The Auditor of the City and County of Denver is independently elected by the citizens of Denver. He is responsible for examining and evaluating the operations of City agencies for the purpose of ensuring the proper and efficient use of City resources and providing other audit services and information to City Council, the Mayor and the public to improve all aspects of Denver’s government. He also chairs the City’s Audit Committee.

The Audit Committee is chaired by the Auditor and consists of seven members. The Audit Committee assists the Auditor in his oversight responsibilities of the integrity of the City’s finances and operations, including the integrity of the City’s financial statements. The Audit Committee is structured in a manner that ensures the independent oversight of City operations, thereby enhancing citizen confidence and avoiding any appearance of a conflict of interest.

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Report number: A2015-020
We have completed an audit of the IT Service Desk. The purpose of the audit was to determine the effectiveness of the IT Service Desk and to ensure that it is meeting the needs of the City and County of Denver’s employees. We assessed the availability of resources, the use of third-party support, performance metrics, and the tools and technologies used by the IT Service Desk to carry out its responsibilities.

As described in the attached report, our audit revealed that the IT Service Desk meets the needs of its customers, however we identified some areas for improvement. Specifically, the IT Service Desk needs to better adhere to and manage the contract with its third-party support provider, enhance the process used to notify customers about the progress of issue resolution, update and secure the internal knowledge base used for issue resolution, and increase customer awareness of the new, web-based tool SupportNow. Our report includes several recommendations for addressing these opportunities for enhancement. Through stronger vendor management and enhanced communications and security, the IT Service Desk will be better able to meet the growing demands of its customers.

This performance audit is authorized pursuant to the City and County of Denver Charter, Article V, Part 2, Section 1, General Powers and Duties of Auditor, and was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We extend our appreciation to the IT Service Desk and the personnel who assisted and cooperated with us during the audit.
Highlights

We found that City employees are generally satisfied with the quality of service provided by the City’s IT Service Desk. A large percentage of surveyed users indicated that IT Service Desk technicians are courteous, professional, and knowledgeable and that their technical issues are being resolved. However, our audit found opportunities for further enhancing the IT Service Desk’s operations in four areas.

- **Third-Party Contract Improvements**—The contract between the City and a third-party after-hours support team is not being monitored on a regular basis, and the vendor’s IT controls have not been evaluated for security integrity.

- **Communicating with Customers about Resolution Status**—Customers are not always notified when an issue is escalated to a different IT team for resolution, which has a negative impact on customer satisfaction.

- **Updating and Securing the Knowledge Base**—The knowledge base that is used internally by the IT Service Desk to relay potential resolutions to known problems is not being updated and reviewed on a regular basis.

- **Increasing Customer Awareness of a Web-Based Tool**—A web-based tool was rolled out to customers in October 2015 to make the IT Service Desk more efficient. However, the features and location of the tool were not sufficiently communicated to City personnel.
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INTRODUCTION & BACKGROUND

Purpose of the City’s IT Service Desk

The operations of the City and County of Denver (City) are heavily reliant on a wide variety of information technology systems, applications, and devices. Although most of this technology is designed to be user friendly, problems inevitably arise and most City employees do not have the expertise to resolve them on their own. Thus, the Information Technology (IT) Service Desk was established to provide City employees with technical assistance, the need for which has grown over time along with the expanded use of technology to support City functions. The IT Service Desk provides support to approximately 11,500 City employees, resulting in a ratio of one IT Service Desk technician per 885 customers. We benchmarked this ratio across five other cities and counties and noted the ratio of technicians to customers is comparable.

The City uses more than 300 enterprise and business applications, hosted services and a variety of IT hardware including mobile devices, tablets, laptops, desktops. Although many City agencies use the same applications, some require specialized software to perform their day-to-day activities. Supporting these systems and applications—both common and unique—through the IT Service Desk provides employees with a central point of contact when they encounter technology issues. Figure 1 demonstrates the most common issues submitted to the IT Service Desk, including problems related to email, mobile devices, desktop computers, and printers.

Figure 1: Common Issues Submitted to the IT Service Desk from March 27, 2015 to November 5, 2015

Source: Created by Audit Services Division Staff.
The IT Service Desk serves as a primary source for technology related information within the City and County. The breadth and depth of knowledge of IT Service Desk technicians ranges from assisting with general IT related questions, first level troubleshooting of problems, solving known issues, providing notifications to users of service disruptions, and escalating issues that require more advanced technical knowledge. The service desk is available twenty-four hours per day, seven days per week, including holidays. City employees operate the service desk Monday through Friday from 6:00 a.m. to 6:00 p.m. After business hours, on weekends, and on holidays, a third-party vendor provides remote service desk support. Figure 2 shows which group provides IT Service Desk coverage throughout the week.

**Figure 2: IT Service Desk and Third Party Vendor Staffing Schedule Coverage**

| Days       | 6am | 7am | 8am | 9am | 10am | 11am | 12pm | 1pm | 2pm | 3pm | 4pm | 5pm | 6pm | 7pm | 8pm | 9pm | 10pm | 11pm | 12am | 1am | 2am | 3am | 4am | 5am |
|------------|-----|-----|-----|-----|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Saturday & Sunday |     |     |     |     |      |      |      |     |     |     |     |     |     |     |     |     |      |      |     |     |     |     |     |
| Mon - Fri   |     |     |     |     |      |      |      |     |     |     |     |     |     |     |     |     |      |      |     |     |     |     |     |

Source: Created by Audit Services Division Staff.

**IT Service Desk Personnel**

For 2016, the IT Service Desk was allocated approximately $1.5 million for staffing, resources, and operations. A portion of the budget supports the salaries of the IT Manager in charge, fourteen tier one service desk technicians, and four advanced support technicians. The associate level tier one position requires an associate’s degree in computer science, computer information systems, business administration, mathematics, or a related field. Additionally, tier one staff must have two years of experience performing user support. The tier one IT Service Desk technicians serve as a single point of contact for employees and primarily interface with City employees through service requests that are made via email, telephone, or a web interface option called SupportNow. The technicians are trained to actively listen to the customer, obtain key information, assess the situation, troubleshoot, and deliver a resolution. Each tier one technician responds to approximately 170 calls, emails, and walk-ins on average each day.

In the event that the solution requires a more comprehensive level of knowledge or expertise, the tier one technician will refer customer requests to an advanced support technician or to another team within TS. This process is known as escalation. Education qualifications for advanced support technicians include a bachelor’s degree in an information technology-related field, and two years of experience performing user support. Advanced support personnel serve as the technical resource for business systems and applications, including support for projects within the system development life cycle, and assisting with the information technology needs of designated departments and agencies.

IT Service Desk technicians have a range of other duties in addition to responding to service requests. They are also responsible for remotely installing software upon request by the TS Licensing Department; performing account maintenance, such as completing IT Service Desk portions of requests and verifying with customers that resolutions are complete; and interacting with advanced support technicians and specialized TS teams that may assist in resolving issues.
The advanced support team includes IT systems administrators who are responsible for installing and configuring operating system hardware and user application environments, and repairing routine to complex problems with system hardware and software across the TS environment.

According to the IT Service Desk Manager, a common misconception is that the 311 call center answers IT support calls, when in fact this entity is responsible for helping citizens with questions about and problems with municipal and non-emergency services.1

After-Hours IT Service Desk Support Personnel

The City has a contract with a third-party vendor to provide after hours, weekend, and holiday support. The contract provides details about the services that will be performed, the fixed costs, insurance requirements, record retention policies, City data confidentiality, the hours of coverage, and Service Level Agreements (SLA). SLAs provide additional details on the expectations of work to be performed, such as achieving certain response times based on ticket priority. For example, one of the SLAs specifies that the third-party vendor will respond to a server outage more quickly than to a password reset request since a server outage is far more severe and would have a significant impact across the City. Prioritization—both by the City-employed IT Service Desk personnel and the third-party personnel—is important so that City employees receive a response and resolution within a reasonable specified timeframe. The SLAs also provide consistency in service regardless of what day or time an employee is seeking support.

Third-party vendor employees must meet similar IT experience requirements as City IT Service Desk technicians. These third-party technicians receive on average sixteen tickets per day, and handle the same variety of issues the IT Service Desk receives. To evaluate the level of service provided by the third party, IT Service Desk personnel regularly select tickets completed by outsourced staff for quality evaluations. Results are communicated back to the third party so it can address issues and ensure that City customers receive consistent and quality service. Surveys are also used to gauge the level of customer service that is provided. Finally, The Service Desk and the third party exchange status reports to ensure that all parties are aware of upcoming maintenance, any known issues, and specific tickets that require follow-up.

IT Service Desk Clients

The IT Service Desk provides support to approximately 11,500 City employees. Agencies that use the IT Service Desk more frequently than others include the Departments of Human Services, Safety, Parks and Recreation, Finance, and Public Works. The majority of the City’s agencies rely on the IT Service Desk for technical support, but some are supported by their own independent IT support staff. The IT Service Desk provides support to many agencies and departments within the City and County of Denver with the exception of the following departments: Botanic Gardens, Denver Art Museum, Denver Convention Center, Denver Health Medical Center, Denver International Airport, Denver Museum of Nature and Science, Denver Public Library, Denver Zoo, Denver Health and Hospital Authority, District Attorney, and County Courts. These agencies rarely contact the IT Service Desk since they have technology support personnel who

1 The 311 Customer Service Center (311 call center) is a comprehensive one-stop resource for anyone seeking information about nonemergency City services. The 311 call center serves both external and internal customers by providing a quick source of information or call routing for external callers, which assists internal City agencies with their customer service efforts.
specialize in their unique technology. However, these agencies may occasionally request Service Desk support. IT Services bills these agencies for services based on a fixed fee.

The IT Service Desk regularly sends out customer satisfaction surveys to receive feedback on their performance. Our audit work also included a survey of agencies that utilize the IT Service Desk most; our analysis of the results is included in the findings below.

**Systems Used by the IT Service Desk**

IT Service Desk technicians use a variety of systems in the course of performing their duties. These systems help with intake and organization of requests for support and store the information that technicians use to provide that support.

**ServiceNow**—The IT Service Desk staff uses a suite of IT service management applications called ServiceNow, which is designed to provide a comprehensive integrated solution for TS staff and improve the customer experience. The ServiceNow application is the tool that IT Service Desk technicians use for entering, tracking, and updating service requests. ServiceNow also has the functionality to process email requests for service through an auto-ticket generation process, creating a corresponding ticket for each request. The ServiceNow suite provides a comprehensive tool for tracking information on users and devices, infrastructure, projects, changes, and incidents in a single platform.

**SupportNow**—SupportNow, a module of ServiceNow, is an employee self-service web interface that allows City employees to enter their own service request into the ServiceNow system. Introduced in October 2015, SupportNow allows users to look up the status of their existing tickets, review answers to frequently asked IT questions, and research for any known issues or incidents affecting the City network. Currently, the SupportNow knowledge base of information is targeted towards City employees in need of technical assistance, but this feature could be expanded to provide content that is more technical and would serve as a resource for the technicians as well.

**Cisco Telephone System**—The IT Service Desk uses a Cisco telephone system to receive incoming calls, provide informational messages, and manage call routing and queues. Currently the service desk has two queues, one for password resets and another for all other calls. The Cisco supervisor module displays information including which staff members are actively taking calls, the duration of the calls, hold times, and number of calls abandoned. This tool provides real-time reporting on call statistics to keep management apprised of when call volumes are increasing. In the event of a widespread issue, the Cisco telephone system’s messaging feature allows the service desk to record an introductory message that all callers would hear prior to connecting to a technician informing them that TS is aware of and is working on resolving a known issue. Additionally, this feature is used in a marketing capacity to communicate the availability of new tools or support desk functionality.

**TS Wiki**—Another tool used by the IT Service Desk is the TS Wiki, which is the key knowledge base for all service desk technicians. The TS Wiki contains entries for critical enterprise applications allowing technicians to research solutions for known issues, or find suggested troubleshooting questions and procedures. This assists the technicians in finding the necessary information to

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2 A call is considered abandoned when a caller ends the call before reaching a technician.
3 A wiki is a website that allows collaborative modification of its content and is accessible through a web browser.
more quickly resolve an issue and provides consistency of service. In addition, the TS Wiki may provide detailed contact and on-call information in the event that a technician needs to escalate an issue. The TS Wiki is a collaborative tool that is managed by TS and shared with IT Service Desk technicians. TS relies on subject matter experts within the organization to create and maintain knowledge base entries. When IT Service Desk technicians encounter a new issue not addressed by the TS Wiki, they may share with IT Service Desk technician’s information about potential solutions using instant messaging tools. A new resolution is not added to the TS Wiki until it has been thoroughly tested to ensure the solution is valid.

Key IT Service Desk Processes

There are three methods by which customers may request technical support from the IT Service Desk: telephone, email, and SupportNow. The majority of customer contacts are initiated by telephone at 78 percent, while email and SupportNow constitute 16 percent and 6 percent of contacts, respectively. When a customer experiences an IT-related issue, the customer may call the IT Service Desk for immediate support. A technician may answer the call immediately or, in the event that all technicians are already helping other customers, the call will be placed in a queue while the customer remains on hold. Once the call is answered, the technician creates a ticket while on the telephone with the customer. All tickets have a corresponding number to identify the request, which allows technicians to track the request through resolution.

Alternatively, the customer may request assistance from the IT Service Desk using email. Rather than contacting an individual technician, all IT Service Desk emails are directed to one general email address, which assigns requests to a similar but separate queue. The system automatically generates tickets from these emails, assigning the requests numbers. Lastly, a customer may request assistance through SupportNow, which also generates tickets and adds them to a separate queue from the email-generated tickets. Technicians are assigned to either work the telephone lines or respond to the ticketing or SupportNow queue, starting with the oldest tickets in the queues.4

The subsequent process for responding to telephone calls and tickets is similar. Technicians start by obtaining or verifying relevant information about the customer, such as telephone number, employee ID, and computer name, and determining whether the customer has already contacted the IT Service Desk about the same issue. This prevents more than one ticket being created for the same issue. After gathering customer information, technicians determine customer needs by either inquiring about the issue with customers who have called in or reading the issue described in the ticket as submitted via email or SupportNow. Technicians assign the ticket a priority and categorize the request based on a specific issue, such as application name or hardware type. The technician will work to understand the issue, perform the necessary work to fix the problem, and close out the ticket to indicate that the problem has been resolved.

Approximately 59 percent of the time, problems require more specialized assistance from an advanced support technician or a specialized team within TS. The advanced support team’s issue-resolution responsibilities include processing and resolving tickets that have been escalated to them from the IT Service Desk regarding provisioning resources in accordance with customer needs, performance management, and system recovery. IT Service Desk technicians also

4 Technicians who work for third party after-hours service desk use the same queues as those used by the IT Service Desk employees.
escalate tickets to specialized TS teams. These teams are considered the Subject Matter Experts (SMEs) in a specified area of technology. For example, the telephony SMEs will handle escalated telephone issues. While there are over 50 specialized TS teams that are capable of responding to escalated tickets, some of the teams that play a more significant role in this capacity include Desktop Support, Network Operations, Business Applications, Desktop Architecture, and Enterprise and Business Applications. Each specialized team is responsible for processing each issue, and resolving and closing tickets. Figure 3 displays the IT Service Desk process flow.

Figure 3: IT Service Desk Process Flow

Source: Created by Audit Services Division Staff.
SCOPE

The scope of the audit was the City’s IT Service Desk, which serves the majority of the City and County of Denver employees with technology related information.

OBJECTIVE

The audit objective was to assess the effectiveness of the City’s IT Service Desk operations. The audit objective included reviewing: documented policies and procedures, availability of resources, access controls to the ticketing system and internal knowledge sharing site, ticketing resolution timeliness, third-party support, performance metrics, and the tools and technologies used by the IT Service Desk.

METHODOLOGY

We applied various methodologies during the audit process to gather and analyze information pertinent to the audit scope and to assist with developing and testing the audit objectives. The methodologies included the following:

- Reviewing relevant audits conducted nationwide and in Canada and comparing them to baseline best practice standards
- Conducting a survey of 200 users from City agencies that generate high IT Service Desk traffic to gain an understanding of customer satisfaction with the IT Service Desk
- Evaluating which users have been granted Privileged Access to the ServiceNow application and knowledge base for appropriateness
- Conducting interviews and walkthroughs with IT Service Desk Tech Leads and Managers on their understanding of IT Service Desk business processes
- Inspecting the ServiceNow ticketing system to understand the process flow and the procedure for resolving tickets
- Inspecting the TS Wiki knowledge base to understand the security controls and the completeness and accuracy of the knowledge shared between IT Service Desk technicians and subject matter experts
- Consulting best practice standards, including the Information Technology Infrastructure Library (ITIL) version 3, Federal Information System Controls Audit Manual (FISCAM), the Government Accountability Office (GAO) Standards for Internal Control in the Federal Government (the Green Book), and the Project Management Body of Knowledge (PMBOK)
- Reviewing results from customer satisfaction surveys conducted by the IT Service Desk
- Examining IT Service Desk policies and procedures
• Inspecting contracts, service level agreements, and staffing schedules with third-party vendors

• Evaluating a sample of tickets opened in 2015 to determine whether they were resolved appropriately and in a timely manner

• Examining access request tickets opened in 2015 to determine whether they were approved by appropriate personnel

• Selecting a sample of critical incidents to determine whether notifications are sent to customers

• Assessing IT Service Desk metrics

• Conducting a benchmarking study of five comparable cities and counties to determine the staffing ratio for IT Service Desk technicians to city and/or county employees. We contacted the following cities and counties:
  ○ City of Seattle, Washington
  ○ Jefferson County, Colorado
  ○ City of Albuquerque, New Mexico
  ○ City and County of Broomfield, Colorado
  ○ City of Portland, Oregon
FINDING

The Information Technology Service Desk Provides Quality IT Support, but Opportunities Exist To Further Enhance its Processes

Based on customer satisfaction data and other analysis, it appears that the City and County of Denver's (City's) Information Technology (IT) Service Desk is providing quality customer service, including during peak times and after hours. However, the audit identified several areas where Technology Services (TS) can further enhance its customer support operations. First, we found that TS could provide additional due diligence in selecting and monitoring any vendor that provides after-hours support. Second, TS could enhance communication between customers and IT personnel who provide issue resolution. Third, the knowledge base that the IT Service Desk uses to inform solutions and guide troubleshooting activities is not being routinely reviewed to ensure that all the information is accurate and current. Finally, TS can enhance the usage of a new self-service feature for service requests, which could provide a better customer experience and reduce the demand on the telephone help line, thereby enhancing efficiency. By addressing these areas, TS will be better positioned to provide accurate, timely, and consistent resolution of IT issues while continuing to protect the data that resides on the City's network.

The IT Service Desk Provides Quality Support to City Employees

The City's IT Service Desk is committed to providing outstanding customer service, which they evaluate through a customer satisfaction survey. Each week, the IT Service Desk sends out customer satisfaction surveys to thirty randomly selected customers who had an issue resolved that week. The response rate on the surveys is typically between 5 and 7 percent. Survey questions ask about the customer's overall experience; the technician's courteousness, professionalism, and knowledge; and whether the issue was resolved to the customer's satisfaction. The audit team reviewed survey results from responses that were submitted between May 8, 2015, and December 1, 2015. We found that customers largely responded with positive feedback about the IT Service Desk. Specifically, 80 percent of respondents indicated that their technician was courteous, professional, and knowledgeable and that their overall experience was very good. Additionally eighty-nine respondents indicated that the IT Service Desk resolved their issue. These customer satisfaction surveys are helpful to determine the effectiveness of the IT Service Desk. Poor customer satisfaction survey results are reviewed by the Service Manager and then discussed with the technician who handled the issue.

The audit team conducted an additional survey to determine the level of customer satisfaction of the IT Service Desk customers. We sent the survey to 200 customers residing in agencies that

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Eighty percent of respondents indicated that their IT Service Desk technician was courteous, professional, and knowledgeable and that their overall experience was very good.

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5 The IT Service Desk began conducting the survey process on May 8, 2015.
frequently use IT Service Desk. Out of the thirty-one responses we received, thirty respondents indicated that the IT Service Desk met their expectations.

Survey results are a good indication of how a service desk is performing. The Information Technology Infrastructure Library (ITIL) is a framework which includes standards of IT components, including the effectiveness of a service desk. ITIL suggests that customer satisfaction surveys are helpful for customers to achieve their business objectives. Poor customer satisfaction surveys could be an indication that the IT Service Desk is not meeting the demands of its customers and delivering poor quality. Since the IT Service Desk has received largely positive survey responses, management can be reasonably assured that the service desk is meeting its business objectives.

Audit work showed that the IT Service Desk maintains high quality customer satisfaction, even during periods where call volume is high. The customer satisfaction survey results provided by the IT Service Desk revealed that twenty-six out of thirty respondents who submitted tickets during high call volumes state the quality of service as “Excellent” or “Very Good.” On average, the IT Service Desk receives ninety tickets during their peak call time from 8:00 a.m. to 10:00 a.m. Given this high demand, IT Service Desk management ensures that the service desk is staffed to its maximum capacity such that customers continue to receive the same high level of support.

The IT Service Desk also uses performance metrics to monitor its performance and ensure a consistently high level of customer service. Specifically, the IT Service Desk gathers metrics such as total tickets by agency, method of contact, issue classification, call abandonment, and excessive hold times. They use this data to identify areas for improvement. Based on performance trends in 2015, service desk calls resolved on first contact and customer satisfaction appear to be increasing. Further, average call speed to answer and average call abandon rate appear to be decreasing. Table 1 includes data regarding these performance metrics and projections for 2016.

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>2014 Actual</th>
<th>2015 Estimated</th>
<th>2016 Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of service desk calls resolved on first contact</td>
<td>65%</td>
<td>70%</td>
<td>72%</td>
</tr>
<tr>
<td>Average call speed to answer (not to exceed)</td>
<td>60 seconds</td>
<td>45 seconds</td>
<td>43 seconds</td>
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<tr>
<td>Average call abandon rate (not to exceed)</td>
<td>7%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>75%</td>
<td>85%</td>
<td>85%</td>
</tr>
</tbody>
</table>

*Source: Mayor’s 2016 Budget*

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6 ITIL Version 3 – Service Operations, Section 6.2.1
Metrics like these assist the IT Service Desk manager to help improve the efficient and effectiveness of the IT Service Desk. For example, the IT Service Desk manager leverages the features of the Cisco telephone system to direct calls based on technician experience. Calls about passwords are assigned to service technicians who are less experienced while the more experienced or lead technicians take calls requiring more knowledge and experience to resolve. As such, the IT Service Desk is utilizing performance metrics to increase the productivity of less experienced technicians.

Our audit found opportunities for further enhancing the IT Service Desk’s processes by improving third-party contract management, notifying customers of ticket status, updating and securing the knowledge base, and enhancing customer awareness of SupportNow.

Technology Services Can Strengthen Contract Administration Practices for the Vendor That Provides After-Hours IT Support

City employees have access to IT technical support twenty-four hours per day, seven days per week. The City employees who staff the IT Service Desk provide support during business hours, but after-hours support is provided by a third-party vendor. After assessing the contract with the vendor, the audit team identified several weaknesses that may put the City at risk. First, Technology Services (TS) has not taken the necessary steps to ensure that the vendor follows appropriate security practices. Second, TS did not verify that the vendor has the appropriate data network security or cyber liability insurance. Third, TS has not ensured that the vendor’s insurance has been kept up to date.

The Vendor for After-Hours IT Support May Not Follow Appropriate Security Practices

When TS selected the vendor to provide outsourced service desk support after business hours and on holidays and weekends, they based the decision on multiple criteria including experience with service desk staff augmentation, company mission and best practices, and status as a minority/women owned business. TS also took several steps to ensure that City data accessible by the vendor would be secure. Specifically, the contract requires that the vendor establish suitable security controls; the IT Service Desk Manager was present on site when third-party support technicians first began answering calls under the contract; and TS required that all of the third-party employees undergo background checks and complete Criminal Justice Information Services (CJIS) security training prior to gaining access to the City’s Safety domain.

Despite these earnest efforts, we determined that the measures did not provide sufficient assurance, which could have been achieved through a security evaluation of the vendor. We interviewed TS staff about the vendor selection process, and they were not aware of a security evaluation being performed as part of the selection process and were unable to identify any documentation indicating that a security evaluation had been performed.

Furthermore, we discovered that the vendor does not have a Service Organization Controls (SOC) report, which would provide an acceptable level of assurance.7 A SOC 2 Report,  

7 Service Organization Controls (SOC) Reports are issued by an independent Certified Public Accountant. There are three types of SOC Reports for service organizations: a SOC 1 Report is a report on controls at a service organization relevant to user
specifically, provides information and assurance about the organization’s controls around security, data confidentiality, integrity, and availability.8 In the absence of a SOC 2 Report, TS should have considered performing an on-site verification of security practices and a review of the vendor’s relevant policies. Without a thorough understanding of the security policies and practices of the third party, there is a risk in granting them access to City data and networks. The third party indicated that it is planning on issuing a SOC 2 Report by fourth quarter of 2016.

Governments are at risk for data breach through their relationships with vendors. The Federal Information Systems Controls Manual (FISCAM) addresses this risk specifically:

Governmental and private entities face a range of risks from contractors and other users with privileged access to their systems, applications and data. Contractors that provide...services or other users with privileged access to agency/entity systems, applications, and data can introduce risks to their information and systems...[and] there are specific risks from...offsite operations. These risks include a poor patch management process...and inadequate oversight at an off-site facility.9

To mitigate this risk, FISCAM recommends a variety of control techniques, including reviewing activities of the third party for compliance with internal policies and procedures, reviewing reports of operating effectiveness, and ensuring that security requirements are included in the contracts based on assessment of risk.10

Accordingly, we recommend that TS perform an assessment to ensure that City data and networks are accessed by the vendor in a secure manner. TS should obtain a copy of the expected SOC 2 Report and review it for suitability of controls as well as review the management responses for any exceptions that are noted. Further, TS should perform an annual review of the vendor’s SOC 2 Reports for the duration of the contract.

**Technology Services Has Not Ensured That the Vendor Contract for After-Hours Support Requires Appropriate IT-Related Insurance**

During our review of the third-party vendor contract, we noted that the insurance section did not contain any provisions requiring data network security or cyber liability insurance. When a third-party vendor has access to City networks and data, the organization’s Risk Management team will typically add contract language requiring cyber liability insurance.11 However, the current contract’s Statement of Work does not clearly specify the access that would be given to entities’ internal control over financial reporting; a SOC 2 Report is a report on controls at a service organization relevant to security, availability, processing integrity, confidentiality, or privacy; and a SOC 3 Report is a trust services report for service organizations.

10 Ibid., pg. 197.
11 The City’s Risk Management team, which resides in the Department of Finance’s Cash, Risk and Capital unit, evaluates City contracts for risk and determines the types and amounts of insurance and other risk management controls necessary to protect City interests.
the vendor team. Therefore, when performing the risk analysis, the Risk Management team did not understand the level of access that would be granted and the related risks. Mitigating factors for this risk include standard contract language specifying that the stated City insurance requirements are the minimum amount, as well as the vendor obtained data network coverage for the City. Although the vendor did obtain network security insurance, without contractual language requiring this insurance the vendor could decide not to renew this insurance in the future. Cyber liability insurance should be required by the Risk Management team to provide coverage to the City in the event of a data breach or some other covered event. If a data breach were to occur through the vendor’s access to City data, the City could face fines and penalties. According to the International Risk Management Institute:

> Cyber and privacy policies cover a business' liability for a data breach in which the firm's customers' personal information, such as Social Security or credit card numbers, is exposed or stolen by a hacker or other criminal who has gained access to the firm's electronic network. The policies cover a variety of expenses associated with data breaches, including: notification costs, credit monitoring, costs to defend claims by state regulators, fines and penalties, and loss resulting from identity theft.  

Risk Management has determined that the coverage currently provided by the third-party vendor through the network security insurance is at acceptable levels, therefore the contract does not require immediate modifications. However, in the event that the contract with the vendor is extended or modified, language requiring cyber liability insurance should be added at that time. The type of Cyber liability insurance that the Risk Management team would like to see purchased provides coverage for business interruptions, data loss and destruction, computer fraud, funds transfer loss and cyber extortion.

**TS Did Not Ensure That the Vendor for After-Hours Support Has Up-To-Date Insurance**

Audit work examined two key provisions of the contract: the vendor’s security practices that safeguard City data and systems, and continued insurance coverage requirements. As noted above, we did not find evidence that a security evaluation was conducted to ensure that the vendor has designed and implemented appropriate security measures. The original contract with the vendor included two ACORD insurance certificates, each with a one-year term. However, we noted that the certificates expired in August 2015, prior to initiation of the audit work.  

TS, as the contract’s initiating authority, has a responsibility to ensure that contract provisions continue to be met. For example, TS needs to monitor insurance components of third-party vendor contracts for continuous compliance and monitor policy effective dates to ensure they are current. During the course of the audit, we did contact the vendor, who provided updated insurance certificates. TS likely did not perform this independently because its contract

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13 ACORD (Association for Cooperative Operations Research and Development) is a global nonprofit association working to improve data quality for the insurance industry. https://www.acord.org/about/pages/default.aspx

14 An ACORD form is an insurance industry standardized form.
administration is informal, and does not allow for more effective contract control and performance measurement. For example, the organization does not have any personnel serving in a dedicated contract administration role.

The insurance provisions in City contracts provide coverage to the City if an event occurs that would be covered under insurance. For example, the Workmen’s Compensation insurance provides coverage in the event an employee is injured on-the-job. Without adequate insurance coverage the vendor might not have the resources to cover the liability incurred. This could result in negotiations or legal actions in order to meet any obligations.

In the absence of a contract administrator we recommend that TS designate a staff member to monitor and request updated ACORD insurance certificates from the third-party vendor as needed to ensure that insurance coverage is provided for the duration of the contract as specified by the contract terms. When the vendor’s SOC 2 Report is issued, TS can review the report on an annual basis to gain further assurance that the vendor has adequate controls in place to safeguard City data and networks.

Customers Are Not Informed When a Ticket Is Sent to an Escalation Team

Currently, when a customer submits a request to the IT Service Desk, a ticket is created and the customer is notified of the ticket number. The customer can then use this ticket number to follow-up on the status of the resolution. However, for tickets that are escalated to an advanced support technician or a specialized team within TS, which accounts for approximately 58 percent of all tickets, we found that the customer does not always receive notification. Survey results conducted by the audit team showed that nine out of thirty-three respondents did not know that their ticket had been escalated to a different team. It is important for customers to know when a ticket has been escalated because these issues on average take fifteen days

![Figure 4: Average time for the IT Service Desk and Escalated Teams to Close Tickets (in days)](image)

Source: Created by Audit Services Division Staff.
longer to resolve. Figure 4 demonstrates the average time it takes the IT Service Desk to close a ticket versus other teams within TS once the ticket has been escalated.

Since resolution time can be so much longer, it is important that customer are made aware that tickets have been escalated. Otherwise they may become frustrated and impatient with the IT Service Desk, not understanding that the IT Service Desk is no longer the party working to resolve the issue. Therefore, the tier one technicians should inform customers when a ticket requires expert troubleshooting or analysis.

Once the escalated teams take on ownership of a ticket, we found that they do not routinely communicate with customers about the status of their issues. This reduced level of communication is different from the experience of working with the IT Service Desk. For any tickets with the IT Service Desk that have been open for three days without resolution, technicians must follow-up with the customer to update them on the status of the resolution. Conversely, there are no formal guidelines in place to ensure that customers are receiving regular updates and target resolution timeframes by an escalated team about the status of their issue.

To establish continuity of service, the IT Service Desk could establish Operational Level Agreements (OLAs) with the escalated teams regarding acceptable levels of communication with customers. OLAs serve as guidelines to maintain a consistent delivery approach. They also establish priorities or benchmarks for service performance. Additionally, they provide a means to maintain customer communication and feedback to achieve customer satisfaction through to resolution. Through inquiry with the IT Service Desk Manager, the IT Service Desk and the escalated teams had agreements in place during prior administrations for customer communication and timely acknowledgement of tickets. However, this is not the case anymore.

Even though an escalation team’s resolution may take more time, they should be held accountable to the customer in the same way as the service desk is responsible for a timely response. This approach to service is supported by ITIL, which specifies that “the continual service improvement process includes OLAs which are an agreement between an IT Service Provider and another part of the same organization. An OLA supports the delivery of IT Services to customers.” Therefore, the IT Director should establish formal operational level requirements between the IT Service Desk and escalated teams, to include expectations surrounding communication to the client when a ticket has been escalated and providing regular updates on when resolution may be expected.

The IT Service Desk’s Knowledge Base Contains Out-of-Date Information and Has Not Been Properly Secured

IT Service Desk Technicians use a knowledge base, called the TS Wiki, for technical information while resolving the wide variety of IT-related issues encountered by City employees. This internal website allows users to work collaboratively to edit the content as new issues arise and new solutions are generated. Using the same body of technical information helps ensure that Technicians are addressing issues consistently and accurately. Implementing the TS Wiki has been useful in providing information in a centralized site available to all technicians. Further, each technician has access to read, update, and create steps for performing tasks, implementing workarounds, and issuing resolutions throughout the TS Wiki. Subject Matter Experts

15 ITIL Version 3 – Service Operations, Definitions List
(SMEs) are encouraged to create and update content relevant to their respective areas of expertise and approve content updated by other technicians where appropriate. The result is a repository of processes and resolutions that are readily available for use by technicians as they work to resolve tickets. However, we found that this knowledge base is not always accurate and may pose a security risk.

**Information Used To Help Solve Employee IT Issues Is Out of Date**

Although the TS Wiki is a convenient and useful tool, which improves technician efficiency, we found that much of the content in the TS Wiki is out of date. The audit team selected ten applications with information available on the TS Wiki and contacted the SMEs for each application to determine whether the information was up-to-date and accurately reflects how to troubleshoot the application. Out of the ten SMEs contacted, six indicated that the TS Wiki is out-of-date and does not accurately reflect the current working environment of their respective applications.

We determined that the Wiki is out of date because TS has not developed a process by which to maintain and update the content on a regular basis. Best practice in information technology support emphasizes the importance of providing accurate information to support staff in an effort to improve issue resolution. Specifically, ITIL explains that it is necessary to provide “first-line staff with an effective knowledge-base, diagnostic scripts and integrated support tools..., as well as ongoing training and awareness, so that first-line resolution rates can gradually be increased.”

In order to operate to its full potential, the knowledge base should reflect the current operating environment of the processes and applications contained within the TS Wiki. An out-of-date knowledge base can result in poor application troubleshooting support and lead to increased troubleshooting time. Accordingly, TS should develop a process to have SMEs review the TS Wiki, or other knowledge bases used by the IT Service Desk, on a regular basis to ensure that information is complete, accurate, and up-to-date.

**TS Knowledge Base Is Not Adequately Secured**

In addition to determining that some of the information within the TS Wiki is out of date, we also determined that access to the knowledge base is not appropriately configured. Through our test work, we concluded that inappropriate access was granted to an employee who did not work in TS. This individual was able to add, modify, and delete information within the knowledge base.

The access was granted as a result of human error, as the employee with incorrect access had the same name as a TS employee, who did require access to the TS Wiki. Best practice in information technology as provided by ITIL specifies that management should verify every request for access to an IT service from two perspectives: first, that the user requesting access is who they say they are, and second, that the person has a legitimate requirement for access to that service.

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16 Information Technology Infrastructure Library Version 3 – Service Operations, Section 6.2.4.2.
17 ITIL Version 3 – Service Operations, Section 4.5.5.2.
When seeking to determine how this error was made, we found that TS does not perform periodic reviews of which users have access to the TS Wiki. If a review of TS Wiki access were performed, any users with inappropriate access would have been identified and subsequently removed. Another source of information technology best practices, the Federal Information System Controls Audit Manual (FISCAM), specifies that security managers should review access authorizations and discuss any questionable authorizations with resource owners.\textsuperscript{18}

Inappropriate access to the knowledge base by unauthorized personnel can result in a misuse of data residing on the TS Wiki, which can further lead to incorrect and increased issue resolution times. By properly confirming access requests as described in ITIL, and implementing a process to review user access as described in FISCAM, TS Wiki access will operate at a more secure level.

**Few City Employees Are Using SupportNow**

In October 2015, Technology Services launched a web-based tool called SupportNow that City employees can use for IT help as an alternative to calling or emailing the IT Service Desk. The purpose of this tool is to improve the customer experience by adding transparency to the IT Service Desk process and reduce the volume of calls that are directed to the IT Service Desk. However, we determined that many customers are not using the SupportNow tool when seeking IT support.

The audit team conducted a survey of agencies that frequently contact the IT Service Desk to better understand customer satisfaction. According to the survey results, twenty-two out of thirty-three respondents indicated that they have not used SupportNow when seeking IT support. We also looked at data from the IT Service Desk about the number of contacts they received each month since the deployment of SupportNow by contact type. As shown in Figure 3, from November 2015 through February 2016, customers most frequently contacted the IT Service Desk by telephone, and were least likely to use SupportNow. In fact, customers were thirteen times more likely to call the IT Service Desk than they were to seek support through SupportNow. Although use of SupportNow appears to be on the rise, most notably in February 2016, it is still being used significantly less frequently than telephone.

\textsuperscript{18} FISCAM section AC-3.1.3.
We determined that many employees are not using SupportNow because TS did not effectively communicate the change to the City. TS has relied on just two formal communications sent to notify customers about SupportNow. Specifically, in early October 2015, TS sent an initial email announcement with the release date of SupportNow, explaining some of the new tool's support features. Later that month, after SupportNow had been released, a formal communication was sent out to all City employees, also via email. Until recently, these two emails were the only methods used to inform the IT Service Desk’s customers about SupportNow and how to access it.

During the course of this audit, we discovered that several months after SupportNow was introduced the IT Service Desk’s telephone greeting was updated to inform customers about SupportNow and how to access it, but this message was not added in concurrence with the launch of the tool.

IT projects such as the launch of a new customer service tool take a lot of time to implement and often require significant financial and personnel resources. Accordingly, it is important to communicate and educate customers on the existence of a new tool so that it will be used as intended. Regardless of how well a project is managed during planning and implementation, if the intended users are unaware of its existence or are not educated about how to use the end product, customers will not benefit from the expected features and functionality. Effective communication to end users during and after a project’s closure is critical to ensure a successful outcome. This principle is emphasized by the Project Management Body of Knowledge (PMBOK), which is a recognized standard for project management. PMBOK Section 10.2.2
recommends that a communications strategy be developed and disseminated using a variety of methods, such as electronic communications and hard copy document distribution.\textsuperscript{19}

Email communications and telephone messages, like the ones used by Technology Services, do help to inform customers. However, without a more strategic and robust communications plan, many customers may miss the communications altogether. In fact, according to the results of our survey, sixteen out of thirty-three respondents indicated they had no knowledge of SupportNow. Of those who did pay attention, the communications may not have been sufficient to change behavior from using telephone or email for requesting IT help to using SupportNow. By not using SupportNow, customers do not receive the enhanced user experience that allows a customer to submit a ticket without the need for a lengthy telephone call. If customers are unaware of this tool, valuable features such as a knowledge base of common answers, ticket status, technology requests, and no hold times are just a few of the services that will go underutilized. Finally, since the initial purpose of the tool was to reduce call volume, the IT Service Desk will continue to receive a large volume of telephone calls as long as users are not opting to use SupportNow. Accordingly, Technology Services should develop methods for increasing the user awareness of SupportNow and develop communication that encourages customers to use the new tool as a means for getting a quicker response.

RECOMMENDATIONS

1.1 Technology Services should continuously monitor the contract between the IT Service Desk and the third-party vendor contract for continued compliance with contractual terms, including verifying that the vendor is maintaining insurance coverage.

**Auditee Response:** Technology Services will establish a process to periodically review the contract between the IT Service Desk and the third-party vendor for continued compliance with contractual terms, including verifying that the vendor is maintaining insurance coverage. – September 30, 2016

1.2 If the contract with the third-party vendor is renewed, requirements for cyber-liability insurance should be included in the contract language.

**Auditee Response:** Technology Services will ensure that requirements for cyber-liability insurance are included in the contract language during the contract renewal process. - December 30, 2017

1.3 Technology Services should obtain a copy of the SOC 2 Report from the third-party vendor upon release and review the report.

**Auditee Response:** Technology Services will obtain and review a copy of the SOC2 Report or similar independent audit report from the third-party vendor upon release. – December 31, 2016

1.4 The IT Director should establish formal operational level requirements between the IT Service Desk and escalated teams, which establish expectations surrounding communication to the client that a ticket was escalated and providing regular updates on when resolution may be expected.

**Auditee Response:** The Director of Service Operations will establish formal operational level requirements for time to update as well as for providing communication to the client when a ticket is escalated and regular updates when resolution may be expected. – October 31, 2016

1.5 Technology Services should develop a process to have subject matter experts review the TS Wiki, and any other knowledge bases used by the IT Service Desk, to ensure that information is complete, accurate, and up-to date. Additionally, access to the TS Wiki should be reviewed on a periodic basis in order to monitor access at a more secure level.

**Auditee Response:** Technology Services has completed the requirements gathering phase of the Knowledge Base project that will replace the TS Wiki and all other knowledge bases used by the IT Service Desk. TS will develop a process to have subject matter experts review the information that populates the new Knowledge Base. In addition, TS will ensure that access to the new knowledge base is secure and reviewed on a periodic basis. – June 30, 2017

1.6 Technology Services should develop methods for increasing the user awareness of SupportNow, and develop communication that encourages customers to use the new tool
as a means for getting a quicker response and making the IT Service Desk function more effectively.

**Auditee Response:** Technology Services will create a marketing campaign to increase user awareness of SupportNow and develop communications that encourage customers to use the self-service feature as a means for getting quicker response and improving the effectiveness of the IT Service Desk function. - October 31, 2016
April 8, 2016

Auditor Timothy M. O’Brien, CPA
Office of the Auditor
City and County of Denver
201 West Colfax Avenue, Dept. 705
Denver, Colorado 80202

Dear Mr. O’Brien,

The Office of the Auditor has conducted an audit of the Information Technology Service Desk.

This memorandum provides a written response for each reportable condition noted in the Auditor’s Report final draft that was sent to us on April 21, 2016. This response complies with Section 20-276 (c) of the Denver Revised Municipal Code (D.R.M.C.).

AUDIT FINDING 1
The Information Technology Service Desk Provides Quality IT Support, but Opportunities Exist To Further Enhance its Processes

RECOMMENDATION 1.1
1.1 Technology Services should continuously monitor the contract between the IT Service Desk and the third-party vendor contract for continued compliance with contractual terms, including verifying that the vendor is maintaining insurance coverage.

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<tbody>
<tr>
<td>Agree</td>
<td>September 30, 2016</td>
<td>Alex Stefanacci 720-913-4987</td>
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Narrative for Recommendation 1.1
Technology Services will establish a process to periodically review the contract between the IT Service Desk and the third-party vendor for continued compliance with contractual terms, including verifying that the vendor is maintaining insurance coverage.
### RECOMMENDATION 1.2

1.2 If the contract with the third-party vendor is renewed, requirements for cyber-liability insurance should be included in the contract language.

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<td>Agree</td>
<td>December 30, 2017 (Contract Expiration)</td>
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**Narrative for Recommendation 1.2**

Technology Services will ensure that requirements for cyber-liability insurance are included in the contract language during the contract renewal process.

### RECOMMENDATION 1.3

1.3 Technology Services should obtain a copy of the SOC 2 Report from the third-party vendor upon release and review the report.

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<td>12/31/2016</td>
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**Narrative for Recommendation 1.3**

Technology Services will obtain and review a copy of the SOC2 Report or similar independent audit report from the third-party vendor upon release.

### RECOMMENDATION 1.4

1.4 The IT Director should establish formal operational level requirements between the IT Service Desk and escalated teams, which establish expectations surrounding communication to the client that a ticket was escalated and providing regular updates on when resolution may be expected.

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<td>10/31/2016</td>
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Narrative for Recommendation 1.4
The Director of Service Operations will establish formal operational level requirements for time to update as well as for providing communication to the client when a ticket is escalated and regular updates when resolution may be expected.

RECOMMENDATION 1.5
1.5 Technology Services should develop a process to have subject matter experts review the TS Wiki, and any other knowledge bases used by the IT Service Desk, to ensure that information is complete, accurate, and up-to-date. Additionally, access to the TS Wiki should be reviewed on a periodic basis in order to monitor access at a more secure level.

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<td>Agree</td>
<td>June 30, 2017</td>
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Narrative for Recommendation 1.5
Technology Services has completed the requirements gathering phase of the Knowledge Base project that will replace the TS Wiki and all other knowledge bases used by the IT Service Desk. TS will develop a process to have subject matter experts review the information that populates the new Knowledge Base. In addition, TS will ensure that access to the new knowledge base is secure and reviewed on a periodic basis.

RECOMMENDATION 1.6
1.6 Technology Services should develop methods for increasing the user awareness of SupportNow, and develop communication that encourages customers to use the new tool as a means for getting a quicker response and making the IT Service Desk function more effectively.

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Narrative for Recommendation 1.6
Technology Services will create a marketing campaign to increase user awareness of SupportNow and develop communications that encourage customers to use the self-service feature as a means for getting quicker response and improving the effectiveness of the IT Service Desk function.
Please contact Alex Stefanacci at 720-913-4987 with any questions.

Sincerely,

Scott Cardenas
Chief Information Officer

cc:  Kip R. Memmott, MA, CGAP, CRMA, Director of Audit Services
     Shannon Kuhn, CISA, IT Audit Supervisor
     Alex Stefanacci, IT Director of Service Operations
     Stephen E. Couy, Chief Information Security Officer