University of Colorado

Boulder | Colorado Springs | Denver | Anschutz Medical Campus

Multi-Campus ERP IT Services

Strategic Plan

10/01/2018

Revision	Modified by	Date

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Multi-Campus ERP IT Services Strategic Plan Executive Summary

In the winter of 2017, IT units across the university embarked on an effort to understand the issues facing administrative business units, in support of campus priorities, common IT priorities across the university and efficient maintenance of existing IT services provided by UIS. IT stakeholder groups were engaged to better understand business strategies, desired outcomes, and anticipated IT needs over the next 3-5 years, resulting in established priorities by campus. In parallel with this effort, IT service providers gathered information about multi-campus ERP IT services via facilitated sessions with stakeholder groups resulting in the strategic priorities of **Service Excellence, Increase University Capabilities by Knowing the Customer,** and **Frictionless Data.**

The Multi-Campus IT Services Strategic Plan is structured as follows:

- An overview of why the Strategic Plan is necessary and the **value expected** from the process.
- **Contextual information** about the Multi-Campus ERP IT services landscape including considerations for stakeholders when making investment decisions to best serve CU.
- Background on the data collection and environmental scan process, and the **priorities for each CU campus**.
- High-level information about UIS, the primary provider of ERP systems at CU, along with the **strategic priorities** developed to best support campus needs over the coming 3-5 years. This section provides an additional level of detail **aligning specific efforts to the strategic priorities**, within the construct of Running, Growing, and Transforming the business.
- Additional information about how the plan will be updated, **contextual information relative to Higher Education, Information Technology, and Multi-Campus ERP IT services**, and detail from the data collection process can be found in the conclusion and appendix, respectively.

Comprehensive IT Strategic Planning of this type is new to CU; therefore, continued refinement can be expected as processes and measurements are implemented to more closely align with the needs of the newly formed IT Governance structures. In future years, each Annual Plan will be used to supplement annual budget requests and provide transparency to how efforts align with strategic priorities.

Introduction

The University of Colorado (CU) is a public research university with multiple campuses serving Colorado, the nation, and the world through leadership in high-quality education and professional training, public service, advancing research and knowledge, and state-of-the-art health care.

Multi-campus ERP Information Technology (IT) services exist to support the mission of the University of Colorado by providing secure, reliant, and usable IT platforms that enable efficiency and collaboration across all four campuses. Historically, CU has not had a process in place for long-term, strategic planning of multi-campus IT services. This lack of process has led to the following impacts:

- **Significant costs and increased risk to the University** due to lack of visibility, duplicative systems and licensing agreements, and missed opportunities to align with Regent-level goals and the vision of the University as a whole.
- **Lack of clarity for the roles, responsibilities, and prioritization mechanisms** needed for ensuring the existing and planned IT service portfolio meets the needs of the organization holistically, both near and long-term.
- **Lack of understanding regarding the best use of IT resources** across the four campuses and system office for the long-term benefit of the University.
- **Unclear long-term vision hinders employee-level understanding** of where IT services are going over the next 3-5 years at CU which, in turn, has impacts to organizational culture and employee engagement for both providers and consumers of IT services.

This document provides an overview of the multi-campus ERP IT services landscape, roadmaps, and supporting strategies to:

- **Form a basis for discussion** when determining IT investment decisions over the coming 3-5 years.
- **Provide transparency and understanding of** the long-term vision of CU's IT services as they align to Regent-level strategic imperatives and campus priorities.
- **Support campus-specific strategies** through the use of common good ERP IT services.
- **Reduce costs and ensure proper stewardship of** resources to meet the holistic needs of the University best.
- **Position the IT function (system and campus) as a proactive partner** to help grow and guide the technology capabilities of the University in fulfilling the **mission** of each campus.

The IT service strategies and support initiatives outlined in this document are limited to those commonly referred to as ERP services, or those that support multi-campus employee, research, advancement, and student administration activities and include:

Human Capital Management (HCM) Services:

- Core HCM (PeopleSoft)
- My Leave

Finance Services:

- Core Finance (PeopleSoft)

Student Services:

- Core Student (PeopleSoft)
- Degree Audit and Transfer Credit (DATC)
- International Student and Scholar Management (ISSM)
- Student Fee Payment (Nelnet)
- PeopleSoft Constituent Relationship Management (CRM)

Research and Grant Services:

- Electronic Research Administration (InfoEd)
- Grants (PeopleSoft)
- Technology Transfer

Advancement Services:

- Donor Management (Ellucian Advance)

Cross Services:

- Central Information Warehouse (CIW) / CU Enterprise BI Tool (CU-Data)
- Document Management (Singularity/OnBase)
- University-wide Portal (PeopleSoft)
- Batch Processing (Automic) and Data Transfer Services (CU Transfer)
- Master Data Management (MDM) and Enterprise Data Quality (EDQ)
- Integration Services
- Identity Management (IdM) Services (OIM)

UIS Organizational Services:

- Infrastructure and Database Services
- IT Service Management Services
- Business Operations Services

For additional detail on how resources and funds are being allocated to support specific multi-campus service initiatives, please see the annual planning documents located at (https://www.cu.edu/it-gov/strategic-and-annual-planning).

University of Colorado Strategic Priorities -- Four Compass Points

The Four Compass Points were developed by the Board of Regents in 2017 and are areas of focus that will help the university address short- to mid-term challenges (three to five years) in a rapidly changing society and educational environment. Meeting these challenges is critical for the university to maximize its potential and to help Colorado thrive.

- Enhancing Student Experience and Faculty Experience
- Fostering Collaboration
- Promoting Healthier Communities
- Bolstering Technological Innovation

Campus Priorities

In the winter of 2017, IT stakeholder groups were engaged to better understand business strategies, desired outcomes, and anticipated IT needs over the next 3-5 years, resulting in established priorities by campus. In parallel with this effort, IT service providers gathered SWOT (Strengths, Weaknesses, Opportunities, and Threats) information about multi-campus ERP IT services via facilitated sessions with key stakeholder groups. The data collected during these

efforts were used as an input for developing the strategic priorities and service-related goals within this document and have been provided below.

University of Colorado Boulder

CU Boulder's ERP governance committee consists of academic, administrative, research, and executive leaders from across the university. The purpose of the committee is to assist and advise the Provost and SVC/CFO to ensure the ERP environment is strategically organized, coordinated and cost-optimized for the academic, research and administrative goals necessary for the success of CU Boulder. In 2018, the committee, along with the Provost and SVC/CFO priorities the top 20 ERP goals into the following five categories. Some of these goals will likely span multiple years:

Academically focused/Student Success
- Unified Student Experience
- Early Alert
- CRM Salesforce Student Success Dashboard
- Online Masters in Electrical Engineering
- Coordination of Academic Advising
- Curriculum Management
- Degree Planning

Advancement
- NextGen Advance

Administration
- Paperless Campus
- Budget and Fiscal Planning Tool
- Campus-wide ServiceNow
- HR Performance Management
- End-to-End Engagement Boulder

Research
- Cybersecurity for Regulatory Requirements
- Public Cloud for Research & Administration
- Research and Administration Infrastructure

Infrastructure
- Build ODA 360 Front End, Data Lake
- Streaming Data Architecture
- Identity and Access Management
- Wired & Wi-Fi Evolution

University of Colorado Denver and Anschutz Medical Campus

Tactical Activities

- SLATE IdM
- Data Network Upgrade and Replacement
- Complete VOIP implementation
- HIPAA Compliance Initiative
- Ongoing Classroom Video Upgrades
- CCPM Building Construction Activities
- Ongoing System Governance Activities
- COMPASS and Research System Support (RSS, Operations and Infrastructure, and Security)
- Business Process Review relative to Pinnacle Billing and Telecom Management System
- RedCap Clinical and Translational Database Upgrade
- Exasol Implementation
- Service Availability Monitoring
- OnCore Upgrade

Strategic Activities

- CRM
- Storage Initiative (0.025 per gig per month)
- Genius Bar at Anschutz
- Innovation Awards
- OIT Strategic Planning
- Financial Review and cost prediction efforts
- COMPASS 2023
- New Data Center (2021) (Construction underway)
- HPC – TiCR
- Virtual HIPAA Environment (Eureka)
- Multifactor Authentication
- COOP Plan and Disaster Recovery Planning
- Implementation of CUAnschutz.edu
- Implementation of new CMS
- ITSM Review and update

Transformative Activities

- ACI (Software Defined Networking)
- Analytics

University of Colorado, Colorado Springs

- Provide leadership in the creation and support of world-class instructional technologies and collaborative learning spaces.
- Improve the Technology Infrastructure to create more efficient and effective use of technology.

- Provide and infrastructure to enhance research computing activities and collaborations.
- Web Services: Create an online environment which is easy for customers to use, content is contributed simply, information and services are delivered quickly, and the system is secure and stable.
- Develop and Implement an IT Training Program in coordination with the TLC, focus training on services offered by the IT Department.
- Align IT Support to address the needs of both on and off campus classes and students, present IT services in a clear and understandable manner.
- Establish a professional/consulting service for campus departments
- Information Security
- Data Analytics
- Accessibility Goals

University of Colorado – Foundation and Advancement

The CU Foundation and the Advancement offices at the University of Colorado across all campuses provide the primary conduit for engagement and private support for the University system at large. This effort is governed by the existing business and data governance groups comprised of cross campus and Foundation representation. This group works to ensure continuity and effectiveness of the business across all campuses, and works to ensure a cohesive plan for Advancement's strategic goals:

Cohesive Constituent Engagement/Experience

- 360 view of constituent engagement across all platforms used within the University
- Ensure visibility to key data points across toolsets
    - Scholarship recipient data
    - Ticketing and outside engagement data from box offices (Tessitura, Paciolan)
    - Alumni engagement data (Salesforce eCRM)

"Next Generation" Technical capability

- Data quality improvements through retirement of point solutions with standalone data
- Transition off aging platform into modern toolset
- Develop scalable collateral creation toolset and self-service center for marketing and communication materials
- Improve online giving site (giving.cu.edu)

Steward constituent data

- Update security standards to meet current and expected privacy/compliance needs

World-class Advancement

- Plan for upcoming capital campaign
- Cohesive governance across all campuses that includes partner organizations
- Standardize core business processes with an eye toward key data points and entry

University Information Services (UIS)

University Information Services (UIS) is the primary provider of multi-campus ERP IT services at the University of Colorado. As such, this section provides contextual information about the UIS organization. Services and support resources provided by other units within System Administration are noted, where applicable.

University Information Services (UIS) focuses on providing secure, reliable and performant IT and consultative services that deliver value to multiple CU constituents and allow for efficiency and cost savings to be realized by the university as a whole. UIS strives to be a neutral and unbiased party with subject matter expertise in higher-education ERP business needs, focused on providing full lifecycle management of enterprise-grade IT services.

Multi-Campus IT Services: Strategic Priorities

The following strategic priorities were developed along with a listing of projected efforts, by service area, which aim to enhance the business value to the entire university over the next three to five years.

Strategic Priority 1: **Service Excellence**

Strategic Priority 2: **Increase University Capabilities by Knowing the Customer**

Strategic Priority 3: **Frictionless Data (Digital Transformation**)

Supporting efforts for each strategic priority are provided below, aligned to known campus priorities, and categorized as follows:

- **Running** the Business**:** These efforts represent ongoing operations of services. They are required to maintain existing service levels and/or regulatory requirements.
- **Growing** the Business**:** These efforts represent improvements or expansions in services that directly benefit customers.
- **Transforming** the Business**:** These efforts inherently change the way business is done and are visible to the customer.

Costs and resource needs for supporting efforts will be provided as part of the annual planning process.

Strategic Priority 1: Service Excellence

ERP services are designed to be enterprise-grade: secure, reliable, and performant. UIS addresses technical debt and decommission services that are out-of-date or under-performing. UIS monitors and manages the health of ERP services, sustaining and supporting them throughout their lifecycle. UIS ensures that services adhere to industry best practice and are compliance. UIS has a consistent decision framework and simpler funding model to guide funding decisions for both existing and new services.

Supporting efforts by service area are provided below and aligned to individual campus priorities where known.

Student Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
TRANSFORM	Online Degrees and Certifications	Online Resolution is a Regent Request	Online MS-EE				
	Integrated Messaging Capabilities, Chat Bots						
GROW	Gender Identity						
	Name Pronunciation Integration						
	Student Persistence Support						
RUN	Semester Startup						
	ISSM Replacement						
	Accessibility Fixes					Accessibility Goals	
	Routine Patching						

Research and Grants Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU – Boulder	**CU – Denver**	**CU – Anschutz**	**CU – Colorado Springs**	**CU – Foundation / Advancement**
GROW	Standard Letter of Credit Processing	CU – Boulder, CU – Colorado Springs	Research Administration Infrastructure			Provide an infrastructure to enhance research computing activities and collaborations.	
RUN	Grants Optimization	All Campuses	Grants Optimization				
	Routine Patching		Research Administration Infrastructure				
	Conflict of Interest Improvements	CU - Anschutz					
	Conflict of Interest Implementation	CU - Boulder	Research Administration Infrastructure				
	InfoEd Dot Version		Research Administration Infrastructure				
	Simplify Grants Configuration		Grants Optimization				
	Automated Testing for eRA		Research Administ				

			ration Infrastructure				

HCM Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
RUN	Routine Patching						
	Open Enrollment						
	Grants Optimization Features	All Campuses					
	Multi-State Taxation CY18 (Phase 2 and 3)						
	Calendar Year End Activities						
	Fiscal Year End Activities						
	Taleo Upgrade						
	Automated Testing for HCM						

Finance Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
RUN	Fiscal Year End	All Campuses					
	PeopleSoft Upgrade						

	Manager Catch-Up / PeopleTools 8.56 Upgrade						
	Grants Optimization	All Campuses	Grants Optimization				
	Grants Post-Optimization						
	Routine Patching						

Cross Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
GROW	OnBase Enhanced / Automated Provisioning		Paperless				
RUN	Rancher 2.1/Kubernetes Upgrade						
	Logging Tool Replacement						Steward Constituent Data
	Automation of Core ERP Middleware Applications						
	OnBase Version Upgrade		Paperless				
	Cognos Upgrade		Data Analytics and Reporting Platform	Analytics		Data Analytics	"Next Generation" Technical Capability
	Upgrade DataStage (DS) 8.5 to 11.7		Data Analytics and	Analytics		Data Analytics	"Next Generation"

			Reporting Platform				Technical Capability
	Upgrade to Oracle Service Bus 12c		Streaming Data Architecture				"Next Generation" Technical Capability
	Retire OSB 11g						
	Improved Automation of Integration testing						"Next Generation" Technical Capability
	Increasing Unit Test Coverage of Java Code Base						
	PeopleTools 8.57 with Elastic Search Update						

UIS Organizational Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
RUN	Routine Patching						
	Automate System-Level Testing						
	Improve Monitoring/Alerting Systems						Steward Constituent Data
	DevOps/Automation						
	Service Continuity						"Next Generation" Technical Capability

Strategic Priority 2: Increase University Capabilities by Knowing the Customer

UIS seeks to understand and document the business, both to enhance the business value of the services we provide and to empower our stakeholders. UIS will first listen, then solution while seeking to prioritize and improve the user experience.

Supporting efforts by service area are provided below and aligned to individual campus priorities where known.

Student Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
TRANSFORM	UCB Unified Student Experience	CU - Boulder	Unified Student Experience				
GROW	Fluid Redesign						

Research and Grants Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU – Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
GROW	eRA Document Management System (DMS)		Research Administration Infrastructure				
	Universal Authentication						

	Job Function-Based Functionality						
	InfoEd-PeopleSoft Mods Integration Release 1		Research Administration Infrastructure				
	InfoEd-PeopleSoft Mods Integration Release 2		Research Administration Infrastructure				
	Budgetary Management Tools						
	Oncore Grants Billing Integration	CU - Denver		COMPASS and Research System Support (RSS, Operations and Infrastructure, and Security)			
	Proposal Development Implementation	CU - Boulder	Research Administration Infrastructure				
	Simplified Analytics						

HCM Services

	Effort	Requesting Campus	Supported Campus Priority

			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
GROW	Enhancement to RAVE system	CU - Boulder					
	Avature Applicant Tracking System Phase 2		Foothill (Underway)				
	Fringe	CU – Denver CU – Anschutz CU – Colorado Springs					
	Benefits Fluidization						
	Cornerstone/Perf Mgmt. Integration with HCM 9.2	CU - Boulder	HR Performance Management				
RUN	HCM Wave 3b	All Campuses					
	Remediation of My Leave/CU Time Absence Management Functionality						

Cross Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
TRANSFORM	Implement OnePortal	CU - Boulder	Unified Student Experience				

GROW	OnBase Retention Rules for Student Content		Paperless				

Strategic Priority 3 Frictionless Data (Digital Transformation)

UIS strives to provide timely access to data delivered in a useful manner and format. UIS will develop university-centric schemas for the exchange of data supported by well-defined data dictionaries defined in customer terms. Integrations endpoints will be decoupled from source systems to minimize downstream reliance on source system uptime. UIS and partners will provide a clear definition of data ownership and use-approval mechanisms.

Supporting efforts by service area are provided below and aligned to individual campus priorities where known.

Student Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
GROW	Approval Workflow Engine (AWE)						
	Slate Consolidations, Improvements						

Research and Grants Services

	Effort	Requesting Campus	Supported Campus Priority

			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
GROW	Enhance ESA to support retrieval of correct contact information						
	Enhance ESA to support retrieval of correct salary information						

Finance Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
RUN	InfoEd-PeopleSoft Mods Integration Release 1		Research Administration Infrastructure				
	Info-Ed-PeopleSoft Mods Integration Release 2		Research Administration Infrastructure				

Cross Services

	Effort	Requesting Campus	Supported Campus Priority				
			CU - Boulder	CU - Denver	CU - Anschutz	CU – Colorado Springs	CU – Foundation / Advancement
TRANSFO	Modernization of CIW		Data Analytics and Reporting	Analytics		Data Analytics	“Next Generation” Technical Capability

			Platform, Streaming Data Architecture				
	Create Canonical data schemas		Streaming Data Architecture				Cohesive Constituent Engagement/Experience; World-class Advancement
GROW	OnBase and DocuSign Integration		Paperless				
	OnBase Dashboard Management System		Paperless				
	OnBase Document Packets		Paperless				
	OnBase Increased HCM integration (Autofill and Related Content)		Paperless				
	OnBase Mailbox Importer		Paperless				
	OnBase Mobile		Paperless				
	OnBase Web Public Reporting Dashboards		Paperless				
	Create Data Lineage and Source to Target Mappings		Data Analytics and Reporting Platform	Analytics		Data Analytics	Cohesive Constituent Engagement/Experience; World-class Advancement; “Next Generation” Technical Capability
	Data Visualization		Next Gen Advance				“Next Generation” Technical Capability; World-class Advancement

	MDM Replacement		Online MS-EE, Streaming Data Architecture				Cohesive Constituent Engagement/Experience; World-class Advancement; "Next Generation" Technical Capability
	Launch Elasticsearch persistent API endpoints		Online MS-EE				Cohesive Constituent Engagement/Experience; World-class Advancement; "Next Generation" Technical Capability

Conclusion: Strategic Planning Moving Forward

This document will act as a mechanism for communicating multi-campus ERP IT services strategy and will be updated at a minimum of every two years, or as necessary, to respond to changing business and technology needs.

For additional detail on how resources and funds are being allocated to support specific multi-campus service efforts, please see the annual planning documents located at (https://www.cu.edu/it-gov/strategic-and-annual-planning).

Appendix

Strategic Plan Drivers

The focus of the following section is to provide a better understanding of the higher education, information technology and University of Colorado landscapes that influence the delivery of ERP IT services at CU and inform the development of the multi-campus strategic plan.

Higher Education Landscape

Funding Pressures: Revenue

Students, employers, parents, and policymakers are focused on the affordability of higher education credentials, loan burdens at graduation, and job prospects for alumni. Higher Education institutions receive revenues from student tuition and fees, state support (if public), private philanthropy, research grants and auxiliary services, with a trend of increasingly relying on private donations and research to augment tuition revenues. Higher Education demographic trends indicate fewer individuals will be pursuing degrees in the next ten years than during the previous ten, with a steady decline in enrollment over the past six years[1]. The outlook of enrollment from international students in US higher education is unsteady.

CU is answering the uncertain enrollment challenges with efforts to bolster the recruitment of traditional students, to recruit and retain diverse students who may not have otherwise come to CU, and to achieve the Regents' goals of choice and affordability; thereby ensuring CU remains competitive in the market. However, the general revenue landscape across Higher Ed is that organizations should expect to seek revenue from sources other than tuition[2].

State support represents a small portion of CU's budget, and funding per resident student FTE at CU's main campus is well below the national average for 4-year public institutions in Colorado.[3] The unique situation surrounding the State of Colorado's budget (TABOR, Amendment 22, etc.) indicates state financial support for Higher Ed will not improve materially. CU cannot rely on state support as a revenue source for future growth.

The recession severely constrained research funding[4]. The outlook has improved—at least within sectors such as NIH funding of R&D work—but faculty continue to be under pressure to diversify their research funding sources and therefore spend more time pursuing awards.

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[1] https://www.insidehighered.com/news/2017/12/20/national-enrollments-decline-sixth-straight-year-slower-rate
[2] https://scholars.fhsu.edu/cgi/viewcontent.cgi
[3] Colorado Legislative Council March 2017 Forecast; Office of the State Auditor December 2016
[4] JAMA article

Universities, including CU, are looking to private financial giving to help keep budgets whole. This funding method has been a reasonable expectation during the current unprecedented period of economic expansion, however; CU needs to be prepared for any economic downturn to constrain giving and investment incomes.

Higher Education institutions must continue to diversify their revenue streams across enrollments (tuition and fees), research grants, and private philanthropy while maintaining affordability for students. For Colorado, in particular, Higher Education institutions cannot rely on increased state revenues.

Funding Pressures: Expenses

Students, parents, elected officials and the public at large expect public universities to provide administrative services at a very low per-transaction cost. CU's early focus on administrative efficiency has positioned the University ahead of the curve, with a ratio of administrative expenditures to total expenditures consistently below peer institutions.[5] However, peers are catching up, by taking drastic actions, like shutting and merging campuses (see the University System of Georgia's campus consolidations). These actions could reset internal and external expectations for how a model of fiscal responsibility should look from the perspective of decreasing costs and increasing efficiencies.

The current strong economy is allowing universities to address their backlogs in capital projects. All CU campuses have significant percentages of buildings needing updates or with maintenance backlogs. Higher education organizations generally borrow for capital projects to address deferred maintenance, update facilities to attract new students, and to replace old buildings. These plant-related projects can compete with IT for resources, but reliance on bonds for building-related expenses helps diversify funding. Some universities are seeing depressed bond ratings resulting from significant building, but CU's bond rating remains strong.[6]

Organizational Structure Changes

University systems are changing how they allocate resources between the system and campuses, becoming matrixed in a search for operational effectiveness and efficiency[7]. Departments sitting in the matrices are expected to provide quantifiable services and deep knowledge of the business simultaneously. Universities are managing these expectations by initiating projects to improve governance (data and IT), enhance IT strategic planning, and by staffing business and systems analyst roles.

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[5] IPEDS; Institutional Support Expenditures

[6] CU Office of the Treasury Quarterly Report, November 2017

[7] https://www.theatlantic.com/education/archive/2016/10/ballooning-bureaucracies-shrinking-checkbooks/503066/

Shift in Engagement Models

Students, alumni, and staff expect to engage with the university differently now from how they have done so in the past. We see customer to service provider interactions supplanting student to institution interactions, donor to organization interactions, and staff to employer interactions.

Constituents expect to have access to services and each other via modern communication methods and tools. Examples include social media, manager self-service, seamless content management, intelligent workflow, collaboration tools, automated assistants like Amazon Alexa and Google Home, and consolidated user interfaces to enable search-first interaction.

Universities are expanding beyond traditional boundaries to reach new students. Smaller state and private universities are striving to have a regional impact. Organizations that used to exercise influence regionally are reaching out worldwide. These changes place new demands on the administration to support a more complex business that may now cross-regulatory, cultural, and geographical boundaries.

Universities are pursuing technology initiatives to satisfy constituent expectations to free students to focus on learning, rather than the administration of learning; to free faculty to focus on teaching, rather than the administration of teaching; and to free researchers to pursue their research, rather than the administration of research.

Higher Education has moved to the Common Application, and this move has realized the expected across-the-board increases in applicants; but institutions are still searching for the application format and requirements that will allow them to increase access for first-generation, low-income, and underrepresented populations.[8]

Finally, while there is a consensus that education should be affordable, the sands are shifting as to the nature and purpose of higher education: Is a credential a private asset or a public good?[9] Should a credential, *per se,* prepare a student for a particular job? And so on. Schools are developing new paradigms and programs requiring IT support, without consensus on these questions, and expect their administrators to support initiatives that come from all sides.

Innovation in Pedagogy

Education models are changing, with funding pressures and retention goals leading to experimentation around pedagogy and curriculum design. Educators and learners have embraced technology, as instructors flip classrooms, adopt blended content, and experiment

[8] https://www.chronicle.com/article/An-Ultra-Selective-University/243678
[9] https://highered.colorado.gov/Publications/Press/Colorado-Rises-Presentation-Web.pptx

with automated grading and options like open-source textbooks and immersive or VR learning material[10]. Universities expect IT to support the technology to enable these new teaching methodologies.

Technology is expected to respond to innovation in curriculum design as well. Practices like micro-credentials, guided degree pathways, and meta majors have been demonstrated to improve retention of all students, and particularly of hard-to-retain populations[11]. These new approaches to curricula require robust degree planning and degree audit systems.

The major Massive Open Online Course (MOOC) platforms, in a push towards profitability, have settled into their business plans and are focused on iterating within those plans. While progression to credit and degree/credential granting models is the next step in the paradigm's evolution, the specifics of MOOC-based credit-granting programs remain unclear. This lack of clarity presents an opportunity to leapfrog those institutions who were earlier to innovate in online education while presenting the concordant first-mover risks.

Cloud ERP in Higher Education

Higher education organizations, lagging behind the private sector, are still generally talking about the cloud for ERP as they look to find IT efficiencies[12]. As schools make changes, they typically find a unique mix of PaaS/IaaS/SaaS and hybrid options to fit their unique positioning and needs.

Compliance and Security

The regulation and compliance landscapes continue to drive business constraints and expectations. Accessibility, data privacy, and security are forefront. Security principals see a shift in threats, with data replacing laptops and servers as the new endpoint for attacks. Managing compliance with regulations like GDPR requires the investment of time from experts in the business. While projects in this domain are often seen as "IT-centric," initiatives must be accepted by and reflect the needs of the business.

Data and Analytics

Universities are expecting to understand and steer interactions with staff, with alumni, with students, and with the business as a whole, based on data and analytics. Particular drivers are advancement offices looking for 360° views of donors, and student retention and success initiatives. While primary data focus has been in the realm of student success and private

[10] Emerging Trends in Higher Education Pedagogy
[11] https://er.educause.edu/articles/2017/6/transforming-higher-education-the-guided-pathways-approach
[12] https://www.forbes.com/sites/oracle/2017/08/29/the-cloud-goes-to-college-to-control-higher-education-costs/#6c37bce25530

philanthropy, Universities should be prepared to utilize data to streamline the administration, HR success, and other non-student-focused initiatives

Information Technology Landscape

Employment Trends

There are well-recognized challenges of recruiting and retaining talent with unemployment at current lows. Additionally, in high demand fields like technology, the ease of recruitment (with big data, AI, social media, etc.) is allowing recruiters to make more connections with qualified candidates, and candidates are more likely to choose a new opportunity when it presents itself. Employers can be successful retaining talent in this environment by actively working to give employees internal opportunities for development and advancement, and by providing "creative reward packages."[13]

Application Density and the Shift to SaaS

The complexity of the modern business and the ability for cloud providers to offer affordable niche IT services to small and mid-sized departments leave centralized IT organizations in the business of: managing ERP systems, niche systems, and the data and security connections that (when done well) compose cohesive business services of many applications. This complexity places a burden on IT staff; with both an increase in the number of applications to support as well as an increased need for highly-technical work, such as security and sophisticated systems integrations.

The ERP center of gravity for these smaller or niche applications is also shifting to the cloud, though not always with a clear road. Key vendors have announced end-of-life for on-premise options. Additionally, SaaS models are driving a shift towards managing ERP functionality via configuration rather than customization. This work requires a different skill set with an aptitude for understanding the business as important as, or more important than, understanding the technology.

The shift to SaaS changes the demand curve for IT staff skills. Rather than a distribution centered between functional and technical, staff are being pulled to either end or are expected to span the full spectrum, with less mastery throughout the range. IT practitioners who currently sit in the center of the bell curve need the training, time, and support to best apply their skills in this new landscape.

Mobile Readiness, Responsive Design, and Modern User Interfaces

[13] https://www.kornferry.com/press/korn-ferry-futurestep-makes-2018-talent-trend-predictions/

Students, faculty, and staff expect to have access to systems using any device and to find information and complete tasks with fewer clicks. This expectation drives a focus on "responsive design" and the user experience. Vendors have developed, and are beginning to drive customers towards, their solution for these requirements within core ERP applications. Ancillary and niche applications will lead or lag depending on the vendor.

Finally, the design is shifting towards a search-driven paradigm within technologies like portals and analytics. Supporting the technologic foundation of search is a unique skill set that is new to many higher education ERP support teams.

Interconnected Applications

Users expect seamless access to and between systems, with fewer requests for passwords, more accurate data, and more current data exchanges. As an organization's application ecosystem becomes more diverse and fragmented, more identity management work and data integrations are required. As a result, technologists spend more time developing the connections that turn fragments into a cohesive, seamless user experience.

Big Data

Data-focused initiatives are no longer vanity projects for organizations with money to spend; rather they are expected of any well-run organization. These projects expect to combine internal and external data sources, to work with disparate data formats, and to use modern platforms that leverage cheap storage and processing. The ultimate success of these initiatives depends on governance and input from the business.[14]

IT Services Delivery Model Evolution

As the business demands both stability and agility from IT, organizations are looking to DevOps and bimodal IT models for the processes that allow them to deliver both. Industry-neutral organizations like Gartner, and industry organization Educause, have endorsed the bimodal models. Key features of these paradigms are infrastructure as code, automated testing and deployment processes, and the embracing of open-source technology. These methodologies move change from a big-bang event to a constant state. Of note, however, is the pressure users can feel when expected to adapt to consistent change without adequate support.

Open Source

[14] https://www.forbes.com/sites/forbespr/2016/10/24/strong-data-governance-enables-business-intelligence-success-says-new-forbes-insights-study/#4369f0c7582d

Open source technology evangelists claim “open source drives innovation,”[15] and five years ago technology leaders were proclaiming that “open source is eating the software world.”[16] However, recent changes to the business model of important open-source players (Microsoft’s acquisition of GitHub, Elastic’s opening of their full code base), suggest the innovation arc may be bending in a new direction.

Regardless of the past and future of open source, it is generally accepted that, in its current state, open source needs to be carefully considered on a case-by-case basis. Open source users choose open source technologies because they perceive them to be more secure, more stable, as well as providing a better user experience.[17] Open source contrarians remind us that there are indirect costs to open source technology and that we can replace vendor lock-in with application lock-in.[18]

[15] https://opensource.com/article/17/11/10-open-source-technology-trends-2018
[16] https://www.linkedin.com/pulse/20130419164101-1893586-open-source-is-eating-the-software-world
[17] http://opensourcesurvey.org/2017/#insights
[18] https://www.forbes.com/sites/rajsabhlok/2013/07/18/open-source-software-the-hidden-cost-of-free/#70a594994001

Multi-Campus ERP Services Landscape

The University of Colorado leverages a wide range of common-use IT services, most of which are provided by System Administration. These systems are critical in supporting the mission of the University, as well as the day-to-day functioning of the institution, and include the commonly understood “ERP” or “enterprise” services.

People, processes, and technologies enhance the delivery of ERP systems to create ERP services. Essential components of the administrative services portfolio include identity and access management (IAM) platforms to provide seamless authentication to services, integration to aid in moving data to other systems, business intelligence (BI) to support reporting and data analysis, portals to allow a customizable user experience, and security and information management practices to protect information assets.

ERP systems require significant initial and ongoing investment, and organizations typically look for at least two benefits in return: IT cost savings as compared to home-grown solutions and business process efficiency. ERP can also provide a platform for ongoing process improvements and business innovation, and through these additional initiatives, add back significantly more value and business maturity to the organization.

On-Premise, Cloud-Based and Hybrid Approaches

Organizations running ERP applications today must decide between traditional on-premise systems, cloud-based options where a vendor is providing more of the technical sustenance of the solution, or a hybrid model mixing the two in a best-of-breed approach. When deciding between cloud, on-premise ERP, or a hybrid approach organizations typically consider a number of factors:

- differing cost models
- flexibility and functionality tradeoffs
- differing roadmaps for various solutions
- support considerations such as the skills market and availability of consulting help
- end-user experience and responsive design needs

Cloud options do not necessarily bring overall cost savings versus their on-premise counterparts. A move to the cloud typically sees capital expenditures replaced with operational expenditures, which often better aligns with business utilization.

The next tradeoff organizations consider is between flexibility and new functionality. Organizations with complex or highly unique business processes may find they cannot work

within the constraints of a typical process-prescriptive cloud solution, and that they instead need an on-premise system that can be customized to meet their needs. Given the unique and highly complex nature of business processes across the CU campuses, an investment should be made now to understand the business processes individually by campus and then determine which processes are a priority and should be made consistent at a cross-campus level and which should remain unique.

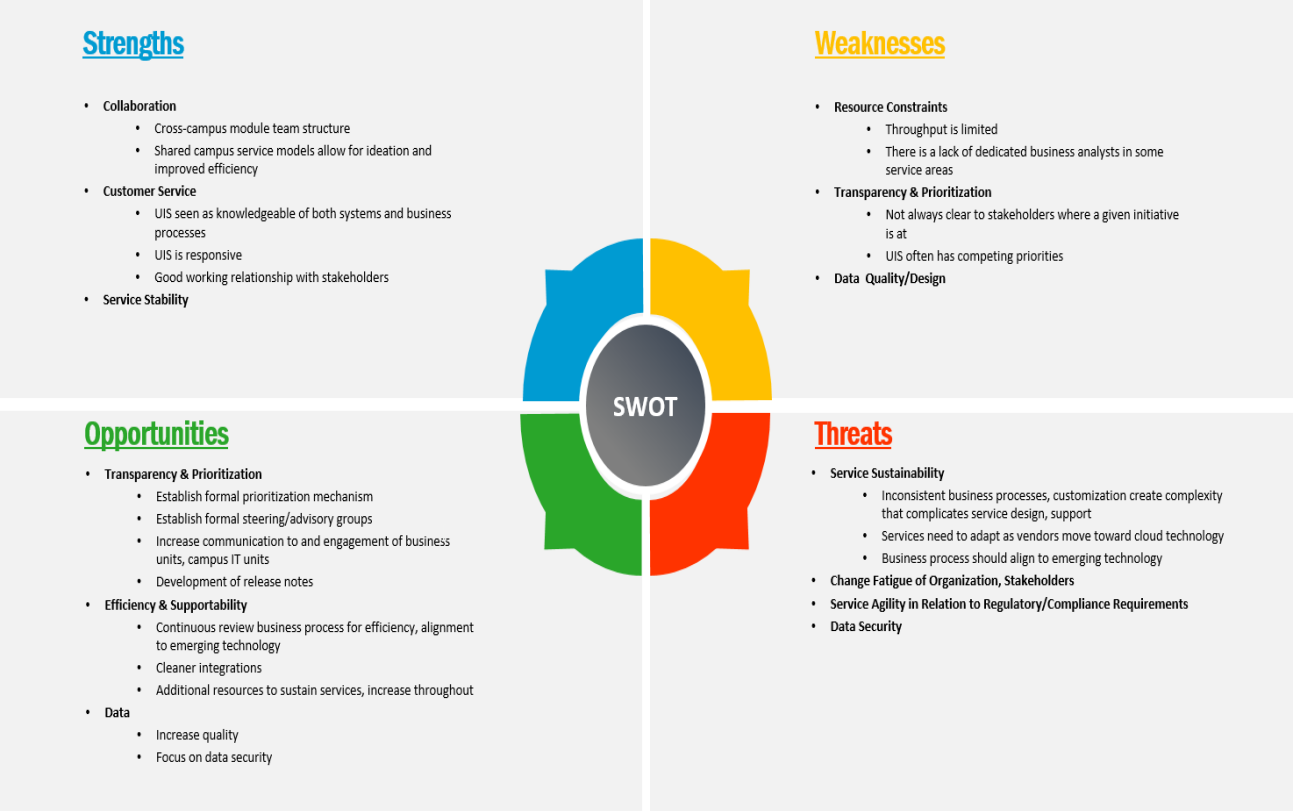
The product roadmaps presented by ERP vendors are often disparate and rapidly changing, making these roadmaps a complex but important factor into on-premise vs. cloud decisions. Globally, nine out of ten PeopleSoft cross-industry customers are still running on-premise applications, and Oracle has announced roadmaps and support through at least 2030 with a stated expectation of extending longer. Finance and HR solutions have led the maturity curve for cloud ERP products. Higher-education focused cloud offerings, including student and grants solutions, are still focused on "core" functionality, but Gartner and Ovum expect the products to mature to handle a large-scale, complex university like CU by 2021 or 2022.

Cloud and on-premise ERP solutions demand differing considerations around staffing. While there is an expected decrease in the overall talent-pool for supporting current ERP, the shift to software as a service, or SaaS, changes the demand curve for IT staff skills. SaaS models are driving a shift towards managing ERP functionality via configuration rather than customization. This work requires a different skill set with an aptitude for understanding the business as important as, or more important than, understanding the technology. Additionally, higher education institutions that have undergone cloud-ERP implementations have had trouble finding enough skilled and knowledgeable resources capable of leading a project, which has been true for CU as well.

Finally, students, faculty, and staff expect to have access to systems using any device and to find information and complete tasks with fewer clicks. This expectation drives a focus on "responsive design" and the user experience. Vendors have developed, and are beginning to drive customers towards, their solution for these requirements within core ERP applications.

Distilled SWOT Themes

In parallel with the strategic priority data collected effort, UIS embarked in a series of facilitated SWOT sessions (Strengths, Weaknesses, Opportunities, Threats) with IT service stakeholder groups, which produced the following high-level themed. Detailed SWOT feedback for individual service lines can be found in the applicable service line roadmap document.



SWOT Participants

The following individuals were engaged to participate in SWOT sessions.

Human Capital Management (HCM) Services

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Kenneth Hopping	Florie Montoya	Rebecca Menkhus	Aaron Mansfield

Kenneth Nelson	Jason Leach	Shannon Huddleston	Carolyn Proctor
Natan Tuchman	Loan La	Shelly Raney	Elijah Olachea
		Susan Watson	Erika Nelson
			Jill Ibeck
			Sharon Bishop

Finance Services

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Laura Ragin	Amy Gannon	Carolyn Rupp	Aaron Mansfield
Leila McCamey	Nara Shaqdar	Nicholas Martinez	Calvin Anderson
Stefanie Furman	Ryan Yu		Jaya Vaidyanathan

Student Services

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
David Humphrey	Alex Alger	Jevita Rogers	Aaron Mansfield
Elizabeth McVeigh	Ashley R. Cooper	Kirk Moore	Art Figel
Gwen Pomper	Carrie A. John	Matthew Cox	Diane Main
Jim Morfeld	Christine Stroup-Benham	Steve Medlin	Fernando Loa
Jon Giltner	Christopher Derry	Todd Casey	Rana Silver
Kristi Wold-McCormick	Eric Gray	Tracy Barber	
Paul O'Brian	Evan Icolari		
Robin Swift	Justin Jaramillo		
Sally Page	Lenore Damrauer		
Somchanok Sitchawat	Shana Naugle		
Stephen Jones			
Victor Goldberg			

Research and Grants Services

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration

Ann E. Bennan	Alison Lakin		Aaron Mansfield
Christina Tenerowicz	Amy Gannon		Jaya Vaidyanathan
Claire Dunne	Cheri VonFeldt		Jennifer Silverthorne
Denitta Ward	Christine Ahearn		
Gwen Evans	Elizabeth Collins		
James Uhes	Ginger Acierno		
Jon Giltner	John Heldens		
Joseph Rosse	Kathy Phillips		
Karen Regan	Kavitha Jakkula		
Laura Ragin	Kevin Lole		
Leila McCamey	Lori Dewender		
Pamela Powers	Ryan Holland		
Pamela Rosse			
Pamela Tazik			
Regina Montano			
Tazik Rosse			

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Christina Tenerowicz	Amy Gannon	Carolyn Rupp	Aaron Mansfield
EJ Lee	Bryce Walsh	Melinda Hamilton	Calvin Anderson
Gabriele Rushing	Cheri VonFeldt		Jaya Vaidyanathan
Gwen Evans	Ginger Acierno		Robert Kuehler
James Ferrell Melancon	Kevin Lole		
James Lei	Koffi Gnatsidji		
Laura Ragin	Seth Hess		
Leila McCamey	Shanelle Roquemore		
Nadezhda Vovk	Stephanie Thompson		
Sharon Decarlo			

Enterprise Content Services

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Anir Banerjee	Alex Alger	Brooke Allen	Aaron Mansfield
Cindi Lee	Amber R. Hudson	Bryan Rossman	Alan Vidmar
Dawn Davis	Jessica McCarty	Steve Perucca	Kimberly Wendelin
Greg Hoppes	Kaylene McCrum		Milap Sharma

Janet Garrett	William Sour		Phillip Curry
Karstee Davis			
Larissa Armand			
Mark Diekhoff			
Michael Bostwick			
Michael Faulkner			

Data and Business Intelligence

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Gwen Evans	Cheri VonFeldt	Jaqueline Gatlin	Aaron Mansfield
Jennifer Rossi	David Deffenbacher	Kirk Moore	Abigail K. Palsic
Joey Laconte	Eric Gray	Rick Rowcotsky	Carl Sorenson
Nischal Dangol	Irene Rael	Robyn Marschke	Derrick Whitney
Raza Dawood	Irma Peralta		Janelle Fossett
Robert Stubbs			Jennifer Silverthorne
Sarah Layton			John Hanna
Somchanok Sitchawat			Lisa Damboise
Theresa Jordan			Milap Sharma
Victor Goldberg			Sandeep Mekala
			Sarju Khadka
			Sharon Bychowski Price
			Shonna Hughes

Identity and Access Management

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Elizabeth McVeigh	Carrie A. John	Janet Kemper	Aaron Mansfield
Gwen Pomper	Heather L Peterson	Kirk Moore	Fernando Loa
Joey Laconte	Irma Peralta	Tracy Barber	Milap Sharma
Kristi Wold-McCormick	Vaughn Larsen		Ryan McDaniel
Robert Stubbs			Sarah Braun
Sally Page			

Integrations

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Christina Tenerowicz	Carrie A. John	Craig Decker	Aaron Mansfield
Joey Laconte	Larsen, Leif	Kirk Moore	Al Wirtes
Kerry Havens	Nicole McWhirter	Todd Casey	Lisa Damboise
Kevin Notheis	Peterson, Heather	Tracy Barber	Milap Sharma
Kristi Wold-McCormick			
Sally Page			

Portal

CU Boulder	CU Denver / CU Anschutz	CU Colorado Springs	System Administration
Elaine Schriefer	Alex Alger	Craig Decker	Aaron Mansfield
Kevin Mayer	Andrew Liakos	Kirk Moore	Chris Toomer
Paul O'Brian	Ashley R. Cooper	Rick Rowcotsky	Milap Sharma
	Catherine Wilson	Ryan LaRoy	Normandy Roden
	Easton, Daniel	Todd Casey	RyAnne Scott
	Kaylene McCrum	Tracy Barber	
	Klimczak, Karen		
	Krystal Fox		