	LENEL					Y			
46		Student and Exchange Visitor Information System	Admissions	SEVIS	Y	Y			Y		Y	Y
47		Student status information	Institutional Research	Student Status Confirmation Report (SCCR)								
48		Submit data to US Dept of Veteran Affairs	Registration	VAONCE system								

No.	Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
				Banner	Power Campus	CX	EX				
49	Track parking permits and payment	Public safety	Pre-Tax Parking System								
50	Track title III Student data	Grants	Tutor Trac								
51	IPEDS (Integrated Post Secondary Education	Institutional Research	TranTrack	Y	Y	Y	Y	Y	Y	Y	Y
52	Integrated Library System	Student Affairs	SIRSI								
53	Volunteer Management	Advancement	The Raiser's Edge	Y	Y					Y	Y
Other Administrative Systems											
54	1099 Reporting	Finance	FMIS - R*STARS	Y	Y	Y	Y	Y	Y	Y	Y
55	Accounting	Finance	FMIS - BPREP	Y	Y	Y	Y	Y	Y	Y	Y
56	Accounts Payable	Finance	FMIS - R*STARS	Y	Y	Y	Y	Y	Y	Y	Y
57	Adult Education and Literacy System	Business and Continuing Education	Literacy Works Information System (LWIS)								
58	Assessment Tracking	Admissions	AssetWin	Y	Y	Y	Y	Y	Y	Y	Y
59	Automated Correspondence (email notifications)	Admissions	N/A	Y	Y	Y		Y	Y	Y	
60	Billing and Cash Receipts	Student Accounting, Finance	FMIS -R*STARS	Y	Y	Y	Y	Y	Y	Y	Y
61	Budget	Finance	FMIS - BPREP	Y	Y	Y	Y	Y	Y	Y	Y

No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
62		Budgeting and Planning	Finance	FMIS - BPREP	Y	Y	Y	Y	Y	Y	Y	Y
63		Career Services	Student Affairs	Career Tech (CTE)	Y	Y	Y	Y	Y	Y	Y	Y
64		Customer Relationship Management	Campus Wide	N/A	Y	Y	Y	Y	Y	Y	Y	Y
65		Degree Information System (Maryland Higher Education Commission)	Registration	DIS								
66		Department of Education , Perkins Grant Dispersal	Financial Aid	Division of Vocational-Technical Education (DVTE)								
67		Enrollment Information System (Maryland Higher Education Commission)	Registration	EIS								
68		Executive Dashboard	Campus Wide	N/A	Y	Y	Y	Y	Y	Y	Y	Y
69		Faculty/Staff Recruiting	Human Resources	Trak-it, Personnel	Y	Y	Y	Y	Y	Y	Y	Y
70		Financial Forecasting	Finance	N/A	Y				Y	Y	Y	Y
71		Grants Management	Grants	N/A	Y		Y	Y	Y	Y	Y	Y
72		Help Desk Automated Ticket Tracking	Campus Wide	HelpSTAR					Y		Y*	Y*
73		HR Federal Data collection	Human Resources	FMIS - HRMS	Y	Y	Y	Y	Y	Y	Y	Y

No.		Process / Functionality	Administrative Area	BCCC Systems	SunGard		Jenzabar		Oracle People Soft	Campus Mgmt	Datatel	SAP
					Banner	Power Campus	CX	EX				
74		Human resources	Human Resources	Trak-it	Y	Y	Y	Y	Y	Y	Y	Y
75		Online Admission applications	Admissions	SIMS - COLLEGE	Y	Y	Y	Y	Y	Y	Y	Y
76		Part-time Employee / Faculty	Human Resources	PEACE								
77		Payroll	Finance	POSITIVE TIME REPORT (PPTR) FT	Y	Y	Y	Y	Y	Y	Y	Y
78		Purchasing (electronic)	Procurement	FMIS - ADPICS	Y	Y	Y	Y	Y	Y	Y	Y
79		Sends data from the college to the US Department of Education(FASFA data)	Financial Aid	Electronic Data Exchange								
80		Store and process budget and contract records	Finance	Budget - database	Y	Y	Y	Y	Y	Y	Y	Y
81		Student Degree, Diploma and external Enrollment verification	Student Affairs	ClearingHouse								
82		Telecounsel	Admissions	N/A		Y		Y	Y		Y	
83		Track Service Requests - Facilities	Facilities	Schooldude								Y
84		Update WIA individual training accounts	Student Affairs	Federal Workforce Investment Act (WIA)								
85		Workflow Automation	Campus Wide	N/A	Y	Y	Y	Y	Y	Y	Y	Y
		Y* = with limited capabilities		**Shaded (empty) boxes: No/limited vendor information was found/available**								

Institutional, Functional and Technical Considerations

In any discussion of the purchase of an integrated administrative system or ERP, consideration must be given to the environment the system will be deployed in. Awareness of institutional challenges, the current technical environment and the on-going functional needs of the institution will provide a framework for solid decision making while evaluating ERP vendors and services.

This section will provide a salient framework of these three areas from a Higher Education perspective.

Institutional Considerations

The implementation of an ERP provides the institution with the unique opportunity to reinvent itself and its business model. It also opens the way for dramatic transformation provided the institution is wholly committed to such a transformation.

Institutional Governance and Project Accountability

An ERP implementation is one of the most expensive projects an institution will ever undertake. An appropriate governance structure and coupled with strong project management will provide a solid basis for an on time and within budget implementation.

ERP projects that have been undertaken without a sufficiently committed executive leadership structure suffer because there are no clear paths to decisions that need to be made in a timely basis or an appropriate mechanism to make such decisions without sufficient vetting by appropriate groups within the institution.

At the highest levels, it is necessary that the ERP project be seen as a fully committed endeavor from all administrators within the institution. An effort of this magnitude cannot be delegated to infrequent communications and updates. All individuals who may be impacted need to have the ability to express concerns, issues, and challenges but also have a structure to celebrate successes and triumphs. The core executive team consisting of the President, Vice Presidents and Directors of impacted functional areas need to be consistently engaged in the process from the start.

In an attempt to save money, many institutions designate current staff to manage and implement an ERP project. The thinking is that the current staff are the subject matter experts and should be able to use the software in their areas where they are the experts. Many institutions that have attempted implementing an ERP with this concept have discovered just how costly this approach is as they predictably experience delayed deployments, reduced staff efficiency, high staff turnover from burnout, and a lack of true understanding of the product to fully utilize the functionality.

Successful institutions recognize that the true cost of an ERP implementation takes into account the human resources necessary to implement and then successfully support the project. There are four approaches to consider for project governance and project management:

1. Institution Project Management – In this model, the institution elects to have internal staff manage the project from start to finish. It is up to the institution to develop project plans, timelines, resource allocations and all associated project resources necessary. To be successful, the institution selects individuals with the expertise necessary for project management and removes other responsibilities from the staff who are engaged on the project. (This process is also known as 'back filling' the positions.) Unless an institution routinely and successfully implements large-scale technology projects, this model is highly discouraged.

2. ERP Vendor Supplied Project Management – In this model, the institution elects to have project management delivered by the vendor. The value in this approach is that the vendor will provide a standard project plan and expected timeline, associated best practices and experience in implementation of their ERP. Risks associated with this approach are canned/static plans, an inability to look at creative ways to solve problems without generating higher costs, a one-way approach to using the software and a lack of objectivity when issues arise during the implementation.

3. Independent Project Management – In this model, the institution elects to have a neutral third party vendor as project manager who has experience in implementing the selected ERP vendor software and within the institution environment of consistent size. The value in this approach is that there is experience on implementing the software, a standard plan that can be customized to the institution, associated best practices, and objectivity when addressing issues or solving problems. The primary risk in this arrangement is the relationship between the ERP vendor and the project management vendor.

4. Co-Managed Project Management – In this model, the institution elects to have project management from both the vendor and an independent, third-party organization. The advantage of this approach is the ability to balance what is provided by the vendor, such as software implementation expertise, along with the impartiality of independent and experienced implementation staff. As long as there is agreement with the reporting structure to the institution, this can be a very effective management model. The challenges with this approach are cost and clear agreements with all vendors involved. It also requires a strong and impartial project sponsor within the institution. Therefore, many organizations elect to include an implementation partner along with the ERP vendor.

Implementation of an ERP solution can drive significant college change and will require the college to develop stronger governance and oversight of the technology environment. This, in turn, will require more participation and direction from functional leaders across the college. While the IT organization often facilitates this process, functional areas will drive many of the decision and policy changes necessary to support a successful administrative systems solution.

Therefore, before engaging any ERP vendor, the project governance and accountability structure should be determined within the institution with an appropriately drafted framework to begin the work. Neglecting this initial phase of the project can result in costly delays to start the project as well as at key points within the project deployment timeline.

Transformation and Cultural Shift

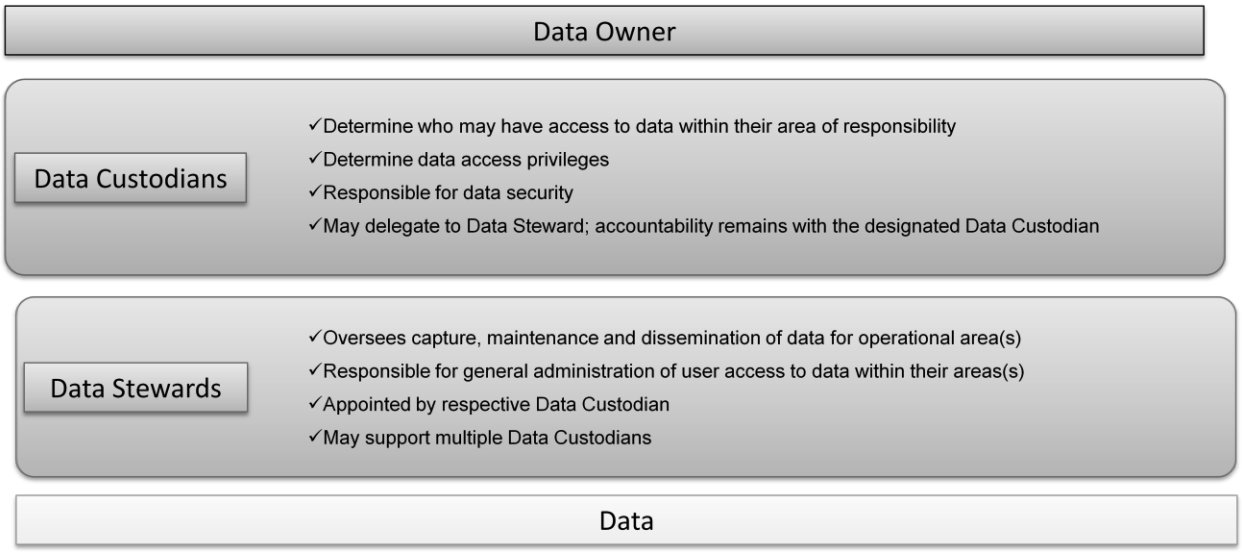
The implementation of an ERP system can dramatically improve the way departments work together to serve all populations of an institution. Throughout the project, each area will need to consider the best approach for the College as a whole. The days of independent decision making will need to come to an end in order to fully utilize the basic functionality of an integrated administrative system. Conflict resolution skills will be necessary to resolve challenges between units that may have established historic boundaries and ownership over roles and tasks.

Again, a solid governance structure is critical in supporting the cultural shifts necessary for an ERP implementation. During an ERP implementation there will be many discoveries that are uncovered during the process reviews that take place to fit the ERP to the institution. Among those discoveries will be processes that are managed by one area that appropriately belong to another. Additionally, as gaps are discovered between current practices and the software, the need to 'customize' or develop 'work-arounds' will occur. Often these requests are a desire to keep things as they are. Institutional leadership can leverage the implementation to drive transformational changes throughout the institution.

As with any long-term initiative consideration needs to be given to identifying and rewarding the key personnel resources over the life of the project to ensure continuity and prevent costly training and skills development, as well as the need to re-establish team identity, project scope, and direction.

Administrative Data Access and Security

ERP applications bring focus to data security; therefore, successful projects require the College to consider the establishment of administrative data security policies that define data owner, custodian, and steward responsibilities within the College. The College will need to create or update existing policies to take advantage of the new security controls provided by the system and ensure the security, confidentiality and appropriate use of the administrative data.



Holistic Approach to Presentation

Timing of a college portal solution is a key part of the planning process. Historically, portal technology (discussed later in the document) has been addressed as an afterthought while the main focus has been on bringing up specific ERP core modules. Best practices are now being modified to address the shortcoming with this approach. More recent approaches have identified that the portal needs be an early deliverable, with new functionality added as new parts of the system are brought to production. As each service or group of functionality is delivered, it can be presented in a single location eliminating the need for multiple access points and login protocols while providing a holistic, well branded view of services to the constituents.

Functional Considerations

While ERP implementations are often considered to be mostly technical in nature, the reality is that they deeply impact the way the college operates. Adjustment from current or as-is processes to the best practice processes provided by the vendor and implementation partners is one of the most challenging and rewarding components of an ERP implementation. Any college undertaking an ERP implementation should be prepared to work thorough fundamental changes in processes and procedures, as well as realignment of functions and employee responsibilities.

Closing Process Gaps

The planning and preparation process consumes a significant portion of time in an ERP project. Consideration of which functional resources are in the best positions to help the project team gain a thorough understanding of the way the College currently operates is important as this is an essential part of the process. Resources need to be forward thinking and flexible as they review the available solutions, looking for the best-fit for the institution as a whole and working to close

any gaps. Fortunately, the business process review work recently completed by CWI and BCCC provides an excellent start and can be used as the foundation for a complete fit-gap analysis.

Role in Information Integrity

Clean-up of legacy data must be driven by the functional area experts. While the actual programmatic conversion is performed by the technical team, all of the logic required to accurately convert the data is provided by the functional areas. This can be complicated since the way the data attributes have been used over the years may have changed. This leads to another conversion challenge that must be addressed: historic data. It is not always reasonable to clean up and convert all of the historic data into the new system. Storage and retrieval of non-converted data must be factored into the conversion plan.

Timing of Implementations

The effect on college operations, semester changes, annual reporting, fiscal or calendar financial closings, payroll cycles, planned infrastructure upgrades, and other critical business functions must be well thought-out within the functional areas and clearly articulated to the implementation team. Without a holistic view, the team will struggle in building a realistic implementation schedule.

Functional teams, as well as technical teams, need to be prepared to work during holidays and other off-work periods as these are often to best windows of opportunity to implement ERP solutions. The conversion effort alone can take multiple days of downtime to complete.

Training Programs

While ERP vendors will provide initial training and staff development programs, on-going training support will be required. Developing internal training material and providing on-going College-specific instruction on the systems is often an afterthought in ERP planning. The College needs to consider where within the College this function will be performed. Often thought of as a system maintenance task and left to the technical staff, it is much more appropriate and effective when training is developed and provided the functional areas who know the business processes, not just the system navigation. This approach will also support a collaborative and recommended support environment with several tiers of accessible support that can address most issues before being sent to IT technical support.

Supporting the Functional Areas

Another factor often overlooked during planning is the role the functional staff will perform in the on-going operation support. Developing strong functional subject matter experts within the areas who can act as advocates for the adoption of new processes is important as these resources can also become the front-line for issue resolution since, especially in the first year, many of the

questions are functional in nature and can best be handled within the business unit. An additional benefit for placing support in the functional area is that updates to the software and processes can be more clearly defined, understood and implemented with upgrades to the software. Many institutions do not plan for this task and new functionality may be often overlooked.

Functional Staffing

While it is common practice to consolidate technical resources and support multiple functional areas with a given resource, consideration must be given to the need for the allocation of functional and process experts from each of the areas being impacted by the ERP solution. Interestingly, the decision to internally or external host a solution has much less impact on the functional staffing requirements.

Functional staffing roles for an ERP implementation can include: subject matter experts, business analysts, quality testers, administrative and policy decision makers, training and process document developers. Cross-training and redundancy in case of attrition must be considered.

The skills, both technical and interpersonal, of the functional resources on the project will be important contributors to project success. These project leaders will become the subject matter experts not only for the project but also for the departments going forward.

Testing and quality assurance is another area for functional staffing consideration. Their knowledge of the business processes, combined with the knowledge they gain through training and hands-on work with the ERP solution, position the functional resources as huge assets. From the development of testing material and data, through system testing, and finally as the signoff point for user acceptance testing, the functional resources are invaluable.

As with technical resources, the need to cover the daily operations and job functions of staff assigned to the ERP project must be taken into account and backfill provided. A multi-year commitment and the ability to work in a close team environment during periods of focused effort to meet deadlines also apply.

Technical Considerations

Internal vs. External Hosting Options

Where the College hosts the ERP hardware and software environments is an important decision for BCCC. Hosting can be done internally by the CITS (Computer Information Technology Services) organization or can be outsourced to the ERP vendor. Vendor supported hosting can provide a variety of services, including hardware/software environment support, implementation services, and on-going support services.

Vendor supported hosting may require less initial capital and can help to maximize the College's return on software assets to maintain lower internal fixed costs for maintenance. It may also reduce the demand for CITS' resources capable of implementing and supporting an ERP solution. Significant benefits can be gained from hosting because vendors can provide for new release implementation, on-going patch upgrades, and support for hardware, operating systems, applications and databases. BCCC can benefit from the depth of experience a hosting vendor brings, which can reduce the requirement for additional staffing, training and certification. A challenge with hosting is that the technical knowledge of the ERP architecture is kept outside of the institution. Technical approaches to solve issues will be fully dependent on the hosting vendor's timeline for development and implementation and can inhibit the College in taking advantage of innovative solutions in an expedited fashion.

As the conversion effort is one of the most significant and difficult ERP implementation tasks, this should be part of a vendor partner's implementation service agreement, particularly with a hosted vendor. Vendor supported hosting also provider for availability and disaster recovery solutions. As the College will become very dependent on the competence and longevity of the vendor hosting solution, best practices in hosting vendor selection is outlined in the section on hosting considerations.

Hardware and Operating System Technology

The hardware required to support an ERP system varies greatly depending on vendor selected, size of the college, performance requirements, business continuity and disaster recovery requirements, and other factors that drive the system architecture.

Strong consideration needs to be given to the college's current data center environments, as well as current technical staff skills, when choosing to internally host an ERP solution. To select a UNIX-based ERP solution running on a hardware platform that is new to the college's data center environment would require significantly more training and resources to support than selection of a Windows-based solution running on familiar platforms. The college also needs to consider the vendor recommendations as, depending on vendor, they may only certify reliability and performance on select platforms.

Application Technology

One of the less obvious considerations is an understanding of the underlying application technology upon which the systems were developed. Depending on the age of the system and the vendor's history of acquisition and blending of disparate functionality, a variety of ERP technologies can be found in the marketplace. Understanding the different technology approaches a vendor may have within the ERP environment can aid the college in recognizing impact during major releases or upgrades. This is particularly true when the underlying

approach, such as the database, is being changed in a different cycle than the ERP application itself.

Database Technology

Some ERPs are dependent on a specific database vendor, usually an Oracle, Microsoft SQL Server, or a proprietary database solution while others are database independent or agnostic. Database agnosticism implies that the solution is not tightly integrated with a particular database and, thus, is able to access any of the major database systems. The ability to run various industry standard database engines can provide benefits to a College particularly when the legacy systems are using a technology that can be matched, thereby simplifying the data conversion effort. These advantages may be offset by a sacrifice in system performance and flexibility.

To support multiple databases, the ERP vendor must pick the lowest-common-denominator set of database features for the ERP to use. In other words, it may not be possible to use the extended features of a particular database because these features are not compatible with other databases being supported. Often this results in less than optimal design, user experience, and performance. Focusing on a particular database product enables the vendor to take maximum advantage of the database's feature set, allowing for additional capabilities and richer functionality not available in a database agnostic solution. Tight ERP and database integration also lowers database management costs because the ERP itself can automate many ongoing data management tasks.

Database licensing cost varies greatly across the ERP solutions and should be a major consideration when selecting a database technology. Vendors provide a variety of licensing options based upon numerous criteria (for example, number of users, number of server processors, or number of transactions). Strong negotiation is essential in order to keep initial and ongoing database costs as low as possible.

Like database licensing, ERP licensing costs can vary greatly from vendor to vendor. Care should be taken to license only the modules to be implemented within the warranty period so as not to incur maintenance costs on functionality that is not being utilized. Strong consideration should be given to the "package discount" as premature maintenance costs may drastically increase total cost of ownership.

Client/Server and Native Internet Browser Technology

When selecting an ERP solution, thought should be give to the type of "footprint" or platform the vendor's software will support. There are two basic structures to be aware of: Client/Service-based solutions and Web-based solutions. A given ERP vendor may support a combination of both, with the power user accessing core functionality using a client/server-based solution while the more casual user accesses limited functionality via by a Web-based solution.

Client/server-based solutions rely on two computer programs: one on the user's desktop/client and one on the application server. In a typical scenario the desktop/client makes a request for information from the server, which delivers the data to the desktop/client, and the desktop/client software processes the data to display only the information requested. It is important that the desktop/client and server applications are matched releases. With client/server-based solutions, the software should be included in a standard desktop/client image and a 'push' to the individual workstation would be needed whenever patches or release updates are required.

Web-based solutions provide access to the data through an Internet browser rather than through a locally installed application. Because the server manages the processing, there is no desktop application to maintain so updates to the software only need to be made on the server, and not to each individual computer accessing it. Retrieving information with a web-based system reduces the volume of data traversing the network. Additionally, since web-based technologies require only an Internet browser, accessing the application requires only an Internet connection and a proper user account; a VPN solution is not required. Adding dependencies on frequently updated web browsers does add validation complexity as there are many browsers in common usage. This could complicate end user issues when they are using a non-supported browser configuration. There is also a risk that browser updates pushed out from the browser vendor may cause unpredictable application behavior. Overall, the web-based solutions can be easier to maintain but the user experience generally is not as rich as the desktop/client user experience.

Vendor Architecture and Tiered Development

Another related structural consideration is the tier architecture of the vendor application. Mature vendors are at different stages of re-architecting their systems to current technology; newer vendors are using more current architecture. This becomes important in the vendor selection as the release of new architecture can drive significant implementation, training, and support costs.

The basic concept is: the more tiers, the more distributed processing the architecture supports. Mainframe systems do all their processing on a central computer (1-tier). Client/server technology introduced 2-tier architecture with processing done on both the client PC and the database server. An advantage to 2-tier architecture is its simple structure and the ease of setup and maintenance. Further client/server development introduced the 3-tier architecture with processing done on the client PC, an application server, and a database server. This architecture brought several advantages, including simplification of how business logic is supported and improved performance. The latest architecture is referred to as N-tier and uses web services and other development technology to share business logic, data, and processes across the network. System architecture is a complicated subject and BCCC may require consultant support to fully research vendor architecture during the RFP process.

Identity Management (IAM)

A major administrative architecture consideration when selecting an ERP system is the vendor's ability to address the college-wide digital-identity challenge as a component in the College's identity management solution. With recent security-breach notification laws, it is crucial that the College strengthen its identity and privacy protections.

Technical Staffing

Staffing an ERP implementation project can be challenging and requires the type of through skills analysis currently underway at BCCC. Existing technical staffing levels and skills, compared to what is required to successfully staff the technical resources on the project team starts the process. This, coupled with the challenge of continuing to maintain normal business operations, will direct a College's staffing level decision. A contributing factor to the decision to external host is that it can mitigate the requirement for increased local staffing during the implementation period.

Technical staffing roles for an ERP implementation can include: database analysts, technical leads and technicians by module/major functionality (Student, HR, Finance, Conversion, Reporting, Portal, etc.), system administrators, security administrators, quality testers, and technical/business analysts. Cross-training and redundancy in case of attrition must be considered.

Resources to cover the daily operations and job functions of staff assigned to the ERP project implementation must be taken into account. It is unrealistic for the same resources to effectively focus on both a new implementation and current operations. Doing so contributes to project failure.

Selection of which BCCC staff will be assigned to the project is important as they will need to be prepared for a multi-year commitment that will include significant training and growth. They must be capable of working in a close team environment during periods of focused effort to meet deadlines.

Planning should also include attention to long-term staffing and turnover. As BCCC technical staff obtain training to strengthen their skills, consideration should be given to adjustments in compensation or other retention methods.

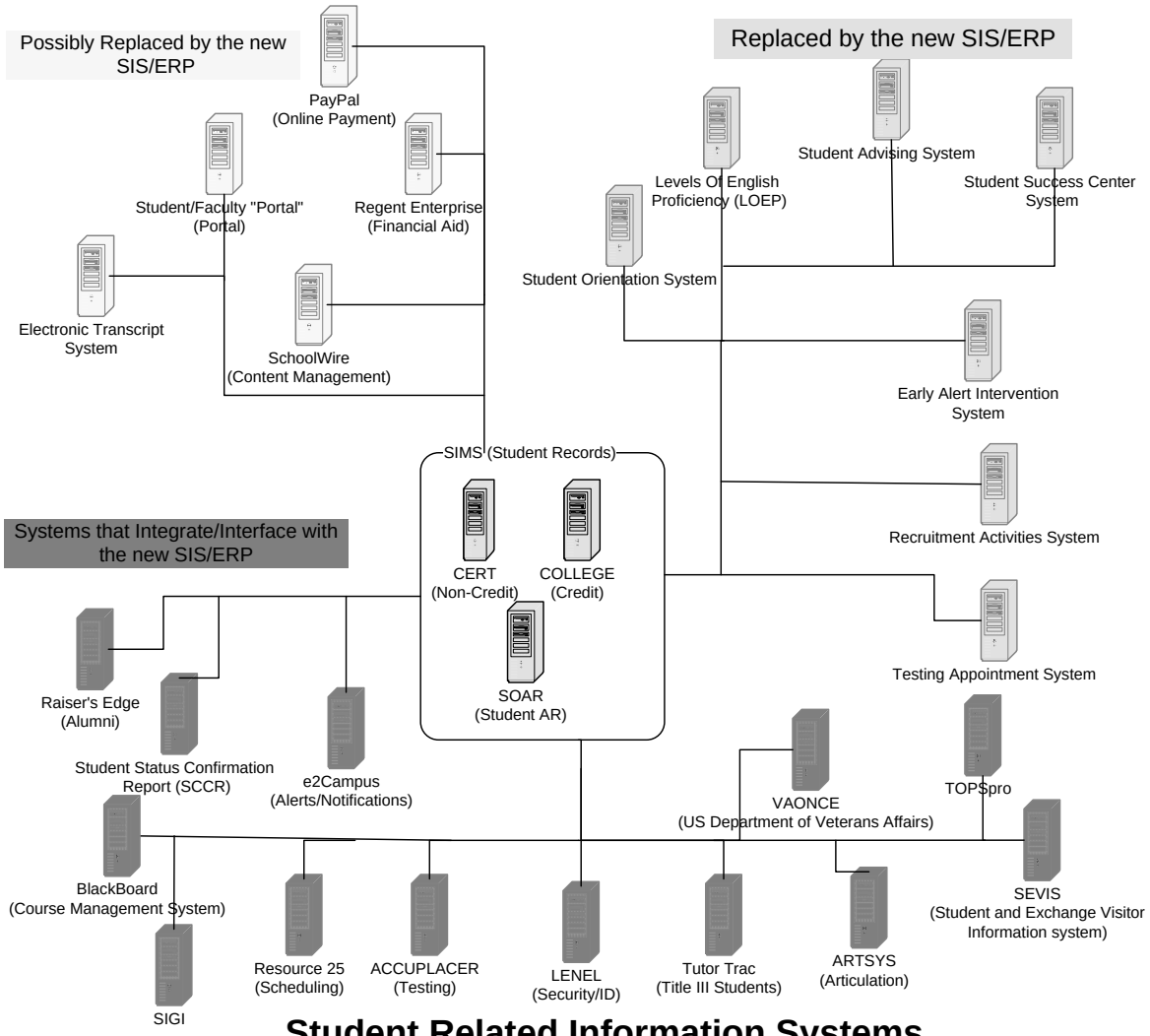
Chapter 2 – Current Administrative Systems Environment at BCCC

Introduction

This chapter reviews the current state of the administrative systems environment at BCCC and discusses which functional areas should be considered for potential replacement by an ERP solution.

When considering an ERP implementation, it is important to include the entire scope of current and future services the College wishes to offer and to develop a comprehensive integrated administrative systems strategy for the institution. These services may be provided by current core administrative systems or by ancillary systems that have been implemented to close gaps in the current administrative applications.

The figure below identifies the major systems currently in use at BCCC.



Student Related Information Systems

Major Ancillary Systems

- Application form
- Cognos QUIZ
- Super Tool
- AssetWin
- Budget -database
- ClearingHouse
- Division of Vocational-Technical Education (DVTE)
- Electronic Data Exchange
- HelpSTAR
- Payroll
- Schooldude
- Trak-it
- WIA
- Dental (CDR) - Allied health
- Enterprise Identity Management System
- Imaging Systems – (OTG & EMS)
- Nebraska Bookstore POS
- Outlook Exchange
- Pre-Tax Parking System
- SharePoint
- SIRSI
- TranTrack

State Provided Systems

- Career Tech CTE
- DIS
- EIS
- FMIS – ADPICS
- FMIS – BPREP
- FMIS – HRMS
- FMIS - R*STARS
- Literacy Works Information System
- PEACE
- Personnel
- POSITIVE TIME REPORT (PPTR) FT
- POSITIVE TIME REPORT (PPTR) PT

Organizational Structure

The current administrative system environment is a loosely grouped set of applications that are technically managed by CITS with the expectation that they are functionally managed by the responsible functional area. In the current environment, there does not appear to be an overarching structure for functional processes, communications and changes. When a college does not have a formalized structure for administrative systems, end users will often create processes, databases and workflows 'on the fly' in order to address an immediate need. This has been the case at BCCC and it only exacerbates the issues that already exist technically with the administrative system.

Administrative Systems

As discussed earlier, ERP core functionality is typically comprised of three functional areas: Finance, Human Resources and Student Information Systems. BCCC is in a unique situation in that it is considered a State Agency within the State of Maryland as well as an educational institution. As such, BCCC is constrained with the types of system solutions that can be implemented at the College because State Agencies are required to interact with the State using State managed systems and interfaces.

State Agency Mandated Administrative Systems

As a State Agency, the College is mandated to use certain administrative systems to provide information and reports to the State for compliance and funding purposes. The systems to manage permanent employees (Human Resources) and financial information (Finance) are State mandated for a State Agency. Unlike other state supported institutions that may provide information in a variety of ways, the designation of 'Agency' for BCCC reduces the possibility of selecting an ERP that would encompass all three functional areas solely within the administrative system.

For BCCC, there are three major considerations (a) the Student Information System functionality which is not mandated by the State, (b) the ability of the selected ERP to work within the framework of the State mandated Human Resource (HRMS) and Finance (FMIS) systems and (c) the functionality of current ancillary systems that might be replaced with an ERP solution.

Human Resource Functionality

BCCC is required to use the Human Resource Information Systems (HRIS) as mandated by the State of Maryland. The modules required for BCCC are:

- Human Resources Management System (HRMS) (FMIS Module)
- Personnel Database on HP Mainframe

- State of Maryland Benefit System (BAS)
- Positive Time Reporting Processing (PPTR) - State 310 system

BCCC has also chosen to purchase and implement Trak-it, a human resource tracking system that is used as a parallel data system to coincide with the data entered into the State HRIS. The goal in implementing an additional HR system was to enable staff better access to their data through the systems internal query and reporting tools. Attempting to access data from the State system requires IT resources to develop, query and report on the data. At present, neither solution seems to meet the needs of the College as identified in the BCCC Business Process Review of HR. As a result, the HR area is considering abandoning TrakIt since it adds no significant value to the process.

Finance Functionality

BCCC is required to use the Financial Management Information Systems (FMIS) as mandated for Maryland State Agencies. FMIS modules include:

- Relations Statewide Accounting and Reporting System (R*STARS)
- Advanced Purchasing and Inventory Control System (ADPICS)
- Budget and Preparation System (BPREP)

The various finance offices in BCCC suffer from the same issues that the Human Resource area experiences in working with the State required system(s). There are numerous external databases and spreadsheets generated to manage information as well as multiple points of data entry.

Non-Credit Course Work/Work Force Development Initiatives

For BCCC, the need to manage non-credit/work force development initiatives will have a significant impact on the selection of an ERP. The State of Maryland directly funds non-credit/work force development offerings. It is one of only a handful of states that provide this funding for such initiatives. In order to receive the appropriate funding for non-credit courses, the State requires a comprehensive set of reports throughout the year. Non-credit courses, by their very nature, are complex offerings that do not lend themselves to a structured reporting requirement. Because so few states have the same compliance requirements, many ERP vendors have not incorporated the functional processes necessary to maintain the data separate from credit offerings or to provide the level of complex reporting required for compliance. This situation will add a layer of complexity to the overall integrated administrative approach at BCCC and may require additional ancillary systems that other institutions would not need.

Other BCCC Systems

While an ERP solution would not be expected to handle the functions of other systems currently part of the BCCC architecture, these systems will need to be considered if they continue to remain viable solutions for the College. Examples of these systems include the learning management application, emergency alert, security, parking, library, and asset management systems.

Student Systems at BCCC

Regent COCO Student Information Management System (SIMS)

BCCC is currently using Regent's COCO Student Information Management System (SIMS). As of December, 2008, the COCO student information system is no longer supported by the vendor and is now internally supported by the College. This places the institution at risk by requiring a level of technical expertise for an application that was not developed by the College. COCO includes four modules:

- COLLEGE – This module manages the data for students and credit coursework.
- CERT - This module manages the data for students and non-credit coursework.
- SAFER - This module manages the data for students and financial aid.
- SOAR – This module manages the data for students and student accounts receivable.

COCO suffers from many functional shortcomings that are now commonplace functionality in ERP software. The fact that individuals need to recreate basic biographic/demographic data in each of the modules means best practices for data management have not been developed within COCO. The system does not appear to be fully integrated within itself. Multiple records for the same person exist within the database with no clear relationship for the data between the modules. This situation forces multiple staff to repeatedly enter identical information in order to have a complete record on an individual for specific transactions.

The technology required to interface COCO to other systems is very limited and prohibits the College from streamlining operations in an efficient manner. It became clear during the BCCC Business Process Review on selected functional areas completed in early 2009, that this inability to integrate basic information has a profound negative impact on student services, faculty retention and staff support.

- COLLEGE – The COLLEGE module maintains basic information on students, schedule and academic history. Unfortunately, it lacks basic functionality to support students' long term. Managing test scores, prior College coursework, transfer information and academic history is time consuming and complex – often requiring entry on multiple screens of the

same information. At any point in the process, a screen or field can be missed leaving the student's record incomplete and inaccurate.

- CERT - The CERT module is dedicated to managing non-credit student data and related coursework. With very limited functionality and no best practice design, the College has been forced to develop numerous shadow databases, spreadsheets and manual file systems to manage the non-credit processes and information.
- SAFER - The SAFER module was designed to manage Financial Aid in conjunction with COLLEGE. With the elimination of support of COCO by Regent at the end of 2008, the College elected to purchase and implement Regent Enterprise Financial Aid. This decision was based solely on the expectation that the new purchase would integrate seamlessly with the legacy COCO system.
- SOAR – The SOAR module is designed to manage student accounts information in conjunction with COLLEGE. Data contained in this module is entered both in SOAR and in FMIS, the State of Maryland Finance system. This dual process is expensive in terms of time and human resources for it requires all information to be entered, checked and validated across both systems. Line item detail is not available in the finance system and there is a great amount of manual tracking for collections activity.

Other Student Related Administrative Applications

Academic and Event Scheduling

An institution's success is dependent on attracting a strong student body and the ability to serve them in a manner that is timely and appropriate. Managing physical resources, particularly classrooms and meeting space is a critical function in delivering that service.

BCCC has licensed a "best of breed" Academic Event and Scheduling System from CollegeNet called Resource25. The Resource 25 product is frequently selected to augment ERP Student Information System functionality. Integration and support with leading Student ERP vendors is currently available.

Advancement / Foundation

In order to more accurately support fund raising and donor activities, BCCC purchased and implemented the fundraising and donor management system *Raiser's Edge*. This application is considered a 'best of breed', which means that it has many of the features, functionality and best practices built within the application. Currently, there is limited data transfer between COCO and Raiser's Edge. Importing information from the student system into the Advancement system on a regular basis is a standard practice since former students and alumni can be a great source of donor contributions. Biographic/demographic information needs to be consistent between the two systems in order to fully serve students, alumni and donors. The inability to easily receive

student information from COCO inhibits the College in maintaining relevant information on the same individuals who have information in Raiser's Edge.

Appointment Scheduling

To fully support a student's academic progress, it is necessary to have regular and appropriate advising sessions during their academic career. Managing appointments for a high volume of students with spreadsheets, paper calendars or individual Outlook calendars is cumbersome, inefficient and leads to confusion. Disparate MS Access databases and spreadsheets are used to schedule testing, advising, orientation and registration. No integration between the databases means that there is a significant amount of redundant data entry.

Degree Audit

While the COCO COLLEGE system has the capability to perform degree audits, there is no consistent approach to maintaining the degree data required to support this functionality. The lack of an approach and understanding of how the software creates a degree audit review has prevented the College from successfully using this capability.

Identity and Access Management (IAM)

A fundamental challenge in managing student information is the ability to know the relationship that each person in the database has to the institution. Appropriately tracking person data and the relationship is critical to allowing appropriate and timely access to resources the student needs when the student needs it. Email, access to course information, registration, library, ID cards, parking are all dependent on this information. For security, it is critically important that access be managed in a timely manner when the relationship changes as well.

BCCC is part of a statewide agreement with Microsoft and has attempted to implement the Microsoft software that supports an enterprise IAM solution. While components including Microsoft Identity Integration Server (MIIS) and Microsoft Identity Lifecycle Manager (ILM) are installed, these products are not configured or integrated into BCCC's system architecture.

Learning Management System

BCCC has implemented the Learning Management System (LMS) - Blackboard – to manage online course delivery and administration. Blackboard allows faculty to delivery courses electronically while providing students the ability to interact online with faculty and fellow students. Student system ERP vendors have integration packages that will either interface or replicate appropriate data from the ERP to the LMS.

Portal Technology

A portal is defined as a central place for providing information accessible to specific populations based on the relationship the individual has with the organization. Portals can be defined in two ways: Enterprise and Content.

Enterprise portals are designed to consolidate a wide variety of information onto a single screen with the ability for the individual to 'drill down' by clicking for further information. This is considered a 'consumer' portal for individuals accessing it 'consume' the information.

Content portals, on the other hand, are designed to allow an easy and accessible way for developers of information to organize, edit and present information. Usually this information is available through an Enterprise portal. In the BCCC environment, COCO purports to have the ability to be an enterprise portal for student information and electronic delivery for the institution. The web interface for COCO is really a system of links to other information and is not a true portal. It is not data driven, nor does it provide personalized content – both of which are hallmarks of a true portal experience.

The current solution requires the CITS staff to maintain the links manually as instructed by other areas of the College. Content management is also difficult to manage leading to outdated information being presented to the users.

Reporting

The numerous and incongruent databases in the BCCC environment make access to administrative data difficult. Since there is no enterprise wide approach to data management, collection and maintenance is inaccurate and may be misleading. A basic question such as "how many full time employees are currently employed at BCCC" can yield wide and varying results depending on which functional area is asked the question

BCCC relies heavily on the standard reporting provided by the commercial systems in place and has very little reporting capability for homegrown systems. While COCO provides some integration, the main modules maintain independent databases making reporting across the system difficult.

BCCC is currently using a discontinued tool, *Cognos Quiz*, to access some of the administrative data. Because of the complexity in relating the data together in a way that ensures accurate reporting, only a few trained CITS staff are able to create limited reports for the College. This issue was raised by many departments during the CWI Business Process Review.

Without an integrated data store available for reporting, the creation of reports is very labor intensive, and reporting across systems becomes a manual process. Many person hours are

invested regularly in acquiring, validating, reviewing and compiling the data from multiple spreadsheets, departmental databases and paper files. Even after all this effort, the information is not always accurate, cannot be fully validated and requires significant explanation on how the data was compiled.

Chapter 3 – Preparation and Planning for an ERP at BCCC

Introduction

In Chapter 1, we provided a general background about ERP in Higher Education and defined the basic approach to selecting an ERP versus integrating multiple systems together across an institution. In Chapter 2, we defined the current overall systems and administrative environment at BCCC. In defining the environment of a community college designated as a state agency, it becomes clear that adopting a complete commercial ERP solution which includes Finance, Human Resources and Student is not a realistic or necessary option for BCCC.

This situation, though, provides a unique opportunity that few institutions have – to select an system that is focused on the needs of the various student functional areas. In addition, the special processing requirements of non-credit/workforce development – both for students and for employers -- can be more fully considered. Resources that might have been spent in determining interoperability with other major functional areas can now be used to better define the needs and requirements for different constituencies.

In traditional IAS implementations, institutional consensus is needed on all the data elements and processes that will be implemented with the new system. Bringing Finance, Human Resources and Student in alignment can be challenging because of the differing data needs across the institution. While this issue will still exist at BCCC, it will be more a matter of having the information collected in the Student System in a manner that will be more efficient for data movement into the required State of Maryland systems. Additionally, the recently completed business process analysis that addressed many high profile functions across each of these areas will enhance the colleges ability to take advantage of new administrative systems.

To clearly indicate this shift in focus from an enterprise-wide system to a student centric system, from this point forward, it may be referred to as the Integrated Administrative System (IAS) when referencing the specific implementation at BCCC. This section will focus on preparing the college to make appropriate decisions regarding the costs, scope, technical options and implementation strategies associated with a new IAS.

Costs and Strategies

As the college begins the process of planning for a new IAS it is imperative that it take stock of the long term costs (Total Cost of Ownership) for such a project so that appropriate and necessary steps can be taken to ensure the funding and success of the project. An extensive analysis of current and potential business processes has shown that significant short and long

term benefits will accrue from the efficiencies and service enhancement to be gained by the implementation of new administrative systems at the College.

Although the total cost of implementing the new systems will not be known until the RFP process has been completed, there is a battery of information available through EDUCAUSE known as the Core Data Service[1] from their ECAR survey of educational institutions throughout the country. The table below is from their 2007 study and shows that the total cost of an ERP system is spread across a variety of cost components, from software to in-house staff. These expenditures are spread over the life of the system and the percentages presented in the AA (Associate Institutions) column are for schools serving populations similar to that served by BCCC.

Table 5-2
Average Proportion of the Total Cost of the ERP by Area of Expenditure

	ALL	DR	MA	BA	AA	OTHER
Software and licenses	23.8%	16.6%	25.0%	29.7%	21.8%	24.7%
Software maintenance	11.4%	8.4%	12.5%	13.2%	12.6%	9.3%
Training	8.4%	6.0%	8.4%	9.4%	10.8%	7.8%
In-house staff costs	19.8%	22.6%	18.9%	19.6%	16.7%	21.2%
Consulting fees	20.6%	26.9%	20.4%	13.1%	20.1%	24.0%
Hardware	11.2%	11.7%	11.3%	9.5%	12.1%	11.5%
Other	4.9%	7.8%	3.5%	5.6%	6.0%	1.5%

[1]Hawkins, Brian, and Rudy, Julia. "Fiscal Year 2007 Summary Report." EDUCAUSE Core Data Service , 2007, 48-49

Determining the strategy to be used for ERP system acquisition is one of the most crucial decisions in the planning process. This decision acts as a driver for many of the other critical project decisions, such as vendor and product options, hosting method, the internal IT resources needed, and budget. As can be seen from the table[1] below, the highest percentage of "Associates Institutions", (and all institutions for that matter in the ECAR study) chose to purchase a commercially available system. (Respondents were allowed to check more than one method so the total percentage does not sum to 100%). BCCC will be acquiring a commercial package through the RFP process, as have over 75% of similar institutions.

Table 5-3
Strategies for Acquiring Information Systems

	ALL	DR	MA	BA	AA	OTHER
Develop systems in-house	58.8%	69.4%	54.8%	58.4%	46.6%	66.5%
Develop systems in partnership with a vendor	43.7%	50.6%	45.2%	39.1%	32.2%	50.9%
Purchase a commercial product without customization	74.8%	81.7%	74.4%	77.7%	69.5%	70.5%
Purchase a commercial product with customization	77.5%	87.2%	77.8%	69.5%	71.8%	81.5%
Use an open source product, with or without customization	50.5%	62.8%	46.7%	54.8%	35.1%	54.3%
Buy best-of-breed applications	53.8%	69.4%	55.9%	46.2%	35.6%	61.3%
Buy a package of integrated systems	62.9%	72.2%	66.3%	63.5%	58.0%	52.0%
Enhance legacy systems and provide web interfaces	43.9%	61.1%	39.3%	42.6%	25.9%	52.6%
Outsource administrative systems	14.1%	18.3%	14.4%	14.2%	9.2%	13.9%
Other	2.0%	3.9%	1.5%	1.5%	0.6%	2.9%

Although the number of institutions choosing to customize a purchased product is nearly the same as those choosing not to customize it, the study found that modifications to the system was the single most important factor related to budget overruns. While there may be valid business reasons for a college to modify the system to meet unique business requirements, in general this can be a very expensive undertaking, both during implementation and throughout the lifecycle of the system, and should be avoided if at all possible. Most institutions enter into the ERP selection process with the intent to be as 'vanilla' as possible and those that are able to maintain that philosophy spend far less money on the TCO – Total Cost of Ownership – than others.

When colleges do find it necessary to customize an application, modification of the configuration and/or modification of external modules, (rather than the core systems) are preferable approaches as they are much easier to implement and maintain over time.

Multi-year Phased Approach for Implementation

This section provides a discussion of a Best Practice approach to legacy migrations (the "Development" Life Cycle) and administrative system implementations. In all cases, legacy migration projects require intensive analysis of existing system structure and use, and in-depth planning for the accurate transfer of data to the new systems. Following is a brief overview of the timing, staffing and planning required to realize a successful ERP implementation. Some overlap between the phases described here may occur depending upon the resources applied.

Phase I – Planning, Readiness and Preparation (9-12 months)

There are vitally important tasks that must be undertaken prior to implementing a new software system and to establish the technology vision and leadership over the duration of the project.

Because of the complexity and variety of issues facing colleges during this Planning and Preparation phase, it is important to deploy a variety of technology expertise in specialty areas such as networking, security, stabilization, strategic planning and business process reengineering. Phase I should provide the following outcomes:

- In-depth Assessment of Infrastructure and Network
- In-depth Assessment of Security
- Comprehensive Tactical Plan
- Complete AS IS Procedure Review and Documentation
- Disaster Recovery Planning Document
- Backup Documentation
- Data Integrity Remediation Plan
- Identification and Plan for Ancillary and Shadow Systems

Phase II – RFP or RFI Process (6-9 months)

The selection process should include campus power users (also known as Subject Matter Experts – SME) and be designed to encourage input from constituents. The primary outcomes for Phase II will include:

- Identifying functionality requirements
- Development of a Communication Plan
- Development of a Training Approach
- Governance Structure Formation and Implementation Teams
- Gap/Fit Analysis, each functional unit
- Development of an RFP/RFI

- Evaluation of vender responses and selection of an Integrated Administrative System
- Project Staffing approach
- Development of a Project Management approach
- Designation of Project Management resources
- High level project implementation timeline

Phase III –System Implementation (24-36 months)

Depending on the project management approach elected, (College managed, Vendor managed, co-managed), work will begin in earnest to define the critical path for tasks and allocate the necessary College resources to the project. This is the point at which backfill resources will become critical for those individuals dedicated to the project. Defining benchmarks, timelines, deliverables and refining expectations will allow the College to validate their requirements within an appropriate production timeline.

Phase III objectives would include the following:

- RFP development and project management to procure hardware required for the new Integrated Administrative System.
- Project Budget Development and Management
- Timeline for Network/Infrastructure Upgrade
- Timeline for System Module Implementation
- Detailed Project Plan for Data Conversion and Implementation
- Project Management to implement the new Integrated Administrative System.
- Management of the vendor relationship and contract.
- Management of temporary development staff.
- Development and management of training for staff and administrators.
- Timely implementation of ERP system modules or components
- Documentation: Technical and Procedural

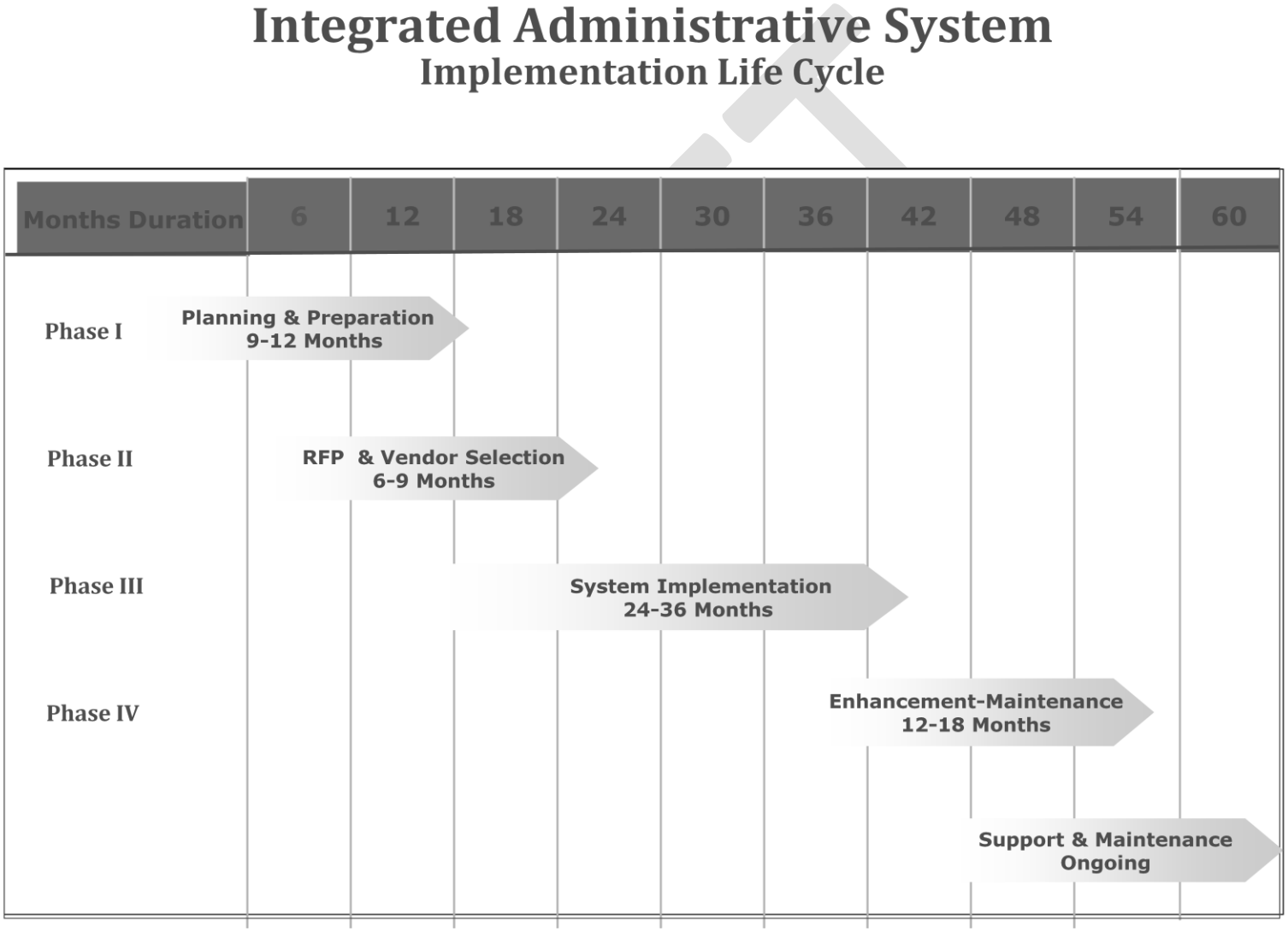
Phase IV – Post-Implementation, Enhancements, Maintenance and Recruiting (12-18 months)

After the initial implementation is complete, post-implementation activities must begin. This marks the period when the College begins to leverage the investment in the new system. Improvements in instructional technology, and new services and market opportunities are all potential administrative projects, each leveraging the new system and the integrated data store.

While implementing an ERP, Colleges often discover gaps in the historic manner of managing large scale/cross-functional implementations. With the structure already successfully in place, the ERP project management group is transformed into a College project office. This office is then charged with College-wide responsibility for overseeing and coordinating the ongoing support, upgrade and implementation of other large-scale/cross-functional, technology-based initiatives.

- Revise and Update Strategic Technology Plan.
- Prioritize, plan and resource software enhancements.
- Identify additional systems for implementation, such as document imaging, room scheduling, voice communications, and smart cards.
- Develop a plan, documentation and training materials for ongoing staff development.
- Evaluate and develop a comprehensive post-implementation information technology-staffing plan.

The project phases are summarized in the following Table. Projected timetables will be updated during Phase II of the project.



ERP & Vendor Selection

While the richness of functionality of an ERP solution is typically the primary focus in the system selection process, the depth, strength and quality of the potential vendor relationship will be of equal importance. When selecting an ERP solution, a college is selecting both the system and the organization that supports it. An ERP decision is a long-term commitment and the partnership with the vendor needs to fit the needs and expectations of the College. This section will review topics and factors that should be considered when selecting an ERP/Vendor. Understanding how the vendor addresses these topics will help the College determine the potential quality of the vender relationship.

References

Any qualified vendor will be able to provide reference customers with whom college representatives can speak regarding their positive experiences. It will be important for the college to seek out clients who have had difficult or negative experiences to determine how the vendor responded to challenging circumstances to resolve any conflicts.

Source Code

While it may not be necessary for the college to have "source code" for the administrative systems, they will want to ensure the ERP vendor offers to "escrow" the source code with a third party. In the event the vendor should no longer be capable of supporting the software, the College can have access to the source code, and either contract for maintenance from another source, or support it internally.

Acceptance Period

It will be important to establish an acceptance period for the new systems during which time the college can verify the systems meet the expectations set in demonstrations and the RFP responses. If significant differences are found, the College would have the right to take whatever corrective action has been established in the agreement.

Development Language

It is essential that the development language in which the vendor's solution is written is not a proprietary language unavailable outside of the vendor's product line. If it were, the College could find itself in position of having a "new" system that is already technologically obsolete.

Modifications

Every effort should be made to perform a careful fit-gap analysis to minimize the potential for modification requirements. The college should plan to adjust business processes to Best Practices commonly followed in the design of commercial ERP systems. Modifications or enhancements, even when they are not applied to the core system are extremely costly to maintain and significantly increase the total cost of ownership. The goal should be to implement the system with no enhancements whatsoever. It is essential to know what the policy of the vendor is towards modifications.

Maintenance and Upgrades

In addition to ensuring some level of commitment by the vendor to address any issues or 'bugs' identified by the College, an ongoing maintenance agreement grants the College access to software upgrades. The cost of standard upgrade maintenance is typically in the 20% range, (of the original license fees) on an annualized basis though first year maintenance is often a negotiable item. Additionally, a multi-year commitment for maintenance can often result in discounts for the college.

Operating Environment

The major commercial ERP systems operate on a variety of platforms, data bases and operating systems. If the college intends to host the new systems on their own servers, the ongoing maintenance and support costs of these operating environments can be significant. It will be important for the college to consider a homogenous environment under these circumstances so as not to overly complicate the task of maintaining these systems for the in-house IT staff. In other words, if existing ancillary systems and other applications are operating in either a Unix or Microsoft environment it may be desirable to ensure that the selected vendor EPR will also operate in that environment.

Support

Most ERP vendors ask customers to follow a problem reporting protocol. Customers log onto their vendor's support website or call into a central support desk, and wait for their issue to be routed to an analyst. If the analyst cannot resolve the problem, it will be escalated up the support hierarchy until someone is able to resolve it. Often, support is handled by the junior IT professionals while developers and analysts with the deepest understanding of the technologies generally only become involved when other efforts have failed. It will be important to understand the support structure and protocol for the selected vendor as a part of the evaluation process.

Vendor Hosting

It is premature to draw any conclusions as to the advisability of considering an arrangement with the ERP vendor that provides for their system. However, dramatically improved communications capabilities and downward budgetary pressure, have combined to make this a far more popular option than it has been in the past. As an example, today at BCCC, the BlackBoard LMS system is hosted offsite, minimizing the need for in-house technical staff to support its operation. All of the major ERP vendors now offer hosting options, either directly or through their business partners.

Support

A Service Level Agreement (SLA) should define in very specific terms the expectations of both the college and the vendor, addressing concerns such as the hours vendor support will be available, definitions of the levels of problem criticality, and response timeframes for each level. Additionally, some vendors allow a trial or "pilot" period in which colleges can use the hosting services and assess their satisfaction with vendor support before making a long-term commitment.

Security

Protecting constituent data is of paramount concern to colleges. It should be the vendor's paramount concern, as well, and this will be evidenced by a well-thought-out and comprehensive security response plan. Security protocols should be up-to-date and reviewed on an ongoing basis and should address the possibility of both internal and external attack. The college should examine backup and restoration policies to ensure that, in the event of a serious security breach or other catastrophic event, the vendor can perform a recovery in an acceptable timeframe to minimize the impact to the college's critical administrative processes.

Pricing

The College should pay only for the hosting services actually used, with the option to scale up or down, depending on business needs. Actual pricing can be based on usage metrics, such as how many users have access to the system or how many transactions are performed, or on a fixed price for subscription to services. As usage patterns change and grow, the College may wish to modify the contract or pricing structure. For example, immediately after implementation, the number of users may be relatively low so a pricing structure based on number of user accounts may be the most cost-effective option for the College. Over time, the number of occasional users may increase dramatically so that, at some point, it becomes more cost-effective to consider pricing based on transaction processing or number of sites. Before signing the contract, the College should verify that

making these types of changes will be possible and whether there will be any additional charges or penalties for doing so.

Delivery

Although services can be delivered through a variety of means, it is the vendor who is responsible for the networking infrastructure and host hardware needed to deliver the services, as well as for performing the necessary management and/or monitoring of the delivery methods. Specific expectations regarding delivery, acceptable down-times, system performance and response times, appropriate timeframes for problem resolution, etc., should be clearly spelled out in the Service Level Agreement (SLA).

Organizing for Success

The success of the implementation project is highly dependent upon a well managed project plan that is supported by the college leadership. We recommend that the college establish an Office of Technology Transformation within the IT organization to act as a catalyst for the wide ranging process and informational changes that accompany a project such as this. Additionally, a governance structure and project team made up of key administrators and practitioners throughout the institution will work together to effect dramatic change in the way the college serves its constituents.

Leadership

Senior leadership must fully endorse and openly support the project. College leadership should remain actively involved throughout the project since these projects are significantly more effective when there is consistency in leadership and direction.

Sponsorship

Sponsorship needs to be at the highest levels of the college. While IT senior leadership performs critical roles in an ERP project, it is recommended that sponsorship originate outside the IT organization. ERP system projects can significantly impact many departments and functional areas within the college, at times with competing objectives and priorities. Sponsorship should be at a level capably of resolution through legitimate authority when necessary.

Governance

While ERP projects have a large technology component, the most significant opportunities for change and improvements lie within the departmental and functional areas. Executive policy committees, focused on understanding how the ERP solution impacts policies and processes and capable of making key decision to current and future

state policies are an essential part of the governance process. Effective project governance is absolutely essential to a successful implementation of an ERP solution.

Project Team

ERP project responsibilities should be shared between IT (Transformation Office) and the departments and functional areas where the software is being implemented. The team composition should include ERP representation from all functional areas involved with a focus on developing key subject matter experts within each area. Other resources include the project manager, an implementation partner, application vendors, and potentially hosting vendors and other professional services.

Where possible, it is best practice to dedicate as separate work environment specifically created for the project team. This collocation of project resources enables the team to bond and provides a channel for clear, direct communication. While project resources may need to support operations to an extent, removing them from the daily work environment enables them to focus on the project priorities.

Communication

One of if not the most critical component of ERP project management is the development and use of an effective communication plan. While everyone agrees it's essential, under communication and unclear communication during ERP implementations are leading contributors to project delay and failure. All stakeholders need to be included in communication planning.

Communication paths may include monthly or quarterly news letters, project update websites, information sessions before each project phase, and targeted update reports to key stakeholder groups.

Risk

Scope control is often one of the highest priority risks to manage. ERP projects have a large stakeholder base with a diverse set of requirements and priorities. ERP project managers must pay close attention to scope change control throughout the project. Senior leadership and project governance must be aware and supportive of the need to limit scope.

Implementation Goals

Once a new Integrated Administrative System has been selected the implementation process will begin as a series of incremental deliverables, each building upon the last. Goals of the effort will be to:

- Streamline Business Practices and integrate Information Systems
- Provide students, faculty and staff with enhanced access, including self-service to demographic data
- Improve services to internal and external customers
- Eliminate data redundancy and increase access to accurate, reliable and timely data
- Implement Information Systems that are flexible and adaptive to college objectives
- Enhance decision-making and planning capabilities
- Meet federal and Maryland state reporting requirements
- Improve communications across the functional areas and our constituent groups
- Improve the productivity of the workforce by increasing institutional knowledge and awareness

In order to achieve these goals, the following objectives must be met:

- Replace functionality of all selected legacy systems, including COCO, CERT and other ancillary systems
- Require training for every person that uses the software as it relates to his or her job
- Ensure all employees will be able to perform their job responsibilities using the new system
- Streamline the business processes through process re-engineering of our current methods
- Use the new system with no enhancements
- Create efficiencies through a reduction in duplicate efforts and shadow systems that occur across the institution
- Have the mechanisms in place to continually enhance and improve the system through software release management
- Incorporate a new portal system to improve information flow and update capabilities to internal and external customers of the College
- Meet all state and federal reporting requirements with the new system

We will achieve these outcomes through:

- College-wide teamwork
- Effective communication
- Customer/Learner focus
- Training
- Process evaluation and Best Business Practices
- Commitment to the success of the project
- Organizational flexibility
- Timely planning and decision-making

As a result, the institution will realize:

Cost savings and avoidance

- Utilization of online paperless reporting to reduce paper and handling costs while at the same time improving access time
- Reduced programming maintenance through use of vendor supported software packages and/or technically current software

Improved productivity

- Development of a new faculty/employee orientation program to introduce and acclimate them to the procedures of the institution, as well as ongoing training for existing faculty and staff
- Elimination of duplicate processes, double data entry and shadow systems
- General improvement of access to administrative databases leading to improved performance throughout all levels of the organization
- Significant improvement in system and information response time
- Integrate common and shared data to improve data accuracy, accessibility and reporting

Improved Services

- Additional services will be available to students, faculty and staff through the enhanced data access and widespread system availability (i.e.: direct access to relevant data and electronic paperless forms management)
- Electronic approval process speeds processing time and provides an online audit trail
- Improved portal development and access for information flow to all customers
- Better business practices and procedures

Summary

Baltimore City Community College is about to embark upon a technology transformation process that will impact virtually every employee, student and friend of the college. One of the major elements of that transformation will be the implementation of a Student-centric integrated administrative system that will streamline data entry and access, enhance accuracy and security, and dramatically improve the ability of the college to serve its constituents. It will allow the creation of a single 'system of record' for student related information, reducing repetitive data entry and misinformation.

The next few years will result in a seachange in the way that Baltimore City Community College gathers, processes and uses information to find and generate new sources of revenue, avoid unnecessary expense and improve services to students. This project has the potential to significantly impact the way the community views the college and the services it provides. It may be the single most "profitable" investment the college will make for the next few years.

Glossary

Ancillary system – Ancillary system is a complementary or supplemental software system to meet the business activities of an organization. These systems may be required to augment or extend the ERP functionality.

API – Application **P**rogramming **I**nterface is a language and message format used by an application program to communicate with the operating system or some other control program such as a database management system (DBMS) or communications protocol. Thus, an API implies that some program module is available in the computer to perform the operation or that it must be linked into the existing program to perform the tasks.

Application Service Provider – Application Service Provider is a hosting service that will operate, support, manages, and maintains a company's software applications for a fee.

Automated system – An automated system is any system that does not require human intervention.

Best of Breed systems – A Best of Breed system is the best product of its type. Organizations often purchase software from different vendors in order to obtain the best-of-breed for each application area; for example, a human resources package from one vendor and an accounting package from another. While ERP vendors provide a wealth of applications for the enterprise and tout their integrated system as the superior solution, every module may not be best-of-breed. It is difficult to excel in every niche. It does not mean absolute best overall; for example, the best-of-class in a low-priced category may be seriously inferior to the best product on the market, which could sell for ten times as much.

Business intelligence – Business intelligence (BI) refers to skills, technologies, applications and practices used to help a business acquire a better understanding of its commercial context. A BI dashboard unites data from all sources and locations so that everyone from the president's office to departmental administrators are working on the same page, viewing identical data against the most current criteria for success.

Client/Server – Client / Server is software that relies on two computer programs – one on the user's desktop/client and one on the application server.

COBOL – A high-level computer programming language widely adopted for corporate business applications.

Customer Relationship Management – Customer Relationship Management is the cultivation of meaningful relationships with actual or potential purchasers of goods or services. Customer relationship management aims to increase an organization's sales by promoting customer satisfaction, and can be achieved using tools such as relationship marketing.

Data attribute – Data Attributes are a quality or characteristic used to describe the data element.

Data custody – Data Custody is the person(s) responsible for keeping the data in trust, "not moving or destroying it without appropriate advance notice and permission from the legal owner"

Data integrity – A term used in computer science and telecommunications that can mean ensuring data is "whole" or complete, the condition in which data are identically maintained during any operation (such as transfer, storage or retrieval), the preservation of data for their intended use, or, relative to specified operations, the a priori expectation of data quality. Put simply, data integrity is the assurance that data is consistent and correct.

Data mining – Data mining is the process of extracting hidden business patterns from data.

Data warehouse solution – Data warehouse is a repository of an organization's electronically stored data. It is an integrated, time-variant and non-volatile collection of information about a particular subject instead of about a company's ongoing operations in support of management's decision making process. Data warehouses are designed to facilitate reporting and analysis

Database – A database is a structured collection of records or data that is stored in a computer system. The structure is achieved by organizing the data according to a database model.

Database agnosticism – Data agnosticism is a solution that is not tightly integrated with a particular database and, thus, is able to access any of the major database systems.

Disaster Recovery - Sometimes referred to as business continuity or business process contingency- is how an organization will deal with potential disasters. Just as a disaster is an event that makes the continuation of normal functions impossible, a disaster recovery plan consists of the precautions taken so that the effects of a disaster will be minimized and the organization will be able to either maintain or quickly resume mission-critical functions. Typically, disaster recovery planning involves an analysis of business processes and continuity needs; it may also include a significant focus on disaster prevention.

Enterprise Resources Planning (ERP) – ERP is a company-wide computer software system used to manage and coordinate all the resources, information, and functions of a business from shared data stores. A solution that integrates recruitment, admissions, financial aid, student records, course delivery, alumni services and other functions by providing the level of oversight and control that is absolutely necessary for any business, as a manager or owner, to make sure that all resources work towards the same goal.

ERP Module – ERP module is basically a part of an ERP system that can be purchased individually to meet specific business needs.

Escrowed source code – Escrowed source code is a contract between the buyer, the seller and a trusted third party providing that the buyer will put the source code into escrow with the trusted third party, known generally as an escrow agent, and the third party will not provide or disclose the source code to anyone, including the buyer, unless certain things happen (example, the software vendor goes out of business).

High Availability – In information technology, high availability refers to a system or component that is continuously operational for a desirably long length of time.

Hosting (Technical) – A host is a node or computer on a network on which your workstation/device can log into or use resources from. Hosting would imply that the software or data would reside on that node, and usually implies off site.

Hyperlink– A hyperlink is an element in an electronic document that links to another place in the same document or to an entirely different document. The area from which the hyperlink can be activated is called its anchor; its target is what the link points to, this depends on the type of hypertext. A hyperlink can appear as text or graphics. Most hyperlinks take you to another Web page. Other hyperlinks perform special functions, such as sending email, submitting a form, accessing an ftp site, execute a database query, or access a Usenet newsgroup.

Implementation – An implementation is a realization of a technical specification or algorithm as a program, software component, or other computer system. Many implementations may exist for a given specification or standard.

Information Technology – Information Technology is the development, installation, and implementation of computer systems and applications.

Integrated Administrative System (IAS) – An acronym sometimes used in higher education to indicate an Enterprise Resource Planning (ERP) application.

Interface – Interface generally refers to an abstraction that an entity provides of itself to the outside. This separates the methods of external communication from internal operation, and allows it to be internally modified without affecting the way outside entities interact with it, as well as provide multiple abstractions of itself. It may also provide a means of translation between entities which do not speak the same language, such as between a human and a computer. Because interfaces are a form of indirection, some additional overhead is incurred versus direct communication.

Legacy Data – Legacy Data is data that is already present and used. Most often, this takes the form of records in an existing database on a system in current use.

Legacy System – Legacy Systems are aging computer systems or application programs that continues to be used, typically because it still functions for the users' needs, even though newer technology is available.

Open-source-software – Open Source Software is not a brand of software: It is a philosophy of software development. Programs written under this philosophy are released with the human-readable program code such that anyone is free to use it and improve it. It must be distributed for free and other people must be allowed to modify or add to the software. Open source software is the most prominent example of open source development and often compared to user-generated content. The term open source software originated as part of a marketing campaign for free software.

Operational Data Stores – An Operational Data Store is an informational database that typically stores detailed data about business events in order to support operational reporting needs and to act as a staging area for data warehouses and data marts used for data analysis.

Outsourced – Outsourcing is subcontracting a process, such as product design or manufacturing, to a third-party company. The decision to outsource is often made in the interest of lowering cost or making better use of time and energy costs, redirecting or conserving energy directed at the competencies of a particular business, or to make more efficient use of land, labor, capital, (information) technology and resources.

Patch updates – Patch updates are also called a service patch, or a fix to a program bug/error. A patch is an actual piece of object code that is inserted into (patched into) an executable program. A small piece of software designed to fix problems with or update a computer program or its supporting data. This includes fixing bugs, replacing graphics and improving the usability or performance.

PDA's – A personal digital assistant (PDA) is a handheld computer, also known as a palmtop computer. Newer PDA's have both color screens and audio capabilities, enabling them to be used as mobile phones (smartphones), web browsers, or portable media players. Many PDAs can access the Internet, intranets or extranets via Wi-Fi, or Wireless Wide-Area Networks (WWANs). Many PDAs employ touch screen technology, Memory cards, Automobile navigation, and are also used for Educational, Sporting, Medical and Scientific purposes. Ex – Blackberry, iPhone, Nokia E series, etc.

Peripheral systems – A system which is not part of an essential system. In this context, an additional module or application that can be integrated with the core ERP system.

Platforms – In computing, a platform describes some sort of hardware architecture or software framework (including application frameworks), that allows software to run. Typical platforms include a computer's architecture, operating system, programming languages and related runtime libraries or graphical user interface.

Portlet technology – Portlets are pluggable user interface software components that are managed and displayed in a web portal. Portlets produce fragments of markup code that are aggregated into a portal page. Typically, following the desktop metaphor, a portal page is displayed as a collection of non-overlapping portlet windows, where each portlet window displays a portlet. Hence a portlet (or collection of portlets) resembles a web-based application that is hosted in a portal. Some examples of portlet applications are email, weather reports, discussion forums, and news. Portlet standards are intended to enable software developers to create portlets that can be plugged in to any portal supporting the standards.

Real-time access – Immediate access - Software and activities related to storing, retrieving, or acting on data housed in a database or other repository during on-going business activities. For example, real-time operating systems are systems that respond to input immediately. They are used for such tasks as navigation, in which the computer must react to a steady flow of new

information without interruption. Real time can also refer to events simulated by a computer at the same speed that they would occur in real life.

Reengineering – Reengineering is the examination and alteration of a system to reconstitute it in a new, user defined form.

Service Level Agreement (SLA)–SLA is a document that describes the minimum performance criteria a provider promises to meet while delivering a service. It typically also sets out the remedial action and any penalties that will take effect if performance falls below the promised standard. It is an essential component of the legal contract between a service consumer and the provider.

Systems Development Life Cycle (SDLC) – SDLC is a formal model of a hardware/software project that depicts the relationship among activities, products, reviews, approvals, and resources. Also, the period of time that begins when a need is identified (initiation) and ends when the system is no longer available for use (disposition).

System Migration – System migration involves moving a set of instructions or programs, i.e. PLC (programmable logic controller) programs, from one platform to another, minimizing reengineering.

Systems architecture – Systems architecture is the conceptual design that defines the structure and/or behavior of a system. An architecture description is a formal description of a system, organized in a way that supports reasoning about the structural properties of the system. It defines the system components or building blocks and provides a plan from which products can be procured, and systems developed, that will work together to implement the overall system. It thus enables to manage investment in a way that meets business needs.

Systems Integration – Systems Integration is the process by which smaller pieces of software are brought together to form a larger piece of software that was designed to solve a problem.

System of record – The system of record is the place where there is a definitive value for some unit of data. It is intuitive and dates back to the days of transaction processing systems.

Tier Architecture - Three-tier architecture is any system which enforces a general separation between the following three parts; Client Tier or user interface, Middle Tier or business logic, Data Storage Tier. If the architecture contains more than three logical tiers -- for instance, multiple data feeds, multiple transactional data sources, and multiple client applications -- then it is typically called “N-tier" or "Distributed" architecture.

Unix – Unix (often spelled "UNIX," especially as an official trademark) is an operating system that originated at Bell Labs in 1969 as an interactive time-sharing system. Ken Thompson and Dennis Ritchie are considered the inventors of Unix. The name (pronounced YEW-nihks) was a pun based on an earlier system, Multics. In 1974, Unix became the first operating system written in the C language. Unix has evolved as a kind of large freeware product, with many extensions

and new ideas provided in a variety of versions of Unix by different companies, universities, and individuals.

Windows-based ERP – Windows based ERP is an ERP system with a GUI (graphical user interface), graphical icons, and visual indicators, as opposed to text-based interfaces, typed command labels or text navigation to fully represent the information and actions available to a user. The actions are usually performed through direct manipulation of the graphical elements.

Workflows – The workflow is a defined series of tasks within an organization to produce a final outcome. Sophisticated workgroup computing applications allows defining different workflows for different types of jobs. At each stage in the workflow, one individual or group is responsible for a specific task. Once the task is complete, the workflow software ensures that the individuals responsible for the next task are notified and receive the data they need to execute their stage of the process.

Chapter 4 – RFP for an Integrated Administrative System

The following section contains a RFP designed for BCCC to use in selecting an Integrated Administrative System (IAS). (Also known as an ERP.)