A Report
to the
Montana
Legislature

Information Systems Audit

Child Care Under the Big Sky (CCUBS) System Modernization and Security

Department of Public Health and Human Services

January 2021

Legislative Audit
Division

19DP-04

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January 2021

The Legislative Audit Committee
of the Montana State Legislature:

This is our information systems audit of the Child Care Under the Big Sky (CCUBS) system managed by the Early Childhood and Family Support Division of the Department of Public Health and Human Services (DPHHS).

This report provides the Legislature information about managing return on investment and security concerns as CCUBS ages. This report includes recommendations to enhance risk identification and remediation procedures to protect CCUBS data. Our findings also address the need for DPPHS to develop a modernization strategy that includes consistent review of metrics that identify public value. A written response from DPPHS is included at the end of the report.

We wish to express our appreciation to Department of Public Health and Human Services personnel for their cooperation and assistance during the audit.

Respectfully submitted,

/s/ Angus Maciver

Angus Maciver
Legislative Auditor

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Figures and Tables

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Appointed and Administrative Officials

Department of Public Health and Human Services	David Crowson, Chief Information Officer, Operation Services Bureau
	Erica Johnston, Operation Services Branch Manager, Director's Office
	Jamie Palagi, Administrator, Early Childhood and Family Support Division
	Patty Butler, Bureau Chief, Early Childhood Services Bureau
	Chad Hultin, Internal Audit Bureau Chief, Operation Services Bureau

Information Systems Audit 19DP-04 December 2020

Montana Legislative Audit Division

Child Care Under the Big Sky (CCUBS) System Modernization and Security

Department of Public Health and Human Services

Background

In fiscal year 2019, the Department of Public Health and Human Services (DPHHS) distributed over $25 million in childcare scholarships to 5,700 Montana families. The Child Care Under the Big Sky system (CCUBS) helps DPHHS determine and distribute childcare funds and track and evaluate childcare providers within Montana.

Agency:
Department of Public Health and Human Services

Administrator:
Adam Meier

Division:
Early Childhood and Family Support Division

The Child Care Under the Big Sky (CCUBS) went live in 2002. As CCUBS technology ages and becomes obsolete, risks to security increase and the system may not be a cost-effective solution. By developing a modernization plan for CCUBS and continually reviewing it, the agency can understand if the value of CCUBS is maintained or if larger replacement plans need to be engaged. This also needs to coincide with ensuring that the final steps of security risk assessment are completed to make sure maintenance decisions coordinate with security needs. Improving these final steps will ensure high risks within CCUBS are addressed in a timely manner.

KEY FINDINGS:

The technologies used by CCUBS are becoming obsolete. However DPHHS continues to use the system and update it as technologies become unsupported. There is no annual review of consistent metrics to identify when large-scale replacements are needed because CCUBS is no longer providing an acceptable business value. Our analysis shows a recent transition into negative return on investment as DPHHS pays for technologies to be updated.

While risk assessments and security plans are updated annually for CCUBS, DPHHS does not have formal procedures in place to ensure high risks are eliminated or reduced. We identified a high-risk security concern within CCUBS in recurring risk assessments. There were no formal remediation plans with timelines and milestones developed when the risk was initially identified. Therefore, the risk went unaddressed and was re-identified in the next risk assessment.

RECOMMENDATIONS:

In this report, we issued the following recommendations:
To the department: 2
To the legislature: 0

(continued on back)

For the full report or more information, contact the Legislative Audit Division.

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Recommendation #1 (page 23):
Modernization Strategy Guidance
Develop a modernization strategy that plans around obsolete technologies, develops metrics for continual measurement of return on investment, and tracks metrics on a yearly basis according to state policy.

Department response: Concur

Recommendation #2 (page 30):
Risk Mitigation Policy
Develop and implement authorization to operate procedures and establish quarterly review of timelines and processes for addressing risks.

Department response: Concur

Chapter I – Introduction and Background

Introduction

The Child Care Under the Big Sky (CCUBS) system went live in 2002. The system is maintained by the Early Childhood and Family Support Division (ECFSD) of the Department of Public Health and Human Services (DPHHS). Part of the mission of ECFSD is to improve the quality, affordability, and accessibility of early care and education in Montana. CCUBS supports this mission by facilitating the process that provides subsidized childcare to qualified families in Montana and the process for licensing childcare facilities. In fiscal year 2019, there were over $25 million in childcare scholarships awarded to 5,700 Montana families. The $25 million is a combination of the federal childcare development fund, State Special Revenue, and state required matching funds.

CCUBS uses information provided by families to determine subsidy eligibility and amount. It also maintains updated information to manage important processes like:

- Paying families childcare grants.
- Childcare provider licensing.
- Family and childcare facility correspondence.
- Childcare facility compliance and inspections.
- Family and childcare facility reporting.
- Grant awards to childcare facilities.

Along with storing personal information for each family, CCUBS also stores childcare provider information such as training, insurance, number of children in a facility, and inspection results and history. CCUBS also interfaces with other public service systems to provide and receive information.

The department has expended approximately $16.5 million since 2011 on a system development and maintenance contract for CCUBS with an external vendor. The average maintenance cost for the last two years is $1.5 million. Based on concerns regarding these costs of maintenance and changing federal requirements and the age of CCUBS, the Legislative Audit Committee prioritized an examination of CCUBS. This chapter provides background on CCUBS and describes the scope and objectives of our audit.

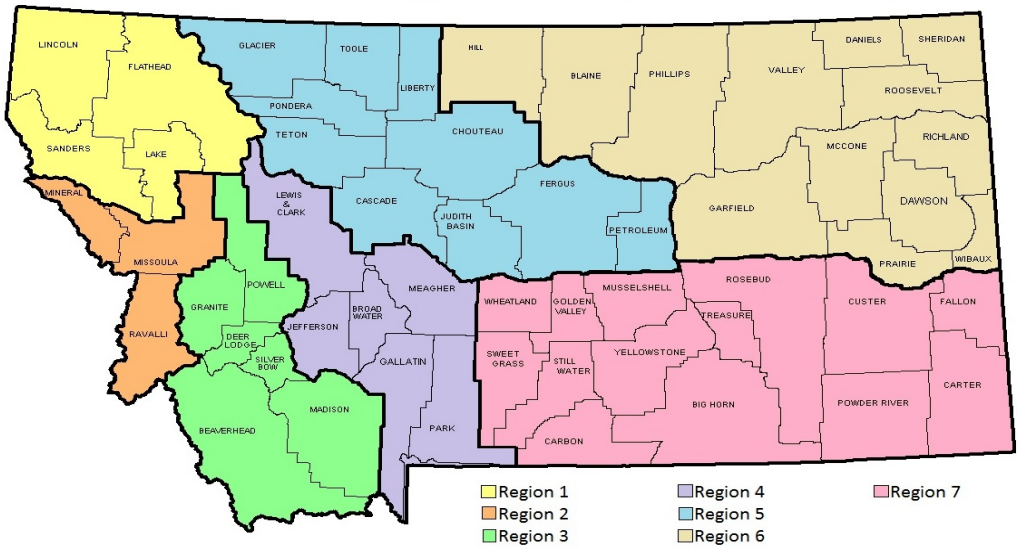
CCUBS Main Users

There are two main users of CCUBS: The Early Childhood Services Bureau (ECSB) and Child Care Resource and Referral (CCR&R) agencies. Additionally, CCUBS has other bureaus and vendors that help manage and support the system.

ECSB: This bureau falls under ECFSD but specifically oversees childcare licensing and inspections and oversees the Best Beginnings Child Care Scholarship Program. Staff set up providers in CCUBS and maintain information on each provider such as training, insurance, and number of children. They also perform annual inspections of childcare facilities. All inspections are tracked and compiled within CCUBS. ECSB currently has 34 full-time equivalent staff (FTE).

CCR&R Agencies: These third-party nonprofit entities work with the department through separate contracts. They work on behalf of the department to determine eligibility for families seeking childcare subsidies. CCR&R agency staff receive information on families from applications and enter the information into CCUBS. CCUBS determines the eligibility for each case. The determination includes information such as approval status and how much a monthly copay will be. CCR&R staff also process subsidy payments by directing state and federal funds to childcare providers. The amount paid to childcare providers is based on the number of hours of care given and is directly tracked for each child. The map below shows the seven different CCR&R regions across Montana.

Figure 1
CCR&R Map



Source: Department of Public Health and Human Services.

CCUBS Management and Support

CCUBS is managed by the ECSB and Fiscal and Operations Bureau. They help CCR&R agencies with training and system support, and manage the childcare subsidies. They are responsible for system administration, such as setting parameters and coordinating with the vendor on childcare subsidy application changes. The vendor that maintains CCUBS has access to testing systems and provides support and help with enhancements to the system. The vendor works with DPHHS's Project Management Bureau to ensure the enhancements are properly made to the system. The State Information Technology Services Division also plays a role in supporting CCUBS by providing hosting and infrastructure support.

Audit Scope and Objectives

Due to the age of the system, there is an increased risk for security weaknesses, high maintenance costs, and a continual need to upgrade the system to meet evolving security requirements and federal program changes. Based on these risks, the scope of our audit centered around managing obsolescence and security governance.

Managing Obsolescence: Older systems tend to cost more in maintenance generally due to knowledge limitations of aging technologies. Changing federal requirements and software upgrades due to the age of the system result in continual enhancements as well. The amount of money and effort spent managing these changes in an older system increases the potential of producing a negative business value for the agency.

We reviewed the department's efforts to evaluate the effect of CCUBS's age on the agency. We conducted a return on investment analysis for CCUBS to determine if the system still produces a positive value. Using information available, we reviewed annual maintenance and upgrade costs from 2011 to present, and determined if the system is operating as intended while costs are managed. We reviewed applications processed, childcare provider invoicing, and other processes that CCUBS allows DPHHS to perform. We also researched other states' systems like CCUBS to compare functionality, costs, and overall structure.

Security Governance: Security is managed by multiple parties involved in CCUBS. Every year the department's Technology Services Division (TSD), with the support of the ECFSD and vendor, assesses the risks to CCUBS. The documentation of this assessment is critical to ensure coordination of these parties and remediation or acceptance of security risks. DPHHS is a large agency with varying priorities and there is high involvement from the vendor for support. Several risks including security role designation, risk identification and remediation, and protection of sensitive data are increased.

Our work focused on reviewing IT roles to determine if they are explicitly identified within the risk prioritization process. We reviewed 2018 and 2019 security documentation to ensure it is maintained, secured, updated regularly, and contains all relevant information. Risk identification and prioritization procedures in these years were reviewed to ensure risks are identified and remedied in a timely manner. Current user management procedures were reviewed to ensure the agency protects Personal Identifiable Information through proper user management procedures.

From this information we were able to form the following objectives:

1. Determine if CCUBS is obsolete or still provides public value to the Department of Public Health and Human Services.
2. Determine if CCUBS security governance:
    - Clearly defines responsibility of CCUBS security roles,
    - Safeguards personal identifiable information and protected health information, and
    - Appropriately prioritizes and remedies IT risks in a timely manner following IT best practices.

Audit Methodologies

To address our objectives, we conducted the following audit work.

We reviewed best practices for conducting a Return on Investment (ROI):

- The Association for Information Systems published *"An Introduction to Return on Investment for Information Systems."* This provided information on ROI equation and components. The Center for Technology in Government at the University of Albany produced the publication *Advancing Return on Investment Analysis for Government IT.* This provided information on public value revenue and how to conduct ROIs on systems that do not produce a monetary return.
- State Information Services Division provided documents and guidance that would be given to state agencies needing assistance with conducting ROI calculations.

We completed an ROI analysis for CCUBS that required reviewing the following:

- Support, maintenance, and upgrade contract costs.
- Reviewing maintenance and support requests.
- Interviewing users to obtain time estimations on procedures conducted within CCUBS.
- Researched other states' systems like CCUBS in order to compare system functionality and costs.

We also researched continuous modernization best practices:

- The International Business Machines (IBM) Center for The Business of Government provides information on continual modernization in its 2018 publication *A Roadmap for IT "Modernization in Government"* and The Information Systems Audit and Control Association (ISACA) *Journal on Continuous Modernization*.

We reviewed state policy and the National Institute of Standards and Technology (NIST) industry standards for security governance criteria to determine system security requirements and best practices. NIST is a nonregulatory federal government agency that develops commonly used security standards and controls for federal agencies.

We also addressed the controls in place to ensure risk identification and remediation occurs for agency systems, user access policies are followed, and security responsibilities are defined. To do this, we:

- Reviewed CCUBS security documentation for specific deliverables of the risk assessment process and user access management.
- Identified and interviewed personnel responsible for maintaining CCUBS security on current risk identification and remediation procedures for DPHHS.

Report Contents

Our work, findings, and recommendations to the agency are discussed in the following chapters:

- Chapter II describes the ROI we conducted for CCUBS, obsolete technology, and the need for a system modernization strategy.
- Chapter III describes DPHHS annual security reviews, authorization to operate, and risk identification and remediation procedures.

Chapter II – CCUBS Requires a Comprehensive Modernization Strategy

Introduction

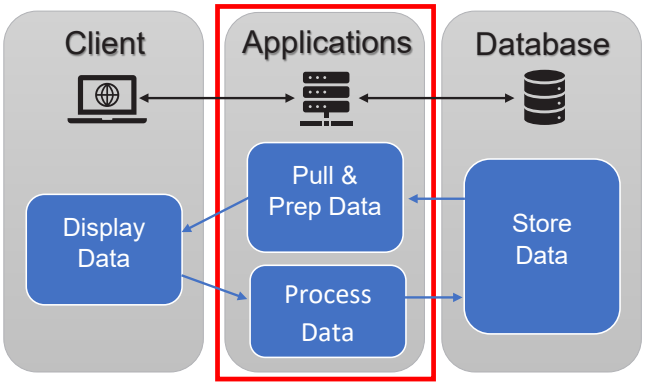
As systems age, there can be increases in costs for maintenance and support, technology becomes obsolete, and risks arise that can leave systems vulnerable. A technology is obsolete when it is no longer efficient, effective, or useful relative to current technology that performs a similar function. Examples of this include when part of the system's functionality is no longer supported, stops receiving security updates, better technology becomes available to perform similar system functions, or it becomes cumbersome to support and upgrade the system.

As part of our work, we reviewed previous efforts to modernize the Department of Public Health and Human Service's (DPHHS) Child Care Under the Big Sky System (CCUBS) and conducted a Return on Investment (ROI) analysis to get an understanding of the current business value of the system. This chapter includes information on the ROI analysis we conducted for CCUBS, other state's structures and costs, and continual modernization best practices.

CCUBS Uses Obsolete Technology

CCUBS is made of various types of technology that work together to perform necessary tasks. Figure 2 shows how these can be broken into three tiers. The client tier refers to the front-end technology for the user to interface with, the application tier contains the processing logic for data in the system, and the database tier contains the back-end technology used to store data.

Figure 2
Three-Tier System Architecture



Source: Legislative Audit Division.

CCUBS uses technology that is obsolete and no longer being supported in the application tier of the system which is outlined in red in Figure 2 (see page 7). While CCUBS is still functioning, it requires a redesign of this tier in order to be maintainable, take advantage of new technology, and to continue to integrate with DPHHS's enterprise services. Along with being forced to upgrade CCUBS over the years, DPHHS has identified high-level security risks due to a lack of functionality within CCUBS. For example, they need to use third-party software to satisfy some basic security requirements, such as implementing audit logs.

In 2014, DPHHS determined that CCUBS was obsolete and requested funding for planning activities to replace and redesign the system. DPHHS requested $2 million through the (HB) 10 Long-Range Information Technology funding process. The funds were requested for performing the planning, request for proposal, feasibility study, and business processing analysis and for modeling for the replacement of CCUBS. DPHHS submitted the request to the Department of Administration's State Information and Technology Services Division (SITSD) for consideration in the HB 10 funding request but it ultimately did not make it into the Governor's budget to be presented to legislators during the 2015 Legislative Session. It was unclear why the funding request did not make it into the Governor's budget and there have been no further funding requests presented relating to CCUBS. As a result, instead of starting the planning activities for replacement, DPHHS has tried to make incremental investments over time to address the outdated components of CCUBS.

Our work focused on analyzing the impact of CCUB's age and these previous maintenance decisions. The following sections discuss state policy for reviewing and replacing systems, modernization best practices, and our analysis on what value this system is providing the agency in its current state.

State Policy Requires Annual Evaluation of Information Systems

The SITSD has a policy discussing the process for determining and managing obsolescence. The policy states that information technology (IT) systems must be reviewed on an annual basis to determine whether they have become obsolete or still provide business value. Through this analysis, the agency then must choose how to address systems with obsolete technology or functionality that are no longer providing business value. State policy does not dictate how an agency should review systems or address obsolescence; however, best practices provide guidance for modernizing obsolete technology. Modernization focuses on continually upgrading and optimizing applications and their underlying infrastructure and services.

Once a system is determined to be obsolete, state policy requires a Return on Investment (ROI) analysis, or business case be conducted as part of a modernization strategy. A business case is a tool used to capture the reasoning for initiating a project or task. They are needed once the decision to make significant changes to a system is approved.

An ROI analysis is a financial calculation used to justify the investment in a new technology by evaluating current technology and comparing it to the potential investment. The state policy regarding these two practices was established in 2017, three years after DPHHS's funding request to plan CCUBS's replacement. Therefore, there is no documentation available of business need or evaluation of CCUBS from 2014. Since 2014, DPHHS has maintained CCUBS without reanalyzing obsolescence or the public value being provided, as required by state policy.

ROI Analysis Best Practices Allow Variability Depending on the Situation

Our objective was to conduct an ROI analysis on CCUBS and identify metrics that can be used to determine if modernization plans are needed for the system. ROI analysis best practices vary widely depending on the situation and there is not a single best method to conduct one. Systems that generate revenue use a more direct method of determining ROI, while systems that provide a service or value use different methods to quantify their value.

State policy dictates that an ROI analysis be conducted but it does not specify how it should be conducted. As a result, we interviewed staff from SITSD in an effort to provide insight on how an ROI analysis would be conducted and what resources would be made available to state agencies where systems generally provide a public value as opposed to generating revenue. SITSD stated that an ROI calculation could be done in two different ways after the agency declares the system obsolete:

- System operation cost vs. public value provided.
- System replacement cost vs. new public value provided.

SITSD also provided examples of ROI calculators and multiple sources of information and guidance they have for agencies. We used this information along with industry best practices to develop our ROI methodology based on system operations costs and the current public value provided.

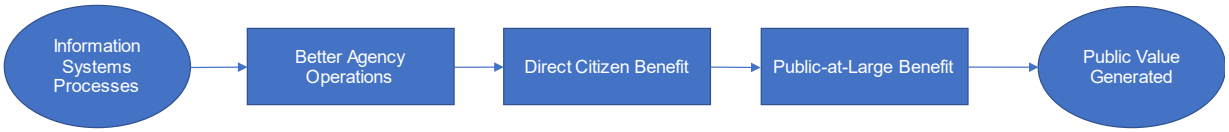
Replacing Traditional Revenue Calculation With Quantifying the Value of a System

The equation to calculate ROI is simple. As illustrated by the following graphic, an ROI is calculated by identifying the Revenue and Cost of a system:

$$\text{ROI} = \frac{\text{Revenue - Cost of Investment}}{\text{Cost of Investment}}$$

However, as it is a system that provides a public service, CCUBS was not intended or designed to produce a financial return via revenue generation, so an ROI analysis must rely on other factors that create value from a public perspective. These public values are considered the social benefits from the system or other positive benefits of having the system in place that do not necessarily relate to generating revenue. The figure below shows how public value is generated from information systems processes. These processes lead to better agency operations which in turn help citizens and provide public value.

Figure 3
Public Value Generated



Source: Advancing Return on Investment Analysis for Government IT.

Consequently, as part of developing an ROI for CCUBS, we had to modify the traditional ROI equation to account for a public value factor. The equation below incorporates public value rather than revenue. It shows how value and cost can provide an idea of the ROI of a system dedicated to providing a public service and it is the equation we used for our ROI analysis of CCUBS.

$$\text{ROI} = \frac{\text{Public Value - Cost of System}}{\text{Cost of System}}$$

Adjusting the revenue factor in the equation still provides a valuable metric, especially when monitored over time. Through the lifetime of a system, ROI can change, so understanding ROI on an annualized basis is helpful for determining current investment decisions. ROI also helps decision-makers understand the investment overall and if the areas of positive ROI outweigh the areas of negative ROI.

Applying these changes to an ROI calculation for CCUBS means public value is based on its impact on citizen's ability to receive childcare assistance funding and ensure licensed facilities are safe. Our work focused on quantifying this value in a way that makes the ROI calculation meaningful to maintenance decisions in CCUBS.

Conclusion

There are a variety of approaches to determine ROI for a system. As long as evaluations of ROI maintain consistency and include necessary factors for either revenues or quantifiable public value, the metric is important in modernization strategies. We determined that quantifying public value is the best method for determining the revenue of CCUBS.

Calculating ROI With Public Value

We were able to obtain information from 2011 to present for public value and costs. We used 2011 as a starting point due to not having reliable data from before this point in time.

Due to the variance in how ROI can be calculated, we provided our methodology for DPHHS feedback to ensure there was an understanding on both sides of what our work would include. DPHHS suggested we capture only processes within the system to ensure accurate comparisons. As a result, this is how we structured our ROI analysis of CCUBS.

Based on our research and input from the department, we determined the process for conducting ROI would include gathering evidence since 2011 for:

- Costs including support, maintenance, and upgrades.
- Public value based on procedures within CCUBS only, including the benefits generated for processing applications and conducting childcare facility inspections.

Using Procedural Costs to Determine Public Value

There are multiple ways to determine public value based on the connection between what happens in government and the impacts on public stakeholders. The straightforward impact of CCUBS includes making specific benefits easier to manage for DPHHS. However, the public impact also can include family or community relationships, social mobility, and status. There is no data available for these types of impacts at this point, but there are resource data to develop a way to understand the value of the system to

DPHHS. Resource data, or the personnel costs, are availiable as the money budgeted to provide a service to the public. Therefore, they can be seen as the value of the service to the public.

While this approach is conservative in understanding the value of the system and does not include the financial benefits obtained by families, it still includes several areas of analysis and multiple metrics to develop an understanding of public value. The following represent the metrics we reviewed to represent public value for our ROI calculation.

- Number of applicants in the system
- Process application time
- Number of childcare providers
- Time to record childcare provider information within the system
- System's ability to handle abrupt change (e.g. COVID-19)

The following sections discuss our work to identify public values with these metrics, what the overall formula represents, and potential solutions gathered from our research of other states' practices.

Public Value Factors

Public value factors as defined by best practices fit into four general areas. Table 1 identifies those areas and how they are applied to CCUBS at a high level.

Table 1
ROI Factors Table

ROI Factors	Definition	CCUBS Application
Cost Avoidance	This benefit will allow the company to avoid a cost completely.	Potential federal fines avoided by using CCUBS.
Cost Reduction	This benefit will reduce (but not eliminate) a cost.	CCUBS allowing for quicker processes.
Public Framework Revenues	Similar to Cost Reduction, but reducing a capital expense.	Social benefits of having CCUBS (i.e. more registrations, better childcare, data driving policy-making decisions).
Reoccurring Costs	Costs incurred to run system.	Maintenance, support, and upgrade contracts.

Source: Legislative Audit Division.

The following sections describes our review of each category and any information we were able to use to determine ROI.

Cost Avoidance

We wanted to specifically look at the role of CCUBS in maintaining eligibility for federal grant funding and what potential penalties CCUBS helps DPHHS avoid. DPHHS staff informed us that there are some reports pulled from CCUBS that are used in federally required reports. This includes information from CCUBS that is used for the Child Care and Development Fund Plan submitted to federal officials. This plan describes how federal childcare money is being spent in Montana, how the state will maintain a level of effort toward the program, and how any state-matched dollars for federal grants will be funded. Maintenance of effort is established by the federal program providing the grant and is the financial commitment expected from an agency to be eligible for the federal childcare grant. This becomes a type of public value because it represents funds further distributed by the state for the benefit of citizens and also avoids the potential loss of federal funding. Since the establishment of the federal grant, the annual maintenance of effort for Montana has been approximately $1.3 million dollars.

Another cost avoidance factor is the department's ability to adjust to changing federal guidelines. Due to COVID-19, DPHHS was forced to make changes to normal processes within CCUBS. Information systems are expected to be agile and respond to issues that may arise. Even with the age of CCUBS, DPHHS was able to give families and providers a chance to adapt to immediate federal program changes, thus, avoiding potential costs for noncompliance and to the public. While there is not a value attributed to this, it is important to consider.

Cost Reduction & Public Value

The main purposes of CCUBS are to reduce the time and effort of managing federal requirements and funds, simplify the process for the public and make assistance easier to access. This is where the personnel cost of each transaction becomes the worth of the system and is used to quantify its value. By determining the cost per transaction or instance, such as entering a paper application into the system, a total value can be derived by multiplying by the volume that occurred. For example, if entering in paper applications takes 15 minutes, and the employee is paid $13 per hour, the personnel cost for each paper application would be $3.25. This value can then be multiplied by the total paper applications in a year to determine the annual value of the application process.

We decided to focus on client intake, eligibility determination, and facility licensing activities in order to ensure we covered processes done solely within the system. Functionality such as contract management and administrative reviews were not included because they do not involve CCUBS functionality, only the data within CCUBS. Specific functions we reviewed include:

- Application processing for families seeking subsidized childcare services.
- Authorization of subsidized childcare and recipient case actions and updates throughout the year.
- Processing payments and adjustments to families and providers every month.
- Establishing a new childcare provider facility in the system.

To determine average costs for these processes, we gathered time estimations and personnel costs from Child Care Resource & Referral (CCR&R) agencie's staff where these processes were taking place. CCR&R agencies are broken into seven different regions, so we interviewed department staff from all the regions in our analysis and averaged their time estimations. We also used the CCR&R budget information to determine the personnel costs for these procedures. We obtained the average hourly wage for the system users that manage the processes, namely eligibility specialists from CCR&R agencies most recent budget request information from 2016. We averaged eligibility specialists' hourly salaries within each agency, which equated to $13.18. Table 2 shows the processes we gathered time information for, and the cost of each process based on the hourly salary calculation.

Table 2
Calculation for Average Cost Per System Managed Process

	Time Estimations by Region (minutes)						Average Time	Average Cost
Processes	**1**	**2**	**3**	**4**	**5 & 6**	**7**	**Per Process**	**Per Process***
Application Process								
- Paper Application Entry	15	10	60	40	30	30	31	$6.77
- Online Application Entry	20	15	30	25	20	15	21	$4.58
Authorization & Case Updates								
- Authorization/Case Note	20	20	20	45	40	30	29	$6.41
Subsidy Payments & Adjustments								
- Paper Invoice	5	7	5	5	5	5	5	$1.17
- Online Invoice	1	4	5	1	2	2	3	$0.55
- Adjustments	5	5	5	30	30	15	15	$3.30

Source: Legislative Audit Division.

*Based on $13.18 average hourly wage of eligibility specialists across all regions.

Overall, time estimations from CCR&R agencies were similar but due to different amount of staff, number of applications to process, and experience levels at the agencies there were some time variances. For example, certain offices had an easier time inputting paper subsidy applications. Agencies also noted that time dedicated to overpayments or adjustments would vary depending on the severity of the error.

For our final public value number, we looked at the process of how department staff record a new childcare facility, specifically the licensing process within CCUBS. Documenting and managing childcare facilities within CCUBS provides value to the public by ensuring public safety and helps maintain the quality of licensed facilities. We used the same process to determine the average cost of establishing a new childcare facility in the system. The average time was estimated at 25 minutes and the average salary of staff conducting this is $23.18. Therefore, the average cost per facility is $9.74.

Overall Public Value Determination for CCUBS

With individual costs developed for each process, we multiplied those by the estimation of occurrences in each year to identify an overall value. Because the number of occurrences is not gathered for all processes, we made estimations. The following describes how each average cost metric was applied to several occurrences and any estimations that were made.

Online Applications: These applications are tracked within the system, so exact counts for online applications per year were used.

Paper Applications: These application counts are not tracked. The difference between the number of online applications and the number of cases that were authorized during the year was used to estimate the occurrences.

Authorization for Subsidy: Each case has to be authorized before receiving a subsidy, and time is spent in CCUBS documenting these case events. These are tracked as case events within the system. The department provided an estimation for this total for our analysis.

Subsidy Payments: The department produces a management report with various family and childcare facility statistics each year. From this report we obtained the number of unduplicated families that are enrolled each year since 2016. We used an average of this yearly number for the years prior to 2016 when the report did not exist. To determine payment occurrences, we multiplied this number by 12 because they occur as part of a monthly invoicing process. The invoicing process for these payments can happen either online or on paper. We estimated personnel costs for both and used

a weighted average of the costs to multiply by the number of occurrences. The weighted average was based on 90 percent of invoices being processed online and 10 percent on paper. We calculated the weighted average based on 90 percent of invoices being processed online (at $0.55 per invoice) and 10 percent on paper (at $1.71 per invoice), for a weighted average of $0.61 per invoice processed.

Overpayments and Adjustments: We estimated a 2 percent error rate in invoicing, so 2 percent of total invoice estimates were used to determine the number of occurrences. This number was used in prior year estimates.

Establishing New Childcare Facilities: We used the total current facility number that the department provided and estimated 10 percent being new each year. This number was used in prior year estimates.

Table 3 shows the yearly calculation of each of these values with the addition of the cost avoidance metric for the maintenance of effort related to federal grants.

Table 3
Public Value Estimations by Factor and Year

	Public Framework Revenues						Cost Avoidance
	Online Applications	Paper Applications	Authorizations	Invoice Processing	Adjustments/ Overpayments	Establishing New Facility	State Maintenance of Effort
$ per instance	$4.58	$6.77	$6.41	$0.61*	$3.30	$9.74	
Year							
2011	$0	$20,434	$19,330	$42,554	$4,587	$1,096	$1,313,990
2012	$0	$43,253	$40,966	$42,554	$4,587	$1,096	$1,313,990
2013	$0	$37,834	$35,860	$42,554	$4,587	$1,096	$1,313,990
2014	$82	$36,751	$34,995	$42,554	$4,587	$1,096	$1,313,990
2015	$3,808	$36,053	$34,572	$42,554	$4,587	$1,096	$1,313,990
2016	$6,906	$36,534	$35,648	$41,681	$4,493	$1,096	$1,313,990
2017	$7,963	$35,342	$35,283	$42,862	$4,620	$1,096	$1,313,990
2018	$8,526	$34,746	$34,578	$43,610	$4,701	$1,096	$1,313,990
2019	$7,935	$31,474	$31,176	$41,974	$4,524	$1,096	$1,313,990
2020	$7,981	$27,688	$26,775	$42,554	$4,587	$1,096	$1,313,990
TOTAL	**$43,201**	**$340,109**	**$329,182**	**$425,451**	**$45,860**	**$10,960**	**$13,139,900**
						Total Public Framework Revenues	**$1,194,763**
						TOTAL PUBLIC VALUE	**$14,334,663**

Source: Legislative Audit Division.

*This is a weighted average of online and paper invoice processing.

The total of the public value over 10 years areas is almost $15 million, shown in green on the table. This represents an estimation of the monetary benefit the public and department receive because of CCUB's processes.

Identifying Costs Associated With CCUBS

In addition to assessing the public value associated with the daily administration of CCUBS, we also reviewed the following areas to determine CCUBS cost:

- **Contract Costs:** Support, maintenance, and upgrade costs associated with CCUBS.
- **System Training:** Time spent training users on how to use the system.
- **System Support:** Focus on support tickets and if waiting on data/system fixes affected the productivity of CCUBS.

While we were able to determine contract costs, system training and support costs were not documented in a way that allowed us to determine their costs. We were still able to obtain valuable information that can be considered by the agency, which is discussed below.

Contract Costs

CCUB's contract costs were straightforward, in comparison to public value, because documenting payments to vendors and determining what funding is necessary year to year is a common practice. We decided to use cost information starting in 2011 due to the availability of information and inflation factors. Total costs for the base system and additional features or functions that may not be part of the base but still contribute to the business processes managed by CCUBS were included. Since 2011, DPHHS spent approximately $16,750,000 for CCUBS maintenance. Additionally, an online provider portal was created and cost approximately $410,000. Total contract costs totaled $17 million.

System Training Costs

Another aspect of cost is system training. This is important because training contributes to the efficient use of the system and is essential for the system to be successful. We determined that it takes anywhere from two to six months to get specialists fully trained to use the system. During this time, eligibility specialist's work is reviewed more thoroughly than the work of fully trained staff. We did not use this number in our final calculation because training is dependent on contracted agencies, with minimal consistency or formal structure from which to obtain data.

System Support Costs

The other aspect of cost of the system we reviewed is support ticket analysis. Our focus was support efforts related to the outdated system, which would be manual changes. While CCUBS maintenance and support is included in the yearly contract, department management need to track this information and quantify how much extra training

and support is being spent on these situations. This will also provide information on yearly contracting decisions and is an important metric in reviewing the system.

DPHHS uses a system to track these efforts through support tickets. We were able to pull a spreadsheet of support tickets from the last two years of this system. When trying to calculate a cost associated with these support tickets and identify trends in extraneous work, we were unable to get specific data for these situations. Tickets are tracked by when it is created and when it is last updated. A measure of how long the work took to complete the ticket is not recorded. We found that over the last two years there have been 127 support tickets to delete duplicate information such as duplicate person or case notes. While a cost value could not be established, we were able to identify that these tickets took an average of 23 days to be closed. Depending on when the error occurred there could be a delay in the childcare subsidy process that delays time frames for families to receive childcare subsidies.

Table 4 shows the yearly breakdown in costs we identified.

Table 4
ROI Cost Table

Year	Costs
2011	$1,214,251
2012	$1,214,251
2013	$1,527,333
2014	$2,275,329
2015	$1,597,893
2016	$1,577,893
2017	$1,565,290
2018	$1,593,478
2019	$2,315,516
2020	$2,275,516
TOTAL	**$17,156,750.00**

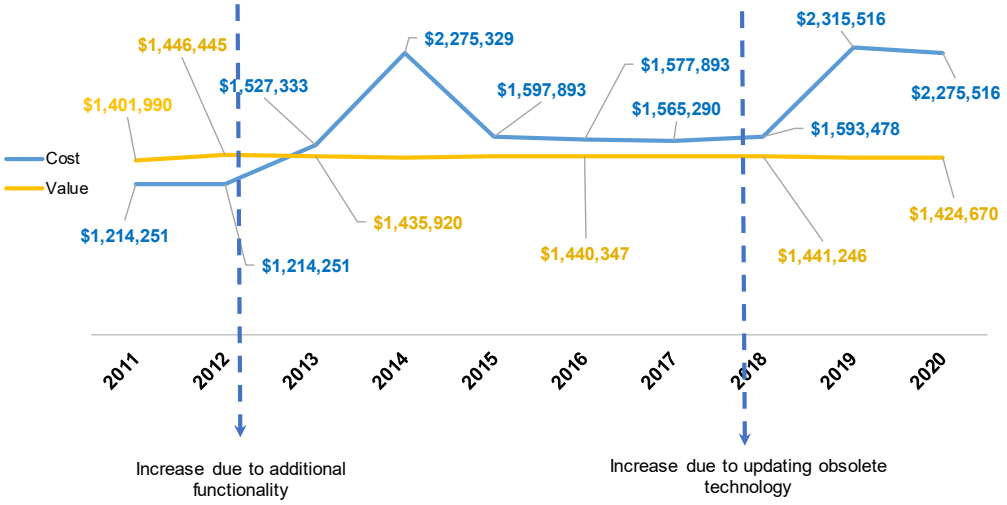
Source: Legislative Audit Division.

Negative Returns Are the Results of Obsolete Technology

Based on our work described above, we calculated a total cost of $17 million and total public value of almost $14 million for CCUBS since 2011. The following figure comparea the annual values and costs of CCUBS since 2011.

Figure 4

CCUBS Cost and Public Value Comparison by Year



Source: Legislative Audit Division.

Figure 4 (see page 18) shows that public value has remained relatively the same over the years while cost has had two significant increases: one for additional functionality where a slight increase in public value also occurred, and another for the transition from obsolete technology. The transition from obsolete technology was needed but did not result in a change to public value.

Clearly there is a negative ROI from this time period using this approach. A negative ROI in terms of public value means more money is spent on providing a service than the value of the service. However, it is not rational for an agency to replace a system based just on the ROI provided at one time. As stated in the best practices we researched, training, service and support tickets, and other factors need to be considered in this decision. Using only ROI can lead to large financial decisions being made with little information or reason to support them. ROI over time should be used by DPHHS to determine to what level they are willing to let the system go before making significant changes to CCUBS.

Using the ROI number is a way to start referring to IT costs as a factor in the equation of how much value the system provides the state. Best practices and state policy indicate a continual approach is needed to evaluate whether a system needs to be modernized. At some point, the approach of how to conduct an ROI transitions from current value and cost to estimated future value and cost. Looking at future costs can help in instances where an agency needs to identify best-fit solutions for major replacements.

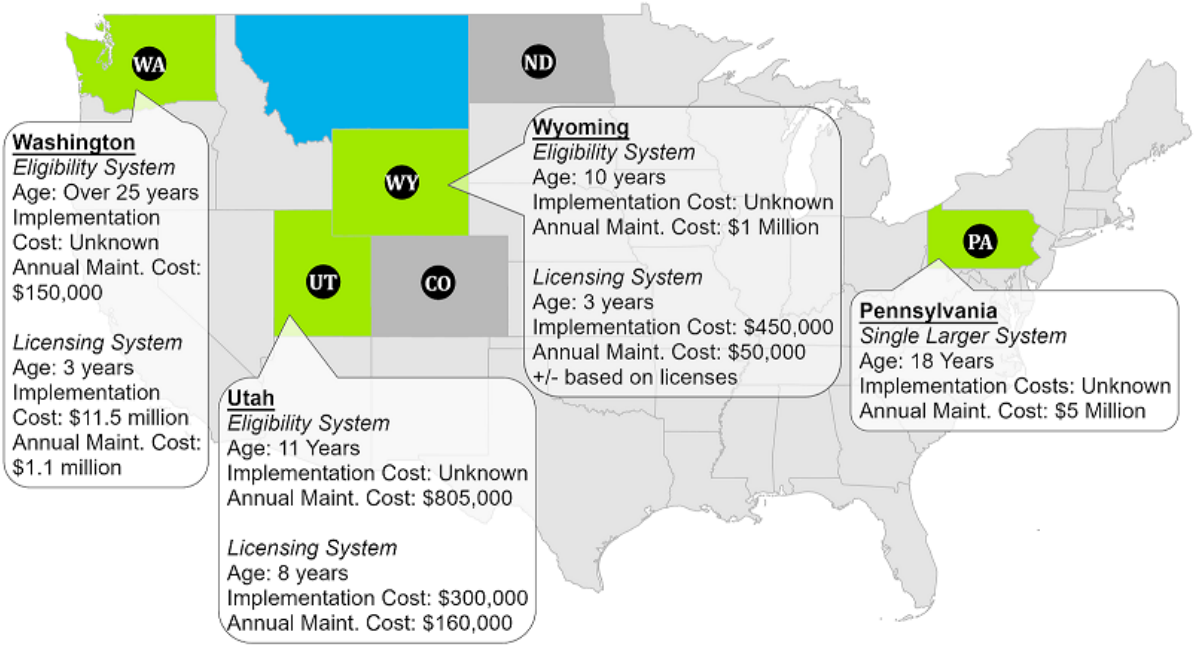
Developing a strategy with either ROI approach leads to more efficient spending and an overall better solution for agencies as they encounter aging systems.

Costs and Structures Vary Across States

We wanted to find information on other state childcare systems and determine if costs were comparable. We reached out to several surrounding states as well other states that use different approaches, like cloud services, commercial off-the-shelf systems, or systems consolidated with other public services. Our work included interviews with staff from Pennsylvania, Utah, Wyoming, and Washington. We talked with North Dakota and Colorado officials but were not able to get the same amount of information from them from them as from their counterparts in other states. We chose these states due to their proximity to Montana and availability. Due to COVID-19, we were only able to get limited information from these states, but this information was still useful in identifying different options for managing this type of public assistance and providing cost and age information of other states systems.

Figure 5 shows the age and cost information for the systems other states use to manage the same processes CCUBS does.

Figure 5
Other States



Source: Legislative Audit Division.

Due to COVID-19, we were unable to gather enough information for an ROI calculation of other states to compare to Montana. However, we were still able to review the costs of the various approaches. The following discussion describes the approach each state takes: an integrated approach that involves a system managing multiple assistance program's eligibility, benefit or subsidy determinations, and licensing; or a multiple-system approach where these functions are separated between individual systems.

Pennsylvania is modernizing a large integrated system that supports an assortment of childcare and education services. Pennsylvania is pushing for more commercial off-the-shelf systems across the state but currently they are simply updating their integrated system. While Pennsylvania is not geographically close, it is a unique example of how one state has structured its childcare and licensing system.

Utah also uses an integrated-system approach for eligibility and subsidy determination, but has a separate system for childcare licensing. The eligibility system also includes online applications for other public assistance programs like Medicaid and the Supplemental Nutrition Assistance Program.

In contrast to Pennsylvania and Utah, **Wyoming** uses two systems to manage eligibility and licensing. No other assistance programs are managed by the systems. The licensing system has web-based functionality and staff can update information in real time.

Washington also uses a separate payment and childcare facility attendance tracking systems. The payment system is not dedicated to childcare payments; multiple payments are processed for the department. Their licensing system is currently only used for childcare, but they are looking to expand to foster care and other areas.

North Dakota is currently in the process of procuring a childcare licensing data system. They are looking at both custom-build and cloud-based solutions with the assumption that cloud-based will come in closer to their budget and be their preferred route.

Colorado currently use a commercial off-the-shelf system as their platform for Licensing, child care subsidy and attendance, and quality assessment and improvement programs. They have contracted with a vendor for the system's implementation, and operation's and maintenance.

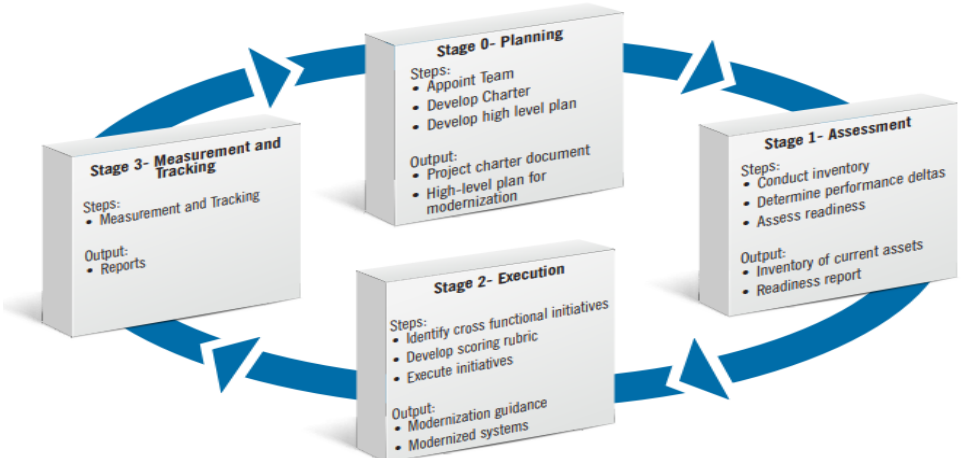
Our research identified that some states have started upgrades and transitions to new systems. However, there are still older systems, like CCUBS, that are being used.

Other states have different structures governing their childcare programs, which can lead to difficulties in direct comparisons of systems.

Obsolete Technology and Need for Continual Modernization

Modernization strategies involve a cyclical process of planning, assessment, execution, and measurement and tracking. Figure 6 (see page 22) shows the full process for determining how to modernize systems. These four steps need to be recurring and based on measurements established by the agency. DPHHS has started these processes with a yearly IT security review but currently there is a gap in action for a comprehensive modernization strategy. The ROI we conducted is an example of a metric used for a continual modernization strategy.

Figure 6
Modernization Strategy Graphic



Source: IBM Center for The Business of Government–A Roadmap for IT Modernization in Government.

Modernization strategies are an ongoing process to allow for continuous improvement rather than costlier sporadic "catch ups." There is a focus on forming a diverse team that can identify obsolete technology and how that technology supports mission goals. There should be a strong commitment to communication with agency, functional, and technical leadership, and key users. Strong communication can help the team develop metrics for technology to measure the system's return on investment or value. For example, ROI provides a useful metric to start a dialogue about system obsolescence and can provide department staff and legislative policymakers with the information they need to consider future large-scale IT investments, such as the potential future replacement of CCUBS and other state IT systems.

Modernization Needs to Be a Proactive Process

We agree with DPHHS that CCUBS is obsolete, and our ROI analysis shows that the return is negative at this point in time. However, we recognize that there are difficulties in replacing large information systems from a financial, technical, and logistical standpoint. DPHHS has faced these difficulties by trying to update CCUBS incrementally over time. DPHHS's approach has been reactionary in nature. Best practice research dictates that modernization must be an on-going process rather than a single stand-alone event.

Continual modernization is required to ensure Montana information systems are secure and provide value to Montana citizens. DPHHS needs to review CCUBS on a yearly basis to determine what their modernization strategy is. This approach will help them determine when it is time to initiate larger projects, such as system replacements.

Recommendation #1

We recommend the Department of Public Health and Human Services develop a modernization strategy to address obsolete technologies and diminishing return on investment of Child Care Under the Big Sky that includes:

A. *Proactive planning to address obsolete technologies,*

B. *Develope metrics, like return on investment or scoring, for continual measurement, and*

C. *Tracking these metrics and reviewing obsolescence on a yearly basis according to state policy.*

Chapter III – CCUBS Security Risk Assessment and Management

Introduction

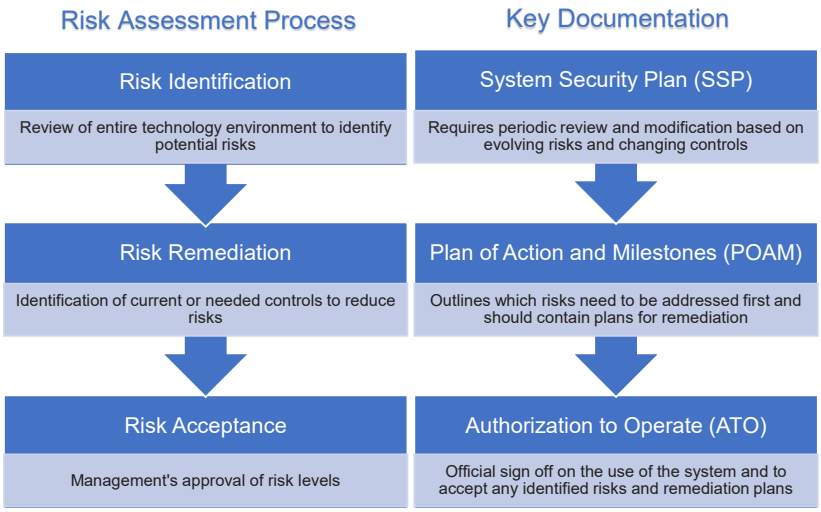
Child Care Under the Big Sky (CCUBS) contains Personal Identifiable Information (PII) and Protected Health Information (PHI) including demographic and financial information for families and providers, as well as disability and immunization information on families. Agencies with systems that contain sensitive information, such as CCUBS, need to ensure they meet security requirements to protect that information. These security controls are outlined within state policy.

We found the Department of Public Health and Human Services (DPHHS) has established a security program that they use to conduct an annual risk assessment within CCUBS. However, improvements can be made to ensure plans are documented to remedy or reduce high risks in a timely manner. This chapter contains information related to annual security reviews, authorization to operate, and risk identification and remediation procedures.

Security Documentation Notes Key System Risk Decisions

One key control in managing security is the risk assessment process and development of high-level security documentation. High-level security documentation helps keep security responsibilities and processes organized for IT systems. The following figure shows the main purpose of the documents and when they are needed during the risk assessment process.

Figure 7
Risk Assessment Process



Source: Legislative Audit Division.

These documents also help manage security at a large agency where multiple systems have risks that need to be prioritized. There are also multiple divisions and vendors that need to coordinate, and in CCUBS's case, the vendor helps manage a large portion of the development and maintenance processes. Due to these factors, there need to be detailed procedures outlined in department policy to ensure updates are appropriately conducted and risks are addressed and remediated in a timely manner.

We reviewed these procedures relative to CCUBS and identified that the security program is mostly complete with standard procedures and clear roles and responsibilities. However, improvements in addressing identified risks are needed. The following section describes DPHHS's security program and areas of needed improvement.

DPHHS Has Established Security Roles and Responsibilities

Defined security roles for an application, especially with substantial vendor involvement, help ensure security responsibilities are clear. It is important to have established security roles to ensure contractor accountability. State policy guides agencies on IT security management and specific security roles that need to be identified. State policy states that agencies must have a system security plan (SSP) in place that provides an overview of the security requirements for the system, describes security controls in place, and documents security categorization of the system.

DPHHS has worked to establish their security program over the last few years. We reviewed the most recent SSP from 2018 to understand the progress made and identify key personnel for interviews, and we identified two levels of security roles pertaining to CCUBS, including those responsible for high-level security administration and decisions, and those responsible for day-to-day operational security of CCUBS. High level security administration includes the chief information officer and the security compliance officer. These roles engage in the creation and approval of the SSP and Plan of Action and Milestone (POAM). Responsibilities at the operational level include system testing, maintenance, and managing user access.

Through multiple interviews with staff and review of documentation, we identified that DPHHS employees know and understand their security roles. These roles align with state policy and help keep CCUBS secure.

CCUBS's Security Program Controls User Access but Lacks Monitoring Activity

We focused the security program review on user management and event logging due to the nature of information within CCUBS. User access management is the procedures that prevent unauthorized access and event logging is the procedures and controls in place to identify unauthorized activity.

User Access Management: We reviewed user access management procedures, including how users are created, maintained, and reviewed. Overall, DPHHS policy and procedures for user access maintenance and review follow National Institute of Standards and Technology (NIST) and state policy. These key controls ensure that user accounts meet the following requirements:

- Specific request for access forms are filled out and approved by the Technology Services Division security team.
- New users are reviewed and approved by system administrators and supervisors.
- Roles assigned align with individuals job functions.
- 6-month reviews are done of all users.
- Specific request-for-termination forms are filled out when an individual leaves the agency or no longer needs access.

User Activity Monitoring: While the procedures to ensure users are given accurate access and to maintain appropriate access exist, procedures need to be in place to monitor activity of users, especially those with elevated access. For example, vendor access often needs further scrutiny and increases the need for additional controls. The CCUBS vendor has elevated access to the system, which introduces additional risk. To limit vendor-related risk, systematic audit logs are required by state policy to document activity and to be monitored by the system owner. These logs provide a baseline of system activity and can help detect when abnormal events occur. Audit logs provide information on:

- Users
  - Actions are automatically recorded and tied to them
  - Confirm users are properly using the system
- Reconstruction of Events
  - When, how, who, and what happened during the incident
- Intrusion Detection
  - Help identify suspicious behavior

According to the 2018 and 2019 POAM document developed internally by DPHHS, such audit logs are not in place for CCUBS.

DPHHS Has Taken Steps to Address Security Risks at the Organizational Level

DPHHS has recognized the lack of implementing audit logs for CCUBS as a high risk. Department personnel indicated they have been working on implementing state security policy over the last five years in order to increase the security around their applications and data. They stated higher level security priorities have been completed, including overall individual application security assessments, implemented multi-factor authentication, implemented a vulnerability scanning program, and building the ability to conduct risk assessments annually.

DPHHS also indicated that increasing security resources and staff have been a slow process over the last four years. This has made conducting annual risk assessments on all systems annually a challenge. Another challenge in addressing audit logs within CCUBS is the solution for implementing them. While this is identified as a high risk, we are able to discuss it in this report because of compensating controls already in place at the agency. CCUBS was developed almost 20 years ago, and due to its age DPHHS needs to use additional software to integrate with CCUBS and provide the necessary controls.

However, it is important to address this situation in CCUBS due to the risk of not being able to identify suspicious or unauthorized activity. Without proper monitoring, it makes it difficult for security staff to monitor and identify suspicious behavior within the system. Information like multiple unsuccessful log-in attempts, data changes, or parameter changes are key metrics of such activity. These are common indicators of unauthorized activity that puts the payment and personal information of Montana citizens at risk.

Final Risk Assessment Procedures Need Action Plans and Timelines

While there are challenges in removing high-level risks within CCUBS that must be balanced with high-level risks found in other applications, application-specific risks that are high need to be removed as soon as possible. As these risks go unaddressed, the system and its data are more vulnerable to threats. Identifying and remediating high risks found in CCUBS ensures that it is secure and plays an important role in authorizing its use.

According to state policy, the department CIO must review high-level security documents, noted in Figure 7 (see page 25), and issue an Authorization to Operate (ATO) every two years. An ATO is the official management decision to authorize operation of an information system and to accept risks found from a review process. The POAM document that DPHHS creates contains risks categorized as high, medium, and low. High-level risks need to have a remedy plan in place to either lower its risk or remove it completely. State policy dictates that these action plans be reviewed quarterly.

Currently, DPHHS has an ATO policy. This policy identifies individuals responsible for the ATO process, but it lacks timelines and action plans to remedy high risks documented in the POAM. Each risk identified in the action plan would go through a different change process, depending on severity. However, staff indicated that they do not currently have written procedure in place for the POAM risk action plans.

When reviewing the ATO process we identified that various procedures to ensure accountability, like timelines, reviews, and follow-ups are not defined. DPHHS does not have procedures in place to ensure high risks are eliminated or reduced or a way to monitor the progress of risk elimination plans to ensure authority to operate timelines are met. They are currently developing the final steps of the process and plan to have it completed in time for next year's assessment cycle. During fieldwork, DPHHS also updated the current POAM to include steps and dates to ensure that high risks are remedied within a 60-day time frame.

Authorization to Operate and Risk Mitigation Plan Procedures Need Accountability and Follow-Through

While high-level procedures for risk identification are important to establish, individual high risks to systems are also important to manage in a timely manner. An example of high risk that has been identified and not addressed is the audit logs within CCUBS. Until CCUBS has audit logs in place, unauthorized activities occurring within the system cannot be identified. Users with elevated access rights can potentially change or misuse system information.

While DPHHS has recently formalized the prioritization of risks to the department and individual systems identified in security assessments, creating formal procedures to ensure that ATO timelines and requirements are met will keep the system functioning safely and minimize risks, like those posed by not having audit logs.

Recommendation #2

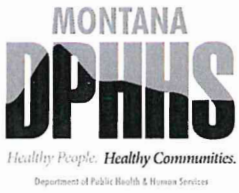
We recommend the Department of Health and Human Services improve risk mitigation policy by:

A. *Developing and implementing Authorization to Operate procedures that include documented risk acceptance or procedures and timelines for remedying or reducing high risks, and*

B. *Establish a quarterly review of timelines and processes for addressing risks to ensure actions are completed.*

Department of Public Health and Human Services

Department Response



Department of Public Health and Human Services

Director's Office ♦ PO Box 4210 ♦ Helena, MT 59620 ♦ (406) 444-5622 ♦ Fax: (406) 444-1970♦ www.dphhs.mt.gov

Greg Gianforte, Governor

Erica Johnston, Acting Director

January 14, 2021

RECEIVED
January 15, 2021
LEGISLATIVE AUDIT DIV.

Angus Maciver
Legislative Auditor
Office of the Legislative Auditor
State Capitol, Room 160
Helena, Montana 59620-1705

Re: Child Care Under the Big Sky LAD Audit Recommendations

Dear Mr. Maciver:

The Department of Public Health and Human Services has reviewed the *Performance Audit of Child Care Under the Big Sky* completed by the Legislative Audit Division. Our responses and corrective action plans for each recommendation are provided below.

Recommendation #1:
We recommend the Department of Public Health and Human Services develop a modernization strategy to address obsolete technologies and diminishing return on investment of CCUBS that includes:

a. Proactive planning to address obsolete technologies,
b. Develop metrics, like return on investment, or scoring, for continual measurement of system return on investment or business value, and
c. Track these metrics and review obsolescence on a yearly basis according to state policy.

Response: Concur

Corrective Action:
The department will develop a modernization strategy for CCUBS that will evaluate the technology being used against the business value being gained and cost. The strategy will include establishing an annual review of obsolescence and metrics to ensure the application is still providing value.

Planned Completion Date: 07/31/2021

Recommendation #2:

We recommend the Department of Public Health and Human Services improve risk mitigation policy by:

a. Developing and implementing Authorization to Operate procedures that include documented risk acceptance or procedures and timelines for remedying or reducing high risks, and

b. Establish a quarterly review of timelines and processes for addressing risks to ensure actions are completed.

Response: Concur

Corrective Action:

The department will update the risk mitigation policies and procedures to include documented risk acceptance or timelines for remedying and/or reducing high risks. The department will review the status on a quarterly basis to ensure the actions are completed.

Planned Completion Date: 03/31/2021

Sincerely,

Erica Johnston, Acting Director
Department of Public Health and Human Services

cc:
Laura Smith, Deputy Director/Economic Securities Branch Manager
David Crowson, Chief Information Officer
Jamie Palagi, Early Childhood and Family Services Division Administrator
Chad Hultin, Audit Liaison