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To University leadership, and to the Governor, General Assembly, and people of Ohio:

It is my pleasure to present to you this performance audit of The Ohio State University. This service to OSU and to the taxpayers of Ohio is provided pursuant to Ohio Revised Code § 117.46 and is outlined in the notice of engagement dated July 27, 2017.

This audit includes an objective assessment of select University programs based on industry standards and leading practices. The Ohio Performance Team of the Auditor of State's office conducted the work in accordance with Generally Accepted Government Auditing Standards.

This engagement analyzed University programs and service delivery processes for efficiency and cost-effectiveness. The scope of the engagement was confined to Information Technology, covering Server Rooms and Printing Management, and Shared Services, covering Current State Process and background Checks.

This report has been provided to OSU and has been discussed with University leadership and other appropriate individuals. The University is reminded of its responsibilities for public comment, implementation, and reporting related to this performance audit per the requirements outlined under ORC § 117.461 and § 117.462. The University is also encouraged to use the results of the performance audit as a resource for improving overall operational efficiency as well as service delivery effectiveness.

Sincerely,

Dave Yost
Auditor of State
September 25, 2018

Additional copies of this report can be requested by calling the Clerk of the Bureau's office at (614) 466-2310 or toll free at (800) 282-0370. In addition, this report can be accessed online through the Auditor of State of Ohio website at http://www.ohioauditor.gov by choosing the "Audit Search" option.

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Table of Contents

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I. Engagement Purpose and Scope

Ohio Revised Code (ORC) § 117.46 provides that the Auditor of State's office (AOS) shall conduct performance audits of at least four state agencies each budget biennium. With the passage of House Bill 384 of the 131st General Assembly, effective April 5, 2017, ORC § 117.46 was modified to allow the AOS to conduct a performance audit of a state institution of higher education as one of the four required performance audits.

Prior to the passage of the legislation, The Ohio State University (OSU or the University) leadership had expressed a desire to lead the way and be the first higher education institution in the State of Ohio to participate in the new performance audit process. In November 2016, the AOS and OSU issued a joint press release announcing the mutual intention to collaboratively enter into a performance audit. Once the legislative authority became effective, and prior to the formal start of the performance audit, the Ohio Performance Team (OPT) and OSU engaged in a collaborative planning process which included meetings, discussion, and assessments. Based on these planning activities, AOS provided the University with a signed notice of engagement marking the official start of the performance audit, effective July 27, 2017. For the purposes of compliance with ORC §117.46, OSU was selected for a performance audit during the fiscal year (FY) 2015-17 Biennium, encompassing FY 2015-16 and FY 2016-17.

The notice of engagement established that the objective of the audit was to review and analyze selected areas of University operations to identify opportunities for improvements to economy, efficiency, and effectiveness.

The notice of engagement led to OPT planning and scoping work, which, in consultation with OSU, identified the following scope areas:
- Information Technology – Server Rooms;
- Information Technology – Printing Management;
- Shared Services – Current State Process; and
- Shared Services – Background Checks.

Based on the established scope, OPT engaged in supplemental planning activities to develop detailed audit objectives for comprehensive analysis. See **Section VIII: Audit Scope and Objectives Overview** for an overview of scope areas and audit objectives.

II. Performance Audit Overview

The United States Government Accountability Office develops and promulgates Government Auditing Standards that provide a framework for performing high-quality audit work with competence, integrity, objectivity, and independence to provide accountability and to help improve government operations and services. These standards are commonly referred to as generally accepted government auditing standards (GAGAS).

Performance audits are defined as engagements that provide assurance or conclusions based on evaluations of sufficient, appropriate evidence against stated criteria, such as specific requirements, measures, or defined business practices. Performance audits provide objective analysis so that management and those charged with governance and oversight can use the information to improve program performance and operations, reduce costs, facilitate decision making by parties with responsibility to oversee or initiate corrective action, and contribute to public accountability.

OPT conducted this performance audit in accordance with GAGAS. These standards require that OPT plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for findings and conclusions based on the audit objectives. OPT believes that the evidence obtained provides a reasonable basis for our findings and conclusions based on the audit objectives.

III. Methodology

Audit work was conducted between July 2017 and July 2018. To complete this report, OPT staff worked closely with OSU staff to gather data and conduct interviews to establish current operating conditions. This information was reviewed with staff at multiple levels within the University to ensure accuracy and reliability. Where identified, weaknesses in the data are noted within the report where germane to specific assessments.

To complete the assessments, as defined by the audit scope and objectives, OPT identified sources of criteria against which current operating conditions were compared. Though each source of criteria is unique to each assessment, there were common sources of criteria included across the audit as a whole. These common sources of criteria include: statutory requirements such as contained in ORC or Ohio Administrative Code (OAC); University bylaws, policies, and procedures; and industry standards and leading practices. All sources of criteria were reviewed to ensure that their use would result in reasonable and appropriate assessments.

The performance audit process involved information sharing with OSU staff, including preliminary drafts of findings and proposed recommendations related to the audit scope and objectives. Status meetings were held throughout the engagement to inform the University of key issues and share proposed recommendations to improve or enhance operations. Input from the University was solicited and considered when assessing the selected areas and framing recommendations. OSU provided verbal and written comments in response to various

recommendations, which were taken into consideration during the reporting process. Where warranted, the report was modified based on University comments.

This audit report contains recommendations that are intended to provide OSU with options to enhance its operational economy, efficiency, and effectiveness. The reader is encouraged to review the recommendations in their entirety.

IV. OSU Overview

Responsibilities, Mission, and Core Values

The Ohio State University (OSU or the University) is Ohio's largest public research university with more than 66,000 students on six campuses. Campuses include the main campus in Columbus, Ohio, as well as campuses in Lima, Marion, Mansfield, Newark and Wooster. Additionally, the University has more than 45,000 faculty and staff as well as 550,000 alumni living and working in 170 countries across the globe.

According to *Time and Change* (OSU, 2017), OSU's strategic plan, through its mission, the University is dedicated to:
- Creating and discovering knowledge to improve the well-being of our state, regional, national and global communities;
- Educating students through a comprehensive array of distinguished academic programs;
- Preparing a diverse student body to be leaders and engaged citizens;
- Fostering a culture of engagement and service;
- Understanding that diversity and inclusion are essential components of our excellence.

Furthermore, the University's core values are:
- Excellence;
- Diversity in people and of ideas;
- Inclusion;
- Access and affordability;
- Innovation;
- Collaboration and multidisciplinary endeavor; and
- Integrity, transparency and trust.

Organizational Structure

OSU is co-governed by an appointed Board of Trustees and the President.

Overview of the Board of Trustees

In accordance with ORC Chapter 3335, the Board of Trustees (the Board) comprises 17 trustees appointed by the Governor with the advice and consent of the Senate. Further, ORC requires that two of the 17 trustees shall be students at the University. Student trustees are appointed for a two-year term while all other Board members are appointed for a term of nine years. Finally, ORC stipulates that the Board members shall not receive compensation for their services, but shall be paid their reasonable necessary expenses while discharging their official duties.

Officers of the Board include a chair, one or more vice chairs, and a secretary. If needed, the Board may elect such other officers as it may deem necessary with such authority and responsibility as delegated to them by the Board. Officers shall be elected annually by the Board and while the chair and the vice chair must be members, the qualifications of all other officers shall be determined by the Board.

The Board is organized into the following standing committees, each with a committee chair and vice chair and all members appointed annually by the Board chair:
- Academic Affairs and Student Life Committee;
- Audit and Compliance Committee;
- Advancement Committee;
- Talent and Compensation;
- Finance Committee;
- Governance Committee; and
- Master Planning and Facilities.

In addition to the Board composition set forth in ORC, University bylaws and OAC, under 3335-1-02 Officers and Committees of The Board, also establish positions for up to three Charter Trustees. Charter Trustees are non-Ohio residents chosen on the basis of:
- University alumna/alumnus or friend of the University;
- Success in his or her chosen field or profession;
- State, national, or international prominence;
- Ability to advocate for higher education; and
- Willingness and ability to offer counsel.

Charter Trustees are appointed to a three-year term upon nomination by the Board Governance Committee and vote of the Board. They have no voting privileges, shall not be considered in determining whether a quorum is present, and shall not be eligible to be officers of the Board, but will otherwise participate in all activities of the Board.

Overview of the President

In accordance with ORC § 3335.09 the Board shall elect, fix the compensation of, and remove, the president and such number of professors, teachers, and other employees as necessary. In accordance with University bylaws and OAC 3335-1-03 Administration of The University, the president shall be the chief executive officer of the University and shall be responsible for the entire administration of the University, subject to control of the Board. The president shall lead in fostering and promoting education, research and outreach as the primary aims of the University. It shall be the duty of the president to enforce the bylaws, rules and regulations of the Board, and, as a member of the faculty, to interpret to the Board proposals and actions of the faculty.

The President is responsible for providing direction and oversight to the Executive Vice President (EVP)/Provost as well as the Senior Vice President for Business and Finance (SVP B&F)/Chief Financial Officer (CFO). Under this structure, the EVP/Provost shall, under the direction of the President, be responsible for and have the requisite authority for the oversight of all academic programs and other instructional and faculty affairs of the University, and shall be the Chief Operating Officer of the University. In turn, the SVP/CFO B&F shall, under the direction of the President, be responsible for and have the requisite authority for the administration of the University's business, financial, and administrative operations. In addition, the SVP/CFO B&F shall report to the president and, as appropriate, shall consult with the EVP/Provost. Within parameters set forth by action of the Board of Trustees, the President or designee(s) shall have the authority to appoint and set the compensation for such other administrative officers, faculty, and staff as are necessary to carry out effectively the operation of the University.

Omitted from this high-level overview are the colleges, vice president and business units, and departments across the University. Collectively, these "areas" carry out the day-to-day operations of the University and, where applicable to the work performed in this performance audit, are noted throughout each section.

Organizational History

The Ohio State University was founded in 1870 following the Land-Grant College Act of 1862. Classes began in the fall of 1873 with 24 students. The first class of six men graduated in 1878, followed by the first woman graduate in 1879. Originally known as the Ohio Agricultural and Mechanical College, OSU has grown over the years into a comprehensive public institution of higher learning, with 15 colleges, more than 250 undergraduate majors, 166 master's degree programs, 120 doctoral programs, nine professional degree programs, and more than 12,000 course offerings. Through August 2017, OSU had granted more than 747,000 degrees.

Staffing and Budgetary Resources

As of autumn 2017, OSU had more than 46,200 employees equating to more than 38,800 full time equivalent (FTE) employees.

According to the *2017 Statistical Summary* (OSU, 2017), total revenues were more than $7.1 billion, including:
- Health System – $3.4 billion;
- Tuition and Fees – $1.1 billion;
- State Support – $525 million;
- Auxiliary – $347 million; and
- Other – $1.7 billion.

Total expenditures equaled $6.6 billion, including:
- Health System – $3.0 billion;
- Salaries – $1.5 billion;
- Benefits – $425 million;
- Financial Aid – $371 million; and
- Other – $1.3 billion.

At that time, OSU also reported that the total University and Foundation endowment had a market value of more than $4.2 billion.

Enterprise Resource Planning System Initiative

OSU is currently undertaking a multi-year transition to replace outdated human resources, financial, and student systems, and implement a cloud-based, enterprise-wide IT system known as Workday. As currently planned, Workday will be the University's primary system for financials, human resources, payroll, and student information. In addition to replacing outdated systems, the primary objective of the project is to adopt industry leading business processes that provide improved customer service, an enhanced student experience, and consistent operations across all parts of the University community. The transition into a unified system with streamlined processes is also expected to greatly enhance the University's business intelligence, analytics, and reporting, providing University leadership with greater access to quality information to inform decision-making. Specific to human resources and finance, Workday implementation is targeted for 2020, with implementation of the student module thereafter.

V. Summary of Recommendations and Impact

The following table shows summarized performance audit recommendations and total impact identified in this performance audit report.

Report Section	Recommendations	Annual Impact
Information Technology – Server Rooms	**R1.1**	**$2,382,700**
Information Technology – Printing Management	**R2.1 and R2.2**	**$684,700**
Shared Services – Current State Process [1]	**R3.1 and R3.2**	**$3,280,700**
Shared Services – Background Checks	**R4.1 and R4.2**	**$90,600**
Total Annual Impact		**$6,438,700**

[1] This annual impact is inclusive of the benefit that will result from retiring current systems, but is not inclusive of the cost of replacing those systems.

VI. Noteworthy Accomplishments

Noteworthy accomplishments acknowledge significant accomplishments or exemplary practices. The following summarizes noteworthy accomplishments identified during the course of this performance audit.

2020 Vision and Efficiency Initiatives: On March 31, 2015, President Michael V. Drake, announced the 2020 Vision laying out a strategic path and challenge for the University to achieve over the next five years. Fundamental to the 2020 Vision were the tenants of:
- Access, Affordability, and Excellence;
- Community Engagement; and
- Diversity and Inclusion.

Although all parts the 2020 Vision are meaningful to OSU's mission, specific to this performance audit the category of Access, Affordability, and Excellence was of particular note because it included the commitment to expand student aid by $100 million; with $15 million in the first year through the President's Affordability Grant and the remainder by 2020. Furthermore, President Drake directed the University to identify $400 million by 2020 to lower costs and improve value for students and families. This $400 million is inclusive of $200 million to be identified through internal efficiencies and another $200 million in new resources.

Building on these focus areas, the Board adopted the Time and Change strategic plan in August 2017. This plan set forth five areas of broad focus including:
- Teaching and learning;
- Access, affordability, and excellence;
- Research and creative expression;
- Academic health care; and
- Operational excellence and resource stewardship.

In additional to the aforementioned commitment to access, affordability, and excellence, the pillar of operational excellence and resource stewardship was also formally established. Under this pillar the University is seeking to be an exemplar of best practices in resource stewardship, operational effectiveness, and efficiency and innovation. According to Time and Change, operational excellence is foundational to the success of the strategic vision as the University must be a responsible steward of its resources to re-direct investment into these initiatives. Goals within the pillar of operational excellence and resource stewardship include:

- Capture hundreds of millions in savings at the University and the Wexner Medical Center over seven years for strategic uses;
- Realize significant improvements in end-user service levels (e.g., project timelines, turnaround times, self-service);
- Simplify core processes and streamline financial mechanisms to create unprecedented transparency and agility;
- Capture hundreds of millions in innovative revenue-generation opportunities and the required funds to fuel our strategy through a bold new fundraising campaign; and
- Maintain levels of local, state and federal support and capture new local, state and federal opportunities for capital projects.

To date, the University reports that it has already surpassed the 2020 Vision goals for increased financial aid and new resource generation and that it is on track to exceed the operational efficiency goal in FY 2019-20. At the same time, President Drake led the establishment of the "Ohio State Tuition Guarantee," which included freezing tuition, mandatory fees, housing and dining for four years for incoming, in-state freshmen. For existing in-state students, tuition has been frozen since FY 2011-12.

Operational Excellence: In FY 2012-13, the Office of Business and Finance established the Operational Excellence at OSU (Operational Excellence) program. Operational Excellence focuses on cost savings, increased efficiency, and continuous improvement through the deployment of Lean Six Sigma tools and methodologies. As an internal service provider, Operational Excellence provides training and support (e.g., mentoring and consulting), at no cost, which is available to all University areas.

The University reports that through FY 2017-18, Operational Excellence team has mentored and trained more than 900 efficiency experts. Furthermore, the University reports that in the four years prior to and including FY 2016-17, Operational Excellence projects saved or avoided $41.2 million in costs and eliminated nearly 225,000 hours of non-value added work.

It is important to note that a portion of the operational improvements and efficiency gains identified in the **Noteworthy Accomplishment** for **Fleet Management** were a direct result of a Lean Six Sigma project facilitated through a partnership between the Office of Administration and Planning and the Office of Business and Finance.

Fleet Management: Prior to the start of this performance audit, OSU independently engaged in multiple reviews of fleet management practices resulting in University-reported efficiency gains and cost savings, including:

- **Office of Administration and Planning (A&P)** – A&P is OSU's largest fleet of on-road, plated vehicles, numbering 318 vehicles as of January 2017. Leadership within A&P established a goal of a 20.0 percent efficiency gain and A&P employees, with the support of Operational Excellence, were able to identify and complete a Lean Six Sigma project that resulted in the identification of efficiency opportunities. A&P began implementing these changes at the conclusion of the project and full implementation is expected by the end of FY 2017-18. Full implementation is expected to reduce the total A&P fleet to 265 vehicles, a reduction of 53 vehicles, or 16% percent; an avoidance of $2.9 million in acquisition cost; and more than $60,000 in one-time revenue from the sale of unneeded vehicles. A&P's annual operating cost is expected to decrease by $740,000 per year.

- **College of Food, Agricultural, and Environmental Sciences (CFAES) –** CFAES is OSU's second largest fleet of on-road, plated vehicles and has also been proactive in fleet management strategies with the goal of improving overall efficiency and service delivery. For example, in CY 2016 CFAES had 288 vehicles but by the end of CY 2017 had reduced the fleet to 266 vehicles, a reduction of 22 vehicles, or 7.7 percent. In addition, starting in FY 2017-18, CFAES replaced six vehicles with as-needed rentals. CFAES plans to fully evaluate the cost effectiveness of implementation of this strategy, and potential for additional applications, at the beginning of FY 2018-19.

The University should continue to build upon these successes by completing additional fleet efficiency studies in its remaining fleet-holding areas.

VII. Audit Results

The performance audit identified recommendations within the scope areas of:
- Information Technology – Server Rooms;
- Information Technology – Printing Management;
- Shared Services – Current State Process; and
- Shared Services – Background Checks.

Throughout this performance audit, two significant considerations were repeatedly identified, both of which are necessary to fully understand the results. These considerations include:
- Higher Education Governance and Organizational Structure; and
- Integrated Business Intelligence and Performance Management.

Comment on Higher Education Governance and Organizational Structure

As previously noted, OSU operates with a co-governed structure, meaning that the University's governance requires partnership among the Board of Trustees, President, Provost, CFO, and other senior leaders (see **IV. OSU Overview**). As a public institution, this structure is prescribed by state law, but the way that the structure is carried out is affirmed through University bylaws, policies, procedures, culture, and traditions.

OSU, as with other higher education institutions, exists within an environment where elected and appointed officials, leaders, and administrators are being asked to do more with less. At the same time, demands for service are increasing. Specifically, the pressure to provide broader access to higher education, often through financial assistance, is increasing, but at the same time, there is increasing pressure to hold tuition in check. Faced with these competing pressures, OSU has increasingly been relying on innovative funding strategies, efficiency initiatives, and smart growth.

As the flagship higher education institution in the State of Ohio, OSU has a long tradition of successfully adapting to create a balanced educational and operational environment. This is especially true throughout the last several years as the University has embarked on a number of groundbreaking, strategic initiatives (see **VI. Noteworthy Accomplishments** for **2020 Vision and Efficiency Initiatives**, **Operational Excellence**, and **Fleet Management**).

Unlike private business, or even a government with a singular executive, in order to make meaningful change, the entire upper echelon of the University's leadership must be supportive of such a change. Even with leadership aligned, the smallest change, to be impactful and carried out across the entire University, may require a tremendous amount of time, energy, effort, and political capital to be successful. Under the co-governance structure neither the Board of Trustees, nor the President, may act independently without consensus. Simply put, no single individual has the ability to change how the University operates down to the farthest reaches of the organization. Furthermore, at the University's highest organizational levels, the central administration is separate from the colleges and research and academic areas, which are, in turn, also separate from the Wexner Medical Center and affiliated organizations.

The degree of separation is reinforced by a largely decentralized, independent budgetary structure. This budgetary structure allows colleges and other areas across the University the flexibility to act in an entrepreneurial manner and make the market-based changes necessary to function in a competitive environment. University leadership retains the ability to make high-level budgetary decisions, such as freezing tuition to enhance affordability or reducing administrative budgets to generate additional resources for increased financial aid. However, making day-to-day operational changes that will provide additional efficiencies and cost savings are largely out of University leadership's immediate control. As a result, leadership must engage in coalition building to achieve these changes, particularly where shared services and daily operational efficiencies are concerned.

Significant opportunity remains to shore up daily operational efficiency and effectiveness and realizing this opportunity will help encourage long-term financial sustainability. Throughout the course of this performance audit, data and information was collected and analysis was performed that identified significant variation in the way that the University's areas carry out day-to-day operations, negatively impacting daily efficiency. In all cases, decentralized decision-making and operations, generally supported by some degree of budgetary autonomy, were identified as either causal, or significantly contributing, factors leading to the variation. This information has been included where relevant to this performance audit report.

Within any organization and operating environment there are barriers to change. Some may be legal, others are budgetary, and some are cultural and historical. Some of these factors are part of OSU's identity as a flagship institution. Others are integral to the higher education operating environment at large. It is the responsibility of the entire University community to strike a long-term, sustainable balance between honoring these traditions while at the same time ensuring that they do not become barriers to efficient, effective, and responsive service delivery.

Comment on Integrated Business Intelligence and Performance Management

Throughout the course of this performance audit, analysis showed that University leadership was rarely supplied with the type of data and information necessary for high functioning business intelligence needs or, at times, even basic performance management. In part, some of this lack of information, and the framework to put this information to work, was due to the aforementioned **Higher Education Governance and Organizational Structure**. However, an additional factor was that key data and information is not being consistently collected, and when it is collected, it often cannot be analyzed due to issues with disconnected, legacy systems, or even no systems at all.

Each scope area and report section includes recommendations that focus on performance measurement and management. This thematic focus evolved over time as progressively detailed work was performed to assess the University's operations within each of the scope areas. In all cases where these deficiencies were identified, this report includes practical, implementable recommendations not only to address the identified deficiencies, but also to begin using the resulting data and information to improve management decision-making and University-wide performance.

As noted, the University is in the process of replacing its legacy human resources, finance, and student systems with a single, integrated system (see **IV. OSU Overview**). Coupled with the approach modeled in this performance audit, this new system should enable significant advances in integrated business intelligence and critical performance measurement and management activities.

See **IX. Abbreviated Terms and Acronyms** for a list of acronyms used throughout this report.

1. Information Technology – Server Rooms

Section Overview

This section of the performance audit focuses on The Ohio State University's (OSU or The University) information technology (IT) delivery related to server hosting. Information was collected and analysis was performed to evaluate the performance of server rooms hosted within OSU campus buildings. Specifically, the total cost of ownership (TCO) of on-campus server rooms was compared to alternative off-site hosting arrangements. Analysis identified opportunities to reduce expenses and increase the level of IT security by migrating server operations from rooms on campus to larger data centers such as the State of Ohio Computer Center (SOCC).

Recommendation Overview

Recommendation 1.1: OSU should consider eliminating the practice of operating on-site server rooms in favor of migrating those servers and racks to a more efficient, secure data center such as the SOCC. In doing so, the Office of the Chief Information Officer and University areas should coordinate to prioritize smaller server rooms, or those in need of immediate infrastructure or security upgrades as those offer the best immediate opportunity.

Financial Implication 1.1: Migrating smaller on-campus server rooms to co-located hosting at the SOCC could generate a total financial impact of **$2,382,700** annually.

R1.1 Information Technology – Server Rooms

Section Background

Servers

In designing and running information technology infrastructure, modern enterprises extensively use specialized hardware called servers. A server is a computer designed to process requests and deliver data to other computers over a network. While any computer can be configured as a server, most servers used in commercial applications are high-powered, rack-mountable machines manufactured specifically for this function.

Table 1-1 lists common types of servers deployed in a business enterprise environment.

Table 1-1: Common Server Types

Server Type	Description
File	Stores network users' data files.
Print	Manages the printers that are connected to the network and the printing of user documents on the network printers.
Communications	Handles many common communications functions for the network, such as e-mail, fax, remote access, firewalls or Internet services.
Application	Shares network-enabled versions of common application software and eliminates the need for software to be installed on each workstation.
Database	Manages common databases for the network, handling all data storage, database management and requests for data.
Domain	Authenticates and authorizes computers and users to access resources within organizational units.

Source: The Telecommunications Industry Association

Although there are numerous server types, they all act as a centralized node on a network, allowing users to access various kinds of computing capabilities without hosting them on their local devices. Users may be internal to the enterprise, as in accessing an email communications server, or external, as in the case of web users accessing a domain server for a public website.

Data Centers

A data center refers to the physical plant that houses servers. Early data centers usually contained mainframe computing systems and typically were housed on-site for ease of support, and due to the limited data transfer speeds on network infrastructure of the time. In recent decades, most enterprises have moved some of their server function to off-site, data centers run by third parties. These large, modern data centers, which often host dozens of entities under one roof, leverage scale to reduce facility overhead cost and related expenses (e.g., electrical, HVAC, and networking systems).

Modern data centers resemble warehouses with rows of server racks, which are modular metal cabinets designed to house server boxes in a vertical arrangement. **Figure 1-1** is an example photo of a data center with several racks of servers, each rack containing many servers.

Exhibit 1-1: Example Data Center Row of Server Racks

Source: Wikipedia, under creative commons license.
Note: The front of a rack is shown on the left, and the rear of a rack is shown on the right.

As shown in **Exhibit 1-1**, servers are typically networked together on the back side of the rack (see right-hand image), with power and networking cables connecting individual racks via under-floor cables.

Several levels of service are typically available to customers of data centers. The most basic and highest maintenance option allows a customer merely to rent rack space while continuing to own the server hardware, physically accessing the boxes with their own personnel for support. A higher level of service allows the client to host applications in a virtual environment on server hardware owned by a third party, never access the facility, and provide support through a third party help desk.

State of Ohio Computer Center (SOCC)

The State of Ohio owns and manages a large data center called the SOCC. During calendar year (CY) 2013 and CY 2014 in a building adjacent to the OSU's main campus, the Ohio Department of Administrative Services (DAS) performed extensive updates to modernize the SOCC. The resulting operation is a building comparable to a Tier-3 data center, as certified by the Uptime Institute.[1]

The four-story SOCC is 350,000 square feet, and includes redundant HVAC, power distribution, and an array of diesel-powered backup generators. In 2014, under a mandate from the Office of

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[1] Conceptually, Tier-3 refers to fully redundant critical capacity components such as HVAC, battery backup, and backup generators, as well as multiple independent distribution paths serving IT equipment critical loads, among a long list of other detailed technical criteria to meet the standard. Due to the cost of obtaining certification, and the lack of one essential requirement for Tier-3 status (i.e., the SOCC lacks two distinct universal power supply (UPS) feeders), DAS currently has no plans to apply for official Tier-3 status.

the Governor, all Ohio cabinet-level state agencies began migrating server operations to the SOCC. Previously, most state agencies hosted servers in their own buildings, within small-scale, local "server rooms". These local server rooms typically housed from one to 10 racks and included some supplemental HVAC and battery backup systems, but lacked the full redundancy and security features of the SOCC. Between 2014 and 2016, DAS managed the transition of over 7,200 servers from 26 different state agencies into the SOCC.

In addition to state agencies, Ohio's institutions of higher education are eligible to house servers at the SOCC. Within OSU, most of the University's centralized IT applications, large enterprises, and several colleges, units, and departments (areas) have already migrated servers to the SOCC. However, many of the University's areas currently remain at a level comparable to Ohio's state agencies prior to 2014, with servers and racks housed in local server rooms in buildings scattered across numerous buildings and locations.

OSU IT Governance

IT services at OSU operate within a framework that mirrors the University's budgetary and management governance. University administration, through the Office of the Chief Information Officer (OCIO), sets IT standards and rules that apply university-wide. OSU's areas then have budgetary authority to procure their own IT hardware and staff to support operations while adhering to OCIO standards.

OCIO, in addition to disseminating IT standards, provides centralized support functions of two kinds: those where OCIO is the "owner" of infrastructure and enterprise applications, and those where OCIO is a vendor for a range of consulting and operational IT services. University areas, as customers of these services, may opt to use OCIO as a vendor.

The main functions owned by OCIO are campus networking infrastructure and OSU's enterprise resource planning (ERP) software. OCIO installs and maintains all the campus networking equipment, mainly buried fiber and switches, between the outside switches of individual buildings and campus exit nodes. All of the networking done inside campus buildings falls within the purview of the areas, rather than OCIO. OCIO also manages the contract and architecting for OSU's ERP software. The ERP suite provides a standard platform for units to manage OSU-standardized back-office operations such as human resources, payroll, finance, and student services.

OCIO also offers managed IT services to area customers should they choose to contract rather than self-administer. Contracting with OCIO for these services allows areas to staff fewer internal IT professionals, and mitigate risk by outsourcing infrastructure and security functions which may otherwise exceed locally available resources or capabilities of area IT personnel. Three categories of OCIO managed services offered include:
- **End-User Support** – This includes helpdesk support, end-point management technicians, file share services, desktop/laptop/tablet hardware purchasing and refresh cycles.
- **Infrastructure and Security Services** – This includes networking services, server/storage/backup services, and professional services such as project management, architecture, engineering, and risk/compliance services.

- **Other Subscription Services** – This includes Skype for Business and other cloud vendor services.

Adoption of OCIO managed services varies and currently the majority of the non-academic areas are using OCIO's managed services, while the majority of academic areas are not.

OCIO also serves as project manager and liaison between OSU areas for certain activities such as server migration to the SOCC. In the case of SOCC migrations, OCIO acts as project manager for colleges relocating servers to the SOCC via a process that provides stakeholders with SOCC requirements, timeline, limited advisory on rack architecture, and moving-day logistics.

OSU Servers

OCIO, in categorizing OSU organizational units for the purpose of IT security, splits the University into business areas within three main categories: Academic, which includes all colleges (except the Medical School) and regional campuses; Administrative, which includes areas such as the Office of Human Resources and Athletics; and Medical, which includes Wexner Medical Center departments and the medical school. For the purpose of managing their servers, each of these areas is engaged predominantly in one of three options for housing servers: hosting in their own physical server rooms; self-managing servers in the SOCC; or contracting with OCIO for managed server services, which are housed within the SOCC in OCIO's racks.

Table 1-2 lists the number of OSU organizational units engaged in each of the three options for server hosting.[2]

Table 1-2: Departmental Server Room Management

	Organization Unit Category			
Hosting Option	**Academic**	**Non-Academic**	**Medical Center**	**Total**
On-Campus Server Rooms	11	4	0	15
Co-Location in SOCC	4	16	1	21
OCIO Managed Services	4	9	0	13

Source: OSU

As shown in **Table 1-2**, more than half of OSU's areas manage their servers through a SOCC solution, either self-managed or through OCIO services. Of those units continuing to host server room operations on campus, the majority are academic units, which historically have had larger IT staffs and greater budgetary autonomy than the administrative units.

Until 2014, OSU had no presence in the SOCC. At that time many of the areas that are now co-located at the SOCC operated their servers out of a large on-campus data center on Kinnear Road. Due to the aging infrastructure at this facility, OSU elected to close it and relocate servers to the SOCC. By the close of 2014, OCIO had migrated its servers to the SOCC, followed by 10 other areas in 2015, two in 2017, and five in 2018.

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[2] Several of the larger units host servers at both the SOCC and on campus. Units with multiple hosting solutions are indicated within the category where the majority of their servers reside.

For areas in the SOCC, either self-managed or using OCIO-managed services, the OCIO has visibility into the number of racks used as well as the monthly server-related operating expenses incurred. As of June 2018, OSU is renting 158 racks at the SOCC each of which incurs a flat $500 per month base rental charge. Electricity is billed separately at $0.18 per kilowatt hour (kWh) based on rack-specific metered usage.[3] During fiscal year (FY) 2016-17, the average monthly electrical consumption across the then 134 racks was 2,007 kWh, equating to an average monthly electric bill of $361.26 per rack.

For units still hosting operations in local server rooms, the OCIO and University administration have no way of monitoring server inventory or even accessing a complete list of buildings and locations with server rooms. So while the number of areas engaged with the SOCC was known, the total number of non-SOCC servers, racks, and server rooms across the areas was previously unknown.

Methodology

This section of the performance audit, **Information Technology – Server Rooms**, seeks to evaluate the efficiency and effectiveness of OSU's IT delivery through an analysis of on-campus server rooms. The term server room, as used in this report, references locations with at least one rack of servers. During the planning and scoping phase of the performance audit, University leadership identified this as a possible area where objective analysis could identify opportunities for improved efficiency.

OSU's organizational structure, IT governance, regulatory environment, security standards and general operating practices were ascertained with reference to official University policies and during interviews with unit and OCIO leadership. Analysis focused on FY 2017-18 to address timely stakeholder needs and due to the rapidly evolving IT environment. Data from prior FYs going back to FY 2014-15 were also referenced to inform sections of the analysis.

From January 2018 through March 2018, IT leaders of units across University areas responded to a survey that requested they identify rooms on campus containing at least one rack of servers. These survey responses allowed the coordination of site visits which identified the physical characteristics of the server rooms to include counts of servers and racks; and types of HVAC, uninterrupted power supply (UPS), backup power generation, fire suppression, and room security.

Using actual historical and current market pricing, the total cost of ownership (TCO) of campus server rooms was modeled. For comparability with alternative hosting options at the SOCC, server room total cost of ownership was compared on a per-rack unit basis and standardized to a hardware specification meeting certain security requirements. The cost structure of on-campus server rooms of various sizes was then compared with the cost of co-location at the SOCC.

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[3] DAS adjusts the rate schedule annually based on market conditions, however, in FY 2016-17 the rate was $0.18/kWh.

Analysis

Server Rooms Inventory

Chart 1-1 shows the number of server rooms identified, categorized by the number of racks each room contains. This is important as it not only provides a quantified total number of racks, but also provides insight into the relative size of operations (i.e., the number of racks per room).

Chart 1-1: On Campus Server Rooms and Racks
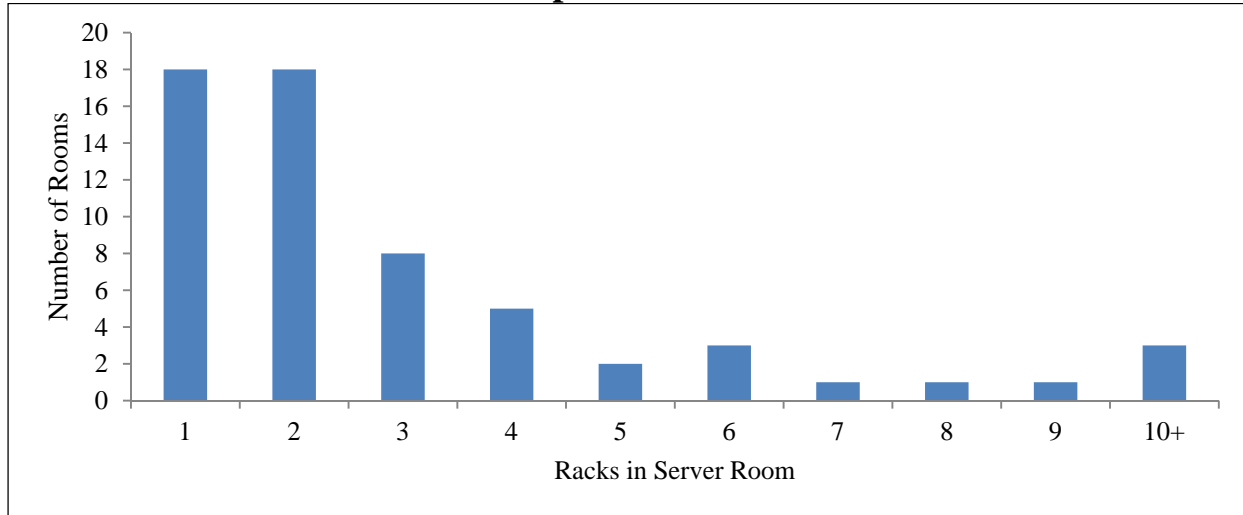
Source: OSU

As shown in **Chart 1-1,** the most common sizes of server room on campus contain one, two, or three racks. A total of 60 different server room locations were identified. These rooms contained a total of 222 racks. Though the majority of server rooms contain three or fewer racks, the majority of racks on campus are located within server rooms with more than three racks.

The University's server rooms vary in the presence and quality of physical infrastructure. For example, HVAC ranged from building central air only, to small supplemental residential units, to precision control grade units. Similarly, UPS ranged from none at all, to modular in-rack units, to floor-standing commercial-data center grade units. The majority of server rooms did not employ clean agent fire suppression. Only four server rooms were wired into a backup generator capable of powering the racks in the event of power loss beyond the UPS runtime. The more robust physical infrastructure typically coincided with server rooms with higher rack counts, although several small rooms in newer buildings were also purpose built to higher specifications.

Total Cost of Ownership: On-Campus vs SOCC Co-Location

A full inventory of the campus server rooms makes it possible to analyze the total cost of ownership (TCO) of on-site hosting in campus buildings versus the cost of renting co-located server racks at the SOCC.

In the SOCC, areas continue to procure and manage their own physical server boxes just as they did on campus, and thus the expense of the server boxes themselves are equivalent between the two scenarios. Similarly, since the SOCC charges units for actual electricity used in their rack equipment at a market rate, the actual cost of powering the servers is equivalent.

The main cost comparison is between owning physical room-related infrastructure on campus versus the $500 per-rack rent charge at the SOCC. For the SOCC rent charge, units are renting spaces within the SOCC that include infrastructure features that would otherwise have to be purchased on campus, including temperature conditioning, instantaneous backup power via SOCC UPS, backup power generation with SOCC generators, controlled-access security, fire suppression, and rack hardware.[4]

Model Set Up

Because the basis of comparison is the infrastructure duplicated by the SOCC's $500 rent charge, costs modeled for the campus server rooms are presented on a per-rack basis for direct comparability to the SOCC. Costs of the main campus server room infrastructure components are presented individually, including:

- HVAC (non-redundant);
- UPS (non-redundant);
- Fire suppression;
- Door locks; and
- Rack hardware.

These costs are shown on a monthly basis, with capital costs amortized over the equipment's useful life. The result represents a "steady state" picture of the costs associated with an on-campus server room where the decision is made to continuously refresh equipment as it reaches the end of its useful life. Cash outlays for individual server rooms are uneven, as equipment is paid for up front; however, amortizing the costs on a monthly basis demonstrates the drivers of economies of scale in addition to showing results on a unit basis directly comparable with the SOCC.

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[4] Though the University pays for all electricity used in on-campus server rooms, the units do not currently receive itemized bills for metered electricity usage. Instead, the electricity charge is reflected in the plant, operations, and maintenance (POM) rate, which units pay on a square footage basis. Pursuant to the 2017 partnership with Engie Energy, there is a possibility that units will begin directly paying for electricity usage in the future.

Representative IT Load

Several components of a server room TCO analysis require estimates of a rack's IT load, which is the amount of electricity it uses during a period of operation. In addition to the direct electricity expense required to operate a rack's servers, this energy usage drives HVAC operating expense arising from heat generation, and it also informs the type of equipment that must be installed. Rack wattage is needed to determine both the size of the HVAC system required to dissipate heat and the size of the UPS system required to provide uninterrupted battery backup for a certain amount of time.

Energy consumption data from OSU units already co-located at the SOCC provides a reference for a rack's energy consumption. **Chart 1-2** summarizes the monthly electricity usage of 134 OSU servers at the SOCC over a 12-month period.[5] Blue dots represent the electricity use of individual servers, and the shaded gray areas represent the middle 25 to 75 percent of electricity use within a given month.

Chart 1-2: Electricity Use in SOCC by Rack
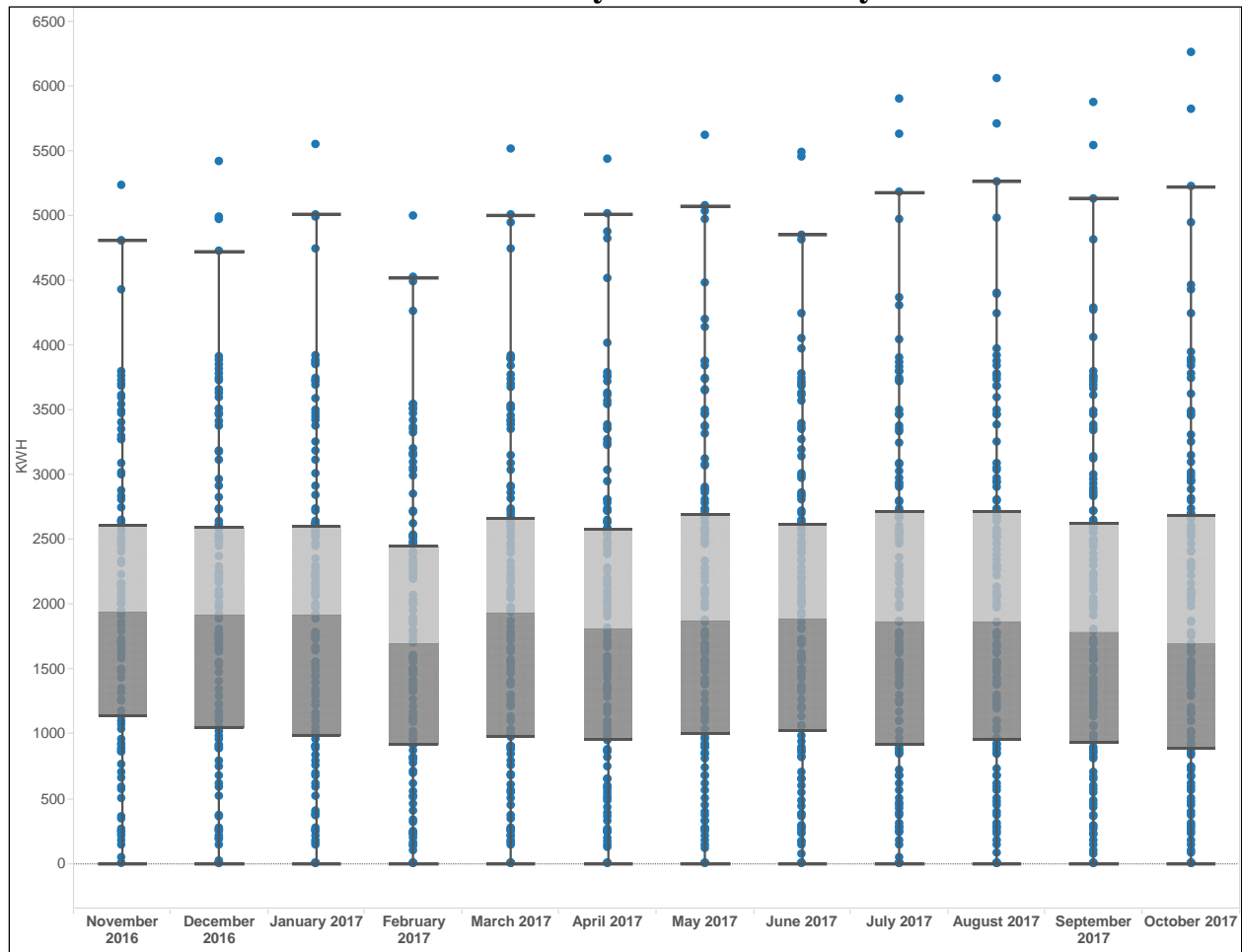
Source: OSU

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[5] Racks for which 12 full months of data was not available were excluded from this analysis.

As shown in **Chart 1-2**, the median in-SOCC rack is consuming slightly less than 2,000 kWh per month, with a wide dispersion in electricity usage among racks in any given month. Similarly, the monthly average per rack consumption was just over 2,000 kWh.

The electrical usage of individual racks was stable across time, with the average standard deviation of a single rack's electricity usage across 12 months falling within 10 percent of its monthly average.

HVAC

The heat generated by operating servers is substantial, and arises from the conversion of electrical energy to heat energy as power is used by CPUs and, to a lesser extent, the motors that power hard drives. Since server equipment is engineered to operate at or below typical building room temperature, additional heat dissipation solutions are usually needed in server rooms to supplement existing building systems.

Several vendors specialize in computer room heating, ventilation, and air conditioning (HVAC). In the smaller rooms, these models are made to sit above a drop-ceiling, whereas in the larger rooms floor-standing direct expansion units are installed and duct work is run to provide airflow throughout the room. HVAC units are sized based on defined formulas which relate the watts used by servers to British thermal units (BTUs) needed to cool the heat generated.

The 2,000 kHw monthly electric usage per rack in the model equates to 9,486 BTUs.[6] To dissipate the heat generated by that single rack, the server room would need HVAC rated for at least 9,486 BTUs. As more racks are added, more cooling is needed, which entails larger HVAC in terms of BTU rating.

In sizing the cooling needs for rooms between one and 15 racks, HVAC units between one-ton and 15-ton were used (e.g., one-ton represents a 12,000 BTU rating). Government contract pricing for these units was used for the price of hardware, and examples of recent installation estimates at OSU were used to estimate labor expenses. Costs of the hardware ranged from $3,277 for the one-ton unit needed for a single-rack server room to $32,644 for a 15-ton unit needed in the 15-rack room.[7] Installation costs ranged from approximately $3,000 to $15,000.

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[6] To convert from kWh to BTUs first convert kHw to watts by multiplying (2,000 kWh / 720 hours per month) * 1,000 = 2,777.77 watts. Then multiply watts by 3.415 BTUs per watt to arrive at 9,486.11 BTUs.

[7] HVAC units in several room sizes were necessarily slightly over-sized due to the unavailability of products at more granular tonnage rating. For example, the manufacturer recently used by OSU, as well as other manufacturers, do not produce a 13-ton unit.

The calculation of the energy cost of running the cooling equipment is straightforward given that these server rooms are located in the interiors of conditioned buildings, so environmental heat does not enter the equation. Electric cost of cooling is 2,000 kWh per rack multiplied by the market rate for electricity. The model uses $0.1779 per kWh to align with the current rate charged by the SOCC.

Chart 1-3 shows the monthly modeled cost per rack for server room HVAC for both capital and operating expenses. Capital costs include both the hardware and installation and are amortized over a 15-year useful life.

Chart 1-3: Monthly HVAC Cost per Rack
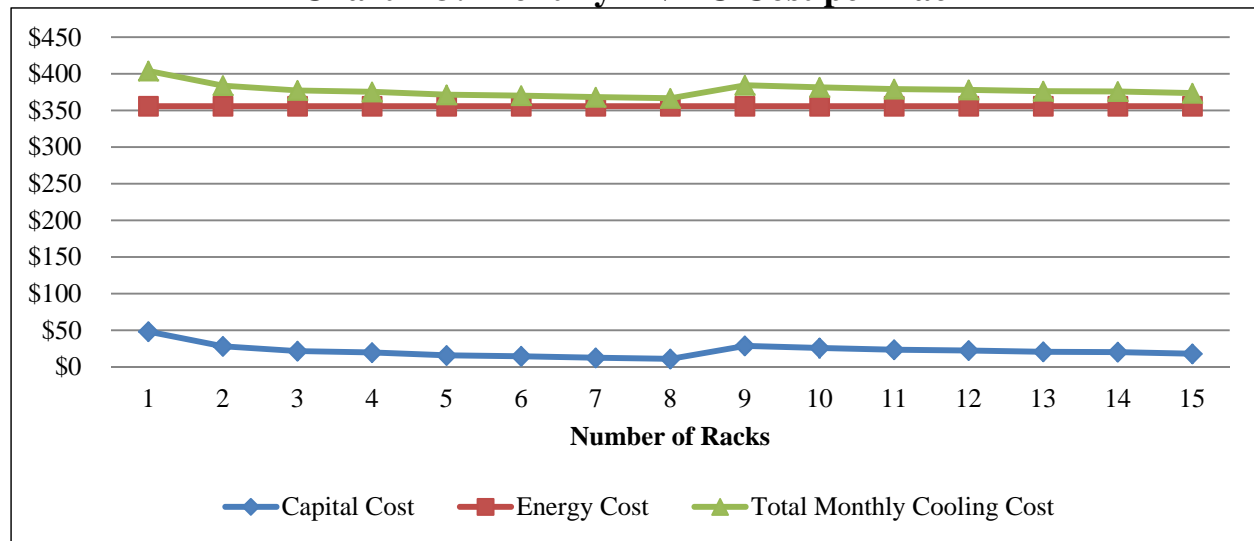
Source: OSU

As shown in **Chart 1-3**, both the capital cost of HVAC equipment and the monthly energy use scale is generally linearly with the number of racks used. With respect to the capital cost, there is some economy of scale realized by moving from one to two racks and from two to three racks, but vendor pricing for these units is structured in such a way that price-per-BTU capacity scales approximately linearly. In short, within the envelope of one to 15 racks, there is no material cost savings available from building larger HVAC.

UPS

UPS units provide battery backup in the event of electrical power failure. Run times on UPS are typically very short, and the units are only meant to bridge the gap between power failure and a backup generator coming online or an orderly shutdown of servers. The most common type of UPS utilized in OSU's campus server rooms are models designed to be housed at the bottom of a rack to power that rack only. Since UPS batteries must continuously charge, there is a small amount of monthly power consumed by the units. A $3,299 UPS, the most commonly used unit in existing campus server rooms, is used in the model.

Chart 1-4 shows the monthly capital cost and energy use for in-rack UPS units, assuming an amortized five-year useful life for the capital equipment.

Chart 1-4: Monthly UPS Cost per Rack
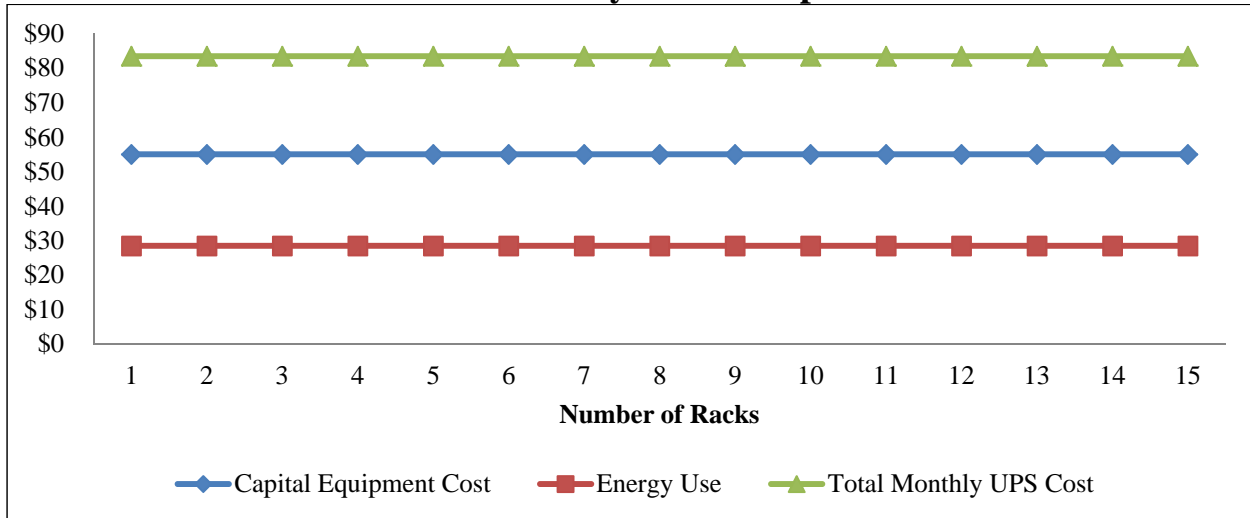
Source: OSU

As shown in **Chart 1-4**, UPS costs scale linearly with the number or racks installed, because there is one UPS unit per rack.

Fire Suppression

Chart 1-5 shows the monthly capital and maintenance cost of a clean agent fire suppression system which dispenses a foam-like substance and, unlike traditional water sprinklers, does not destroy electronic equipment. Capital costs were derived from a recent installation in an on-campus server room and maintenance cost are based on a $500 annual service contract.

Chart 1-5: Monthly Fire Suppression Cost per Rack
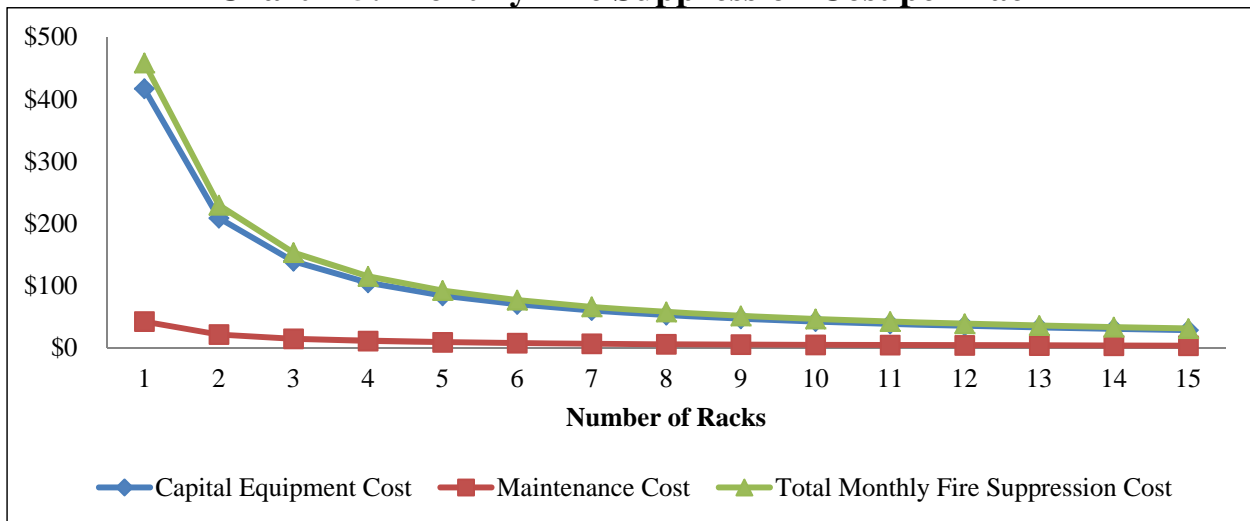
Source: OSU

As shown in **Chart 1-5**, installed fire suppression quickly achieves economies of scale as additional racks are added. This is due to the high up-front fixed cost for even the smallest suppression system. More capacity added to the suppression system (in the form of additional lines and volume of agents) adds relatively small incremental cost compared to the fixed cost of installing the system.

Camera Monitoring

Certain kinds of data, such as patient medical records under HIPAA and certain kinds of sensitive research, stipulate that the equipment hosting the data be subject to continuous video monitoring. Installation, hardware, and ongoing maintenance costs related to video monitoring were available from a recent installation of an OSU unit. **Chart 1-6** shows the video monitoring cost per rack, with the capital cost amortized over 10 years.

Chart 1-6: Monthly Video Monitoring Cost per Rack
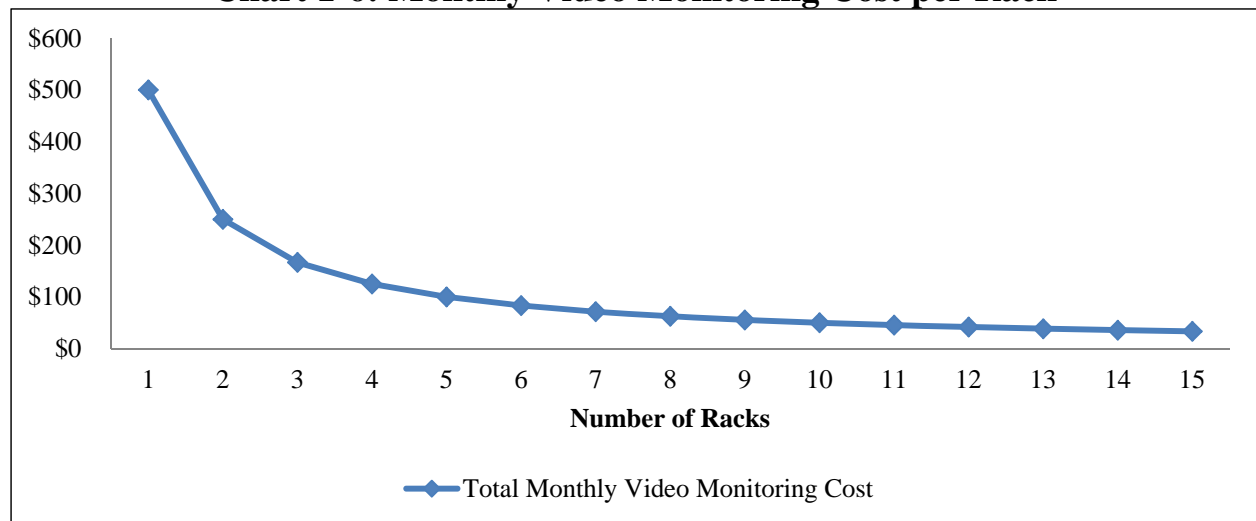
Source: OSU

As shown in **Chart 1-6,** the per-rack cost of video monitoring declines steeply due to its large fixed cost component. The costs used assume one camera per server room, irrespective of the number of racks.

Door Locks

Similar to camera monitoring, regulation surrounding many types of data stipulate certain controls related to physical access to the server room housing the data, including electronic logging of personnel accessing the room. In practice, this is achieved with a key-card activated door lock system, with access granted based on a controlled list of identities. **Chart 1-7** shows the cost installation and hardware cost per rack of electronic door locks, with the assumption of one door per server room. These capital costs are amortized over a 10-year period.

Chart 1-7: Monthly Door Lock Cost per Rack
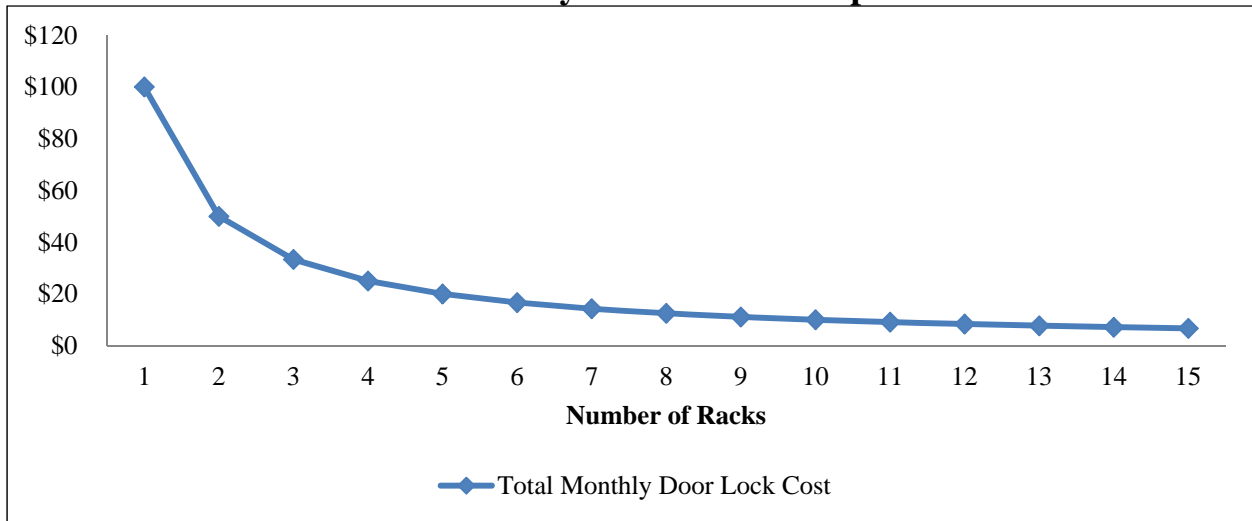
Source: OSU

As shown in **Chart 1-7**, the per-rack cost of installing electric door locks declines sharply as more racks are added. Because there is only one door used as entrance to a server room, this fixed cost is spread evenly over the total number of racks per room.

Rack Hardware

The racks that house servers are specialized pieces of equipment that include a modular system of mounting servers and power supplies. **Chart 1-8** shows the amortized monthly cost per rack of a common make and model at a cost of $2,400 per rack and an assumed useful life of 10 years.

Chart 1-8: Monthly Rack Hardware Cost per Rack
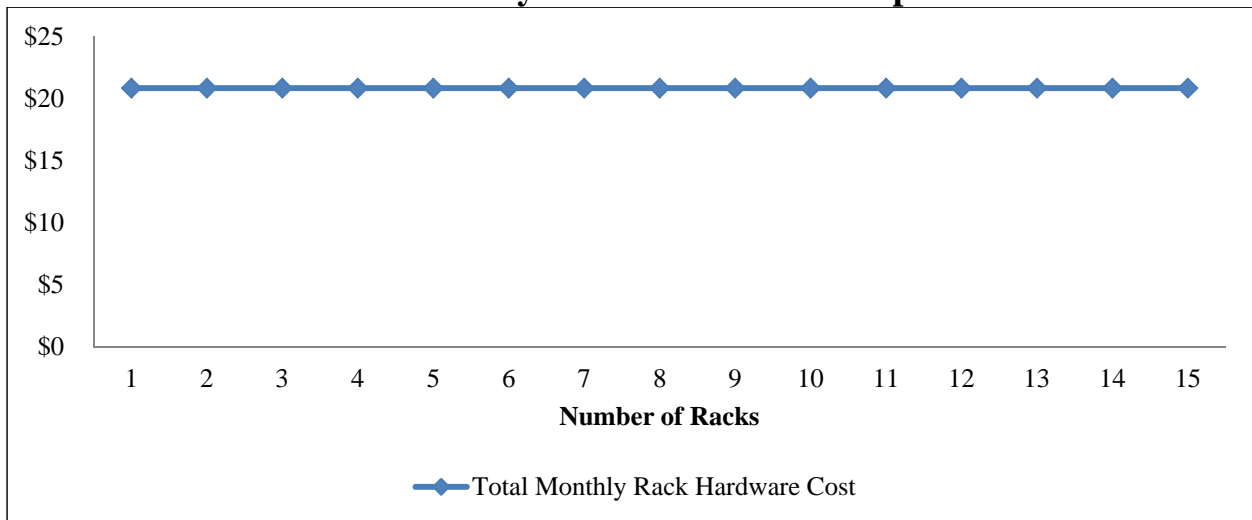
Source: OSU

As shown in **Chart 1-8**, the cost per rack is steady as more racks are added. This result follows arithmetically from the fact that the rack itself is the unit of division in the analysis.

Combined Rack-Unit Economics

Chart 1-9 shows aggregated cost per rack for all the physical infrastructure-related expenses previously presented. This total cost per rack can be directly compared to the SOCC cost.

Chart 1-9: Monthly On-Campus Costs per Rack
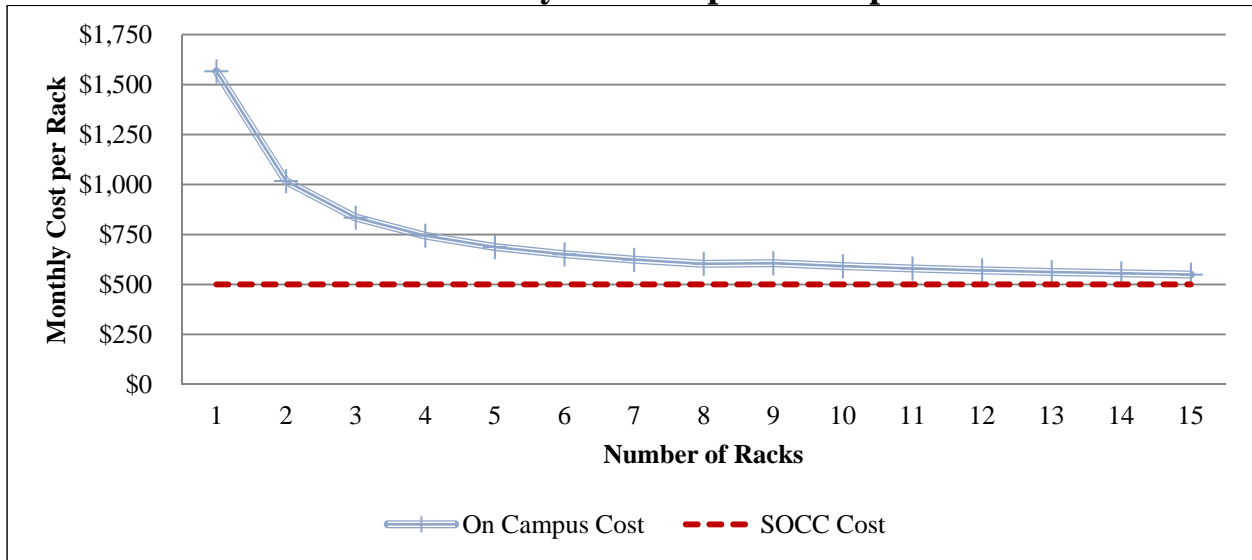
Source: OSU

As shown in **Chart 1-9**, the total cost-per-rack decreases as more racks are added to a campus server room, indicating economics of scale are achieved in larger rooms. A 15-rack server room with a cost of $548 per month, is nearly on par with the $500 per month total cost of ownership possible by co-locating within the SOCC. In contrast, a one-rack server room, of which there are currently 18 on campus, costs $1,567 per month to operate in a steady state; over three times as expensive as a SOCC rack.

Chart 1-10 shows the total monthly physical infrastructure (i.e., building) costs for server rooms with one to 15 racks. This overall room cost is important because it enables a total potential savings per room to be calculated when compared with the SOCC.

Chart 1-10: Monthly On-Campus Building and IT Load Cost
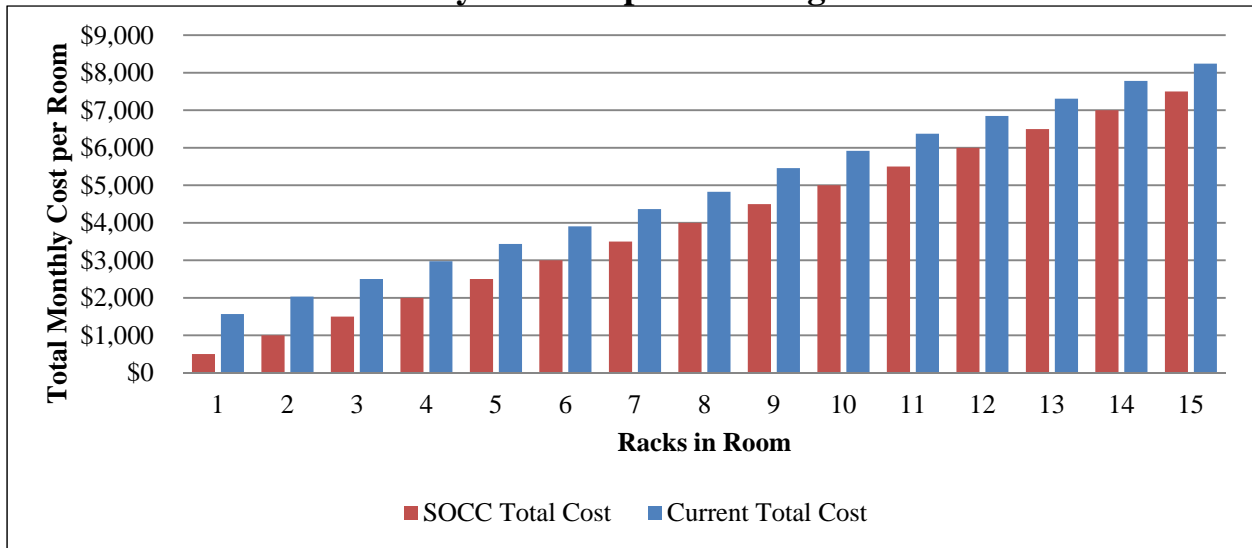
Source: OSU

As shown in **Chart 1-10**, the relative savings from hosting in the SOCC is greater in the lower room sizes. At the size of a 15 rack server room, the monthly cost of co-location at the SOCC approaches on-campus cost.

The unit economic analysis presented is valid for analyzing an ongoing, steady state hosting operation, with the choice made to refresh campus capital equipment as the equipment reaches the end of its useful life.

In these instances, depending on where units are in the replacement cycle for major capital equipment, OSU could potentially save money by deferring a move into a data center until they are close to facing a large capital expense for equipment replacement; however, there are risks associated with a strategy of waiting until equipment nears the end of its life. A move to an alternative location such as the SOCC takes several months of planning, which include putting in an order for space at the SOCC and planning an organized move around uptime needs and critical systems continuity. In the event of infrastructure failure in the on-campus server room, a unit would not be able to immediately move to the SOCC and could face costly temporary hosting arrangements or downtime.

Certain features of the SOCC are effectively impossible to duplicate on campus at a reasonable cost, including:
- Front-desk security with metal detectors and photo-ID check;
- Two electric generation companies feeding the SOCC building;
- 30 minutes of UPS time;
- Redundant back-up generators; and
- Traffic barriers and a moat.

Other features of the SOCC are only replicable on campus at substantial cost, including:
- Fully redundant HVAC systems;

- Fully redundant UPS;
- Fire suppression systems; and
- The presence of a back-up generator.

Security

OSU's Information Technology Security Policy (ITSP) establishes high-level security requirements to which all units are required to adhere. The OCIO, through the Chief Information Security Officer (CISO), provides detailed implementation guidance to the area CIOs in a document called the Information Security Control Requirements (ISCR). There is specific server-related guidance in the ISCR that pertains to physical access control, redundancy in systems, and the ability to audit and log user activity.

The OCIO requires the areas units to complete a self-assessment of their performance with respect to ISCR standards annually. On the most recent survey, deficient responses to server-related prompts were associated with units that maintain smaller on-site server rooms that are provisioned with a lower standard of infrastructure. Most units located in the SOCC, and those with the most robust on-site infrastructure, generally indicated the highest scores on the assessment.

Going forward, the OCIO plans to continue to drive security improvements through increased compliance with ISCR and through updates to make the ISCR guidance more stringent as federal and global standards become more stringent. The ISCR is scheduled to be updated in the second half of 2018, and one item under consideration is re-categorizing student-related data that is currently classified as S3 to the highest possible security classification, S4. To handle S4 data, a server room is supposed to have physical room security such as camera monitoring and electronic access logging, as well as redundancy in room systems. Nearly all University areas store some types of student-related data, but the majority of on-site server rooms are not fully provisioned with the infrastructure required by S4. The infrastructure in the SOCC is already S4 compliant.

SOCC Savings over On-Site S4 Specification

Although on-site S4 server rooms at OSU are not the norm, one University area recently constructed a new server room, completed in CY 2015, which is in compliance with S4 data standards. This example server room hosts two server racks, and contains fully redundant HVAC and UPS, as well as a clean-agent fire suppression system and active video monitoring. The room is also connected to a backup building generator.

While this on-site server room does not fully offer all of the advantages of the SOCC, it does represent the best on-site comparison and is in line with the University's ISCR direction regarding security for S4 data. As such, this example room provides a valid estimate of the expected cost of bringing other on-site server rooms up to standard and is also valuable in comparison to the cost of co-locating within the SOCC.

Table 1-3 shows the one-time and ongoing annual costs related to room infrastructure, as well as expected useful life where applicable, based on the example room.

Table 1-3: Example Server Room Build and Annual Operating Cost

Cost Item	One Time	Annual	Useful Life (Years)
UPS	$16,000	$4,894	10
Fireproofing	$50,000	$500	10
Door Locks	$12,000	N/A	10
HVAC	$60,000	$2,000	10
Camera Monitoring	N/A	$6,240	
Total	**$138,000**	**$13,634**	

Source: OSU

As shown in **Table 1-3**, the complete server room build-out cost is $138,000 in one-time expense and $13,634 in ongoing annual expenses. It is important to note that these figures do not include the cost of the building shell necessary to house the room, presumably this square footage could either have been avoided or would have been purposed to meet other needs. Additionally, this total does not factor in any cost associated with the wiring necessary to link the building to the shared backup generator.

Table 1-4 shows the previously derived capital costs per rack, for various room sizes.

Table 1-4: Example Room Hardware Cost per Rack

Racks	1	2	3	4	5	6	7	8	9	10
One-Time Build Cost										
UPS	$133	$67	$44	$33	$27	$22	$19	$17	$15	$13
Fire	$417	$208	$139	$105	$83	$70	$61	$51	$46	$42
Door Locks	$100	$50	$33	$25	$20	$17	$14	$13	$11	$10
HVAC	$500	$250	$167	$125	$100	$83	$71	$63	$56	$50
Sub-Total	**$1,150**	**$575**	**$383**	**$288**	**$230**	**$192**	**$165**	**$144**	**$128**	**$115**
Annual Ongoing Cost										
UPS	$408	$204	$136	$102	$82	$68	$58	$51	$45	$41
Fire	$41	$21	$14	$10	$8	$6	$6	$5	$4	$4
HVAC	$167	$83	$56	$42	$33	$28	$24	$21	$19	$17
Camera	$520	$260	$173	$130	$104	$87	$74	$65	$58	$52
Sub-Total	**$1,136**	**$568**	**$379**	**$284**	**$227**	**$189**	**$162**	**$142**	**$126**	**$114**
Total Cost	**$2,286**	**$1,143**	**$762**	**$572**	**$457**	**$381**	**$327**	**$286**	**$254**	**$229**

Source: OSU

As shown in **Table 1-4**, the room-related capital costs decline per unit as more racks are added to the room. This economy of scale arises from the fact that the fixed cost portion of the room is spread over additional racks.

After adding ongoing HVAC electrical expense to the cost of room hardware, it is possible to directly compare the cost structure of this example campus server room with the SOCC. The

savings potential is equal to the difference between the SOCC's flat fee per rack and the total cost of ownership of operating on campus.

Table 1-5 shows the calculation of annual savings that could be achieved by migrating to the SOCC, contrasted with a scenario that upgrades existing on-campus infrastructure to the example S4 specifications.

Table 1-5: Savings from SOCC Migration over Upgrade-on-site

Racks in Room	1	2	3	4	5	6	7	8	9
On-Site Server Rooms	18	18	8	5	2	3	1	1	1
Total On-Site Racks	18	36	24	20	10	18	7	8	9
Capital Cost per Rack	$2,286	$1,143	$762	$572	$457	$381	$327	$286	$254
Cooling Cost per Rack	$356	$356	$356	$356	$356	$356	$356	$356	$356
Monthly Operating Cost per Rack	$2,642	$1,499	$1,118	$927	$813	$737	$682	$642	$610
Total Monthly Operating Cost per Room	$2,642	$2,998	$3,354	$3,709	$4,065	$4,421	$4,777	$5,133	$5,488
Total Annual Operating Cost	**$570,665**	**$647,518**	**$321,942**	**$222,562**	**$97,564**	**$159,155**	**$57,321**	**$61,591**	**$65,860**
SOCC Cost per Rack	$500	$500	$500	$500	$500	$500	$500	$500	$500
Total Monthly SOCC Cost per Room	$500	$1,000	$1,500	$2,000	$2,500	$3,000	$3,500	$4,000	$4,500
Total Annual SOCC Cost	**$108,000**	**$216,000**	**$144,000**	**$120,000**	**$60,000**	**$108,000**	**$42,000**	**$48,000**	**$54,000**
Sub-Total Annual Cost Savings	**$462,665**	**$431,518**	**$177,942**	**$102,562**	**$37,564**	**$51,155**	**$15,321**	**$13,591**	**$11,860**
Total Annual Cost Savings									**$1,304,178**

Source: OSU
Note: Totals will vary due to rounding.

As shown in **Table 1-5**, the majority of potential savings are generated from the smaller server rooms. This is the expected result given prior unit-economic analysis showing per-rack economies of scale in server room total cost of ownership. When adding across all the server rooms on campus for which ongoing costs were determined to exceed the SOCC, this room-related infrastructure savings amounts to more than **$1,304,100** annually.

In addition to the room-related infrastructure savings shown in **Table 1-5**, migrating server operations to the SOCC would allow for savings in three other areas: reallocating server-related personnel, reducing the total number of racks needed, and repurposing the square footage currently used to host servers on campus.

Redirected Personnel

Hosting an on-site server room requires a certain amount of labor effort from IT staff related to the management of the physical hardware. If OSU servers were moved off-site to a data center such as the SOCC, it would be possible to reallocate the time IT personnel spend on server room activities.

When Ohio's state agencies migrated servers from on-site locations to the SOCC, DAS calculated the required IT labor-effort associated with operational support of servers as one full time equivalent (FTE) position for every 200 servers.

Within the OSU on-campus server rooms containing between one and nine racks, the room types shown as being less cost-effective than the SOCC in **Table 1-5**, there are approximately 1,574 servers. Using DAS' 200-to-1 ratio, this represents 7.87 FTEs of labor effort spread across campus. Based on annual salary and benefits of $81,077 for this position type, reallocating these 7.87 FTEs represents an opportunity to redirect more than **$638,000** annually toward higher-priority, more efficient needs.[8]

Rack Reduction Savings

OSU units which have already migrated from on-campus to the SOCC have been able to achieve a net reduction in the number of racks hosted at the SOCC compared to the number of racks previously hosted on campus. This reduction was mainly attributed to pruning the total number of server units operated. The migration process requires units to fully account for their server inventory and hosted applications, and during that process, it is common for units to determine that it is no longer necessary to continue operating certain servers.

Rack count data for CY 2015 through CY 2018 was available for 13 OSU units which have moved from hosting on-campus to co-location at the SOCC. Across these units, 119 racks were hosted on campus compared to 91 racks hosted at the SOCC immediately following the migration.[9] This represents a 23.5 percent reduction in total server racks.

Within on-campus server rooms containing between one and nine racks, the most cost effective rooms to co-locate to the SOCC, there are 150 racks (see **Table 1-5**). Based on the historical achievement of a 23.5 percent reduction in racks, these remaining units could eliminate 35 net racks by migrating to the SOCC. At the monthly SOCC rack rental rate of $500, this represents savings of **$210,000** annually.

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[8] Compensation of $81,077 is based on FY 2016-17 salary and benefits for the systems manager non-SAP, technician position.
[9] Although OSU rents 158 racks from the SOCC as of June 2018, documentation of historical pre- and post-migration rack count data was only available for a subset of units.

Square Footage Savings

OSU units which have previously migrated server rooms from on-campus to the SOCC have been able to repurpose server room square footage (SF) for other building uses such as classroom space, office, and storage exist across units.

OSU on-campus server rooms containing between one and nine racks, the room types shown as being less cost-effective than the SOCC in **Table 1-5**, encompass approximately 14,214 SF of building space. OSU Facilities Operations and Development charges individual OSU units for building space a plant operations and maintenance rate of $16.23 per square foot annually. Using this rate to value the 14,214 square feet that could be repurposed by migrating to the SOCC represents savings of more than **$230,600** annually.

Total Financial Impact

Table 1-6 shows the total annual financial impact associated with migrating on-campus server rooms with nine or fewer racks to co-located hosting at the SOCC.

Table 1-6: Financial Impact Summary

Source of Financial Impact	Annual Financial Impact
Avoided IT Capital Expenditure	$1,304,100
Reallocated Labor Effort from IT Personnel	$638,000
Reduced Number of Server Racks	$210,000
Repurposed Building Square Footage	$230,600
Total Financial Impact	**$2,382,700**

As shown in **Table 1-6**, co-located hosting to the SOCC would generate an annual financial impact of more than **$2,382,700**.

Conclusion: Across OSU, and outside of the SOCC, areas are hosting servers in at least 60 on-site rooms. On a per-rack basis, and in total, these on-site server rooms have a higher total cost of ownership than would be experienced if co-located in the SOCC. In addition, even with S4 infrastructure upgrades in place, a data center such as the SOCC still offers some security and infrastructure advantages that cannot be achieved in a cost-effective manner at an on-site server room.

Recommendation 1.1: OSU should consider eliminating the practice of operating on-site server rooms in favor of migrating those servers and racks to a more efficient, secure data center such as the SOCC. In doing so, the Office of the Chief Information Officer and University areas should coordinate to prioritize smaller server rooms, or those in need of immediate infrastructure or security upgrades as those offer the best immediate opportunity.

Financial Implication 1.1: Migrating smaller on-campus server rooms to co-located hosting at the SOCC could generate a total financial impact of **$2,382,700** annually.

Additional Consideration: Research-related servers were identified within several OSU areas. Dependent on specific needs, and the type of data housed within these servers, it may be necessary to keep a portion of these servers within close proximity to the researchers. This would include any situation in which all or part of server hardware is the subject of research. Even though servers fitting this description would be better functionally described as "lab equipment", these servers are currently housed in on-site server rooms.

Identified instances would have to remain on campus for the associated research and grant funding for them to continue, and therefore, the OSU units that host this type of research should make provisions to keep some amount of server-room space on campus available. Two OSU academic units specifically identified the need for research-related use cases. Both of these units currently operate several large (10+ rack) server rooms. Because these larger rooms are provisioned to a high standard of room system equipment and operate at a low unit cost approaching that of the SOCC, cost savings identified in this report would not be substantially affected if the colleges were each to keep these types of server rooms to accommodate research use.

Issue for Further Study

In April 2018, OSU entered into an agreement with Amazon Web Services (AWS) that will allow all University areas to use AWS cloud hosting services at a defined rate structure. Unlike the per-rack price structure that the SOCC charges for co-located hosting, AWS prices cloud services based on use and utilization. Determining whether AWS is cost-effective requires a holistic evaluation of each area's service delivery model, including estimates of CPU utilization and data usage at the level of individual applications.

Although this type of analysis was not within the scope of this performance audit, it is within the capability of each University area. A detailed analysis could identify opportunities to use AWS cloud services which could potentially result in savings and improved service delivery beyond what is achievable by a SOCC co-location. Two specific cloud use cases that warrant attention are applications that have sporadic and variable traffic, since AWS charges on a utilization basis, and those for which AWS hosts the program as a service, rather than running the area's own service on AWS' virtual machine.

2. Information Technology – Printing Management

Section Overview

This section of the performance audit focuses on The Ohio State University's (OSU or the University) Print Management practices. Information was collected and analyzed to evaluate the efficiency and effectiveness of print management practices. Analysis identified opportunities to improve efficiency through device consolidation and optimization.

Recommendations Overview

Recommendation 2.1: OSU should reduce or eliminate on-program prepaid B&W copier pages that are currently underutilized. In doing so, the University should consider reducing the total number of underutilized copiers and also reducing the number of on-program printers and off-program printers. Shifting pages to fully utilize on-program copier leases will allow for higher volume, lower cost printing.

Financial Implication 2.1: OSU could save **$548,300** annually by consolidating and optimizing underutilized copiers and printers.

Recommendation 2.2: OSU should shift off-program desktop printing to on-program copiers. Doing so would allow for cost avoidance of off-program printing, but also improved utilization of on-program leases and elimination of additional unused prepaid B&W pages. However, if the University is not fully able to do so, it should, at minimum, shift to on-program desktop printing. Doing so can reduce the overall cost of page production as well as allow the University to better track page production.

Financial Implication 2.2: OSU could save **$136,400** annually by shifting off-program desktop printing to on-program printing.

Section Background

OSU provides document management services to students, faculty, and staff through a support services division referred to as UniPrint.[10] UniPrint's mission statement is to "….deliver the most cost-effective and efficient solutions to meet [its] customers' document management needs, including traditional and specialty printing, high-speed copying and duplicating, and equipment management and service."

Scope of Service Delivery

To help facilitate with efficient delivery of document management services, OSU contracts with ComDoc, Incorporated (ComDoc) which is a subsidiary of Xerox. The University is on its second contract with ComDoc; the most recent contract having been signed in 2016 and effective from January 1, 2016, until December 31, 2023. Prior to contracting with ComDoc, the University contracted with several different vendors for different types of devices. UniPrint is responsible for managing the day-to-day execution of the contract and UniPrint leadership noted that it has experienced improvements through simplified contract management since moving to a single vendor.

At OSU, services provided by ComDoc, and managed by UniPrint, broadly fall into two categories:[11]

- **Multifunction Devices (Copiers)** – Broadly, these devices can function as printers, copiers, and scanners. Each unit is individually leased for 60 months and, as part of the lease, ComDoc provides service, toner, and maintenance. In accordance with the terms of each lease, a monthly cost is set based on unit-specifics: speed, measured in pages per minute; resolution, measured in dots per inch; paper capacity; and a B&W pages allocation.
- **Desktop Printers (Printers)** – These devices are purchased and owned by the University. Given that these devices are owned by the University, the scope of ComDoc services is limited to providing toner and maintenance.

Although document management services, and specifically copier and printer services, are available University-wide through Uniprint and ComDoc, it is possible that services and devices are being procured elsewhere based on decisions that are specific to colleges or VP units (areas). Devices not under UniPrint's purview are considered "off-program". These copiers and printers are purchased, supplied, serviced, supported, and managed independently by the area within which they are purchased. Although these off-program devices may have an impact on the number and type of on-program devices that are needed, there is no comprehensive tracking of these devices or associated costs.

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[10] Organizationally, UniPrint is aligned under the Senior Vice President for Administration and Planning.

[11] UniPrint also offers additional, highly specialized services to fit the needs of areas with unique situations. "Math" and "MFD Purchase" are contract types for devices which are owned by UniPrint and serviced by other vendors. Devices on these unusual contract arrangements account for less than 1.0 percent of all devices and will not be included in the scope of this report.

Service Cost Overview

As previously noted, each category of service has a unique billing structure set forth within the ComDoc contract, and areas are billed quarterly for these services. Specific cost structure by category includes:

- **Copiers** – Under the B&W page allocation, each unit has a set number of monthly pages for which that the area is billed. The B&W page allocation cost per device ranges from $20 per month for 400 pages to $398 for a large unit with 15,000 monthly pages. If a device exceeds the monthly B&W page allocation, the area is billed a flat rate of $0.0075 for each "overage" page, with no specific limit on overage pages set forth in the contract. Color printing availability is device-specific, but when used, it is priced at a flat rate of $0.065 per page with no specific limit on number of pages set forth in the contract.
- **Printers** – Unlike copiers, there is no fixed monthly allocation for printers. Prices are set per page, at a flat rate of $0.01 for B&W and $0.10 for color.[12] Similarly, there is no specific limit on the number of B&W or color pages set forth in the contract.

University-wide for fiscal year (FY) 2013-14 through FY 2016-17, total on-program copier and printer costs grew from nearly $6.10 million to more than $6.58 million.[13] **Chart 2-1** shows a breakdown of these costs between copiers and printers and also provides context as to the significance of each category of service within the ComDoc contract.

Chart 2-1: Total Copier and Printer Cost
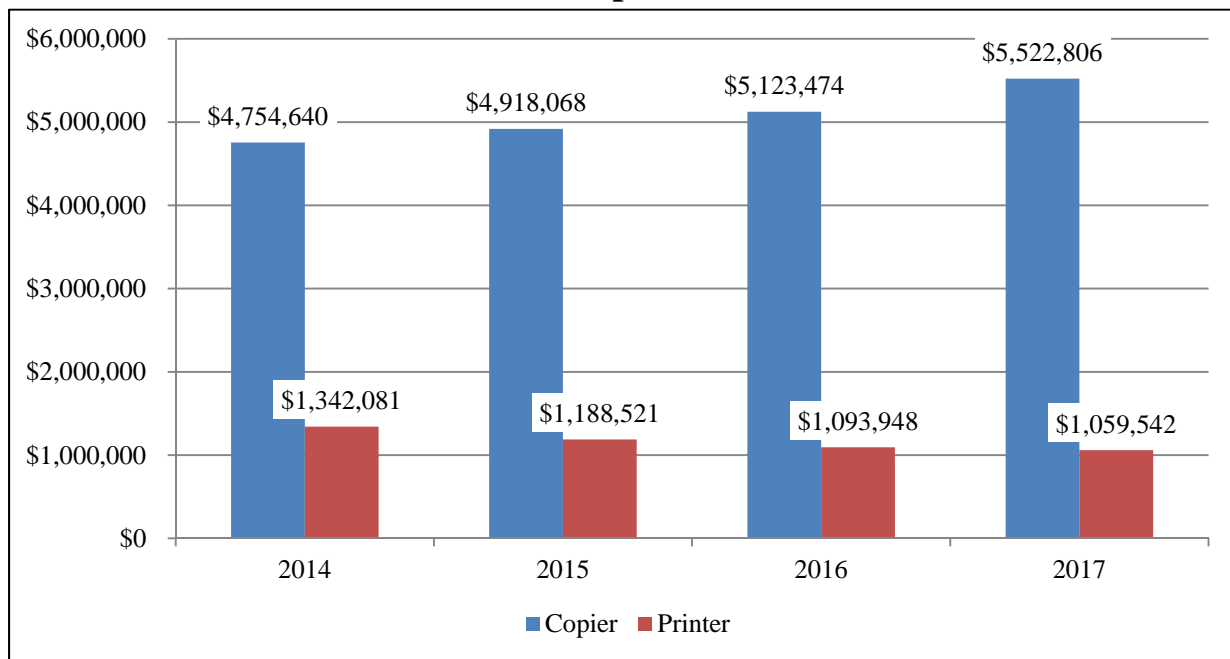
Source: OSU and ComDoc

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[12] Uniprint also operates public facing devices accessible to customers from the University Community. Uniprint charges an internal billing rate of $0.0085 per B&W page and $0.055 per color page for these services. Approximately 2.3 million B&W pages, or 4.5 percent, and 81,831 color pages, or 2.7 percent, are printed on these public facing devices.

[13] FY 2016-17 was the last full year of data available as of the completion of this analysis.

As shown in **Chart 2-1**, copiers account for the majority of overall page production costs. In addition, copier costs have increased relative to printer costs, from $4.75 million, or 78.0 percent, in FY 2013-14 to $5.52 million, or 83.9 percent, in FY 2016-17. The overall increase in costs can be attributed to slight changes in the contract costs. The increase of copier costs relative to printer costs is the result of an overall strategy of pushing page production toward copiers.

While it is important to understand total cost, and the breakdown of total cost by service category, it is also important to consider how this cost is associated with each University area. **Chart 2-2** shows the cost of copying and printing by area for FY 2016-17. This analysis provides additional context to the relative significance of each category of service by area.

Chart 2-2: Copier and Printer Costs by Area
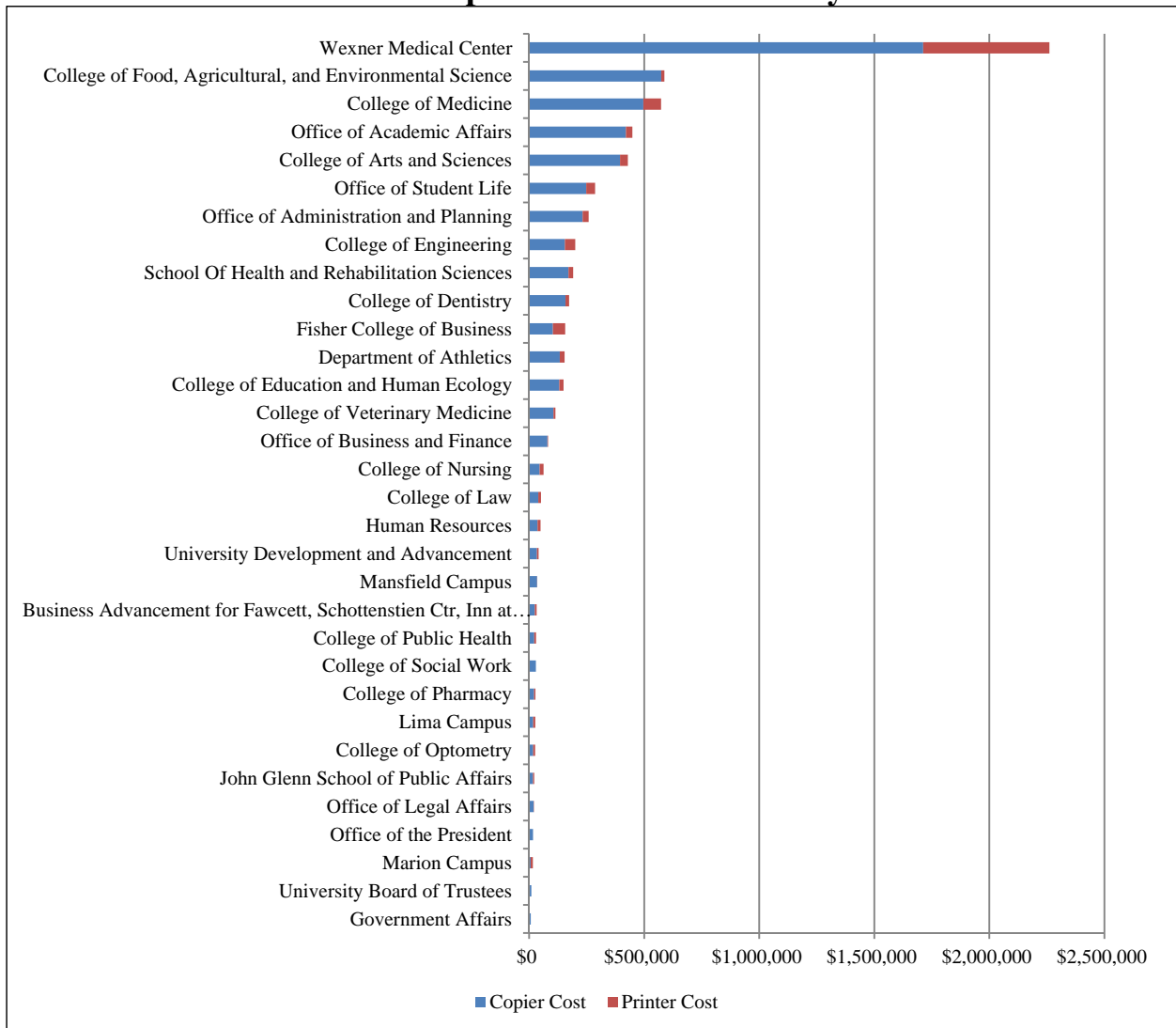
Source: OSU and ComDoc

As shown in **Chart 2-2**, of the 32 areas incurring on-program copier and printer costs, the top nine areas were responsible for 79.7 percent of the total costs. Further, the Wexner Medical

Center had, by far, the largest area-specific cost for each service category at $1.7 million or 75.8 percent of copiers, and $548,321 or 24.2 percent of printers.

Copiers Cost Detail

Given that on-program copiers are leased and that a major portion of the contract cost is per-unit cost, it is important to consider the total number of copiers and how that total fluctuates over time. In FY 2016-17, OSU operated with an average of 2,273 copiers per month. The exact number of copiers in use by the University during any given month will vary primarily due to two factors. First, as University needs expand, contract, or shift among the areas, the total number of copiers will fluctuate. Second, as individual device leases expire, there may be a reasonable delay in replacement as well as area-specific decisions to proceed with replacement.

Chart 2-3 shows copier count by month for FY 2016-17 and fiscal year-to-date (FYTD) 2017-18. Showing copier counts by month illustrates how the number of copiers can vary throughout the year.

Chart 2-3: Copier Count by Month
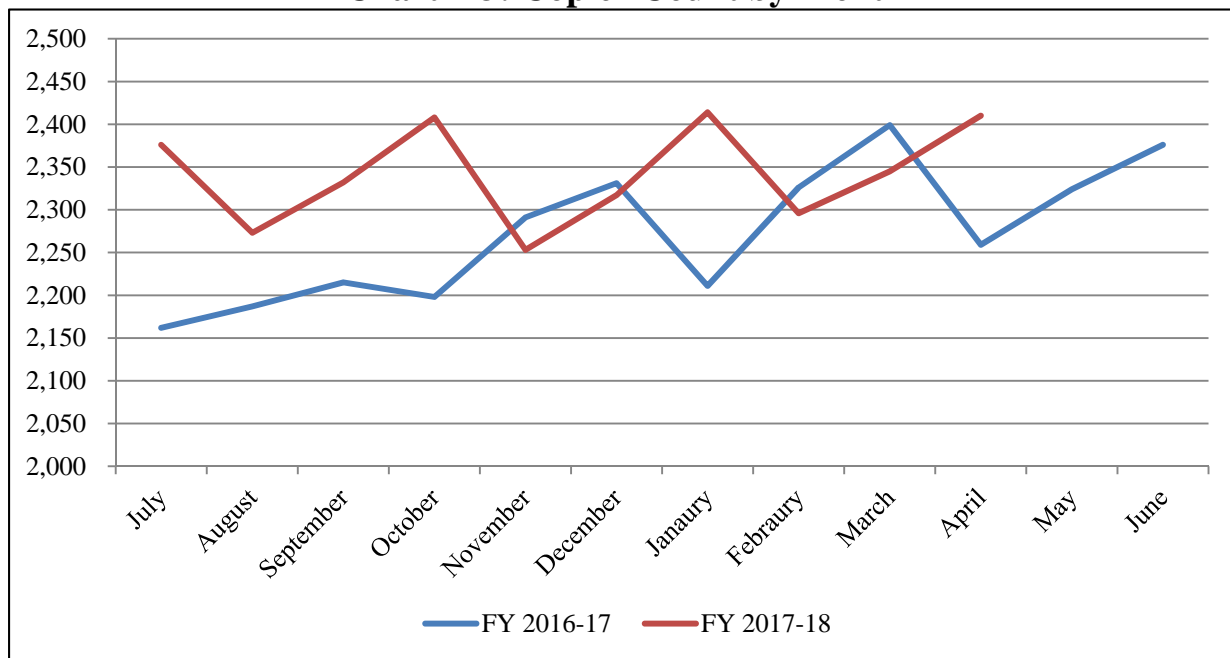
Source: OSU and ComDoc

As shown in **Chart 2-3,** the overall count of copiers can vary by up to 11.0 percent throughout the fiscal year. In FY 2016-17, the number of devices varied from 2,162 in July 2016 to 2,399 in March 2017, a difference of 237 units, or 11.0 percent. For FYTD[14] 2017-18, units varied from 2,253 in November 2017 to 2,414 in January 2018, an increase of 162 units, or 7.1 percent.

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[14] FYTD 2017-18 data is complete as of April 30, 2018, the most up-to-date information available as of the completion of this analysis.

Changes in the exact count during any given month are driven by the printing needs of the areas and the original install date of any given unit.

Chart 2-4 shows the distribution of copiers by installation year as of December 2017.[15] Given that all leases are for a 60-month period, the installation year can typically be used to estimate how many leases will expire in any given year.

Chart 2-4: Copiers Distribution by Install Year
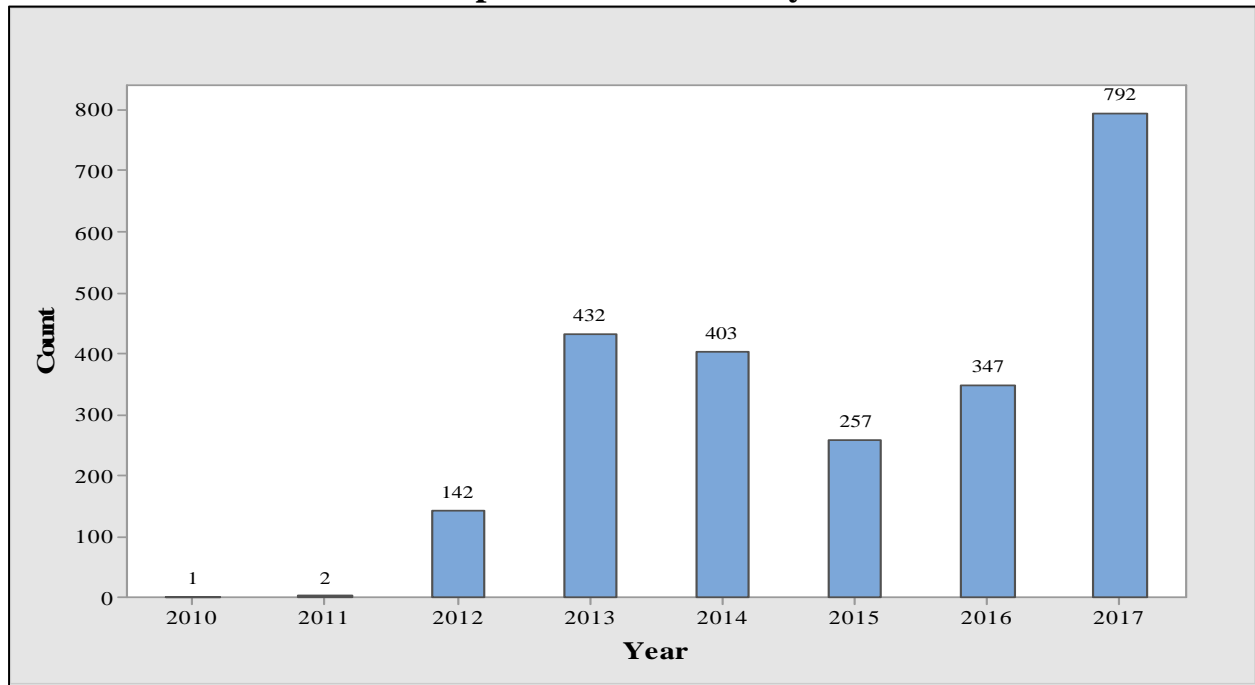
Source: OSU and ComDoc

As shown in **Chart 2-4**, there were 2,376 total active copiers as of June 2017. The devices installed in 2010 and 2011 are large, highly specialized sign printing devices and therefore not on the standard refresh cycle of common copiers. A significant portion of these units, 792 or 33.3 percent, were installed in 2017. Because the first contract was signed in 2012, 2017 was the end of the five-year lease for many devices installed early on in the contract period. However, based on the 60-month lease cycle, 835, or 35.1 percent, have leases that will expire by the end of 2019. When a device's lease expires, the University is under no obligation to renew it and may choose to remove the device. In addition, the contract allows the University to remove up to 250 units each year prior to lease renewal.

To generate the quarterly ComDoc bill, UniPrint is responsible for collecting the data necessary to calculate the appropriate bill. This data is collected from each device in the form of a "meter read". Depending on the device, this may be an automated or manual process.[16] As previously noted, each device is billed based on a combination of:

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[15] December 2017 was the end of the last full year of available data as of the completion of this analysis.

[16] Some devices are able to automatically report utilization statistics to UniPrint; others must be read individually by printing out specific utilization statistics each quarter.

- **B&W Base Cost**– A set monthly cost which includes the device itself and set number of prepaid B&W pages. Base costs range from $20 per month for 400 pages to $398 for a large unit with 15,000 monthly pages;
- **B&W Overage per Page** – A flat rate of $0.0075 for each page in excess of the monthly B&W page allocation; and
- **Color per Page** – A flat rate of $0.065 per page.

Chart 2-5 shows a breakdown of copier costs by type (i.e., base cost, overage cost, and color cost) for FY 2016-17. This type of analysis provides additional context to the relative significance of each cost category as it relates to the total cost of on-program copiers.

Chart 2-5: Copier Cost Breakdown

$1,764,044

$3,456,740

$311,776

■ B&W Base ■ B&W Overage ■ Color
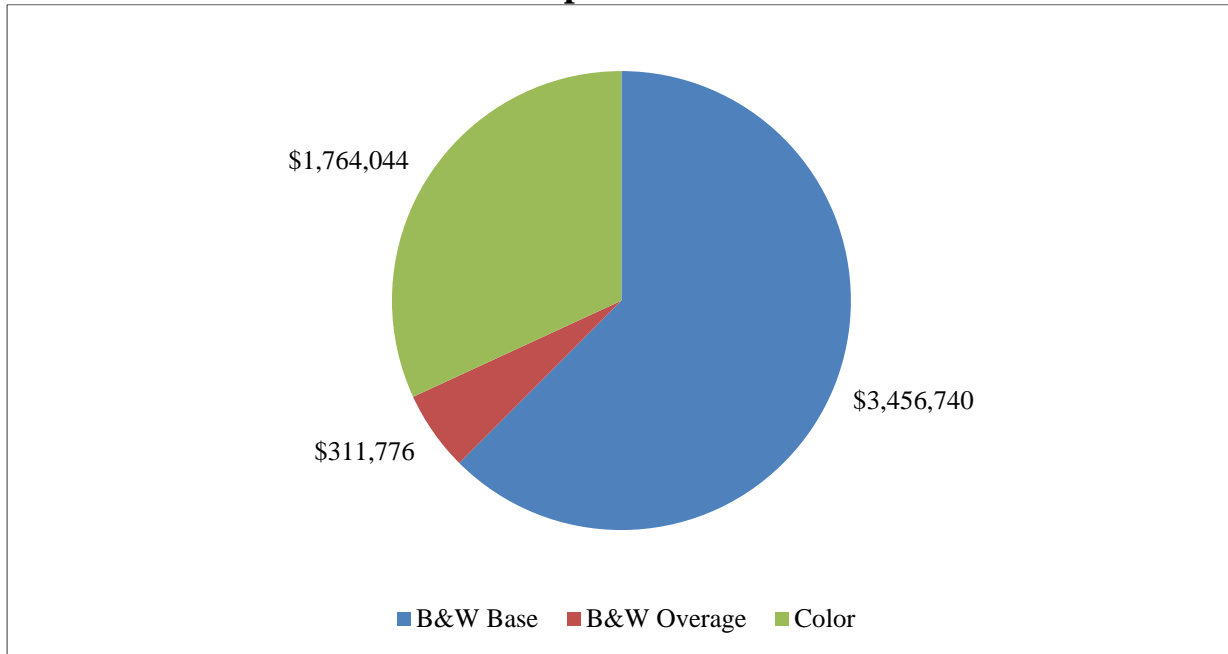
Source: OSU and ComDoc

As shown in **Chart 2-5**, the base cost was the largest category, accounting for $3.5 million, or 62.5 percent of total on-program copier cost in FY 2016-17. Color was the second largest category, accounting for $1.8 million, or 31.9 percent. Finally, B&W overage accounted for $311,776, or 5.6 percent of the total, and was the smallest category.

It is also important to consider how this copier cost breakdown is associated with each University area. **Chart 2-6** shows the breakdown of copier cost by area for FY 2016-17, providing additional context to the relative significance of each category of usage by area.

Chart 2-6: Copier Cost Breakdown by Area
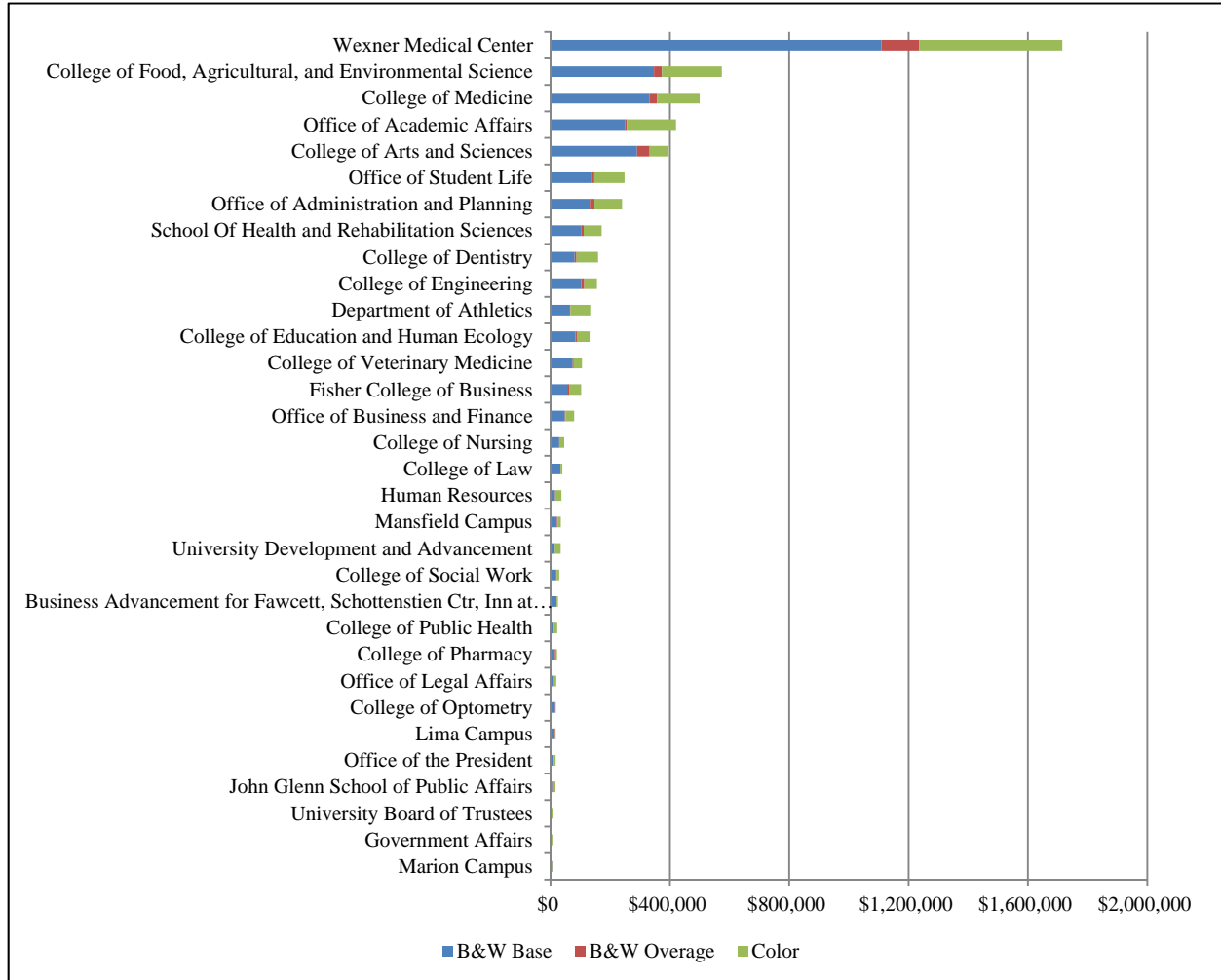
Source: OSU and ComDoc

As shown in **Chart 2-6**, 32 areas incurred on-program copier cost. A total of $4.6 million, or 82.3 percent, of the total cost of copying in FY 20216-17 can be attributed to the top 10 areas. By far, the Wexner Medical Center had the largest area-specific costs for B&W base cost, B&W overage, and color, of $1.1 million; $480,524; and $1.7 million, respectively.

Printer Cost Detail

While on-program printers are owned by the various areas across OSU, toner is provided through the ComDoc contract. In FY 2016-17, there was a monthly average of 1,159 active on-program printers receiving services and being billed accordingly. As previously noted, each device is billed based on a combination of:

- **B&W per Page** – A flat rate of $0.01 per page; and
- **Color per Page** – A flat rate of $0.10 per page.

Chart 2-7 shows a breakdown of printer costs by type (i.e., B&W and color) for FY 2016-17. This provides additional context to the relative significance of each cost category as it relates to the total cost of on-program printers.

Chart 2-7: Printer Cost Breakdown

$548,759 $508,282

■ B&W   ■ Color
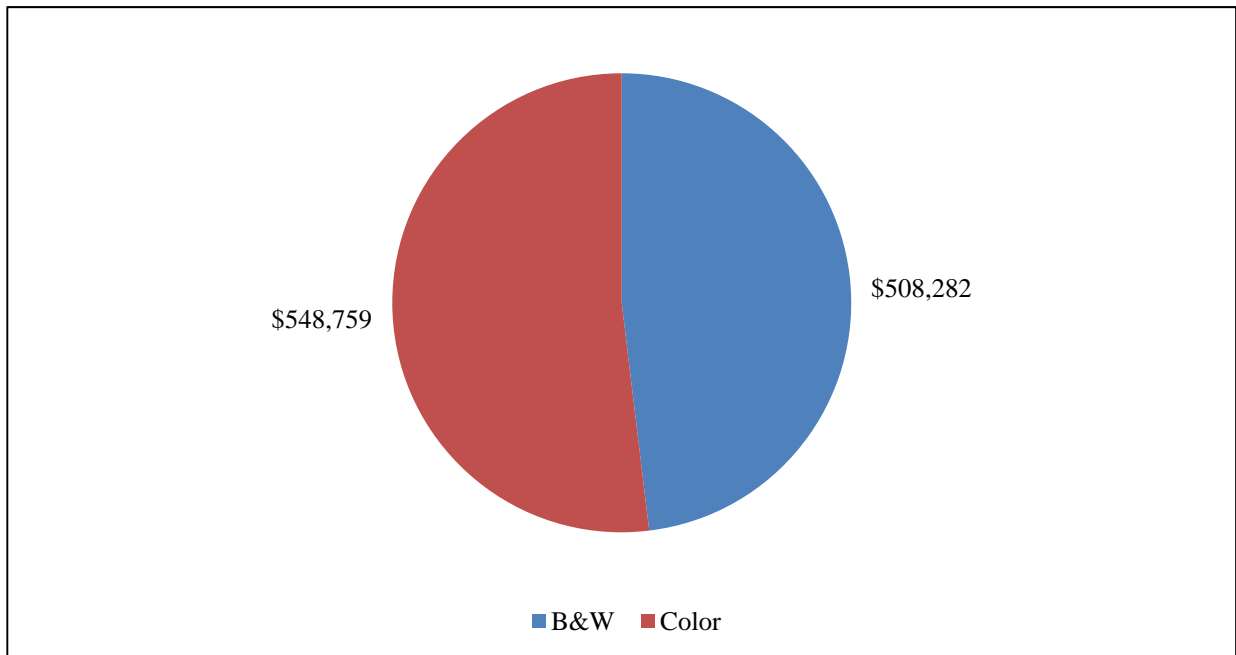
Source: OSU and ComDoc

As shown in **Chart 2-7**, color per-page printing was the largest cost category, accounting for $548,759, or 51.9 percent, of total on-program copier costs in FY 2016-17. B&W per-page printing accounted for the remaining cost of $508,282, or 48.1 percent. The relatively high expenditure for color printing is a reflection of the fact that each color page costs $0.10 versus each B&W page which costs $0.01, a difference of $0.09, or 90.0 percent.

Chart 2-8 shows the breakdown of printer cost by area for FY 2016-17 to provide additional context to the relative significance of each category of usage by area.

Chart 2-8: Printing Cost by Area
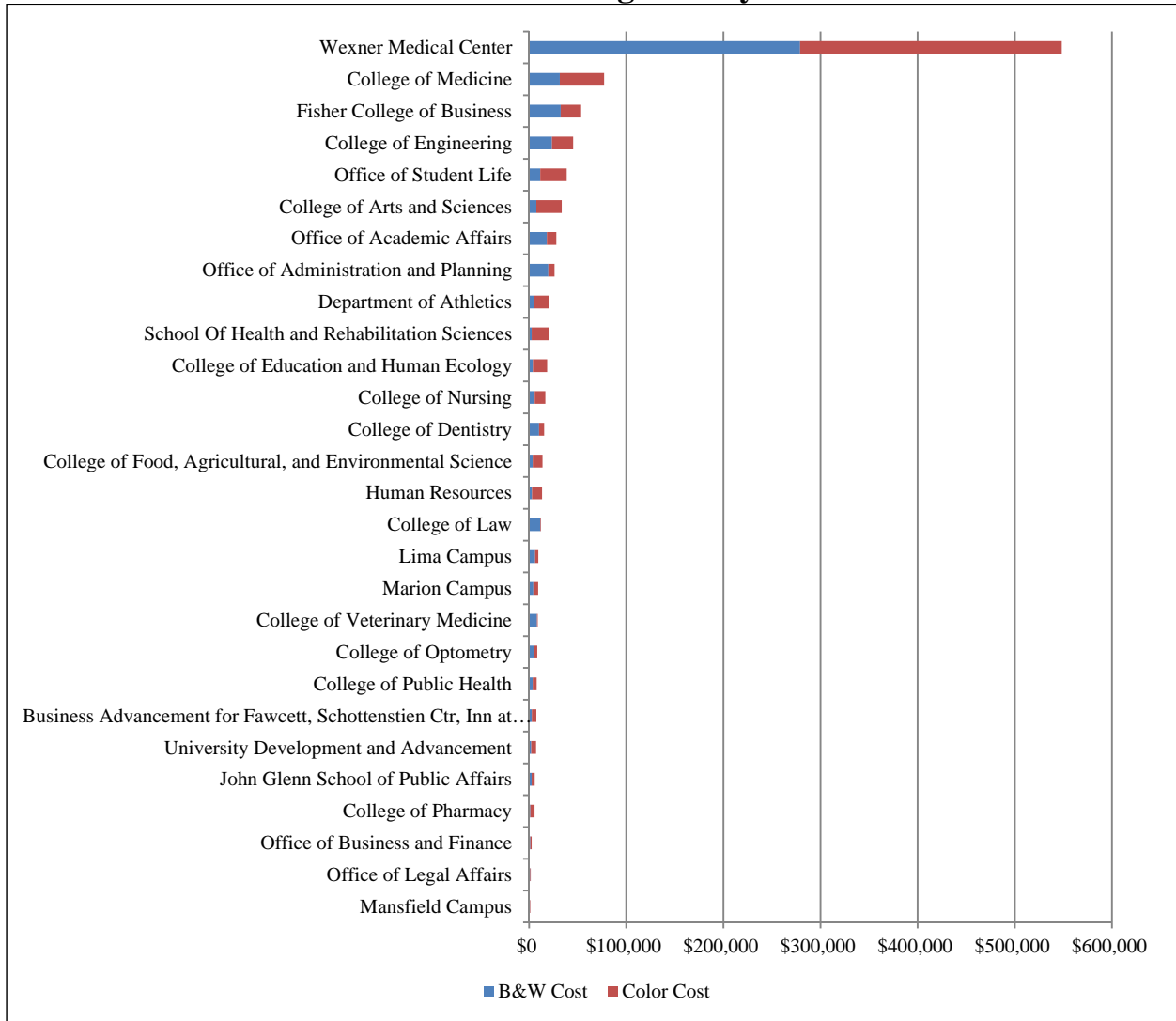
Source: OSU and ComDoc

As shown in **Chart 2-8**, 28 areas incurred on-program printing costs. A total of $850,981, or 80.0 percent of the total cost of printing in FY 2016-17, can be attributed to the top eight areas. By far, the Wexner Medical Center had the largest area-specific costs for B&W and color of $278,952, and $269,369, respectively.

Page Production Options

Exhibit 2-1 shows a comparison of different approaches to printing services. This provides important context around the pros and cons of the various page production methods available within the University, and also helps to highlight the tradeoffs, especially those associated with off-program desktop printers.

Exhibit 2-1: Page Production Options Compared

Source: OSU

As shown in **Exhibit 2-1**, on-program copiers and printers offer a number of advantages over the off-program alternatives, especially in terms of the costs per page and level of customer service associated with the UniPrint contract.

The **Printer Management** section is divided into two sub-sections of analysis, each analyzing a distinct element of printer management and related practices including:

- **On-Program Copier and Printer Consolidation** – This sub-section analyzes copier utilization based on location and identifies opportunities to improve utilization rates by consolidating devices.
- **Off-Program Printing** – This sub-section analyzes the effects of off-program toner purchases and identifies opportunities to reduce the cost of service.

R2.1 On-Program Copier and Printer Consolidation

Background

The University provides copiers to students, staff, and faculty through a contract with ComDoc. In FY 2016-17, the University had an average of 2,273 copiers each month. Copiers are distributed among 32 areas located in 350 addresses.

In addition to cost, another metric to assess copier performance is the utilization rate. Utilization rate can be measured by comparing the actual number of pages printed to three metrics:
- **B&W Prepaid Pages** – B&W prepaid pages included with each device lease.
- **Manufacturer's Recommended Print Volume (Recommended)** – Manufacturer's recommended monthly volume for optimal printing.
- **Manufacturer's Maximum Duty Cycle (Maximum)** – Manufacturer's identified monthly point at, or beyond, which a given unit may begin to experience accelerated wear.

Table 2-1A shows total prepaid B&W pages, B&W pages produced, color pages produced, and prepaid utilization by area for FY 2016-17. Comparing the actual usage of prepaid B&W pages to the total prepaid B&W pages is important as a measure of cost-effective contract utilization because OSU pays for all prepaid pages whether or not they are actually used. A high number of unused prepaid B&W pages could be indicative of two potential issues; the first being more copiers than needed to actually meet area-specific printing needs; the second being the wrong type of devices (i.e., more prepaid B&W pages included in the lease than actually needed) being used to meet area-specific printing needs.

Table 2-1A: Copier Production and Prepaid Utilization Comparison by Area

Area	Prepaid B&W Pages	Total B&W Pages Printed	Color Pages Printed	Total Pages Printed	Prepaid B&W Utilization
Wexner Medical Center	28,228	37,155	7,393	44,547	131.6%
College of Arts and Sciences	13,115	12,685	978	13,664	96.7%
College of Food, Agricultural, and Environmental Science	11,135	11,104	3,100	14,204	99.7%
College of Medicine	9,364	9,409	2,188	11,597	100.5%
Office of Academic Affairs	5,828	3,751	2,529	6,280	64.4%
College of Engineering	3,822	3,778	651	4,429	98.8%
School Of Health and Rehabilitation Sciences	3,650	2,520	927	3,447	69.0%
Office of Student Life	3,432	2,893	1,556	4,449	84.3%
College of Education and Human Ecology	3,020	2,386	661	3,047	79.0%
Office of Administration and Planning	2,821	5,461	1,420	6,881	193.6%
College of Veterinary Medicine	1,935	1,667	429	2,095	86.1%
College of Dentistry	1,733	1,957	1,114	3,071	113.0%
Fisher College of Business	1,723	2,405	594	3,000	139.6%
Department of Athletics	1,671	1,453	1,022	2,475	87.0%
College of Nursing	1,287	574	255	829	44.6%
Office of Business and Finance	1,160	965	453	1,418	83.2%
Business Advancement for Fawcett, Schottenstien Ctr., Inn at Fisher and Drake	1,157	573	69	643	49.6%
College of Law	927	569	94	663	61.4%
College of Optometry	760	678	16	694	89.1%
College of Social Work	721	671	128	799	93.1%
College of Pharmacy	693	958	45	1,003	138.2%
Mansfield Campus	687	944	157	1,101	137.4%
Lima Campus	502	651	28	679	129.8%
Human Resources	378	503	312	815	133.0%
University Development and Advancement	276	167	296	463	60.3%
College of Public Health	240	309	187	496	128.9%
Office of Legal Affairs	212	188	147	335	88.8%
Marion Campus	182	93	25	118	51.0%
Office of the President	156	54	91	145	34.7%
John Glenn College of Public Affairs	108	272	147	419	251.7%
Office of Government Affairs	72	35	51	86	48.2%
University Board of Trustees	48	34	88	121	70.3%
Totals	**101,042**	**106,861**	**27,151**	**134,012**	**105.8%**

Source: OSU and ComDoc
Note: All page counts are presented in thousands.

As shown in **Table 2-1A**, 20 of the 32 areas with copiers, or 62.5 percent, had aggregate B&W utilization rates below 100.0 percent. In total, areas collectively used 105.8 percent of the prepaid B&W volume in FY 2016-17. This means that while the majority of areas experienced underutilization, those that exceeded did so through significant cost of B&W overage.

Table 2-1B shows the total pages production, recommended print volume, and percent of recommended print volume actually used in FY 2016-17. This analysis is important to contextualize the lease arrangements and the prepaid B&W pages as they relate to the actual expected capabilities of each device.

Table 2-1B: Copier Recommended Utilization Comparison by Area

Area	Total Pages Printed	Manufacturer's Recommended Pages	Manufacturer's Recommended Utilization %
Wexner Medical Center	44,547	145,147	30.7%
College of Arts and Sciences	13,664	54,697	25.0%
College of Food, Agricultural, and Environmental Science	14,204	43,202	32.9%
College of Medicine	11,597	40,535	28.6%
Office of Academic Affairs	6,280	26,675	23.5%
College of Engineering	4,429	14,603	30.3%
School Of Health and Rehabilitation Sciences	3,447	15,940	21.6%
Office of Student Life	4,449	14,277	31.2%
College of Education and Human Ecology	3,047	13,414	22.7%
Office of Administration and Planning	6,881	13,758	50.0%
College of Veterinary Medicine	2,095	7,686	27.3%
College of Dentistry	3,071	8,991	34.2%
Fisher College of Business	3,000	9,053	33.1%
Department of Athletics	2,475	6,947	35.6%
College of Nursing	829	5,222	15.9%
Office of Business and Finance	1,418	5,005	28.3%
Business Advancement for Fawcett, Schottenstien Ctr., Inn at Fisher and Drake	643	3,714	17.3%
College of Law	663	3,200	20.7%
College of Optometry	694	3,150	22.0%
College of Social Work	799	3,798	21.0%
College of Pharmacy	1,003	3,048	32.9%
Mansfield Campus	1,101	2,750	40.0%
Lima Campus	679	1,944	34.9%
Human Resources	815	1,507	54.1%
University Development and Advancement	463	1,320	35.1%
College of Public Health	496	765	64.8%
Office of Legal Affairs	335	876	38.2%
Marion Campus	118	993	11.9%
Office of the President	145	743	19.5%
John Glenn College of Public Affairs	419	444	94.4%
Office of Government Affairs	86	330	26.0%
University Board of Trustees	121	180	67.4%
Totals	**134,012**	**453,912**	**29.5%**

Note: All page count and manufacturer's recommended data is presented in thousands.
Source: OSU and ComDoc

As shown in **Table 2-1B**, 27 of the 32 areas with copiers, or 84.4 percent, had recommended utilization rates below 50.0 percent. Overall, areas used 29.5 percent of recommended page

count. The highest utilization rate was the John Glenn College of Public Affairs, with 94.4 percent. This same area had a prepaid B&W utilization rate of 251.7 percent (see **Table 2-1A**), meaning that for this particular group of copiers, the prepaid B&W pages were less than 25.0 percent of the recommended pages for these same devices.

Table 2-2 shows the most common lease types by count, type (i.e., B&W or color, with a color enabled device effectively able to do both), prepaid B&W volume, recommended print volume, and cost for the top 80.0 percent of most common lease types for FY 2016-17. This illustrates the size and cost of the most common devices.

Table 2-2: Common Lease Types

Count of Devices	Color/B&W	Prepaid B&W Pages	Recommended Pages	Contract Cost per Device
291	B&W	1,000	8,000	$34.50
287	B&W	4,000	15,000	$113.76
226	B&W	1,000	12,000	$34.50
206	Color	4,000	15,000	$163.37
158	B&W	1,000	12,000	$74.11
150	Color	4,000	20,000	$163.97
112	Color	2,000	12,000	$147.88
89	Color	1,000	8,000	$101.58
87	Color	2,000	12,000	$147.88
76	B&W	400	1,000	$20.00
70	B&W	1,000	5,000	$77.34
66	B&W	20,000	125,000	$277.92
63	B&W	20,000	125,000	$277.92

Source: OSU and ComDoc

As shown in **Table 2-2**, of the top five most common leases by device count, 962, or 82.4 percent, are smaller or mid-sized B&W units. In addition, the recommended print volume exceeds the prepaid B&W pages for every type of device shown. Specific to these devices, the weighted average ratio of prepaid B&W pages to manufacturer's recommended pages is 17.3 percent. Therefore, any given device is able to produce significantly more pages than the prepaid B&W print volume would suggest.

Methodology

This sub-section, **On-Program Copier and Printer Consolidation**, seeks to analyze the utilization of University's fleet of co-located copiers and co-located printers. During the planning and scoping phase of the performance audit, University leadership identified this as a possible area that an objective analysis could identify opportunities for improved efficiency.

Analysis focused on opportunities to improve copier efficiency through device consolidation and optimization. Data was gathered from UniPrint based billing from FY 2016-17. When necessary, University and operations staff provided additional testimonial evidence to explain the copier billing and data collection system as well as the day-to-day operations of Uniprint. Finally, site visits were conducted at selected buildings to verify the location of devices and learn more about building layouts.

Three models of potential device consolidation were analyzed:
- **Co-Location** – A single room featuring two or more copiers.
- **Clusters** – Multiple devices within close proximity, although not necessarily in the same room. Devices in a cluster could include copiers and printers. All devices within a single cluster will be accessible without moving through a locked door.
- **Floor-wide consolidation –** Multiple devices located on the same floor of a given building. Device consolidation scenarios could include copiers and/or printers.

Analysis was based on scenarios testing the results of removing one or more devices from the location and shifting all printing to the remaining device(s). Devices with either the lowest prepaid utilization rate or the highest number of unused, prepaid B&W pages were tested for removal first. The removal of the device with the second lowest utilization rate was tested second, and so on, until each potential removal scenario was tested. Any given scenario was considered infeasible if it was determined that remaining devices would be unable to substitute for the device(s) that might be removed.[17] Infeasible scenarios, based on either capacity or capability, were excluded from further analysis.

Devices were analyzed first based on co-location, then based on clusters, and finally based on floor-wide consolidation. Devices which were analyzed as part of one model were excluded from the next; i.e., devices analyzed in the co-located analysis were excluded from the floor-wide consolidation analysis.

Each model of analysis prioritized the analysis of copiers; however, opportunities to consolidate printers were analyzed if the remaining copiers still had excess capacity. Printer pages were first consolidated to use up any remaining B&W prepaid capacity, and then color printer pages were consolidated.

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[17] Feasibility was determined based on device capability and device capacity. Capability was determined based on page type (i.e. color or B&W) and capacity was determined based on the manufacturer's recommended print volume. Capacity was considered to be sufficient if the total print volume did not exceed 100.0 percent of the manufacturer's recommended print volume.

Analysis

Unused B&W Prepaid Pages

Table 2-3 shows the average total copiers by area, the copiers with prepaid utilization rates below 100 percent, the percent of copiers with utilization rates below 100 percent, and the used and unused prepaid B&W pages by area for FY 2016-17. Displaying data in this manner illustrates the magnitude of underutilized prepaid pages.

Table 2-3: Unused Prepaid B&W Pages by Area

Area	Avg. Total Copiers	Avg. Copiers< Prepaid	% of Total Copiers< Prepaid	Prepaid B&W Pages	Actual B&W Pages	Unused Prepaid B&W Pages
Wexner Medical Center	994	473	47.6%	15,784,000	7,916,810	7,867,190
College of Medicine	245	140	56.9%	6,510,100	3,062,866	3,447,234
College of Food, Agricultural, and Environmental Science	142	81	57.2%	7,168,100	3,588,147	3,579,953
College of Arts and Sciences	132	89	67.1%	8,251,400	4,115,222	4,136,178
Office of Academic Affairs	129	96	74.7%	4,791,300	1,826,701	2,964,599
Office of Student Life	77	50	64.4%	2,336,500	907,597	1,428,903
Office of Administration and Planning	76	53	70.2%	1,993,400	991,284	1,002,116
School Of Health and Rehabilitation Sciences	63	38	59.7%	2,974,800	881,618	2,093,182
College of Dentistry	53	32	61.4%	1,127,200	561,872	565,328
College of Engineering	50	35	70.0%	2,305,700	934,302	1,371,398
College of Veterinary Medicine	43	23	53.8%	1,385,000	654,780	730,220
Department of Athletics	41	26	62.7%	1,123,600	391,532	732,068
College of Education and Human Ecology	33	23	67.5%	2,298,500	1,091,222	1,207,278
Office of Business and Finance	33	21	63.8%	781,900	288,645	493,255
Fisher College of Business	27	16	58.3%	720,500	324,954	395,546
College of Law	14	11	79.4%	698,000	263,269	434,731
College of Optometry	15	9	58.0%	512,600	288,295	224,305
Business Advancement for Fawcett, Schottenstien Ctr, Inn at Fisher and Drake	12	10	84.2%	1,098,000	477,079	620,921
Mansfield Campus	12	6	53.2%	266,000	177,096	88,904
College of Social Work	9	6	67.0%	555,800	279,171	276,629
Human Resources	9	3	36.1%	141,000	91,303	49,697
University Development and Advancement	8	7	83.9%	252,000	128,409	123,591
College of Nursing	8	6	82.4%	1,188,000	451,161	736,839
Lima Campus	7	4	54.2%	166,000	56,950	109,050
Office of Legal Affairs	6	5	76.1%	148,000	85,046	62,954
College of Pharmacy	6	3	51.4%	432,000	121,684	310,316
Office of the President	6	5	94.0%	146,000	44,092	101,908
Marion Campus	5	4	77.4%	110,000	18,388	91,612
College of Public Health	5	3	60.0%	144,000	75,130	68,870
Government Affairs	2	2	96.0%	66,000	28,692	37,308
University Board of Trustees	1	1	100.0%	36,000	19,743	16,257
Total	**2,264**	**1,279**	**N/A**	**65,511,400**	**30,143,060**	**35,368,340**

Source: OSU

As shown in **Table 2-3**, 31 areas had at least one underutilized device in FY 2016-17. The median number of total devices was 11, and the median percentage of underutilized devices relative to total devices was 64.1 percent.

The unused prepaid B&W pages shown on **Table 2-3** could have a number of opportunity costs, including but not limit to:
- **Redundant pages** – The 35.4 million unused B&W pages represent $350,000 in direct opportunity costs assuming those pages were produced elsewhere on desktop printers at the cost of $0.01 per page. In FY 2016-17, the University printed over 50 million B&W pages using desktop on-program printers.
- **Unneeded devices** – An inefficient distribution of page production resources could lead to an over-leasing of copiers. The least expensive copier costs $240 per year, so minimizing the overall number of copiers needed could be a way to control costs.

In addition to the direct and opportunity cost of prepaid but unused B&W pages, the University can also reduce per-page costs by increasing utilization rates above 100 percent for any given device; still remaining within the manufacturer's recommended monthly volume, and also well below the manufacturer's monthly maximum. An example of this would be an underutilized copier with a contract cost of $3,335 per year with 240,000 prepaid B&W pages. In this example, the device produces 23,318 B&W pages at the cost of $0.1430 per page. **Table 2-4** shows how the price per page could change if the device was better utilized.

Table 2-4: Example Device Utilization and Cost per Page Scenarios

Example Device Overview	
Annual Contract Cost	$3,335
Annual Prepaid B&W Pages	240,000
Annual Recommend Pages	1,500,000

Utilization Scenarios and Resulting Cost per Page			
	Scenario 1: Current Operation	**Scenario 2: Using All Prepaid Pages**	**Scenario 3: Operating at Manufacturer's Recommendation**
Annual Pages	23,318	240,000	1,500,000
Unused Prepaid B&W Pages	216,682	0	(1,260,000)
Overage Cost	$0.00	$0.00	$9,450.00
Total Operating Cost	$3,335.00	$3,335.00	$12,785.00
Cost per Page	**$0.1430**	**$0.0139**	**$0.0085**
Cost per Page Difference Vs. Scenario 1	N/A	($0.1291)	($0.1345)
Cost per Page Difference Vs. Scenario 2	$0.1291	N/A	($0.0054)
Cost per Page Difference Vs. Scenario 3	$0.1345	$0.0054	N/A

Source: OSU and ComDoc

As shown in **Table 2-4**, increasing the utilization of a mid-sized copier to use all prepaid B&W pages would reduce the effective cost-per-page from $0.1430 to $0.0139, a difference of $0.1291 or 90.3 percent. In addition, increasing the utilization up to the manufacturer's recommendation could further reduce the cost per page to $0.0085, a change of $0.1345, or 94.1 percent, from the current state.

In addition to reducing the cost per page, meeting existing copier needs through optimization can also reduce the fixed cost of copiers. As shown in **Table 2-2,** the University pays for pages that are not actually used. Optimizing the number and placement of copiers could reduce the fixed cost of unused copies.

On-Program Device Consolidation

One approach to increasing utilization and reducing the number of unused prepaid pages for a device is to consolidate page production into a smaller number of devices. In FY 2016-17, the University operated an average of 2,273 on-program copiers each month (see **Chart 2-3**) and the ComDoc contract provides the University the option to eliminate up to 250 on-program copiers each year. In addition, the University produced over 5 million pages using on-program desktop printers at a cost of $0.01 per page; this is $0.0025 more than the cost of producing the same page on a copier, but also leads to decreased utilization of copiers. Locating devices that could be good candidates for consolidation could allow the University to improve overall copier efficiency.

To illustrate how consolidation might help reduce cost and improve efficiency, consider a floor with two copiers, one that is relatively large and the other that is mid-sized. Collectively, the two devices produced 36,584 B&W pages in FY 2016-17; whereas the combined B&W prepaid volume was 264,000 pages. **Exhibit 2-2** shows an example of how consolidation could increase efficiency in the example.

Exhibit 2-2: Copier Consolidation Example

Total Prepaid Pages: 264,000
Total B&W Pages: 36,584
Total Color Pages: 0
Total Unused Pages: 227,416
Total Overage Cost: $0
Total Cost: $6,404

Two Underutilized Copiers

Total Prepaid Pages: 24,000
Total B&W Pages: 36,584
Total Color Pages: 0
Total Unused Pages: 0
Total Overage Cost: $739.41
Total Cost: $3,448
Net Savings: $2,956

One Optimized Copier
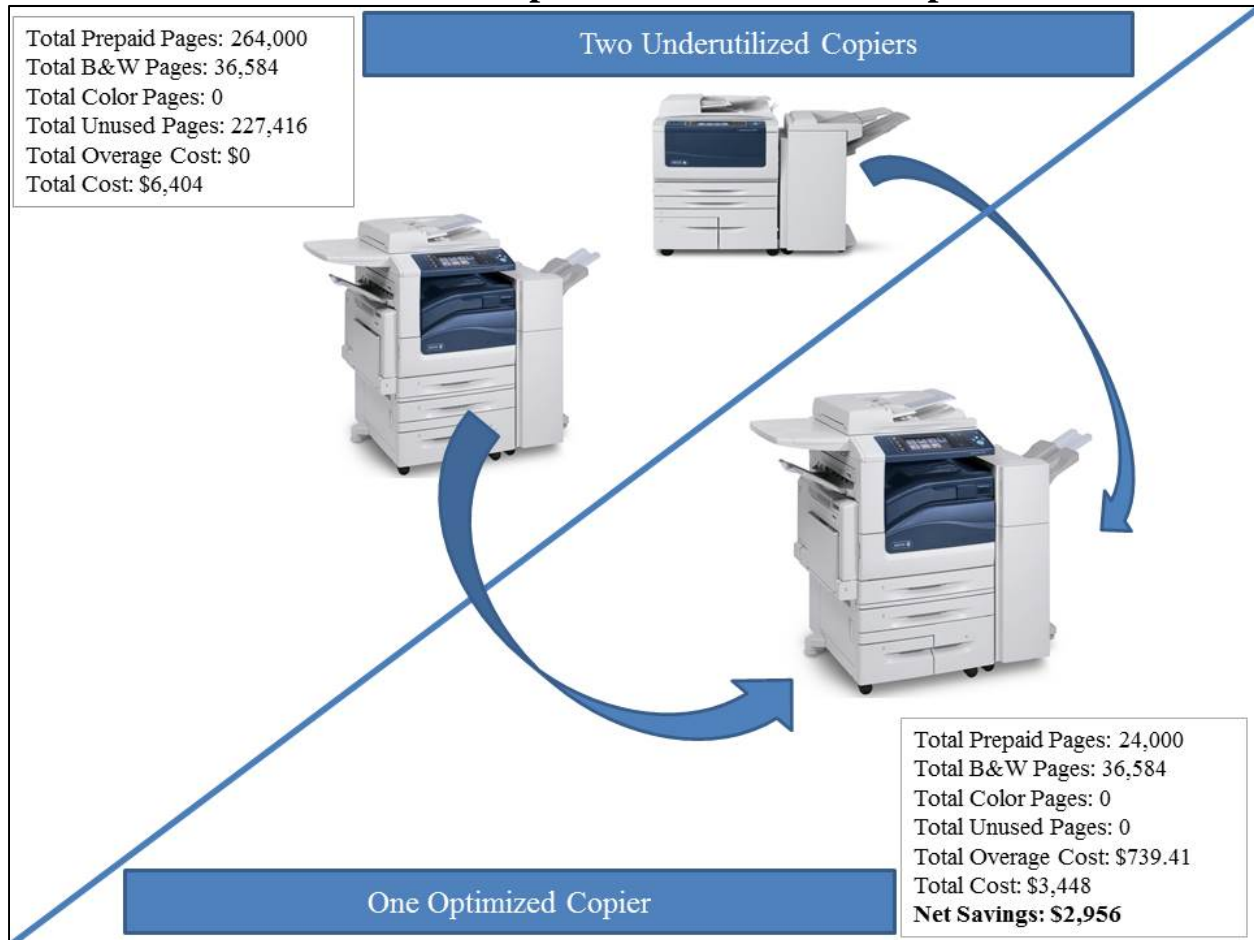
Source: OSU and ComDoc

As shown in **Exhibit 2-2**, eliminating the larger of the two devices and shifting those pages to the smaller device will result in a net savings of $2,956 and completely eliminate the unused pages. Although this consolidation would result in overage, relative to the contract prepaid pages on the remaining device, the total pages of 36,584 would remain well below the manufacturer's recommended pages of 144,000.

In addition to consolidation opportunities from eliminating copiers, there could also be efficiency improvements by shifting pages currently produced using on-program, desktop printers to on-program copiers. For example, consider a floor with three copiers and one printer. All three copiers are mid- to smaller sized copiers; a Xerox 7844, a Xerox 7530, and a Xerox 7120. Collectively, the copiers produced a total of 60,394 B&W pages, whereas the combined B&W prepaid volume was 81,000 pages. In addition, there were 1,759 B&W pages produced on a desktop printer. **Exhibit 2-3** shows an example of how consolidation could increase efficiency in the example.

Exhibit 2-3: Copier and Printer Consolidation Example
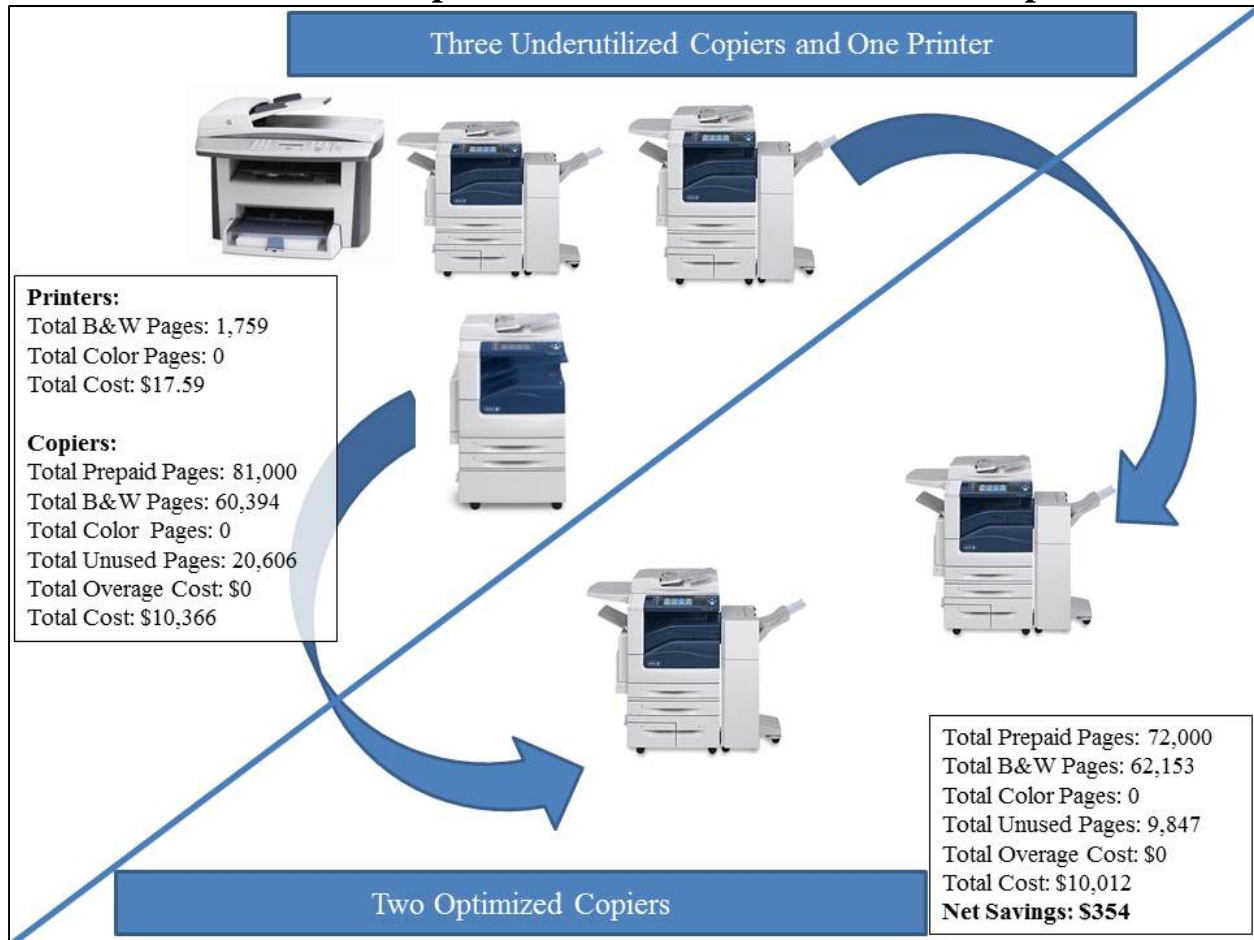
Source: OSU and ComDoc

As shown in **Exhibit 2-3**, eliminating one device and shifting B&W pages from the removed copier and the desktop printer could result in a net savings of $354 and reduce unused prepaid B&W pages by 10,759, or 52.2 percent. Even after this consolidation, 62,153 total pages across the two devices would still remain below the prepaid B&W pages of 72,000 and well below the manufacturer's recommended pages of 336,000.

On-Program Device Consolidation Scenarios

Optimization through consolidation involves identifying devices which are in close physical proximity to one another. For the purposes of this analysis, three types of physical proximity were considered:

- **Co-Location** – Rooms with two or more devices could be easiest to consolidate because the remaining device(s) will still be accessible to current users with little change.
- **Clusters** – These are groups of devices in close proximity to each other, some of which may already be co-located, but in different rooms. Clusters can provide an opportunity for optimization, but could require a user to walk to a nearby room to make a copy or retrieve a print job.

- **Floor–Wide** – These are groups of devices located on the same floor. Analysis is otherwise substantially similar to clustered devices.

Co-Located Printer Consolidation

Table 2-5 shows the number of locations with co-located devices (i.e., either two or more or three or more), the total number of co-located devices by area, and the average number of co-located devices per location across all areas for FY 2016-17. Areas with two or more devices may have immediate opportunities to increase efficiency through device consolidation.

Table 2-5: Co-Located Devices by Area

Area	Two Devices	Three or More Devices	Total Devices	Avg. Devices per Location
Wexner Medical Center	51	6	120	2.1
College of Arts and Sciences	18	1	39	2.1
College of Medicine	16	2	38	2.1
Office of Academic Affairs	8	1	20	2.2
College of Engineering	6	0	12	2.0
College of Dentistry	5	0	10	2.0
College of Food, Agricultural, and Environmental Sciences	5	1	13	2.2
Department of Athletics	5	0	10	2.0
School Of Health and Rehabilitation Sciences	4	1	12	2.4
Fisher College of Business	3	0	6	2.0
Office of Administration and Planning	3	3	15	2.5
Office of Business and Finance	3	0	6	2.0
College of Law	2	0	4	2.0
College of Social Work	2	0	4	2.0
Human Resources	2	1	7	2.3
Office of Student Life	2	0	4	2.0
College of Optometry	1	0	2	2.0
College of Veterinary Medicine	1	1	7	3.5
Mansfield Campus	1	0	2	2.0
University Development and Advancement	1	0	2	2.0
Totals	**139**	**17**	**333**	**2.1**

Source: OSU and ComDoc

As shown in **Table 2-5**, there are a total of 156 locations with at least two devices. The distribution of co-locations follows a similar pattern to overall device utilization and expenditures, with the top nine areas responsible for 130, or 83.0 percent of, areas with two or more devices. The area with the most co-located devices, the Wexner Medical Center, has a total of 57 locations with two or more devices, or 36.5 percent of all identified co-locations.

Chart 2-9 shows costs for co-located copiers, contract costs, overage costs, and color costs. Cost data is a key metric for analyzing device performance.

Chart 2-9: Co-Located Device Cost by Area
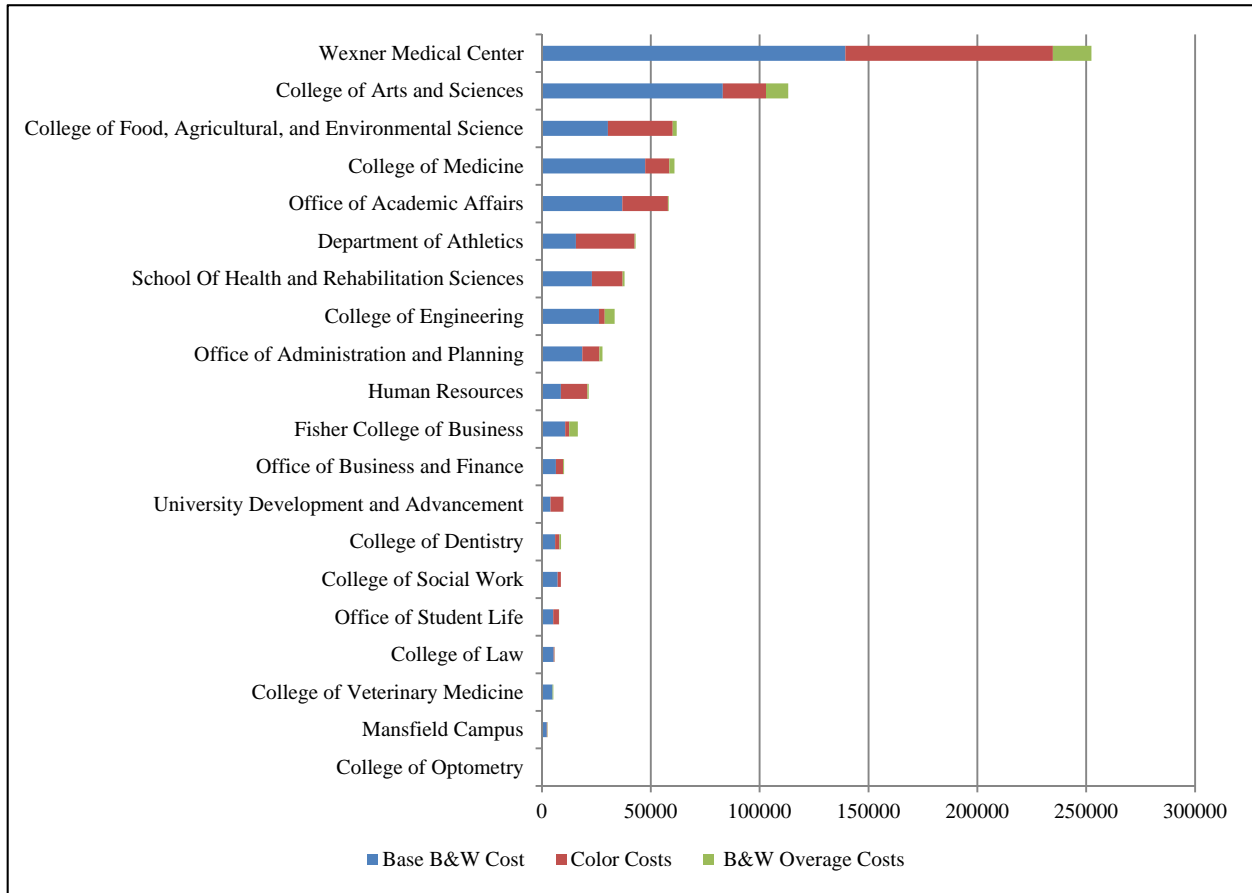
Source: OSU and ComDoc

As shown in **Chart 2-9**, the top eight areas had a cumulative cost $$599,980, or 76.3 percent, of the total costs for FY 2016-17. The Wexner Medical Center was responsible for largest share of the total costs with $252,406, or 32.1 percent, of the total.

Chart 2-10 shows the total page production and manufacturer's recommended volume for the top ten areas by page production volume with co-located copiers for FY 2016-17. Page counts relative to the manufacturer's recommended volumes are key to identifying opportunities for device consolidation.

Chart 2-10: Co-Located Device Page Production
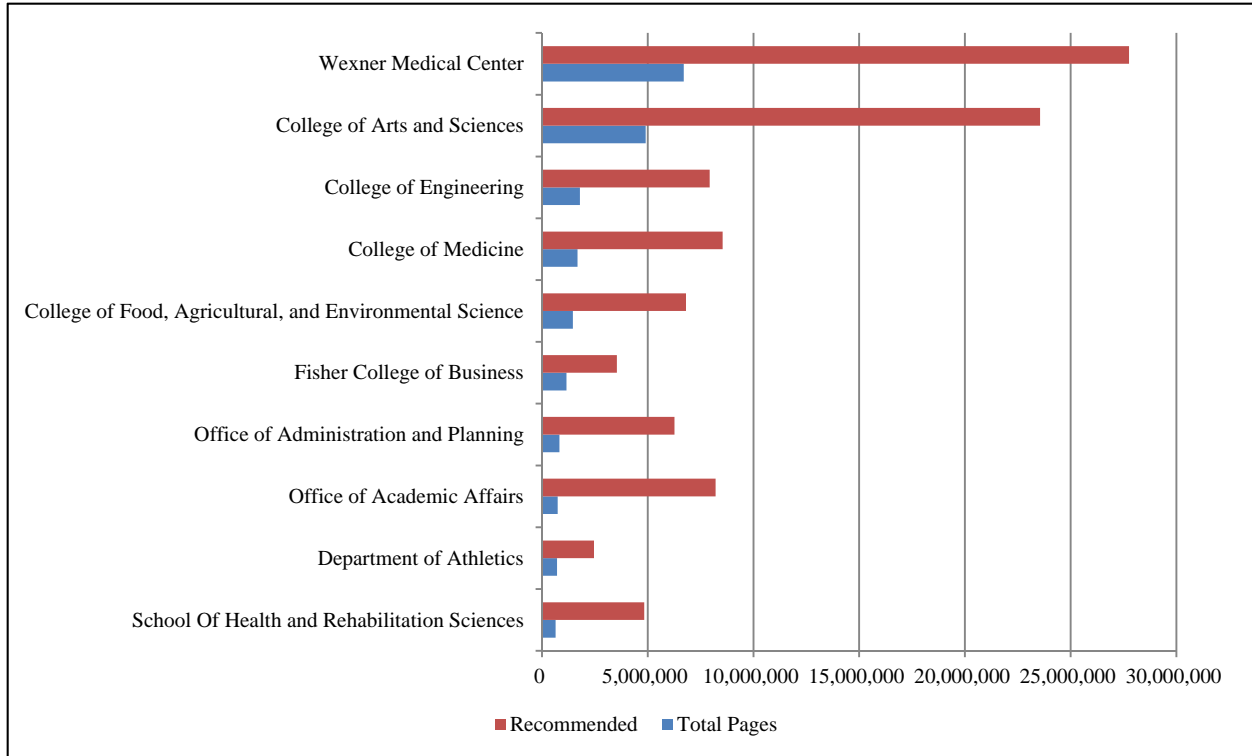
Source: OSU and ComDoc

As shown in **Chart 2-10**, total page production follows a Pareto distribution with the top producer, the Wexner Medical Center, responsible for 6.7 million pages, or 32.5 percent, of the pages produced by the top ten areas.[18] In addition, **Chart 2-10** highlights the gap between the actual device utilization and the potential utilization based on the manufacturer's recommendation. Overall, the maximum utilization of the top ten areas was the Fisher College of Business, with 32.7 percent. The median utilization rate was 21.1 percent.

Once co-located devices are identified, they can be optimized by taking into account location-specific device needs. Consolidating devices means removing one or more devices and shifting printing duties to the remaining device(s). Consolidation can increase the prepaid utilization and thereby push down the overall cost per page. Given that each device has a specific contract and unique capabilities, it is necessary to evaluate the impact that removal of each device could have from both an efficiency and service continuity standpoint. Therefore, consolidation was tested for each co-located device using the following four scenarios, when applicable:

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[18] A Pareto distribution refers to the Pareto Principal which states that, for many events, roughly 80.0 percent of the effects come from 20.0 percent of the causes.

- Remove the device with the lowest utilization and shift all remaining print jobs to the remaining device(s);
- Remove the device with the second lowest utilization and shift all remaining print jobs to the remaining device(s);
- Remove the device with the third lowest utilization and shift all print jobs to the remaining device(s); or
- Remove the device with the fourth lowest utilization and shift all print jobs to the remaining device (s).

Chart 2-11 shows the summary results, by area, of implementing the optimum consolidation scenario for each location with a co-located copier.

Chart 2-11: Savings from Consolidation
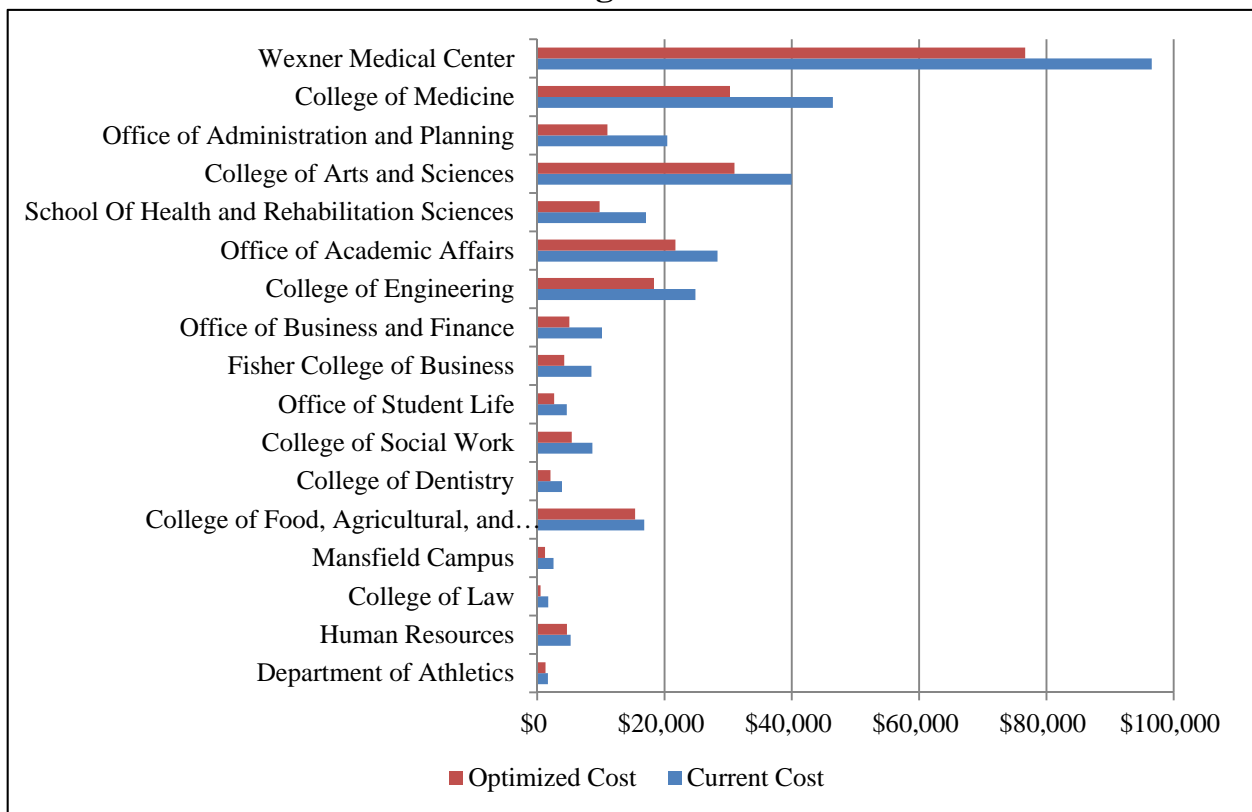
Source: OSU and ComDoc

As shown in **Chart 2-11**, areas that will experience the largest savings from consolidation follow a pattern similar to the overall expenditures and overall page production. The area with the largest single savings opportunity is the Wexner Medical Center, with $19,888, or 20.7 percent, of the total savings. In total, the University could save $96,234 by consolidating co-located copiers.

Co-Located Copier and Printer Optimization

In addition to consolidating co-located copiers, the University can benefit from consolidating co-located on-program printers with those copiers. Co-locations with printers and copiers are relatively rare throughout the university; however, each page of B&W and color printer production that can be shifted to a copier will result in a savings of $0.0025 and $0.035, respectively.

Table 2-6 shows a count of co-locations with copiers and printers, the amount of B&W and color pages, the manufacturer's recommended utilization, and total cost for FY 2016-17. Identifying co-located copiers and printers can help identify opportunities for consolidation.

Table 2-6: Copier and Printer Co-Locations

Copiers								
Area	**Locations**	**B&W**	**Color**	**Prepaid**	**%**	**Recommended**	**%**	**Cost**
Wexner Medical Center	13	341,468	12,163	344,760	99.0%	1,866,000	19.0%	$14,872
Lima Campus	4	614,624	27,517	358,000	171.7%	2,052,000	31.3%	$13,053
College of Medicine	3	21,537	7,658	39,000	55.2%	312,000	9.4%	$2,997
Total	**20**	**977,629**	**47,338**	**741,760**	**131.8%**	**4,230,000**	**24.2%**	**$30,921**

Printers								
Area	**Locations**	**B&W**	**Color**	**Prepaid**	**%**	**Recommended**	**%**	**Cost**
Wexner Medical Center	13	439,080	9,533	N/A	N/A	N/A	N/A	$6,079
Lima Campus	4	147,869	6,469	N/A	N/A	N/A	N/A	$1,764
College of Medicine	3	16,951	0	N/A	N/A	N/A	N/A	$350
Total	**20**	**603,900**	**16,002**	**N/A**	**N/A**	**N/A**	**N/A**	**$8,193**
							Total	**$39,114**

Source: OSU and ComDoc

As shown in **Table 2-6**, there are a total of 20 locations with co-located copiers and printers. The Wexner Medical Center is the area with the largest number of co-located copiers and printers, with 13 locations, or 65.0 percent of the total. Overall, co-located printers and copiers produced over 1.58 million B&W pages and 63,340 color pages, at a total cost of $39,114.

Table 2-7 shows the results of optimizing copiers and printers through consolidation.

Table 2-7: Savings from Copier and Printer Co-Location Optimization

Area	Current Printing Cost	Current Copier Cost	Current Total	Optimized Total	Savings
Wexner Medical Center	$6,079	$14,872	$20,950	$18,955	$1,995
Lima Campus	$1,764	$13,053	$14,817	$14,582	$234
College of Medicine	$350	$2,997	$3,347	$3,086	$261
Total			**$39,114**	**$36,624**	**$2,490**

Source: OSU and ComDoc

As shown in **Table 2-7**, consolidating printers with co-located copiers will save a total of $2,490.

Summary Results of Co-Location Optimization Analysis

Table 2-8 shows the summary results of co-located consolidation and optimization, including the number of prepaid B&W pages, number of unused prepaid B&W pages, and number of devices that can be eliminated. Furthermore, the total savings available to the University through co-located consolidation and optimization is also shown. This analysis is important in that it shows the impact that this change can have on the previously identified unused prepaid B&W pages, but also the impact that it can have on the total number of on-program copiers. Specifically, the ComDoc agreement allows the University to terminate active leases for up to 250 on-program copiers per year and co-located consolidation and optimization is one meaningful way to do so while increasing efficiency and generating cost savings.

Table 2-8: Summary Results of Co-Located Optimization

FY 2016-17 Underutilized Copiers Overview	
Total Underutilized Copiers	1,279
Total Prepaid B&W Pages	65,511,400
• Used – Prepaid B&W Pages	30,143,060
• Unused – Prepaid B&W Pages	35,368,340
Impact of Co-Located Optimization	
Copiers Eliminated	65
Prepaid B&W Pages Eliminated	4,115,700
Unused Prepaid B&W Pages Eliminated	1,723,009
Total Cost Savings from Co-Located Optimization	**$98,724**
Remaining Underutilized Copiers Overview	
Remaining Copiers Available to Eliminate (Up to 250 Total per Year)	185
Remaining Total Prepaid B&W Pages	61,395,700
• Remaining Used – Prepaid B&W Pages	30,143,060
• Remaining Unused – Prepaid B&W Pages	31,252,640

Source: OSU and ComDoc

As shown in **Table 2-8**, co-located device consolidation and optimization could result in elimination of more than 4.1 million unused prepaid B&W pages and 65 copiers with a total cost savings of $98,700. However, even after these changes, the University would still have more than 31.3 million unused prepaid B&W pages and 1,214 remaining underutilized copiers. As previously noted, the University can terminate leases and eliminate up to 250 on-program copiers per year. Therefore, additional cluster-based and floor-wide analyses are necessary to assess which copiers are optimal to prioritize for elimination.

Cluster-Based Consolidation and Optimization

In addition to analyzing co-located devices, another potential opportunity to optimize copying and printing resources is to examine copiers and printers by clusters (i.e.; devices which are in close proximity but not necessarily in the same room). Cluster analysis could be especially beneficial for reducing printing costs because each B&W printer page costs $0.065 whereas the

same page produced by a copier will cost $0.0075. In addition, a cluster analysis can help reduce the amount of prepaid but underused B&W printer pages.

Exhibit 2-4 shows a cluster analysis of the first floor of Hagerty Hall to include B&W pages, color pages, and the percent of the prepaid pages and manufacturer's recommendation used by copiers. A cluster analysis can identify additional opportunities for device consolidation.

Exhibit 2-4: Hagerty Hall First Floor Clusters
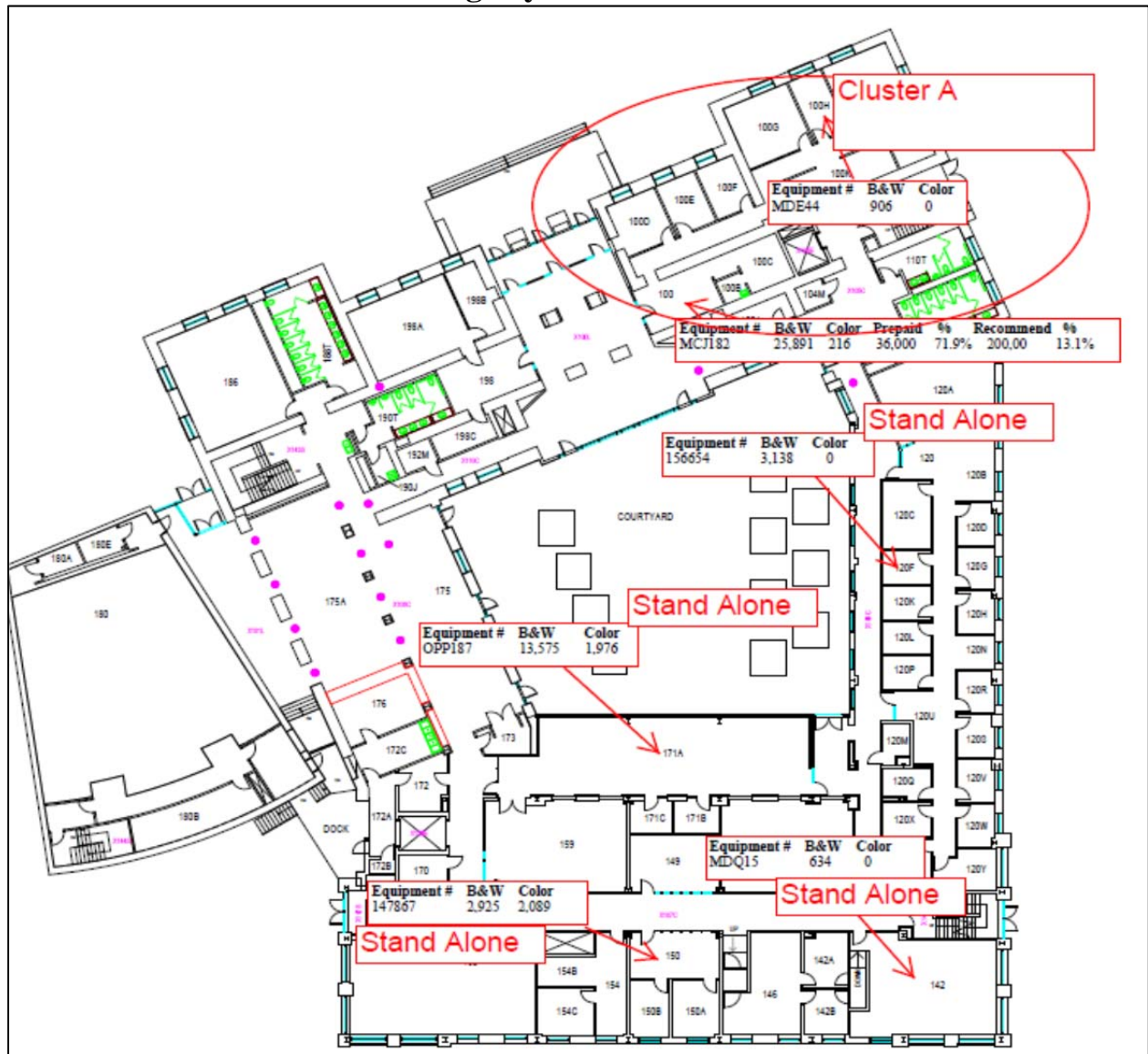
Source: OSU and ComDoc

As shown in **Exhibit 2-4**, there is a cluster on the first floor, including one printer and one copier. For FYTD[19] 2017-18, Cluster A produced a total of 26,797 B&W and 216 color pages.

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[19] FYTD 2017-18 data is complete as of April 30, 2018, the most up-to-date information available as of the completion of this analysis.

Exhibit 2-5 show a cluster analysis of the second floor of Hagerty Hall to include B&W pages, color pages, and the percent of the prepaid pages and manufacturer's recommendation used by copiers. A cluster analysis can identify additional opportunities for device consolidation.

Chart 2-5: Hagerty Hall Second Floor Clusters

Equipment #	B&W	Color	Prepaid	%	Recommend	%
MCF124	171,875	0	180,000	95.5%	1,250,000	13.8%
MCF125	104,249	0	180,000	57.9%	1,250,000	8.3%

Equipment #	B&W	Color	Prepaid	%	Recommend	%
MCH103	217,158	0	180,000	120.6%	1,250,000	17.4%
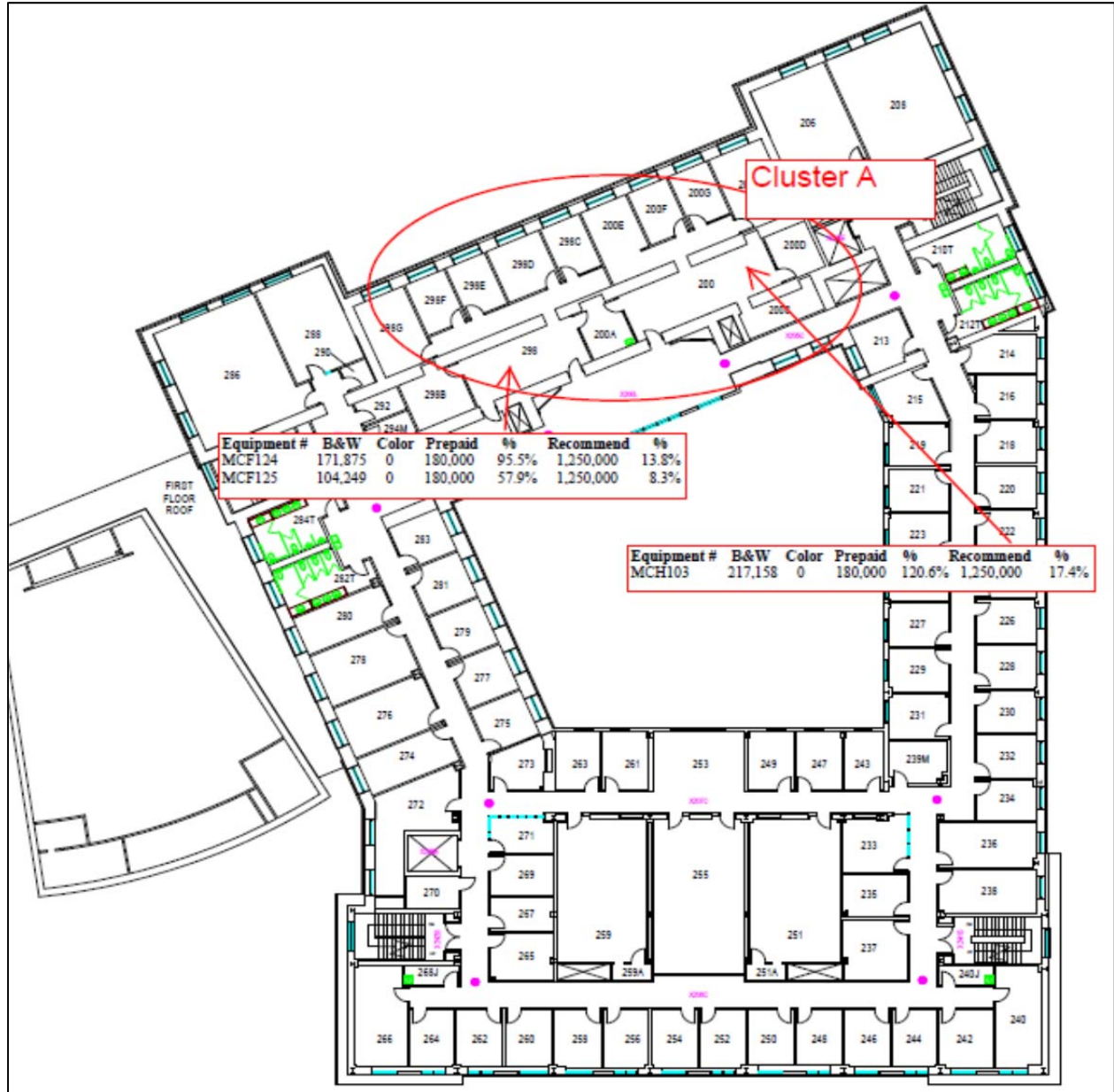
Source: OSU and ComDoc

As shown in **Exhibit 2-5**, there is one cluster on the second floor, including three copiers. For FYTD 2017-18, the cluster produced 493,282 B&W pages.

Exhibit 2-6 show a cluster analysis of the third floor of Hagerty Hall to include B&W pages, color pages, and the percent of the prepaid pages and manufacturer's recommendation used by copiers. A cluster analysis can identify additional opportunities for device consolidation.

Exhibit 2-6: Hagerty Hall Third Floor Clusters
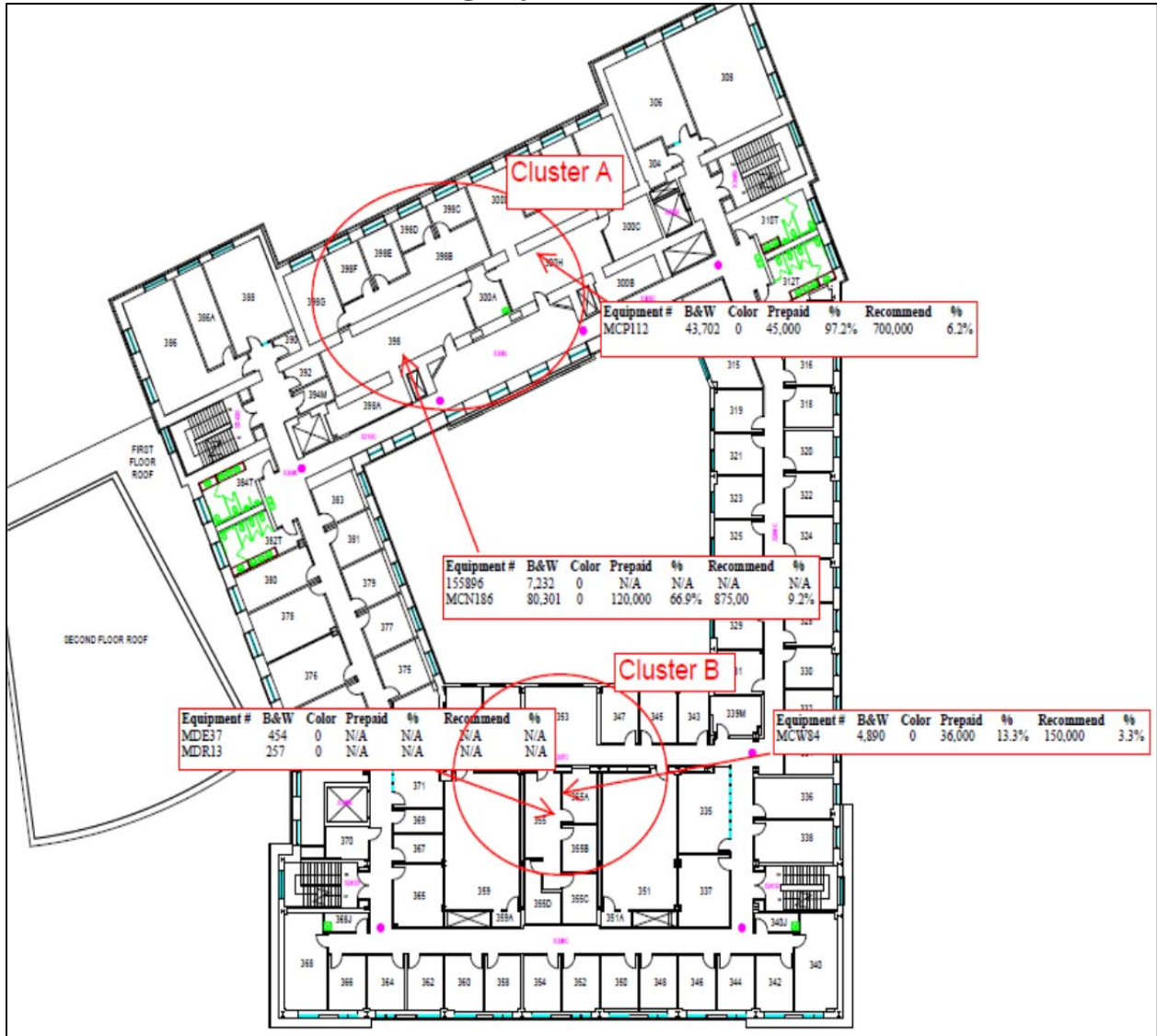
Source: OSU and ComDoc

As shown in **Exhibit 2-6**, there are two clusters on the third floor, including three copiers and three printers. For FYTD 2017-18, Cluster A produced a total of 131,235 B&W pages and no color pages and Cluster B produced a total of 5,601 B&W pages.

Exhibit 2-7 show a cluster analysis of the fourth floor of Hagerty Hall to include B&W pages, color pages, and the percent of the prepaid pages and manufacturer's recommendation used by copiers. A cluster analysis can identify additional opportunities for device consolidation.

Exhibit 2-7: Hagerty Hall Fourth Floor Clusters
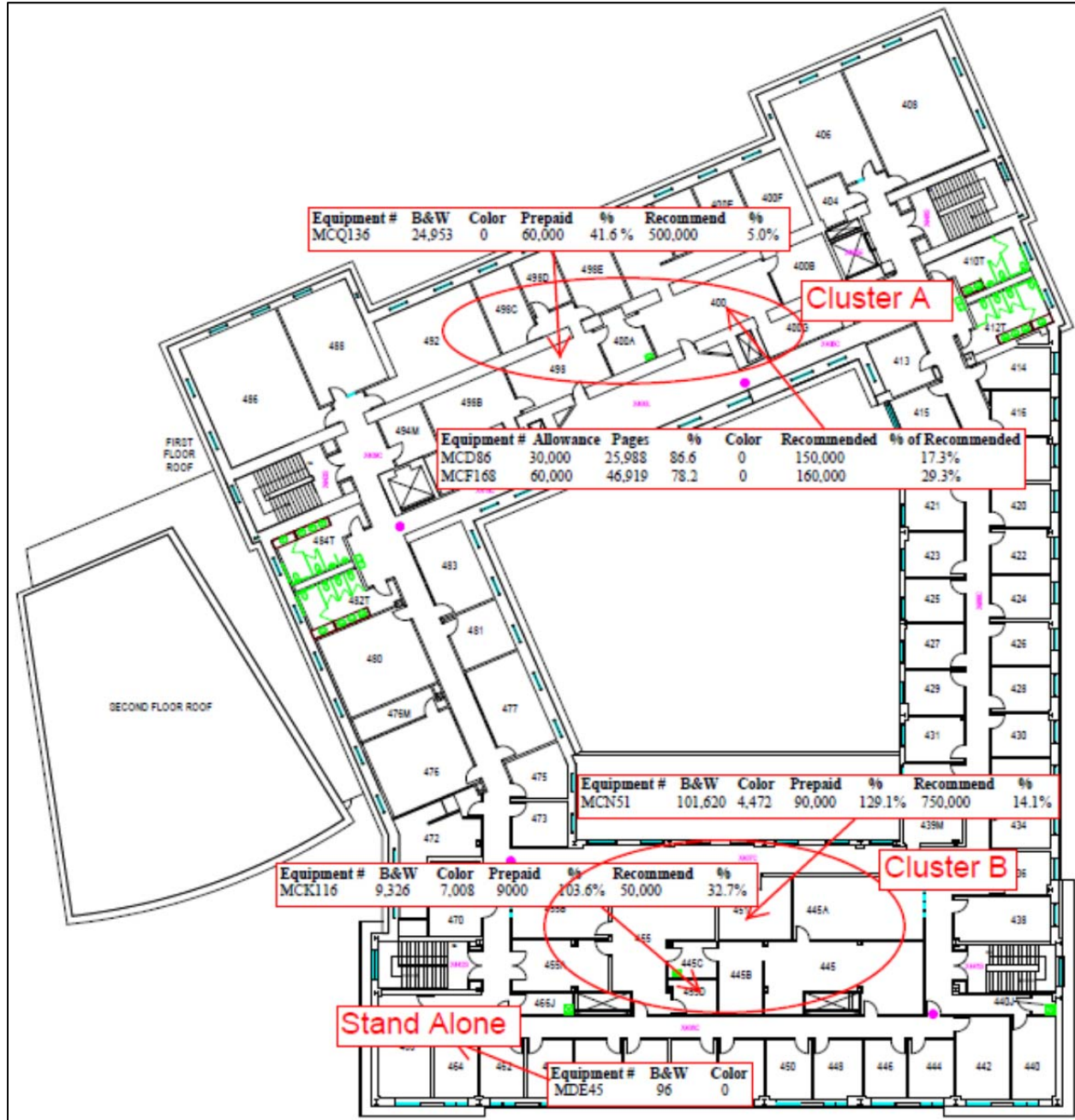
Source: OSU and ComDoc

As shown in **Exhibit 2-7**, there are two clusters on the fourth floor, including five copiers. For FYTD 2017-18, Cluster A produced a total of 97,860 B&W and Cluster B produced a total of 110,946 B&W pages and 11,480 color pages.

Table 2-9 shows the number of clusters in Hagerty Hall, devices within each cluster, device performance measured by page production, and cost. Examining clusters based on page performance is one way to identify opportunities for improved efficiency.

Table 2-9: Hagerty Hall Devices

Devices							
Floor	Clusters	Clustered Copiers	Clustered Printers	Stand-Alone Copiers	Stand-Alone Printers	Total Devices	
1	1	1	1	0	4	6	
2	1	3	0	0	0	3	
3	2	3	3	0	0	6	
4	2	2	0	0	1	3	
Total	**6**	**9**	**4**	**0**	**5**	**18**	

Clustered Pages							
Floor	Device Type	B&W Prepaid	B&W Pages	Prepaid Utilization	Color	Recommended	% of Recommended
1	Copier	36,000	25,891	71.9%	216	150,000	17.4%
1	Printer	N/A	906	N/A	0	N/A	N/A
3	Copier	540,000	493,282	91.3%	0	2,812,500	17.5%
3	Printer	N/A	7,943	N/A	0	N/A	N/A
4	Copier	226,500	208,697	92.1%	11,480	1,087,500	20.2%
4	Printer	N/A	N/A	N/A	N/A	N/A	N/A
Total	**N/A**	**802,500**	**736,719**	**N/A**	**11,696**	**4,050,000**	**13.0%**

Clustered Cost						
Floor	Device Type	Base Cost	Color Cost per Page	B&W Cost per Page	B&W Overage Pages	Total Device Cost
1	Copier	$1,812.20	$0.065	$0.0075	74,620	$2,386
1	Printer	N/A	$0.100	$0.0100	N/A	N/A
3	Copier	$4,411.29	$0.065	$0.0075	9,463	$4,482
3	Printer	N/A	$0.100	$0.0100	N/A	N/A
4	Copier	$7,280.58	$0.065	$0.0075	34,959	$8,289
4	Printer	N/A	$0.100	$0.0100	N/A	N/A
					Total	**$15,157**

Source: OSU and ComDoc

As shown in **Table 2-9**, each cluster with a copier in Hagerty Hall is well below the recommended utilization production for each device type. Overall, the recommended utilization percentage is 13.0 percent. In total, all devices in Hagerty Hall spent $15,157 in page production for copiers and printers.

Table 2-10 shows the results of copier consolidation for the clusters in Hagerty Hall. Clusters were included if copier consolidation was shown to be cost beneficial based on preliminary

analysis. Considering the potential performance improvements and cost reductions from consolidation is one method to gauge the potential opportunities from consolidation.

Table 2-10: Hagerty Hall Cluster-Based Copier Consolidation

Current State			
Floor/Cluster	**2/A**	**3/A**	**4/A**
Total Copiers	3	2	2
Total Copiers Cost	$8,897	$3,103	$2,790
B&W Prepaid Utilization	91.3%	75.2%	76.7%
Recommended Utilization	17.5%	10.5%	18.6%
Future State			
Floor/Cluster	**2/A**	**3/A**	**4/A**
Total Copiers	1	1	1
Eliminated Copiers	2	1	1
B&W Prepaid Utilization	274.0%	275.6%	162.9%
Utilization Gain/(Loss)	182.7%	200.4%	86.3%
Recommended Utilization	39.5%	17.7%	19.6%
Utilization Gain/(Loss)	21.20%	7.2%	0.9%
Total Cost	$5,129	$1,679	$1,395
Cost Savings	$3,768	$1,424	$1,395
Total Cost Savings for Copier Consolidation			**$6,587**

Source: OSU and ComDoc

As shown in **Table 2-10**, there are opportunities for copier consolidation in the three clusters shown. Overall, consolidation by cluster could eliminate four devices, a reduction equal to 57.1 percent. This consolidation may increase prepaid utilization by between 86.3 percent in cluster 4/A, and 200.4 percent in cluster 3/A, resulting in a device reduction that could reduce overall copier expenditures by **$6,587**.

Table 2-11 shows opportunities for copier and printer consolidation for Hagerty Hall. Clusters were included if printer and copier consolidation was shown to be cost beneficial based on preliminary analysis. Consolidating printers and copiers in the same cluster could provide additional opportunities for efficiency improvements.

Table 2-11: Hagerty Hall Cluster-Based Copier and Printer Consolidation

Current State			
Floor/Cluster	**3/A**	**1/A**	**3/B**
Total Copiers	2	1	1
Total Printers	1	1	1
Total Copiers Cost	$3,103	$1,826	$1,379
Total Printer Cost	$72.32	$9.06	$7.11
Combined Total Cost0	$3,176	$1,835	$1,386
B&W Prepaid Utilization	91.3%	71.9%	13.6%
Recommended Utilization	17.5%	17.4%	3.3%
Future State			
Floor/Cluster	**3/A**	**1/A**	**3/B**
Total Copiers	1	1	1
Eliminated Copiers	1	0	0
Eliminated Printers	1	1	1
B&W Prepaid Utilization	291.6%	74.4%	15.6%
Utilization Gain/(Loss)	200.3%	2.5%	2.0%
Recommended Utilization	18.7%	13.4%	3.7%
Utilization Gain/(Loss)	1.2%	(4.0)%	0.5%
Total Cost	$1,734	$1,833	$1,384
Cost Savings	$1,442	$2.28	$1.78
Total Cost Savings for Consolidating Printers and Copiers			**$1,446**

Source: OSU and ComDoc

As shown in **Table 2-11**, there are opportunities for copier consolidation in the three clusters shown. Overall, consolidation by cluster could eliminate four devices, a reduction equal to 57.1 percent. This device reduction could reduce overall page production expenditures by $1,446, or 9.5 percent and could increase prepaid utilization by between 2.0 percent in cluster 3/B, and 200.3 percent in cluster 3/A.

Table 2-12 shows the number of clusters in Denney Hall, devices within each cluster, device performance measured by page production and cost. Examining clusters based on page performance is one way to identify opportunities for improved efficiency.

Table 2-12: Denney Hall Devices

Devices						
Floor	Clusters	Clustered Copiers	Clustered Printers	Stand-Alone Copiers	Stand-Alone Printers	Total Devices
1	2	5	31	1	0	37
3	0	0	0	1	0	1
4	1	2	4	0	0	6
5	0	0	0	1	0	1
Total	**3**	**7**	**35**	**3**	**0**	**45**

Clustered Pages							
Floor	Device Type	B&W Prepaid	B&W Pages	Prepaid Utilization	Color	Recommended	% of Recommended
1	Copier	63,800	39,713	62.2%	4,051	454,500	9.6%
1	Printer	N/A	32,990	N/A	3,601	N/A	N/A
4	Copier	80,000	53,518	66.9%	0	562,500	9.5%
4	Printer	N/A	9,639	N/A	3,257	N/A	N/A
Total	**N/A**	**143,800**	**135,860**	**N/A**	**10,909**	**1,017,0000**	**14.4%**

Clustered Cost						
Floor	Device Type	Base Cost	Color Cost per Page	B&W Cost per Page	B&W Overage Pages	Total Device Cost
1	Copier	$4,219.10	$0.065	$0.0075	13,876	$4,586
1	Printer	N/A	$0.100	$0.0100	N/A	$690
4	Copier	$1,668	$0.065	$0.0075	0	$1,668
4	Printer	N/A	$0.100	$0.0100	N/A	$422
Total	**N/A**	**N/A**	**N/A**	**N/A**	**13,876**	**$7,366**

Source: OSU and ComDoc

As shown in **Table 2-12**, each cluster with a copier in Denney Hall is well below the recommended utilization production for each device type. Overall, the recommended utilization percentage is 14.4 percent with expenditures for all devices in Denney Hall, totaling $7,366 in page production for copiers and printers.

Table 2-13 shows opportunities for copier and printer consolidation for Denney Hall. Clusters were included if printer and copier consolidation was shown to be cost beneficial. Consolidating printers and copiers in the same cluster could provide additional opportunities for efficiency improvements.

Table 2-13: Denney Hall Cluster-Based Printer and Copier Consolidation

Current State			
Floor/Cluster	**1/A**	**4/A**	**1B**
Total Copiers	4	2	1
Total Printers	24	4	1
Total Copiers Cost	$4,387	$1,668	$200
Total Printer Cost	$228	$422	$463
Combined Total Cost0	$4,614	$2,090	$663
B&W Prepaid Utilization	63.3%	66.9%	45.4%
Recommended Utilization	9.8%	9.5%	7.3%
Future State			
Floor/Cluster	**1/A**	**4/A**	**1B**
Total Copiers	1	1	1
Eliminated Copiers	3	1	0
Eliminated Printers	24	4	1
B&W Prepaid Utilization	675.9%	157.9%	329.8%
Utilization Gain/(Loss)	612.6%	91.0%	284.4%
Recommended Utilization	101.4%	22.5%	52.8%
Utilization Gain/(Loss)	91.6%	12.9%	45.5%
Total Cost	$1,909	$1,219	$511
Cost Savings	$2,705	$871	$152
		Total	**$3,727**

Source: OSU and ComDoc

As shown in **Table 2-13**, opportunities exist for copier consolidation in three clusters. Overall, consolidation by cluster could eliminate four copiers, a reduction equal to 57.1 percent, which could increase prepaid utilization by between 12.9 percent in cluster 4/A, and 91.6 percent in cluster 1/A. In addition, device reduction could reduce overall page production expenditures by **$3,727**.

Table 2-14 shows the number of clusters in Dreese Labs, devices within each cluster, device performance measured by page production, and cost. Examining clusters based on page performance is a method of identifying opportunities for improved efficiency.

Table 2-14: Dreese Labs Devices

		Devices				
Floor	Clusters	Clustered Copiers	Clustered Printers	Stand-Alone Copiers	Stand-Alone Printers	Total Devices
2	1	2	1	0	0	4
3	0	0	0	1	0	1
7	0	0	0	0	3	3
Total	1	2	1	1	3	8

		Clustered Pages					
Floor	Device Type	B&W Prepaid	B&W Pages	Prepaid Utilization	Color	Recommended	% of Recommended
2	Copier	146,667	104,604	71.3%	0	937,500	11.2.%
2	Printer	N/A	433	N/A	168	N/A	N/A
Total	N/A	146,667	105,037	N/A	168	937,5000	11.2%

		Clustered Cost				
Floor	Device Type	Base Cost	Color Cost per Page	B&W Cost per Page	B&W Overage Pages	Total Device Cost
2	Copier	$2,779.20	$0.065	$0.0075	11,914	$2,869
2	Printer	N/A	$0.100	$0.0100	N/A	$21.13
Total	N/A	N/A	N/A	N/A	11,914	$2,890

Source: OSU and ComDoc

As shown in **Table 2-14**, each cluster with a copier in Dreese Labs is well below the recommended utilization production for each device type. Overall, the recommended utilization percentage is 11.2 percent. In total, all devices in Dreese Labs spent $2,890 in page production for copiers and printers.

Table 2-15 shows opportunities for copier and printer consolidation for Dreese Labs. Clusters were included if copier consolidation was shown to be cost beneficial. Consolidating printers and copiers in the same cluster could provide additional opportunities for efficiency improvements.

Table 2-15: Dreese Labs Cluster Based Copier Consolidation

Current State	
Floor/Cluster	2/A
Total Copiers	2
Total Copiers Cost	$2,869
B&W Prepaid Utilization	71.32%
Recommended Utilization	11.2%

Future State	
Floor/Cluster	2/A
Total Copiers	1
Eliminated Copiers	1
B&W Prepaid Utilization	130.8%
Utilization Gain/(Loss)	59.4%
Recommended Utilization	16.7%
Utilization Gain/(Loss)	5.6%
Total Cost	$1,574
Cost Savings	**$1,294**

Source: OSU and ComDoc

As shown in **Table 2-15**, opportunities for copier consolidation are evident in one cluster. Overall, consolidation by cluster could eliminate one copier, a reduction equal to 50.0 percent. In addition, device reduction could reduce overall page production expenditures by **$1,294**.

Table 2-16 shows the summary results of cluster based consolidation and optimization, including the number of prepaid B&W pages, number of unused prepaid B&W pages, and number of devices that can be eliminated. Total savings available to the University through cluster based consolidation is also shown.

Table 2-16: Total Savings from Cluster-Based Optimization

Remaining Underutilized Copiers After Co-Located Optimization [1]	
Remaining Underutilized Copiers	1,214
Remaining Copiers Available to Eliminate (Up to 250 Total per Year)	185
Remaining Total Prepaid B&W Pages	61,395,700
• Remaining Used – Prepaid B&W Pages	30,143,060
• Remaining Unused – Prepaid B&W Pages	31,252,640
Impact of Cluster-Based Optimization	
Copiers Eliminated	9
Prepaid B&W Pages Eliminated	517,867
Unused Prepaid B&W Pages Eliminated	191,098
Total Cost Savings from Cluster-Based Optimization	**$11,631**
Remaining Underutilized Copiers Overview	
Remaining Copiers Available to Eliminate (Up to 250 Total per Year)	176
Remaining Total Prepaid B&W Pages	60,877,833
• Remaining Used – Prepaid B&W Pages	30,143,060
• Remaining Unused – Prepaid B&W Pages	30,734,773

Source: OSU and ComDoc
[1] See **Table 2-8** for summary results of co-located optimization.

As shown in **Table 2-16**, cluster-based device consolidation and optimization, as applied in the three specific examples for Hagerty Hall, Denney Hall, and Dreese Labs, could result in elimination of more than 500,000 unused prepaid B&W pages and nine copiers with a total cost savings of $11,600. Even after these changes and the preceding changes from co-located optimization, the University would still have more than 30.7 million unused prepaid B&W pages and 1,205 remaining underutilized copiers. While the University has additional opportunity to analyze cluster-based opportunities across all remaining buildings, building-specific, floor-wide analysis is another way to assess which copiers are optimal to eliminate with the remaining 176 opportunities.

Floor-Wide Consolidation and Optimization Analysis

In addition to the co-located and cluster analyses shown above, the University may also benefit from taking a wider view of devices located on the same floor. Effectively, it could identify copiers based on underutilization and isolate opportunities to consolidate other devices on the same floor, with the goal of increasing utilization over fewer devices.

Consolidation can be one method to improve the efficiency of underutilized devices; however, not all devices with underused pages are good candidates for consolidation. For example, there may be devices that are stand alone or are in relatively isolated areas where there are not easily implementable opportunities for consolidation. There are, however, 300 devices that are located on a floor with other similar copiers and/or printers that could be potential candidates for consolidation.

Table 2-17 shows devices that are located on floors with other devices and may have potential opportunities for consolidation and optimization. This helps to illustrate the opportunity associated with rethinking the current printing model, primarily where devices are owned, operated, and used within an area or department, to a model where devices are a service available to all University areas and departments. Depending on the building, there may be multiple departments, even within the same area, sharing space on a single floor, but not sharing the on-program copiers and printers optimally within the same space.

Table 2-17: Underutilized Copiers Evaluated for Floor-Wide Optimization

Total Underutilized Copiers Evaluated for Floor-Wide Optimization	300
Total Prepaid B&W Pages	15,150,300
• Used – Prepaid B&W Pages	5,073,525
• Unused – Prepaid B&W Pages	10,076,775

Source: OSU and ComDoc

As shown in **Table 2-17**, this look at floor-wide consolidation and optimization opportunities encompasses 300 copiers with more than 15.1 million B&W prepaid pages and nearly 10.1 million unused prepaid B&W prepaid pages, or more than 66.5 percent of the total amount of prepaid pages.

In addition to budgetary barriers associated with the current printing environment, another potential barrier to floor-wide consolidation could be concerns about privacy. Currently, most copiers begin printing as soon as a job is sent to the device and the printed pages remain at the device until picked up by the user. It is also possible that even after a job is printed, the user may need to cancel the job for a number of reasons. In the current printing environment, because the job starts printing as soon as the user sends the job to the device, there may be a number of wasted pages actually printed. Finally, some print jobs are simply forgotten by the user and never picked up, resulting in a number of wasted pages.

In FY 2015-16, the Office of Chief Information Officer (OCIO) introduced a software package known as Pharos which allows for a service known as "Follow Me Printing". A key functionality of Follow Me Printing is that printing is directly tied to the user and the user must release the job before pages are produced. Another key feature is that a user is able to access the job from any Follow Me Printing-enabled device; a significant improvement in convenience for users that may print across multiple devices or across multiple floors or even buildings. Follow Me Printing effectively addresses privacy concerns as the user is responsible for directly releasing the job at the desired device, regardless of location. Finally, because it requires the user to release the job, it can also help reduce accidental or forgotten printing currently resulting in waste.

When implementing Follow Me Printing, the OCIO chose Mount Hall as a proof-of-concept. To date, Follow Me Printing in Mount Hall has directly achieved, or facilitated, the following results:

- **Data Security** – Follow Me Printing uses data encryption to protect secure data that may be transmitted through devices. Devices using Follow Me Printing also use encrypted hard drives and encrypt data in transmission to and from the device.
- **Device Reduction** – The number of devices decreased from 16 to nine, a net reduction of seven devices or 43.8 percent. This improvement was primarily associated with the floor-wide copier optimization made possible through consolidating OCIO employees into Mount Hall and implementing Follow Me Printing.
- **Page Reduction** – Follow Me Printing has also reduced wasted pages including overprints and accidental prints. In total, the OCIO reports an 11.0 percent overall reduction in the total number of pages produced.
- **Cost Reduction** – In FY 2015-16, the OCIO spent $49,750 for page production. This was reduced to $33,330 by FY 2017-18, a decrease of $16,420, or 33.0 percent. The upgraded technology had a one-time cost of $7,060 and an ongoing annual cost of $1,300. In total, the net financial impact of implementing Follow Me Printing in Mount Hall was $8,090 for the first year, or 16.2 percent. In addition, assuming similar performance in future years, the net savings would be $15,150 from the FY 2015-16 baseline, or 30.4 percent.

Currently, there are plans to roll-out Follow Me Printing to all customers of the OCIO's Managed IT services.

Floor-wide consolidation of B&W printer pages is one option for additional consolidation; however, consolidating copiers first and printer pages when possible could provide the option with the largest overall financial impact. **Table 2-18** shows the summary results of floor-wide consolidation, including the number of prepaid B&W pages, number of unused prepaid B&W pages, and number of devices that can be eliminated. Furthermore, the total savings available through floor-wide consolidation are also shown.

Table 2-18: Floor-Wide Copier and Printer Optimization

Remaining Underutilized Copiers After Co-Located and Cluster-Based Optimization [1]	
Remaining Underutilized Copiers	1,205
Remaining Copiers Available to Eliminate (Up to 250 Total per Year)	176
Remaining Total Prepaid B&W Pages	60,877,833
• Used – Prepaid B&W Pages	30,143,060
• Unused – Prepaid B&W Pages	30,734,773
Impact of Floor-Wide Copier Optimization	
Copiers Eliminated	176
Prepaid B&W Pages Eliminated	11,251,000
Unused Prepaid B&W Pages Eliminated	7,494,010
Sub-Total Cost Savings from Floor-Wide Copier Optimization	**$325,879**
Impact of Floor-Wide Printers Optimization	
Unused Prepaid B&W Pages Eliminated	1,412,235
Sub-Total Savings from Consolidating Unused Prepaid B&W Pages	$14,122
Sub-Total Savings from Consolidating Color Printing from Printers to Copiers	$61,011
Sub-Total Savings from Consolidating Additional B&W Pages to Copiers	$36,993
Sub-Total Cost Savings from Floor-Wide Printer Optimization	**$112,127**
Total Cost Savings from Floor-Wide Copier and Printer Optimization	**$438,006**
Remaining Underutilized Copiers Overview	
Remaining Copiers Available to Eliminate (Up to 250 Total per Year)	0
Remaining Total Prepaid B&W Pages	49,626,833
• Remaining Used – Prepaid B&W Pages	31,555,295
• Remaining Unused – Prepaid B&W Pages	18,071,538

Source: OSU and ComDoc

[1] See **Table 2-8** for summary results of co-located optimization and **Table 2-16** for summary results of cluster-based optimization.

As shown in **Table 2-18**, floor-wide consolidation and optimization of printers and copiers, could result in elimination of more than 12.6 million unused prepaid B&W pages, and the remaining 176 copiers, with a total cost savings of **$438,000**.

Summarized Consolidation and Optimization Impact

Table 2-19 shows the total results of implementing all opportunities for improved copier and printer consolidation and optimization.

Table 2-19: Summary of Copiers Eliminated and Savings

	Copiers Eliminated	Cost Savings Identified
Co-Located Optimization	65	$98,724
Cluster-Based Optimization	9	$11,631
Floor-Wide Optimization	176	$438,006
Total Results	**250**	**$548,361**

Source: OSU and ComDoc

As shown in **Table 2-19**, fully implementing co-located, cluster-based, and floor-wide consolidation could result in a savings of more than **$548,300.**

Conclusion: The University operates an average of over 2,200 copiers printing more than 134 million pages annually. In addition, the University produced over 50 million B&W pages on desktop printers. Desktop printers produce pages at a higher cost when compared to copiers. In addition, there are currently a high number of underutilized copiers and a significant number of unused prepaid B&W pages. Co-located, cluster-based, and floor-wide consolidation and optimization of underutilized devices is possible and technologies such as Follow Me Printing could achieve greater efficiency and cost savings.

Recommendation 2.1: OSU should reduce or eliminate on-program prepaid B&W copier pages that are currently underutilized. In doing so, the University should consider reducing the total number of underutilized copiers and also reducing the number of on-program printers and off-program printers. Shifting pages to fully utilize on-program copier leases will allow for higher volume, lower cost printing.

Financial Implication 2.1: OSU could save **$548,300** annually by consolidating and optimizing underutilized copiers and printers.

Additional Consideration

The preceding analysis, conclusion, and recommendation, as well as those included in **R2.2**, provide data-driven options to significantly reduce the overall cost of OSU's document management services. Collectively, underutilized copiers, unused prepaid B&W pages, and inefficient cost per page all represent a very real cost to the University. Due to the current state of the University's operational and budgetary structure, however, it may be difficult to achieve the efficiency and financial gains identified in this performance audit. Areas, or even departments or units within the areas, are currently making independent decisions on purchasing and operating off-program and on-program printers, and although working through Uniprint to inform decision making, are largely doing the same for on-program copiers. There are very real budgetary considerations since current state devices are organized around an ownership model, but future state consolidation is largely predicated on an efficient service delivery model

regardless of ownership. While it is possible for areas and departments to cost share at the device level, doing so may be an unnecessary barrier to timely, efficient consolidation and optimization.

An alternative service model already exists with Follow Me Printing. Under this model, document management is organized as a true fee-for-service where areas effectively subscribe to and receive printing services. In turn, these services can be allocated in an efficient and effective manner for all users across the University. Although implementation of this alternative service model is not technically necessary to achieve the results identified in this performance audit, it could facilitate a quicker, smoother, and more cost-effective transition to the future state and may also unlock additional opportunities for increased efficiency.

Issue for Further Study

The University's contract with ComDoc was signed on January 1, 2016 and will be in effect until December 31, 2023. As shown in this section of analysis, the University had 35.4 million unused prepaid B&W pages in FY 2016-17. Even after implementation of **R2.1** and **R2.2** the University would still have as many as 18.1 million unused prepaid B&W pages. Given that the monthly prepaid B&W allocation is the key service function and primary cost parameter, it is possible that the current structure of the contract and its subsequent leases may lead to a misalignment of efficiency and effectiveness as the service is delivered. Therefore, OSU should further study if there are opportunities to seek to renegotiate with ComDoc to bring efficiency and effectiveness into alignment without compromising service requirements such as reliability and security. One such opportunity could be to explore the potential of a University-wide page allocation with a fixed cost rather than the current state of more than 2,000 individual copier leases, all with separate page allocations and costs.

R2.2 Off-Program Printing

Background

All OSU on-program copiers and printers have toner supplied by UniPrint/ComDoc. In contrast, off-program printers, which are directly owned and operated within the areas, require ink and toner which must be purchased by the area. When purchasing directly, individuals can choose to purchase ink and toner through the University's eStore system, which is supplied through pre-negotiated contracts with Staples, Inc.; Computer Discount Warehouse (CDW); and ComDoc, Inc. In addition, areas may also purchase off-contract from other suppliers due to convenience or preference.

The nature of off-program printing makes detailed analysis challenging. There is no central tracking of exact page production or location of individual devices. However, data is available on off-program toner purchases. **Chart 2-12** shows toner spend in FY 2014-15 through FYTD 2017-18.[20] Toner spend can be used as a proxy to measure the magnitude of off-program printing.

Chart 2-12: Off-Program Toner Spend
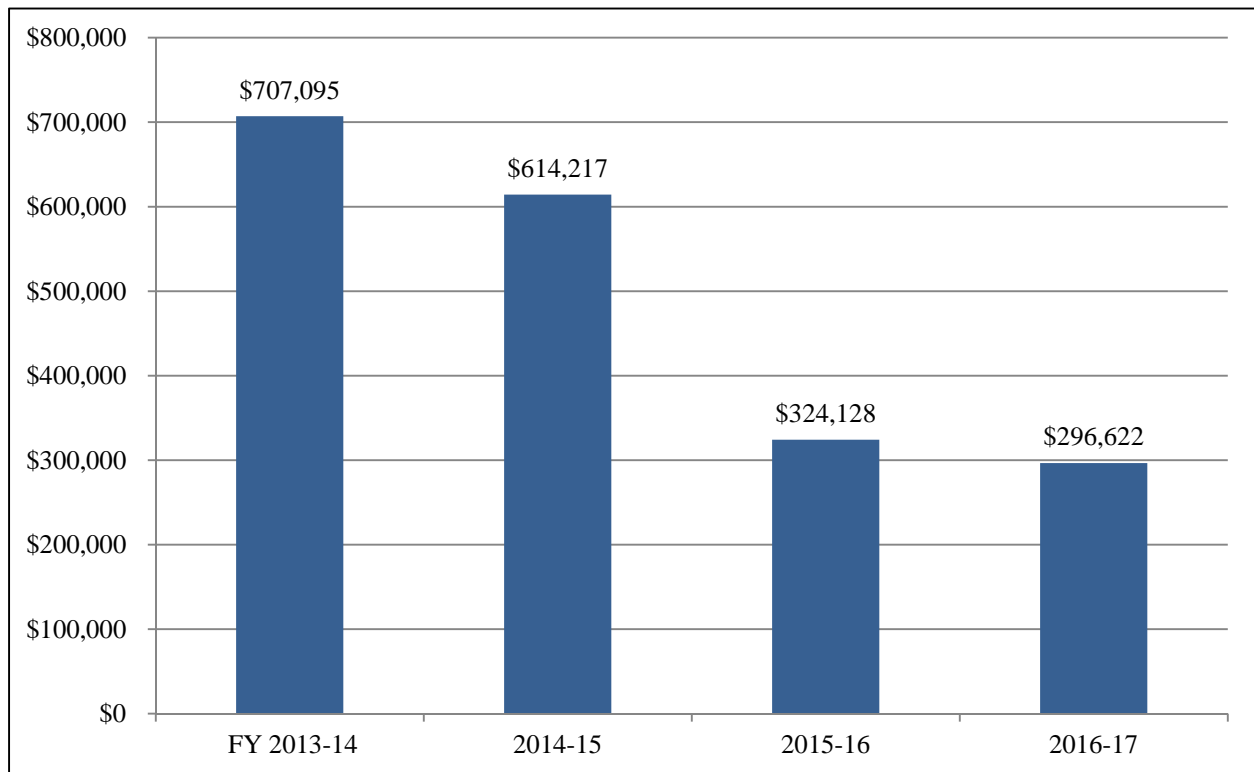
Source: OSU and ComDoc

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[20] FYTD 2017-18 data is complete as of April 30, 2018, the most up-to-date information available as of the completion of this analysis.

As shown in **Chart 2-12,** off-program toner spending has declined significantly in the four year period shown. In total, off-program spending decreased from $707,095 in FY 2014-15 to $296,622 in FY 2016-17, a decrease of $410,473, or 58.1 percent. The decrease was a result of University areas switching to on-program printers and copiers.

When purchases are made outside of the preferred vendor contract, there is no comprehensive ability to track the detailed spending (e.g., type of ink and toner purchased, quantity, and cost) due to current accounting and purchasing systems limitations. However, purchases made using the preferred vendor contract are able to be tracked.

Chart 2-13 shows toner spend by area for FYTD 2017-18. Displaying toner spend in this manner can help highlight the opportunity for further improvements in efficiency.

Chart 2-13: Off-Program Toner Spend by Area
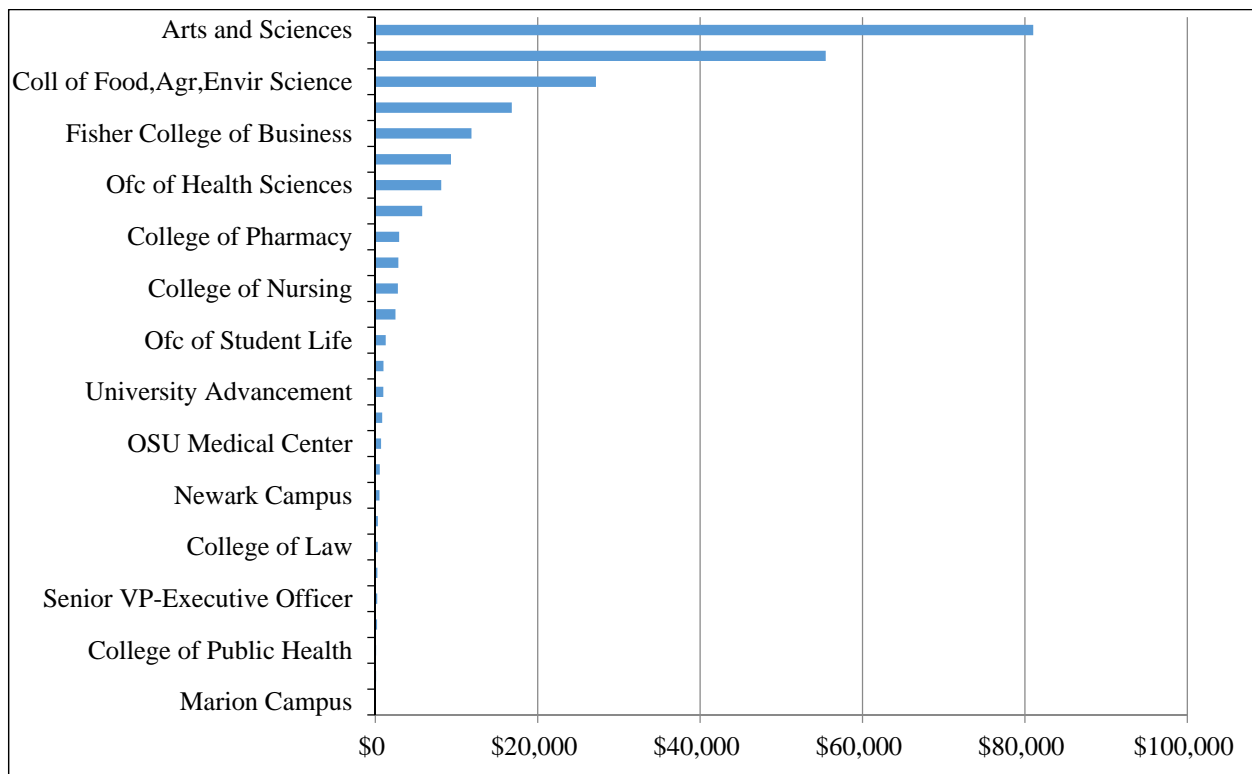
Source: OSU

As shown in **Chart 2-13**, off-program toner spend follows a similar pattern to other categories of printer and copier related spending and page production, with the top 10 areas responsible for $221,375, or 94.5 percent, of the FYTD 2017-18 spend.

Methodology

This sub-section, **Off-Program Printing**, seeks to analyze the utilization of off-program printers. During the planning and scoping phase of the performance audit, University leadership identified this as a possible area where an objective analysis could identify opportunities for improved efficiency.

Analysis focused on the utilization rate for off-program copiers. Data was gathered from UniPrint and purchasing from FY 2017-18. When necessary, University and operations staff provided additional testimonial evidence to explain the copier billing and data collection system as well as the day-to-day operations of Uniprint.

Off-program printing was analyzed by calculating a cost per page of off-program page production. The cost per page was calculated by taking the purchase cost of the toner and dividing by the number of pages expected to be produced on a given toner cartridge. This cost-per-page was then compared to the alternative, such as using a printer on the Uniprint contract.

Analysis

In addition to consolidating printers and copiers, there could be an additional opportunity to increase efficiency by further consolidating off-program printing onto on-program printers or copiers.

The nature of off-program printing makes it impossible for the University to track exact page production and cost per page in the same manner that it can be tracked for on-program printing. The amount of toner spend can serve as a useful, though less exact, proxy for number of pages printed. Based on desktop laser printers commonly purchased across the University, an efficient desktop printer is able to produce B&W pages at a cost of $0.0239 per page. This is a relatively low cost in comparison to less efficient desktop laser printers that can be $0.05 or more per page, or desktop inkjet printers that can be even more expensive. Efficient off-program desktop laser printing, however, still compares unfavorably to on-program; costing between $0.01 per page for on-program printers and on-program copiers, which charge $0.0075 per page of B&W overage, but typically have substantial unused prepaid B&W pages.

Table 2-21 shows a comparison between the FYTD 2017-18 costs of off-program toner purchase and the cost that would have been incurred if the same number of pages were produced on an on-program printer.

Table 2-21: Shifting from Off-program to On-program

Area	Current	Shift to UniPrint	Difference
College of Arts and Sciences	$81,040	$33,965	$47,075
College of Engineering	$55,476	$23,251	$32,225
College of Food, Agriculture and Environmental Science	$27,170	$11,387	$15,783
College of Medicine	$16,816	$7,048	$9,768
Fisher College of Business	$11,848	$4,966	$6,883
Office of Academic Affairs	$9,326	$3,909	$5,417
Office of Health Sciences	$8,126	$3,406	$4,720
College of Education & Human Ecology	$5,786	$2,425	$3,361
College of Pharmacy	$2,942	$1,233	$1,709
John Glenn College Public Affairs	$2,845	$1,192	$1,652
College of Nursing	$2,791	$1,170	$1,621
Office of Business and Finance	$2,483	$1,041	$1,442
Office of Student Life	$1,281	$537	$744
College of Veterinary Medicine	$1,019	$427	$592
Office of the President	$845	$354	$491
Wexner Medical Center	$719	$301	$418
College of Social Work	$555	$233	$323
Newark Campus	$516	$216	$300
College of Dentistry	$332	$139	$193
College of Law	$312	$131	$181
Athletics	$260	$109	$151
Senior VP-Executive Officer	$237	$99	$138
Office of Government Affairs	$225	$94	$131
College of Public Health	$106	$45	$62
Board of Trustees	$101	$42	$59
Marion Campus	$52	$22	$30
Totals	**$234,210**	**$97,741**	**$136,469**

Source: OSU

As shown in **Chart 2-21**, each area with off-program toner spend would benefit from shifting to on-program printing. In total, the University could save more than **$136,400** by shifting all off-program toner spend to on-program printers.

Conclusion: The University uses a number of methods to procure printing services, including a contract with ComDoc and through the purchase of printers and toner outside the ComDoc contract. For FYTD 2017-18, the University has purchased over $200,000 worth of toner for use in off-program printers. Off-program printing can result in a cost per page that is higher than alternative, on-program, page production options, and there could be significant savings from shifting to on-program printing.

Recommendation 2.2: OSU should shift off-program desktop printing to on-program copiers. Doing so would allow for cost avoidance of off-program printing, but also improved utilization of on-program leases and elimination of additional unused prepaid B&W pages. However, if the University is not fully able to do so, it should, at minimum, shift to on-program desktop printing. Doing so can reduce the overall cost of page production as well as allow the University to better track page production.

Financial Implication 2.2: OSU could save **$136,400** annually by shifting off-program desktop printing to on-program printing.

3. Shared Services – Current State Process

Section Overview

This section of the performance audit focuses on Shared Services at The Ohio State University (OSU or the University). Specifically, the "recruit-to-hire", PCard transaction, and travel reimbursement processes were analyzed to identify opportunities for improved efficiency and effectiveness.

The **Shared Services - Current State Process** section is divided into two sub-sections of analysis, each analyzing a distinct area of shared services, including:
- **Human Resources:** The first sub-section analyzes how the University could increase the efficiency of its recruit-to-hire process through the standardization of process steps among several areas within the University.
- **Finance:** The second sub-section analyzes how the University could increase the efficiency of two processes, PCard transactions and travel reimbursement payments, through the standardization of process steps among several areas within the University.

Recommendation Overview

Recommendation 3.1: OSU should develop and deploy a consistent, efficient, and effective process for recruit-to-hire that is uniformly enacted across all areas. In doing so, the University should ensure that the uniform process is reinforced by a single, end-to-end system while eliminating the current array of disconnected, and sometimes area specific, systems. However, prior to deploying the new process and system to support it, all University areas should collect standard data to inform the complete current state processes, ultimately allowing for a full measurement of the effectiveness and efficiency gains once the new process is implemented. Finally, the University should ensure that the new system has the capability to uniformly collect data that can be used for enterprise-wide performance measurement and management.

Financial Implication 3.1: OSU can retire several HR systems once Workday is implemented. Doing so could result in the opportunity to save or redirect more than **$1,204,400** annually based on just those systems directly involved with the recruit-to-hire process.[21]

Recommendation 3.2: OSU should develop and deploy a consistent, efficient, and effective process for PCard transaction approvals and travel reimbursement payments that are uniformly enacted across all areas. In doing so, the University should ensure that the uniform processes are reinforced by a single, end-to-end system while eliminating the current array of disconnected, and sometimes area specific, systems. Finally, the University should ensure that the new system has the capability to uniformly collect data that can be used for enterprise-wide performance measurement and management.

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[21] This annual impact is inclusive of the benefit that will result from retiring current systems, but is not inclusive of the cost of replacing those systems.

Financial Implication 3.2: OSU could realize efficiency gains and redirected savings of **$87,000** and **$276,100** annually by streamlining and implementing efficient processes that eliminate rework for PCards and travel reimbursement transactions, respectively. Furthermore, the University can retire several finance systems once Workday is implemented. Doing so could result in the opportunity to save or redirect more than **$1,713,200** annually based on just those systems directly involved with the PCard and travel reimbursement processes.[22] Collectively, improvements in these areas would allow the University to save or redirect more than **$2,076,300** annually.

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[22] This annual impact is inclusive of the benefit that will result from retiring current systems, but is not inclusive of the cost of replacing those systems.

Section Background

OSU carries out various administrative functions to fulfill the needs of the University. The University is organized into areas that each have distinct functions, including academic areas that report to the Provost, and administrative areas that report to the Chief Financial Officer (CFO) or the Senior Vice President for Human Resources (SVP HR). The Provost, CFO, and SVP HR report to the President, who, in turn, reports to the University Board of Trustees.

Chart 3-1 shows the high-level organizational structure of the University. This is important as it illustrates the relationships among the highest levels of the University, which affect the way that Human Resources and Finance activities are carried out.

Chart 3-1: Central University Organizational Structure
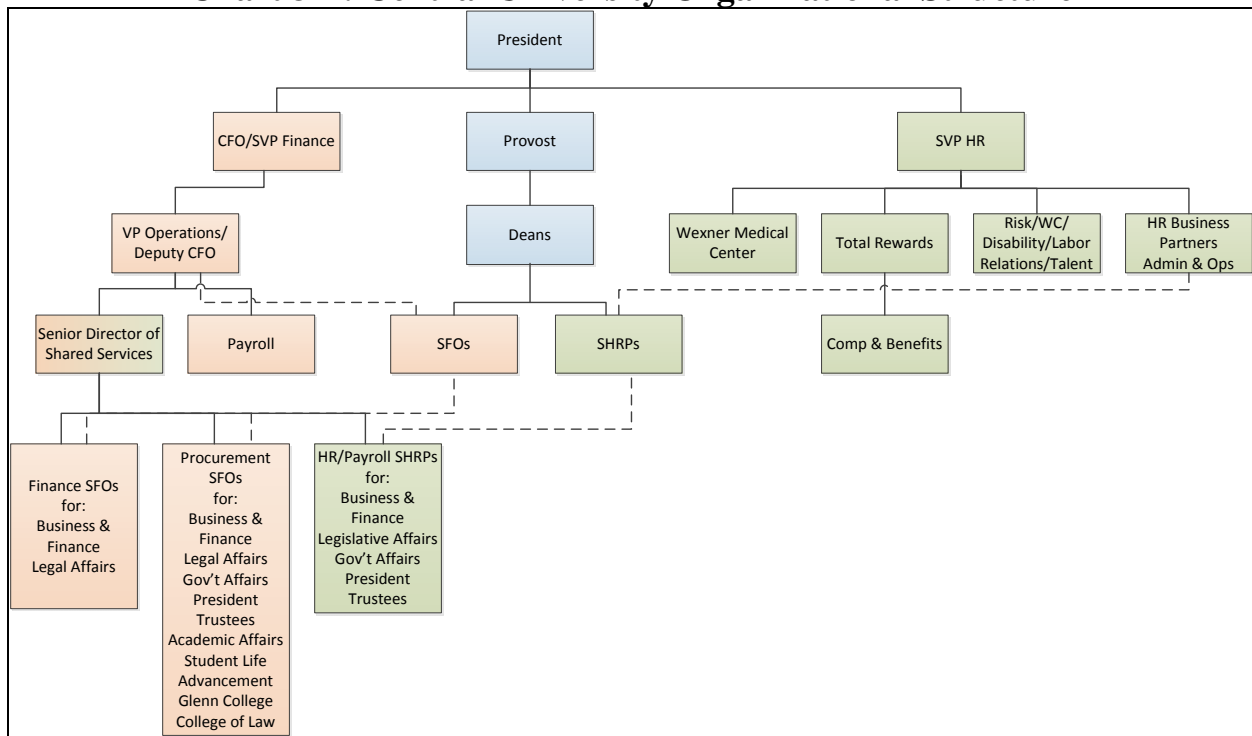
Source: OSU

As shown in **Chart 3-1**, the University's organizational structure is such that the deans of the colleges, or academic areas, have straight line authority over the area-specific Senior Fiscal Officers (SFOs) and Senior Human Resource Professionals (SHRPs). In general, each area employs an SFO and an SHRP; though, depending on the size of the area, this may be a role filled by the Dean, Director, or a Chief Administrative Officer (CAO), filling both roles. It is also possible that the SFO and SHRP may report to a CAO. Regardless of how each area is organized, the CFO and SVP HR do not have straight line authority over SFOs or SHRPs in academic areas, limiting their ability to mandate detailed processes carried out within these areas. Instead, academic areas maintain a general decentralized independence over administrative decisions.

Chart 3-2 shows an example of an organizational structure for a large college with a service center.

Chart 3-2: Example Organization for a College with a Service Center
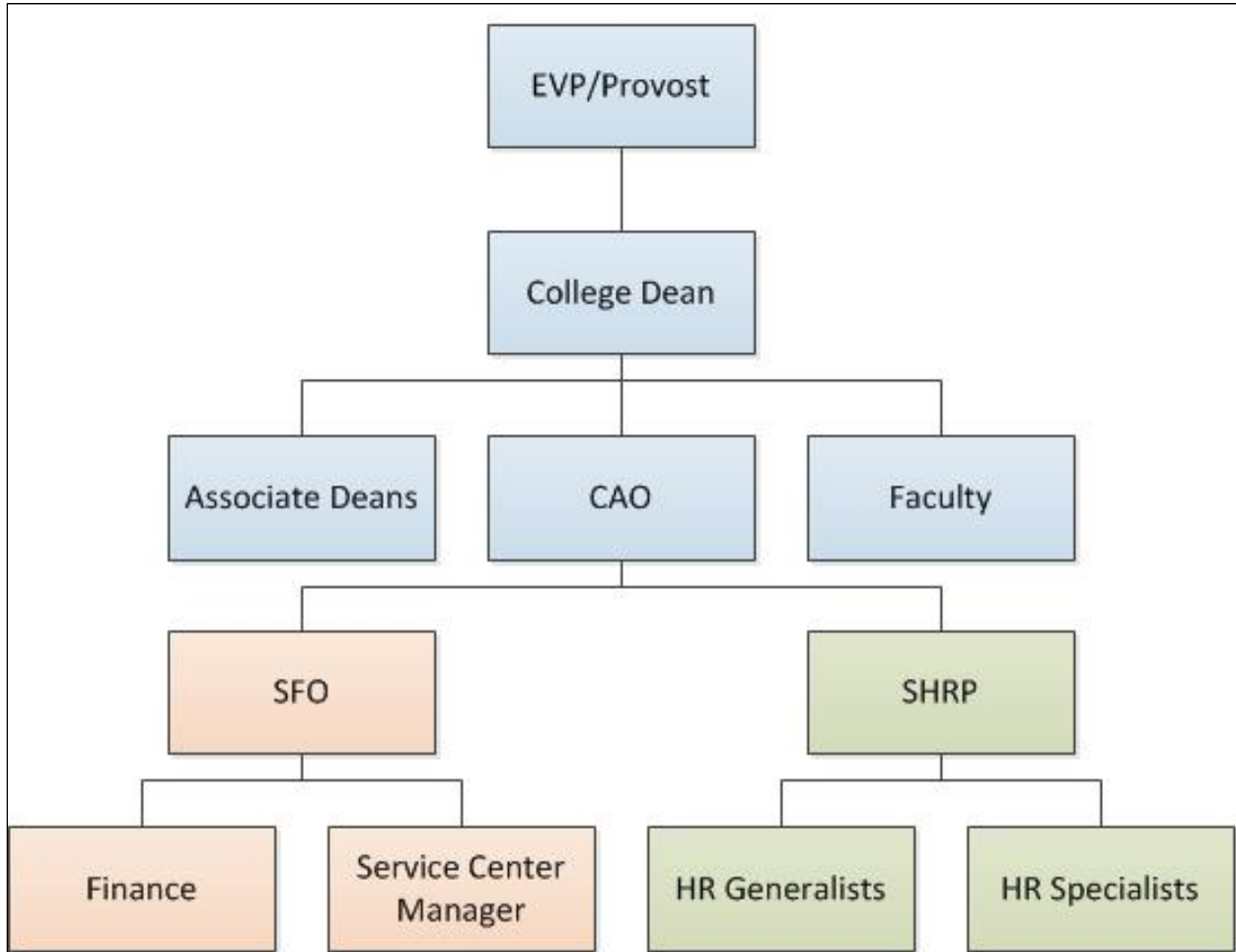
Source: OSU

As shown in **Chart 3-2**, the CAO is neither the SFO nor the SHRP in this example, instead those roles report to the CAO. This organizational structure is more common in larger academic areas while, in smaller academic areas, the CAO may be the SFO and/or the SHRP. It is important to note that there is no required organizational structure, and while these variations are typically associated with smaller or larger academic areas, there is a high degree of potential for variation associated with the aforementioned decentralized structure.

Shared Services at OSU is generally defined as a collaborative strategy that consists of consolidating support functions, to optimize staff, equipment, facilities, and knowledge to improve operational efficiencies and enable higher-value service delivery. In general, there are three types of shared service centers at the University, including:

- **Human Resources** – which process transactions related to human resources, including the recruit-to-hire process;
- **Procurement –** which process transactions related to the procurement of goods and services for the University, including travel reimbursements;
- **Fiscal** – which performs functions related to accounting, reporting, and budgeting; including financial statement management; and
- **Information Technology** – operated by the Office of the CIO, which performs centralized IT functions such as supporting key systems and also provides managed IT services such as end-user support, and infrastructure and security services.

Shared Service Centers can provide services for one or more areas of the University. For example, the Procurement Shared Service Center (PSSC), organized under the Office of Business and Finance, provides procurement services to the areas of the Office of Business and Finance, Office of Legal Affairs, Office of Government Affairs, Office of the President, Office of the Board of Trustees, Moritz College of Law, John Glenn College of Public Affairs, Office of Student Life, Office of University Advancement, and Office of Academic Affairs. Alternatively, there are other examples of shared service centers, such as the College of Arts and Sciences HR Service Center, which provide services only within their own area due to the current scope and complexity of operations as well as high volume of transactions. Although shared service centers may or may not be a part of the area they service, they generally work collaboratively with the serviced areas to meet the collective needs of the University community.

R3.1 Current State Process – Human Resources

Background

OSU continuously recruits and hires employees to fulfill the needs of the University. In fiscal year (FY) 2016-17, the University had over 33,000 employees[23], including more than 11,000, or about one-third of its total employees, that were hired during the year. As a result, a significant commitment of time, energy, and effort goes into the recruit-to-hire process. The recruit-to-hire process encompasses all of the decisions and actions necessary to make the strategic decision to fill an existing position or create a new position, select a qualified candidate, and the administrative tasks necessary to facilitate the hire.

It is important to note that the recruit-to-hire process includes more than faculty, staff, and administration, it also includes students hired into paid positions. In FY 2016-17, OSU had approximately 13,000 student employees[24], amounting to an additional 17,000 hires. Due to the transient nature of the student population (e.g., a high degree of turnover due to new enrolling or graduating students), and the temporary nature of their employment, student employees turn over more often than other University employees.

Table 3-1 shows the number of hires for the University by position type for FY 2014-15 through FY 2016-17. Analyzing hires over time helps to provide insight as to year-to-year variation, which, in turn, also impacts University operations and workload.

Table 3-1: OSU Hires by Position Type FY 2014-15 to FY 2016-17

Position Type	FY 2014-15	FY 2015-16	FY 2016-17	Three-Year % Difference
Faculty	2,404	2,372	2,431	1.1%
Staff	8,727	7,931	8,627	(1.1%)
Student-Graduate Assistant (GA)	2,765	2,737	2,598	(6.0%)
Student-Other	13,763	13,707	14,709	6.9%
Total	**27,659**	**26,747**	**28,365**	**2.6%**

Source: OSU
Note: This number does not include certain types of internal transfers, and thus may understate the total number going through the recruit-to-hire process. Issues with data quality were discussed with OSU leadership during the course of the audit.

As shown in **Table 3-1**, University hiring across each position type has remained relatively constant. While FY 2015-16 had a slightly lower number of hires in all position types, the total change in hiring over the three year period was relatively stable at 706 hires, or 2.6 percent.

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[23] Employee headcount from 2017 Statistical Summary.
[24] Employee headcount from 2017 Statistical Summary.

Chart 3-3 shows the University hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into recruit-to-hire process workload fluctuations throughout the year.

Chart 3-3: OSU Hires by Month FY 2016-17
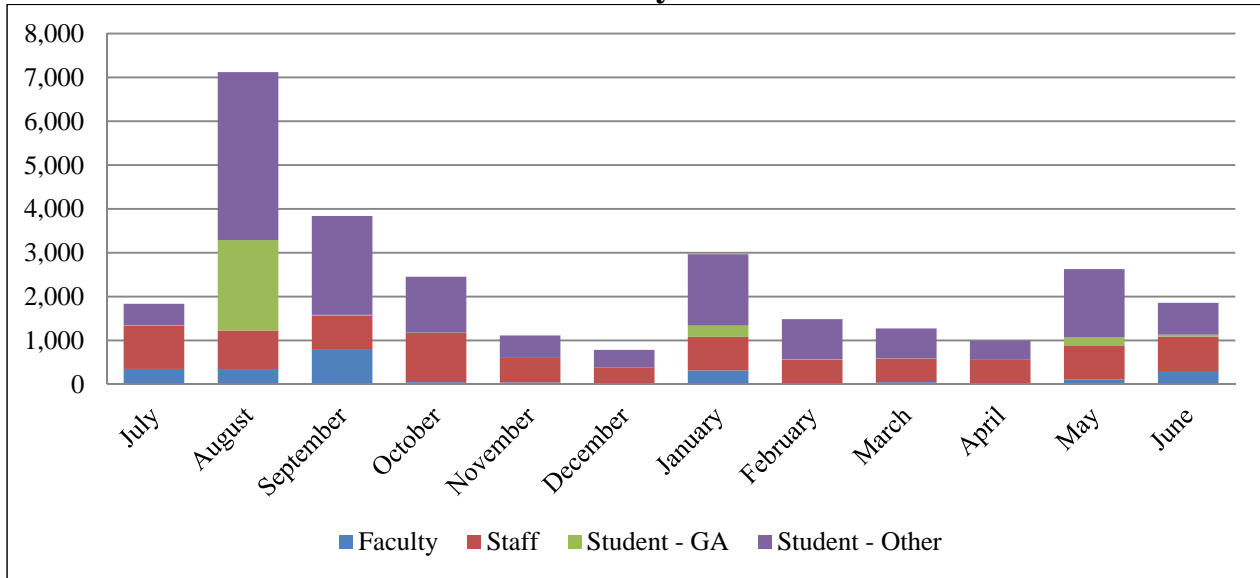
Source: OSU

As shown in **Chart 3-3**, August and September represent the highest volume of hires for the University. More specifically, the number of student hires shown in August (student – GA[25] and student – other[26]) and September (student – other) drives a dramatic increase in total hiring volume. Faculty hires also increase in September, but have less of a proportionate impact on total hires. It is important to note that this increase in volume is in sync with the University calendar, which creates a naturally unequal workload distribution month over month for the recruit-to-hire process.

Current State Organization/Governance

For most human resources related activities, and for the recruit-to-hire process specifically, OSU operates in a largely decentralized manner. The Office of Human Resources (OHR) is centralized within the University's administrative structure and has the authority to develop policies, procedures, high-level processes and requirements, and provide general structure to areas across the University. Areas within the University are then responsible for carrying out the day-to-day operations within the confines of these policies and procedures. In doing so, the areas have varying degrees of autonomy, some of which is a product of the historical operating environment of the University, and some of which is necessary based on the operational needs of the area. For example, the College of Food, Agricultural and Environmental Sciences, which is the University's oldest college, has different hiring needs than the Wexner Medical Center. As a

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[25] Student-GA refers to graduate assistant positions. These positions are for graduate students and are accompanied by tuition, benefits, and a stipend in return for a specified job.
[26] Student-Other refers to all other regular student employees and are paid hourly.

result, some differences may be due to long-standing operational preferences while others may be due to specific hiring needs.

Currently, each area employs a Senior Human Resources Professional (SHRP). These SHRPs report directly to the dean or director of their area, but also indirectly report to OHR from a policy, procedure, and process standpoint. Furthermore, the structure of each area is highly customized based on needs and size. For example, a small area might have an SHRP and one other staff member conducting all recruit-to-hire activities, while a larger area may have an SHRP, a team of central human resource professionals (HRPs) and several other HRPs located throughout the departments.

Some areas are also supported by Human Resources Shared Services Centers (HRSSCs or Service Centers). These are administrative units that process transactions to support a variety of human resources functions, including the recruit-to-hire process. At a high level, the University has undertaken several initiatives to standardize key human resources activities, often through some degree of centralization. For example, starting in calendar year (CY) 2014, the background checks function on campus became centralized. However, aside from a small number of specific process steps, the current recruit-to-hire process is more accurately described as a series of area-specific processes that are all largely designed to accomplish the same goal, but are highly customized to each area.

Current State Information Technology (IT) Systems

The University currently uses multiple IT systems to carry out the recruit-to-hire process. Major systems used include:
- **PeopleAdmin** – an online portal for OSU job postings at jobs@osu.com and internal applicant tracking system;
- **PeopleSoft** – the University's IT system, used for various functions within the University, but specific to the recruit-to-hire process and to facilitate payroll;
- **Human Resources Action Request (HRA)** – an internal web-based system designed to facilitate communication and capture electronic signatures. HRA requests facilitate workflow approvals without the use of paper;
- **Student Life Timekeeping** – an internally built Kronos timekeeping system that Student Life uses to track employee hours and facilitate payroll approvals; and
- **eRequest** – an internal system used to submit for the purchase and payment of goods and services on behalf of the University.

Future State Workday Implementation

OSU is currently undertaking a multi-year transition to replace outdated systems, including those previously identified, and implement a cloud-based, enterprise-wide IT system known as Workday. As currently planned, Workday will be the University's primary system for financials, human resources, payroll, and student information. In addition to replacing outdated systems, the project will adopt industry leading business processes that provide improved customer service, an enhanced student experience, and consistent operations across all parts of the University community. The transition to a unified system is also expected to greatly enhance the University's business intelligence, analytics, and reporting, ultimately providing University leadership with quality information to guide decision-making.

Specific to HR and the recruit-to-hire process, the transition to Workday is expected to occur during the summer of CY 2020. To facilitate the extensive development leading up to implementation, the University has organized an Enterprise Project Team. The team consists of University employees, consultants, and Workday professionals. University employees may be involved in one or more component parts of the Enterprise Project Team which is responsible for leading the transition to Workday throughout the life of the project.

For the recruit-to-hire process, the transition to Workday means that multiple IT systems will be streamlined into a single, enterprise-wide resource. This will require changes in the way that each area currently carries out the process, though the degree of change will vary, depending on each area's current process.

As a part of Workday implementation, the Enterprise Project Team has already created a future state process map for recruit-to-hire. However, with over 30 highly customized and autonomous areas within the University, the Enterprise Project focused on the future state, rather than fully capturing the current state process for each area. The future state process is separated into high level process steps. **Chart 3-4** shows the high level process steps for the future state recruit-to-hire process developed by the Enterprise Project. Although these steps are adequate to describe the major movements of the process, it is also important to note that there are a number of intermediary process steps that have already been identified and will be included in future state implementation.

Chart 3-4: Future State Recruit-to-Hire Process Flow
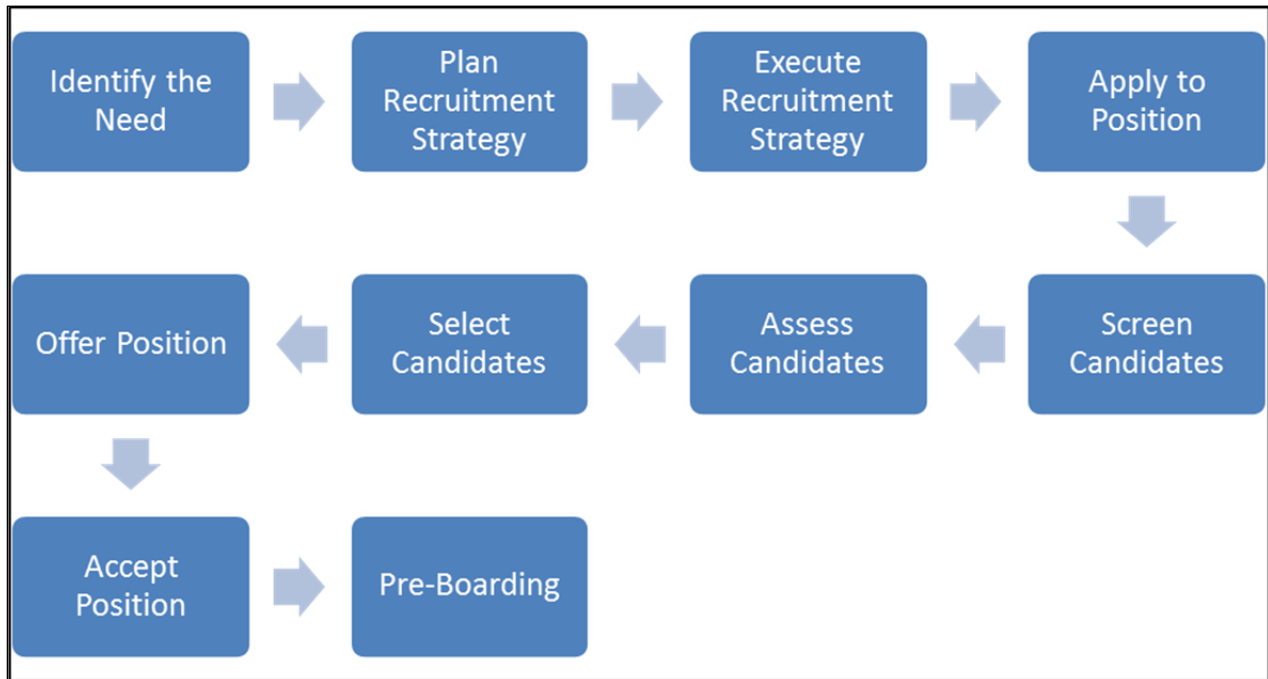
Source: OSU

As shown in **Chart 3-4**, there are ten high level process steps in the future state recruit-to-hire process. As previously noted, each area undertakes intermediary process steps to carry out each of these high level process steps, but at a high level, each of these process steps are carried out to hire an OSU employee.

Methodology

This sub-section, **Current State Process – Human Resources**, focuses on the current procedure for recruiting and selecting candidates for hire and identifies opportunities to gain efficiencies through elimination of variation. During the planning and scoping phase of the audit, OSU identified the recruit-to-hire process as a possible area in which an analysis could identify opportunities to reduce processing time, eliminate redundant process steps, and reduce variation in process steps for more uniform operations.

Due to the overall size of the University, five areas were selected for analysis with input from OSU HR leadership. These five areas include: College of Arts and Sciences, College of Engineering, College of Optometry, Newark Campus, and Office of Student Life. These areas were selected to provide a representative variety of the size and scope of recruit-to-hire operations within the remaining areas of the University.

Operational information was provided by the University and each area and supplemented by testimonial evidence from management and staff within each area. Additional sources of information included OSU's internal policies and procedures. Data points were used from the last three complete fiscal years as of the completion of performance audit field work (i.e., FY 2014-15 to FY 2016-17). During the course of the performance audit, data relevant to the recruit-

to-hire process was evaluated for sufficiency and appropriateness. In seeking to better understand each Area's management of the recruit-to-hire process, key pieces of business intelligence, including the total time of the recruit-to-hire process, were discussed. However, due to the multiple, disconnected IT systems currently in place, there is no systemic ability to track the process from beginning to end. These weaknesses in business intelligence reporting were discussed with OHR and University leadership.

The first part of the analysis provides a high-level overview for each of the five areas reviewed, In addition, total hires for each area and hires by month by area are presented to provide broad context on transaction volume and the degree to which seasonality and hiring type affects total workload. The analysis then summarizes the current state process for each area organized within each of the main process sections identified for the future-state process. Specific focus is on the number of current state process steps within each section as well as the step owners, as these are the two main indicators of variation in the current process. Finally, the analysis focuses on the benefit that may be possible through elimination of largely disconnected systems with implementation of the Workday system.

Analysis

As previously noted, the University operates in a largely decentralized manner, with areas having autonomy to make decisions about the recruit-to-hire process to meet their business needs. A general description of the organization, size, business and academic needs of each area analyzed in detail includes:

- **College of Arts and Sciences** – a large academic area with 38 departments and schools, more than 20 centers and institutes, and more than 2,000 faculty and staff. The College of Arts & Sciences has recently transitioned to a more centralized HR model. This transition, which occurred in the fall of 2017, changed the decentralized structure of HRPs in the departments to a more centralized structure with HR Generalists reporting to HR Managers in the central HR office within Arts & Sciences.

- **College of Engineering** – a large academic area with 12 departments and schools, more than 40 centers and institutes, and more than 600 faculty and staff. The College of Engineering is also responsible for the operations of the OSU Airport and is transitioning to a centralized HR model, but still has HR professionals in the departments and schools.

- **College of Optometry** – a small academic area for post-undergraduate study. It is the smallest college at OSU and graduates fewer than 100 optometrists each year. The College of Optometry operates a Vision Clinic as a teaching tool and resource to the public and its small nature means that just one staff member is responsible for the majority of HR functions and as a result, operates as a centralized model.

- **Newark Campus** – an OSU extension campus, in Newark, Ohio, it is co-located, and has a unique partnership with, the Central Ohio Technical College (COTC). Within this partnership many Newark Campus and COTC employees work for both entities. Newark

Campus employs one SHRP that serves both Newark Campus and COTC, and two staff members supporting both, a largely centralized model.

- **Office of Student Life** – a large business and service area with more than 40 departments, more than 5,500 part-time student employees, 700 administrative and professional staff, 300 bargaining unit staff (e.g., housekeeping, food service, maintenance), and 100 civil service staff. Student Life is responsible for fostering learning and development as well as operation of all of the residence halls on OSU's campuses. Residence hall operations includes recreation and dining services, a major area of student employment with more than 30 food service locations and more than 50 residence halls and housing complexes. The Office of Student Life has a decentralized HR model.

Table 3-2 shows the total number of hires by area for FY 2016-17. Analyzing the total number of hires helps to provide insight into the size of the recruit-to-hire operations within each area.

Table 3-2 Total Hires by Area FY 2016-17

	Faculty	Staff	Student-GA	Student-Other	Totals
College of Arts and Sciences	488	385	1,133	1,380	3,386
College of Engineering	178	223	556	1,459	2,416
College of Optometry	7	16	0	27	50
Newark Campus [1]	60	13	0	148	221
Office of Student Life	0	549	34	5,657	6,240
Totals	**733**	**1,186**	**1,723**	**8,671**	**12,313**

Source: OSU

[1] Newark Campus hires include only those individuals that are considered OSU employees and are paid by OSU. Shared cost positions that are paid through COTC are not included in these totals.

As shown in **Table 3-2**, the number of hires in each area varies greatly, from a minimum of 50 hires in the College of Optometry to a maximum of over 6,000 hires in the Office of Student Life. As previously noted, OSU has seasonal fluctuations in hiring due to hiring a majority of student employees around the academic calendar and each area also experiences seasonal fluctuations, though the extent varies according to business needs.

Chart 3-5 shows the College of Arts and Sciences hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-5: Arts & Sciences Hires by Month FY 2016-17
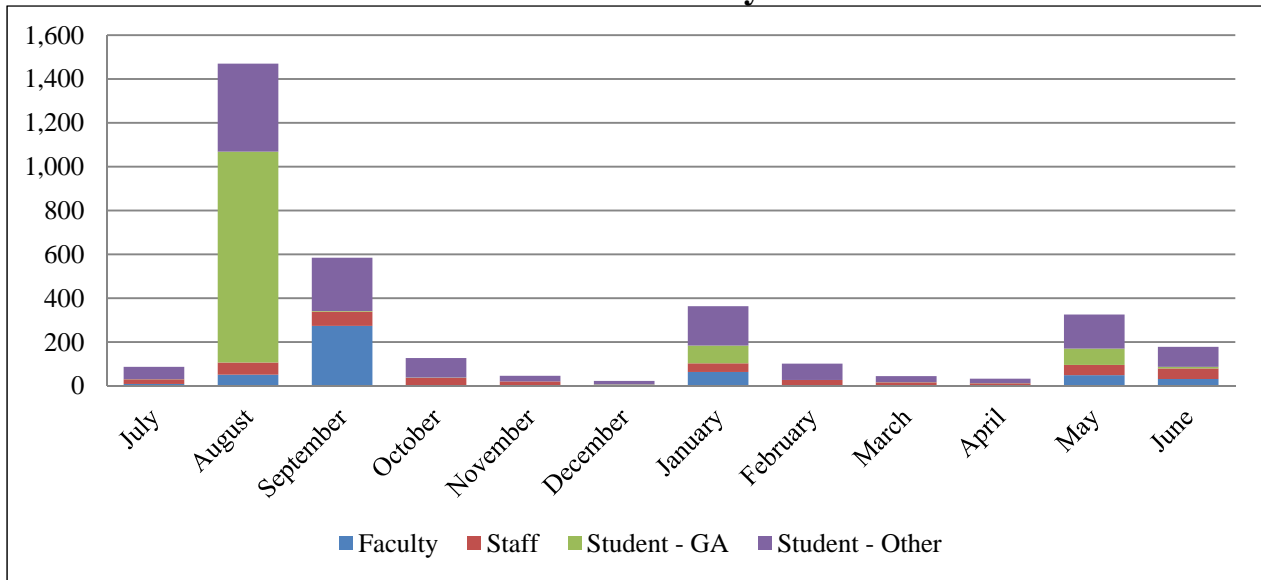
Source: OSU

As shown in **Chart 3-5**, the College of Arts and Sciences hires the largest number of employees in August and September. This represents the seasonality of hiring due to the academic calendar.

Chart 3-6 shows the College of Engineering hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-6: College of Engineering Hires by Month FY 2016-17
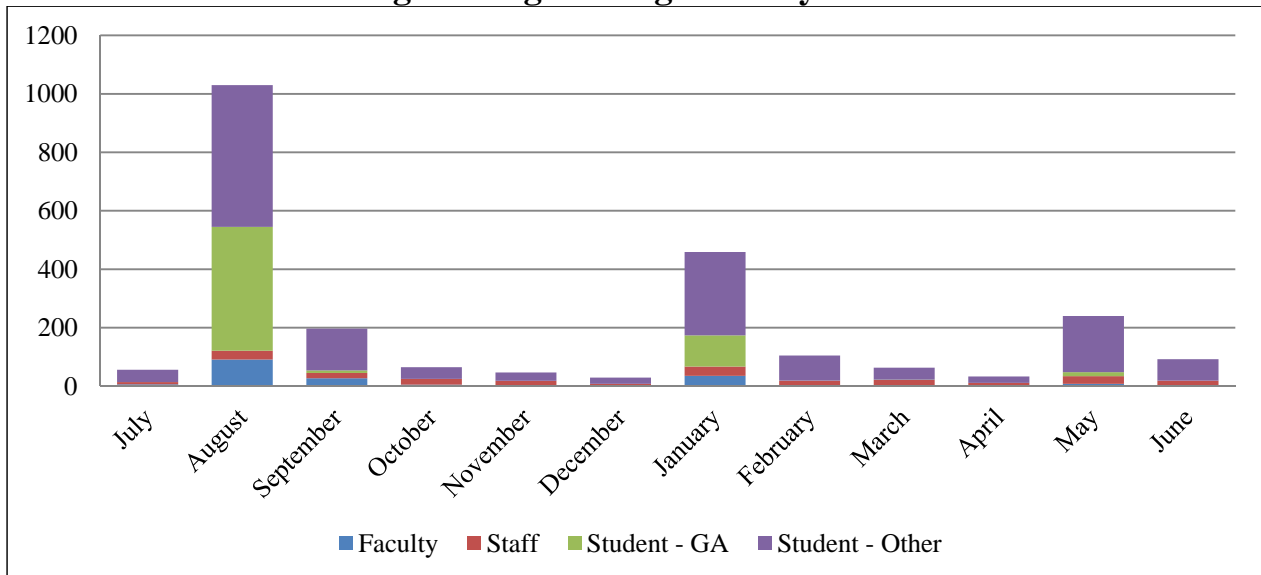
Source: OSU

As shown in **Chart 3-6**, the College of Engineering hires the largest number of employees in August, reflecting the seasonality due to the academic calendar. Engineering also hires a larger number of employees in January, reflecting the start of the winter term.

Chart 3-7 shows the College of Optometry hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-7: College of Optometry Hires by Month FY 2016-17
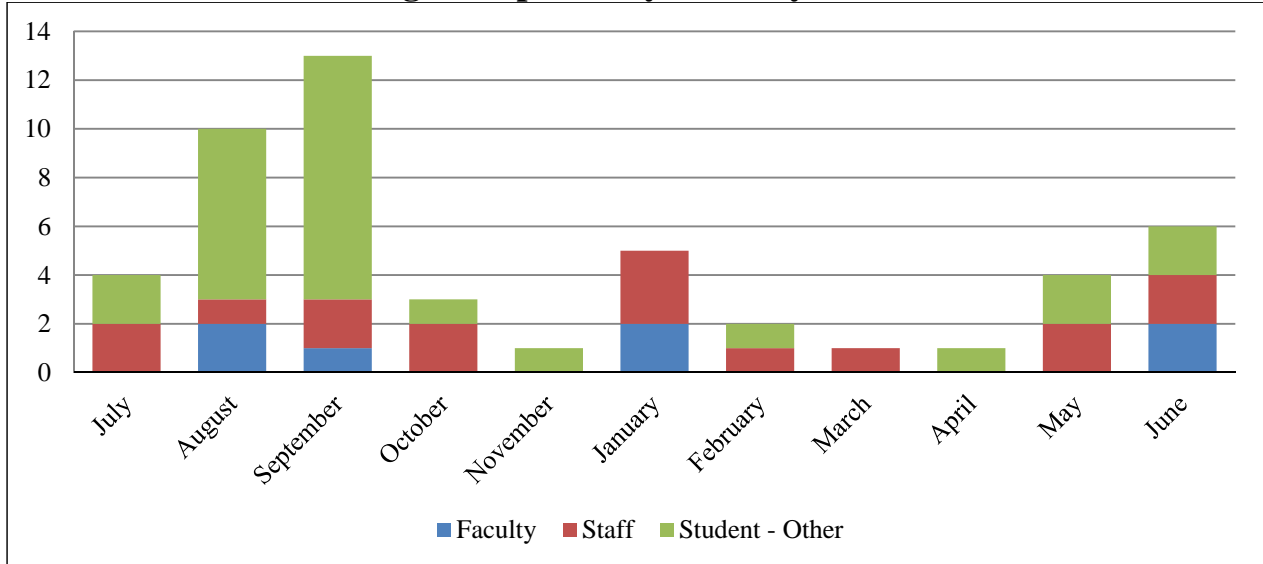
Source: OSU
Note: College of Optometry did not have any hires during the month of December.

As shown in **Chart 3-7**, the College of Optometry has less hiring seasonality as compared to OSU in general. This is likely due to the very small overall number of hires, and the fact that it is the smallest college at OSU.[27]

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[27] The College of Optometry also makes placements for graduate students across the country, but these numbers are not reflected in the hiring data.

Chart 3-8 shows the Newark Campus hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-8: Newark Campus Hires by Month FY 2016-17
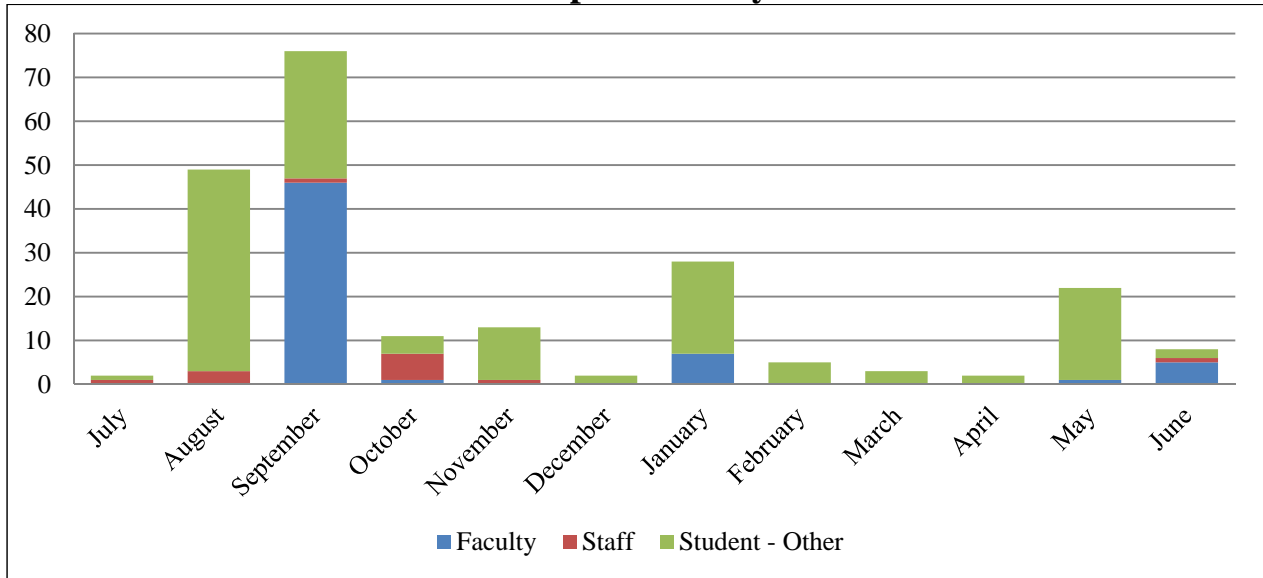
Source: OSU

As shown in **Chart 3-8**, Newark Campus hiring trends also match the academic calendar. They also hire a significant number of faculty during September, which is consistent with the academic calendar.

Chart 3-9 shows the Office of Student Life hires by month for FY 2016-17. Analyzing hires by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-9: Student Life Hires by Month FY 2016-17
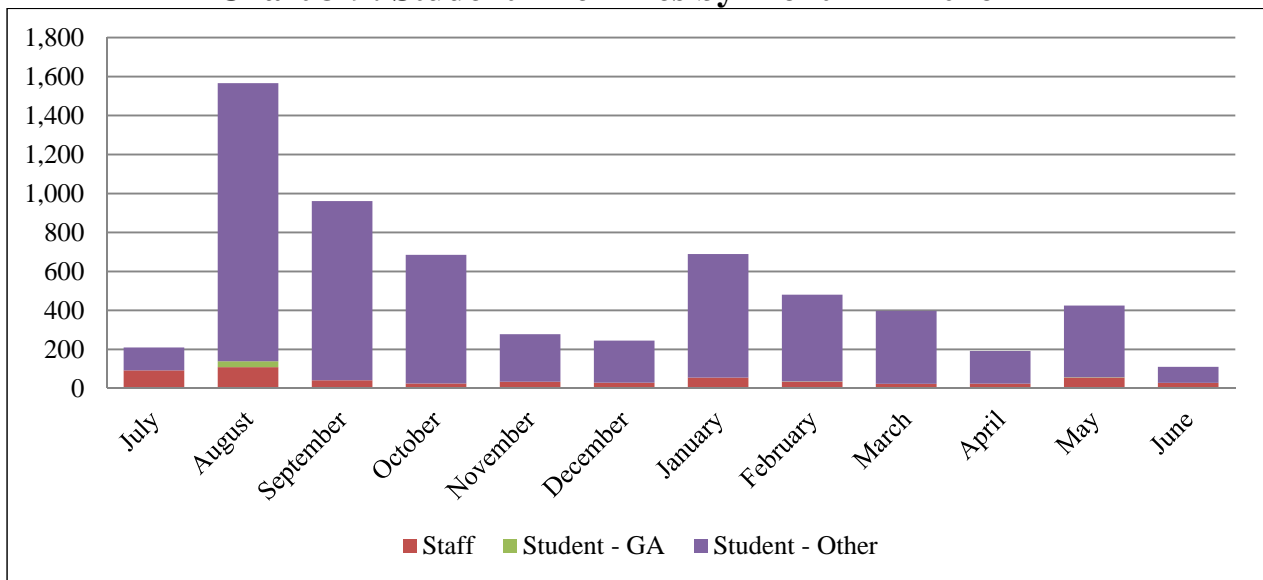
Source: OSU

As shown in **Chart 3-9**, the majority of hiring in the Office of Student Life is for regular student employees. While they do experience the same seasonality in hiring as other areas of OSU, there are a significant number of hires occurring throughout the year as a result of the turnover in student employees.

A full current state process map was documented for each area by determining which process steps occurred during the high level process flow described above. **Table 3-3** shows the number of steps and decision points for the current state recruit-to-hire process in each of the areas analyzed. The detailed process map can be found in **Appendix 3**.**A**.

Table 3-3: Recruit-to-Hire Process Summary Overview

	Arts & Sciences	Engineering	Optometry	Newark Campus	Student Life
Identify the Need	10	10	4	2	15
Plan Recruitment Strategy	0	3	1	0	2
Execute Recruitment Strategy	4	5	5	6	1
Apply to Position	1	1	1	1	1
Screen Candidates	2	6	3	5	4
Assess Candidates	6	13	7	4	5
Select Candidates	2	2	2	8	2
Offer Position	3	5	2	1	1
Accept Position	1	2	1	1	1
Pre-Boarding	6	14	19	12	18
Total	**35**	**61**	**45**	**40**	**50**

Source: OSU
Note 1: Process steps and decision points were combined for analysis.
Note 2: Not all areas currently have process steps in each phase of the process, as indicated by zeros in **Table 3-3**.

As shown in **Table 3-3**, the number of steps in the current state process varies significantly in each area. The only high level process step that does not currently have variation is in the 'apply to position' step, representing the step where the candidates are applying to OSU. The total process steps vary from a minimum of 35 for the College of Arts & Sciences, to 61 for the College of Engineering. It is important to note that Arts & Sciences has completed its transition to a centralized model and has fewer process steps. In contrast, the College of Engineering has not completed its transition to a centralized model, currently with HR professionals both in the departments and in the Central HR Office, contributing to the higher number of steps.

Much of the variation in the process occurs during the first few steps, including: identify the need, plan recruitment strategy, and execute recruitment strategy. Once a candidate is selected, the steps to hire the candidate are largely the same. These are also the tasks that are most easily transferred to service centers, as the majority of administrative tasks associated with hiring an employee, including data entry into systems, are not area specific tasks and could be provided by any associate at an HR service center.

Table 3-4 shows how the process phases and steps are organized by process owner within each area. As previously noted, the current state process variation shows in both number of process steps, but also in ownership of those process steps, and both are important factors for consideration when planning to implement a future-state process.

Table 3-4: Recruit-to-Hire Process Owner and Steps Overview

		Identify the Need	Plan Recruitment Strategy	Execute Recruitment Strategy	Apply to Position	Screen Candidates	Assess Candidates	Select Candidates	Offer Position	Accept Position	Pre-Boarding	Total
Arts & Sciences	OSU HR	1	0	2	0	0	0	0	0	0	0	3
	Area Central HRP	5.5	0	1	0	0	0	0	2	0	1	9.5
	Department Level HRP	1	0	0	0	1	3	1	0.5	0	1	7.5
	Hiring Manager	1	0	0	0	1	3	1	0.5	0	0	6.5
	Finance/Non-HR Approver	0.5	0	0	0	0	0	0	0	0	0	0.5
	Shared Service Center	1	0	1	0	0	0	0	0	0	4	6
	Total Steps	10	0	4	1	2	6	2	3	1	6	35
COE	OSU HR	1	1	1	0	0	0	1	0	0	0	4
	Area Central HRP	1	0	1	0	0	0	0	1	0	0	3
	Department Level HRP	1	2	0.5	0	3.5	6.5	0.5	3.5	1	8	26.5
	Hiring Manager	3	0	0.5	0	2.5	6.5	0.5	0.5	0	0	13.5
	Finance/Non-HR Approver	3	0	0	0	0	0	0	0	0	1	4
	Shared Service Center	1	0	2	0	0	0	0	0	0	4	7
	Total Steps	10	3	5	1	6	13	2	5	2	14	61
Optometry	OSU HR	0	0	2	0	0	0	0	0	0	0	2
	Area Central HRP	2	1	2	0	1.5	3.5	0	0.5	0	13.5	24
	Department Level HRP	1	0	0	0	0	0	0	1.5	0	0	2.5
	Hiring Manager	1	0	0	0	1.5	0	2	0	0	2.5	7
	Finance/Non-HR Approver	0	0	1	0	0	3.5	0	0	0	1	5.5
	Shared Service Center	0	0	0	0	0	0	0	0	0	0	0
	Total Steps	4	1	5	1	3	7	2	2	1	19	45
Newark Campus	OSU HR	0	0	1	0	0	0	0	0	0	1	2
	Area Central HRP	1	0	2	0	0	2	3	0	0	5	13
	Department Level HRP	0	0	0	0	0	0	0	0	0	3	3
	Hiring Manager	0	0	1	0	5	2	4	1	0	2	15
	Finance/Non-HR Approver	1	0	2	0	0	0	1	0	0	1	5
	Shared Service Center	0	0	0	0	0	0	0	0	0	0	0
	Total Steps	2	0	6	1	5	4	8	1	1	12	40
Student Life	OSU HR	2	0.5	1	0	0	0	0	0	0	0	3.5
	Area Central HRP	7.5	0	0	0	0	0	0	0	0	2	9.5
	Department Level HRP	0	1.5	0	0	3	2	1	0	0	3	10.5
	Hiring Manager	3	0	0	0	1	3	1	1	0	0	9
	Finance/Non-HR Approver	0.5	0	0	0	0	0	0	0	0	3	3.5
	Shared Service Center	2	0	0	0	0	0	0	0	0	10	12
	Total Steps	15	2	1	1	4	5	2	1	1	18	50

Note: Since most phases of the process involve more than one process owner, for this analysis, quantification is based on the predominant owner of each process step. In cases where two process owners share the step, each is shown as 0.5. See **Appendix 3.A** for the full process map detail, including a color-coded breakdown of process ownership by detailed process step.

As shown in **Table 3-4**, the predominant process owners for each phase varies by area for the recruit-to-hire process. The structure of the organization largely determines the process owners of each step. For example, a smaller area such as the College of Optometry relies heavily on one HR individual to complete the work for the entire recruit-to-hire process. In contrast, larger areas, such as the College of Engineering, have multiple hand-offs due to the complexity of their structure (e.g., central office HR and HRPs in the departments, in addition to a service center for transactional work) and associated demand.

Process step variation does not necessarily mean a faster processing time. During the course of the audit, system limitations, which prevent insight into the recruit-to-hire total processing time, were identified and discussed with OSU. Specifically, the data within the systems does not contain consistent uniquely identifying information with defined relationships, resulting in the inability to analyze data from multiple systems centrally. To gain insight on current overall processing times, OSU could consider asking areas to capture data prior to the Workday transition. For example, the College of Engineering currently tracks much of the process time, but largely leaves out the beginning of the process (i.e., identify the need), and the end of the process, after a candidate accepts an offer of employment but before their official start date. To have a full accounting of the process time necessary for the recruit-to-hire process, in advance of Workday implementation, OSU should consider having areas capture the following data points:

- **Hire Request Date –** The date a request was made for a hire;
- **Hire Decision Date –** The date a decision to hire was established;
- **Hire Post Date –** The date the position was posted;
- **Offer Extended Date –** The date an offer of employment was extended;
- **Offer Accepted Date** – The date an offer of employment was accepted; and
- **Hire Start Date** – The date a new employee started in the position posted.

HR Systems

OSU also operates and maintains key systems to facilitate the recruit-to-hire process as well as to track and report key data and information. Over time, systems were added, and then developed or modified as needed to achieve this purpose. As previously noted, the recruit-to-hire process directly touches the following systems: HRA, PeopleAdmin, PeopleSoft HRIS, and Student Life Timekeeping. However, OSU plans to retire these systems as their functions are integrated into Workday.

Table 3-5 shows a current valuation of the annual subscription cost and an estimated annual internal labor cost to provide a total annual associated cost of each system. Quantifying the resources, both internal and external, that are currently used to support the systems associated with the recruit-to-hire process is important as these resources will be freed up as cost savings or can be redirected to higher priority needs following Workday implementation.

Table 3-5: Estimated Annual Cost of HR Systems Replaced by Workday

System	Annual Subscription Cost	Estimated Annual Internal Labor Cost [1]	Total Annual System Cost
HRA	N/A	$73,483	**$73,483**
PeopleAdmin	$68,608	N/A	**$68,608**
PeopleSoft HRIS	$864,360	N/A	**$864,360**
Student Life Timekeeping [2]	$13,025	$185,000	**$198,025**
Total	**$945,993**	**$258,483**	**$1,204,476**

Source: OSU

[1] HRA is one of six systems all maintained by a single group. While the University was unable to provide a direct labor cost associated with HRA, the total cost of the group, $440,900, was evenly divided by the six systems to estimate the annual labor cost associated with a single system.

[2] Even after Workday implementation, Student Life has already identified that it will require another timekeeping system and this system is already under development. Once Workday and this new timekeeping system are integrated, Student Life Timekeeping will be retired.

As shown in **Table 3-5**, the University is incurring cost of more than **$1,204,400** annually for systems that will be eliminated when Workday is fully in place and providing the functionality currently provided by HRA, PeopleAdmin, PeopleSoft HRIS, and Student Life Timekeeping. It is important to note that the majority of this cost is the annual subscription for PeopleSoft. It may be possible for the University to retire additional systems due to Workday implementation. Doing so will allow for additional redirected cost savings and increased efficiencies while also providing opportunities to streamline and improve process consistency across areas.

Conclusion: Currently, OSU's recruit-to-hire process is carried out in a manner that varies from area to area. The variation is largely a product of the University's decentralized structure and lack of a singular approach. Furthermore, the University areas use a variety of systems to administer the recruit-to-hire process, only some of which are directly connected. Lack of uniform process and an enterprise system to administer the process has resulted in a lack of comprehensive data necessary to define key performance indicators as well as to measure and improve performance over time. Although some University areas are independently standardizing and improving processes through data collection, this has not been carried out by all areas.

Recommendation 3.1: OSU should develop and deploy a consistent, efficient, and effective process for recruit-to-hire that is uniformly enacted across all areas. In doing so, the University should ensure that the uniform process is reinforced by a single, end-to-end system while eliminating the current array of disconnected, and sometimes area specific, systems. However, prior to deploying the new process and system to support it, all University areas should collect standard data to inform the complete current state processes, ultimately allowing for a full measurement of the effectiveness and efficiency gains once the new process is implemented. Finally, the University should ensure that the new system has the capability to uniformly collect data that can be used for enterprise-wide performance measurement and management.

Financial Implication 3.1: OSU can retire several HR systems once Workday is implemented. Doing so could result in the opportunity to save or redirect more than **$1,204,400** annually based on just those systems directly involved with the recruit-to-hire process.[28]

Additional Consideration

Implementation of consistent, efficient, and effective processes supported by a single end-to-end system will reduce or eliminate the current high degree of variation. In the future state, areas will shift their need for personnel away from specialized and more towards administrative and support personnel. Therefore, additional consideration should be given to adopting a single University-wide HR Shared Service Center. This would likely offer significant economies of scale over the current decentralized model.

Further Study

Although the Wexner Medical Center is outside of the scope of this section of the performance audit, further study should be performed to evaluate the current state recruit-to-hire process and the potential benefit of adopting the recommended process. Due to the size and complexity of the Med Center's operations, it is likely that some of the same current state process variability exists among its various departments and units. Furthermore, the Med Center uses many of the same disconnected systems that were examined in detail for selected areas, and these systems may be able to be fully replaced by a single end-to-end system that is supportive of the consistent, efficient, and effective process.

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[28] This annual impact is inclusive of the benefit that will result from retiring current systems, but is not inclusive of the cost of replacing those systems.

R3.2 Current State Process – Finance

Background

Carrying out financial operations to support the OSU's needs is a significant undertaking. In fiscal year (FY) 2016-17, the University had total expenditures of $6.6 billion, of which $1.4 billion is related to the purchase of goods and services on campus.[29] As a result, a significant commitment of University time, energy, and effort goes into managing financial operations. Such operations include procuring goods and services, making payments, managing University funds, and accounting for all financial transactions. This sub-section focuses on two processes — procurement card (PCard) transactions and travel reimbursements.

Governments classify transactions in a number of different ways. A chart of accounts (COA) provides the framework for classifying transactions, and is a string of informational fields that identifies, segregates, and categorizes transaction and budget data. This information is typically entered and stored in an accounting system. At OSU, the accounting system is PeopleSoft Financials. This system enables the University to track spending in a detailed and systematic way, ensuring that funds are used appropriately, regardless of the procurement method.

PCards are credit cards used to procure goods and services on behalf of the University. In FY 2016-17, OSU processed over 160,000 PCard transactions exceeding $49 million. Travel reimbursements are payments for travel incurred to facilitate University business and are made to faculty, staff, students, and sometimes other non-OSU affiliated individuals who are traveling for specific University needs. In FY 2016-17, OSU processed nearly 44,000 travel reimbursement payments exceeding $28 million.

With a variety of different funding sources with different rules and regulations attached, paying for goods and services can be a complicated venture. For example, an OSU professor attends and pays for a conference with a University PCard where they are presenting findings from grant funded research. A portion of the travel might be covered by the grant funding, and another portion covered by the University. To ensure that the proper funds are being used and accounted for, the University has a system of policies, procedures, and processes in place to ensure the correct COA is used for each transaction.

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[29] This number does not include Med Center expenses or capital improvements.

PCard Transactions

OSU uses several types of PCards. Each type of PCard has a different purpose, usage limits, and eligibility considerations. Types of PCards include:[30]

- **Service Center Card** - Have limits of $7,500 for individual transactions or $50,000 per cycle and are issued to service centers, in a department's name, and administered by a card manager.
- **Department Card** - Have limits of $5,000 for individual transactions or $10,000 per cycle and are issued to departments for smaller dollar purchases and administered by a card manager.
- **Individual Card** - Have limits of $5,000 for individual transactions or $10,000 per cycle and are issued to faculty or staff, in an individual's name.
- **Group/Extended Travel Card** – Have limits that are dependent upon the needs of the traveler and/or trip and are issued to staff, in an individual's name for a specific extended travel trip, in an individual's name.

Current State Organization/Governance

For most financial activities, and for the travel reimbursement and PCard processes specifically, OSU operates in a largely decentralized manner. For example, the Office of Business and Finance (OBF) is centralized within the University's administrative structure and has the authority to develop policies, procedures, high-level processes and requirements, and provide general structure to areas across the University. Areas within the University are responsible for carrying out the day to day operations within the confines of these policies and procedures. In doing so, the areas have varying degrees of flexibility and autonomy, some of which is a product of the historical operating environment of the University structure, and some of which is necessary based on the operational needs of the area. For example, the College of Arts and Sciences, one of the University's largest colleges, has different purchasing needs than the Wexner Medical Center. As a result, some differences may be due to long-standing operational preferences while others may be due to specific business needs.

Each area employs a Senior Fiscal Officer (SFO). These SFOs report directly to the Dean or Director of their area, but also indirectly report to OBF from a policy, procedure, and process standpoint. Furthermore, the structure of each area is highly customized based on needs and size. For example, a small area might have an SFO and one other staff member conducting all financial activities, while a larger area may have an SFO, a team of central fiscal associates and several other fiscal associates located in departments.

In addition, some areas are also supported by shared services centers (SSCs or service centers). These are administrative units that process transactions to support a variety of financial functions, including the PCard transactions and travel reimbursements. At a high level, the University has undertaken several initiatives to standardize key financial activities, often through some degree of centralization. For example, the University recently required that all individual air travel bookings occur through its central travel agency, where previously individual travelers

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[30] Additionally, the University has "Ghost Cards", which are credit card accounts used to procure University travel. No physical card is issued for these accounts and they are used for travel booking purposes only.

could choose how to procure their own air travel. However, each area has autonomy in decisions about using a service center or process transactions for themselves. University-wide, there are 21 procurement service centers supporting financial operations and 26 fiscal service centers. PCard transactions and travel reimbursements are processed by procurement service centers.

Current State Information Technology (IT) Systems

The University currently uses multiple IT systems to carry out the PCard and travel reimbursement processes, including:
- **PeopleSoft** – the University's financial system, used for various functions within the University, but specific to the PCard approval and travel reimbursement processes, and to facilitate payment approvals;
- **eRequest** – an internal system used to submit for the purchase and payment of goods and services on behalf of the University; and
- **eTravel –** an internal system used to submit for the request of business travel to meet the needs of the University.

There are also an undefined number of "shadow" systems or homemade tracking systems used by University staff to assist with managing workflow. These shadow systems are designed to work around the constraints of the IT systems. For example, one associate tracks their work in an excel spreadsheet so that real-time reports can be pulled on workload and assignments for staff. The current PeopleSoft system reports information not in real time but a day behind, pulling information that was saved on the previous workday.

Future State Workday Implementation

OSU is currently undertaking a multi-year transition to replace outdated systems, including those previously identified, and implement a cloud-based, enterprise-wide IT system known as Workday. As currently planned, Workday will be the University's sole system for financials, human resources, payroll, and student information. In addition to replacing outdated systems, the primary objective of the project is to adopt industry leading business processes that provide improved customer service, an enhanced student experience, and consistent operations across all parts of the University community. The transition into one unified system with streamlined processes is also expected to greatly enhance the University's business intelligence, analytics, and reporting, providing University leadership with greater access to quality information to inform real-time decision-making.

Specific to Finance and the travel reimbursement and PCard processes, the transition to live implementation of Workday is expected to occur during the summer of CY 2020. To facilitate the extensive development leading up to implementation, and for bringing he transition to fruition, the University has organized an Enterprise Project Team. The team consists of University employees and Workday professionals. University employees may be involved in one or more component parts of the Enterprise Project Team. The Enterprise Project Team is responsible for leading the transition to Workday throughout the life of the project.

For OBF, the transition to Workday means that multiple IT systems will be streamlined into a single, enterprise-wide resource. This will require changes in the way that each area currently carries out the process, though the degree of change will vary, dependent upon the amount of variation between the desired, future state process and each area's actual current state process.

As a part of the Workday implementation effort, the Enterprise Project Team has already created a desired, future state process map for financial transactions as well as a prototype of the newly designed system. With over 30 highly customized and autonomous areas within the University, however, the Enterprise Project focused on the future state, rather than fully capturing the current state process for each area.

Methodology

This sub-section, **Current State Process – Finance**, focuses on the current procedure for PCard transaction approvals and travel reimbursement payments and identifies opportunities to improve process efficiencies, through elimination of variation. During the planning and scoping phase of the audit, OSU identified these processes as possible areas in which an objective analysis of the current state could identify opportunities for improved efficiency with respect to reduced time, elimination of redundant steps, and reduced variation for a more uniform approach to operations.

Due to the overall size of the University, three areas were selected for analysis with input from OSU Business and Finance leadership. These three areas include: College of Arts and Sciences, College of Optometry, and the Procurement Shared Services Center (PSSC), which is the largest Service Center on campus and services 12 areas throughout the University, including most of the administrative offices. These areas were selected to provide a representative variety of the size and scope of financial operations within the remaining areas of the University.

Operational information was provided by the University and supplemented by testimonial evidence from management and staff within each area. Additional sources of information included OSU's internal policies and procedures and data points were used from the last three complete fiscal years, FY 2014-15 to FY 2016-17.

The first part of the analysis provides a high-level overview for each of the three areas reviewed. In addition, total transactions by month by areas are presented to provide broad context on transaction volume and the degree to which seasonality affects total process workload. The analysis then summarizes the current state process for each area. Focus is on the number of current process steps within each section as well as the current step owners as these are the two main indicators of variation in the current process. The second part of the analysis identifies the current processing time by area for each type of transaction. The analysis then quantifies the efficiencies that can be gained by adopting the most efficient current processes. The analysis is presented first for PCard transactions and then for travel reimbursement transactions. Finally, the analysis focuses on the benefit that may be possible through elimination of current, largely disconnected systems with implementation of the future state Workday system.

Analysis

PCard Transactions

As previously noted, the University operates in a largely decentralized manner, with areas having autonomy to make decisions about the processing of financial transactions to meet their business needs. University leadership communicated several suspected areas of variation and provided historical context regarding the current processes. A general description of the organization, size, business and academic needs of each service center analyzed in detail including:

- **College of Arts and Sciences** – A large academic area with 38 departments and schools, more than 20 centers and institutes, and more than 2,000 faculty and staff. The College of Arts & Sciences provides services to its own departments.
- **College of Optometry** – A small academic area for post-undergraduate study. It is the smallest college at OSU and graduates fewer than 100 optometrists each year. The college operates a Vision Clinic as a teaching tool and resource to the public. Its small nature means that just two staff members are responsible for the processing of PCard and travel reimbursement payments.
- **Office of Business & Finance Procurement Shared Service Center (PSSC)** – a large service center that provides services for the office of Business and Finance, Office of Legal Affairs, Office of Government Affairs, Office of the President, Office of the Board of Trustees, Moritz College of Law, John Glenn College of Public Affairs, Office of Student Life, Office of University Advancement, and Office of Academic Affairs.

Chart 3-10 shows the high level process steps for processing a PCard transaction.

Chart 3-10: PCard Transaction Process Overview
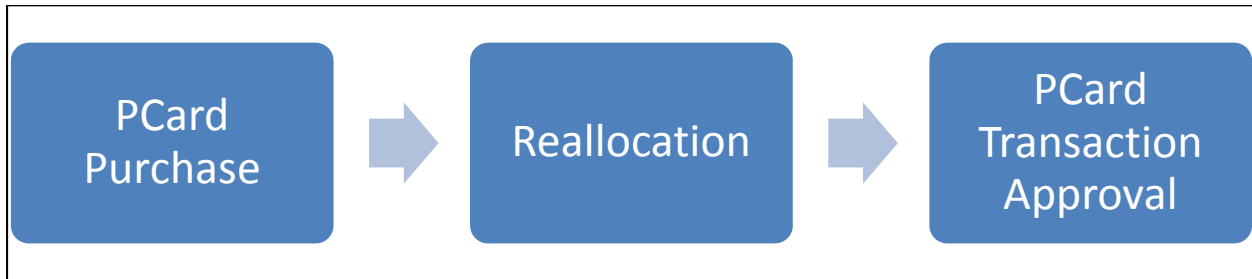
Source: OSU

As shown in **Chart 3-10**, there are three high level process steps for processing PCard transactions. Each area undertakes intermediary steps to carry out each of these high level steps.

Chart 3-11 shows the University PCard transactions by month for FY 2016-17. Analyzing transactions by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-11: PCard Transactions by Month FY 2016-17
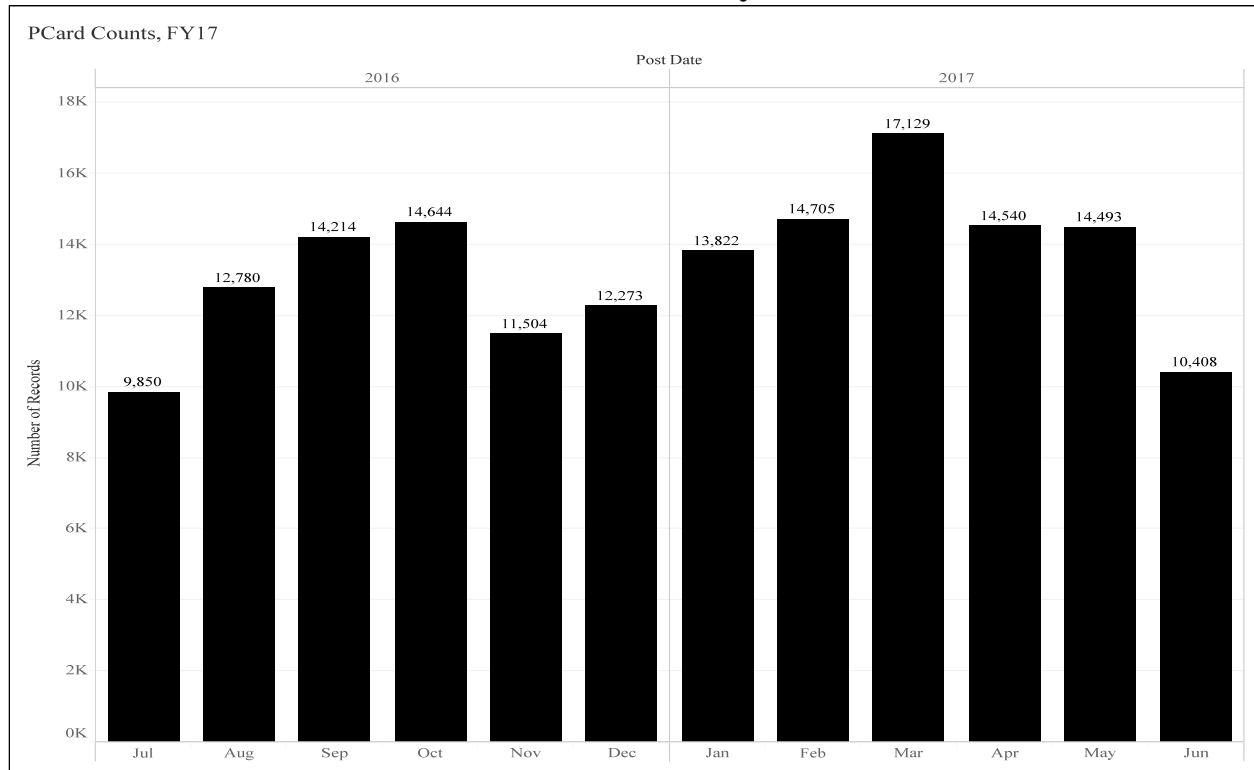
Source: OSU

As shown in **Chart 3-11**, the number of PCard transactions varied month to month, from a low of over 9,000 transactions in July, to a high of over 17,000 transactions in March. This shows that the volume of transactions varies greatly month to month, and service center staff must be prepared for fluctuations in workload.

To process a PCard transaction, several requirements must be met.[31] First, there must be approval from the area showing that the transaction is an approved business expense. Area approval is managed through eRequest or eTravel requests, which are the electronic request systems for procurement and travel requests. Transactions are posted to a holding account. A finance employee then has to manually adjust the payments so that the correct COA is charged for the transaction. This process is called reallocation, and it ensures the University is accounting for all PCard transactions appropriately. Once the transaction is reallocated, it must be approved in the accounting system. A full current state process map was documented for each area by determining which steps occurred during the high level process flow described above. A detailed process map can be found in **Appendix 3.B**. **Table 3-6** shows the total number of process steps by area for PCard transaction approvals, from the time the transaction is posted in PeopleSoft to the final approval in PeopleSoft.

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[31] University Policy 2.23 governs the use of PCards at OSU.

Table 3-6: PCard Approval Process Summary Overview

	Arts & Sciences	College of Optometry	PSSC
Reallocation Process Steps	7	6	5
Approval Process Steps	5	4	1
Total Process Steps	**12**	**10**	**6**

Source: OSU

As shown in **Table 3-6**, the number of process steps varies in each area, even when the total number of process steps is small. This highlights the variation in how PCard transactions are approved by area. The main source of variation observed in the PCard process is the segregation of duties for reallocation and approval in the colleges of Optometry and Arts & Sciences, where PSSC has one person complete both of these duties.

Chart 3-12 shows the number of PCard transactions processed in each area by year and by month for FY 2016-17. Analyzing transactions by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-12: PCard Transactions Processed by Area FY 2016-17
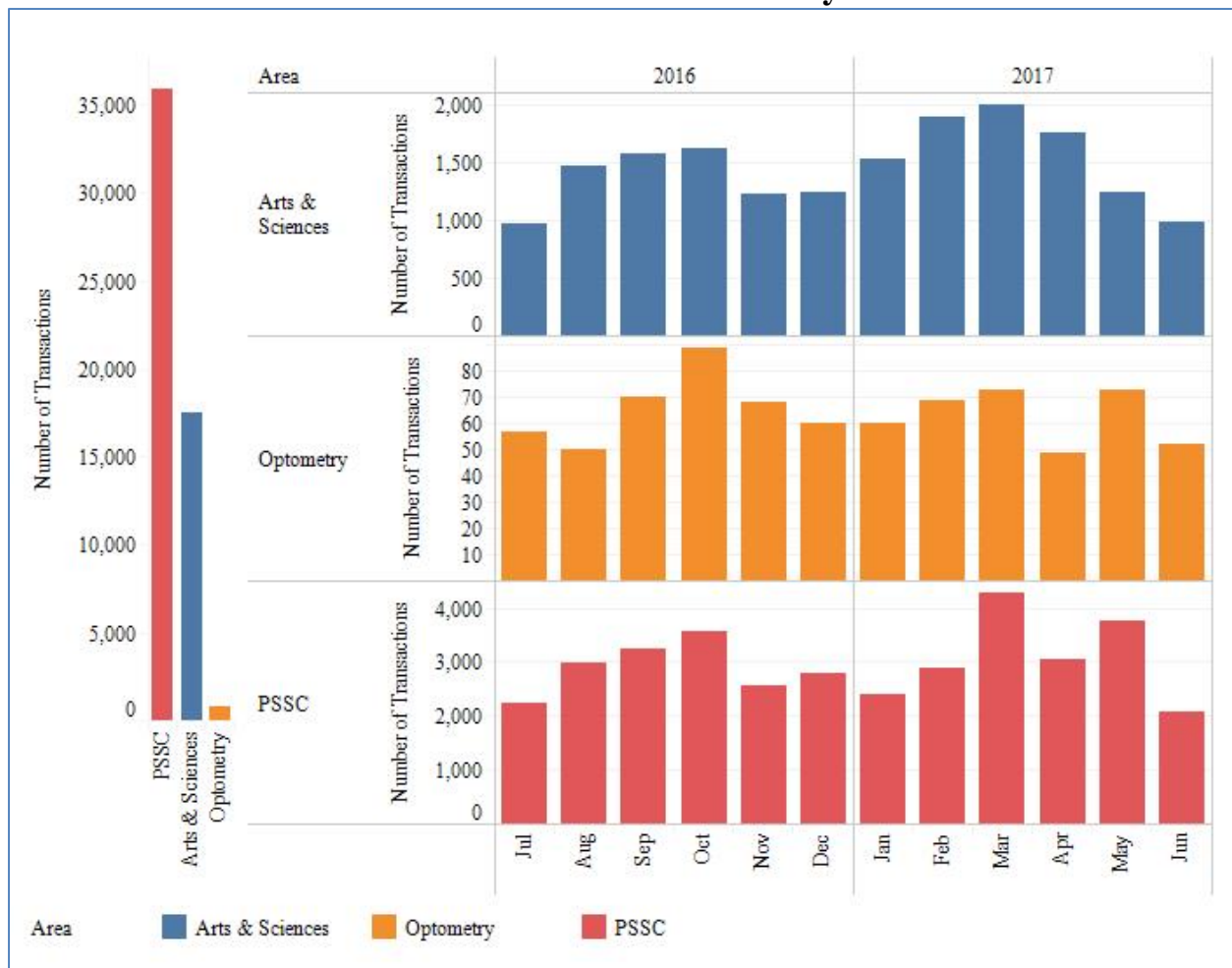
Source: OSU

Chart 3-12 shows the number of transactions processed by area, which varies significantly. Optometry processed only 770 PCard transactions, while the PSSC processed 35,900 transactions during FY 2016-17.

Table 3-7 shows the three categories of PCard transaction approval scenarios that were observed during the time study, including:

- **Type 1** – Accepted at reallocation and approved;
  - o Under this scenario, no rework is needed.
- **Type 2** – Rejected at reallocation, reworked and then reallocated, and approved; or
  - o Under this scenario, the PCard was submitted incorrectly resulting in rework for the submitter as well as the service center associate reallocating the transaction.
- **Type 3** – Accepted and reallocated, returned at the approval level, and reworked and approved following rework.
  - o Under this scenario, the PCard transaction was submitted incorrectly, but also incorrectly reallocated or missing documentation necessary for approval, constituting an approver error, resulting in rework for both the submitter and the approver.

Categorizing observations by scenario type is informative to understanding the steps necessary to complete each transaction, which, in turn, informs total transaction time, as well as sources of rework and the impact it has on total transaction time.

Table 3-7: PCard Transaction Time Study Scenarios Overview

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Reallocation			
Complete	**Y**	N/A	**Y**
Incomplete	N/A	**Y**	N/A
Complete - Following Rework	N/A	**Y**	N/A
Approval			
Approved	**Y**	**Y**	N/A
Returned	N/A	N/A	**Y**
Approved - Following Rework	N/A	N/A	**Y**
	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Number of Transactions by Type	**63**	**9**	**6**
Percent of Observed Transactions	**80.77%**	**11.54%**	**7.69%**

Source: OSU

As shown in **Table 3-7**, at 63 of 78 total transactions, or 80.7 percent of the total, the most commonly observed scenario was Type 1, meaning that the PCard transaction was submitted correctly, reallocated correctly, and approved without need for rework. However, a total of 15 of the 78 transactions, or 19.2 percent, were in Type 2 or Type 3, meaning that the PCard transaction was submitted incorrectly requiring rework. This proportion of transactions requiring

rework is significant in that the identification of errors, communication of those errors, corrective action, and re-review and acceptance or approval all result in additional process time.

Table 3-8 shows the results of the PCard transaction time study in terms of the average time to complete each transaction type as well as the total time associated with all transactions by type and for all observations. This type of comparison provides a direct measure of the lost time due to rework and errors (i.e., Types 2 and 3) relative to a correctly submitted PCard transaction that can be reallocated and approved without need for rework (i.e., Type 1).

Table 3-8: PCard Transaction Time Study - Rework Focus

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Reallocation – Average Time for All Transaction (in Minutes)			
Complete	**2.47**	N/A	**2.47**
Incomplete	N/A	**2.78**	N/A
Complete - Following Rework	N/A	**2.47**	N/A
Sub-Total Reallocation Time	**2.47**	**5.25**	**2.47**
Approval – Average Time for All Transaction (in Minutes)			
Approved	**0.93**	**0.93**	N/A
Returned	N/A	N/A	**1.50**
Approved - Following Rework	N/A	N/A	**0.93**
Sub-Total Approval Time	**0.93**	**0.93**	**2.43**
Total Time per Transaction	**3.40**	**6.18**	**4.90**
Difference Vs. Type 1 per Transaction	**N/A**	**(2.78)**	**(1.50)**
Number of Transactions by Type	**63**	**9**	**6**
Total Time by Type	**214.20**	**55.62**	**29.40**
Total Time All Types All Transactions			**299.22**
Impact of Eliminating Rework – All Transactions at Type 1			
Total Time All Transactions At Type 1			**265.20**
Total Difference in Minutes from Actual			**(34.02)**
Total Difference in Hours from Actual			**(0.6)**

Source: OSU

Note: All minutes shown in this analysis are expressed as decimals, meaning that 8.95 minutes represents an observed time of 8 minutes and 57 seconds. Similarly, the total difference in hours is also expressed as a decimal, meaning that 4.9 hours represents 4 hours and 54 minutes.

As shown in **Table 3-8**, the average Type 1 transaction takes 3.40 minutes, consisting of 2.47 minutes to complete the reallocation and 0.93 minutes to complete the approval. In contrast, the average Type 2 transaction takes 6.18 minutes with an extra 2.78 minutes accruing to the reallocation step. Although less total time than a Type 2 transaction, the Type 3 transaction is still 40 percent more time consuming to complete the review process than a Type 1, with an extra 1.50 minutes accruing to the approval step.

In total, the 78 transactions observed in the time study totaled 299.22 minutes. If OSU were able to design a process, and supporting system, that eliminates the incorrect PCard submissions and resulting rework, total time to perform these transactions could decrease to 265.20 minutes or 0.6 total review hours just for the 78 transactions. As previously noted, OSU does not have a process to collect data necessary to understand the total number of rework loops, or the time necessary to submit, rework, and resubmit a PCard transaction on the PCard user end of the transaction.

Table 3-9 shows reallocation, approval, and total review times for each area observed. Furthermore, total potential time to complete all 78 transactions is shown based on the process employed by PSSC, the area with the fastest average time to complete Type 1 transactions. This analysis provides further context on the potential gains from elimination of rework.

Table 3-9: PCard Transaction Time Study - Rework and Process Focus

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Reallocation – Average Review Time by Area			
Arts and Sciences	2.58	4.08	2.58
Optometry [1]	2.28	N/A	N/A
PSSC	2.45	5.60	2.45
Approval – Average Review Time by Area			
Arts and Sciences	1.17	1.17	3.17
Optometry [1]	0.95	N/A	N/A
PSSC	0.58	0.58	2.08
Average Total Time by Area			
Arts and Sciences	3.75	5.25	5.75
Optometry [1]	3.23	N/A	N/A
PSSC	3.03	6.18	4.53
Impact of Eliminating Review Rework and Streamlining Process			
Total Transactions Observed			78
Total Time at PSSC Type 1			236.34
Total Review Time All Types All Transactions			299.22
Total Difference in Minutes from Actual			(62.88)
Total Difference in Hours from Actual			(1.0)

Source: OSU

[1] The College of Optometry did not experience a Type 2 or Type 3 transaction during the observation period.

As shown in **Table 3-9**, PSSC routinely processes PCard transactions with the least amount of total review time at each level. Combining the previous opportunity to eliminate process rework, effectively getting all the transactions to Type 1, and then modeling the efficient process that PSSC has been able to achieve at Type 1 reduces the total time to complete all 78 transactions to a projected 236.34 minutes versus the actual 299.22 minutes. This is a reduction of 62.88 minutes, or a 1.0 total review hours just for the 78 transactions.

With 160,362 total PCard transactions performed in FY 2016-17, even excluding requester time, the University could gain efficiencies of an additional 67,449 minutes, or more than 1,124 hours annually, by eliminating rework or 119,065 minutes, or more than 1,984 hours annually, by eliminating rework and adopting a consistent, efficient process. In total, these efficiency gains could result in saved or redirected time worth as much as **$87,000** annually, in salaries and benefits.[32]

Travel Reimbursements

Chart 3-13 shows the high level steps for processing a travel reimbursement payment. It is important to note that there are number of intermediary process steps that have already been identified and will be included in the future state implementation.

Chart 3-13: Travel Reimbursement Payment Process Overview
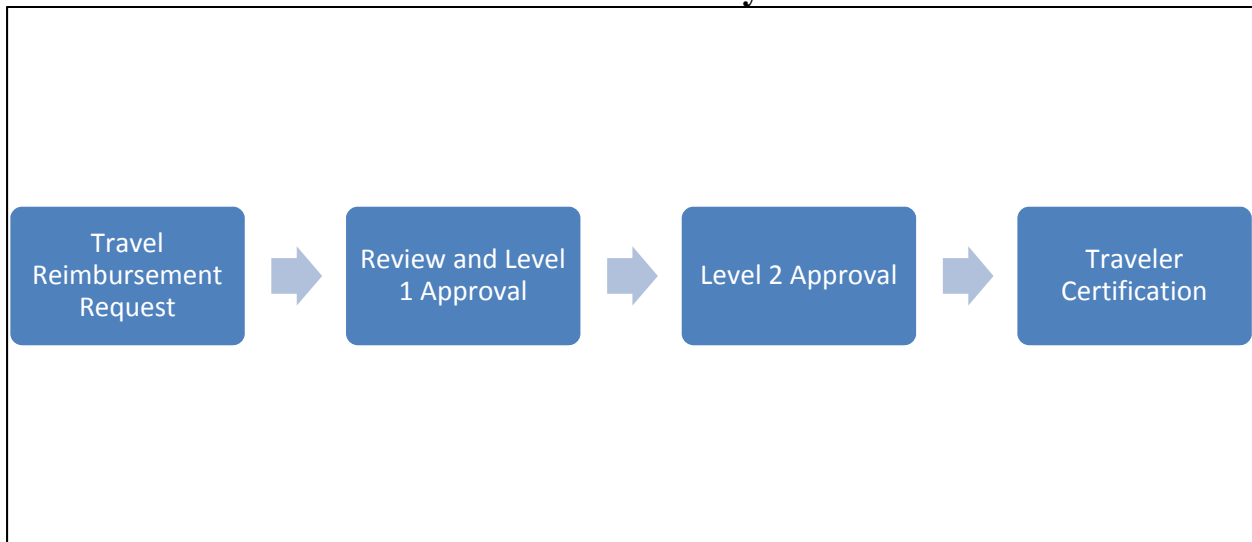
Source: OSU

As shown in **Chart 3-13**, there are four high level process steps for processing travel reimbursement payments.

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[32] This quantification is based on the PSSC's average salaries and benefits for employees responsible for performing these transactions.

Chart 3-14 shows the University travel reimbursement transactions by month for FY 2016-17. Analyzing transactions by month helps to provide insight into workload fluctuations throughout the year.

Chart 3-14: Travel Reimbursement Transactions by Month FY 2016-17

FY2016-17 Travel

Created By Date/Time

	2016						2017				
July	August	September	October	November	December	January	February	March	April	May	June
2,904	3,551	2,991	4,085	4,092	3,649	2,710	2,923	4,203	4,222	4,434	4,410

Number of Transactions (y-axis: 0 to 4,500)
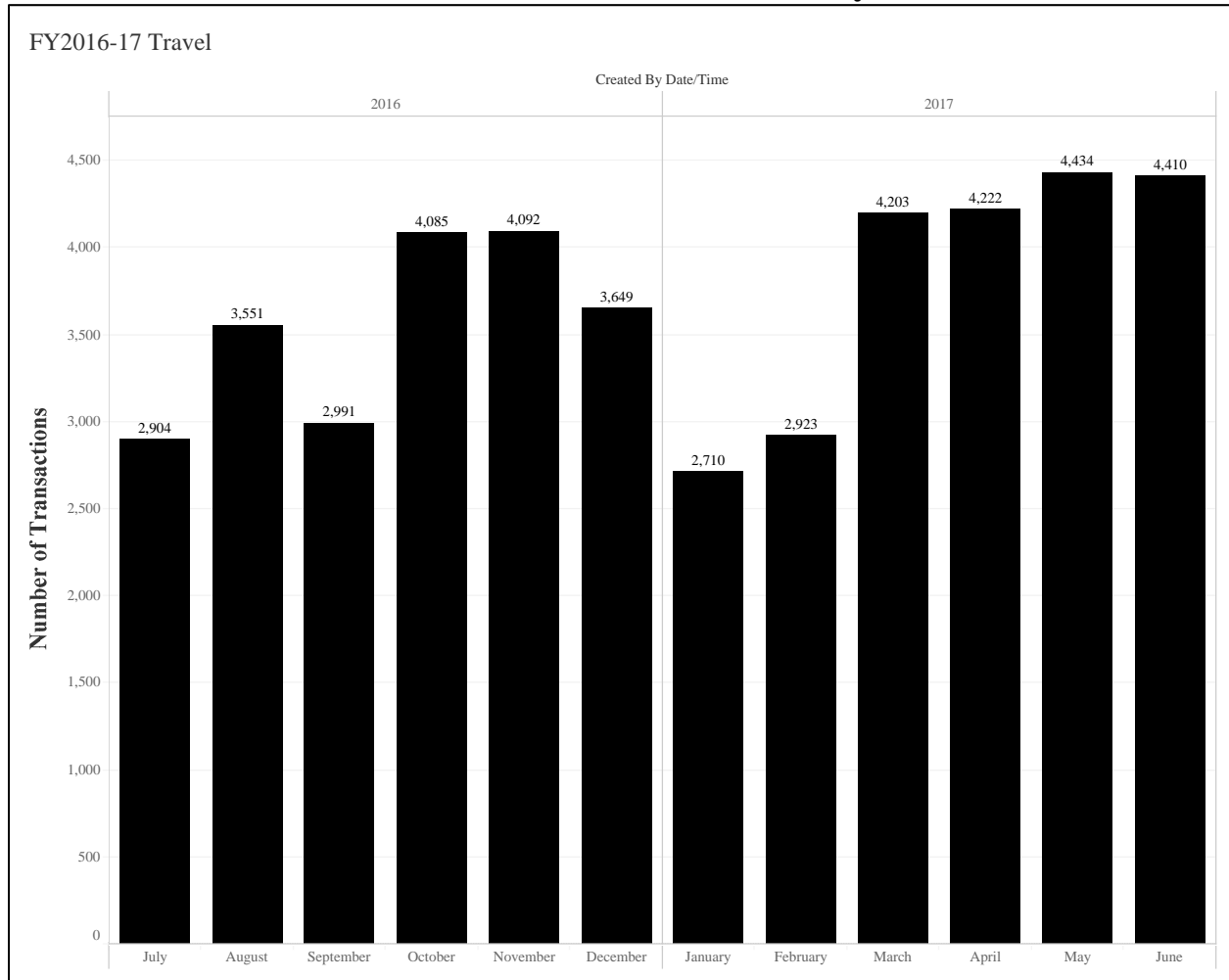
Source: OSU

As shown in **Chart 3-14**, travel reimbursement payments varied from a minimum of 2,710 in January to a high of 4,434 in May during FY 2016-17.

To process a travel reimbursement payment, several requirements must be met.[33] First, there must be approval from the area showing that the travel is for an approved business purpose. Area approval is managed through eTravel. Depending on the area, there may also be an eRequest for the same transactions if the traveler is using a PCard for approved travel expenses. Once the travel occurs, a traveler must submit required receipts and documentation associated with the travel. This information is reviewed and approved by a service center associate (Level 1 approval), a manager reviews and approves (Level 2 approval). Once the service center has completed their approvals, the transaction is sent to the traveler for verification that the travel was conducted for a business purpose. The payment is made once the traveler certifies the travel expenses.

A current state process map was documented for each area by determining which process steps occurred during the high level process flow described above. A detailed process map can be found in **Appendix 3.B. Table 3-10** shows the total number of process steps by area for travel reimbursement payments from the time the reimbursement payment is requested to the final approval.

Table 3-10: Travel Reimbursement Process Summary Overview

	Arts & Sciences	College of Optometry	PSSC
Level 1 Approval Process Steps	7	9	8
Level 2 Approval Process Steps	4	5	4
Total Process Steps	**11**	**14**	**12**

Source: OSU

As shown in **Table 3-10**, the number of steps varies slightly by area. The main source of variation is the entry point into the system, which can be seen in the full process map in **Appendix 3.C**.

The structure of the organization largely determines the process owners of each step. For example, a smaller area such as the College of Optometry relies heavily on one individual to complete the work for the area. Larger areas, such as PSSC, have multiple communication points due to the complexity of their structure and demand.

Chart 3-15 shows the number of travel reimbursement transactions processed in each area by year and by month for FY 2016-17. Analyzing transactions by month helps to provide insight into workload fluctuations throughout the year.

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[33] University Policy 2.11 governs business travel expenditures at OSU.

Chart 3-15: Travel Reimbursements Processed by Area FY 2016-17
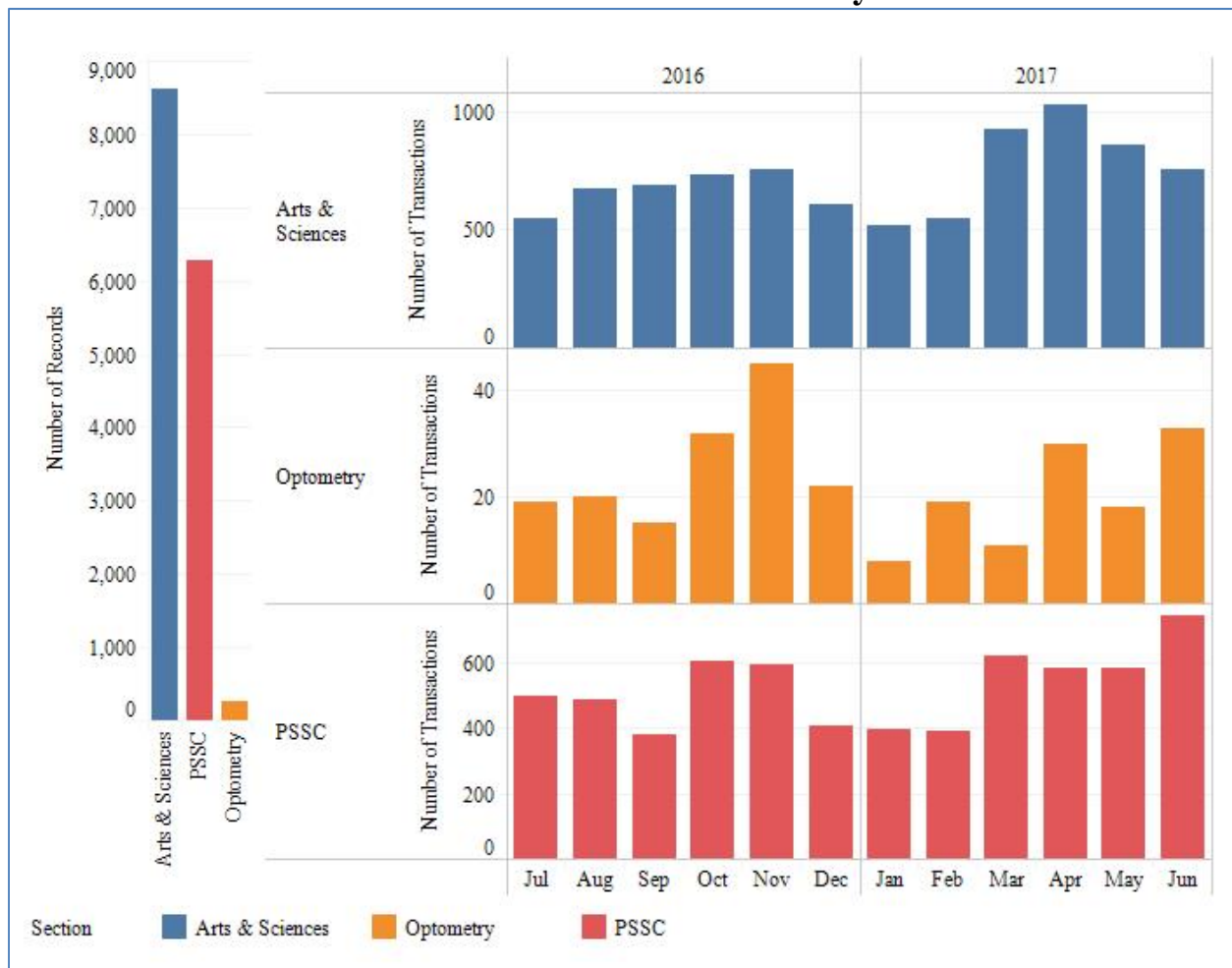
Source: OSU

Chart 3-15 shows the number of transactions processed by area, which varies significantly. The College of Optometry processed only 272 travel reimbursement transactions, while the College of Arts & Sciences processed 8,616 transactions during FY 2016-17.

Table 3-11 shows the three categories of travel reimbursement review scenarios that were observed during the time study, including:

- **Type 1 –** Accepted at Level 1 review and approved at Level 2 review;
  - o Under this scenario, no rework is needed.
- **Type 2 –** Rejected at Level 1 review, reworked and then accepted at Level 1 review, and approved at Level 2 review; or
  - o Under this scenario, the travel reimbursement was submitted incorrectly resulting in rework for the submitter as well as the Level 1 reviewer.
- **Type 3 –** Accepted at Level 1 review, returned at Level 2 review, and reworked and approved at Level 2 review following rework.

o   Under this scenario, the travel reimbursement was submitted incorrectly, but also incorrectly accepted at Level 1, constituting an approver error, resulting in rework for both the submitter and the Level 2 reviewer.

Categorizing observations by scenario type is informative to understanding the steps necessary to complete each transaction, which, in turn, informs total transaction time, as well as sources of rework and the impact it has on total transaction time.

Table 3-11: Travel Reimbursement Time Study Scenarios Overview

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Level 1 Review			
Accepted	Y	N/A	Y
Rejected	N/A	Y	N/A
Accepted - Following Rework	N/A	Y	N/A
Level 2 Review			
Approved	Y	Y	N/A
Returned	N/A	N/A	Y
Approved - Following Rework	N/A	N/A	Y
	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Number of Transactions by Type	36	25	6
Percent of Observed Transactions	53.73%	37.31%	8.96%

Source: OSU

As shown in **Table 3-11**, at 36 of 67 total transactions, or 53.7 percent, the most commonly observed scenario was Type 1, meaning that the travel reimbursement was submitted correctly, accepted without need for rework at Level 1, and approved without need for rework at Level 2. A total of 31 of the 67 observations, or 46.3 percent, were in Type 2 or Type 3, meaning that the travel reimbursement was submitted incorrectly requiring rework. This high proportion of transactions requiring rework is significant in that the identification of errors, communication of those errors, corrective action, re-review, acceptance, and approval all result in additional process time.

Table 3-12 shows the results of the travel reimbursement time study in terms of the average time to complete each transaction type as well as the total time associated with all transactions by type and for all observations. This type of comparison provides a direct measure of the lost time due to rework and errors (i.e., Types 2 and 3) relative to a correctly submitted travel reimbursement (i.e., Type 1).

Table 3-12: Travel Reimbursement Time Study - Rework Focus

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Level 1 Review – Average Time for All Transaction (in Minutes)			
Accepted	**8.95**	N/A	**8.95**
Rejected	N/A	**10.40**	N/A
Accepted - Following Rework	N/A	**8.95**	N/A
Sub-Total L1 Review Time	**8.95**	**19.35**	**8.95**
Level 2 Review – Average Time for All Transaction (in Minutes)			
Approved	**4.28**	**4.28**	N/A
Returned	N/A	N/A	**5.50**
Approved - Following Rework	N/A	N/A	**4.28**
Sub-Total L2 Review Time	**4.28**	**4.28**	**9.78**
Total Review Time per Transaction	**13.23**	**23.63**	**18.73**
Difference Vs. Type 1 per Transaction	**N/A**	**(10.40)**	**(5.50)**
Number of Transactions by Type	36	25	6
Total Review Time by Type	476.28	590.75	112.38
Total Review Time All Types All Transactions			1,179.63
Impact of Eliminating Review Rework – All Transactions at Type 1			
Total Review Time All Transactions At Type 1			886.63
Total Difference in Minutes from Actual			(292.78)
Total Difference in Hours from Actual			(4.9)

Source: OSU

Note: All minutes shown in this analysis are expressed as decimals, meaning that 8.95 minutes represents an observed time of 8 minutes and 57 seconds. Similarly, the total difference in hours is also expressed as a decimal, meaning that 4.9 hours represents 4 hours and 54 minutes.

As shown in **Table 3-12**, the average Type 1 transaction takes 13.23 minutes, consisting of 8.95 minutes to complete the Level 1 review and another 4.28 minutes to complete the Level 2 review. In contrast, a Type 2 transaction takes 23.63 minutes with an extra 10.40 minutes accruing to the Level 1 initial review and rejection step. Although less total time than a Type 2 transaction, the Type 3 transaction is still more than 40 percent more time consuming than a Type 1 transaction, with an extra 5.50 minutes accruing to the Level 2 initial review and return step.

In total, the 67 transactions observed in the time study equated to a total time of 1,179.63 minutes. If OSU were able to design a process, and supporting system, that eliminates incorrect travel reimbursement submissions, total time to perform these transactions could decrease to 886.63 minutes, a decrease of 292.78 minutes or 4.9 total review hours just for the 67 transactions. As previously noted, OSU does not have a process to collect data necessary to understand the total number of rework loops, regardless of level, or the time necessary to submit, rework, and resubmit a travel expense reimbursement on the requester end of the transaction.

In addition to the opportunity to eliminate time associated with rework, there is also the opportunity to improve timeliness by completing all transactions in a consistent, efficient manner. As shown in **Appendix 3.C** even for a relatively simple process such as travel reimbursement processing, the areas involved in the time study still employ customized, area specific processes to accomplish the same goal.

Table 3-13 shows total Level 1 review, Level 2 review, and total review times for each area observed. Furthermore, total potential time to complete all 67 transactions is shown based on the process employed by the College of Arts and Sciences, the area with the fastest average time to complete Type 1 transactions. This type of analysis provides further context on the potential gains associated with combined elimination of rework and employment of a consistent, efficient process to approve a travel reimbursement.

Table 3-13: Travel Reimbursement Time Study - Rework and Process Focus

	Scenario Type		
	Type 1	**Type 2**	**Type 3**
Level 1 Review – Average Review Time by Area			
Arts and Sciences	**5.68**	**15.95**	**5.68**
Optometry [1]	14.40	16.40	Unknown
PSSC	10.88	22.80	10.88
Level 2 Review – Average Review Time by Area			
Arts and Sciences	**3.47**	**3.47**	**9.13**
Optometry [1]	6.40	6.40	Unknown
PSSC	4.28	4.28	9.62
Average Total Review Time by Area			
Arts and Sciences	**9.15**	**19.42**	**14.81**
Optometry [1]	20.80	22.80	Unknown
PSSC	15.16	27.08	20.50
Impact of Eliminating Review Rework and Streamlining Process			
Total Transactions Observed			67
Total Time at Arts and Sciences Type 1			613.05
Total Review Time All Types All Transactions			1,179.63
Total Difference in Minutes from Actual			(566.58)
Total Difference in Hours from Actual			(9.4)

Source: OSU

[1] Optometry did not experience a Type 3 transaction during the observation period.

As shown in **Table 3-13**, the College of Arts and Sciences routinely processes travel reimbursement transactions with the least amount of review time at each level. Combining the previous opportunity to eliminate process rework, effectively getting all transactions to Type 1, and then modeling the efficient process that the College of Arts and Sciences has been able to achieve reduces the total time to complete all 67 transactions to a projected 613.05 minutes versus the actual 1,179.63 minutes. This is a reduction of 566.58 minutes, or 9.4 hours just for the 67 transactions.

With 44,174 total travel reimbursement transactions performed in FY 2016-17, even excluding requester time, the University could gain efficiencies of an additional 195,431 minutes, or more than 3,257 hours annually, by eliminating rework or 377,909 minutes, or more than 6,298 hours annually, by eliminating rework and adopting a consistent, efficient process. In total, these efficiency gains could result in saved or redirected time worth as much as **$276,100** annually, in salaries and benefits.[34]

Finance Systems

OSU also operates and maintains key systems to facilitate the PCard and travel reimbursement processes as well as to track and report key data and information. Over time, systems were added, and then developed or modified as needed to achieve this purpose. As previously noted, finance, in the PCard and travel reimbursement processes, uses eRequest, eTravel, and PeopleSoft Financials. However, OSU plans to retire these systems as their functions are integrated into Workday.

Table 3-14 shows a current valuation of the annual subscription cost and an estimated annual internal labor cost to provide a total annual associated cost of each system. Quantifying the resources that are currently used to support the systems associated with the recruit-to-hire process is important as these resources will be freed up as cost savings or can be redirected to higher priority needs following the implementation of Workday.

Table 3-14: Annual Cost of Retired Finance Systems

System	Annual Subscription Cost	Estimated Annual Internal Labor Cost [1]	Total Annual System Cost
eRequest	N/A	$73,483	**$73,483**
eTravel	N/A	$73,483	**$73,483**
PeopleSoft Financials	$1,566,270	N/A	**$1,566,270**
Total	**$1,566,270**	**$146,966**	**$1,713,236**

Source: OSU

[1] eRequest and eTravel are two of six systems all maintained by a single group. While the University was unable to provide a direct labor cost associated with eRequest and eTravel, the total cost of the group, $440,900, was evenly divided by the six systems to estimate the annual labor cost associated with each system.

As shown in **Table 3-14**, the University is incurring more than **$1,713,200** annually for systems costs that will be eliminated when Workday is fully in place. The majority of this savings is associated with the annual subscription costs for PeopleSoft financials. It may be possible for the University to retire additional systems due to Workday implementation. Doing so will allow for additional redirected cost savings and increased efficiencies while also providing opportunities to streamline and improve process consistency across areas.

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[34] This quantification is based on the PSSC's average salaries and benefits for employees responsible for performing these transactions.

Conclusion: Currently, OSU's PCard transaction approval and travel reimbursement payment processes are carried out in a manner that varies from area to area. The variation is largely a product of the University's decentralized organizational structure and lack of a singular approach. Furthermore, the University areas use a variety of systems to administer these financial transactions, only some of which are directly connected. Lack of a uniform process and a system to administer the process has resulted in a lack of data necessary to define key performance indicators and to measure and improve performance. Although some University areas are independently standardizing and improving processes through data collection, this has not been a uniform effort.

Recommendation 3.2: OSU should develop and deploy a consistent, efficient, and effective process for PCard transaction approvals and travel reimbursement payments that are uniformly enacted across all areas. In doing so, the University should ensure that the uniform processes are reinforced by a single, end-to-end system while eliminating the current array of disconnected, and sometimes area specific, systems. Finally, the University should ensure that the new system has the capability to uniformly collect data that can be used for enterprise-wide performance measurement and management.

Financial Implication 3.2: OSU could realize efficiency gains and redirected savings of **$87,000** and **$276,100** annually by streamlining and implementing efficient processes that eliminate rework for PCards and travel reimbursement transactions, respectively. Furthermore, the University can retire several finance systems once Workday is implemented. Doing so could result in the opportunity to save or redirect more than **$1,713,200** annually based on just those systems directly involved with the PCard and travel reimbursement processes.[35] Collectively, improvements would allow the University to save or redirect more than **$2,076,300** annually.

Additional Consideration 1

Implementation of consistent, efficient, and effective processes supported by a single end-to-end system will reduce or eliminate the current high degree of area-specific variation. In the future state, areas will need fewer specialized process steps currently requiring specific administrative and support personnel. Therefore, OSU should consider adopting a single University-wide shared service center. A single shared service center would likely offer significant economies of scale advantages over the current decentralized and highly independent model.

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[35] This annual impact is inclusive of the benefit that will result from retiring current systems, but is not inclusive of the cost of replacing those systems.

Additional Consideration 2

An efficiency gain is possible in the PCard process even prior to implementation of Workday. Specifically, approval and reallocation both provide for independent review and confirmation of the appropriateness of the transaction. Within PSSC, these steps are completed by the same service center associate for non-service center cards. In contrast, other areas have reallocation completed by a service center associate and approval completed by a separate manager, which requires rework of the entire transaction. With the creation of the service center model, this step is redundant for non-service center cards, as the University has now created a natural segregation of duties between the transaction and approver that historically had not been in place. However, even though the additional step and handoff is no longer necessary, there are areas still performing it. OSU should seek to eliminate as many of these unnecessary and potentially inefficient or ineffective process steps as possible in advance of Workday implementation. Doing so will allow service center resources and focus to be immediately redirected toward critical, required process steps.

Issue for Further Study

Although the Wexner Medical Center is outside of the scope of this section of the performance audit, further study should be performed to evaluate the current state PCard transaction and travel reimbursement payment processes and the potential benefit of adopting the recommended processes. Due to the size and complexity of the Wexner Medical Center's operations, it is likely that some of the same process variability exists among its various departments and units. Furthermore, many of the same disconnected systems are used that were examined in detail for selected areas, and these systems may be able to be replaced by a single end-to-end system that is supportive of the consistent, efficient, and effective process.

Appendix 3.A: Recruit-to-Hire Process Map

Phase One: Identify the Need

Arts & Sciences: Opening Identified → HRA Request for Staff → New Employee Needed? → Existing Job? → Assessment of Needs → Requirements List Created → Formal Job Description Created → Approve HRA Request → Enter Job Description into PeopleSoft → Approve Job Description

CoE: Unit Approval for Hire → Notify HRP of position to be filled → Draft Position Description → Complete Position Approval Template → Review Position Description, Update if Needed → Submit Position in HRA → Business Mgr Approve HRA → College Level Approve HRA → Update official PD in PeopleSoft → Compensation Review and Approval

Optometry: Request to Hire → New Hire? → Create or Edit Position Description → Approve Position Description

Newark Campus: Position Authorized → Update Position Description

Student Life: Opening Identified → New or Existing? → Assessment of Needs → Update or Create Position Description (Informal) → List Requirements → Build Screening Questions → Create Formal Job Description → Create HRA for Job Posting → Add Ad Hoc Approvals to HRA & Budget Approval → Approve HRA → Enter Job Description into PeopleSoft → Approve Job Description → Create Job Opening → Approve Job Opening → Approve Job Opening

Process Owner Key: OSU HR | Area Central HRP | Department Level HRP | Hiring Manager | Finance or Non-HR Approver | Shared Service Center

Section 1 of 5

Phase Two: Plan Recruitment Strategy	Phase Three: Execute Recruitment Strategy	Phase Four: Apply to Position

A&S continued

Create Job Opening → Approve Job Opening → Approve Job Opening → Job Posting Created → Applications Received

CoE continued

Create recruitment strategy, document in Recruitment Strategy Template → Create Advertising Request Template and eRequests → Talent Acquisition Team places advertise-ments in requested sources → Create Job Opening → Create Posting → Approve Job Posting → Talent Acquisition Team Reviews, Approves, and Posts Opening to jobs@osu.com → Create Intake Meeting Template → Applications Received

Optometry continued

eRequest for Recruiting/Advertising Costs → Create Job Opening → Create Posting → Approve Job Posting → Talent Acquisition reviews, approves, and posts opening to jobs@osu.com → Place Advertise-ments → Applications Received

Newark continued

Fill out Advertising Requisition → Approve Advertising Requisition → Approve Advertising Requisition → Approve Advertising Requisition → Enter Advertising Requisition in PeopleSoft → Approve Requisition → Applications Received

SL continued

Create Recruiting & Implement-ation Plan → Implement Recruitment Plan → Job Posting Created → Applications Received

Process Owner Key:

OSU HR	Area Central HRP	Department Level HRP	Hiring Manager	Finance or Non-HR Approver	Shared Service Center

	Phase Seven: Select Candidates	**Phase Eight: Offer Position**	**Phase Nine: Accept Position**
A&S continued	Call References → Positive References?	Draft Offer Letter → Approve Offer Letter → Send Offer Letter to Candidate	Candidate Accept?
CoE continued	Conduct Reference Check → Reference Checks OK?	Verbal Offer to Candidate → Salary negotiation with candidate → Create offer letter and submit for approval → Approve Offer Letter → Send offer letter to candidate	Candidate Accept? → Disposition any remaining candidates
Optometry continued	Conduct Reference Checks → Reference Checks OK?	Salary Discussion/Agreement → Verbal Offer to Candidate	Candidate Accept?
Newark continued	Conduct Reference Checks → Reference Checks OK? → Fill out Intent to Hire Packet → HR Determines Recommended Pay Rate → Submit Intent to hire Packet to Newark HR → Human Resources Review and Approval of Intent to Hire Packet → Dean/Director/SFO review and approve Intent to Hire packet → Notify HR Manager of Approval to Extend Offer and Recommended Pay Rate	Verbal Employment Offer	Candidate Accept?
SL continued	Call References → Reference Checks OK?	Verbal Offer to Candidate	Candidate Accept?

Process Owner Key: OSU HR | Area Central HRP | Department Level HRP | Hiring Manager | Finance or Non-HR Approver | Shared Service Center

Section 4 of 5

Phase Ten: Pre-Boarding

A&S continued

Initiate Hire HRA → Approve Hire HRA → Initiate Background Check → Initiate New Hire Paperwork → Enter Hire Data into PeopleSoft → Close HRA

CoE continued

Close Job Posting in PeopleAdmin → Create Hire Request in HRA → HRA Hire Approval → Send DocuSign Paperwork to candidate → Submit ETS Ticket/ Order Equipment → HRA Assigned for Background Check Process → Monitor for Background Check Results → Monitor for Returned Documents from New Hire → Complete DocuSign File → Add Hire Data Worksheet to HRA → Add new employee to PeopleSoft → Import to OnBase → Offer Letter Added to OnBase → Verification and closing of HRA

Optometry continued

Select Candidate Start Date → Initiate Hire HRA → Create Offer Letter → Send Offer Letter to Candidate → Candidate Sends Back Signed Offer Letter → Attach Offer Letter to HRA → Complete Financial Information → HRA Request for Background Check → Monitor for Background Check Complete-ness → HRA Approval → Send New Hire Packet to Candidate → New Hire Paperwork Complete → Enter Hire Data into PeopleSoft → Create HelpDesk Request for IT setup → I-9 Entry and Completion → Verification of file and Close HRA → Close Posting → Dispositioning of unselected candidates → OnBase Import

Newark continued

Notify HR of Offer Acceptance → Send Offer Letter (Hire Date Established) → DocuSign Offer Letter Received Back from Applicant → Email to request background check → Background Check OK? → New Hire Paperwork Sent to Candidate → New Hire Paperwork Received → Add New Employee to PeopleSoft → Disposition-ing → Change Posting to Filled Status → I-9 Completion (First Day) → New Hire Orientation (First Day)

SL continued

Generate Offer Letter → Send Offer Letter to Candidate → Create Hire HRA Request → HRA Hire Approval → Ad Hoc Approvals → HRA Final Approval → Initiate DocuSign New Hire Paperwork → Initiate Background Check Request → Monitor Background Check Results → Monitor New Hire Paperwork Document Return → Enter New Hire into PeopleSoft → I-9 Completion → Mark DocuSign File Complete → File Transfer to OnBase → Add Offer Letter to OnBase → Initiate HRA to Payroll Team → Payroll Team Check Verification and Finalize Hire → Enter into SL Timekeeping System

Process Owner Key: OSU HR | Area Central HRP | Department Level HRP | Hiring Manager | Finance or Non-HR Approver | Shared Service Center

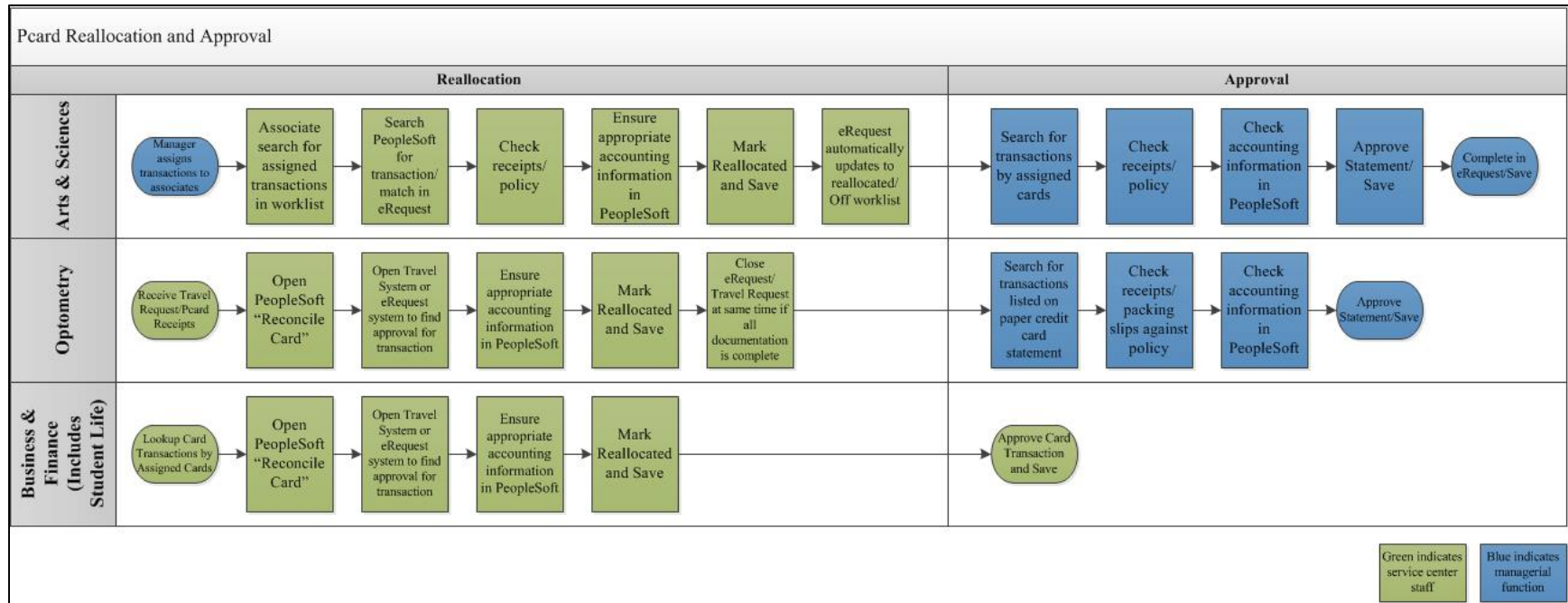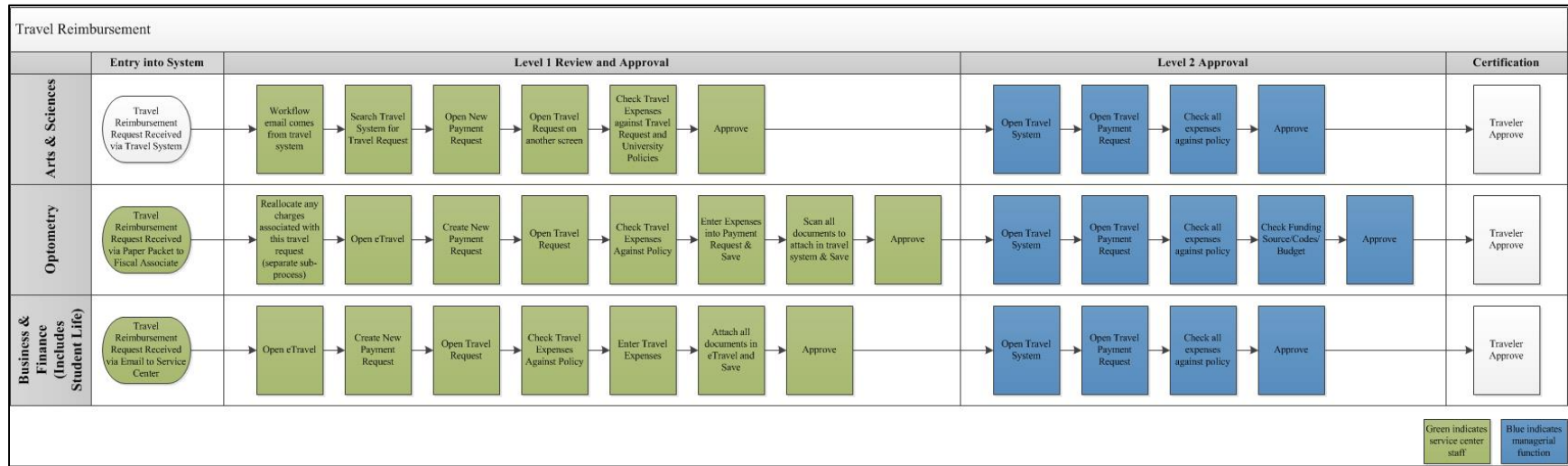**Section 5 of 5**

Appendix 3.B: PCard Reallocation and Approval Process Map

Appendix 3.C: Travel Reimbursement Process Map

4. Shared Services – Background Checks

Section Overview

This section of the performance audit focuses on background checks at The Ohio State University (OSU or the University). Information was collected and analysis was performed to evaluate background check policies, processes, and procedures. Analysis identified opportunities to improve operational efficiency through policy, procedural, and operational changes.

Recommendation Overview

Recommendation 4.1: OSU should ensure that all background checks are conducted in accordance with official University policies. However, in doing so, the University should revisit policy requirements to ensure that they are both effective in achieving the overall goal without resulting in unnecessarily inefficient or costly processes. When choosing to deviate from the common process, all University areas should collect the data and information necessary to evaluate the efficiency and effectiveness of these decisions. In addition, the University should regularly reevaluate the full cost of this process and ensure that an appropriate amount is recovered through administrative fees.

Financial Implication 4.1: By revising the current OHR background check administrative fee to recover the direct cost of the service provided, areas may repurpose **$90,600** toward other initiatives.

By implementing policy and procedural changes, the University may realize savings by reducing the scope of candidates undergoing background checks. These savings could not be quantified due to data quality issues in identifying which hiring transactions are associated with a background check.

Recommendation 4.2: OSU should seek to improve background checks operational efficiency and effectiveness by combining all background check personnel into a single team. This single team should service all University customers and should use consistent process and IT systems to track detailed workload and productivity in a consistent and complete manner.

Financial Implication 4.2: N/A

Section Background

OSU conducts background checks to maintain a safe and secure environment for the University-wide community. A background check is the process of acquiring records regarding an individual that are then used to determine eligibility for employment or other University activities. University Policy 4.15 outlines that, at minimum, "Background checks are required for final candidates for the following positions:
- Regular faculty and staff;
- All student employees, including graduate associates, with access to restricted institutional data;
- Temporary, term, seasonal, and intermittent appointments;[36]
- Associated faculty;
- Visiting scholars; and
- Temporary staff provided by third-party staffing vendors unless the vendor has conducted its own background check that complies with university requirements."

While the policy regarding background checks has been in effect since 2008, a major change was enacted in June 2016 requiring all employees with access to restricted institutional data to have a background check on file. The policy change affected student employees who previously would not have been required to have a background check as well as current employees without a previous background check on file.

OSU is governed by relevant federal and state laws and regulations regarding background checks. Numerous state laws require individuals with "access to children" to have a fingerprint-based criminal records check conducted through the Ohio Attorney General's Bureau of Criminal Investigation (BCI or the Bureau).[37] The Bureau maintains a statewide database of criminal arrests transactions from all Ohio law enforcement and corrections officials.[38] The Bureau also has access to the Federal Bureau of Investigation (FBI) criminal database for national criminal records checks.[39] For the purposes of this performance audit, BCI/FBI refers to a fingerprinting background check conducted by the Bureau of one or both of these databases. University Policy 1.50, in alignment with state law, requires BCI/FBI background checks for "any faculty, staff, appointee, student, student employee, graduate associate, or volunteer

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[36] Excluding graduate associates and student employee appointments except when covered by an approved area background check program or when the position has access to restricted institutional data.

[37] States are authorized by 34 U.S. Code 40102 to create procedures for requiring fingerprint-based background checks through the FBI for entities with the responsibility for the safety and well-being of children. Ohio has numerous requirements in the Ohio Revised Code (ORC) requiring fingerprint–based background checks based on occupation or place of employment or volunteering where an individual has access to children. A common requirement affecting OSU employees and volunteers is ORC § 2151.86 regarding child day camps. Examples of professional licensures with BCI/FBI background check requirements include: ORC § 3319.39 (public educators), ORC § 4725.121 (Optometry Board), ORC § 4729.071 (Pharmacy Board), ORC § 4731.081 (Medical Board), and ORC § 4755.70 (Occupational Therapy, Physical Therapy, and Athletic Trainers Board). In the absence of explicit state procedures, federal law allows entities responsible for children to request fingerprint-based background checks through the state provider.

[38] There are no restrictions on who may request a search of this database.

[39] A search of this database may only be requested for purposes outlined in state or federal law.

working in activities and programs with minors, who is likely to have responsibility for the care, custody, or control of a minor."

Aside from circumstances that require a BCI/FBI background check, OSU has policies that allow it to obtain standard background checks through a third-party vendor, First Advantage.[40] First Advantage background checks are generally conducted for employment purposes and the standard domestic check includes a county-level review of the prior seven years of criminal history, a national criminal database search, social security number verification, and a national sexual offender registry search. First Advantage allows the University to conduct nationwide criminal searches of all candidates, in contrast to a BCI/FBI background check where a nationwide check of the FBI database may only be conducted where legally required. In addition, First Advantage and BCI/FBI checks are not searches of the same databases, so they are not guaranteed to be fully redundant.

University Policy 4.15 allows areas to request other types of background checks in addition to the standard check by first submitting a Program Approval form to the Office of Human Resources (OHR). Examples of additional checks include education verifications, credit checks, and motor vehicle report checks. On the Program Approval, the area must specify the additional checks requested by position, and provide a business reason for requesting the check. The Program Approval also must be approved by the Office of Legal Affairs.

Background check requirements differ between the Wexner Medical Center (Med Center) and campus, which refers to all areas of the University excluding the Med Center.[41] All campus candidates receive a First Advantage check, regardless of whether a BCI/FBI check is conducted. In accordance with its interpretation of 42 Code of Federal Regulations (CFR) 455.434 regarding requirements for Medicaid providers to conduct fingerprint-based background checks, the Med Center made the business decision to require BCI/FBI checks in lieu of First Advantage for all employees and most onsite non-employees, including: unpaid students, internal and external volunteers, contractors, vendors, and visiting physicians. This business decision was made in part due to the increased risk associated with patient contact.

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[40] OSU has used First Advantage as its third-party vendor since 2013. The University initially signed a contract for this service with LexisNexis in 2011 until it was acquired by First Advantage in 2013. As of the completion of this performance audit, the University was in contract with First Advantage with an effective date of April 21, 2017 and a term of 36 months.

[41] For the purposes of background check requirements, the Med Center includes the following entities: College of Medicine and Office of Health Sciences (COM/OHS), the Comprehensive Cancer Center (CCC), and the Health System (HS), which includes:

- Ambulatory Services;
- Harding Hospital;
- Health Plan;
- Hospital East;
- James Cancer Hospital;
- Ross Heart Hospital;
- Med Center Shared Services;
- Specialty Care Network; and
- University Hospital.

Although the Med Center requires the BCI/FBI background check, there are times when a First Advantage background check will also be used for employment candidates. In the event of a pending BCI/FBI background check, a First Advantage background check may be used on a provisional basis until the BCI/FBI results are received. Additionally, a First Advantage background check will be conducted in lieu of BCI/FBI for internal candidates without a break in service. This procedure differs from campus, where all candidates required to have a background check undergo First Advantage background checks, regardless of whether they are also required to receive a BCI/FBI background check.

Campus and Med Center Background Checks Operation

The Med Center and campus also differ in how background checks are carried out. Campus background checks are conducted by the OHR Background Check Team. The OHR Background Check Team was created in 2014, but previously University areas were fully responsible for creating and carrying out their own background checks. Nearly all areas on campus were centralized by January 2014, with the exception of the Office of Student Life, which was centralized in July 2014.

In the Med Center, the Security ID Processing Team conducts BCI/FBI background checks, while First Advantage background checks are ordered by Med Center Human Resources (HR).

OHR Background Check Team

The OHR Background Check Team consists of 2.0 full-time equivalent (FTE) Background Check Coordinators and 1.0 FTE Lead Background Check Coordinator. Additional oversight, as needed, is provided by the OHR Recruitment Manager. The OHR Background Check Team primarily conducts background checks, but with about 15 percent of total time spent on Form I-9 Verifications[42] and about 5 percent of time spent on contractor First Advantage results.[43] For First Advantage background checks, the OHR Background Check Team is responsible for initiating and ordering the check, processing electronic results, making a recommendation of whether a criminal record disqualifies a candidate from being hired, and communicating these recommendations to the hiring areas. For BCI/FBI background checks, the OHR Background Check Team is responsible for taking the individual's fingerprints, ordering the background check, processing electronic and mailed results, determining if a criminal record disqualifies the individual, and communicating those results to the interested party.
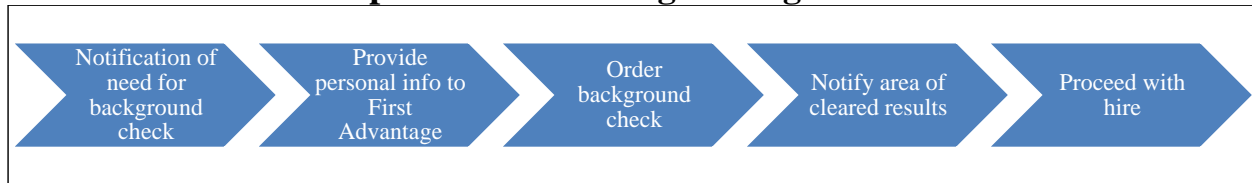
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[42] Form I-9 is used for verifying the identity and employment authorization of individuals in the United States. The University uses eVerify to conduct I-9 verifications. The OHR Background Check Team is responsible for administering the eVerify database, providing customer service to areas regarding the database, and assists candidates when their authorization to work in the U.S. could not be initially confirmed. This work is primarily done through phone calls, emails, and meetings, and in CY 2017, the OHR Background Check Team sent and received a projected 3,320 emails and conducted 337 meetings with candidates. I-9 verification is considered part of the Employment Eligibility function within OHR, which is the responsibility of the OHR Background Check Team.

[43] To comply with University Policy 4.15, many contractors and third party staffing vendors order First Advantage checks for their employees through a separate portal set up for vendors. This includes Med Center offsite contractors. The OHR Background Check Team is responsible for compiling a weekly report with cleared results, email communications, and managing the badge form approval process for Facilities Operations and Development. In CY 2017, the OHR Background Check Team managed 271 contractor portal transactions compiled into a weekly report, sent and received 2,378 emails, and managed 298 badge form approvals.

Campus First Advantage Procedure

The procedure for conducting First Advantage background checks is part of the Recruit-to-Hire Process (see **R3.1 Current State Process – Human Resources**). After a candidate accepts an offer, the candidate must undergo a First Advantage background check, as the offer is contingent upon a cleared background check. **Chart 4-1** shows an overview of the process for a candidate who had a cleared background check and was ultimately hired.

Chart 4-1: Campus First Advantage Background Check Process

Notification of need for background check	Provide personal info to First Advantage	Order background check	Notify area of cleared results	Proceed with hire

Source: OSU

As shown in **Chart 4-1**, there are five main process steps. First, the area notifies the OHR Background Check Team of the need for a background check for a final candidate. The Background Check Coordinator then initiates the background check in the First Advantage system, which automatically sends a form to the candidate to fill out with his or her personal information. Once First Advantage receives the candidate's completed form, the Background Check Coordinator orders the background check, and once the results are cleared, the Background Check Coordinator notifies the hiring area. The area is then able to proceed with the hire.

Campus BCI/FBI Background Check Procedure

For positions requiring BCI/FBI background checks, the hiring area will request the check concurrently with the First Advantage check. **Chart 4-2** shows an overview of the process for a candidate who had a cleared background check and was ultimately hired.

Chart 4-2: Campus BCI/FBI Background Check Process

Notification of Need for Background Check	Conduct fingerprinting and order background check	Notify area of cleared results	Proceed with hire
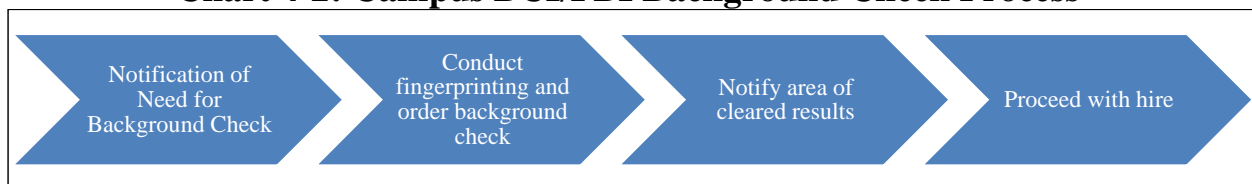
Source: OSU

As shown in **Chart 4-2**, there are four main process steps. First, the area notifies the OHR Background Check Team of the need for a BCI/FBI background check for a final candidate. Additionally, the area notifies the candidate that he or she must go to OHR for fingerprinting. When the individual reports to OHR, the Background Check Coordinator takes the fingerprints and orders the background check. Once the results are cleared, the Background Check Coordinator notifies the hiring area. The area is then able to proceed with the hire.

Campus Billing Procedure

The cost of a standard domestic First Advantage background check is $15.65[44] and additional checks have supplementary fees that are outlined in the contract price schedule. The Ohio Attorney General charges $22.00 for BCI checks, $24.00 for FBI checks, and $46.00 for both. All background check costs for employment purposes are billed back to the area requesting the check. Additionally, some areas cover the cost for volunteers. Individuals responsible for paying for their own background check do so at the time the fingerprint is taken. In addition to the direct cost of the background check, OHR also charges an administrative fee of $15.70 per check to cover the cost of the background check function (see **R4.1**). The administrative fee is charged to both areas and individuals paying for their own check.

Med Center Security ID Processing

The Med Center Security ID Processing Team consists of 3.0 FTE Information Associates and 1.0 FTE ID Processing Supervisor. Additional oversight, as needed, is provided by the Badging and Access Manager and the Assistant Director of Communications Center, Project Management, and Access Control/ID Processing. The Med Center Security ID Processing Team is responsible for conducting BCI/FBI background checks and for creating Med Center access badges. For BCI/FBI background checks, the Med Center Security ID Processing Team is responsible for taking the individual's fingerprints, ordering the background check, and communicating the results to HR. The ID Processing Supervisor, with input as needed from the Med Center Director of Talent Acquisition, is responsible for making a determination if a criminal record disqualifies a non-employee from working at the Med Center. The Director of Talent Acquisition makes that determination for candidates and paid students.[45]
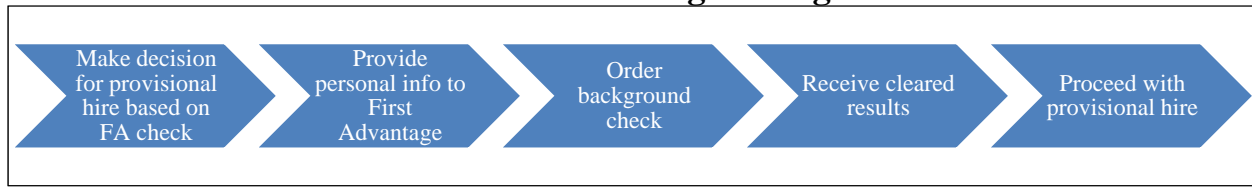
Med Center First Advantage Procedure

Internal candidates without a break in service typically only receive a First Advantage background check. Additionally, if there is a delay in the BCI/FBI background check results for an external candidate, a First Advantage background check may be run to provisionally hire the candidate until the BCI/FBI check clears. **Chart 4-3** shows an overview of the process for an external candidate who had a cleared First Advantage background check and was provisionally hired.

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[44] Additional fees are charged for international background checks and certain county criminal history checks.

[45] All Med Center BCI/FBI background checks are run under the Volunteer Children's Act (in reference to 34 U.S. Code 40102), which is used in the absence of explicit state legislation requiring BCI/FBI checks for individuals working with or volunteering with children. Since Med Center BCI/FBI checks are not run under an ORC code, there are no legally prescribed disqualifying reasons for certain criminal offenses. Therefore, disqualification of a candidate based on a criminal record is at the discretion of the Med Center.

Chart 4-3: Med Center First Advantage Background Check Process

| Make decision for provisional hire based on FA check | Provide personal info to First Advantage | Order background check | Receive cleared results | Proceed with provisional hire |

Source: OSU

As shown in **Chart 4-3**, there are five main process steps. First, Med Center HR makes the decision to provisionally hire someone on the basis of a cleared First Advantage background check. Upon request of the recruiter, the Med Center HR Service Center initiates the background check in the First Advantage system, which automatically sends a form to the candidate to fill out with his or her personal information. Once First Advantage receives the candidate's completed form, the Service Center orders the background check. The Service Center receives notification of cleared results daily from the OHR Background Check Team. Med Center HR is then able to proceed with the provisional hire.

Med Center BCI/FBI Background Check Procedure

For the Health System, the BCI/FBI check is typically conducted in conjunction with the interview, resulting in multiple qualified candidates for a position receiving a background check. This was a business decision made by the Med Center for high demand positions with a high volume of job openings. Historically, the background check process for the College of Medicine (COM), Office of Health Sciences (OHS), and Comprehensive Cancer Center (CCC) has been more similar to campus by waiting for an accepted offer before requesting the background check. However, COM and OHS began following the Health System process in June 2018. **Chart 4-4** shows an overview of the process for an external candidate who had a cleared background check and was ultimately hired.

Chart 4-4: Med Center BCI/FBI Background Check Process

| Notification of Need for Background Check | Conduct fingerprinting and order background check | Notify HR of cleared results | Proceed with hire |

Source: OSU

As shown in **Chart 4-4**, there are four main process steps. Med Center HR notifies the Med Center Security ID Processing Team of the need for a BCI/FBI background check for a candidate. Additionally, the candidate is notified that he or she must go to ID Processing for fingerprinting. When the individual reports to ID Processing, the Information Associate takes the fingerprint and orders the background check. Once the results are cleared, the Security ID Processing Supervisor notifies the Service Center. Med Center HR is then able to proceed with the hire.

Med Center Billing Procedure

Med Center HR absorbs the cost of all candidate First Advantage background checks. Some offsite contractors pay for First Advantage checks ordered through Med Center HR. Med Center Security, under the campus Department of Public Safety, absorbs the cost of BCI/FBI background checks for candidates and non-employees, with the exception of many non-direct patient care contractors and vendors. Those responsible for paying for their own background check do so at the time the fingerprint is taken and are charged $50, which includes the $46 billed by BCI and a $4 administrative fee.

Total Background Checks

Table 4-1 shows the total number of First Advantage and BCI/FBI background checks conducted for the University, by campus and the Med Center, for calendar year (CY) 2015 through CY 2017. This represents the historical workload of those responsible for conducting background checks. The campus totals represent the majority of the OHR Background Check Team's operations. The Med Center BCI/FBI totals represent a core function of the Med Center Security ID Processing Team's operations. The Med Center First Advantage totals represent a portion of responsibilities carried out by the HR Service Center, recruiters, and the Director of Recruitment.

Table 4-1: Total Background Checks

	Campus			
	CY 2015	**CY 2016**	**CY 2017**	**3-Year % Change**
First Advantage	7,878	11,127	12,422	57.7%
BCI/FBI	5,585	5,191	5,506	(1.4%)
Total	**13,463**	**16,318**	**17,928**	**33.2%**
	Med Center			
	CY 2015	**CY 2016**	**CY 2017**	**3-Year % Change**
First Advantage	4,440	4,610	5,227	17.7%
BCI/FBI	12,578	12,841	13,300	5.7%
Total	**17,018**	**17,451**	**18,527**	**8.9%**

Source: OSU

As shown in **Table 4-1**, the total number of First Advantage background checks significantly increased for campus and moderately increased for the Med Center. The campus increase can be attributed to the policy change that went into effect in June 2016 requiring students with access to restricted data to have background checks, as well as current employees who had access to restricted data and did not have a background check on file. The Med Center increase can be attributed to an increase in total job openings and an increase in internal hires. BCI/FBI background checks totals remained relatively stable.

Background Checks Costs and Budgetary Impact

Table 4-2 shows the University's full cost of the background check operation. It is inclusive of the fees charged by First Advantage and BCI, total personnel cost, and other non-labor costs (see table footnote). It also takes external recoupment into account, which is the amount paid by individuals responsible for paying for their own background check.

Table 4-2: Cost of Background Checks

	Campus			
	CY 2015	**CY 2016**	**CY 2017**	**3-Year % Change**
Total Cost	**$601,512**	**$609,880**	**$646,190**	**7.4%**
First Advantage Fee	$146,989	$206,172	$248,711	69.2%
BCI/FBI Fee [1]	$222,395	$216,472	$230,992	3.9%
Personnel	$227,411	$184,613	$163,715	(28.0%)
Other Non-Labor Costs [2]	$4,717	$2,623	$2,772	(41.2%)
External Recoupment	$140,276	$145,920	$175,219	24.9%
Net Cost	**$461,236**	**$463,960**	**$470,971**	**2.1%**
	Med Center			
	CY 2015	**CY 2016**	**CY 2017**	**3-Year % Change**
Total Cost	**$882,329**	**$948,911**	**$972,765**	**10.2%**
First Advantage Fee	$102,660	$113,552	$128,072	24.8%
BCI/FBI Fee	$578,588	$590,686	$611,800	5.7%
Personnel	$201,081	$244,673	$232,893	15.8%
Other Non-Labor Costs [3]	N/A	N/A	N/A	N/A
External Recoupment [4]	N/A	N/A	$88,130	N/A
Net Cost	**$882,329**	**$948,911**	**$884,635**	**0.3%**
CY 2017 Total Cost for OSU				**$1,618,955**
CY 2017 Net Cost for OSU				**$1,355,606**

Source: OSU

[1] The BCI/FBI Fee is inclusive of maintenance fees for software and the ink card machine. It should be noted that some areas reimburse new hires for the cost of the BCI/FBI background check if it was conducted at a location other than OHR. In CY 2017, there were a total of 471 BCI/FBI background checks conducted locally that may have been reimbursed up to $16,926, which is not accounted for in the table.

[2] Campus Other Non-Labor Costs is inclusive of credit card fees, postage, internal maintenance, supplies, and other miscellaneous costs.

[3] Med Center Non-Labor Costs could not be quantified. The monthly supplies cost tracked by Med Center Security only accounts for costs associated with the badge function of the Med Center Security ID Processing Team.

[4] Improved recoupment tracking began in January 2017. The recoupment for CY 2015 and CY 2016 could not be broken down by external and internal sources, and is presented in total in **Table 4-4**.

As shown in **Table 4-2**, the cost for First Advantage background checks has risen commensurate to the increase in number of checks, while the BCI/FBI cost has remained relatively stable. Campus personnel costs have significantly decreased, due to a staff reduction of 0.5 FTE and attrition of higher paid employees. The increase in background check fees in relation to the decrease in personnel costs results in a relatively stable total net cost for campus.

Table 4-3 shows the cost recovery of First Advantage and BCI/FBI background checks by campus areas. OHR initially pays the First Advantage and BCI/FBI fee for campus, and bills the background check fee plus an administrative fee back to the area requesting the background check. The administrative fee covers the cost of the OHR Background Check Team and other non-labor costs associated with background checks.

Table 4-3: Campus Background Checks Budgetary Impact

	CY 2015	CY 2016	CY 2017	3-Year % Change
Full Cost to OHR for First Advantage and BCI/FBI	$595,763	$603,717	$640,326	7.5%
External Recoupment	$140,276	$145,920	$175,219	24.9%
Cost Recovered from Campus Areas	$425,751	$513,474	$568,669	33.6%
Net Cost to OHR	**$29,736**	**($55,677)**	**($103,561)**	**(448.3%)**
Full Cost to Facilities Operations and Development for First Advantage	$3,729	$3,249	$3,637	(2.5%)
Full Cost to Office of Student Life for First Advantage Motor Vehicle Reports	$2,019	$2,914	$2,228	10.4%

Source: OSU

As shown in **Table 4-3**, the cost recovered by areas exceeded the actual cost of the background check function in CY 2016 and CY 2017 (see **R4.1**).

Table 4-4 shows the budgetary impact of Med Center background checks. Med Center HR absorbs the cost of Med Center First Advantage checks. The cost of Med Center BCI/FBI checks is absorbed by the Med Center Security budget, which falls under the Department of Public Safety. The Department of Public Safety recovers a portion of this cost through internal cost transfers and cash and credit card payments for non-clinical contractor background checks. Med Center HR is billed back for contractors with direct access to patients and areas are billed back for board certifications. The amount billed back internally covers the BCI/FBI fee only. The amount billed externally to contractors includes a $4 administrative fee.

Table 4-4: Med Center Background Checks Budgetary Impact

	CY 2015	CY 2016	CY 2017	3-Year % Change
First Advantage				
Full Cost to Med Center HR	$102,660	$113,552	$128,072	24.8%
Cost Recovered	$0	$0	$0	0.0%
Net Cost to Med Center HR	$102,660	$113,552	$128,072	24.8%
BCI/FBI				
Department of Public Safety Full Cost	$578,588	$590,686	$611,800	5.7%
Cost Recovered [1]	$20,560	$25,747	$89,630	335.9%
Net Cost to Department of Public Safety	$558,028	$564,939	$522,170	(6.4%)

Source: OSU

[1] Tracking for cash payments does not have the detail needed to quantify only the cost recovered for background checks. Therefore, the cost recovery includes cash payments for lost badges and lanyards.

As shown in **Table 4-4**, cost recovery for the Department of Public Safety rose significantly in CY 2017. This is due to a new cost recoupment procedure for billing all non-clinical contractors

for background checks, which went into effect in May 2017. In spite of the 5.7 percent increase in background checks, the significant increase in cost recovery resulted in a 6.4 percent decrease in net cost to the Department of Public Safety.

The **Background Checks** section is presented as two separate sub-sections of analysis, including:

- **Background Check Policies and Procedures:** The first analysis seeks to assess the efficiency and effectiveness of the University's policies, processes, and procedures for administrating background checks.
- **Staffing and Operational Structure:** The second analysis seeks to assess the efficiency and effectiveness of the current operational structure of the campus and Med Center background check functions.

R4.1 Background Check Policies and Procedures

Background

As stated in the **Section Background**, OSU has University-wide policies requiring First Advantage background checks for most internal and external employment candidates and requiring BCI/FBI background checks for any University affiliate working with minors. The policy also prescribes the procedure for areas to request other types of background checks in addition to the standard criminal check.

While the campus procedure for carrying out background checks is centralized within OHR, the Med Center has its own procedure that is mostly housed internally. The OHR Background Check Team administers First Advantage and BCI/FBI checks on behalf of University areas with the cost of that service billed back to the area. The Med Center requires BCI/FBI checks for all employees and most non-employees, and these checks are administered by Med Center Security. Often, multiple final candidates for a position receive background checks. First Advantage checks are not required for Med Center employees; however, First Advantage is used in lieu of BCI/FBI for internal candidates, and may be administered on a provisional basis for external employment candidates.

Methodology

This sub-section, **Background Check Policies and Procedures**, seeks to assess the efficiency and effectiveness of the University's policies, processes, and procedures for administrating background checks. This analysis was requested by OSU leadership as an area that could benefit from objective data-driven assessment to inform management decisions. The purpose of this analysis is to compare OSU policies and procedures with those of other higher education institutions, and to identify opportunities for improved efficiency and cost-effectiveness of the current approach for administering background checks.

Operational data and information was provided by OSU and supplemented by testimonial evidence from management and staff within the Office of Human Resources (OHR), Med Center Human Resources (Med Center HR), and Med Center Security. Testimonial evidence on staff duties and informal processes was corroborated through direct observation of staff. Additional sources of information include First Advantage, the Ohio Attorney General's Bureau of Criminal Investigation (BCI), the Background Check Log, an internal tracker used by the OHR Background Check Team, eServices, and PeopleSoft. Data points were used from either calendar year (CY) 2014 through CY 2016, or fiscal year (FY) 2013-14 through FY 2016-17, the last complete three-year time periods as of the completion of audit field work. During the course of the audit, data was evaluated for sufficiency and appropriateness.

In-state and out-of-state higher education institutions and their affiliated health systems were selected to compare policies and procedures related to employment candidate background checks. The following universities from Ohio provided information used in the analysis, henceforth referred to as In-State Universities: University of Akron, Bowling Green State University, Central State University, University of Cincinnati, Cleveland State University, Kent State University, Miami University, Northeast Ohio Medical University, Ohio University, Shawnee State University, University of Toledo, Wright State University, and Youngstown State University. The following large universities from contiguous states also provided information used in the analysis, henceforth referred to as Out-of-State Universities: Indiana University, University of Kentucky, University of Louisville, University of Michigan, Penn State University, and University of Pittsburgh. Additionally, the following university-affiliated health systems provided information used in the analysis: Michigan Medicine, Penn State Health, University of Cincinnati (UC) Health, University of Kentucky (UK) Healthcare, and the University of Toledo Medical Center.

In addition to collecting publicly available information on the policies and procedures of other institutions, extensive interviews were conducted with those charged with overseeing the operations and/or legal aspects of employee background checks. Key areas of comparison include operations and staffing structure, cost structure, policy scope, minimum requirements for faculty and staff, and differentiation between university and health systems requirements.

This sub-section first focuses on assessing the appropriateness of University policies and procedures. Background check requirements for internal candidates was a specific policy area identified as an area where OSU provides greater coverage than many in-state and out-of-state universities. The analysis then evaluates the appropriateness of the current billing structure in respect to the actual operational costs. Next, the analysis assesses the appropriateness of deviation from standard policies and procedures. Finally, the analysis considers the Health System's deviation from University procedure regarding the timing of the background check within the recruit-to-hire process, and how that procedure affects the number of candidate background checks.

Analysis

Internal Candidates

University Policy 4.15 requires background checks for all final candidates, which includes both internal and external applicants considered for the position. Additionally, the policy states the following regarding internal candidates:

> "Internal candidates who have had a background check through the university within the past 12 months are not required to have a new background check unless additional searches are required by the unit's approved background check program. The additional searches must be conducted at the time of the transfer. The Background Check Coordinator (BCC) should review previous background check results in relation to the position for which the candidate is being considered."

Therefore, all internal candidates must undergo a new background check if they have not had a background check within the past year. If the area has a program approval on file requiring an additional check for the position the employee is transferring to, the additional check must be conducted. According to OHR, the University generally does not consider an employee receiving a promotion to be an internal candidate. However, a background check will be conducted of an employee receiving a promotion if the employee did not previously have a background check, due to being hired prior to the policy being enacted.

Table 4-5 shows OSU's background check requirement for internal candidates compared to other in-state and out-of-state universities. The three policy choices include:
- **All Internal Candidates** – A background check is required of all internal candidates regardless of hiring position responsibilities. This is what OSU currently requires with the policy applying to all internal candidates who have not undergone a background check within the prior year.
- **Only New Job Responsibilities** – A university will only conduct a background check of an internal candidate for certain types of promotions or job changes. For example, the university may conduct a new background check if the candidate will be gaining financial responsibility. Another example is if the employee is moving into a position that requires an additional check, such as a position with driving responsibilities requiring a Motor Vehicle Report.
- **Not Required/Only if No Previous Background Check** – Background checks are generally not required for internal candidates, unless the candidate never received a background check upon their initial hire.

This policy comparison is important to provide context not only on OSU's policy choice, but also how common that choice is across other in-state and out-of-state universities.

Table 4-5: Internal Candidate Background Checks Policy Comparison

	All Internal Candidates	Only New Job Responsibilities	Not Required/ Only if No Previous Background Check
Ohio State University	X		
In-State Universities			
University of Akron			X
Bowling Green State University		X	
Central State University	X		
University of Cincinnati		X	
Cleveland State University	X		
Kent State University			X
Miami University		X	
Northeast Ohio Medical University			X
Ohio University			X
Shawnee State University			X
University of Toledo		X	
Wright State University		X	
Youngstown State University	X		
Totals	**3**	**5**	**5**
Out-of-State Universities			
Indiana University		X	
University of Kentucky			X
University of Louisville			X
University of Michigan		X	
Penn State University			X
University of Pittsburgh	X		
Totals	**1**	**2**	**3**

Sources: OSU, In-State Universities, Out-of-State Universities

As shown in **Table 4-5**, OSU's policy of requiring a background check for all internal candidates is less common, with only three of the 13 in-state universities and only one of the six out-of-state universities having a similar requirement. A more common requirement, applicable to five of the in-state universities and two of the out-of-state universities, is to only require a background check for internal candidates gaining additional job responsibilities. Effectively, this policy choice adds a level of scrutiny for higher risk positions, while also allowing flexibility for lateral job changes and transfers between or within areas without need for a background check. Finally, a marginally more common policy is to not require a background check of internal candidates at all. While this policy choice represents the lowest up-front cost, in terms of background checks, it also affords the least protection to the hiring areas.

OSU Policy 4.17 requires employees to self-disclose criminal convictions that occur during their employment. Therefore, if a background check on an internal candidate reveals a new conviction since their hire, the employee should have already disclosed it to the University. As such, internal candidate background checks primarily function as a check for compliance with the

policy. In addition to redundancy to OSU Policy 4.17, the practice adds an additional step to the recruit-to-hire process for all internal candidates, adding time and personnel effort to the process.

OSU should consider if a blanket policy requiring background checks for internal candidates is necessary to meet the overall policy goal while also being a valuable use of resources. However, rather than foregoing a background check of internal candidates, OSU may consider a model similar to that employed by several other universities of conducting a new background check for internal candidates moving to a position with increased financial responsibility or decision-making authority. One potential way to identify such positions is by looking at those with the authority to approve human resources and financial transactions, such as travel, procurement, and hiring.

While this change would narrow the policy scope, effectively reducing the number of hires required to undergo a background check, the financial impact of this policy change could not be quantified. This is due to data limitations in quantifying historical internal candidates. Currently, areas may vary in what candidates are considered internal hires, versus internal transfers or promotions. Lack of consistency in how these conditions are defined has led to the potential for inconsistent interpretation of the policy. While OSU's IT systems are designed to capture movement into, and out of, the University as well as movement between areas, the systems are not designed to identify and track which internal transfers are considered hires that would go through the recruit-to-hire process.

Administrative Fee

As discussed in the **Background** (see **Table 4-6**), OHR charges an administrative fee to all employees and non-employees who order background checks through the OHR Background Check Team. This fee was established in 2014 when the OHR Background Check Team was created as a part of the University's initiative to centralize background check administration. The fee was designed to cover the full cost of the background check function at that time and based on a static workload. OHR Background Check Team's full cost has decreased over time, however, while workload has increased.

Table 4-6 shows the methodology used by OHR to calculate the fee in FY 2013-14, in comparison to what the cost per background check would be using FY 2017-18 total costs and total background checks. It is important to evaluate if the fee level is still appropriate based on fluctuations in cost and total background checks.

Table 4-6: Administrative Fee Comparison

	FY 2013-14 Actual Fee [1]	FY 2017-18 Calculated Fee [2]	Difference
Total Personnel Cost & Other Non-Labor Costs	$204,883	$174,955	($29,928)
Total Background Checks [3]	13,047	16,917	3,870
Cost per Background Check	**$15.70**	**$10.34**	**($5.36)**
		FY 2017-18 Total Cost with $15.70 Fee	**$265,597**
		FY 2017-18 Total Cost with $10.34 Fee	**$174,922**
		Difference	**$90,675**

Source: OSU

[1] This calculation used FY 2012-13 background check volume in relation to FY 2013-14 projected salaries and benefits. The Other Non-Labor Costs are the total costs for credit card fees, postage, supplies, the annual maintenance fee to BCI, and other costs from FY 2012-13.

[2] This calculation used FY 2016-17 background check volume in relation to FY 2017-18 projected salaries and benefits. The Other Non-Labor costs were calculated using total costs for credit card fees, postage, supplies, the annual maintenance fee to BCI, and other costs from FY 2017-18.

[3] The FY 2013-14 actual fee was calculated using the total number of background checks ordered by the University in FY 2012-13. At that time, OHR was planning for 100 percent of background checks to be administered by the OHR Background Check Team. However, as of FY 2016-17, all Facilities Operations and Development background checks and all Motor Vehicle Reports requested by the Office of Student Life are administered at the area level. Therefore, the 508 background checks from those areas were excluded from the FY 2017-18 total.

As shown in **Table 4-6**, Personnel Cost and Other Non-Labor Costs significantly decreased from FY 2013-14 to FY 2017-18, due to a reduction in total staffing by 0.5 FTE in March of FY 2015-16, and the attrition of a higher paid employee in July of FY 2016-17. While personnel costs decreased, the total number of background checks increased, resulting in a large disparity in the cost per background check between FY 2013-14 and FY 2017-18. Adjusting the fee to represent the FY 2017-18 cost per background check results in a total difference of more than **$90,600.**

It should be noted that this methodology assumes that the OHR Background Check Team spends 100 percent of its time administering background checks, as the total personnel cost includes the full salaries and benefits of those individuals. However, the OHR Background Check Team has additional duties in addition to First Advantage and BCI/FBI background checks. The team spends an estimated 15 percent of its time on Form I-9 verifications and 5 percent of its time on contractor First Advantage results, which includes communicating cleared results to areas and adjudicating flagged results (see **Section Background**).

An alternative methodology for calculating the cost per background check is to use the actual time to carry out each process step. **Table 4-7** calculates the average hourly cost per employee for FY 2017-18. It then uses the weighted average time in minutes to complete flagged versus unflagged results for First Advantage and BCI/FBI background checks to calculate the average cost per background check. This method is useful in that it only accounts for actual time spent conducting background checks.

Table 4-7: Alternative Administrative Fee Calculation Example

Total Personnel Cost & Other Non-Labor Costs	$174,955
Average Annual Cost per Employee	$58,318
Average Hourly Cost per Employee [1]	$29.28

First Advantage	
Average Cost per Minute	$0.49
Average Time in Minutes to Complete Full Process [2]	6.88
Average Cost per Background Check	**$3.37**

BCI/FBI	
Average Cost per Minute	$0.49
Average Time in Minutes to Complete Full Process	8.72
Average Cost per Background Check	**$4.27**

	Total Checks	Total Cost
First Advantage Checks Conducted by OHR	11,548	$38,931
BCI/FBI Checks Conducted by OHR	5,370	$22,945
Total Checks Conducted by OHR	**16,918**	**$61,876**

Source: OSU

[1] Assumes working 1,992 hours per year, which is the average hours worked in CY 2017 for the two OHR Background Check Team employees who worked the full year. Average hours worked excludes paid leave hours.
[2] This is a weighted average of the 6.82 minutes required for unflagged results and 8.18 minutes for flagged results, with unflagged results accounting for 95.9 percent of the workload and flagged results accounting for 4.1 percent.
[3] This is a weighted average of the 9.32 minutes required for unflagged results and 11.06 minutes for flagged results, with unflagged results accounting for 97.0 percent of the workload and flagged results accounting for 3.0 percent.

As shown in **Table 4-7**, the calculated cost per background check, using the actual time to carry out each step of the process, is $3.37 for First Advantage and $4.27 for BCI/FBI, with a weighted average of $3.66. The total cost based on CY 2017 volume is $61,876. This calculated average cost is lower than the method used in **Table 4-6**, which is consistent with the concept that assumes the OHR Background Check Team spends 100 percent of its time on background checks which will inflate the calculated cost per check.

Both methodologies for calculating cost per check reach the same conclusion that charging a fee of $15.70 per transaction is inconsistent with the projected actual cost for FY 2017-18. *Pricing Internal Services* (Government Finance Officers Association, 2013) recommends that governments "regularly review their internal charge rates against actual experience for appropriate adjustments. Governments should also develop guidelines to determine what will happen to excess funds should an internal charge generate cost recovery proceeds in excess of actual costs." OSU should consider reevaluating the fee using the above methods or a similar method that is regularly adjusted for changes in costs and number of background checks, and accurately accounts for time dedicated to background checks.

Program Approvals

As previously noted, areas may request checks in addition to the standard criminal check for certain positions by submitting a Program Approval form. The area may request criminal checks for students not covered by the policy, or may request additional First Advantage checks including Education Verifications, Financial Reports, and Motor Vehicle Reports (MVR).

OSU Policy 4.15 states the following regarding Program Approvals:

> "Units must assess the need for any unit background check programs not mandated by this policy and seek approval from the Background Check Coordinator (BCC) and in conjunction with the Office of Legal Affairs for a unit background check program. Any such program must be consistent with this policy, have a business justification, conduct checks consistently across positions, be consistent with the Background Check Standards and Toolkit, and be approved by the BCC in conjunction with the Office of Legal Affairs."

To be in compliance with the policy, any area (or "unit" as expressed in the policy) ordering First Advantage background check packages, with checks in addition to the standard criminal check, must have approval from OHR and the Office of Legal Affairs. To gain approval, areas must submit a Program Approval form indicating specifically which positions will receive additional checks and the business justification for conducting those checks. Areas were required to submit new Program Approval forms when the OHR Background Check Team centralized in 2014. This policy does not apply to the Med Center, as it is following a different procedure requiring BCI/FBI background checks for all external candidates. In accordance with OSU Policy 1.50 regarding the care, custody, and control of minors, areas do not need to submit Program Approvals for positions already required to have BCI/FBI background checks.

Table 4-8 shows all campus areas with Program Approvals on file, and the approved type of additional check.

Table 4-8: Approved Additional Checks by Area

Area	Approved Additional Checks
Office of Academic Affairs	Financial & MVR (Pre-Centralization)
Office of Advancement	Financial & MVR (Pre-Centralization)
Office of Business & Finance	Education, Financial, & MVR
College of Engineering	Criminal for all students
College of Pharmacy	BCI/FBI as legally required
College of Social Work	Criminal for all students
University Libraries	Education, MVR, & BCI/FBI as legally required

Source: OSU

As shown in **Table 4-8**, there are seven areas with Program Approvals on file. There are four areas approved to request additional First Advantage checks. Two areas are approved to conduct criminal checks on all students, and two areas noted on their Program Approval that certain positions legally require BCI/FBI checks. However, it should be noted that two of the areas did not submit new Program Approval forms after the centralization of background checks.

Table 4-9 shows areas that ordered a significant number of Education Verifications, Financial Reports, and/or MVRs. For each area, the types of First Advantage checks allowed per the Program Approval are indicated. The number of Education Verifications, Financial Reports, and MVRs run by area in CY 2017 are indicated in the table for the purposes of evaluating if an area ordered a significant number of a type of check that was not in the Program Approval.

Table 4-9: Areas with Significant Additional Checks Ordered in CY 2017

Area	Approved First Advantage Additional Checks	Number of Checks by Type		
		Education	**Financial**	**MVR**
Office of Academic Affairs	Financial & MVR (Pre-Centralization)	0	17	96
Office of Administration & Planning	None [1]	0	0	271
Office of Advancement	Financial & MVR	40	0	0
Office of Business & Finance	Education, Financial, & MVR	0	54	11
University Libraries	Education & MVR	0	0	25

Source: OSU

[1] The Office of Administration and Planning does not have a Program Approval, but is legally required to conduct MVRs for employees hired into a position requiring a commercial driver's license (CDL).

As shown in **Table 4-9**, there are multiple areas that are ordering additional checks without an explicit Program Approval on file. These areas are not acting explicitly in accordance with OSU Policy 4.15 and OHR does not have a procedure in place to ensure compliance with the policy. OHR should consider establishing a procedure to bring all areas in line with the policy, and routinely evaluate if all areas ordering checks in addition to the standard check have the correct Program Approval on file.

Additional consideration should be given to the value of having a Program Approval policy in place. The majority of additional First Advantage checks are for MVRs for positions that are required to have a CDL and involve driving a University vehicle. As each area is consistent in when they require MVRs, the University could consider a University-wide policy for positions involving driving. In general, the comparable institutions interviewed for the policy analysis have university-wide standardized policies for background checks by position. OSU may consider standardizing additional background check requirements by position as part of their efforts to restructure employee classifications and compensation.

Med Center Background Check Process

As discussed in the **Background**, the Med Center has different background check processes and procedures than campus. For example, all employees of the Med Center, which includes the Health System, College of Medicine (COM), Office of Health Sciences (OHS), and Comprehensive Cancer Center (CCC), are required to have BCI/FBI background checks, which are conducted as the standard in lieu of First Advantage checks, which are the standard on campus. In addition, between the Health System and other areas, there have historically been differences in when the background check occurs within the recruit-to-hire process. For the Health System and College of Medicine, the general practice is to conduct the background check in conjunction with the interviews of final candidates. The Comprehensive Cancer Center generally follows the campus practice of waiting for an accepted offer before requesting the background check. Since interviews are typically conducted for multiple qualified candidates,

conducting a check before the acceptance of a final offer results in the possibility that multiple background checks may be conducted for a single hire. This approach is reflective of a Med Center business decision attributed to the need to hire a high volume of high demand positions. It is believed that this approach is necessary because process delays could result in a preferred candidate turning down the position, which would then require a background check of the second candidate to be run. Additionally, there is a belief that this approach may help to create a pool of background checked candidates for future job openings, at which time the candidates may be more quickly hired. The Med Center will generally not run a new background check if the candidate received one from Med Center Security ID Processing within the past year.

The practice of conducting background checks on multiple candidates for a single position is not a common practice. For example, the following health systems typically would only run a background check on a single, final candidate: Michigan Medicine, Penn State Health, UC Health, UK Healthcare, and the University of Toledo Medical Center.

The Med Center should consider the cost-benefit of continuing to background check multiple candidates at the time of the interview. While this change in procedure would likely reduce the number of Med Center BCI/FBI background checks, the financial impact of this change could not be immediately quantified. The eServices system tracks all individuals who are fingerprinted by the Med Center Security ID Processing Team, but does not adequately track if the individual is a candidate for employment. Therefore, the number of employment candidates receiving a BCI/FBI check could not be quantified.

Conclusion: Currently, OSU's background checks are largely conducted in accordance with University policies. However, there are opportunities to tighten up the process by ensuring that all background checks, over and above the standard check, are formally supported by an official Program Approval. Furthermore, there may be opportunities to revisit current policies, such as the requirement that all internal candidates, regardless of position responsibilities, be required to undergo a background check, which is inherently redundant to the University's self-disclosure policy. Finally, and specific to the Med Center, there may be opportunities to reduce the total number of background checks by focusing on final candidates. However, there may be a data-driven justification for continuing to operate as is, but the data necessary to evaluate the effectiveness of current decisions is not currently captured in a systemic or useful manner.

Recommendation 4.1: OSU should ensure that all background checks are conducted in accordance with official University policies. However, in doing so, the University should revisit policy requirements to ensure that they are effective in achieving the overall goal without resulting in unnecessarily inefficient or costly processes. When choosing to deviate from the common process, all University areas should collect the data and information necessary to evaluate the efficiency and effectiveness of these decisions. In addition, the University should regularly reevaluate the full cost of the background check process and ensure that an appropriate amount is recovered through administrative fees.

Financial Implication 4.1: By revising the current OHR background check administrative fee to recover the direct cost of the service provided, areas may repurpose **$90,600** toward other initiatives.

By implementing policy and procedural changes, the University may realize savings by reducing the scope of candidates undergoing background checks. These savings could not be quantified due to data quality issues in identifying which hiring transactions are associated with a background check, and which Med Center BCI/FBI checks are associated with an employment candidate.

Issue for Further Study

For the I-9 verification process, the Office of International Affairs is responsible for processing visas and the OHR Background Check Team provides administrative support. OSU will be combining these functions into the new Immigration Services Center within OHR, starting with a two-year pilot program.

As stated in the **Section Background**, the OHR Background Check Team spends a significant portion of its time on I-9 verifications. Similar to background checks, the OHR Background Check Team is providing a service to University areas, as all new hires are required to go through this process. **Table 4-6: Administrative Fee Comparison** shows one methodology for billing the cost of background checks to areas using the background check workload only. OSU should further study applying a similar methodology to the I-9 workload, using the personnel costs of those assigned these duties, whether it be the OHR Background Check Team or other positions within the Immigration Services Center.

R4.2 Staffing and Operational Structure

Background

As stated in the **Section Background**, the current operational structure for background checks involves three groups across the Med Center and campus, with two dedicated background check teams. Within the Med Center, the Med Center Security ID Processing Team is directly responsible for BCI/FBI background checks, including adjudication for contractors. Med Center Human Resources (Med Center HR) is responsible for First Advantage background checks, currently ordered and reviewed by Med Center HR recruiters. Background check adjudication for the Med Center not performed by the ID Processing Team is the responsibility of the Med Center's Director of Talent Acquisition. For campus, all BCI/FBI and First Advantage background checks and adjudication activities are performed by the OHR Background Check Team.

Med Center Security ID Processing Team

The Med Center Security ID Processing Team consists of four total positions, all of which are full-time employees. These positions have been organized into 3.0 FTE information associates and the ID Processing Supervisor (1.0 FTE). Organizationally, this team is aligned to directly report to the Access Control and ID Processing Manager who, in turn, reports the Assistant Director of Dispatch, Access Control, ID Processing and Projects (the Assistant Director).

The Med Center Security ID Processing Team has recently experienced fluctuations in staffing levels.[46] The team operated with 2.0 FTE associates for 11 weeks from November 2016 to January 2017. The ID processing supervisor position was vacant for 15 weeks from May to August 2018, but has since been filled. During the supervisor position vacancy, much of the responsibility and workload associated with the position was absorbed by the information associates, who reported directly to the Access Control and ID Processing Manager.

Additional supervisors of the Med Center Security ID Processing Team include the Access Control and ID Processing Manager, who dedicates about 50.0 percent of total available time to supervision, administrative, and logistical support for the information associates; and the Assistant Director, who continues to provide administrative support, manages the billing process, and provides other supervision and oversight as needed, estimated to be about 30.0 percent of total available time.

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[46] Between the two-week pay periods ending November 12, 2016 and January 21, 2017, the Med Center Security ID Processing Team experienced an information associate staffing vacancy. This vacancy was filled starting January 22, 2017. Thereafter, the team continued operating for the remainder of CY 2017 and into CY 2018 with three, full-time information associates. While the ID processing supervisor position was vacant for 15 weeks from May to August 2018, this vacancy was filled starting August 19, 2018.

Prior to June 1, 2018, a significant portion of the ID processing supervisor's responsibilities were to meet with individuals to discuss the results of BCI/FBI background checks that could not be cleared. Up until this time, per federal law, rap sheets from searches of the FBI database would only be released to the individual.[47] As such, the ID processing supervisor would have needed to contact the individual, set up a time, and meet to discuss the FBI rap sheet. As of June 1, 2018, detailed results may now be provided directly to the prospective employer, which eliminates the need for the contact and meeting prior to adjudication.

The Med Center Security ID Processing Team's two main service responsibilities are BCI/FBI background checks and creating access badges for the Med Center. These services are provided for most onsite Med Center employees/non-employees (e.g., faculty, staff, students, vendors, contractors, volunteers, and visitors/observers). While all of these individuals are required to have a background check and badge, the process for obtaining these differs based on the area (e.g., Health Systems, Comprehensive Cancer Center (CCC), and College of Medicine (COM)) and type of employee/non-employee.

There are two main process steps for BCI/FBI background checks. First, the individual reports to ID Processing for fingerprinting, at which time the background check is ordered. Once the background check results are available in the BCI system, cleared results are communicated to the requesting area through eServices, the Med Center's system for tracking background checks. If the background check was not cleared, the Med Center Security ID Processing Team must wait to receive the mailed rap sheets before adjudication, which is conducted by the ID Processing Team for contractors and forwarded to the Med Center's Director of Talent Acquisition for all others.

There are two main process steps for access badges. First, the individual reports to ID Processing to have a badge profile created within Matrix, the Med Center's badge access system, and have a badge picture taken. Secondly, the badge is printed for the individual at the time the badge profile is created, or it may be printed at a later time. The timing of these process steps differs for each of the following groups:[48]

- Health Systems - Employment candidates are typically fingerprinted for a BCI/FBI background check immediately following the job interview. Prior to the biweekly Med Center Orientation (MCO), the information necessary to complete the badge profile in Matrix is sent to the ID Processing Team. The badge profile creation and badge printing is batched for delivery in advance of the upcoming MCO.

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[47] In contrast, BCI's policy has been, and continues to be, to release rap sheets for BCI database searches to directly to the entity requiring the background check.

[48] While these processes represent the vast majority of employees/non-employees receiving services from the Med Center Security ID Processing Team, there are other small groups and unique circumstances that would not strictly follow these processes.

- **COM** - Employment candidates report to ID Processing after accepting the job offer. Formerly, the standard process was to conduct fingerprinting immediately followed by creating the badge profile and taking the picture. However, COM is currently moving to the Health Systems process. As not all COM candidates attend MCO, the badge may be created and printed with the other MCO badges, or the COM recruiter may obtain the badge.

- **CCC** - Employment candidates may follow a process similar to the Health Systems or to the COM former process.

- **Med Center** Volunteers - Report to ID Processing for fingerprinting which is immediately followed by creating the badge profile and taking the picture. With a small number of exceptions, volunteers are participating in one of three "Volunteer Days" occurring throughout the year on a weekend. In preparation for Volunteer Day, the Med Center Security ID Processing Team prints all of the badges for the Director of Volunteer Services, holding badges for individuals who have not yet cleared the background check.

- **Med Center Contractors and Vendors** - Initially report to ID Processing for fingerprinting. Each vendor or contractor has a Med Center sponsor and once the sponsor is notified that the background check has cleared, the individual returns to ID Processing to have the badge profile created, picture taken, and badge printed and picked up all in the same visit.

The Med Center Security ID Processing Team also reprints lost badges and prints replacement badges for employees moving to new positions, requiring new badges. In these circumstances, the former badge profile is replaced with a new profile before the new badge is printed and carries out a variety of administrative tasks including email and phone communication with Med Center HR and potential employees/non-employees, and maintaining supplies and equipment.

OHR Background Check Team

The OHR Background Check Team conducts all campus BCI/FBI and First Advantage background checks with 3.0 FTE employees, including 1.0 FTE Lead Background Check Coordinator (a working supervisor position) and 2.0 FTE background check coordinators. The Lead Background Check Coordinator carries out the same job responsibilities as the other Background Check Coordinators, with additional administrative responsibilities. Similar to the Med Center Security ID Processing Team, the OHR Background Check Team experienced a staffing vacancy in CY 2017. One background check coordinator position was vacant for five weeks from February through March 2017, during which time the team operated with only 2.0 FTE employees.

The OHR Background Check Team's main job responsibility is to conduct BCI/FBI and First Advantage background checks for campus. BCI/FBI background checks are provided as a service to individuals required to have BCI/FBI background checks per OSU Policy 1.50, Activities and Programs with Minor Participants. This includes students and volunteers participating in University programs, as well as some employees. Additionally, this service is provided for 4-H and the Salvation Army. While fingerprinting for most 4-H and some regional campus employees/non-employees is conducted locally, OHR is responsible for adjudicating and disseminating the results. First Advantage background checks are provided as a service to University areas as part of the recruit-to-hire process.

The process for BCI/FBI background checks is similar to the Med Center in that it requires two main process steps. First, the individual reports to OHR for fingerprinting, at which time the background check is ordered. Once the background check results are available in the BCI system, cleared results are communicated to the requesting entity. Results for areas are typically communicated through Human Resources Action (HRA), unless the area specifically requested batched results through email. 4-H results are communicated through the 4-H system or email if the individual does not have a record. In addition to electronic notification, some non-employees come to OHR for a physical copy of their results. If the background check is not cleared, the ID Processing Team must wait for the mailed rap sheets before adjudicating. The Background Check Coordinators are responsible for determining if an individual is disqualified from the job or program requiring the BCI/FBI background check per Ohio law.

There are three main steps for the First Advantage background check process, which do not require direct interaction with the candidate receiving a background check. First, the Background Check Coordinator initiates all requests for background checks, which sends a form to the candidate to fill out. Once the form is complete, the Background Check Coordinator orders the check. Once the results are available in the First Advantage system, the requesting area is notified through HRA, or through email if the request is from a regional campus. If the background check is not cleared, the Background Check Coordinator reviews the reason(s) the it was flagged. If it is an error that the individual can correct, the Background Check Coordinator reaches out to the individual and attempts to resolve it. If a criminal record is returned, the Background Check Coordinator, with input from the Lead Background Check Coordinator, makes a recommendation to the requesting area on whether they should move forward with the hire.

In addition to BCI/FBI and First Advantage background checks, the OHR Background Check Team is responsible for managing the I-9 verification process. Form I-9 is used for verifying the identity and employment authorization of individuals in the United States and the University uses the vendor eVerify to conduct these verifications. The OHR Background Check Team is responsible for administering the eVerify database, providing customer service to areas regarding the database, and assisting candidates through in-person meetings and phone calls when their authorization to work in the U.S. could not be initially confirmed.

The OHR Background Check Team also manages the contractor First Advantage portal. Contractors and third party staffing vendors order First Advantage background checks for their own employees through the portal. The OHR Background Check Team provides customer service for areas and contractors using the portal, generally through email communications. For the Med Center, the OHR Background Check Team is responsible for compiling contractor background check results and communicating them to Med Center HR. For Facilities Operations and Development, the team confirms background check results with the vendor and manages their badge form process.

To support these job responsibilities, the OHR Background Check Team also carries out a variety of administrative tasks including email and phone communication with areas and individuals receiving background checks, managing mailed results, maintaining supplies and equipment, and following records retention protocols. Additionally, the team provides an ink card fingerprinting service for individuals affiliated with OSU who are required to submit ink fingerprints for a background check not conducted by OSU.

Med Center HR

Med Center First Advantage background checks are administrated by Med Center HR as a portion of the responsibilities carried out by the HR Service Center, recruiters, and the Med Center's Director of Recruitment. First, the recruiter initiates the request, which sends a form to the candidate to fill out. Once the form is complete, the recruiter orders the check. Once the results are available in the First Advantage system, the recruiter is able to move forward with the hiring process. If the background check is not cleared, it is forwarded to the Med Center Director of Talent Acquisition to make a determination on whether or not to move forward.

Methodology

This sub-section, **Staffing and Operational Structure**, focuses on the efficiency and effectiveness of the campus and Med Center background check functions. This analysis was requested by OSU leadership as an area that could benefit from objective, data-driven assessment to inform management decisions. The purpose of this analysis is to identify opportunities for improved efficiency and cost-effectiveness of the current approach for administrating background checks.

Operational data and information was provided by OSU and supplemented by testimonial evidence from management and staff within the Office of Human Resources (OHR), Med Center Human Resources (Med Center HR), and Med Center Security. Testimonial evidence on staff duties and informal processes was corroborated through direct observation of staff. Additional sources of information include First Advantage; the Ohio Attorney General's Bureau of Criminal Investigation (BCI); the Background Check Log, an internal tracker used by the OHR Background Check Team; eServices; and PeopleSoft. Data points were used from calendar year (CY) 2015 through CY 2017, the last three complete years as of the completion of this analysis.

In addition to gathering historical data, time studies were also conducted to capture the time required to complete a background check in both the OHR Background Check Team, including First Advantage and BCI/FBI, and the Med Center Security ID Processing Team, including BCI/FBI as well as badge profile creation. Additional activities completed by the two teams were also identified, quantified, and corroborated as necessary to provide a complete picture of the significant activities performed on a day-to-day basis.

The analysis first focuses on quantifying historical background checks completed by the Med Center Security ID Processing Team and the OHR Background Check Team. The analysis then focuses in on CY 2017, as both the most up-to-date completed year available as well as the year with the most total background checks across CY 2015 through CY 2017. Time study results as well as other workload timing quantification is then applied to the number of background checks completed by the Med Center Security ID Processing Team and the OHR Background Check Team in order to provide context on the amount of annual workload necessary to complete these background checks. Further, the analysis organizes the remaining activities by priority level (i.e., 1, 2 and 3) as well as time off (including holidays and paid leave), administrative time, and overhead time for both supervisors and associates. Staffing and workload is then quantified for each team including an adjusted staffing and workload that specifically accounts for staffing vacancies that each team experienced during CY 2017. Finally, the analysis focuses on the potential benefit associated with creating a combined background check team and the potential for that team to take on all BCI/FBI and First Advantage background checks.

Although this analysis shows that it may be possible to complete the total workload with at least 1.0 FTE employee less than shown, there were certain data weaknesses, particularly in how the Med Center Security ID Processing Team records key workload data related to background checks or lack of adequate information to fully support all tasks that are currently being quantified as overhead. As such, the University is encouraged to further study the specific job duties of a combined team, the time necessary to complete those duties, and, if appropriate, the extent to which those duties may be satisfactorily completed with fewer dedicated employees.

Analysis

Background Checks Volume

Chart 4-5 shows the total background check volume by team for CY 2015 to CY 2017. The OHR Background Check Team's total volume includes First Advantage and BCI/FBI background checks, while the Med Center ID Processing Team's volume is BCI/FBI background checks only. The volume by month is important to identify peaks and valleys in workload.

Chart 4-5: Historical Background Check Volume by Team
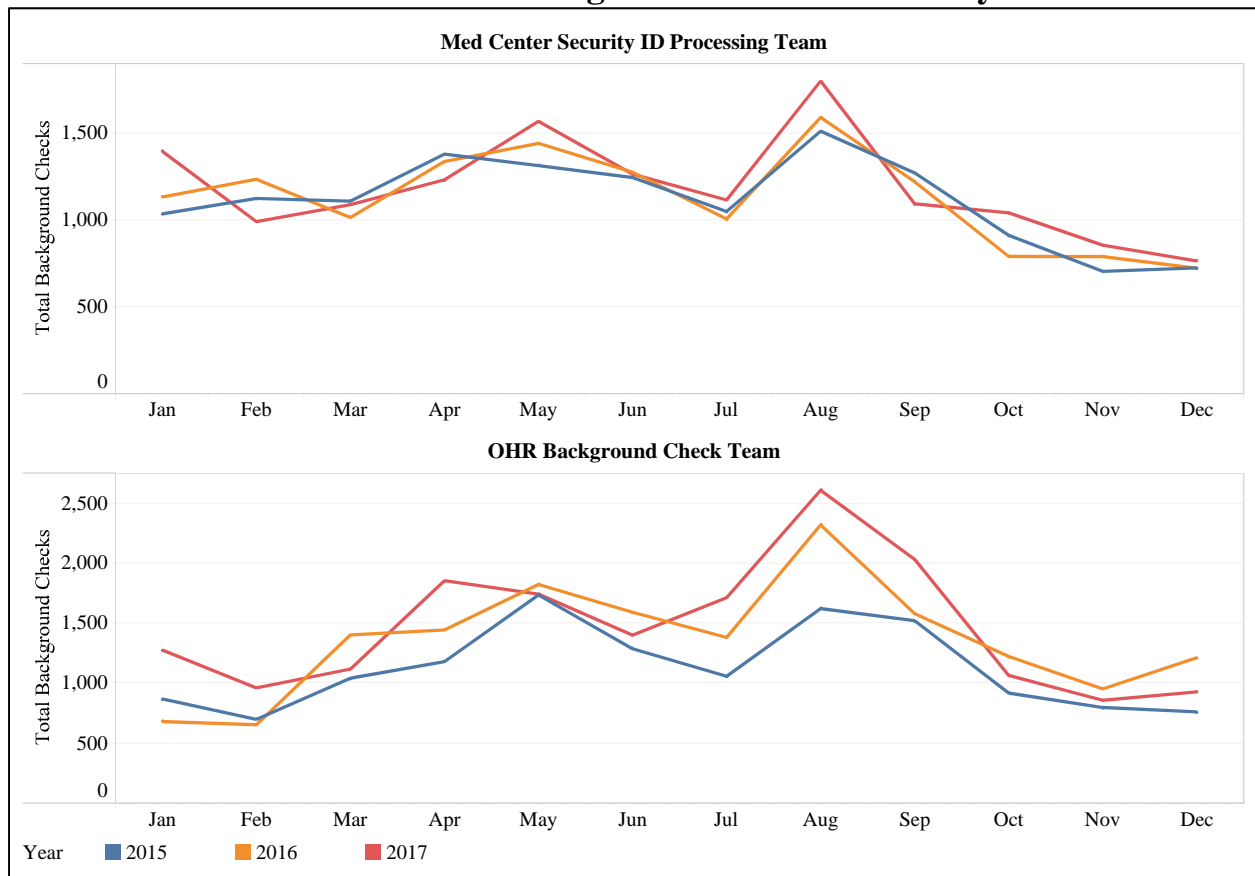
Source: OSU, BCI, and First Advantage

As shown in **Chart 4-5**, both teams experience a moderate peak in volume from April to May and a high peak in August. In total, CY 2017 represents the highest volume of background checks for each team over the three-year period.

While the total number of background checks is an important indicator of workload demand, not all background checks require the same amount of time to complete. **Chart 4-6** shows each team's total background check volume by type for CY 2015 to CY 2017. As discussed in the **Background**, Med Center First Advantage background checks are administrated by Med Center HR as a portion of the responsibilities carried out by the HR Service Center, recruiters, and the Med Center's Director of Recruitment.

Chart 4-6: Historical Background Check Volume by Type
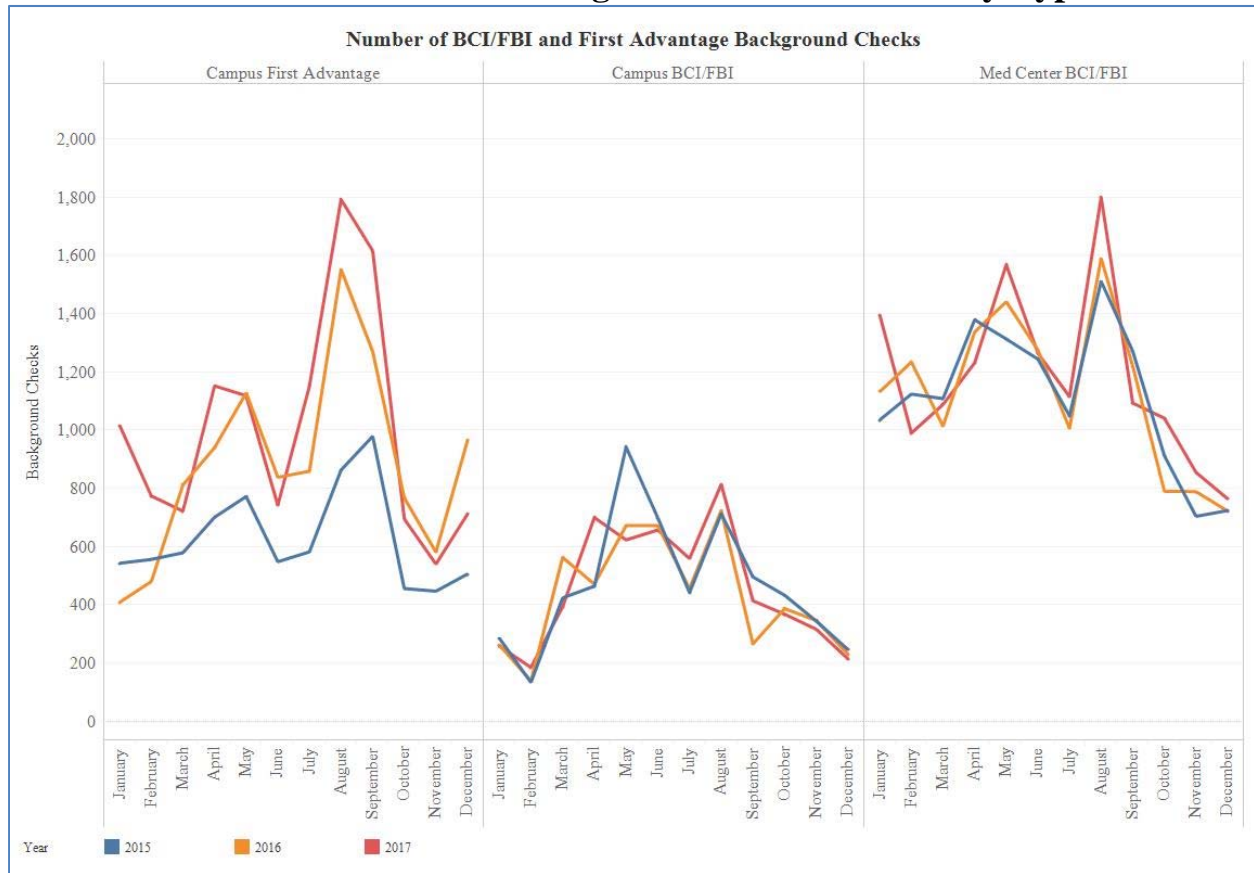
Source: OSU, BCI, and First Advantage

As shown in **Chart 4-6**, in CY 2017, the background checks conducted by the OHR Background Check Team both peaked during the August to September timeframe. However, the peak volume of First Advantage background checks was more than double the volume of BCI/FBI background checks. Similarly, the Med Center Security ID Processing Team's BCI/FBI background checks peaked at the same time with a total volume approximately equal to the number of First Advantage background checks conducted on campus.

Background Checks Time Study

Even within similar types of background checks the process carried out between the Med Center Security ID Processing Team and the OHR Background Check Team varies. Most notably, as discussed in the **Background**, all Med Center BCI/FBI checks are run under the Volunteer Children's Act while on campus checks performed by the OHR Background Check Team may only be run according a specific reason code. Verifying or determining this specific reason code as it relates to each walk-in customer adds processing time for each BCI/FBI background check conducted by the OHR Background Check Team.

Table 4-10 shows the average duration for each campus background check scenario carried out by the OHR Background Check Team in CY 2017. It includes the two possible scenarios for

First Advantage, four scenarios for BCI/FBI, and additional tasks related to background checks. The labor hours needed for each scenario is calculated based on CY 2017 actual volume.

Table 4-10: Campus Background Check Types, Duration, and Hours Needed

	First Advantage		
	Avg. Duration in Minutes	**Number of Background Checks**	**Total Hours Needed**
Unflagged	6.82	11,574	1,315.58
Flagged	8.18	455	62.03
Total First Advantage	**N/A**	**12,029**	**1,377.61**
	BCI/FBI		
	Avg. Duration in Minutes	**Number of Background Checks**	**Total Hours Needed**
Fingerprinted at OHR			
Unflagged	9.32	5,353	831.50
Flagged	11.06	149	27.47
Subtotal Fingerprinted at OHR	**N/A**	**5,502**	**858.97**
Fingerprinted Elsewhere [1]			
Electronic Record Updated with Results [2]	2.70	4,225	190.13
No Record Found – Added to Unclaimed List [3]	3.41	1,648	93.66
Subtotal Fingerprinted Elsewhere	**N/A**	**5,873**	**283.79**
Total BCI/FBI	**N/A**	**11,375**	**1,142.76**
	Additional Background Check Tasks		
	Avg. Duration in Minutes	**Number of Background Checks**	**Total Hours Needed**
Printing BCI/FBI Result for Walk-in Customer	2.89	981	47.23
Ink Card Fingerprinting [4]	7.00	48	5.60
Total Additional Background Check Tasks	**N/A**	**1,029**	**52.83**
Total Hours Needed for Campus Background Checks			**2,573.20**

Source: OSU, BCI, and First Advantage

[1] Individuals required by the University to undergo BCI/FBI background checks may have their fingerprints taken at a local fingerprinting location and have the results mailed to OHR.

[2] This scenario primarily occurs for 4-H employees and volunteers. Although OHR does not take the fingerprint, they are required to review the results and update each individual's record in the 4-H system. For other, less common scenarios, OHR must communicate the results to the University area requesting the background check.

[3] Occasionally, OHR receives results for individuals who do not have an active record in the 4-H system. They are manually added to the unclaimed list, which is shared with all 4-H clubs.

[4] OHR does ink card fingerprinting as a service to OSU affiliates who are required to submit ink cards for a background check. OHR does not order these background checks or receive results for them. Therefore, these transactions are tracked separately from BCI/FBI background checks.

As shown in **Table 4-10**, the OHR Background Check Team needed more than 2,573 total hours to complete background checks in CY 2017. Of these calculated workload hours, 53.5 percent were associated with First Advantage, 44.4 percent were associated with BCI/FBI, and the remaining 2.1 percent were associated with the additional background check tasks.

Table 4-11 shows the average duration for each Med Center background check carried out by the Med Center Security ID Processing Team in CY 2017. The labor hours needed are calculated based on CY 2017 actual workload volume.

Table 4-11: Hours Needed for Med Center BCI/FBI Workload

Process Step	Avg. Duration in Minutes		
Fingerprint Collection	4.98		
Updating Results in eServices	1.89		
Total Time per BCI/FBI Background Check	**6.87**		
	Avg. Duration in Minutes	Number of Background Checks	Total Hours Needed
Total Hours Needed for Med Center BCI/FBI	**6.87**	**14,235**	**1,629.90**

Source: OSU and BCI

As shown in **Table 4-11**, the Med Center Security ID Processing Team needed more than 1,629 total hours to complete BCI/FBI background checks in CY 2017.

Current State Staffing and Workload

Both teams are primarily responsible for background checks, but this is not the only responsibility. When prioritizing workload, especially during peak demand, or times when staffing levels are down due to turnover, each team naturally categorizes and prioritizes workload to ensure critical services are delivered in a timely manner. For the purposes of this analysis time off, due to holidays or other leave use, is subtracted from available working hours as is administrative time, defined as twice daily breaks, timesheet entry and leave request time. The remaining time is allocated based on the following prioritization hierarchy:

- **Priority 1**
  - Med Center Security ID Processing Team – Including BCI/FBI background checks and necessary follow-up activities.
  - OHR Background Check Team – Including BCI/FBI and First Advantage background checks and necessary follow-up activities.
- **Priority 2**
  - Med Center Security ID Processing Team – Including badge profile creation and printing.
  - OHR Background Check Team – Including managing the I-9 verification process and related support activities such as email communication and meeting with employment candidates to provide direct I-9 assistance.
- **Priority 3** [49]
  - Med Center Security ID Processing Team – Including extra property detail, building badge clips and rings, checking equipment inventory, filing credit card receipts, and delivering badges to OSU East.

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[49] There are a number of other priority 3 tasks that are carried out by each team, all of which are taken into account in this analysis. However, only those that account for 80.0 percent of CY 2017 time are included in this description.

> o   OHR Background Check Team – Including First Advantage monthly invoice reconciliation, fingerprinting payment reconciliation, ink card machine transaction management, filing fingerprinting results, mailing fingerprinting results to other users, and filing paper-based web check consent forms.

Peak workload times are typically dictated by seasonal, or other business oriented, spikes in hiring (see **Chart 4-5** and **Chart 4-6**). During these peaks, with the increase in Priority 1 tasks and hours, there are fewer hours remaining to allocate to Priority 2 and Priority 3 tasks. At times, there may not be enough available work hours to complete all Priority 3 tasks. For other times, when there are more hours available than expressly needed to complete prioritized task, those remaining hours accrue as overhead, either to the supervisors or associates.

Chart 4-7 shows actual staffing and workload for the OHR Background Check Team by pay period for CY 2017. An adjusted staffing and workload analysis is also shown to account for the staffing vacancy that the team experienced for five weeks from February through March 2017. This is an important measure of team productivity as it actually occurred during CY 2017 and as it would have occurred during that same time-period had staffing remained constant.

Chart 4-7: OHR Background Check Team Staffing and Workload
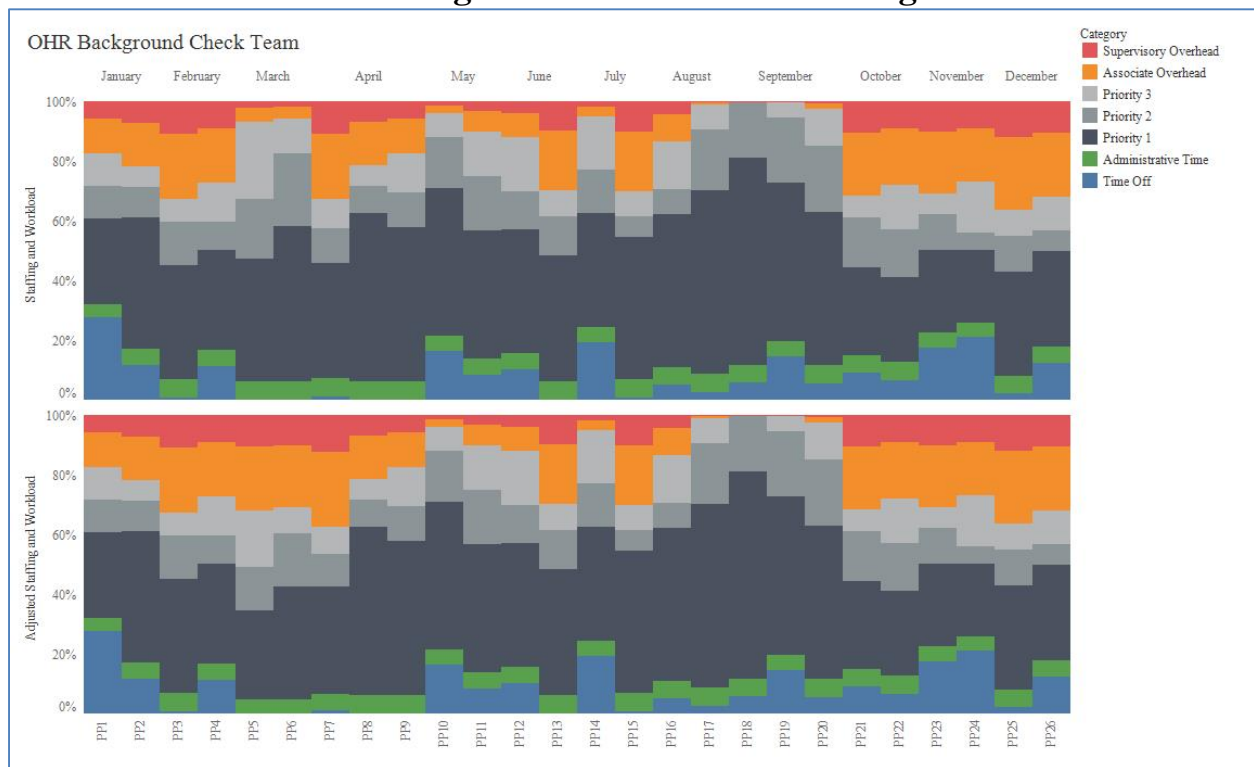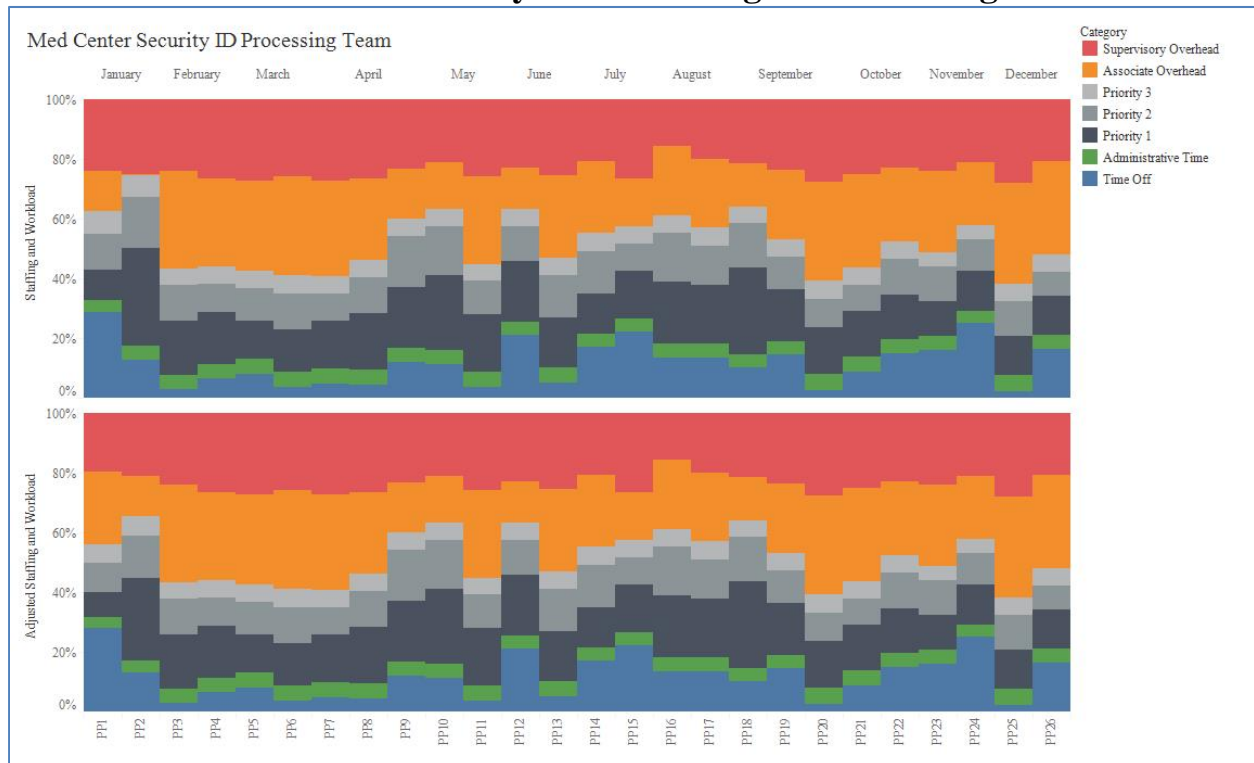

Source: OSU, BCI, and First Advantage

As shown in **Chart 4-7**, the OHR Background Check Team experienced fluctuations across the year in all categories of workload, but most specifically due to increases in background checks during August and September 2017. There were instances where these workload peaks resulted in no overhead hours and fewer Priority 3 hours. Across the entire year utilization by category averaged out to be:

- Priority 1 – 42.6 percent;
- Priority 2 – 13.9 percent;
- Associate overhead – 12.4 percent;
- Priority 3 – 10.9 percent;
- Time off – 8.3 percent;
- Supervisory overhead – 6.2 percent; and
- Administrative time – 5.7 percent.

In total, the combination of priority 1, 2, and 3 tasks accounted for 67.3 percent of total hours in CY 2017 while the combination of associate and supervisory overhead accounted for 18.6 percent of total hours. Holding staffing constant at 3.0 FTEs results in the adjusted combination of priority 1, 2, and 3 tasks accounting for 65.9 percent of total hours while the adjusted combination of associate and supervisory overhead accounts for 20.4 percent of total hours.

Chart 4-8 shows actual staffing and workload for the Med Center Security ID Processing Team by pay period for CY 2017. An adjusted staffing and workload analysis is also shown to account for the staffing vacancy that the team experienced for the first three weeks of January 2017. This is an important measure of team productivity as it actually occurred during CY 2017 and as it would have occurred during that same time-period had staffing remained constant.

Chart 4-8: Med Center Security ID Processing Team Staffing and Workload

Source: OSU, BCI, and First Advantage

Note: This analysis includes 50 percent of the time that the Access Control and ID Processing Manager dedicates to supervision, administrative, and logistical support for team, but does not include the Assistant Director, who continues to provide administrative support, manages the billing process, and provides other supervision and oversight as needed, estimated to be about 30.0 percent of total available time.

As shown in **Chart 4-8**, the Med Center Security ID Processing Team experienced fluctuations across the year in all categories of workload, but most specifically due to increases in background checks during January, May, August, and September 2017. However, there were no instances where these workload peaks resulted in no overhead hours or fewer Priority 3 hours. Across the entire year, average utilization by category was:

- Associate overhead – 24.5 percent;
- Supervisory overhead – 24.0 percent;
- Priority 1 – 17.5 percent;
- Priority 2 – 12.0 percent;
- Time off – 11.3 percent;
- Priority 3 – 5.9 percent; and
- Administrative time – 4.8 percent.

In total, the combination of priority 1, 2, and 3 tasks accounted for 35.4 percent of total hours in CY 2017 while the combination of associate and supervisory overhead accounted for 48.4 percent of total hours. Holding staffing constant at 4.5 FTEs results in the adjusted combination of priority 1, 2, and 3 tasks accounting for 35.0 percent of total hours while the adjusted combination of associate and supervisory overhead accounts for 48.8 percent of total hours.

Combined Future-State Staffing and Workload

As shown in **Chart 4-7** and **Chart 4-8**, both teams experience seasonal fluctuations in workload demand. However, both teams also incur overhead, both supervisory and associate, throughout the year as staffing levels are independently set to ensure each team has the resources necessary to deal with peak workload as needed. Combining similar teams that perform similar workload responsibilities is an option to reduce excess supervisory overhead while also having a steady-state staffing level that is adequate to meet all background check and related activities needs throughout the entire year.

Chart 4-9 shows a combined background check team staffing and workload by pay period for CY 2017. An adjusted staffing and workload analysis is also shown to account for the staffing vacancies that each team experienced during CY 2017.

Chart 4-9: Combined Background Check Team Staffing and Workload
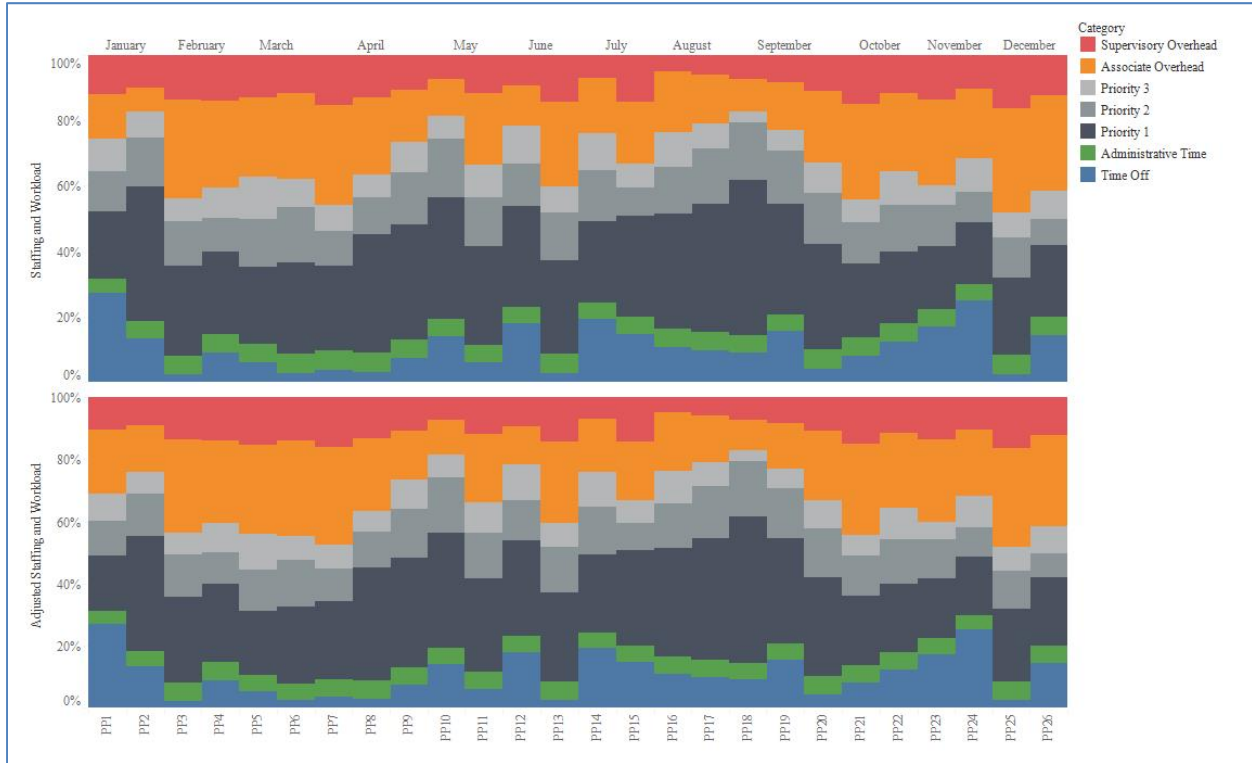
Source: OSU, BCI, and First Advantage

Note: This analysis does not include any time associated with the Access Control and ID Processing Manager as that time is predicated on a combined background check team operating out of the Med Center. This report does not opine on the optimal placement of a combined background check team though it does encourage the University to carefully consider placement of a combined team to meet the needs of background checks customers while also efficiently and effectively meeting the needs of the University.
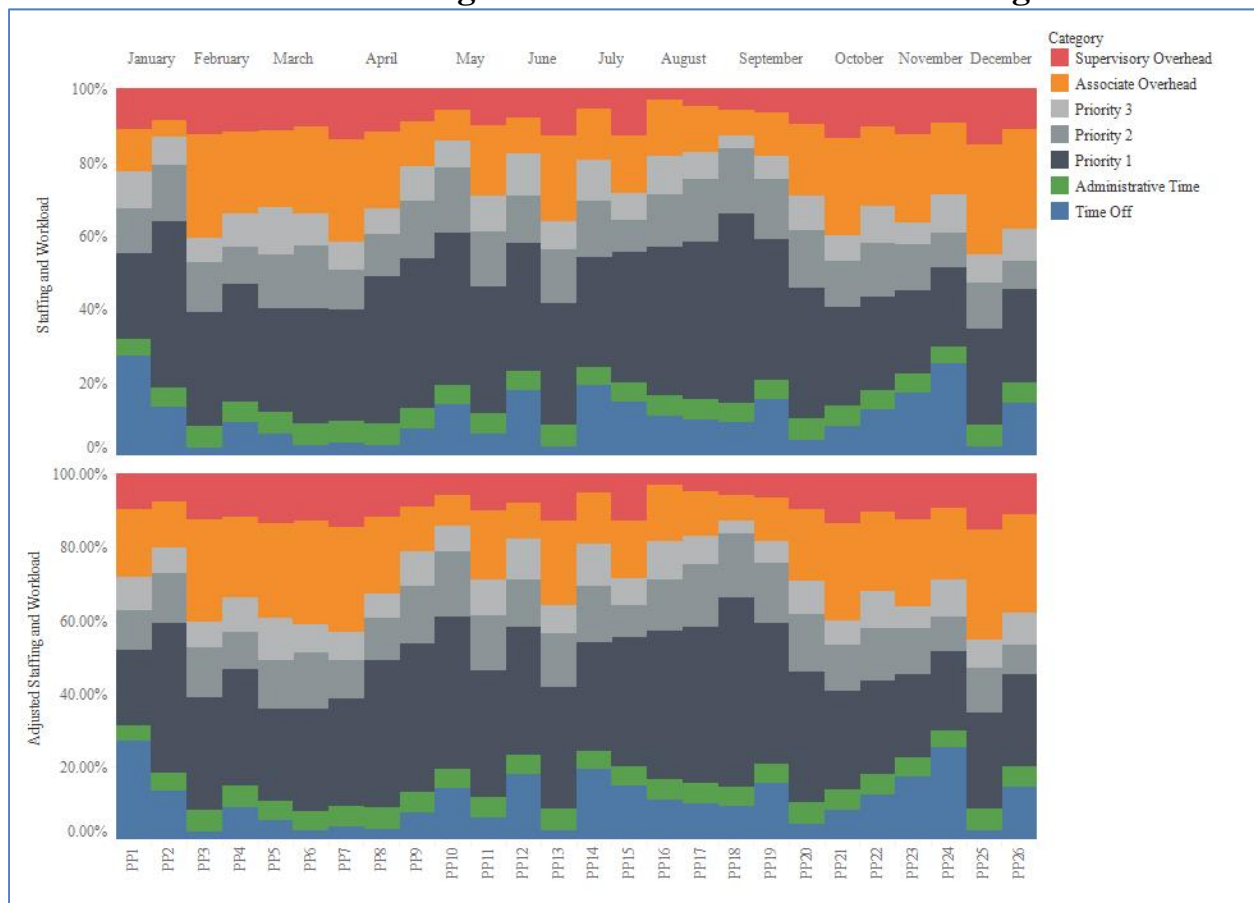
As shown in **Chart 4-9**, a combined background check team would have been better able to deal with peak workload fluctuations across CY 2017. There would have been no instances where workload peaks would have resulted in no overhead hours or fewer Priority 3 hours

In total, under a combined background check team, the combination of priority 1, 2, and 3 tasks would have accounted for 51.5 percent of total hours in CY 2017, while the combination of associate and supervisory overhead accounted for 32.4 percent of total hours. Holding staffing constant at 7.0 FTEs results in the adjusted combination of priority 1, 2, and 3 tasks continuing to account for 51.5 percent of total hours while the adjusted combination of associate and supervisory overhead increase slightly to account for 34.0 percent of total hours.

In addition to reduced supervisory overhead, it may also be possible for a combined team to take better advantage of economies of scale allowing it to be more flexible to take on increased workload in the future or additional background check workload currently being performed by other groups. Med Center First Advantage, with 5,224 background checks in CY 2017, is a specific example of one such opportunity. This workload is currently performed by Med Center HR as a portion of the responsibilities carried out by the HR Service Center, recruiters, and the Med Center's Director of Recruitment.

Chart 4-10 shows a combined background check team, with a steady state staffing of 7.0 FTEs, responsible for performing all Med Center and campus BCI/FBI and First Advantage background checks for CY 2017. This is an important measure of the potential to consolidate all current background checks into a combined team.

Chart 4-10: Combined Background Check Team with All Background Checks

Source: OSU, BCI, and First Advantage

As shown in **Chart 4-10**, a combined background check team would have had sufficient capacity to conduct all BCI/FBI and First Advantage background checks in CY 2017. In total, under a combined background check team with a constant level of staffing, taking on all Med Center First Advantage background checks would result in the combination of priority 1, 2, and 3 tasks accounting for 54.7 percent of total hours in CY 2017 while the combination of associate and supervisory overhead accounted for 29.3 percent of total hours.

In addition to being in a position to take on additional background check workload, a combined team also offers the benefit of additional flexibility to take on increasing workload in the future. However, a more immediate benefit to a combined team could be realized in consistent completion of similar processes and improved recording of the workload and other business intelligence associated with the processes. For example, the two teams currently use different IT software to track background checks and data quality was identified as an issue in eServices where some information necessary to fully quantify exact workload was missing. Combining the team presents an opportunity to track background checks through one system, and evaluate which pieces of information need to be captured to inform management decision making and allow for continuous improvement. Secondly, centralizing the adjudication of background check results will help to ensure that the process is completed in a consistent manner for all employees and non-employees across the University. Finally, as improvements to the consistency of the recruit-to-hire process are achieved, the University will be in a better position to ensure that background checks are being completed in a timely, consistent manner across all areas.

Conclusion: OSU has made significant strides in recent years to centralize the campus background check function and to increase the scope of background check requirements with the goal of improving safety and reducing the risk of harm to students, faculty, staff, and affiliates. However, the University's current system of background checks is still carried across separate groups. Combining the background checks into a single area administered by a combined team servicing all of OSU will increase operational efficiency while offering the opportunity to improve the consistency of data collection to better inform future operations and improvement initiatives.

Recommendation 4.2: OSU should seek to improve background checks operational efficiency and effectiveness by combining all background check personnel into a single team. This single team should service all University customers and should use consistent process and IT systems to track detailed workload and productivity in a consistent and complete manner.

Financial Implication 4.2: N/A

Additional Consideration

Additional consideration should be given to the most efficient and effective composition and placement of a combined background check team.

Currently, the background check coordinators on the OHR Background Check Team are in the Human Resources Associate classification, while the Med Center Security ID Processing Team associates are in the Information Associate classification. As such, it may be necessary to move or reclassify current employees when moving to a combined team, depending on job responsibilities.

Currently, there are two physically separate locations to which employees and non-employees are required to report for background check fingerprinting. The University should carefully

consider which location, or a possible alternative location, makes the most sense to meet the needs of background checks customers while also efficiently and effectively meeting the needs of the University.

Issue for Further Study

Even after combining background check teams, it may be possible to meet all background check workload needs with fewer than 7.0 FTE employees. As shown in **Chart 4-10** a combined background check team, responsible for all BCI/FBI and First Advantage, with steady staffing at 7.0 FTEs would still incur 29.3 percent of time as combined overhead. This equates to more than 4,200 total hours of overhead. Given that each full-time employee is compensated for 2,080 annual hours the amount of overhead may be indicative of inefficient staffing.

However, any staffing reduction will require the use of more specific workload and productivity data than is currently being captured. In addition to the current potential to reallocate underutilized personnel to other priorities this will be an important area for further study as recent increases in the total number of background checks may continue to push workload up in the future. In order to deal with those potential increases the University will need to fully understand the current level of utilization, including the extent to which that current utilization is reflective of University priorities and to what extent that utilization can be expected to increase in the future due to process improvements and technological efficiencies.

VIII. Audit Scope and Objectives Overview

Generally accepted government auditing standards require that a performance audit be planned and performed so as to obtain sufficient, appropriate evidence to provide a reasonable basis for findings and conclusions based on audit objectives. Objectives are what the audit is intended to accomplish and can be thought of as questions about the program that the auditors seek to answer based on evidence obtained and assessed against criteria.

AOS and OSU formally entered into this performance audit with the delivery of a notice of engagement effective July 27, 2017. This notice of engagement led to OPT planning and scoping work, in consultation with the University, which identified four distinct scope areas including:
- Information Technology – Server Rooms;
- Information Technology – Printing Management;
- Shared Services – Current State Process; and
- Shared Services – Printing Management.

Based on the agreed upon scope, OPT developed objectives designed to identify improvements to economy, efficiency, and effectiveness. **Table VIII-1** shows the objectives assessed in this performance audit and references the corresponding recommendation(s) when applicable.

Table VIII-1: Audit Objectives and Recommendations

Objective	Recommendation(s)
Information Technology – Server Rooms	
What opportunities exist to improve the efficiency and effectiveness of IT services through the use of IT migration and/or optimization or in in relation to industry standards and leading practices?	**R1.1**
Information Technology – Printing Management	
What opportunities exist to improve the efficiency and effectiveness of printing services in relation to industry standards and leading practices?	**R2.1 and R2.2**
Shared Services – Current State Process	
What opportunities exist for the University to improve the efficiency and effectiveness of key processes through reduction or elimination of unnecessary process steps or process variation in the future state?	**R3.1 and R3.2**
Shared Services – Background Checks	
What opportunities exist to improve the efficiency and effectiveness of background checks in relation to legal requirements, industry standards, and leading practices?	**R4.1 and R4.2**

Note: Although assessment of internal controls was not specifically an objective of this performance audit, they were considered and evaluated when applicable to scope areas and objective.

IX. Abbreviated Terms and Acronyms

A&P - Office of Administration and Planning

AOS - The Ohio Auditor of State

Areas - Colleges, VP Units, and Departments

AWS - Amazon Web Services

B&F - Business and Finance

B&W - Black and White

BCC - Background Check Coordinator

BCI or the Bureau - Ohio Attorney General's Bureau of Criminal Investigation

BTUs - British Thermal Units

CAO - Chief Administrative Officer

CCC - Comprehensive Cancer Center

CDL - Commercial Driver's License

CDW - Computer Discount Warehouse

CFAES - College of Food, Agricultural, and Environmental Sciences

CFO - Chief Financial Officer

CFR - Code of Federal Regulations

CISO - Chief Information Security Officer

COA - Chart of Accounts

COM - College of Medicine

ComDoc - ComDoc, Incorporated

Copiers - Multifunction Devices

COTC - Central Ohio Technical College

CY - Calendar Year

DAS - Ohio Department of Administrative Services

ERP - Enterprise Resource Planning

EVP - Executive Vice President

FBI - Federal Bureau of Investigation

FTE - Full Time Equivalent

FY - Fiscal Year

FYTD - Fiscal Year-to-Date

GA - Student-Graduate Assistant

GAGAS - Generally Accepted Government Auditing Standards

HR - Human Resources

HRA - Human Resources Action Request

HRPs - Human Resource Professionals

HRSSCs or Service Centers - Human Resources Shared Services Centers

HS - Health System

HVAC - Heating, Ventilation, and Air Conditioning
ISCR - Information Security Control Requirements
IT - Information Technology
ITSP - Information Technology Security Policy
kWh - Kilowatt Hour
Maximum - Manufacturer's Maximum Duty Cycle
Med Center - Wexner Medical Center
Med Center HR - Med Center Human Resources
MVR - Motor Vehicle Reports
OAC - Ohio Administrative Code
OBF - Office of Business and Finance
OCIO - Office of the Chief Information Officer
OHR - Office of Human Resources
OHS - Office of Health Sciences
Operational Excellence - Operational Excellence at OSU
OPT - The Ohio Performance Team
ORC - Ohio Revised Code
OSU or the University - The Ohio State University
PCard - Procurement Card
POM - Plant, Operations, and Maintenance
Printers - Desktop Printers
PSSC - Procurement Shared Service Center
Recommended - Manufacturer's Recommended Print Volume
SF - Square Footage
SFOs - Senior Fiscal Officers
SHRPs - Senior Human Resource Professionals
SOCC - State of Ohio Computer Center
SSCs or Service Centers - Shared Services Centers
SVP - Senior Vice President
SVP HR - Senior Vice President for Human Resources
TCO - Total Cost of Ownership
UC - University of Cincinnati
UK - University of Kentucky
UPS - Uninterruptable Power Supply
VP - Vice President

X. OSU Response

The letter that follows is OSU's official response to the performance audit. Throughout the audit process, staff met with University officials to ensure substantial agreement on the factual information presented in the report. When the University disagreed with information contained in the report and provided supporting documentation, revisions were made to the audit report.

THE OHIO STATE UNIVERSITY

Office of Business and Finance

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September 19, 2018

David Yost
Auditor of State
88 East Broad St., 5th Floor
Columbus, Ohio 43215

Auditor Yost:

Thank you and the Ohio Performance Team for contributing to Ohio State's ongoing work in operational excellence and resource stewardship.

As you know, the university has made significant progress in recent years to become more efficient and effective — with an end goal of translating administrative cost savings into direct benefits to Ohio students.

Our efficiency efforts are funding President's Affordability Grants, which make college more affordable for more than 15,000 low- and moderate-income students each year. Likewise, we are using innovative approaches to support our academic mission. Using proceeds from the Comprehensive Energy Management partnership, Ohio State created the Buckeye Opportunity Program to ensure aid packages cover the cost of tuition and mandatory fees for Ohio students who qualify for Pell Grants.

We are on a path of continuous improvement, so our commitment to operational excellence and resource stewardship continues as a pillar of Ohio State's strategic plan. We volunteered to become the first university in Ohio to undergo a performance audit because of this commitment, and we welcome the findings of this report.

I can report that we are already planning to sunset legacy computer systems as part of our Workday implementation, and that we are continuing to migrate servers to the State of Ohio Computer Center, two of your team's most impactful recommendations. Ohio State will work to integrate your other recommendations into our efficiency planning process alongside other projects.

Thank you again.

Michael Papadakis
Interim Senior Vice President, Chief Financial Officer, and Treasurer
The Ohio State University

THE OHIO STATE UNIVERSITY

FRANKLIN COUNTY

CLERK'S CERTIFICATION
This is a true and correct copy of the report which is required to be filed in the Office of the Auditor of State pursuant to Section 117.26, Revised Code, and which is filed in Columbus, Ohio.

Susan Babbitt

CLERK OF THE BUREAU

CERTIFIED
SEPTEMBER 25, 2018