



Factors That Contributed to MNLARS Problems

SPECIAL REVIEW
February 14, 2019

OFFICE OF THE LEGISLATIVE AUDITOR
STATE OF MINNESOTA

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February 14, 2019

Members of the Legislative Audit Commission:

During the 2018 legislative session, legislators expressed concern about the Minnesota Licensing and Registration System (MNLARS), which was released in July 2017. The system did not adequately meet the needs of Minnesota residents and key stakeholders, despite a decade of work and significant state expenditures.

In our review, we identified many reasons that MNLARS fell short of expectations. Some were technical—for example, related to coding or testing standards. Some were nontechnical—for example, related to who was included or excluded in the project decision-making process.

Ultimately, we concluded that the Department of Public Safety (DPS) and the Office of Minnesota Information Technology Services (MNIT) must share responsibility for the system's unsatisfactory release. Leaders of these agencies and the project did not provide the oversight and direction necessary to ensure, in the end, that the system would meet user needs.

We received cooperation from DPS and MNIT during the preparation of this report.

Sincerely,

Handwritten signature of Judy Randall in black ink.

Judy Randall
Deputy Legislative Auditor

Handwritten signature of Joel Alter in black ink.

Joel Alter
Director, Special Reviews

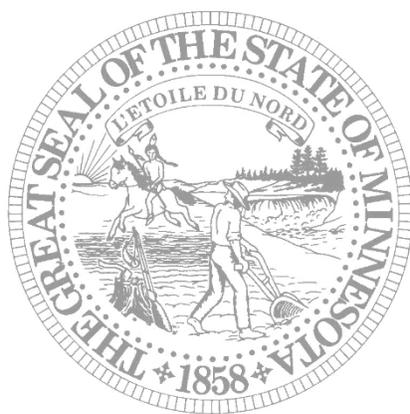
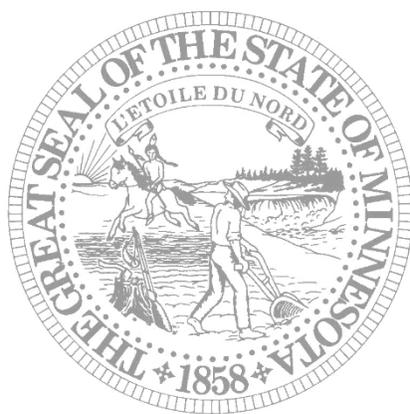


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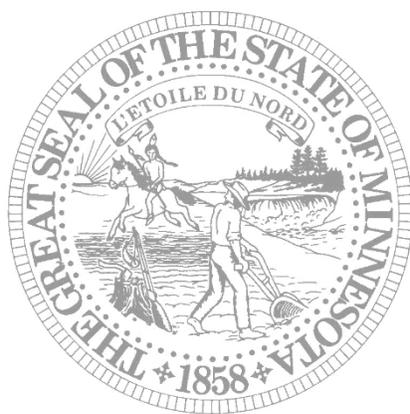
Conclusion

The Minnesota Licensing and Registration System (MNLARS) is a large, complex software application. The portion of that system that processes license plates, vehicle registrations, and vehicle titles—released in July 2017—was beset by problems.

Ultimately, the Minnesota Department of Public Safety (DPS) and Office of Minnesota Information Technology Services (MNIT) must share the blame for the system’s deficiencies. The project’s total amount of funding (more than \$100 million) and time (nine years leading up to the 2017 release) should have been sufficient to successfully complete this project.

Many factors—rather than a single person or a single decision—contributed to the system’s unsuccessful release. The problems started early, when agency officials initially selected a private vendor to build the system. Despite a detailed contract and “statement of work,” there were disputes about what the vendor was supposed to deliver, and the vendor’s initial work products were unsatisfactory to DPS and MNIT. When those agencies agreed to terminate the contract in 2014, they had little to show for several years of work.

DPS and MNIT then decided there was sufficient time and money to build the system in-house, using a mix of state employees and private contractors. But agency leadership did not take sufficient steps to ensure that this large and risky project would succeed. DPS did not revise its business practices before embarking on the project, and it did not adequately define business requirements during the project. The project’s governance bodies did not include some critical stakeholders, and decisions regarding the system’s scope and functionality were not sufficiently transparent. MNIT did not have adequate policies and procedures for overseeing software development projects or providing guidance to affected agencies (in this case, DPS). Neither MNIT nor DPS had adequate numbers of their own staff working on the project. Project officials did not enforce proper code development practices, and there was insufficient testing of the software. In the end, despite years of hard work by project staff, DPS and MNIT did not ensure that the product released in July 2017 would meet the needs of the affected agencies, stakeholders, and Minnesota residents.



Introduction

In July 2017, the Minnesota Department of Public Safety (DPS) released and began administering a new motor vehicle registration and title system. This was part of a nearly decade-old project called the Minnesota Licensing and Registration System (MNLARS), which was intended to replace a system developed more than 30 years earlier. DPS developed MNLARS in conjunction with the Office of Minnesota Information Technology Services (MNIT), which is state government’s information technology agency.

The MNLARS release did not go smoothly. The new system was plagued by technical defects, missing components, and system performance problems in the months that followed the release. Despite having received more than \$100 million in state revenues to develop this system, DPS and MNIT requested an additional \$43 million from the Legislature in late January 2018 to address remaining issues with the system. The 2018 Legislature appropriated \$9.65 million, leaving DPS and MNIT to work with stakeholders to identify top expenditure priorities for the available funding.¹

In response to widespread legislative and public concern about the July 2017 release, the Office of the Legislative Auditor (OLA) agreed to conduct a “special review” of MNLARS. We examined one primary question:

- **What factors contributed to the MNLARS project’s troubled history and unsatisfactory July 2017 release?**

This report focuses primarily on the motor vehicle portion of MNLARS. For most of the project’s history, MNLARS—as its name suggests—was intended to be a single system that would include driver licensing and vehicle registration components. However, in late 2017, MNIT entered into a contract with a private vendor to develop a new driver licensing system, separate from the MNLARS motor vehicle system.² MNIT and DPS initiated this contract after the 2017 Legislature required DPS to begin issuing driver’s licenses by October 1, 2018, that complied fully with the federal “Real ID” law.³ In public testimony, MNIT officials have stated that there are limited or no interfaces between the driver licensing and motor vehicle systems. According to MNIT, there is little business need for the driver license and motor vehicle components to be part of a single software system.

¹ *Laws of Minnesota* 2018, chapter 101, sec. 1, subd. 1.

² In November 2017, MNIT contracted with a private vendor (Fast Enterprises) to work on the driver licensing part of this project, rather than managing this part of the project in-house, as previously planned. Under federal law, states must be able to issue driver licenses that comply with federal “Real ID” requirements. Minnesota’s new licensing system is capable of issuing Real IDs, although individuals can continue until October 2020 to use regular driver licenses or other authorized forms of identification for purposes such as boarding flights. DPS released its updated licensing system on October 1, 2018. According to a MNIT official, the vendor for the driver license system benefitted “substantially” from work done by the MNLARS team prior to the contract (data conversion work and analysis of business rules, fee rules, and external interfaces).

³ *Laws of Minnesota* 2017, chapter 76, as codified in *Minnesota Statutes* 2017, 171.01, 171.017, 171.04, 171.06, 171.061, 171.07, 171.071, 171.072, 171.12, and 171.27. We discuss the Real ID requirements further in Chapter 3.

Methods

This review relied on various methods and sources of evidence. We examined a large number of documents related to MNLARS and its predecessor systems. This included annual reports, meeting minutes, audit reports, requests for proposals, vendor contracts, organization charts, plans, training materials, newsletters, and many documents related to project activities and actions. Through interviews and correspondence, we solicited input from more than 50 individuals who oversaw or worked on MNLARS (state employees and contractors), plus several individuals who represented MNLARS stakeholders.⁴

It is worth noting two limitations of our review. First, we obtained the perspectives of many people who worked on the MNLARS project who had specialized knowledge, but we did not employ our own information technology experts. Thus, our review did not independently assess the MNLARS architecture or code.⁵ Second, in accordance with Minnesota law, we classified some of our interviews of individuals (or portions of interviews) as “not public.”⁶ We did this, where appropriate, to obtain the cooperation of interviewees or protect certain information from disclosure. To some extent, however, this classification limits our ability to present evidence in a public report.

This report represents our best efforts to distill and interpret available evidence, and to reconcile the perspectives of many individuals. We found project documents indispensable to review, but they did not always present a complete picture of MNLARS activities and decisions. Likewise, the individuals we interviewed provided helpful recollections and observations, often under oath, but their accounts did not always agree with each other. As with any OLA report, we have exercised judgment to evaluate the evidence we obtained and draw conclusions.

Problems with the Previous Driver and Vehicle Services System

The DPS licensing and registration system prior to MNLARS was developed in the early 1980s. In 2000, DPS implemented a system that allowed Minnesota residents to renew vehicle registrations online. However, OLA audits in 2001 and 2005 showed that this online system—which accounted for a small share of the state’s vehicle registration revenue—had serious security weaknesses.⁷ A top DPS official from that time period told

⁴ We also had access to the unredacted version of an investigative report that was completed at MNIT’s direction: William Everett, *Investigation Report* (Rosemount, MN: Everett & VanderWiel, February 8, 2018). The report relied largely on interviews to examine the performance of a MNIT chief business technology officer, Paul Meekin. Large portions of the report were redacted when it was released to the public. In June 2018, MNIT reached a settlement agreement with Meekin; he resigned effective March 2018.

⁵ OLA received funding from the 2018 Legislature to hire information technology auditors to help the Legislature assess the MNLARS system’s current status (*Laws of Minnesota* 2018, chapter 101, sec. 1, subd. 2). For purposes of this special review, we occasionally consulted with those auditors but did not use them to look at details of the MNLARS development process.

⁶ *Minnesota Statutes* 2018, 3.979, subd. 3(c).

⁷ Office of the Legislative Auditor, Financial Audit Division, *Department of Public Safety, Web-based Motor Vehicle Registration Renewal System as of April 2001* (St. Paul, August 17, 2001); and *Department of Public Safety, Security Audit: Web-based Motor Vehicle Registration Renewal System* (St. Paul, April 19, 2005).

us recently that the broader system (of which the online system was part) “was operating on Band-Aids and paper clips.” In 2007, an external review of the licensing and registration system said:

[The Driver and Vehicle Services Division] has had, and continues to have serious fundamental issues with these systems, and with the business processes which they support. Serious problems with fundamental requirements of stability, data integrity, security and customer service are immediately evident. They need a completely redesigned set of processes and systems. Fixing the current system environment is not a viable long-term strategy. The current technologies—platforms, database, applications and access control—are simply not sound.... [This system involves] more than a billion dollars in annual revenue and millions of customers.... A major failure would be embarrassing to the department, to the state, and to their customers and business partners.⁸

As we discuss in Chapter 1, the Legislature initially provided DPS with funding for MNLARS in 2008. When DPS prepared a document in 2009 that explained the need for MNLARS, it outlined many specific concerns about the existing system, such as the following:

- The system relied significantly on manual processes, and users tracked their work on paper because some transactions took several days to enter.
- The system did not allow DPS to effectively track fraud.
- Users of the system did not trust the system’s accuracy, and there were occasional issues with data integrity.
- The system relied on some obsolete technologies that would be difficult to support in the future.
- Federal and state mandates could not be programmed into the system in a timely manner.
- The system provided limited support for law enforcement purposes.⁹

According to DPS, MNLARS was intended to address the goals shown in the box at right.



Goals for MNLARS

- Efficient business processes and service delivery
- Effective integration of driver and motor vehicle information
- Stable, flexible, secure web-based information systems
- Electronic communication with other information systems

— DPS, *MNLARS 2009 Annual Report*

⁸ Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis* (St. Paul, March 29, 2007), 2.

⁹ Department of Public Safety, *MNLARS Business Case* (St. Paul, June 1, 2009), 5-6.

Previous Research on Software Project Failures

Large software development projects represent a significant risk to organizations. Many such projects are critically important to organizations' daily operations, and they can be expensive to build or buy. Often, these projects do not have the positive outcomes desired by their sponsoring organizations. For example:

- The Standish Group has collected worldwide data on about 5,000 software projects yearly. For Fiscal Year 2015, it found that 29 percent of such projects were “successful”—that is, they were delivered on time, on budget, and with a satisfactory result.¹⁰ By Standish's account, 19 percent of projects “failed”—meaning the projects were canceled before they were completed, or they were completed but not used. The remaining projects (52 percent) were completed but did not achieve all the intended measures of success. Standish has reported that large, complex projects are much more likely to fail or encounter problems than small ones, and government projects are more likely to struggle than private ones.
- McKinsey & Company reported on 5,400 software projects it had reviewed as of June 2012.¹¹ It found that, on average, large software projects (those exceeding \$15 million) ran 66 percent over budget and 33 percent beyond the scheduled completion time, while delivering 17 percent fewer benefits than predicted. McKinsey reported that 17 percent of IT projects “go so bad that they can threaten the very existence of the company.” McKinsey's surveys of business executives found that four general factors accounted for most failures: (1) missing focus (unclear objectives; lack of focus on business needs); (2) content issues (technical complexity; changing requirements); (3) skill issues (lack of staff skills; lack of alignment among team members); and (4) execution issues (unrealistic schedule; inadequate planning).

In a 2007 report, the Minnesota Office of Enterprise Technology said, “Troubled [information technology] systems arise from a combination of factors, many of them not directly technical in nature.”¹² It said this can include problems related to **governance** (planning, managing to a clear set of business objectives and requirements, managing for risk, and overseeing project progress); **systems management** (project management, selecting viable solutions, and following basic requirements of design, testing, implementation, documentation, and problem management); and **active life cycle management** (implementing change management processes and obtaining adequate resources to ensure the long-term success of the systems). The office said: “Current [DPS Driver and Vehicle Services] systems are deficient because of shortcomings in all of these areas,” and it offered suggestions for how DPS should upgrade its systems.¹³

¹⁰ The Standish Group, “CHAOS Report 2015,” https://www.standishgroup.com/sample_research_files/CHAOSReport2015-Final.pdf, accessed November 14, 2018.

¹¹ Michael Bloch, Sven Blumberg, and Jurgen Laartz, “Delivering Large-Scale IT Projects On Time, On Budget, and On Value,” <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/delivering-large-scale-it-projects-on-time-on-budget-and-on-value>, accessed November 7, 2018.

¹² Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis*, 6. The Legislature changed the name of this office to MNIT in 2013, following a 2011 legislatively mandated consolidation of state government IT functions.

¹³ *Ibid.*

Problems with the MNLARS Release

Our review did not attempt to exhaustively document the problems that occurred when DPS released the motor vehicle portion of MNLARS in July 2017. After the release, those problems were discussed in legislative hearings, press accounts, and other places. However, it is worth noting a few of the critical issues that arose:

- **MNLARS was unable to process vehicle title applications promptly.** During the first seven weeks following the release of MNLARS, the system was unable to connect with the National Motor Vehicle Title Information System, which is a critical system interface needed to process titles.¹⁴ Between mid-2017 and late 2017, there was an increase of 500 percent in the maximum amount of time it took to process title applications.¹⁵ By December 1, 2017, DPS had about 380,000 title applications that were “in the work queue,” awaiting action.¹⁶
- **Some vehicle transactions were not possible.** MNLARS was incapable of transferring specialty license plates to different vehicles. Among those affected were individuals who had special plates due to disabilities or veterans status, as well as individuals who had purchased personalized license plates. Also, because of the system’s inability to connect with the national title information system, MNLARS was initially incapable of producing titles for auto dealers and others.
- **Individuals and businesses experienced hardships.** Vehicle owners and auto dealers were frustrated about difficulties getting titles, license tabs, or registration renewals in a timely manner. Local “deputy registrar” offices that processed vehicle transactions for DPS reported financial hardships due to longer times to process transactions (and transactions that could not be processed at all).¹⁷ A time and motion study showed that it took much longer for deputy registrars to process titles and registrations after the MNLARS release than before.¹⁸
- **MNLARS did not accurately compute some transactions.** A 2018 audit found that while MNLARS correctly calculated certain types of transactions, inaccurate data and programming errors within MNLARS contributed to inaccurate taxes and

¹⁴ A DPS Driver and Vehicle Services Division manager said his teams were not able to issue motor vehicle titles during that seven-week period.

¹⁵ Historically, DPS tracked trends in the oldest applications that were awaiting action at any given time; prior to the release of MNLARS, DPS did not have information on the average age of all pending applications or the total number of unprocessed applications. DPS aims to process all applications in no more than 30 days. The age of the oldest applications grew from 17 days on July 3, 2017, to 102 days on December 11, 2017.

¹⁶ There are no pre-MNLARS data on applications in the work queue that can be used for comparison purposes. However, the work queues have declined significantly since late 2017—for example, for November 1, 2018, DPS reported that the work queues contained about 125,000 title applications.

¹⁷ In Minnesota, more than 170 deputy registrar offices—owned by counties, cities, or private entities—provide vehicle registration and licensing services throughout the state. These deputies enter customer information directly into MNLARS.

¹⁸ Ronald Leander, Leander Ltd., letter to Jeff Lenarz, Minnesota Deputy Registrar Association, February 20, 2018.

fees charged to other customers.¹⁹ In some cases, the owners of similar vehicles were charged different tax or fee amounts.

- **The state of Minnesota’s revenues may have been affected.** An audit estimated, on a statewide basis, the cumulative over- and under-charges for certain categories of MNLARS transactions.²⁰ Due to sample limitations, the audit could not estimate the statewide financial impacts for some other categories of transactions—thus, it did not offer an estimate of the overall impact of transaction inaccuracies on state revenues. However, MNLARS collected a total of more than \$1.6 billion in motor vehicle taxes and fees for the state of Minnesota in Fiscal Year 2018, and problems with inaccurate assessments may have affected the state’s total revenues from vehicle licensing and registration transactions.

Finally, it is worth noting that problems with a widely used system such as MNLARS can undermine the confidence of Minnesotans in the competence of their state government. Most Minnesota households own vehicles, and they rely on DPS’s systems to process transactions in a timely, accurate way.

¹⁹ Office of the Legislative Auditor, *Special Review: MNLARS Transaction Accuracy* (St. Paul, September 25, 2018), 2. Based on a review of a sample of transactions, the report estimated that 36 to 46 percent of the registration tax transactions for passenger vehicles with base values established in MNLARS were inaccurate. On the other hand, the report estimated that several categories of taxes or charges had inaccuracies in fewer than 1 percent of transactions.

²⁰ *Ibid.*

Chapter 1: Issues from the Early Years of the MNLARS Project

The Minnesota Licensing and Registration System (MNLARS) project began in 2008, when the Legislature authorized initial funding for the project.¹ At that time, state agencies—including the Department of Public Safety (DPS)—employed their own information technology staff. In 2011, the Legislature passed a law to consolidate state government information technology employees, services, and finances in a single agency.² That agency was initially called the Office of Enterprise Technology (OET), and it was renamed the Office of Minnesota Information Technology Services (MNIT) in 2013.³

This chapter discusses key issues that affected efforts by DPS and OET/MNIT to develop MNLARS between 2008 and 2014. In some cases, these issues may also have affected the ability of DPS and MNIT to successfully deliver a viable software product in 2017, when the motor vehicle portion of MNLARS was released.

KEY FINDINGS IN THIS CHAPTER

- **DPS did not streamline business processes before it initiated development of the MNLARS software.**
 - **From 2008 until the time MNLARS was released, the Legislature provided DPS with all of the funding DPS said it needed to build MNLARS.**
 - **The inability of Hewlett-Packard to successfully complete major components of MNLARS cost the project significant time and resources.**
-

Initial Business Modernization

The business processes for Minnesota’s driver and vehicle services systems are extremely complex. This partly reflects complicated laws related to these services; Minnesota statutes authorize more than 1,200 different types of license plate fees and user “contributions.”⁴ At the time the MNLARS project started, the complexity of the driver and vehicle services systems also reflected administrative processes—overseen by DPS—that had evolved over

¹ *Laws of Minnesota* 2008, chapter 363, art. 11, secs. 6-9, codified as *Minnesota Statutes* 2008, 168.013, subd. 21; 168A.29, subd. 1; 171.06, subd. 2; and 299A.705, subd. 3.

² *Laws of Minnesota* 2011, First Special Session, chapter 10, art. 4, as codified in *Minnesota Statutes* 2011, 16B.99, 16E.016, 16E.036, 16E.04, and 16E.145.

³ *Laws of Minnesota* 2013, chapter 142, art. 3, sec. 36.

⁴ Office of the Legislative Auditor, *Special Review: MNLARS Transaction Accuracy* (St. Paul, September 25, 2018), 47, citing *Minnesota Statutes* 2018, 168.12 through 168.1299.

many years. An early DPS annual report on MNLARS referenced “outmoded... processes developed in the 1980s.”⁵

For the most part, the Department of Public Safety did not streamline and improve business processes prior to initiating development of the MNLARS software.

In 2007, the Governor’s Office directed an external agency (OET) to assess DPS’s readiness to undertake the project that would soon become MNLARS.⁶ OET said that the existing licensing and registration systems needed to be “replaced with modern, professionally designed and built systems.”⁷ OET said that the first step for DPS’s Driver and Vehicle Services (DVS) Division should be a “fundamental redesign of business processes.”⁸ The report also said the Department of Public Safety should “ensure that DVS will adopt proper development, delivery and governance structures for their system management before they seek to create new systems to support the reengineered processes.”⁹

In 2009, DPS hired a contractor partly to document existing business processes and suggest how those processes might be changed. State officials told us this was done to help DPS prepare a request for proposals to solicit vendors to build MNLARS; it was not intended to produce a sufficiently detailed list of business requirements (or needed changes to those requirements) for actual system development.

When an independent auditor reviewed the MNLARS project in 2014, its first recommendation was “Improve Business Processes Before Automating Them.”¹⁰ The auditor concluded that, while this recommendation “is too late for this project, it may be helpful for other state projects.”¹¹ In sum, the auditor concluded that OET’s 2007 recommendation—that DPS redesign business processes as a first step in the development of MNLARS—had not been implemented during the prior seven years.¹² A top DPS official from the early years of the MNLARS project told us that reengineering business processes was “not overlooked,” but probably was “not done the way it should have been done.” Another DPS official told us he could not recall that DPS or the Legislature initiated

⁵ Department of Public Safety, *Minnesota Licensing and Registration System: 2009 Annual Report* (St. Paul, date not specified), 1.

⁶ Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis* (St. Paul, March 29, 2007). Earlier, we said that the 2011 Legislature consolidated state information technology services into one agency (OET). OET was not created by the 2011 consolidation legislation; rather, it existed prior to 2011 but received additional authority from the 2011 Legislature.

⁷ *Ibid.*, 6.

⁸ *Ibid.*, 3.

⁹ *Ibid.*

¹⁰ Susan Heidorn, Macro Group, *MNLARS Project Audit: Findings Report*, prepared for the Minnesota Department of Public Safety (Minneapolis, April 27, 2014), 15. The Macro Group is a Twin Cities-based IT consulting firm that, since 1987, has assisted public and private organizations with project management, software selection, process improvement, and other tasks.

¹¹ *Ibid.*

¹² At the time of the auditor’s report in 2014, DPS and MNIT were about to terminate a contract with the primary vendor—Hewlett-Packard (HP)—chosen to build MNLARS. HP had completed two years of work on MNLARS at that point.

any significant effort to streamline state statutes related to motor vehicle or driver's license requirements before the development of MNLARS began.

In Chapter 3, we discuss the more general—but related—issue of whether the MNLARS project adequately defined business requirements as the new system was being developed. DPS oversaw multiple efforts to document business requirements during the MNLARS project, but these activities did not always provide timely, complete information for the persons developing software code.

Funding Issues

From fiscal years 2009 through 2018, the state of Minnesota spent about \$98 million to build a new driver and vehicle services system, and the expenditures to complete the system are continuing into Fiscal Year 2019 and beyond. Some people have questioned why the state spent so much; on the other hand, some might question whether funding constraints contributed to the motor vehicle system's problems at the time of its July 2017 rollout.

Through 2017, the Legislature provided the Department of Public Safety with all of the funding the department said it needed to build MNLARS.

In 2008, shortly after deciding to rebuild its driver and vehicle services systems, DPS requested legislative funding for this purpose. The DPS deputy commissioner from that time recalled for us that the department relied on one of its key information technology staff to estimate the total amount of funding that would be needed to cover the cost of MNLARS. She said she instructed this staff person to be “absolutely accurate” so there would be no need to seek additional legislative funding at a later time.

Based on the department's estimate, the Governor's 2008 supplemental budget included a request for \$12 million annually over a four-year period to replace DPS's driver and vehicle services “automated support systems” and to streamline related business processes.¹³ The Governor requested a direct appropriation from the Trunk Highway Fund for this purpose, but the 2008 Legislature instead authorized a “technology surcharge” of \$1.75 per vehicle registration renewal.¹⁴ The surcharge was to be in effect from July 1, 2008, through June 30, 2012, and it was projected to raise \$12.3 million annually—or a total of about \$49 million. By law, these revenues went into a DPS Driver and Vehicle Services “technology account” that could be used for “research, development, deployment, and maintenance of a driver and vehicle services information system.”¹⁵

In 2011, DPS concluded that the previously approved surcharge would be insufficient to pay for development of MNLARS. The person who was DPS's deputy commissioner in 2008 was still serving in this position in 2011; she was retained even after a governor of a different party was elected in 2010, and a different commissioner for the department was

¹³ State of Minnesota, *Governor's 2008 Supplemental Budget, All Funds by Omnibus Bill and Agency*, <http://mn.gov/mmb-stat/documents/budget/gov-budget-archives/gov-2007/gov-consolidated-statement.pdf>, accessed May 7, 2018.

¹⁴ *Laws of Minnesota* 2008, chapter 363, art. 11, secs. 6-9, codified as *Minnesota Statutes* 2008, 168.013, subd. 21; 168A.29, subd. 1; 171.06, subd. 2; and 299A.705, subd. 3.

¹⁵ *Laws of Minnesota* 2008, chapter 363, art. 11, sec. 9, codified as *Minnesota Statutes* 2008, 299A.705, subd. 3.

appointed. She told us that, by 2011, DPS had concluded that its previous estimate of the revenue required for MNLARS was “terribly wrong.”¹⁶

The Governor’s biennial budget proposal in 2011 recommended extending the existing \$1.75 technology surcharge for an additional three years—through June 30, 2015. The 2011 Legislature authorized an extension of the surcharge for four years—through June 30, 2016—but at a lower level (\$1 per vehicle registration renewal) than it had been previously.¹⁷ In addition to extending the surcharge for additional years, the 2011 Legislature provided two other revenue sources for MNLARS that were not part of the previous funding arrangements. First, the Legislature transferred \$7.1 million from the DPS Driver and Vehicle Services operating accounts to the Driver and Vehicle Services technology account.¹⁸ Second, the Legislature increased the vehicle-related “filing fees” by \$1.50, and it required that \$1.50 of each filing fee be deposited in the technology account until there was sufficient funding for the “administration, development, and initial full deployment” of MNLARS.¹⁹ At the time of these actions, the Legislature anticipated that the surcharge extension and fund transfer would result in an additional \$37.7 million in revenues for the MNLARS project.²⁰

There were no additional executive branch requests for funding to build MNLARS between 2011 and the initial MNLARS release in July 2017. However, in 2016, the Governor asked the Legislature to extend the technology surcharge until June 30, 2019; the extended surcharge was to be called an “operation fee.”²¹ The revenues generated by the three-year extension were intended to fund operating costs for completed parts of the system while other parts of the system were still being developed with the previously authorized funding. In other words, this extension was intended to pay for the cost of *operating* but not *developing* MNLARS. According to the Governor’s proposal, this extension would have provided an additional \$10 million in revenues annually. The Legislature did not extend the surcharge in response to the 2016 request.

By the time the motor vehicle portion of MNLARS was released in July 2017, DPS estimated that about \$106 million in total revenues had been generated for the MNLARS

¹⁶ Persons we interviewed provided different observations about why the initial estimate was incorrect. The person who largely made the 2008 estimate for DPS told us that the agency’s subsequent decision to seek a vendor to build MNLARS—rather than building it in-house—created a need for up-front cash that the original estimate had not anticipated. In contrast, a technical-side manager for the MNLARS project told us that the original concept for building MNLARS was flawed because it assumed that only a portion of the existing system would be rebuilt (and then integrated with the department’s mainframe computer system, which would continue to be used). He said such an approach would have been impractical and much more expensive than had been assumed in the initial estimate.

¹⁷ *Laws of Minnesota* 2011, First Special Session, chapter 3, art. 3, secs. 6-8, codified as *Minnesota Statutes* 2011, 168.013, subd. 21; 168A.29, subd. 1; and 171.06, subd. 2. The \$1 per vehicle registration renewal surcharge began July 1, 2012.

¹⁸ *Laws of Minnesota* 2011, First Special Session, chapter 3, art. 1, sec. 5, subd. 7.

¹⁹ *Laws of Minnesota* 2011, chapter 117, sec. 2, codified as *Minnesota Statutes* 2011, 168.33, subd. 7. The Legislature increased the vehicle registration renewal filing fee from \$4.50 to \$6 per transaction, and it increased all other vehicle filing fees from \$8.50 to \$10.

²⁰ It is unclear whether this estimate by legislative staff included the additional revenue that the technology account would receive from the 2011 increase in filing fees.

²¹ State of Minnesota, *Governor’s Fiscal Year 2016-2017 Supplemental Budget Recommendations, All Funds by Agency*, https://mn.gov/mmb/assets/16-17-supplemental-agency-item_tcm1059-198119.pdf, accessed October 9, 2018.

project since 2008. This exceeded the earlier estimates of these revenues, and it was also well above DPS's estimated MNLARS expenditures through July 2017 (about \$79 million). However, there was a need for additional expenditures after the July 2017 release to (1) continue working on the vehicle portion of the system (adding functionality that was not in the initial release and fixing problems identified in the system) and (2) work on the driver services part of the system, which was deployed in late 2018.

Overall, the Legislature—through the 2008 technology surcharge and the surcharge's extension in 2011—responded directly to DPS's requests for MNLARS funding. In fact, it appears that the surcharge generated more revenue for MNLARS than originally expected. Some people told us that the project—or portions of the project—lacked sufficient resources, or that DPS was reluctant to ask for additional money to build MNLARS following the 2008 and 2011 requests. However, we do not think the Legislature should be faulted for the resources it provided. There remain questions about what funding DPS needs to maintain MNLARS in future years, but the Legislature—through 2017—provided funding to build MNLARS that was generally consistent with DPS's requests.

Failure of a Private Vendor to Build MNLARS

In 2007, the Minnesota Office of Enterprise Technology recommended “total replacement” of DPS's existing driver and vehicle systems.²² However, the office did not recommend whether the systems should be replaced by purchasing existing software or by building a new system from scratch. Regarding the option of building a new system, the Office of Enterprise Technology did not recommend who should build it, although it noted that the DPS Division of Driver and Vehicle Services was reportedly not engaged in any software development projects at the time.

There was a dilemma in the early years of the MNLARS project: the private sector had little experience successfully building similar systems, and the state of Minnesota lacked the capacity to build MNLARS in-house.

Prior to 2011, the state employees with expertise to develop software applications for state agencies were scattered throughout Minnesota state government. These staff were employed by individual agencies. In the case of DPS, it had been many years since that department had built a driver and vehicle services information system, so there was limited technical expertise among its employees specifically related to building such a system. During the early years of the MNLARS project, leadership in the Department of Public Safety rejected the idea of in-house construction of MNLARS as impractical.

In 2011, the Legislature consolidated the state's previously decentralized IT resources into the agency that was later renamed MNIT. Following the consolidation legislation, all agency-level information technology employees became employees of MNIT. We asked the first MNIT commissioner (who served in that role from 2011 to 2015) whether her consolidated agency could have led in-house development of MNLARS starting in 2011,

²² Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis*, 3.

and she said, “Not a chance.” She said the consolidated IT agency did not have a clear approach to software development at that time.

Around that time, there was also concern among state officials about the ability of private sector vendors to build MNLARS. Former MNLARS managers told us they had reviewed prior efforts by private contractors to implement systems similar to MNLARS in other states. They said these efforts had resulted in missed deadlines, litigation, and rarely (if ever) successful implementation.²³

But, with DPS and MNIT lacking confidence that the state of Minnesota could build MNLARS internally, DPS issued a request for proposals for a “prime vendor” in May 2010. The request specified that, at a minimum, a responding vendor or subcontractor must have implemented a license, title, and registration system comparable in size and scope to Minnesota’s for a state, county, municipality, or similar foreign entity. In addition, the vendor must have implemented a statewide project comparable in size and complexity to the proposed MNLARS project. The request for proposals did not require that vendors had successfully implemented comparable systems elsewhere.

DPS received two proposals—from 3M and Hewlett-Packard (HP)—that met its minimum requirements. The process of reviewing the proposals, negotiating the terms of a contract, and entering into an agreement took nearly two years to complete. According to a MNIT official, DPS scored 3M as its top choice and spent months trying to work out a contract. State officials examined in detail 3M’s “code base” (which 3M would use to build software), and they conveyed to 3M their concerns about 3M’s proposal. Ultimately, 3M was unable or unwilling to address these concerns to DPS’s satisfaction, according to former state officials with whom we spoke, and DPS turned its attention to negotiating with HP. DPS finalized a contract with HP in April 2012. A DPS official from that time told us the department had concerns about HP’s ability to deliver, based on what they knew about HP’s experience in another state. However, as she told us, HP was “our best hope, at that point.”

After entering into a contract, the state and Hewlett-Packard (HP) disagreed about what product HP was expected to provide.

The state contract committed HP to provide hardware and software described in a lengthy “Statement of Work” (more than 200 pages) that was developed jointly by the state and HP. A former MNIT manager told us this was one of the most detailed contracts he had ever seen. But he added, “They [HP] just didn’t abide by it.” He said, “What they [HP] said and what they did were very different.” In fact, several people who worked for MNIT or DPS at that time told us that HP was not delivering what it promised.²⁴

²³ A 2015 article said that at least seven states in the previous four years had experienced delays on IT projects (including several driver/vehicle licensing projects) for the vendor—Hewlett-Packard—that was selected by DPS in 2012 to build MNLARS. See Colin Wood, “Michigan Sues HP Over \$49 Million IT Modernization Project,” *Government Technology*, September 22, 2015.

²⁴ A former MNIT official told us that it was acceptable for HP to use code it had developed for other purposes when building MNLARS, so long as the HP code was customized to Minnesota’s requirements. In the end, he said, HP’s code was poor quality, so it did not meet Minnesota’s specifications.

HP believed that the state was asking for something different than what was specified in the contract and Statement of Work. An HP official told us:

The Number 1 thing that did not go well was the changing requirements or the ones that were missed and then requested by the State along the way. It's hard to hit a moving target.... Requirements were not clearly defined, ...and they were changing quite regularly throughout the development process.

Meanwhile, state officials thought HP was constantly seeking contract amendments in an effort to make more money. As described by a DPS manager, "Everything that we had conversation about [with HP] was a change order, and it was going to be more expensive." Two MNIT project managers made similar observations:

- "Weekly change control meetings led by HP, during which we argued about what they reasonably should and should not be billing us for[,] became increasingly contentious and were eventually discontinued."
- "HP consistently stated that the delivery of anything that wasn't working or usable was rework that would require a change request to the Statement of Work (AKA extra money)—thinking that a one size fits all approach would work for the state of [Minnesota's] unique business processes and legislation."

An external auditor who reviewed the MNLARS project in 2014 observed the incompatible views of state officials and HP regarding what was to be implemented:

There appears to be a disconnect between the State and the Vendor's understanding of how existing software code [from applications the Vendor has developed in other places] is used in the development of the State's application. The State's perspective is that the Vendor can use the existing code if helpful, but otherwise it is custom developed software fit for purpose. The Vendor's perspective appears to be that the existing software will be used and it will only be modified when all other options to meet the State's needs are exhausted.... These views are not compatible.²⁵

The external auditor also said the state and HP had what she called "incompatible architectural goals" for the MNLARS project:

The Vendor wants to focus on what the business needs today and this formed the basis for their bid. The State's Technical Team wants to ensure the system is flexible, maintainable, and scalable for future needs of the business and a fast response time that meets business expectations and the [Statement of Work].²⁶

During the HP contract, there was also a dysfunctional working relationship between MNIT, DPS, and HP. In our interviews with key staff and reviews of documents, we heard fault for this assigned to all three parties. This ineffective working relationship led to a state

²⁵ Heidorn, *MNLARS Project Audit*, 11.

²⁶ *Ibid.*

contract with a consulting firm (Shorebird Coaching & Consulting) in 2013-2014 to “devise a path to improved teamwork.”²⁷ The April 2014 report by the MNLARS external auditor said the business and technical teams “don’t fully understand the other’s perspective.”²⁸

State information technology officials became increasingly convinced that HP could not meet the state’s needs, leading to termination of the contract.

First, state officials had concerns about the quality of HP’s work. A former MNIT official told us that he was “horrified” by HP’s code for the MNLARS system, due to errors and poor design. He also said HP was incorporating code in MNLARS from other places where it had worked—hoping to reduce its costs—but “the quality of that code base was unacceptable.” Another former MNIT official said HP had “terrible code control internal processes,” and that its releases of code failed to fix old problems or created new problems.

Second, HP’s work was not meeting project timelines. As shown in the box at right, an early 2014 weekly MNLARS status report showed that all of the early software releases planned for the project had fallen behind schedule by many months. A former MNIT

In January 2014, the Planned Releases of HP’s Work Products Were Significantly Overdue

Work Product	Original Due Date	Forecast Completion Date
Release 1	August 13, 2013	February 21, 2014
Release 2	May 2, 2014	October 16, 2014
Release 3	February 27, 2015	September 2, 2015

project manager attributed schedule problems to the quality issues mentioned above: “The initial Production deployment of the very small first release was literally delayed by months because the builds that HP kept delivering over and over again were riddled with bugs.”

Third, HP’s business analysts—who worked with state staff to identify business requirements for MNLARS—apparently did not perform adequately. The 2014 MNLARS independent audit said “it appears that [the HP business analysts] are not trained in formal business analysis, nor do they follow best practice.”²⁹ Likewise, a former MNIT project manager told us that “the documentation churned out by the HP business analyst staff was riddled with factual and logical errors, and written in a format that was excessively verbose and difficult to understand.”

Fourth, various other problems related to HP’s contract compliance and communications were cited in the 2014 independent audit of the MNLARS project. A sampling of that audit’s criticisms of HP’s performance is shown in Exhibit 1.1.

Of particular concern, the independent auditor concluded: “The Vendor is driving the project rather than the state business.”³⁰ DPS’s current Driver and Vehicle Services director told us that her staff had forged a strong working relationship with HP, but she is grateful that MNIT was “looking out for us.” She said her staff did not have the ability to “look under the hood” of HP’s work in the way that MNIT did.

²⁷ Minnesota Department of Management and Budget, Management Analysis & Development Project Number 2013-166, Interagency Agreement (April 2013), Attachment A.

²⁸ Heidorn, *MNLARS Project Audit*, 44.

²⁹ *Ibid.*, 13.

³⁰ *Ibid.*

Exhibit 1.1: Examples of Criticisms of the MNLARS Vendor (Hewlett-Packard) in 2014 External Audit

- “The first [Hewlett-Packard] Project Manager had refused to work and collaborate with the State’s Technical Project Manager, even when asked by the State.... [Hewlett-Packard] often keeps the [State’s] Technical Team at arm’s length.... [Hewlett-Packard] tries to prevent any architectural and technical oversight by running around the Technical Team and going to the [Department of Public Safety] for decisions.”
- “Although [Hewlett-Packard] was reminded multiple times to use the State’s communication infrastructure and [the Statement of Work] states this as a requirement, [Hewlett-Packard] flatly refuses to adhere to this contractual obligation.”
- “The [request for proposal] asserts that the State will provide governance as well as technical and architectural oversight for the project, yet [Hewlett-Packard] has not allowed this to happen.”
- “Although the [Hewlett-Packard] Business Analysts are very well versed in the work of the DMV, it appears that they are not trained in formal business analysis, nor do they follow best practice.”
- “[Hewlett-Packard’s] project documentation, artifacts and tools are not accessible by the State, or if accessible only on a limited basis.”
- “[Hewlett-Packard] does not provide information or insight into the application defects. [Hewlett-Packard] only provides defect information on a high level and does not provide any tracking or trending information for the State to determine if the defects are lessening or increasing.”
- “[Hewlett-Packard] refuses to provide conceptual models.... Integration is critical, particularly now that the development [efforts] have moved to a Scrum approach, so conceptual or logical models that provide a big picture on how all the components fit together [are] critical.”

NOTE: For clarity, we have replaced the term “the Vendor” with “Hewlett-Packard” in these quotations.

SOURCE: Susan Heidorn, Macro Group, *MNLARS Project Audit: Findings Report*, prepared for the Minnesota Department of Public Safety (Minneapolis, April 27, 2014), 10-14.

With work on the largest parts of MNLARS still to come, state officials worried about the overall state of the project in 2014. As a former DPS deputy commissioner told us: “To be honest, I remember just thinking, ‘This is impossible. We’re going to get nothing and have spent millions of dollars.’” A former MNIT commissioner told us that she “owned” the decision to terminate the HP contract, saying she could not justify “throwing more money at this.” Under the terms of a September 2014 settlement agreement, HP had to provide the state with its MNLARS documents and code by October 31, 2014. DPS officials told us they agreed with the decision to terminate the contract.

The inability of HP to successfully complete major components of MNLARS cost the project significant time and resources.

According to a former MNIT official, HP furnished two work products toward the overall MNLARS project: an identity access management system (which changed the way that about 1,000 users accessed driver and vehicle services data) and an updated vehicle permitting process. The MNIT official characterized these products as a “tiny” part of the overall MNLARS project; another said HP delivered “so little of value.” There were problems with both systems that required additional attention and expenditures after HP

completed its work on the MNLARS project.³¹ MNIT paid a different contractor (PricewaterhouseCoopers) more than \$2.1 million for its work through mid-2015 on the identity access management system.³²

The amount of the contract the state entered into with HP (following a series of amendments) totaled \$46.1 million. The state was not obligated to pay this full amount because HP did not build most of MNLARS, but the state paid HP nearly \$18 million. That represented about 22 percent of total MNLARS expenditures between the start of the project in 2008 and the release of the MNLARS motor vehicle system in July 2017. This does not include DPS and MNIT expenditures for planning and negotiating the contract and working with the vendor. After the HP contract ended, most of MNLARS remained to be built; because of the HP expenditures, a reduced amount of dedicated funding was available for this purpose.

In addition, the state spent a large amount of project time trying to get MNLARS built through a vendor contract. Five years elapsed between the time the state entered into a contract for assistance in developing a request for proposals for vendor construction of MNLARS (September 2009) and the termination of the HP contract (September 2014). There was no statutory deadline for the completion of MNLARS, but legislative and agency impatience grew as a project originally described as a four-year effort extended well beyond that time frame.

Some MNIT and DPS leaders expressed cynicism about private information technology contractors in the wake of the HP experience. A former DPS official told us: “These companies are vultures.... They want to come into a state, they want to do it their way, they want to make a profit, they hire people that aren’t very qualified to do these systems, and they either succeed or fail, but either way they make money.” Likewise, a former MNIT leader said to us: “They [the vendors] have no incentive to do the right thing.... They just feed at the trough of government.”

³¹ A former MNIT manager said HP’s identity access management system was built in an overly complicated way, and the state’s in-house MNLARS team spent time simplifying it after terminating the HP contract. Also, the permitting system was not fully completed by HP, and the in-house MNLARS team did considerable work to finish this system. The in-house technical team was “shocked” by the remaining problems with the permitting system given to the state by HP, according to one of the staff who worked on it.

³² According to MNIT, the HP identity access management system was replaced to meet stricter security standards that had been established by the MNIT central office.

Chapter 2: Leadership Issues

After the Office of Minnesota Information Technology Services (MNIT) and the Department of Public Safety (DPS) decided in 2014 to terminate the Hewlett-Packard (HP) contract to develop MNLARS, those two state agencies decided to build MNLARS “in-house.” The agencies relied on a mix of state employees and contractors, but MNIT and DPS managers directly planned and oversaw the development of the software.

Chapters 2 and 3 of this report focus primarily on the period between spring 2015, when the in-house development of MNLARS started in earnest, and July 2017, when the motor vehicle portion of MNLARS was released. This chapter examines leadership issues—oversight of the project by top DPS and MNIT leaders, and the adequacy of the project’s governance structure. Issues regarding project management—below the level of top agency officials—are discussed in Chapter 3.

KEY FINDINGS IN THIS CHAPTER

- **DPS leaders did not ensure prior to release that MNLARS could meet the department’s business needs.**
 - **During the development of MNLARS, MNIT did not have adequate policies and processes for overseeing agency-based software development.**
 - **Until 2018, the MNLARS project did not directly involve key stakeholders in the project’s governing bodies.**
-

Project Oversight by DPS Leadership

DPS’s services related to driver licenses and motor vehicles directly affect most Minnesota households, and the information system that supports these services is a critical tool. From the MNLARS project’s start and through its evolution, it was apparent that this project posed significant risks. In 2007, the state Office of Enterprise Technology told DPS the plans for this system were inadequate, and that “[a] major failure would be embarrassing to the department, to the state, and to their customers and business partners.”¹ In 2012, a report prepared for DPS cited existing project conditions when identifying key risks faced by the MNLARS project—including the risk that the project would be perceived to be driven by technical staff rather than DPS staff, and the risk that DPS staff and stakeholders might not be prepared to embrace the new system’s changes.² In 2014, an external audit conducted for DPS identified significant issues facing MNLARS, which at that point was a six-year-old project.³ In sum, DPS leadership was warned multiple times that the MNLARS project would require careful oversight and management.

¹ Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis* (St. Paul, March 29, 2007), 2.

² North Highland, *MNLARS Risk Assessment Report*, prepared for the Department of Public Safety (April 6, 2012).

³ Susan Heidorn, Macro Group, *MNLARS Project Audit: Findings Report*, prepared for the Minnesota Department of Public Safety (Minneapolis, April 27, 2014).

Ultimately, DPS leadership bears responsibility for the department’s failure to ensure that the MNLARS release in July 2017 could meet its business needs.

DPS is a large agency, and it administers diverse functions such as the State Patrol, Bureau of Criminal Apprehension, Emergency Management, Pipeline Safety, and the State Fire Marshal’s Office, in addition to Driver and Vehicle Services. We recognize that there are limits to the involvement of DPS’s top leaders in the development of information systems.

But, in the end, DPS’s leaders must be accountable for ensuring that the department’s critical operating systems work as intended. State law says that, as part of DPS’s mission, the DPS commissioner “shall endeavor to...use technology where appropriate to increase agency productivity [and] improve customer service....”⁴ Throughout this report, we conclude that DPS did not take sufficient steps to modernize its business systems before automating them (Chapter 1); did not adequately define MNLARS business requirements in a timely manner (Chapter 3); did not adequately prepare to conduct user acceptance testing (Chapter 3); and did not ensure that key DPS stakeholders were represented in MNLARS governance bodies (Chapter 2). While decisions at levels below the commissioner’s office undoubtedly contributed to problems with MNLARS, top DPS leadership must also bear responsibility for failing to ensure that this system would meet user needs.

In addition, we question whether top DPS leadership adequately ensured proper oversight of MNLARS by agency “sponsors.” As described by two recognized experts in information technology, the designation of high-level project “sponsors” is an important component of a successful software development project:

To avoid disasters, senior managers need to assign business executives to take responsibility for realizing the business benefits of an IT initiative. These “sponsors” need authority to assign resources to projects and time to oversee the creation and implementation of those projects. They should meet regularly with IT personnel, arrange training for users, and work with the IT department to establish clear metrics for determining the initiative’s success. Such sponsors can ensure that new IT systems deliver real business value....⁵

Minnesota law has a reference to “executive sponsors” of information technology projects, but it does not define this term or specify who such sponsors should be.⁶ MNIT officials told us that executive-level involvement is critical to the success of an IT project.

Until her retirement in July 2014, a Department of Public Safety deputy commissioner (Mary Ellison) served as the MNLARS project “sponsor.” A 2014 external audit credited Ellison with getting MNLARS “on the right track” in its early years, and the audit warned that her departure could have a “huge impact” on the project.⁷ The audit said: “It may be

⁴ *Minnesota Statutes* 2018, 299A.01, subd. 1a(4).

⁵ Jeanne Ross and Peter Weill, “Six IT Decisions Your IT People Shouldn’t Make,” *Harvard Business Review* (November 2002), 91.

⁶ *Minnesota Statutes* 2018, 16E.01, subd. 3(d). This provision specifies circumstances in which independent project audits must be presented to “agency executive sponsors, the project governance bodies, and the chief information officer.”

⁷ Heidorn, *MNLARS Project Audit*, 22 and 29.

difficult to find someone to fill her shoes in providing leadership to the MNLARS project, holding the Vendor accountable, and getting the business and technical sides of the business to work together for the success of the project.”⁸

Some current and former DPS officials told us that MNLARS did not receive enough attention from top department management after Ellison retired in 2014. They said that, in their opinions, the DPS commissioner (Ramona Dohman) did not do enough to ensure the success of MNLARS.⁹ At times, they said, the commissioner did not give sufficient attention to the project or did not appreciate the importance of engaging top agency leadership in the project.

After Ellison retired, the commissioner did not formally assign the MNLARS “sponsor” role to someone in DPS upper management. Rather, the sponsor role was filled by individuals within DPS’s Division of Driver and Vehicle Services. These individuals played important roles in the day-to-day development of MNLARS, but it is questionable whether they were in a position to ensure that MNLARS received the attention and support from DPS leadership the project needed.

A project that had experienced a major setback (the termination of the HP contract) needed careful DPS oversight as it transitioned to in-house development. We cannot say for certain what the involvement of top DPS leadership was in the MNLARS project during the transition; we saw little documentation in project files regarding the involvement of upper DPS leaders in project decisions during this period. However, a project official told us the project felt orphaned by DPS leadership after Ellison left in July 2014 until mid-2016, when a new deputy commissioner (Cassandra O’Hern) “definitely took more of an interest” in the project.

Commissioner Dohman told us that she asked many questions about MNLARS during the project’s development. She said she communicated regularly with MNLARS staff and MNIT officials and received no indications that the project would not succeed. DPS officials told us they relied significantly on MNIT to ensure that the technical aspects of MNLARS would work well.¹⁰ In addition, DPS officials said they were reassured by a spring 2017 external review that said: “The management and security controls [the Division of Driver and Vehicle Services] and MNIT are currently developing and implementing for MNLARS appear to be adequate.”¹¹

We agree that MNIT’s weak oversight and guidance—discussed in the next section—contributed to DPS’s failure to ensure that MNLARS was ready for release. Also, as we discuss in Chapter 3, an inadequate level of technical testing gave DPS and MNIT an unwarranted level of confidence in the readiness of the system. Still, we think DPS

⁸ *Ibid.*, 22.

⁹ Dohman served as DPS commissioner from 2011 to 2019.

¹⁰ DPS officials provided us with an e-mail that they said exemplified the favorable portrayal the department received about the project’s technical readiness. One month before the July 2017 release, a MNLARS technical leader (the “release train engineer”) told project staff, “WE ARE OUT OF DEFECTS FOR [the upcoming release]!!!!” The e-mail said there were 13 remaining defects, and each had been assigned to a staff person to address.

¹¹ Office of the Legislative Auditor, *Minnesota Licensing and Registration System (MNLARS): Preliminary Review* (St. Paul, June 2017), 1. However, that review cautioned readers that it could not determine whether MNLARS would meet public and stakeholder expectations until after it was fully developed and deployed.

leadership bears significant responsibility for authorizing the release of a system that was unable to adequately meet its business needs.

MNIT's Oversight of Agency Software Development

The consolidation of state government information technology services into a single agency (MNIT)—which was mandated by 2011 legislation—remains a work in progress today.¹² Some people told us that the problems encountered by MNLARS should be considered within the broader context of state government information technology services. For example, they suggested to us that MNIT's ability to successfully complete the MNLARS project may have been affected by MNIT's overall funding levels in recent years. To the extent that MNIT was underfunded or understaffed, they said, this may have hampered the success of individual projects.¹³

We do not have a basis for saying whether the state's information technology agency (MNIT) is underfunded. Furthermore, as we said in Chapter 1, the MNLARS project received—through 2017—all of the funding for software development that DPS requested.

However, we think that MNIT's general practices adversely affected the MNLARS project in at least one key area.

Prior to the 2017 release of MNLARS, MNIT did not have adequate policies and processes for overseeing agency-based software development.

For example:

- Even today, the respective responsibilities of MNIT and the agencies seeking to develop software applications have not been clearly delineated. Neither state law nor MNIT policy clearly specifies which party has ultimate responsibility for determining whether to build or buy software, what type of software (or underlying architecture) is appropriate, what standards for testing must be met, and whether newly developed software is ready for release. MNLARS (and other IT projects) can have “directors” and “managers” on both the business and technology sides of the project, but state laws and policies do not clearly delineate who is in charge of which aspects of the project.
- When agencies like DPS start software application projects, there is no “how-to” guide that explains what steps should be taken by MNIT and the affected agency. MNIT policy requires MNIT staff to report certain descriptive information about

¹² *Laws of Minnesota* 2011, First Special Session, chapter 10, art. 4, as codified in *Minnesota Statutes* 2011, 16B.99, 16E.016, 16E.036, 16E.04, and 16E.145. The Office of the Legislative Auditor will release an evaluation of MNIT in early 2019. That report will also discuss the current status of the 2011 information technology consolidation.

¹³ We heard some other general concerns about MNIT or state information technology-related services—for example, that state contracting statutes are outdated, that state procurement processes are very time consuming, and that pay scales for MNIT employees may not be competitive with those in the private sector. For example, one DPS official told us, “I don't think any of us had any concept of how difficult it was going to be to not only get staff but maintain staff over a period of time.” Such issues may have affected the MNLARS project (and other IT projects), but we did not investigate these more general issues for this review.

the project into a central MNIT database. But, for example, an agency developing software might be unfamiliar with the concept of “user acceptance testing”—when it should be done, how it should be done, the respective roles of MNIT and the agency in overseeing this testing, and how much is enough.¹⁴ As we discuss in Chapter 3, DPS was unprepared to do user acceptance testing for MNLARS.

- State law says that, for any active information technology project with a total expected project cost of more than \$10 million, the agency developing the project “must perform an annual independent audit that conforms to published project audit principles promulgated by [MNIT].”¹⁵ MNLARS—with a total expected cost of more than \$90 million—was subject to this provision, and an external auditor reviewed its project management. However, contrary to law, MNIT has not published a set of audit principles for such reviews. In addition, the independent auditor was not directed by MNIT to assess the technical quality of MNLARS, such as the adequacy of the system’s architecture or software code.¹⁶

Various MNIT leaders—past and present—told us that MNIT’s oversight of agency software application projects has not been as rigorous or well developed as necessary. For example, MNIT’s first commissioner (Carolyn Parnell)—who left the agency in 2015—told us that, by the time she left, MNIT’s role in agency-based software development was perhaps “a quarter” of the way toward where it needed to be. MNIT’s second commissioner (Tom Baden)—who left the agency in 2018—told us: “[Software development] wasn’t where I wanted it to be when [I] left, flat out.” When asked if MNIT had adequate policies for software development, he said no. Another former MNIT executive agreed that standards for software development were inadequate, describing MNIT’s software development practices as “the wild west.” Current and recent MNIT officials told us that MNIT did not develop or has not yet developed adequate policies or standards to govern the architecture of software developed by agencies.

Just as DPS leadership bears responsibility for releasing a system that was unable to adequately meet that department’s business needs, MNIT’s top leadership bears responsibility for not implementing proper MNIT oversight of state government software projects. MNIT’s lack of sufficient standards, guidance, and oversight for software development contributed to the implementation problems we discuss in Chapter 3.

Project Governance Issues

For large information technology projects, a governance structure provides overall direction to help ensure that the project meets its specified business and technical requirements in a timely manner and within budget. During the in-house development period (2015-2017) leading to the initial MNLARS release, several governance bodies guided the work of the project team. These bodies are shown in Exhibit 2.1.

¹⁴ “User acceptance testing” is a type of testing in which the “business” users of software determine whether it will meet their requirements and provide the expected level of service for which they are paying.

¹⁵ *Minnesota Statutes* 2018, 16E.01, subd. 3(e). This provision was enacted in 2008 (*Laws of Minnesota* 2008, chapter 318, art. 1, sec. 8).

¹⁶ In software development, “architecture” refers to the foundation on which the software is built—for example, how the components of the system are organized, and how they behave.

Exhibit 2.1: MNLARS Governance Bodies, 2015-2017

Governance Body	Members	Description	Frequency of Meetings	OLA Comments
Executive Sponsor Committee	DPS commissioner and deputy commissioner; MNIT commissioner and deputy commissioner; MNIT chief business technology officer for DPS; DVS director; MNIT director of DPS applications management; and DPS MNLARS program director	Highest MNLARS governance body. Empowered to make final decisions on any issues presented to it. Addressed cross-agency issues.	Usually every three months	DPS provided us with agendas of these meetings, but it did not have meeting minutes or records of who attended these meetings.
Champions Committee	MNIT chief business technology officer for DPS; DVS director; MNIT director of DPS applications management; DPS MNLARS program director; a MNIT financial analyst; and two contract employees who served in key roles	Provided support and guidance to Executive Sponsor Committee and MNLARS team. Could make decisions about project scope, budget, and schedule.	One to four meetings per month	Meeting summaries showed who attended and what actions occurred. Limited documentation from early 2016; otherwise appeared fairly complete.
Business Strategies Committee	MNIT chief business technology officer for DPS; DVS director; MNIT director of DPS applications management; DPS MNLARS program director; and several other key DVS, MNIT, and contract staff	Represented the customer perspective. Brought issues to the MNLARS program director or Champions Committee, as needed.	One to four meetings per month	DPS lacked documentation regarding any meetings of this committee between August 2016 and March 2017.

SOURCE: Office of the Legislative Auditor, based on review of MNLARS project documents.

One of these bodies—the Executive Sponsor Committee—included representatives of upper management from both DPS and MNIT. This committee provided overall direction to MNLARS and was its highest ranking governance body.

Due to insufficient recordkeeping, the decision-making and oversight role played by the MNLARS Executive Sponsor Committee is unclear.

We reviewed the Executive Sponsor Committee’s agendas and meeting materials for six meetings that were scheduled between April 2015 and July 2017. It appears that project staff may have provided the Executive Sponsor Committee with an overly rosy assessment of project status. For example, the meeting materials in mid-2016—one year prior to the initial MNLARS release—suggested that the system was in the final stages of development:

DONE: Production infrastructure in place, adequate to support the MNLARS [Motor Vehicle] Product.... DONE: All MNLARS [a]uthenticated users credentials are in place to allow for Day 1 login.... Some necessary functionality needs to be completed in [Program Increment 7] AND we need to reserve some time to address final gaps that emerge.... DONE: The MNLARS software product has been “tuned” to assure acceptable response time for all users.... [A]ll parties are not yet fully

confident that [the Read/Write version of MNLARS] is production ready, but it's getting quite close to that point.¹⁷

DPS and MNIT did not prepare minutes for the Executive Sponsor Committee meetings, so it is not possible to determine who attended and what decisions the committee made. It is not clear what role, if any, this committee played in actions regarding the project's scope, testing, and timelines. As we recommend in Chapter 4, project governing bodies should always document their proceedings with meeting minutes so there is proper accountability for project oversight.

The other MNLARS governance committees (the Champions Committee and Business Strategies Committee) included key MNLARS project staff from DPS and MNIT, but not upper agency management. Unlike the Executive Sponsor Committee, these committees prepared meeting summaries that documented who attended the meetings and actions the committees took. As we discuss below, however, the composition of the various MNLARS governance committees was too limited.

Stakeholder Representation

The Department of Public Safety (and its Driver and Vehicle Services Division) was “the business” for which MNLARS was developed. DPS obtained funding and developed the “business case” for MNLARS, and it would be the administrator of the system. However, the DPS commissioner appoints more than 170 public and private entities—called “deputy registrars”—to issue vehicle titles, vehicle registrations, and driver licenses to customers.¹⁸ Deputy registrars represent the front lines of Minnesota's vehicle registration and title system.

Until 2018, the MNLARS project did not directly involve key stakeholders—including deputy registrars—in MNLARS governance bodies.

As we discuss in Chapter 3, deputy registrars had many opportunities to discuss MNLARS with project staff in the years leading up to the release of MNLARS in July 2017. For example, there was a MNLARS Stakeholder Committee that had monthly meetings between at least June 2016 and April 2017. Also, as the project progressed, there were regular “showcases” in which project staff demonstrated MNLARS capabilities to deputy registrars.

But the bodies that governed MNLARS, such as the Executive Sponsor Committee and Champions Committee, did not have deputy registrar representation. Thus, while deputy registrars could participate in aspects of the MNLARS development process, they did not have opportunities to directly provide input to governance bodies with authority to make decisions. For example, deputy registrars were not at the table when the governance bodies discussed project scope and timelines.

¹⁷ MNLARS status update meeting materials, July 18, 2016. At the time of these materials, the MNLARS team was planning to launch MNLARS in March 2017; the launch date was later postponed to July 2017.

¹⁸ These appointments are made in accordance with *Minnesota Statutes* 2018, 168.33, and *Minnesota Rules*, Chapter 7406.

In addition, deputy registrars did not have full awareness of the challenges MNLARS would present. They were not provided with a list of functions that would be in (or not in) the July 2017 MNLARS release, nor a schedule showing when missing functions would be added. Also, deputies were told that problems they observed with MNLARS during pre-release training were unique to the training environment and would not be issues when MNLARS was released, according to a deputy registrar representative.¹⁹

The absence of formal involvement of deputy registrars in the governance process contrasts significantly with what followed after the problematic July 2017 release of MNLARS. As development of MNLARS continued into early 2018, MNIT and DPS made changes to the project governance process. Under the new structure, MNLARS was governed by a MNLARS Executive Steering Committee, which met weekly.²⁰ That committee included MNIT and DPS representatives, but also various stakeholders: six deputy registrars; two officials from the Minnesota Auto Dealers Association; a representative of Minnesota Auto Auctions; and a representative of the Minnesota Bureau of Criminal Apprehension. None of these stakeholders had been formally represented in the previous governing bodies. The new Executive Steering Committee made important decisions—for example, setting priorities for the components of MNLARS that were not yet completed or working properly.

Quality Assurance Representation

One of the most important contractors on the MNLARS project was a company called Sogeti. MNIT’s contract with Sogeti—which took effect in February 2016—stated that Sogeti would “[p]rovide [quality assurance] leadership and ownership of all aspects of [quality assurance]” for the project.²¹ In this role, Sogeti was supposed to oversee various types of testing during the MNLARS development process.

As of May 2018, the state of Minnesota had paid Sogeti about \$9.5 million for its work on the vehicle and driver services parts of the project. This represented nearly 10 percent of all MNLARS project expenditures in fiscal years 2009 through 2018.

Representatives of the company that provided quality assurance expertise to the MNLARS team in 2016-2017 did not have a direct role in the MNLARS decision-making bodies.

A Sogeti representative told us that the company did not have a formal seat on any of the MNLARS governance committees. This person said that, on a large IT project, the testing team is typically on the project steering committee or other governance bodies. He said it is unusual for the testing team to have no formal role in the bodies that can determine whether it is necessary to stop or delay the release of software applications. There is room for

¹⁹ For example, according to this representative, deputies were assured by training staff that they would be able to transfer specialty license plates to different vehicles at the time of the July 2017 release—but this was not the case.

²⁰ The MNLARS Executive Steering Committee—which serves as a project governing body—is different from a legislative oversight body established by the 2018 Legislature called the MNLARS Steering Committee. The latter committee is composed of six legislators and is required to meet at least every three months to oversee the status of the MNLARS project.

²¹ State of Minnesota IT Professional Technical Services Master Contract Program Work Order SWIFT Contract Number 105120, T-Number 14ATM, effective February 2, 2016. Sogeti is a worldwide provider of technology and engineering services, and it is a wholly owned subsidiary of Capgemini SE.

debate about whether a quality assurance vendor's inclusion on a software project's governance team would compromise that vendor's independence, but we think it is reasonable to expect such a vendor to have opportunities—especially at critical decision points—to directly advise a governance team about a project's status and readiness.

The Sogeti representative told us that he raised testing-related concerns on multiple occasions with MNLARS officials, and he said he would have recommended more extensive testing prior to the July 2017 release if he had been part of the formal decision-making process.²² (We discuss testing issues in greater detail in Chapter 3.) The MNLARS Champions Committee unanimously decided in May 2017 that MNLARS was ready to be released on July 24, 2017, and meeting notes confirm that Sogeti officials were not present at this meeting.

Decisions During 2014-2015 Transition Period

In July 2014, the MNIT and DPS commissioners sent a letter to HP providing notice of their intention to terminate HP's contract to build MNLARS. In the months that followed, MNIT and DPS transitioned from the HP contract to plans for building and overseeing MNLARS in-house.

Some project decisions for the in-house development of MNLARS predated the establishment of key project governance bodies, which hindered transparency and accountability.

One of the lead MNLARS technical staff—who began working for the state of Minnesota in April 2015—told us that many fundamental project decisions had already been made about the in-house development of MNLARS before she started. She said this included decisions about:

- Whether to custom develop the MNLARS software in-house (rather than buying off-the-shelf software).
- Whether to release MNLARS all at once (a “big bang”) rather than having a series of smaller releases.
- How the architecture for the new system should be designed.²³
- Whether there would be an option of returning to the existing vehicle services system if problems arose with the new vehicle system.
- Whether MNLARS would be a “real time” system, with data entry by business offices at the point of customer contact.

²² MNIT's chief business technology officer for DPS told us that Sogeti officials never brought their concerns to his attention during the weeks leading up to the release.

²³ For example, she said she advocated for the addition of a “service layer” to the architecture but that a decision had already been made to build MNLARS without this. She described a “service layer” as a part of the architecture between the business logic and the system database. However, a MNLARS project official told us that the lead technical manager who expressed this concern was responsible for key MNLARS architectural decisions during her tenure and had the authority, time, and opportunity to add a service layer, if she had decided to do so.

If these decisions were made by a MNLARS governance body, we did not see documentation in the files we reviewed. The earliest documentation we saw of a MNLARS Executive Sponsor Committee was for a meeting on April 24, 2015.²⁴ That was nine months after DPS and MNIT sent HP the letter notifying the company of their intent to terminate the contract. We reviewed notes from the MNLARS Champions Committee meetings that occurred in early 2015, but they did not show evidence of major decisions by this committee regarding project scope or approach.²⁵ Without additional documentation, it is unclear to us when some key decisions about in-house development occurred and who participated in them. To our knowledge, MNLARS stakeholders were not part of the groups making these decisions.

²⁴ There was a meeting of a body called the MNLARS Steering Committee in December 2014, but we did not see minutes for that meeting in the project documents we reviewed.

²⁵ In addition, we reviewed the 2014-2015 meeting minutes of a body called MNLETS that included MNLARS project members from DPS and MNIT; the body's full name was not included in the meeting minutes. It is unclear that this body had decision-making authority; a 2015 document described it as advisory, and the meeting minutes did not have a "decisions" section.

Chapter 3: Implementation Issues

Chapter 2 examined MNLARS-related leadership issues in the Department of Public Safety (DPS) and the Office of Minnesota Information Technology Services (MNIT). Like Chapter 2, this chapter focuses on the period between spring 2015, when the in-house development of MNLARS started in earnest, and July 2017, when the motor vehicle portion of MNLARS was released. This chapter addresses a variety of issues—aside from agency leadership and project governance—that affected project implementation.

KEY FINDINGS IN THIS CHAPTER

- **There was too little transparency about which functions would—and would not—be included in MNLARS.**
 - **Portions of the computer code written for the MNLARS software did not follow best practices.**
 - **There was insufficient testing of MNLARS prior to its release.**
 - **During the development of MNLARS, MNIT relied too heavily on two managers, and DPS relied too much on staff within the agency who had other assignments.**
-

Project Scope Issues

The motor vehicle portion of MNLARS that was first released in July 2017 did not include certain functions. For example, it could not transfer specialty or disability license plates to different vehicles.¹ Also, it did not allow deputy registrars to issue refunds, issue expedited titles for a fee, or amend data that had been entered incorrectly. Customers and stakeholders expressed concern that these functions—and others—had not been included in the version of MNLARS that was initially released.

During development, there was too little transparency regarding the scope of MNLARS—that is, which functions would be included and excluded.

When MNIT and DPS formally started the in-house development of MNLARS in 2015, officials from those agencies adopted a “charter” for the project. In broad terms, the charter addressed the scope of the MNLARS project. The charter said the initial release of the motor vehicle portion of MNLARS would implement a “Minimum Viable Product” (MVP).

¹ There are specialized license plates available for veterans, firefighters, and law enforcement personnel, for example. Persons making contributions to certain causes, such as colleges or critical wildlife habitat, may obtain specialized plates. There are also special plates for collector cars and motorcycles, and individuals may purchase plates with personalized license characters, subject to DPS approval.

The box at right provides an information technology website’s definition of MVP. According to the MNLARS charter, MVP “was developed in collaboration between the business and technology groups and is the basis for the initial sizing of the development work to be completed for the first deployment to production.”² However, officials who worked on both the technical and business sides of the MNLARS project told us that stakeholders—such as deputy registrars—were not a part of the decision-making processes that defined MVP. As noted in Chapter 2, it is unclear what role the MNLARS governance bodies played—if any—in initial project scope decisions.



Minimum Viable Product is:

“[A] development technique in which a new product or website is developed with sufficient features to satisfy early adopters. The final, complete set of features is only designed and developed after considering feedback from the product’s initial users.”

— Techopedia

As MNLARS proceeded toward the July 2017 release, project officials from DPS or MNIT made changes to the definition of MVP—often by removing some components from the scope of that release. Our review of governing body meeting materials did not indicate that these bodies played a significant role in defining exactly what MVP would (or would not) include.³ MVP decisions appear to have been made by the MNLARS project’s business or technical leaders, not by top DPS or MNIT officials.⁴ However, project staff expressed concern that these decisions were not sufficiently transparent:

- A MNLARS project manager wrote an e-mail about “the dramatically reduced, previously committed scope that [Larry Ollila of DPS has] chosen to cut behind closed doors with Sue [Rohde of MNIT] over the last two months—and not being shared transparently with his business team. . . .”⁵ Rohde told us that Ollila informed the MNLARS Champions Committee about all project scope decisions. However, we observed that the meeting minutes of this committee appeared to have limited information regarding scope-related actions.
- A member of the MNLARS project team said that—in the months before the system was released—the DPS Driver and Vehicle Services director (Dawn Olson) made the final decisions about which software features would be included or excluded, and that Olson, Ollila, and Rohde stifled dissent from team members who voiced concerns. Olson told us she did not make the decisions about which features would be included in or excluded from the initial MNLARS release, and she said she did not stifle dissent during the process.

² Minnesota Department of Public Safety and [Office of] Minnesota Information Technology [Services], *MNLARS Program Charter* (St. Paul, June 2015), 4. An appendix to the charter provided details on the initial MVP components.

³ One of the MNLARS project managers told us that the MVP definition was not reviewed by the MNLARS Executive Sponsor Committee because it was too detailed.

⁴ MNIT staff told us that scope decisions were made by the DPS Division of Driver and Vehicle Services. Some DPS staff said, however, that these decisions were strongly influenced by MNIT staff on the MNLARS project.

⁵ During most of the in-house development of MNLARS, Ollila and Rohde were the day-to-day leaders on the business and technical sides of the project, respectively. Ollila told us he did not recall the details of cutbacks in scope from the period described in the e-mail, and Rohde told us that all MNLARS scope decisions were made by DPS.

- A member of the MNLARS project team told us: “[I]t was very difficult to track down what would be delivered and when. . . . It wasn’t transparent to MNLARS team members and stakeholders. . . . what was in or out of scope. Many [Driver and Vehicle Services] staff and contractors spent a lot of time trying to track down what’s in and out.”
- A May 2017 meeting of the MNLARS Champions Committee considered whether to allow deputy registrars to edit incorrect entries of data into MNLARS. The meeting notes said, “Need to take offline for discussion.” Subsequent notes did not indicate what decision was made or by whom.
- A MNLARS manager told us he was concerned that decisions about the functionality that would be a part of the initial release occurred with little transparency to the project team, including him. Another manager reportedly expressed concern to a MNLARS leader about project scope and schedule decisions but said to us, “I felt that I was being shut down anytime I brought anything up.”

Project leaders intended to follow the initial July 2017 release with subsequent releases that provided additional functionality, but a plan for these releases was not provided to key system users. Deputy registrars told us they did not receive a list or schedule of functionality that would be added after the initial release. Likewise, a former MNIT commissioner and MNIT’s current chief enterprise architect told us they did not see such a list (or one that was sufficiently detailed). Representatives of a DPS vendor that was hired to coordinate MNLARS implementation planning on behalf of stakeholders told us they never saw the MNLARS “strategic readiness plan” referenced in their contract.

In addition, it took much longer for MNLARS functionality to be added after the initial July 2017 release than the project team had promised. Some project staff recalled assurances from project leaders that the items excluded from the initial release would be added as little as two weeks later. But, when MNLARS encountered significant problems following the July 2017 release, plans for adding new functionality were postponed. As one DPS employee told us:

I think the concept of a minimum viable product (MVP) was a bad one and worked against us in the end. Business was forced to choose between function A (what was needed on day 1) and function B (something that could be delayed a few weeks). In reality, for motor vehicle services to operate smoothly[,] we needed both A and B, and those few weeks turned into many months.

Other project staff expressed regrets—after MNLARS was released—about scope decisions, or how the project team had approached these decisions. The MNIT chief business technology officer who oversaw the technical development of MNLARS told us that DPS’s decision to remove certain key functionalities from MVP was “just a miss, in terms of not understanding the users.” A DPS team member said:

When the main focus became reduction of [project] scope, or what functions could not be developed, it started to be troubling for many of us involved. Too late I realized that a question being asked repeatedly was not one that we should answer. The question being asked was: “Can we ship [MNLARS] without it?” I should not have answered that question. The question which should have been asked and answered was “Will the system

work without it?” In many cases the answer to the first question was yes, but the answer to the second would have been no.

The replacement of DPS’s motor vehicle registration and title system was a huge undertaking, and it may have been impractical to deliver all parts of the system at once. But the MNLARS project invited problems by not involving stakeholders—or, more broadly, governance bodies—more actively in key decisions about project scope, and not ensuring that those decisions—once made—were well understood. In the end, the MNLARS project team did not deliver a viable, properly scoped software product to users.

Identification of Business Requirements

A key part of building software applications is identifying the requirements that must be built into a system so that it will meet the business needs of a company or agency. There were many DPS efforts to document MNLARS business requirements over the course of the project, and Exhibit 3.1 shows some of them (starting in 2009). According to one software development author,

Study after study has shown that requirements mistakes are among the worst to plague software projects. Much of software engineering is about building systems right; requirements are about building the right system.⁶

Exhibit 3.1: Examples of Efforts to Document MNLARS Business Requirements, 2009-2017

- Between 2009 and 2010, a DPS contractor (Mathtech) identified existing and desired business requirements. These were used to help the MNLARS team develop a request for proposals for a vendor to build MNLARS; they were not sufficiently detailed to guide the actual development of MNLARS.
- A contractor (Knowledge IT) was hired between 2009 and 2014 to lead and support “the analysis and definition of business processes,” among other tasks.
- According to a MNLARS manager, DPS developed a document around 2013 that identified about 1,750 items of functionality that were needed in MNLARS.
- A former DPS project manager provided us with versions of a “MNLARS Business Activities List,” which DPS assembled to inventory hundreds of business processes and determine which would be needed.
- DPS hired four business analysts around early 2014 to help identify MNLARS business requirements. By mid-2015, they had all left the agency or been terminated.
- During the in-house MNLARS build (2015-2017), project staff developed hundreds of “user stories” that were intended to identify needed elements in the system. The staff that developed user stories included DPS staff who split time between working on MNLARS and their other DPS jobs.

SOURCE: Office of the Legislative Auditor.

⁶ Bertrand Meyer, *Agile! The Good, The Hype, and the Ugly* (Springer International Publishing Switzerland, 2014), 32.

Key participants in the MNLARS project cited problems that hindered efforts to develop and use business requirements in a satisfactory way.

Over the course of the MNLARS project, the approach to building the new system changed—in the terminology of information technology experts—from a “Waterfall” to an “Agile” approach. A Waterfall approach typically involves developing a comprehensive “business requirements document” at an early stage of the project; this is subsequently used during code development and testing. In contrast, the Agile approach rejects the idea of developing business requirements up-front; it focuses on identifying detailed requirements—just before they are needed—over the course of the system development process.

Problems arose during the process of developing business requirements, as discussed below and in the example to the right:



Example of a MNLARS business requirements problem

Officials with the Bureau of Criminal Apprehension told us they were not adequately consulted about business requirements during the development of MNLARS. Thus, for example, MNLARS was built with a problem they said was unique to Minnesota. If a vehicle with specialty license plate “ZRB ADL” was involved in a crime, and a witness recalled only that the letters B, A, and D appeared in sequence on the plate, a Minnesota law enforcement query could only identify this vehicle if the witness correctly recalled that there was a space in the sequence—and where exactly it appeared. In other states, queries did not require information on spaces. This problem was fixed months after MNLARS “went live.”

- A MNLARS project manager said that, prior to the Hewlett-Packard (HP) contract, DPS-based MNIT staff were “prohibited from speaking directly to [Driver and Vehicle Services] staff members, asking them questions, or attending meetings with DVS personnel. Gathering requirements in such an environment is impossible.” In addition, this manager said that, during the HP period, the “business requirements developed by HP were error-ridden, poorly written and unworkable.”
- A contractor (Knowledge IT) hired to develop business requirements did not perform up to expectations. A 2014 evaluation of the contractor by a MNIT manager said, “Often we had difficulty receiving responses from the contractor and ended up having to do the work ourselves. In the end, we decided it wasn’t prudent to continue the contract.”
- MNIT’s chief business technology officer for DPS during the in-house construction of MNLARS (2015-2017) said DPS staff were supposed to bring descriptions of business functions needed in the system (called “user stories”) to periodic two-day meetings for the purpose of planning upcoming work.⁷ He said they did not always do so, and this required software developers to make “guesses” about the requirements. He described this as “the worst possible situation.” Furthermore, he said that, to benefit the software developers, the user stories should have included both a description of the needed business functions (such as “renew a motorcycle registration”) and information about steps needed to accomplish the functions, but some of the stories did not have this level of detail.

⁷ “User stories” are a part of the “Agile” software development methodology.

- The vendor that oversaw quality control during the in-house construction of MNLARS told us that the business requirements were never adequately defined. The vendor told us that the requirements inherited from the HP period were “really poorly put together,” and the requirements were ill-defined even before MNLARS went live in July 2017.
- A MNLARS project leader told us that DPS was “never able to define [business] requirements in the correct time frame. They were always behind on that.” The official attributed this to limited DPS staffing and experience.
- A MNIT official said, “If you want to hold anyone directly accountable, try looking at the business customers who did not know their system well enough to even write [business] requirements.... [W]e literally discovered missing parts to MNLARS after we had deployed to production that the business had never told us about.”
- A 2018 review of the MNLARS project said: “Business Analysis expertise has been absent on the project from the beginning. Because of this gap in team skills, development team members define and write user stories.”⁸ This was contrary to good practice, according to a website on Agile software development: “An important concept is that your project stakeholders write the user stories, not the [software] developers.”⁹

It had been many years since the DPS Division of Driver and Vehicle Services had undertaken a large software project, so its staff may have lacked the skills to effectively ensure that MNLARS met business requirements. Project staff told us that DPS staff may have displayed naiveté, excessive trust in technical staff, or an inability to challenge technical staff. One DPS official said that DPS employees “felt they knew better than anybody about the business practices” and disregarded people who questioned them.¹⁰

In addition, we heard concerns about the system’s “traceability.” The components of a software application are traceable “if [they satisfy] all the requirements stated in the software requirements specification.”¹¹ A requirements traceability matrix is created for this purpose. The matrix can also be used to ensure that the requirements are fully addressed during tests of the software. Without proper traceability, it may be unclear if the software will address the business’s needs.

The independent project management auditor for MNLARS identified concerns about traceability on multiple occasions. In June 2017—a month before MNLARS was

⁸ Colleen Adams and Laura Wakefield, *MNLARS Project Management and Technical Review* (St. Paul: MNIT, June 2018), 3.

⁹ “User Stories: An Agile Introduction,” <http://www.agilemodeling.com/artifacts/userStory.htm>, accessed December 7, 2018.

¹⁰ A 2012 MNLARS risk assessment had cautioned DPS that MNLARS was perceived to be a “technology-driven” (rather than business-driven) project. The report said that the number of staff on the project’s technology side (MNIT and its contractors) outnumbered the staff on the business side (DPS and its contractors), and it said there was a perception that the project was more focused on the technology part of the project than satisfying business needs. North Highland, *MNLARS Risk Assessment Report*, prepared for the Department of Public Safety (April 6, 2012), 20.

¹¹ Chambers & Associates, “Traceability Analysis,” http://www.chambers.com.au/glossary/traceability_analysis.php, accessed October 19, 2018.

released—the auditor commented about the “Rally” tool in which documentation of MNLARS requirements was stored:

The Rally environment contained User Stories, Test Cases, and test results; however, traceability between User Stories and test results were not evident. The following table summarizes traceability status based on available data [for recent program increments, or “PIs”].¹²

[Was There Documented Traceability of:]	PI 5 (Ended 8/9/16)*	PI 6 (Ended 10/18/16)*	PI 7 (Ended 12/27/16)*	PI 8 (Ended 3/7/17)	PI 9 (Ended 5/16/17)	PI 10 (Ended 7/25/17)
User Story to Test Case	YES	YES	NO	NO	NO	–
Test Case to Test Results	YES	YES	NO	NO	NO	–

The time period (program increments 7 through 9) for which the auditor was unable to trace key system elements extended from late 2016 until May 2017. Thus, in the final report before MNLARS was released, the auditor reported no documented traceability over a several-month period. In a discussion with our office, the lead auditor said: “No, [traceability] was never satisfactory from my point of view.”

We heard concerns about traceability from other participants in the MNLARS development process. A representative of the vendor that conducted quality assurance reviews for MNLARS told us that his staff had a difficult time understanding how the individual business requirements linked together and functioned as part of the larger application. In addition, a MNLARS manager during the period when the project was being built in-house told us she did not see a traceability matrix; another manager reportedly asked a superior where to find a traceability index and was told that such an index was not needed.

Also, as we indicated earlier, it would have been useful to have stakeholders represented on MNLARS governance bodies; this would have placed them in better position to ensure that key business requirements were incorporated into MNLARS.

Prior to system launch, DPS officials believed that MNLARS would meet their business needs, but there was no formal DPS “sign-off” indicating that the project met “acceptance criteria.”

“Acceptance criteria” identify circumstances under which the intended user can accept a software product as complete. It is important for a business—DPS, in the case of MNLARS—to define the broad criteria for accepting a software development project. For example, in 2014, an external auditor made the following observations about the MNLARS project:

There are no clear acceptance criteria metrics or measures from a project or business perspective. Acceptance criteria represent a specific and defined

¹² Software Engineering Services, *MNLARS Quarterly Review Report QR-6F: Final, Observation Period February 25, 2017-May 26, 2017* (June 14, 2017), 21. OLA added estimated end dates for program increments 5 through 7 (shown with asterisks), based on the fact that program increments occurred sequentially in roughly 10-week periods.

list of conditions that must be met before a project is considered complete and the project deliverables accepted by the approvers. ...[T]here are no clear project metrics around product scope, budget and schedule tolerances, product quality (number or level of defects acceptable) or business metrics around customer satisfaction, improved productivity, and business benefits. This could create difficulty for final product sign-off and warranty if both Vendor and the State have different interpretations of when the product is considered “done” and what should be acceptable.¹³

The auditor recommended that DPS develop “clear project acceptance criteria.”¹⁴ However, a DPS official told us that there was an “informal” conveyance of the department’s decision to accept MNLARS as ready for release in 2017, rather than a formal sign-off by DPS that the system would meet the department’s business needs.¹⁵

Coding Issues

We did not conduct a technical review of the MNLARS software released in July 2017, nor did we hire independent experts to do so. However, we talked with technical experts who were part of the MNLARS team. We also examined the findings of a technical review of MNLARS conducted by an external entity after MNLARS was released.

According to technical experts, portions of the code written for MNLARS did not follow good practices.

We heard the following examples:

- Various MNLARS teams used different coding practices as they built different parts of MNLARS.¹⁶ Staff said this resulted in inconsistencies in the way MNLARS calculated customer fees, established deadlines, and determined what constituted (for the system’s purposes) the end of a day or month.
- A representative of the contractor (Sogeti) hired to provide quality assurance for MNLARS said his company repeatedly raised questions about the absence of standardization and an overall technical architecture in MNLARS. The representative told us this was a serious problem and contributed to many of the difficulties that arose when MNLARS was released.¹⁷

¹³ Susan Heidorn, Macro Group, *MNLARS Project Audit: Findings Report*, prepared for the Minnesota Department of Public Safety (St. Paul, April 27, 2014), 28-29.

¹⁴ *Ibid.*, 2 and 20.

¹⁵ Although there was no formal sign-off or attestation by DPS leadership that MNLARS was ready for release, multiple DPS staff were present for the May 2017 decision by the MNLARS Champions Committee to authorize MNLARS to “go live” on July 24, 2017.

¹⁶ The MNLARS project had multiple “Scrum Teams.” In Agile terminology, Scrum Teams include a “product owner” (who conveys customer needs or business priorities) and software “developers.”

¹⁷ MNIT’s chief business technology officer for DPS told us he does not recall Sogeti officials ever conveying to him any documents that expressed concern about standardization or architecture.

- In September 2017, MNIT Commissioner Tom Baden assembled a group of technical staff and identified flaws in the way MNLARS had been constructed. For example, the team found “crisscrossing between domains” within MNLARS, which caused data in the system to collide.
- MNIT brought in Microsoft in October 2017 to review the way MNLARS had been built. Microsoft identified many areas in which queries needed to be “tuned” so they would run more efficiently; this tuning work was “largely not done” in earlier stages, according to a MNIT official.¹⁸ In response to the Microsoft analysis, MNIT implemented various fixes in the months that followed.
- MNIT’s current enterprise architect told us that too many MNLARS staff were given access to enter code in the “production environment.”¹⁹ After she joined the MNLARS team in late 2017, she limited access to a very small number of people.²⁰ In addition, she initiated a requirement that someone other than a code’s developer perform a “desk check” of that code before it could be added to MNLARS, thus providing an additional level of quality control.²¹

MNIT’s commissioner during the in-house development of MNLARS (Tom Baden) told us that such problems reflected lax “discipline” during the construction of MNLARS. He said certain coding problems should have been flagged prior to release—for example, through more rigorous “load testing” of the software.²² In the next section, we further discuss testing issues, including load or performance testing.

Testing Issues

Testing is done during the software development process for the purpose of detecting software defects. If defects are identified through testing, they should be corrected, as verified by subsequent tests.

One of the principles that has emerged from several decades of software testing is the following: “Exhaustive testing is impossible.”²³ In other words, testing involves samples,

¹⁸ The lack of tuning contributed to system “deadlocks,” outages, errors, and slowdowns, according to MNIT. A technical expert we contacted said that software applications using Structured Query Language (SQL)—such as MNLARS—require careful tuning. This expert added that the transition to SQL code posed special challenges for the MNLARS team: “Moving from a mainframe-based to a SQL server-based application is not trivial, especially when high transaction volumes are involved. Beyond the extensive planning and load-testing required for adequate server infrastructure, there is also a significant difference in logic involved in moving from mainframe record-at-a-time to SQL set-at-a-time access to data.”

¹⁹ The “production environment” is the setting where software is actually put into operation for the intended users.

²⁰ A MNLARS architect found in late 2016 that a key layer of the MNLARS architecture had been removed. It was unclear who removed the layer or why, but the architect said this “wreaked havoc on code that had been working just fine.”

²¹ In a “desk check,” someone reviews code manually to verify its logic or look for possible defects or errors.

²² “Load” or “performance” testing is intended to see how software will perform when subjected to normal conditions.

²³ Andreas Spillner, Tilo Linz, and Hans Schaefer, *Software Testing Foundations: A Study Guide for the Certified Tester Exam*, 4th ed. (Santa Barbara: Rocky Nook, Inc., 2014), 33-34.

based on the elements of the software that are perceived to be the most risky or important. Because there are practical limits to the amount of testing that can be done, there is an art to determining how much—and what type of—testing is sufficient for a given software application.

There was insufficient testing of MNLARS prior to its July 2017 release.

There are multiple types of testing that can be done during software development. The following sections focus on three types: regression testing, performance testing, and user acceptance testing. MNIT hired a contractor (Sogeti) to provide quality assurance for the MNLARS project, including oversight of testing.²⁴

Regression Testing

A critical type of software testing is regression testing. As described by a software testing guidebook, “A regression test is a new test of a previously tested program following modification to ensure that faults have not been introduced or uncovered as a result of the changes made (uncovering masked defects).”²⁵

Contrary to recommended practice, MNLARS was not subject to full regression testing in the months prior to release.

A Sogeti representative told us that it is a best practice in software development to conduct “full” regression testing through the date when the software is released. “Full” regression testing examines how the software components work together; it is different than “partial” or “targeted” regression testing, which examines selected features of the software.

According to a report prepared by Sogeti on MNLARS testing, the final full regression of the software prior to its July 24, 2017, release occurred during “Program Increment 8,” a segment of software development that ended on March 7, 2017. Some partial regression testing occurred in the more than four months that preceded the release, but Sogeti said: “No full-regression suite execution was allowed [after Program Increment 8] due to time pressure for the release code.”²⁶

A Sogeti representative told us that Sogeti raised concerns with MNLARS staff about the adequacy of the testing on multiple occasions. However, he said, Sogeti was directed by MNLARS project leadership to reduce the scope of its testing to the bare minimum. The Sogeti official told us that if he had been asked to “sign off” on testing—that is, to vouch for its adequacy—prior to the software’s release, he would not have done so.²⁷

²⁴ According to the contract, Sogeti was to “[p]rovide [quality assurance] leadership and ownership of all aspects of [quality assurance]. This will include functional testing, test automation, data generation and management, regression testing, [User Acceptance Testing] Strategy and testing, accessibility testing, mobile testing and performance testing.”

²⁵ Spillner, Linz, and Schaefer, *Software Testing Foundations: A Study Guide for the Certified Tester Exam*, 75.

²⁶ Sogeti, *Test Report, MNLARS, as of 11/09/2017* (date of report unspecified), 4.

²⁷ A MNIT manager during the in-house development of MNLARS told us that Sogeti did not convey its concerns about testing to her. She suggested that if Sogeti truly had concerns about the adequacy of testing, it should have communicated these concerns to state officials.

According to Sogeti, MNIT manager Sue Rohde was the person who did not heed Sogeti’s cautions. (Rohde served as the application director for MNLARS from spring 2015 to fall 2017.) A Sogeti representative told us that Rohde was the de facto MNLARS project leader, and “we all operated within the confines of [Rohde’s] bubble.” A MNIT official also told us that a review of MNLARS after its July 2017 release led that official to fault Rohde for the failure to implement proper regression testing.²⁸

MNIT’s current chief enterprise architect (Joan Redwing) told us that the MNLARS design was not suited to the targeted type of regression testing that occurred prior to the software’s release. (Redwing was hired as a MNIT employee one month before the MNLARS initial release but was not assigned to work on MNLARS until late 2017.) Redwing said MNLARS had seven “domains,” which all connected to a single “application program interface.” With this type of configuration, she said, any change to the interface could have adversely affected any of the domains—and, therefore, each of the domains should have been re-tested following a change. Redwing told us: “I won’t let a release go out without a full regression, and if you make one change to the software I make you restart your regression.”

Some MNIT officials said they were surprised by the problems that arose with MNLARS after the July 2017 release because, in their opinion, the defects identified prior to the release were fairly limited in both number and severity. However, other people told us that the lack of adequate regression testing prior to the release may have allowed significant problems to go undetected.²⁹

Performance Testing

Before releasing software, it is important to determine whether the software is likely to overload servers, websites, or other system infrastructure when multiple people use it simultaneously. If a system does not have the capacity to handle the loads it will receive, this can affect system “performance”—for example, by resulting in system slowdowns. The MNIT commissioner at the time of the software’s release in July 2017 told us that many of the MNLARS problems that occurred in the months following the release were “just plain performance”—meaning that the MNLARS infrastructure could not support the demands on the system.

There was insufficient testing to determine whether MNLARS could accommodate its expected “loads.”

As described by one website,

[L]oad testing involves applying ordinary stress to a software application or IT system to see if it can perform as intended under normal conditions. It is

²⁸ This official told us: “Sogeti was instructed to descope defects, reduce testing coverage, eliminate regression tests, and overall compartmentalize their testing approach because the architecture supported risk-based and targeted testing activities only. It turns out that this guidance to Sogeti was incorrect and the architecture mandated more testing than they were instructed to provide.”

²⁹ It is unclear to us—based on our interviews and the documents we reviewed—whether the MNLARS team initiated a “code freeze” prior to the final regression testing and in the weeks prior to application release. (A “code freeze” is a period of time when changes to a software application are not allowed.) If there was no code freeze, it is possible that system elements were changing during the period when the code was being tested, or that late changes to the software caused unintended consequences.

related to its bigger, more brutal cousin, stress testing, but load testing ensures that a given function, program, or system can simply handle what it's designed to handle, whereas stress testing is about *overloading* things until they break, applying unrealistic or unlikely load scenarios.³⁰

Before the MNLARS software's release, Sogeti developed scenarios to test performance by overloading the system. But Sogeti told us that the test environment constructed by MNLARS operations staff was different from the setting (called the "production environment") in which the software would actually be available to users. Sogeti told us it raised concerns with MNLARS officials before the release about what it perceived to be a wrong-sized test environment—that is, one that would not accurately reflect what the real system looked like—but Sogeti also said it did not fully understand the scope of the test environment's limitations until after the system was released.³¹

MNLARS users experienced slowdowns—that is, performance problems—in the months following the software's release. The MNIT commissioner said these problems were not detected prior to release because of inadequate load testing. MNIT's chief business technology officer for DPS told us that the MNIT commissioner received regular status reports on the MNLARS load testing, and he does not recall the commissioner raising concerns about the testing. In late 2017, the performance problems were mitigated after MNIT staff added significantly more processing power to the MNLARS infrastructure.³²

User Acceptance Testing

User acceptance testing is a type of testing that is often completed shortly before software is released. In fact, however, user acceptance testing may occur throughout the lifecycle of a software development project, not just at the end. This type of testing focuses on whether the software will meet the identified business requirements, and will therefore satisfy users or customers. Typically, it is the responsibility of the business—in this case, the Department of Public Safety—to oversee user acceptance testing.

Despite early and repeated warnings, the Department of Public Safety did not take sufficient steps to prepare for user acceptance testing.

There were problems with user acceptance testing during the period when HP was building MNLARS, even though HP completed only small portions of the system. In 2014, an independent auditor said state officials had not developed clear "acceptance criteria" for the MNLARS project—that is, "conditions that must be met before a project is considered complete and the project deliverables accepted by the approvers."³³ In addition, the auditor said there was no plan in place to guide the user acceptance testers. Also, the auditor said,

³⁰ SmartBear, "What is Load Testing?" <https://smartbear.com/learn/performance-testing/what-is-load-testing/>, accessed October 22, 2018.

³¹ Sogeti told us the MNLARS testing and development teams were not given accurate information by MNLARS operations staff about how the test environment had been constructed.

³² We heard differing accounts from MNIT staff about why it took a long time *following* the July 2017 release to add sufficient processing power to resolve the performance problems. But, in our view, the more important issue is why the systems' inadequate processing power was not identified during the performance testing that occurred prior to release.

³³ Susan Heidorn, Macro Group, *MNLARS Project Audit: Findings Report*, prepared for the Minnesota Department of Public Safety (St. Paul, April 27, 2014), 28.

few of the testers had any background in user acceptance testing, and they did not know how to write “test cases.” Thus, as the MNLARS project entered a new phase in 2014 and 2015—when project staff decided to manage software development in-house, without a primary vendor—there had been warnings about the need to strengthen user acceptance testing.³⁴

During the in-house development, the contractor hired to conduct periodic project management audits (Software Engineering Services) issued repeated warnings—starting in 2015—about the risks posed by the project’s limited capabilities to do user acceptance testing. Exhibit 3.2 provides a sampling of those comments. The report issued by this contractor for the period that included the MNLARS release date (July 24, 2017) indicated that the auditor still considered “insufficient time to perform UAT” an active risk faced by the project. In contrast, the MNLARS project team had classified this as a “closed” (that is, resolved) issue for the same period.

Exhibit 3.2: External Auditor Comments on User Acceptance Testing (UAT) Risks, 2015-2017

Date of Report	Comments about User Acceptance Testing
December 3, 2015	“[T]he business team does not have documented plans to accomplish UAT.”
March 7, 2016	“The UAT capability is not yet developed.”
June 3, 2016	“UAT vendor on-boarding did not occur in time to develop and execute user tests during [Program Increment] 4. UAT scheduling and testing had still not been planned in detail. Qualified State Testers had not been secured; any needed test team training materials and scheduling was not in evidence. Entrance and Exit Criteria were not documented and approved. Test Plan review and product acceptance process was not established and scheduled.”
September 19, 2016	“There is a [high] risk that...[t]here will not be sufficient time for the new UAT Team to prepare plans; develop test scripts/cases; validate previous and current Program Increments; and perform thorough UAT test planning and management.”
December 7, 2016	<i>[Same as September 19, 2016.]</i>
March 29, 2017	<i>[Same as September 19, 2016.]</i> The auditor said this risk is now categorized as a “project issue.”
June 14, 2017	“There is a [medium] risk that...[t]here will not be sufficient time for the new UAT Team to prepare plans; develop test scripts/cases; validate previous and current Program Increments; and perform thorough UAT test planning and management.”

SOURCES: Quarterly and annual reports on MNLARS issued by Software Engineering Services on the dates shown.

DPS’s inability to do adequate user acceptance testing was partly a staffing issue. (We separately discuss staffing issues later in this chapter.) The current director of DPS’s Driver and Vehicle Services Division told us, “We didn’t have [the] depth or capacity to do [user acceptance testing].” She said her division was initially told by the MNLARS quality

³⁴ In addition, DPS had been given a more general warning in 2007 about its need to improve the Division of Driver and Vehicle Services’ ability to conduct software testing (Office of Enterprise Technology, *Department of Public Safety, Driver and Vehicle Services: System Readiness Analysis* (St. Paul, March 29, 2007), 7 and 10). That report said there was “no testing environment,” which hindered efforts to test system operation or possible changes to the system.

assurance vendor it would need to find 20 staff to do this testing, but she said it was not possible to assign this many, given the staff's other responsibilities and lack of training to do testing.

Due to DPS's limitations, MNIT gave the MNLARS quality assurance vendor (Sogeti) significant responsibilities for user acceptance testing.³⁵ Sogeti's initial contract (February 2016) said it would: "Provide strategy on the best User Acceptance Testing (UAT) practices with inclusion on the MNLARS team. MNLARS staff will be a key component of the UAT Testing efforts. [Sogeti] will be responsible for structuring and managing these UAT efforts." MNIT amended the contract in June 2016 so that Sogeti would provide "expanded leadership for User Acceptance Testing." Specifically, Sogeti was directed to "[m]anage the status of the UAT effort" and provide UAT training to DPS staff.

Sogeti assisted DPS with user acceptance testing until early 2017, when it turned these responsibilities over to DPS. (The funding for Sogeti's user acceptance testing work had run out.) A top MNLARS official told us that, even at this point, DPS was not prepared to assume user acceptance testing responsibilities from Sogeti. We did not independently assess the extent or quality of the user acceptance testing done by DPS.

Although MNIT believed it was necessary to ask Sogeti to oversee user acceptance testing for a period of time, due to DPS's lack of readiness, this arrangement posed important risks. Several people suggested to us that it was very unusual—and perhaps a conflict of interest—for MNIT's quality assurance vendor to take a leading role in assessing the acceptability of software that its supervisor (MNIT) helped to build.

Additional Independent Auditor Concerns

The independent auditor (Software Engineering Services) that reviewed MNLARS project management during the 2015-2017 period raised heightened concerns about testing and defect correction in a March 2017 quarterly report. The auditor said the MNLARS team "has demonstrated that delivering a quality MNLARS application is high priority."³⁶ However, problems related to quality management convinced the auditor to declare these a "project issue" rather than a mere risk. The auditor said:

The development schedule has never accounted for the significant effort and time required to correct and re-test defects to bring the MNLARS application to an acceptable level of quality on schedule. A result has been competing demands on technical staff time, who collectively fix defects while continuing a Sprint cadence to design, build, and test new functionality....

[T]he substantial increase in defect backlog demonstrates that the time and/or resources have been inadequate to produce the required product quality in the expected time. Audit Team recommends updates to overall MNLARS schedule that includes explicit activities for defect correction

³⁵ Another vendor—Trissential—entered into a MNLARS contract in April 2016 that said it would, among other duties, "coordinate user acceptance testing (UAT) efforts for deputy registrars and [auto] dealers." However, the contractor told us it did not fulfill this role, and stakeholders were not part of the user acceptance testing that occurred.

³⁶ Software Engineering Services, *MNLARS Quarterly Review Report QR-5F, for November 26, 2016, to February 24, 2017*, prepared for the Minnesota Department of Public Safety (March 29, 2017), 22.

and re-testing (unit, system, regression, etc.) based on historical data of defect creation rates, and actual time needed for defect correction and re-testing.³⁷

Despite these concerns, the auditor's report gave the project's "quality management" (which included the testing components) an overall "green" rating for the quarter. (It is common for external reviewers of IT or other projects to assess project status using red, yellow, and green ratings; red generally indicates significant problems, while green generally indicates that the reviewed items are in good shape.) Careful readers of the MNLARS audit report would have seen evidence of important concerns about testing and defect correction, but the executive summary did not highlight these problems.

By the next quarterly report (issued in mid-June 2017), this auditor said the risk of "unresolved defects" in the upcoming software release had declined.³⁸ According to the auditor, however, this partly reflected a decision by MNLARS project officials to allow certain less-serious defects—which three months earlier had been required to be fixed prior to the July 2017 release—to be included in the released software.³⁹

Working Relationships

This section discusses the working relationships that existed in 2015-2017 between (1) MNIT and DPS, and (2) the MNLARS project team and key stakeholders.

MNIT-DPS Relationship

In the previous chapter, we discussed the difficult working relationship that existed between MNIT, DPS, and the primary contractor (HP) in 2012 to 2014.

Some strong working relationships developed between DPS and MNIT during 2015 to 2017, but they were offset by concerns that technical staff were controlling the project.

During the in-house development of MNLARS, staff representing MNIT and DPS worked together on small "Scrum Teams" that were developing pieces of the system. This was part of the Agile software development methodology mentioned earlier in this chapter. One project member observed: "The chance to work together daily in close proximity to each other and to come together every nine weeks as one program implement ended and another was about to begin went a long way to developing a more cohesive, better informed team." In addition, some project leaders from MNIT and DPS said they forged good working relationships with their counterparts in the other agency.

³⁷ *Ibid.*, 12 and 22-23.

³⁸ Software Engineering Services, *MNLARS Quarterly Review Report QR-6F, for February 25, 2017, to May 26, 2017*, prepared for the Minnesota Department of Public Safety (June 14, 2017), 18.

³⁹ Defects are categorized by their level of severity, with Severity Level 1 being the most significant. Prior to the July 2017 release, MNLARS officials decided to allow unresolved Severity Level 3 defects to be included in the release, thus reducing the number of defects that were supposed to be retested before release.

However, there were also concerns that DPS's business perspectives were not being adequately considered. One project member said: "There was a good working relationship for a while, but it became increasingly clear that MNIT leadership was making a majority of the development decisions and did not consider the full business impact of those decisions." Some staff said that key MNIT officials did not adequately listen to the perspectives of DPS.

Part of the tension reflected a more general lack of role clarity that existed between MNIT and the state agencies it served. When the 2011 Legislature consolidated state government's information technology functions, staff who were previously employees of individual state agencies were now employees of MNIT.⁴⁰ This change created new challenges for software application projects. Such projects had always required technology experts to work with business experts, but now those experts were in different agencies rather than part of the same one. For a large, complicated project like MNLARS, this meant there was a need for MNIT and DPS to have clear divisions of responsibilities. But, as a MNLARS project team member told us:

In all my experiences[,] there was never a clear understanding of who was in charge, who would set the priorities, who would set the tone and direction. In the vacuum, [the Office of Enterprise Technology]/MNIT took over. And DPS/[Driver and Vehicle Services] didn't push back.... Roles and responsibilities were muddled and contributed to the distrust and conflict between business and technical.

The lack of clarity about how responsibilities are divided between MNIT and the agencies it serves is not unique to the MNLARS project. Current and former MNIT officials told us that this has been an ongoing problem in the state of Minnesota's software development projects, at least in some agencies.

Relationships with Stakeholders

Exhibit 3.3 shows the groups (or "stakeholders") that use MNLARS for various purposes. In this section, we focus primarily on deputy registrars, who—because they function as administrative arms of the Department of Public Safety to register vehicles and issue titles—are perhaps the most important group of users.

⁴⁰ Before the consolidation, there were fewer than 400 employees in the state's main information technology agency; with the transfer of agency IT staff to MNIT, MNIT now has more than 2,000 employees.

Exhibit 3.3: MNLARS Users and Business Purposes

Department of Public Safety, Deputy Registrars
and Driver's License Agents

To provide motor vehicle registration and licensing services

Auto Dealers

To pre-register new vehicles and transfer ownership of vehicle titles

Law Enforcement

To review privileges and information of licensed drivers
To identify registered owners of vehicles
To perform duties of a public defender and/or prosecutor
To conduct investigations of tax, registration, and insurance fraud

Financial Lending Institutions

To verify lienholder information on record

Metropolitan Council

To verify and manage public transportation assistance programs

Minnesota State Higher Education System

For public safety-related traffic and parking enforcement

Human Services Agencies

To enforce child support claims and court-ordered payments
To administer social service programs

Towing Companies

To notify owners and lienholders of impounded vehicles

Citizens

For web-based transactions

SOURCE: Office of the Legislative Auditor.

During the in-house development of MNLARS (2015-2017), DPS undertook several constructive efforts to engage deputy registrars in the project. DPS:

- Established a deputy registrar committee that met monthly during the MNLARS development period.⁴¹
- Contracted with one deputy registrar representative to participate, starting in 2016, on a part-time, ongoing basis in the development and testing of the MNLARS software.
- Designated a 12-week period (April 24, 2017, to July 14, 2017) as an “adoption phase” for deputy registrars, prior to the release of MNLARS. During that time, deputy registrars had access to a version of MNLARS that they could test.
- Communicated via e-mail with all staff at deputy registrar offices, not just office managers or designated liaisons.
- Trained selected staff (called “Super-Users”) in deputy registrar offices how to use MNLARS; those staff were then supposed to train the other staff in their offices.

DPS officials told us that the way they developed MNLARS—relying on deputy registrars to do front-end data entry—was intended to allow deputy registrars to remain viable at a time when other states were moving away from “brick and mortar” licensing and registration operations.

DPS’s efforts to engage key stakeholders were important but ultimately insufficient.

First, as noted in Chapter 1, the deputy registrar stakeholder committee was not formally a part of the MNLARS decision-making process. Thus, while it was helpful to have a venue at which deputy registrars could receive information about MNLARS and provide input, this should not have been a substitute for providing deputy registrars with representation on at least one governance body. Furthermore, individuals who observed the deputy registrar committee meetings told us the meetings were primarily opportunities for DPS to impart information to the registrars; they said DPS demonstrated little responsiveness to registrar input.⁴²

Second, DPS and MNIT officials told us that, in retrospect, the decision to have a single deputy registrar interacting on a part-time basis with the development team was not enough.⁴³ They said that one person could not adequately represent the opinions and business needs of all deputy registrars. That individual, who worked for a private St. Paul-based deputy registrar, might not have fully appreciated the concerns of the wide range of

⁴¹ Between June 2016 and the July 2017 release of MNLARS, the DPS Division of Driver and Vehicle Services also met every two months with officials representing the Minnesota Auto Dealers Association and Northland Independent Auto Dealers Association.

⁴² We heard a similar observation about meetings between the DPS Division of Driver and Vehicle Services and the auto dealers.

⁴³ The MNIT commissioner from 2015 to 2018 told us he had mistakenly assumed that each of the project “Scrum Teams”—developing the MNLARS software—contained “front-line” business users, such as deputy registrars. He said he learned late in the development process that this was not the case.

registrar offices throughout the state, they said. In addition, the registrar who served in this capacity told us that his interactions with MNLARS project officials were constructive and useful for a limited period of time. He told us: “Things went really good, they listened, they liked me, they included me, until I started making waves.” He said that after he objected to one of the project team’s decisions in October 2016 (and after the deputy registrar association subsequently expressed concerns to DPS about MNLARS), he was no longer invited to some of the meetings he would have expected to attend.⁴⁴

Third, the April to July 2017 adoption phase did not fully satisfy either the deputy registrars or DPS.⁴⁵ The deputy registrar who was paid to work with the MNLARS development team told us that having an adoption phase was a “great idea,” but he said it was disappointing to learn that the problems identified by registrars during this phase generally could not be addressed before the system “went live” in July 2017. DPS and MNIT officials expressed concern to us that deputy registrars did not test the system very often during the adoption phase. However, DPS did not retain detailed data showing the extent to which deputy registrars accessed MNLARS during this period prior to launch, so we were unable to draw independent conclusions about deputy registrar use of the system.⁴⁶

Fourth, although the DPS Division of Driver and Vehicle Services provided a significant amount of training to selected deputy registrars on the use of MNLARS, the director of that division told us, “I don’t think the training was adequate.” DPS required each deputy registrar office to designate at least one “Super User” from the office (or to partner with a Super User from another deputy registrar office).

Super Users received three phases of training on MNLARS, as shown in the box at right. Super Users were then supposed to (1) train the other staff in their offices about how to use MNLARS, (2) ensure that those staff spent enough time practicing on MNLARS to become proficient, and (3) convey questions or concerns to

DPS Pre-Release MNLARS Training for Deputy Registrar “Super Users”

- Phase 1: Eight hours of online or classroom training in several core MNLARS functions (April-May 2017).
- Phase 2: Seven weekly one-hour training sessions (May-June 2017) on various additional topics.
- Phase 3: One hour of training provided about one week before MNLARS “went live.”

DPS. The Driver and Vehicle Services Division told deputy registrars: “Offices that fail to complete training or practice during the Adoption phase may have to close temporarily when MNLARS goes live, until DVS is satisfied they can carry out their responsibilities competently in MNLARS.”⁴⁷ The director of the Driver and Vehicle Services Division told us there was considerable variance in the efforts made by Super Users to train staff.

⁴⁴ The MNLARS project team decided that deputy registrars would not have the ability to make corrections to MNLARS records. The deputy registrar hired to assist with MNLARS development said it was inevitable that data entry mistakes would occur, and he asked that registrars be given the ability to edit what they had entered. A MNLARS team member told us that when a deputy registrar made a mistake—such as transferring a title for an incorrect vehicle—the only person who could fix the error was a code developer at DPS.

⁴⁵ At one time, the vehicle portion of MNLARS was scheduled for release in March 2017, and there was supposed to be an adoption phase in the months prior to this release. However, the MNLARS release date was postponed to July 2017 due to defects and limited functionality.

⁴⁶ In addition, a person representing Minnesota auto dealers told us that the dealers did not have a hands-on opportunity to try out MNLARS before the system was launched, nor were they given training during that period in how to use the system.

⁴⁷ DPS, Division of Driver and Vehicle Services, “Training Frequently Asked Questions 1,” December 22, 2016.

Nevertheless, the division did not close any offices due to lack of preparedness to use MNLARS. The director told us she now wishes her division had gone to deputy registrar offices and provided MNLARS training in person. She said resource constraints were the reason training was not conducted in this manner.

Fifth, the working relationship between DPS and the deputy registrars was not helped by DPS's failure to address—prior to release—possible increases in deputy registrar workloads. DPS acknowledged that MNLARS would require deputy registrars to do more work entering customer data at the front end of the process than they had previously done. There were differing views within DPS about whether this added workload would be fully or only partially offset by time savings in other parts of the process. But, prior to release, there was no DPS study of the potential workload impact of MNLARS, and DPS did not propose changes to the Legislature in deputy registrar compensation. Following the implementation of MNLARS, a study completed for the Minnesota Deputy Registrar Association showed that the amount of time it took to process a vehicle registration increased 80 percent between October 2016 and October 2017; the time it took to process a title transfer increased 62 percent over this period.⁴⁸

In addition, stakeholder groups besides deputy registrars asserted that DPS did not adequately consult with them either. For example, the Minnesota Auto Dealers Association told us that DPS did not solicit input from dealers about MNLARS before the MNLARS team made key system design decisions. According to the association, dealers were assured in early 2016 that MNLARS would be released with all of the existing system's capabilities, and then "enhancements" would be added later. However, the dealers were surprised to learn from DPS in mid-2016 that an electronic vehicle title and registration process (which worked in conjunction with the predecessor system to MNLARS and was supposed to continue after MNLARS was implemented) would be unavailable to dealers for a period of several months.⁴⁹ In fact, that electronic process has been unavailable to dealers since June 1, 2017, and a dealer representative told us this has slowed processing time for license plates and vehicle titles, and it has added to deputy registrar workloads.⁵⁰

Also, staff with the Bureau of Criminal Apprehension (BCA)—which is part of DPS—were unsatisfied with the communications they received from the MNLARS team during system development. A BCA official told us that BCA inquiries during the planning period for MNLARS were "pushed to the back burner," and BCA was not treated like a major MNLARS customer. BCA staff were not part of MNLARS governance teams, and they did not believe they had adequate input into the definition of the system's business requirements.

⁴⁸ Leander Limited, letter to Jeff Lenarz, Board President, Minnesota Deputy Registrar Association, February 20, 2018. The analysis was based on a review of 19 deputy registrars from around the state.

⁴⁹ A dealer representative told us that DPS staff initially said the Electronic Vehicle and Title Registration process would be unavailable to dealers from September 2016 (when the contract for that system's vendor was scheduled to expire) until Spring 2017 (when a new vendor would be in place). DPS eventually extended the old vendor's contract until May 31, 2017.

⁵⁰ A dealer representative told us that the title transfer process that will be implemented with the new electronic vehicle title and registration vendor will be less efficient and more expensive to dealers.

Staffing Issues

In addition to problems with technical issues and certain working relationships, the MNLARS project also encountered staffing challenges. This section discusses three issues that relate to how the MNLARS project was staffed: (1) MNIT management’s reliance on two employees to oversee the technical aspects of MNLARS, (2) the performance of those individuals, and (3) DPS’s minimal staffing for the project.⁵¹

MNIT Project Management Staffing

It was risky for MNIT leadership to rely entirely on two managers to oversee all technical aspects of a large, complicated project.

The state of Minnesota’s efforts to manage the development of MNLARS in-house began in earnest in spring 2015. That was when the in-house project members formed the first “Scrum Team” to work on MNLARS. (A Scrum Team is a collection of individuals who collaborate closely to address a common goal and—when necessary—changes in circumstances or business requirements. Later, the MNLARS project had multiple Scrum Teams that worked simultaneously on different aspects of the project.)

From April 2015 through the release of MNLARS in July 2017, the technology side of the MNLARS project had two managers, as shown in Exhibit 3.4. Paul Meekin oversaw information technology activities for MNIT in the departments of Public Safety and Corrections. Due to his responsibilities in two large agencies, Meekin spent a limited portion of his time overseeing the MNLARS project.⁵² The MNLARS project was Sue Rohde’s first assignment for the state of Minnesota after a lengthy private sector career. She provided day-to-day management of the technology aspects of the MNLARS project. The activities of these two managers during this period were overseen by the MNIT commissioner, Tom Baden—for example, through periodic meetings at which the managers provided Baden with updates on the status of the project.

Rohde’s span of control was noteworthy. By one account, MNIT had about 60 to 70 MNLARS contractors and employees during the in-house development of MNLARS. Because Meekin’s duties involved high-level project oversight, these contractors and employees were primarily Rohde’s responsibility. Rohde told us she was not concerned about this because there were individuals (contractors or employees) who fulfilled supervisory roles on the project. For example, each Scrum Team was overseen by a “Scrum Master,” and the Scrum Masters reported to a “Release Train Engineer” (a contractor). However, Meekin said he unsuccessfully urged Rohde to hire at least one additional MNIT manager.⁵³ After Rohde left the MNLARS project in September 2017, Meekin took over her duties because there were no other MNIT managers on the technical side of the project.

⁵¹ Project staff raised some other staffing issues that we do not discuss here. For example, one MNLARS project official told us the MNIT staff under this person’s supervision were “unbelievably weak,” and several staff expressed concern about the amount of staff and contractor turnover on the project.

⁵² Meekin said he typically spent two days a week working on issues related to DPS. This included MNLARS, but it also included information technology activities related to the Bureau of Criminal Apprehension, State Patrol, and other DPS divisions.

⁵³ Rohde said she waited for Meekin to work out funding details for the position; Meekin said it was within Rohde’s authority to pursue funding in collaboration with MNIT financial staff.

Exhibit 3.4: MNIT Managers During the In-House Development of MNLARS

MNIT Manager and Position	Background
Paul Meekin <i>Chief business technology officer for the state departments of Public Safety and Corrections</i>	<ul style="list-style-type: none"> • Began working for the state of Minnesota (and DPS) in 2007. Started working on MNLARS in 2009. • Became a chief business technology officer (then called a chief information officer) in 2011. Continued in this position when all agency-based IT staff transferred to MNIT in 2012 as part of a statewide IT consolidation. • As chief business technology officer, served as MNIT's primary liaison with two major state agencies and oversaw all software applications and other IT projects of those agencies (including MNLARS). • Reported to the MNIT deputy commissioner during the in-house development of MNLARS.
Sue Rohde <i>MNLARS application director</i>	<ul style="list-style-type: none"> • Worked for Wells Fargo from 2004 to 2015 as a senior vice president for information technology. • Began working for the state of Minnesota, MNIT, and the MNLARS project in April 2015. • Was the lead technical manager of the MNLARS project on a day-to-day basis. Supervised several MNIT employees, and oversaw dozens of MNLARS contractors. • Reported to Paul Meekin during the in-house development of MNLARS.

SOURCE: Office of the Legislative Auditor, based on review of MNLARS documents.

In the first half of 2017, Meekin expressed concern about his workload to a former MNIT deputy commissioner (Jesse Oman). Specifically, Meekin raised the possibility of being relieved of his duties at the Department of Corrections so he could concentrate solely on activities at the Department of Public Safety (including MNLARS). According to Meekin, MNIT management wanted him to continue overseeing both agencies for a while longer. The former MNIT deputy commissioner offered a different account; Oman said he deferred to Meekin's judgment on this issue at that time, and that Meekin preferred to give it further consideration. MNIT relieved Meekin of his Corrections duties around September 2017, weeks after the initial MNLARS release.

It is difficult to conclusively assess—long after the fact—what exact impact MNIT's limited staff presence may have had on the MNLARS project. However, various individuals expressed concern to us about this issue:

- We asked Tom Baden—MNIT's commissioner from 2015 to 2018—whether the number of MNIT staff on MNLARS was adequate; he said it was not. He said he raised this issue with the MNLARS project team but found out much later that MNIT employees still comprised a very limited part of the project. Meekin said Baden had full awareness of the project's staffing, as described to Baden in ongoing meetings regarding the project's status.
- MNIT's current chief enterprise architect told us that the limited number of MNIT employees working on MNLARS before July 2017 was a problem. She said that

payments to technical contractors were approved by either Rohde or Meekin, and the contractors may have been reluctant to express concerns to the managers responsible for their continued employment.

- A DPS official told us: “There was constant turnover of project and development/IT staff with no one actively managing IT contract staff, especially as it pertains to quality work.” In contrast, however, a MNIT official told us there was active oversight of the MNLARS project and that “numerous” contractors were released from the project due to performance problems.

A 2018 report commissioned by MNIT management concluded that Paul Meekin should have done more to improve MNIT’s oversight of the project. It said: “Meekin’s failure to [ensure] that there was an adequate complement of State employees who could discharge managerial functions relating to MNLARS was not in keeping [with] the expectations resting on him as an IT executive.”⁵⁴ In our view, a similar conclusion could be drawn about Sue Rohde, who had an even closer view of the project’s daily demands and its need for adequate oversight.⁵⁵

Performance of Individual MNIT Managers

With only two MNIT employees actively managing the MNLARS project, the performance of each manager had particular significance. Other people in MNIT and DPS also contributed to the MNLARS project’s outcome, but we think it is appropriate to comment on the roles of Paul Meekin and Sue Rohde.

Staff who worked with Paul Meekin on MNLARS offered mixed comments on his performance. But, as MNIT’s chief technology officer for the Department of Public Safety, he bears a share of responsibility for failing to deliver a successful product.

Some staff praised Meekin’s skills and contributions. A former DPS official said: “Paul Meekin is the best thing that could have happened to that project, and it’s a tragedy what’s happened to him.”⁵⁶ The official said Meekin performed better as MNIT’s chief business technology officer for DPS than others who preceded him. Another DPS official said Meekin was an advocate “for us standing this thing [MNLARS] up right. I don’t believe that if Paul had known the [system’s problems] he would have allowed that to go.” More generally, Meekin’s performance appraisals by MNIT leadership between 2012 and 2016 showed that he met or exceeded expectations throughout that period.

Some people offered criticisms of Meekin. For example, they said that he did not provide meaningful project oversight or needed to be “dogged” to provide sufficient project updates to MNIT leaders; did not take steps that could have prevented deletion of a key MNLARS database; did not establish lines of communication with technical staff other than Sue Rohde; deferred to Sue Rohde on key decisions; did not adequately answer questions posed

⁵⁴ William Everett, *Investigation Report* (Rosemount, MN: Everett & VanderWiel, February 8, 2018), 5.

⁵⁵ The Everett & VanderWiel report did not offer an opinion about Rohde because the report’s findings focused entirely on Paul Meekin’s performance during the MNLARS project.

⁵⁶ MNIT placed Meekin on leave in late 2017 while it investigated his job performance.

by team members; and fostered an environment in which some decisions could not be challenged.⁵⁷

Meekin's 2016 position description said that he, as chief business technology officer, "must [b]e accountable for all IT projects that are within the scope of the agency-based office," including software projects. A MNIT official told us that chief business technology officers do not need to make all of the detailed project decisions but are responsible for the successful delivery of the projects they oversee. For a variety of reasons, some beyond Meekin's control, MNLARS did not fulfill the expectations of MNIT and DPS. Although it is possible (as Meekin claims) that Meekin was not aware before July 2017 of the flaws in the implementation of MNLARS or the shortcomings of its testing, it was his job to be accountable for the product delivered.

Sue Rohde oversaw the day-to-day technical development of MNLARS starting in 2015, so she also bears a share of responsibility for technical flaws that plagued the MNLARS release in 2017.

Rohde was a subordinate to Paul Meekin, but she was a leading player in the technical development of the MNLARS software for more than two years. While some key project decisions may have been made before Rohde was hired, many others were made during her tenure. In addition, her position description said:

The primary skill needed is the ability to effectively plan, implement and maintain production, enterprise-class mission-critical information systems. . . . The incumbent must be able to use their extensive knowledge of information technology to evaluate the accuracy and thoroughness of IT solutions or apply operations concepts to remove technical obstacles. They must also demonstrate an ability to work with a wide range of groups to productively come to agreements about technology direction and develop strategies to implement.

MNLARS project staff and stakeholders expressed many concerns to us about Rohde's performance on the MNLARS project. One official said that Rohde downplayed potential problems or "sugarcoated" the condition of the developing software. Some said Rohde did not listen to concerns raised by stakeholders or was difficult to work with. Rohde reportedly decided—without consulting superiors—to continue using the mainframe computer as a database for the driver licensing portion of MNLARS; as one of her superiors told us, this was a decision that MNLARS may not have had the budget to support.⁵⁸ A MNIT official said Rohde did not enforce proper standards for code development or proper testing. The MNLARS quality assurance contractor told us that Rohde "was basically

⁵⁷ Meekin told us he provided detailed MNLARS status reports to Commissioner Baden every two to three weeks prior to the July 2017 launch and "constant" updates following the release. Meekin attributed the unintended deletion of a database to an action by an exhausted employee "three levels down from me," and he said the deletion did not result in a loss of data. Meekin said he did not defer to Rohde but, rather, reviewed her decisions in detail to ensure that they were based on sound reasoning.

⁵⁸ MNIT officials told us that the mainframe continued to be used for the driver licensing system for a period of time after the July 2017 MNLARS launch for Bureau of Criminal Apprehension (BCA) queries, but the mainframe was never used for the new MNLARS motor vehicle system. According to Rohde, it was necessary to use the mainframe for BCA queries of driver license data after July 2017; there was "no other option." However, MNIT officials faulted Rohde for not properly communicating this decision, which had financial implications.

running the program from A to Z” and cited decisions she made that created problems or system defects.⁵⁹ A MNLARS manager said the project team periodically developed “risk lists,” but that Rohde denied that there were risks on the technical side of the project.⁶⁰ One project member said: “In retrospect, it seems as though many decisions that [Rohde] made would not have been made had [she] had an accurate understanding of what it takes to deliver quality software in a particularly challenging business environment.” Another project official said: “It became very, very clear after launch that either [Rohde] was in way over her head or she had severely miscalculated all of the things that she made promises that would work later....”

Rohde was new to state government when she started working on the MNLARS project, so her superiors in MNIT bear responsibility if she needed closer oversight. They told us she was highly qualified for the position she was hired into, and that the evidence they saw suggested that the project was on track. Rohde’s annual performance appraisals by her MNIT superiors (in 2015 and 2016) were very positive. The appraisals said her performance consistently met or exceeded expectations. Her most recent performance appraisal covered the period through October 2016, which was nearly a year before she left state employment. One MNLARS official observed about Rohde: “She took on the Herculean task of transforming the way [the DPS Division of Driver and Vehicle Services] and MNIT work and think. I am grateful for all she did.”

Rohde told us that her role in the MNLARS project was a limited one. She said: “I showed up eight years after MNLARS started and did everything I could to make it successful, even though a number of truly mind baffling, terrible decisions had been made...before I arrived. Those decisions set MNLARS on a much riskier course than was necessary.” However, a MNIT official told us that Rohde had numerous opportunities—and a responsibility—to influence the project’s design choices, mitigate implementation risks, and express any concerns to top officials.

In our view, Meekin and Rohde bear a share of responsibility for a portion of the project shortcomings described in our report, such as the failure to ensure adequate regression testing prior to the release of MNLARS, and the failure to ensure that code development was done in a consistent, effective manner. MNIT management placed Meekin on leave of his MNLARS duties in November 2017, and he resigned from MNIT effective March 9, 2018, per the terms of a settlement agreement. Rohde resigned from state employment in September 2017.⁶¹

Limited DPS Staffing

During the early years of MNLARS, DPS had two project business managers: one for the vehicle part of MNLARS, and one for the driver’s license part. One of those managers told us that he initially thought those two individuals would be the only DPS staff working on

⁵⁹ For example, the contractor said that Rohde approved doing a process called code refactoring in the same MNLARS software environment in which other project staff (developers and testers) were working. The contractor said this caused “a lot of defects” and “was not a good decision.”

⁶⁰ Another MNLARS project manager told us that he prepared risk lists for the MNLARS team, but the team was not receptive to hearing or resolving these risks.

⁶¹ Rohde told us she initially submitted her resignation in May 2017 but deferred her departure—at Meekin’s request—until September 2017.

MNLARS, but the department eventually assigned “subject matter experts” from within DPS to key parts of the project.

Many project staff thought DPS relied too much on agency staff who had assignments other than MNLARS.

To a considerable degree, MNLARS managers used DPS Division of Driver and Vehicle Services staff to provide assistance with the project’s development, such as identifying business requirements and determining whether the software met those requirements. However, many of these individuals’ MNLARS assignments supplemented their regular daily duties. As one person observed:

[Driver and Vehicle Services] participation [in MNLARS] was largely assigned to staff who were already 100 percent busy with their normal business work. There were a handful of full-time DVS staff assigned to the project, but a project of this size would have benefitted from 10 to 20 full-time business staff to better align with the size of the technical team.

A MNIT manager—who described the business side of the project as “massively understaffed”—said it is important to have enough business experts on a project so that the technical staff are not waiting to receive complete documentation of the business processes that need to be automated. This manager also said DPS had only about 5 staff assigned to the MNLARS help desk for deputy registrars on the day of initial release but it should have had at least 20.⁶² A top DPS official told us that the Division of Driver and Vehicle Services was understaffed even *without* the diversion of certain staff to work on MNLARS—suggesting that MNLARS assignments compounded staff workloads.

In our interviews, an exception to the viewpoint that DPS had inadequate staffing for MNLARS was the agency’s commissioner from 2011 to 2019 (Ramona Dohman). She said DPS has operated with lean staffing, but she did not think staffing resources were an obstacle to the successful completion of MNLARS.

Time Pressures

More than nine years passed between the time the Legislature initially authorized funds for MNLARS (May 2008) and the date of initial release for the MNLARS motor vehicle system (July 2017). Given this long time frame, it might seem odd to suggest that the 2017 release failed partly because of time constraints. However, it is important to consider that the early years of the project were spent negotiating and executing a contract with a private vendor (Hewlett Packard), and DPS then terminated this contract in 2014 with little to show for HP’s efforts.

⁶² This help desk—called the Deputy Support Center—answered questions exclusively from deputy registrars. DPS has a separate help desk—called the Public Information Center—that takes questions from the general public. At the time of the July 2017 release, the Public Information Center had 43 phone agents.

For several reasons, project staff felt pressure to release MNLARS by mid-2017—an ambitious timeline after the project was restarted in 2015.

One reason for an urgency to release MNLARS in 2017 was a pending change in county-based “wheelage taxes.” A wheelage tax is an amount that a county may levy “on each motor vehicle that is kept in such county when not in operation and that is subject to annual registration and taxation under [*Minnesota Statutes*] chapter 168.”⁶³ For calendar years 2014 through 2017, counties were allowed by law to impose a wheelage tax of \$10 per year. Starting in January 2018, counties could levy wheelage taxes of their choosing “up to \$20 per year.”⁶⁴ The director of the DPS Driver and Vehicle Services Division said she was told it would not have been possible to program the existing mainframe vehicle services system to accommodate wheelage rates that varied by county (in contrast to the uniform \$10 tax that applied previously). DPS officials told us this new wheelage tax provision was the reason they scheduled completion of the motor vehicle portion of MNLARS before the driver licensing portion.

A second reason for the urgency to complete MNLARS in mid-2017 was the 2017 Legislature’s passage of a deadline for implementing “Real ID.” In 2005, the U.S. Congress passed legislation (known as the “Real ID Act”) that required states—for security reasons—to meet federal standards for driver licenses.⁶⁵ The U.S. Department of Homeland Security subsequently authorized extensions of the deadline for states to comply with this law.⁶⁶ The 2009 Minnesota Legislature passed legislation that prohibited the DPS commissioner from even planning for implementation of the Real ID law, but the 2017 Legislature repealed this prohibition and required DPS to begin issuing licenses that complied with the federal act by October 1, 2018.⁶⁷ Because of this looming deadline for meeting Real ID standards, state officials moved staff in 2017 who had been working on the motor vehicle part of MNLARS to work on the driver licensing part. A top DPS official told us that the decision to release MNLARS in July 2017 was “heavily influenced” by the Legislature’s passage of the Real ID deadline.

A third reason there was pressure to release the motor vehicle portion of MNLARS in July 2017 was legislative impatience. DPS’s first annual report on MNLARS (for calendar year 2009) described MNLARS as a four-year project.⁶⁸ State law never specified a deadline for implementation of MNLARS, but legislators questioned why the project was taking so long. As one MNLARS project member told us:

⁶³ *Minnesota Statutes* 2018, 163.051, subd. 1(a). The law says: “The [county] board may provide by resolution for collection of the wheelage tax by county officials or it may request that the tax be collected by the state registrar of motor vehicles.”

⁶⁴ *Minnesota Statutes* 2018, 163.051, subd. 1(b).

⁶⁵ Real ID Act of 2005, Public Law 109–13, May 11, 2005.

⁶⁶ Under current federal requirements, U.S. residents will have to present a Real ID-compliant license or other authorized form of identification starting October 1, 2020, to access federal facilities, enter nuclear power plants, or board commercial aircraft.

⁶⁷ *Laws of Minnesota* 2009, chapter 92, sec. 1; and *Laws of Minnesota* 2017, chapter 76, secs. 24 and 28. A DPS official told us that DPS considered the Legislature’s 2018 deadline “arbitrary” and said that DPS opposed this action.

⁶⁸ Department of Public Safety, *Minnesota Licensing and Registration System: 2009 Annual Report* (St. Paul, unspecified date), 1.

It was commonly understood by people on the MNLARS teams that the need to reduce scope and move to an ever-more-minimum viable product was a result of legislative pressure on DPS and MNIT leadership to deploy MNLARS by a certain time. The perceived reason for this was the feeling among legislators that the project had taken too long and cost too much.⁶⁹

Some MNLARS managers told us they expressed concerns to their superiors about project schedules during the early stages of in-house development (2014-2015), but the superiors were not receptive. A project manager told us: “We weren’t managing to a timeline that was meetable.... I felt that I was being shut down any time I brought anything up [about these concerns].”

As of spring 2016, the MNLARS project team tentatively planned to release a “read-only” version of the MNLARS software in October 2016, followed by a more complete version (a “read-write” version, which would allow for data entry) in December 2016. However, concerns about system readiness caused postponement of the read-write release.

A MNLARS governing body unanimously decided in May 2017 that the software was ready to be released.

Although there was pressure to release the MNLARS software during 2017, it is important to note that a key MNLARS committee—which included DPS and MNIT representatives—reached a judgment that the software was ready to “go live.” On May 24, 2017, the MNLARS Champions Committee voted unanimously that the new system would be released on July 24, 2017.⁷⁰ Some of the officials at that meeting told us that, based on what they had seen, there was nothing that warranted further delays. In fact, a MNIT official described excitement in the room because staff thought the new system would work well.

However, it is worth reiterating our earlier observation that the Champions Committee did not include stakeholder representatives—such as deputy registrars—or representatives of the MNLARS quality assurance contractor. This committee also did not include representatives of upper-level MNIT and DPS management.⁷¹

⁶⁹ Another MNLARS manager told us that MNIT and DPS “saved the State from a potential disaster” by cancelling the HP contract. Although he said the agencies adopted an “aggressive” schedule for the in-house development that followed, legislators still viewed the project as “years behind schedule.”

⁷⁰ The individuals present at this meeting were MNIT employees Paul Meekin, Sue Rohde, Joyce Simon, and Wendy Montgomery; DPS employees Dawn Olson, Larry Ollila, and Joan Kopcinski; and contractors Dan Stark (MNLARS release train engineer), Chet Anderson (MNLARS project manager), and Norman Mandy (MNLARS project management auditor).

⁷¹ In mid-July 2017, there was a staff briefing of MNIT and DPS upper management on the upcoming MNLARS release, but there are no minutes of that meeting and no indication whether the go-live decision was revisited. The person who was DPS deputy commissioner at that time told us the information she saw during the days prior to release indicated the system was ready for launch. Likewise, the MNIT commissioner from that time told us he was open to delaying the release if the software was not adequate, but he believed—from what he was hearing—that it was ready to go. MNIT and DPS leaders told us they have questions about whether project staff were as forthcoming with them about the system’s readiness as those staff should have been.

Other Possible Issues

We considered several other factors that may have affected the 2017 MNLARS release. The impact of the four topics discussed in the section below may have been less obvious than other factors we examined, but they merit discussion.

Use of “Agile” Methodology

In our earlier discussion of MNLARS business requirements, we described some ways in which an “Agile” approach to software development differs from the traditional “Waterfall” approach. Exhibit 3.5 shows basic principles that guide Agile development. The Agile software development approach was developed nearly 20 years ago, and it is now widely used throughout the U.S. and the world. HP began using Agile techniques on the MNLARS project in early 2014, and the project continued to use an Agile approach after transitioning to the in-house development period that started in 2015.⁷²

Exhibit 3.5: Principles of “Agile” Software Development

- **Customer-centric:** Customer representatives should be involved throughout the project.
- **Self-organizing:** Agile teams decide on their own tasks; managers play lesser roles.
- **Sustainable pace:** Programmers work reasonable hours.
- **Minimalistic:** Software is built only with essential functions.
- **Accepting of change:** Needs are defined (and may evolve) throughout the development process; changes are a normal part of this process.
- **Iterative process:** Software is developed through a series of successive, short iterations that customers can try out.
- **Primacy of tests:** To ensure quality, new development may not start until software passes all necessary tests.
- **Scenarios define functionality:** Rather than assembling a list of “requirements,” a project identifies scenarios (“user stories”) that exemplify how users will interact with a system.

SOURCE: Bertrand Meyer, *Agile! The Good, the Hype and the Ugly* (Springer International Publishing Switzerland, 2014), 4-7.

Adopting a different project methodology (Agile) did not necessarily contribute to the MNLARS implementation flaws, but it required staff to learn a new process.

One of the MNLARS project leaders told us she liked the Agile approach because it improved communication between the business and technology teams, and between teams working on different parts of the project. A company (The Standish Group) that conducts research on information technology projects worldwide has reported that large projects

⁷² The MNLARS project used a particular type of Agile approach called Scaled Agile Framework, or SAFe.

developed with an Agile methodology fail about half as often as large projects built with a Waterfall methodology.⁷³

However, learning Agile requires time and training. The Standish Group has reported that “gifted” Agile teams are much more likely to deliver “high value” projects than “unskilled” Agile teams.⁷⁴ Some MNIT staff and vendors had experience with Agile prior to the MNLARS project, but others said it was risky to embark on a large, difficult project using a methodology unfamiliar to many staff. According to one manager:

Transition from Waterfall to Agile...takes many months if not years to accomplish. The state embarked on a new method of delivering software without fully evaluating the feasible timelines it would take to adopt...the new way of doing things.

A DPS manager told us that, due to the learning process required, Agile worked better toward the end of the MNLARS development process than in earlier stages. In addition, a MNIT official we spoke with questioned whether the Agile approach provided the rigor and structure that the MNLARS project needed.

Overall, we cannot say for certain whether the decision to transition to a different project methodology—Agile—created problems that were reflected in the 2017 release. In fact, Agile has been adopted by many organizations for developing software. However, the transition to Agile—with concepts such as “Scrum Teams,” “user stories,” and “minimal viable product”—required many of the MNLARS technical and business staff to learn new approaches to software development.

Lack of Phased Implementation

The MNLARS project team scheduled the old motor vehicle registration and title system to be replaced at the same time the new MNLARS system was to be released. The new system was built without the option of “rolling back” to the old system if problems arose. A project leader told us the system relied on a “one-way ticket” because the cost of building a roll-back option would have been large.

Although the MNLARS project team planned to release only a “minimum viable” version of the motor vehicle system on July 24, 2017, they expected to complete and release most of the remaining functions of MNLARS very soon after that initial release. The plan was not to release the motor vehicle system over a period of many months or years, which is what ultimately occurred. Some MNLARS staff have referred to the July 2017 release of the new motor vehicle software as a “big bang.”

⁷³ The Standish Group, *CHAOS Report 2015*, https://www.standishgroup.com/sample_research_files/CHAOSReport2015-Final.pdf, accessed November 14, 2018.

⁷⁴ *Ibid.*

Large software projects fail more often than small ones, and the plan to transition the old motor vehicle registration and title system to the new system largely at once may have been a mistake.

According to analyses of information technology projects worldwide, the Standish Group has reported that 61 percent of “small” projects are successful, compared with only 11 percent of “large” projects and 6 percent of “grand” projects.⁷⁵ (Standish defined success as projects that finished on time, on budget, and with a satisfactory result.) Likewise, a contributing editor to an information technology journal wrote:

A project’s sheer size is a fountainhead of failure. Studies indicate that large-scale projects fail three to five times more often than small ones. The larger the project, the more complexity there is in both its static elements (the discrete pieces of software, hardware, and so on) and its dynamic elements (the couplings and interactions among hardware, software, and users; connections to other systems; and so on). Greater complexity increases the possibility of errors, because no one really understands all the interacting parts of the whole or has the ability to test them.⁷⁶

A MNLARS official said the vehicle system released in July 2017 was “probably bigger than we would have liked,” but he said that at least the development of the driver licensing system had been split off and scheduled for a later release. A current MNIT executive told us the decision to leap from 1980s technology to 2017 technology in a single software release “blows my mind.” Another MNLARS project official told us: “You want to ship the smallest pieces that the organization can absorb—meaning that you can train on, that you can communicate on.” In her view, it would have been less risky if the new software had been rolled out in a series of small, incremental releases. She said this would have required significant planning, as well as consultation with legislators and stakeholders (such as deputy registrars). Also, it might have required duplicate data entry into parallel systems for a period of time.

We cannot say conclusively that the MNLARS motor vehicle system would have been more successful if it had been released in phases rather than all (or mostly) at once. The new motor vehicle system—even broken into smaller pieces—was still going to be a challenging software endeavor. A former MNIT commissioner said MNLARS may have been the largest software application that Minnesota state government has tried to build from scratch. Therefore, in our opinion, the plan to release most of the new system in a very short time span, and with no option for returning to the previous system, was a risky one.

⁷⁵ According to the Standish Group, a “grand” project would be one using over 100,000 hours of productive labor; a “large” project would use 60,000 to 100,000 hours. MNLARS would fit the definition of a “grand” project.

⁷⁶ Robert Charette, “Why Software Fails,” IEEE Spectrum, September 2, 2005, <https://spectrum.ieee.org/computing/software/why-software-fails>, accessed June 14, 2018.

Use of IT Best Practices

In 2006, DPS adopted the Information Technology Infrastructure Library (ITIL), a set of recommended best practices for managing and delivering information technology systems.⁷⁷ ITIL consists of standards on a wide range of topics, such as information technology financial management, service desks, and software deployment management. Some people who worked on the MNLARS project told us that the project's ITIL and related practices were discontinued by MNIT or DPS around the time that the HP contract ended in 2014, and they said this was a mistake. For instance, a former MNLARS team member told us this decision had adverse impacts on internal collaboration in the months after ITIL was discontinued.

It is difficult to judge whether MNIT's discontinuation of a proprietary set of best practices had a direct impact on the 2017 MNLARS release.

A former MNLARS operations manager told us that the DPS Division of Driver and Vehicle Services “had to scale back” after the HP contract was terminated so that DPS would have resources to hire staff for the in-house development of MNLARS. He and others told us it was important for DPS and MNIT to continue using good software development practices, but those practices did not necessarily have to be unique to ITIL. Our report offers evidence that the MNLARS project did not follow good practices in a variety of areas. But, in our view, it would be difficult to conclusively determine that the discontinuation of ITIL in 2014 directly contributed to the disappointing MNLARS release in 2017.

We also heard a more general concern about the use of information technology best practices in the state of Minnesota software development: that decisions to apply such practices (ITIL or others) to projects have been made at the discretion of individual agencies (or the MNIT staff in those agencies). A former MNIT official suggested to us that MNIT should provide greater leadership and direction regarding this aspect of application development. He said, “The ITIL processes are difficult to get right and require specialized tools and management expertise that will be impossible to garner on a silo by silo basis.” He said this suggests that MNIT may wish to consider a broader strategy—not one that is agency-specific—for ensuring the implementation of best practices on future IT projects.

Ratings by Independent Auditor

State law requires independent annual audits for state government information technology projects with total costs expected to exceed \$10 million.⁷⁸ The law also requires MNIT to adopt “audit principles” for such audits, but it has not done so.⁷⁹ For the MNLARS project, MNIT contracted with a private audit firm (Software Engineering Services) to produce quarterly and annual audit reports; the first report was issued in September 2015.

⁷⁷ ITIL is owned by AXELOS, a joint venture between a private company and the United Kingdom Cabinet Office. AXELOS issues licenses to use ITIL and manages changes to the ITIL framework. However, organizations do not need to obtain a license from AXELOS to use ITIL for internal purposes.

⁷⁸ *Minnesota Statutes* 2018, 16E.01, subd. 3(e).

⁷⁹ *Ibid.*

The independent auditor that reviewed MNLARS gave the project largely favorable overall ratings prior to the system’s release.

Exhibit 3.6 shows the auditor’s ratings of “overall project health” in the periods leading up to the July 2017 release. These ratings appeared in the reports’ executive summaries and did not suggest that the MNLARS project posed serious risks. Most of the ratings were green—which generally indicates that a project meets standards—and there were a few yellow ratings (related to schedule or staffing issues) that indicated a lesser degree of project readiness. None of the overall ratings were red, which would have indicated serious risks. The auditor’s final report prior to the July 2017 release said that, based on composite measures of risk, the project’s risk trends were “overall encouraging.”⁸⁰ Such reports may have given a false sense of assurance to agency and project leaders.

Exhibit 3.6: Ratings of MNLARS “Overall Project Health” by Independent Auditor

Rating Area	Independent Auditor Ratings, by Date of Report				
	June 2016	September 2016	December 2016	March 2017	June 2017
Project Cost	Green	Green	Green	Green	Green
Quality Management	Green	Green	Green	Green	Green
Schedule Management	Yellow	Yellow	Green	Yellow	Yellow
Scope Management	Green	Green	Green	Green	Green
Project Staffing	Green	Green	Yellow	Yellow	Yellow

NOTE: Green indicates that the project is largely compliant with established standards; yellow indicates that the project is partially compliant with standards; and red indicates that the project is not compliant with standards.

SOURCE: Software Engineering Services reports.

It is important to consider that the auditor did not examine all aspects of the MNLARS project. According to the auditor, MNIT did not direct the auditor to do technically focused reviews, so the audits focused largely on project management issues. For example, the auditor did not scrutinize the code that was developed for MNLARS. The lead auditor told us that he knew the MNLARS project posed some risks as it approached the release date, but his firm did not have a basis for judging the quality of the software.

MNIT staff told us that, in the future, they would like to use independent project auditors that, when the circumstances warrant, can conduct technically focused audits—for example, critiquing the architecture, code, or security of the system being developed. In late 2018, MNIT issued a request for proposals for firms that would conduct independent audits—potentially including technical audits—under the terms of a MNIT “master contract.” However, until MNIT adopts and enforces “principles” for its project audits (as required by law), readers of the audits might not understand the risks posed by the audits’ scope and limitations.

⁸⁰ Software Engineering Services, *MNLARS Quarterly Review Report QR-6F: Final, Observation Period February 25, 2017-May 26, 2017* (June 14, 2017), 4.



Chapter 4: Discussion

When state officials began building MNLARS “in-house” in 2015, they said: “The mission of MNLARS is to make technology an asset not an obstacle to [the Department of Public Safety’s Driver and Vehicle Services Division], its business partners and customers.”¹ That mission was not achieved when MNLARS was released in July 2017. The new system worked for some purposes, but it caused significant hardship for many customers, deputy registrars, and other stakeholders.

The problems that arose with MNLARS were not due to an overall lack of effort. Many people in the Office of Minnesota Information Technology Services (MNIT), Department of Public Safety (DPS), and private firms worked diligently—and with the best intentions—to implement a useful vehicle registration and title system.

Many factors—rather than a single person or a single decision—contributed to the unsuccessful release of MNLARS in July 2017.

As described in the Introduction of this report, it is not uncommon for information technology projects—especially large ones—to fail in the public and private sectors. This is why such projects require careful oversight and risk management.

The MNLARS project had sufficient resources (\$100 million) and time (nine years) to succeed, but resources and time were spent in the project’s early years without achieving the intended outcome. It took time to solicit, choose, and reach an agreement with a private vendor, but there were disputes about vendor responsibilities even after this lengthy process. Ultimately, MNIT and DPS officials agreed that the vendor did not produce high-quality work in a timely manner. When state officials terminated the contract, MNLARS was already a six-year-old project that had spent significant funds to make limited progress toward its ultimate goal.

DPS and MNIT leaders decided to embark in 2015 on the in-house construction of MNLARS, believing—rightly or wrongly—that they still had sufficient time and resources to complete the assignment. These leaders should bear considerable responsibility for the problems that arose. Despite warnings, they misjudged the riskiness of this project, and they did not give enough attention to important decisions made by project staff. DPS—without recent experience developing a driver and vehicle services system—was unable to adequately define its business needs, involve stakeholders in a meaningful way, test the application’s ability to meet user needs, and engage as an equal partner with technical staff. MNIT leaders had observed the problems that occurred in another high-visibility state software project (the MNsure health insurance exchange, released in 2013), and they should have understood the risks posed by MNLARS. However, MNIT did not have effective standards, policies, and procedures for overseeing state agency software projects, and MNIT leaders gave significant discretion to a small number of managers.

¹ Minnesota Department of Public Safety and Office of Minnesota Information Technology Services, *MNLARS: Program Charter* (St. Paul, June 2015), 2.

This report identifies some individuals who played large roles in the project and should bear a share of responsibility for its failings. However, MNLARS did not fail because of any single individual or decision. As we suggest below, there should have been more effective oversight and project governance in place.

Recommendations

Staff from DPS and MNIT are today still working to implement fixes and new functionality for MNLARS, but the project's development phase is largely completed. Thus, rather than directing recommendations to DPS and MNIT specifically about MNLARS, we offer broad recommendations for MNIT, as it oversees software development and procurement in other agencies, and for state agencies generally.

RECOMMENDATION

MNIT should improve its oversight of agency-based software application projects.

MNIT has not had adequate standards for overseeing software development projects. For example, MNIT has not adopted standards for project architecture; it has not established principles to govern independent audits of project management or technical quality; and it has not provided sufficient statewide guidance on software project best practices. MNLARS project staff had discretion to determine how much and what types of testing were sufficient, and MNIT policies provided little direction on this.

In addition, there has been lack of clarity about the respective roles of MNIT and state agencies in agency-based software projects. This could be addressed by changes in state law or MNIT policy, but MNIT should play a leading role in adopting clearer policies or recommending statutory changes. For example, agencies need to understand whether they have authority to decide whether to build or buy software, and whether they have authority to decide that a project will "go live."

MNIT should provide additional assistance to agencies in managing software projects. MNIT guidance could help agencies understand the sequence of project activities and decisions; what is required for conducting good "user acceptance testing"; what is the role of a "project sponsor" within the agency initiating software development; how to establish effective project governance bodies; and how to solicit input from key stakeholders.

RECOMMENDATION

Top agency officials should serve as "project sponsors" for large, high-risk software application projects.

A project as critical to agency operations as MNLARS requires direct involvement by top agency management. In such cases, agencies should designate a "sponsor" from top management who can help ensure that a project has the resources it needs and will, when completed, meet agency business requirements. The involvement of top DPS officials in the MNLARS project appears to have varied over time.

Perhaps agencies should formally “sign off” on software projects—attesting, before authorizing the release of software, that the software will meet the agency’s business needs. In our view, it would be good practice for an agency to specify project “acceptance criteria” that can help it decide whether the software is ready for release. Even if there is not a formal sign-off, however, agency management should carefully consider whether the scope and schedule of future releases is acceptable. The concept of “minimum viable product” that was used in the MNLARS project is a plausible one, but agency management should play a direct role in deciding what system components meet the agency’s minimum requirements, and whether the designed system will be viable for the agency’s purposes.

RECOMMENDATION

Leaders of large projects should include key stakeholders and independent quality assurance representatives in project governance activities.

During a large software project, staff from MNIT and the affected agency will spend a lot of time working with each other. It is important for leaders from these agencies to be part of project governance teams, but it is also important to include other voices in the decision-making process. Stakeholders—such as deputy registrars or auto dealers in the case of MNLARS—may have perspectives and knowledge that others do not. They may raise questions about project scope or schedule that did not occur to agency officials. Also, for large projects that hire independent contractors to provide quality assurance or to review certain project components, these contractors should be closely consulted regarding key project decisions.

RECOMMENDATION

Project management staff should ensure that there is full documentation of the project governing body meetings.

Governance bodies provide overall direction to a project. For accountability purposes, it is important to have a complete record of decisions these bodies make (or do not make). In our review of MNLARS records, we could not adequately determine the extent of direction the MNLARS Executive Sponsor Committee provided to the project. There were no meeting minutes of this committee that showed which individuals attended and what decisions were made. In addition, we saw little documentation of decisions that occurred in the very early stages of building MNLARS in-house, which started in late 2014.

RECOMMENDATION

When necessary, agencies should streamline business processes before they build information systems based on those processes.

Sometimes agencies identify business process improvements at the same time they are developing software applications. But it may be easier to build software for a system after the agency has systematically considered—and amended—how that system should function. If agencies identify changes to business processes at the front-end of a project, software developers might not have to develop code for a moving target—that is, a system

for which the business processes are in flux. In some cases, an agency may wish to seek statutory changes as a part of streamlining business requirements.

RECOMMENDATION

Agencies should strive to break large software projects into smaller pieces—or, if this is not feasible, have contingency plans in the event that large-scale software releases do not go as intended.

It is common for software projects to discover defects or problems after software is initially released. However, as noted in the Introduction, studies have shown that large software projects are more likely to experience overall failures than smaller ones. Sometimes it may be feasible to break large projects into a series of smaller releases, reducing the likelihood of large-scale failures. If this is not possible, project leaders should consider back-up plans that could be implemented if problems arise following release. In the case of MNLARS, project leaders planned to release some important functions after the July 2017 “big bang” release, but problems with the initial release prevented those subsequent releases from occurring in a timely manner. In addition, MNLARS was built without a practical alternative to the new system once serious problems with that system arose.

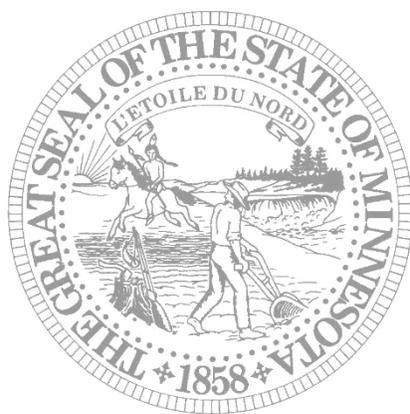
More generally, state officials should aim to replace or update outdated technology on an ongoing basis—before it is necessary to replace an entire large system that is decades old. To accomplish this, state agencies should realistically assess the need for updates or upgrades over the expected life of an information system and present this information in a timely manner to key executive and legislative branch officials. In addition, the Legislature should consider ways to strategically assess information technology priorities across state government so that it can provide development and maintenance funding for these activities in a timely manner.

Responses

The following pages contain three responses to the report. We always offer affected agencies an opportunity to submit an official response to our reports. For this report, the two agencies that worked on MNLARS chose to submit a joint response letter. In addition, part of our report discussed two former state employees who played important roles on the technical side of the project, and we offered each of those individuals an opportunity to submit a letter.

Responses:

1. Joint letter from the Office of Minnesota Information Technology Services (MNIT) and the Minnesota Department of Public Safety (DPS)
2. Letter from Paul Meekin, former MNIT chief business technology officer for DPS and Minnesota Department of Corrections
3. Letter from Sue Rohde, former MNIT application director for MNLARS



February 5, 2019

Judy Randall, Deputy Legislative Auditor
 Office of the Legislative Auditor
 Centennial Office Building
 658 Cedar Street
 Saint Paul, MN 55155

Dear Ms. Randall,

Thank you to you and your team for your work conducting this special review, to identify the factors that contributed to the difficult rollout of the Minnesota Licensing and Registration System (MNLARS) vehicle services functionality in July 2017. Your team conducted a thorough review of a complex system development project which started in 2007 and involved a significant number of private sector vendors, contractors, and employees from the Department of Public Safety (DPS) and the Office of Minnesota Information Technology Services (MNIT). This special review required your team to develop a solid understanding of the history of this project, in addition to evaluating information about the successes and failures of large software development projects worldwide.

This special review focused on what led up to the original launch of MNLARS in July 2017. However, it is important to point out that, since November 2017, MNIT and DPS have overhauled MNLARS system development processes, which have yielded improvements in the stability and reliability of the system for our stakeholders. This report cites many of these implemented improvements as recommendations or findings.

Finding or Recommendation	Implementation & Timeframe
Stakeholders' involvement (including deputy registrars) in MNLARS governing bodies.	MNIT began stakeholder meetings that included Driver and Vehicle Services (DVS), deputy registrars, and other stakeholders on December 12, 2017. DVS now leads these meetings, which continue with business partners and stakeholders on a biweekly basis, and this group now serves as the Executive Steering Committee (ESC) for the project. The ESC reviews release plans, prioritizes release content, and coordinates acceptance testing and post release testing, among other responsibilities.
Involve Quality Assurance in project governance.	The Quality Assurance team joined project leadership activities and has had a formal voice in release decisions beginning in November 2017. The team's engagement in these processes has yielded improvements in test coverage and overall product quality.

When possible, large software projects should be delivered in smaller releases and have rollback or other contingency plans in place in case a release does not go as planned.	Since November 2017, MNIT and DPS have implemented rigorous rollback and contingency plans for each hardware upgrade and software release. Where not possible, the risks inherent to not having rollback and contingency plans are documented, escalated, and visible to executive leadership and project sponsors.
DPS should provide formal signoff indicating the system meets their business needs.	Since December 2017, acceptance signoff is required by DVS subject matter experts for all features, and it is managed in a tracking tool. The MNLARS project team reviews these as part of the software release process. In addition, acceptance testing for each release has been enhanced to include deputy registrars since mid-2018. Formal signoff now includes “live” production acceptance testing on launch days.
Portions of the computer code written for the MNLARS software did not follow best practices.	Since February 2018, automated processes known as “DEVOPS” were built into the development process to ensure the following improvements: proper coding standards, low level code testing executed with each release, and mandatory code reviews.

We agree with your approach to not focus on specific recommendations about MNLARS as “the project’s development phase is largely completed,” but to offer broad recommendations for all state agencies as they embark on their business systems’ modernization efforts within the state’s technology ecosystem. The lessons learned from the MNLARS experience will inform future modernization efforts, to ensure that other state agencies do not experience the same result.

We also agree with your recommendation that “MNIT should improve its oversight of agency-based software application projects.” As the technology experts, MNIT is in a position to provide assistance to agencies in managing the software and technology portion of projects. While some agencies manage and prioritize a significant portfolio of agency-based projects, other agencies do not frequently undertake large complex projects and therefore do not have the experience or institutional knowledge within the agency to successfully manage and staff these projects. With so many large IT modernization efforts looming on the horizon to upgrade or replace decades-old legacy systems, it is critical that MNIT be positioned to effectively oversee and audit these projects from an enterprise perspective, confirming best practices are followed related to project governance, testing, quality assurance, stakeholder engagement, and business requirements documentation.

As we learned from the MNLARS experience, much of this work must ultimately be carried out by agency business staff. That said, all agencies should strongly consider developing key personnel that understand their business processes and requirements before embarking on a major modernization or system replacement effort. MNIT must effectively assess IT project personnel and project progress across the executive branch to guarantee best practices are being followed. MNIT will work with executive branch partner agencies and the legislature to implement these improvements, and to address any necessary changes in policies, processes, staffing, resources, or state law.

We agree with your recommendations that top agency officials should serve as “project sponsors” for large, high-risk software application projects, that leaders should “include key stakeholders and independent quality assurance representatives in project governance activities,” and that there be “full documentation of the project

governing body meetings.” While commissioner-level leadership was involved at an executive sponsorship level on the MNLARS project before July 2017, it was insufficient, not formalized, not documented consistently, and it appeared to vary over time.

We recognize the importance of consistent senior leadership’s involvement on this project and the insufficient involvement prior to July 2017. We took significant steps to improve this after the failed roll-out. The governance structure of the MNLARS project now includes a MNLARS Executive Steering Committee, a MNLARS Project Management Team, a MNLARS Senior Leadership Team, and a MNLARS Executive Leadership Team. The MNLARS Quarterly Updates submitted to the MNLARS Legislative Oversight Committee identify the specific members’ details in accordance with Minnesota Laws 2018, Chapter 101. We have already established consistent documentation of the Executive Steering Committee, and we are implementing documentation requirements at all levels of the project’s governance teams. Additionally, we have added a member of the quality assurance team to the project governance structure.

We agree with your recommendation that, when necessary, agencies should streamline business processes before they build information systems based on those processes. That said, we believe agencies should go even further. More specifically, all agencies should, to the extent possible, document their business processes in sufficient detail as they determine what business processes, functions, and capabilities should remain, change through innovation, and/or be streamlined because they are outmoded or cost-prohibitive. These activities should be led and undertaken by the “business side” with MNIT supporting as needed, to identify opportunities where technology may produce efficiencies or where proposed business processes may translate to excessive implementation cost. The agencies’ innovation and streamlining activities may require statutory changes, and these should be addressed prior to securing legislative funding for long-term and/or high-cost projects. Once the business side sufficiently identifies detailed business processes, MNIT can advise on how best to approach implementation through readily available commercial products, in-house development, or a combination of both.

From the above, it is clear that for a large complex system development such as MNLARS, this process is detailed, time-consuming, and staff-intensive —and absolutely critical to the project’s success. As such, going forward, we must factor additional resources into the overall project timeline, staffing, and budgeting processes. The state must conduct this analysis at the beginning of the project’s schedule, before significant development investment begins, and before a decision on how it will be implemented - or who will do that work - has been approved. The outcomes of this effort must require the approval of senior leadership from the sponsoring agency and from MNIT.

In the case of MNLARS, the OLA report makes clear that there was nascent activity for a critical phase of the project, from 2007-2014. The report also indicated that in the Macro Group’s 2014 audit, the auditor recommended, “Improve Business Processes Before Automating Them.” We absolutely agree. However, the auditor subsequently indicated their recommendation “is too late for this project.” We believe this is patently false for any project; it’s never too late to stop a project, regroup, and make sure business requirements are fully documented, and that the project will meet its final objectives. The OLA report is silent on the role the 2014 audit report had in subsequent DPS or MNIT decision-making but, in our view, the Macro Group’s assessment regarding that recommendation was deeply flawed. Our enhanced user acceptance testing with deputy registrars and our improved test case traceability efforts after the flawed July 2017 roll-out reflect the team’s effort to stop, regroup, and ensure we deliver what the customer needs from MNLARS.

We strongly agree with the recommendation that, when possible, large software projects should be delivered in smaller releases and have rollback or other contingency plans in place, in case a release does not go as planned. Since November 2017, MNIT and DPS have separated improvements into smaller releases so the development and regression testing is manageable. As noted earlier, we have also ensured rollback and contingency plans accompany each release.

Without appropriate resources to guarantee sufficient staff for business process development, identify system improvements, perform user acceptance testing, and provide stakeholder training, we are shifting resources from business needs supporting our customers to completing these critical tasks. In the case of MNLARS, DVS staff perform these duties, which has created vacancies in critical business roles. These staffing shifts have resulted in significant backlogs, with Minnesotans not getting the services they expect and deserve.

Given this experience, it is the responsibility of all agencies to plan and gain legislative and executive sponsor approval for the requisite resources needed to guarantee comprehensive business process development, user acceptance testing, and stakeholder training prior to significant development investment.

Finally, we strongly agree that the state should address agency technology needs on an ongoing basis to ensure our heavy investments in these systems and capabilities do not fall into disrepair, become irrelevant to changing customer and business needs, or remain unprotected from increasing cybersecurity threats endangering citizen and government data, system performance, and reliability. All agencies should work with the legislature to ensure existing systems have funding secured for the future, and that future systems are resourced to operate and maintain their functionality for the system's expected lifecycle. We have worked to better identify the requisite staffing, operations, and maintenance needs for MNLARS to meet Minnesotans expectations regarding the MNLARS system, and we will work with the legislature to secure necessary and vital resources.

Once again, thanks to you and your team for your efforts with this complex special review. We look forward to continuing to inform your office, elected officials, and stakeholders about the ongoing progress being made on MNLARS and our efforts to reduce customer service frustrations.

Sincerely,



William Poirier
Acting Commissioner and State Chief Information Officer
Minnesota IT Services



John M. Harrington
Commissioner
Minnesota Department of Public Safety

February 5, 2019

Judy Randall, Deputy Legislative Auditor
Office of the Legislative Auditor
Centennial Office Building
658 Cedar Street
Saint Paul, MN 55155

Dear Ms. Randall,

Thank you for the opportunity to comment on the MNLARS Special Review. MNLARS was a long and complicated project and it is clear that great care was taken in gathering and analyzing the information for this report, drawing conclusions, and offering actionable recommendations.

Information Technology (IT) is not only critical for State government, it is foundational. Nearly every aspect of our lives is infused with technology, and by extension, government cannot function or serve its constituency without exceptional information technology. We must get IT right in the State of Minnesota.

Your report recommends governance. I agree. Yet, what is missing -- and critically needed -- is the legislature to oversee, be involved and likewise share accountability for the success of State IT.

I recommend the following: The Minnesota State Legislature needs to create a dedicated legislative committee with a charge to oversee the Office of Minnesota Information Technology Services (MNIT) and large IT projects. Currently, State IT and IT projects report to multiple legislative committees and there is not the time or ability to educate all of these committees on the complexity of executing information technology projects in state government. A legislative committee dedicated to understanding and overseeing State IT would be an invaluable asset to the legislature, the executive branch agencies, and the whole State.

The IT legislative committee will have a deep understanding of IT and be able to critique the health of MNIT and the projects it's executing with agencies in a meaningful and productive way. In the same way that MNIT partners with other state agencies to address the needs of Minnesotans, this committee needs to be the primary resource for other legislative committees that oversee those business agencies.

This committee will be able to assess the health of large IT projects, compare them to other state and industry projects, and evaluate how they are keeping pace with IT industry best practices. MNIT and its partner agency could report out to a joint hearing, for example, consisting of the new IT legislative committee and the Transportation, Finance and Policy committee, on both IT and business aspects of a given project.

This legislative IT committee needs to assess the systemic changes that must be made to increase the overall success rate of state IT projects and then take action appropriately. The legislature should immediately focus on the following areas: contracting, staffing, and The Project Management Triangle -- project budget, deadlines, and scope.

Contracting

State IT contracting has not kept pace with IT industry best practices (e.g., Agile Methodologies) and must be overhauled. State statutes regulating IT contracting are antiquated and have not changed in years. Because of this, private options for IT operations and development are limited, and when possible, are a significant challenge to manage. If a vendor is awarded too much responsibility, the State loses leverage and control. If multiple

vendors are hired, then coordination is difficult and finger pointing becomes the norm. State contracting laws, therefore, must be updated to allow the State the greatest flexibility and control. Currently, the State is not permitted to work closely with vendors during the contracting process. This is, however, exactly the time that a deeper partnership and collaboration is needed. Vendors would benefit from greater knowledge of a project, which, in turn, would lower the State's risk and costs and enable higher-value deliverables. An open and competitive process must be created that allows the State to partner earlier with potential vendors instead of having to stop all communications once a request for proposal is posted.

Staffing

The State must make its pay and benefits package competitive with IT salaries and benefits in the private sector and streamline the process for hiring. Hiring and retaining qualified IT workers in State government is difficult because demand for IT workers in the private sector is high and State pay scales do not compete. Further, the State hiring process takes so long that by the time a top candidate receives an offer, he or she has often accepted a position elsewhere. As a result, the ranks of IT staff are dangerously thin and many critical technical areas do not have adequate backup coverage.

Project Budget, Deadlines, and Scope - The Project Management Triangle

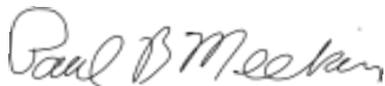
The legislative committee I propose must understand the dynamics of the Project Management Triangle and have a firm understanding of the status of a project. This will ensure that everyone has an accurate and reliable assessment of IT projects, and all parties can have informed conversations about budget, deadlines, and scope.

The quality of an IT system is dependent upon balancing three constraints: project budget, deadlines, and scope (system functionality). It is not possible to oversee a large project without understanding the interrelationship between these three factors for any particular project. Changes in one constraint require changes in others to compensate -- or quality will suffer. In replacing large government systems, there is an inherent minimum set of functionality that must be achieved for continuity of services. Deadlines are often mandated or legislated (e.g., REAL ID and Wheelage Tax). And, to get funding from the legislature, budgets are often estimated very early in multi-year projects, making them less reliable, and subsequent requests are discouraged. System quality is put at risk when none of the three constraints can be adjusted -- which is often the case with State IT projects.

The legislature needs a dedicated IT committee so it understands how systemic factors, if actively managed, can greatly increase the success rates of IT projects. Without this level of legislative involvement and activity, we will continue to see State IT projects that do not meet expectations, or worse, fail completely.

It was my honor to serve the State of Minnesota for over a decade. I care deeply about Minnesota and the ability of MNLARS to serve the people and businesses of Minnesota. The Special Review of MNLARS offers suggestions on how to improve government IT for the future. I hope my suggestions in this letter likewise offer a starting point to do just that.

Respectfully,



Paul B. Meekin

February 5, 2019

Mr. Alter,

I have carefully reviewed the “Special Review: Factors That Contributed to MNLARS Problems” audit and offer this letter as my response.

Before I dive into the details, I remind you that when I arrived in April of 2015,

- MNLARS had just severed its relationship with HP,
- the MN Legislature was very upset with the lack of MNLARS progress
- and the project was already staring at an extremely aggressive delivery schedule.
- As I shared and was summarized on page 27 and 28 the MNLARS leadership had already made several very poor fundamental decisions which put MNLARS on a high-risk path.

Given the above context, it is inconceivable that as a newly arrived MN.IT director, I would have been able to halt MNLARS, revisit those decisions and redo the architecture. The direction I was given was to do the best I could with a bad situation and deliver MNLARS, which I and many other dedicated individuals achieved.

Hindsight may be 20-20, but audit inquisitions only lead to revisionist history encouraging individuals and companies to point the finger towards someone else. The number of provably false statements about me within this report are beyond what I can memorialize in this response. However, I am providing the following details to help give readers of the report some factual perspective on the MNLARS project.

The value the State of MN received with the MNLARS Release

One aspect of this report that is puzzling to me is that the State of MN legislature and administration seem less concerned about the \$30 million spent from 2009 to 2014, for which the State of MN received almost no value than the \$35 million that was spent to build MNLARS for which the state received a much more secure software product build on current technologies with real-time capture of information. The recent MNLARS Transaction Accuracy audit is one example, specifically that MNLARS captures so much more data at such a much lower lever of granularity that literally, as the report references, for the first time ever the State of MN can know with certainty how much revenue is being collected and if fees are being correctly calculated.

Another troubling aspect of this report is that there is not a single mention of residents of MN who use the online DMV site. That site is the future of the MN DMV and residents should have equal representation on the MNLARS governing bodies to assure that future is realized.

One final benefit of the detailed MNLARS financial tracking is that in August of 2017, the first full production month of MNLARS, the Deputy Registrars collection \$3,368,816 in fees and one year later, in August of 2018, the Deputy Registrars collected in \$3,464,166, which is well within normal monthly fluctuations. So, the referenced harm to the Deputy Registrars throughout this report was certainly not reflected in their year over year income.

The Scope and Scale of MNLARS

Before I arrived, MNLARS leadership had decided to do a “big bang” release of their vehicle title and registration system. The figure below provides an overview of the MNLARS R1.2 numbers as of 1.31.17.

Release MV:

Release MV By the Numbers – as of 1.31.17

Release MV Area	“Number”
User Signup	Over 9000 Users to be Registered
User Agreements	Over 2900 New User Agreements
Plates and Fees	286 types of plates / 1160 Plate Fees (w/ dozens of exceptions)
Finance	1131 Line Items and 316 deposit locations
Data Conversion	93 Million Data Records Converted
Requirements	2162 Stories, 311 Features 38 Epics (Sub-Projects)
Software Product Size	Over 360K Lines of authored code (140 million generated)
Defects	2766 Total Defects (2639 Resolved - 127 still in flight)
Software Quality	4777 QA Test Cases / approx. 600 UAT Test Cases
Legacy Decommissioning	161 Jobs, 740 COBOL members and ~ 300 eSupport Jobs
MNLARS Infrastructure	Approx. 250 Servers, 14 separate environments

In addition to the work outlined above MNLARS also included

- an Identity Management solution,
- a Disaster Recovery solution,
- a Performance Monitoring solution,
- a secure File Transport facility and
- an Image Capture system.

It is also true that on June 7th of 2017 DVS produced a list of 90 items that they chose not to include in MNLARS’s production deployment. As a technology person I cannot opine if the correct functionality was excluded, but I can say that it represented approximately 22% of the overall requirements feature count. In addition to excluded functionality a number of “requirements gaps” were uncovered after production. Let me provide you two out of several dozen examples.

Example 1: Shortly after production, a “gap” was discovered with customers who started their MNLARS transaction online but for whatever reason chose to finish the transaction at a Deputy Registrar office. That scenario was missed and caused considerable confusion as the MNLARS team wrote code to fill the gap and the data team worked to assure those customers could complete their transactions. This scenario did not exist in the prior DVS business process; it was simply not imagined by individuals writing the business requirements.

Example 2: One way the public can renew their registration is by mail. The MNLARS team had completed and tested a batch job to do that work. However, no one still living knew how that job worked, so it was an unpleasant surprise when we discovered “gaps” that had to be quickly filled. It led to delayed registrations for those customers.

These gaps were unfortunate but when the scope is that large and the individuals who wrote the original system over the last several decades have departed; the customers simply cannot write requirements that they do not know exist and technology cannot build that function into the software product.

MNLARS Quality Assurance Testing

Throughout the audit there are numerous accusations concerning testing. Specifically, that we skipped various types of testing, did not conduct rigorous enough testing or as is implied, did not honestly and accurately share the quality assurance information. This is categorially not true.

Let me start with the assertion that MNLARS did not do adequate performance testing and database tuning. There are many documented examples of performance tuning but for the purposes of this response I offer a single summary slide which was provided by a Sogeti individual who conducted the final load testing results prior to the July 24th deployment.

Conclusion

Conclusion

Application tested in HA2 AWS environment. (50% Scale to prod)

- Application supported 700 concurrent users load
- Response times measured under expected levels with a few exceptions – within SLA
- System resources utilized were under threshold levels
- Achieved aggressive 1-hour ramp time – 450 Users in 45 minutes
- Verified work load from the main 3 transactions from last year are achievable
- Aimed for 20 TPS as peak x2 - Achieved 39 TPS
- Found the breaking point of the system in Scalability Test

Recommendations

- Instrument production environment with proper monitoring for both system level and application level and set alarms in case of failures
- Investigate and hotfix transactions with response times outside of SLAs

The first recommendation was implemented, and we investigated several long running transactions to understand the root cause.

Lack of regression testing was highlighted in several parts of the audit. MNLARS had two types of regression testing; several thousand automated tests that ran every time the MNLARS application was changed via a build process and manual regression testing which took approximately 3 weeks to complete. As mentioned in the audit, Sogeti, the MNLARS Quality Assurance vendor, was responsible for overall quality assurance testing.

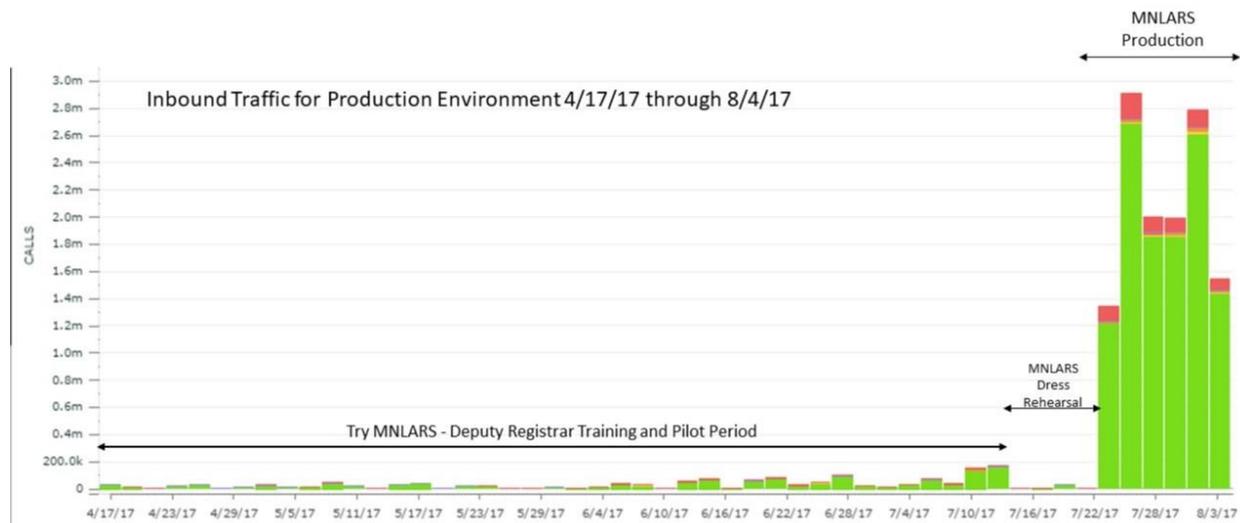
Software “bugs” and critical pre-production discovered “gaps” were also closely tracked in Rally. No known “bug” or “gap” was hidden from anyone and in fact every one of the key players had access to exactly the same real-time quality assurance (QA) information I did.

The portion of MNLARS which was the most difficult to test were the 27 distinct batch interfaces. Many of the batch interface partners simply did not have a robust test environment where we could do this testing. For example, the State of MN accounting system, SWIFT, told us they could only “desk check” our file before our production deployment.

Throughout this report Sogeti, the MNLARS QA vendor engages in serious revisionist history. It is simply not true that Sogeti provided information that was ignored by me or anyone else I am aware of within the MNLARS leadership.

Lack of a Deputy Registrar Partnership

Driver and Vehicle Services, not MN.IT, was responsible for interfacing with and providing training to the Deputy Registrars(DRs). DVS was responsible to triage any uncovered issues and provide them to the MNLARS team. There are references in the report that the Deputy Registrars reported issues to MNLARS during that “Check Out” period that were ignored. While I have no visibility to all “Check Out” issues reported to DVS by the DRs, I do know we had a process for DVS to report issues to MNLARS and the technical team worked the issues presented to us. I also do know that the Deputy Registrar traffic into MNLARS (see chart below) during the three-month training and practice period was extremely light which caused the MNLARS team to be concerned that the Deputy Registrars were not taking the MNLARS production launch seriously enough.



In closing, I have provided a few facts above but in general, I am greatly disturbed by the anonymous and unsubstantiated opinions used to impugn my character rather than a thoughtful, fact-based review resulting in actionable recommendations for MNLARS going forward. The State of MN must pivot from obsessing over MNLARS’ past and instead plot MNLARS’ future because the 21st century is here and the State of MN is behind the DMV curve.

Susan Rohde

Ms. Susan Rohde
2.5.2019

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