Developing IT governance at the Virginia Department of Transportation

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ABSTRACT

As an organization responsible for public safety and accountable to the Virginia Legislature, the Virginia Department of Transportation (VDOT) has had a long history of change, and its current federated hierarchy has sometimes led to problems when communication and integration are needed, especially when information technology is involved. Personnel changes in late 2015 have had a dramatic effect on the Information Technology Division (ITD) at VDOT. Over twenty-months planning into how to restructure the ITD occurred so that ITD's behaviors aligned with VDOT executives' expectations for VDOT's information systems (IS) and information technology (IT) assets, which has led to strategic alignment and governance challenges. The desire for an incorporated enterprise architecture, separate IT strategic planning from the IT Division, and negotiated responsibilities and improved organization relationships have been brought to light. To facilitate these goals, VDOT hired a Director of IT and an Enterprise Architect. In creating an Enterprise Architect, VDOT sought to provide forward-looking technology expertise that would ensure that VDOT leveraged the existing technology throughout the organization and that the appropriate technology was brought in to VDOT to provide needed business capabilities. Students are asked to consider the long history of VDOT and its past and current use of IT and ponder what these new executives should do moving forward to facilitate strategic alignment of IT and business processes, achieve governance and planning for the future.

Keywords: Information technology, governance, strategic planning, enterprise architecture

INTRODUCTION

> Highwayes shall be layd in such convenient places as are requisite accordinge as the Governor and Counsell or the Commissioners for the monthlie corts shall appoynt, or accordinge as the parishioners of every parish shall agree.
> — Virginia House of Burgesses (1632)

> Our mission is to plan, deliver, operate and maintain a transportation system that is safe, enables easy movement of people and goods, enhances the economy and improves our quality of life.
> — Virginia Department of Transportation (2014a)

The history of the Virginia Department of Transportation (VDOT) begins at the dawn of the twentieth century and closely aligns with the United States' increasing dependence on the internal combustion engine for its transportation. Using predominately publicly available information, we provide a brief history of the creation and evolution of VDOT, an explanation of the agency's organization, and an identification of the agency's significant constituencies and priorities.

The Virginia Department of Transportation is an Agency of the state government of Virginia. VDOT traces its history back to 1906 when the Virginia General Assembly (the government's legislative branch) created the State Highway Commission. This legislation authorized the Governor to appoint a commissioner who is subject to confirmation by the General Assembly (Virginia General Assembly, 2017). The commissioner had to be a citizen of Virginia, a civil engineer, and experienced in road-building. The General Assembly provided the commissioner with the following authority:

> Shall have a general supervision of the construction and repair of the main traveled roads in the state; the Commissioner may recommend to the local road authorities of any county, and to the Governor, needed improvements in the public roads; he shall supply technical information on road building to any citizen or officer of the state, and from time to time publish for public use such information as will be generally useful for road improvement. (VDOT, 2006, p. 20)

In 1922, the General Assembly divided the state into eight districts (the Northern Virginia District was added in 1984, and the current nine districts are shown in Figure 1 (Appendix). During a 1927 state government reorganization, the General Assembly created the Department of Highways, which was a state agency.

In 1974, the agency authority was expanded to include rail and public transportation and was named the Virginia Department of Highways and Transportation; in 1992, the legislature removed rail and public transportation from VDOT and created the Department of Rail and Public Transportation as an Agency under the Secretary of Transportation. The General Assembly renamed the agency most recently in 1986 to the Virginia Department of Transportation. Concurrently, the General Assembly expanded the state highway board and called it the Commonwealth Transportation Board (CTB); in 1990 the Secretary of Transportation was designated the Chair of the CTB Board, and VDOT's Commissioner was designated the Vice-Chair (VDOT, 2016a). In 2015, the legislature adjusted the membership of

the CTB removing the VDOT Commissioner as the Vice Chair and designating a senior non-legislative citizen to be appointed. Further, the Governor was provided authority to remove any CTB member for cause, e.g., malfeasance, misconduct, conflict of interest, etc. Also, the General Assembly changed the method to allocate transportation funding to a priority ranking system (Commonwealth of Virginia, 2015).

ORGANIZATION

Figure 2 (Appendix) shows VDOT's organization as of mid-2017. As shown, the agency's Commissioner directly manages the Deputy Commissioner, Chief Engineer, Human Resources, and Assurance and Compliance. The Deputy Commissioner is responsible for the Chief of Administration, Chief Financial Officer, Chief of Policy, and the managers of several administrative areas including communications, civil rights, strategy, public-private partnerships, and the research council.

The Chief Engineer is responsible for the operations of the districts and through the Deputy Chief Engineer, the VDOT's engineering areas, e.g., construction, planning, materials, bridges, traffic engineering. The Chief of Administration manages the Information Technology Division, which consists of Development, Division Relationship Management, Enterprise Architecture, IT Governance and Provisioning, and Maintenance and Operations (see Figure 3 (Appendix)).

There are two essential norms that the VDOT organization chart can only imply. First, VDOT is an engineering organization; this is evident from the use of the term *Chief* in several roles on the organization chart. The engineering norm is grounded in the agency's historical founding when a civil engineer led the organization; when throughout VDOTs history, many of its managers were Virginia Military Institute graduates; and presently that many of the agency's leadership are Professional Engineers. Second, VDOT is a federation.

The organization chart shows that the districts are currently the responsibility of the Chief Engineer (this reporting arrangement has varied; the Commissioner has been responsible for the districts). The districts are semi-autonomous organizations within VDOT that are expected to adhere to the policies established by VDOT's *Central Office*, which is in Richmond and consists of the various divisions and offices shown on the organization chart under the Deputy Commissioner and Deputy Chief Engineer. Further, as an executive branch agency, VDOT operates within a federation. Therefore, VDOT is part of a legislative-based federation and is operationally a geographically-based federation.

KEY STAKEHOLDERS AND PRIORITIES

Analyzing VDOT's fiscal year 2017 budget can provide an understanding of VDOT's complexity, significant stakeholders, and priorities. The Commonwealth of Virginia's fiscal year begins on July 1. When compared to the corporations on the Fortune 500 list, VDOT's fiscal year 2017 budget revenues of 5.358 billion dollars (VDOT, 2016b) would place VDOT in the 479th position (Fortune.com, 2017). In that position, VDOT would be slightly larger than the Western & Southern Financial Group, which is a Cincinnati-based financial services and insurance business that has nearly 2,200 employees. VDOT would be marginally smaller than the Englewood, Colorado-based CH2M Hill, whose 22,000 employees work on large-scale engineering projects such as the Panama Canal expansion. Other well-known corporations whose

revenues are about the same as VDOT (i.e., between about five and six billion dollars) include Levi Strauss, Keurig Green Mountain, Magellan Health, Caesars Entertainment, Adobe Systems, Williams-Sonoma, M&T Bank Corporation, Neiman Marcus Group, Big Lots, Simon Property Group, Booz Allen Hamilton Holding, Owens Corning, Western Union, St. Jude Medical, Alaska Air Group, J. M. Smucker, Mattel, United Rentals, Marathon Oil, Harley-Davidson, Dr. Pepper Snapple Group, and JetBlue Airways.

Most of these corporations are well known throughout the country and commonly considered substantial organizations. The scope of these organization's activities throughout the United States, and in many cases internationally, is accomplished through complex organizing and processes, i.e., each of these corporations is a complex system. VDOT significantly differs from these Fortune 500 corporations in two ways: the political boundaries of the state of Virginia confine VDOT's operations, and the Virginia legislature has granted VDOT near exclusive authority within the state to perform its activities. Nevertheless, VDOT's fiscal year 2017 funding places it on par with the Fortune 500 corporations previously described. Therefore, when considering VDOT as a holistic organization rather than as an element of the government of the state of Virginia, it is a complex system, i.e., VDOT accomplishes its activities through complex organizing and processes.

Comparing VDOT to Fortune's ranking of corporations by revenue equates VDOT's funding to a Fortune 500 corporation's revenue. While this equivalence is valid from the perspective of an accountant's Balance Sheet, it is not equivalent from the perspective of entities from whom these revenues originate, e.g., customers, creditors, shareholders. Figure 4 (Appendix) shows the relative contribution of the sources of VDOT's funding.

The largest source of funds is the United States government (19.2%), taxes on motor vehicle sales and use (16.4%), and taxes on fuel (15.5%) (VDOT 2016b, 9). VDOT receives dedicated funds through tolls and other fees that are passed through to transportation authorities in Northern Virginia and Hampton Roads (9.3%). The agency makes use of GARVEE bonds (4.2%), which is a financing vehicle authorized in the Code of the United States that enables states to borrow against future expected (although not guaranteed) federal highway funding. From the perspective of funding, VDOT's significant stakeholders are the United States government, Virginia tax-payers, and the Virginia Legislature.

Figure 5 (Appendix) shows how VDOT allocates funding to its programs and operations. As shown, VDOT uses nearly 65% of the funds for construction and maintenance programs, which is about $3.5 billion for the purchase of materials and related services, e.g., consulting, design, contractors. The next largest allocation is for locality assistance and authorities. These nearly one-billion dollars provide funding to cities and towns for improvements or maintenance of roads or transportation facilities, for specific recreational access programs, and for dedicated tax revenues to transportation authorities in Northern Virginia and Hampton Roads. VDOT spends slightly over $200 million for its internal administrative and support services of which nearly $90 million is for information technology. In addition to these internal support services, VDOT spends about 70 million dollars for activities that other state agencies provide to support VDOT's programs. These agencies include the Department of Motor Vehicles, the Virginia Commercial Space Flight Authority, the Virginia State Police, the Department of Minority Business Enterprise, the Office of the State Inspector General, and the Department of Emergency Management. From the perspective of spending, VDOT's significant stakeholders include the transportation industry, Virginia municipalities and residents, and certain Virginia state agencies, departments, and authorities.

VDOT is required to maintain the existing transportation infrastructure and then to construct new infrastructure. Figure 5 (Appendix) clearly shows this priority: the largest funded areas are highway system maintenance, highway construction, and assistance to localities, which receives about 80% of the agency's funding. As shown in Figure 6 (Appendix), most new construction funding is for specialized state and federal projects, transportation authorities, and projects that the state had funded before the change in the funding prioritization rules in 2016.

Figure 6 (Appendix) shows that most maintenance funding is for the secondary road system (the roads throughout Virginia designated as a county route. Virginia is one of the few states that maintain county roads), primary road system (the roads throughout Virginia designated as a US route or a state highway), locality assistance, and the interstate road system. Next, VDOT provides construction and maintenance pass-through funding for the transportation authorities in Northern Virginia and Hampton Roads (Virginia Law stipulates that the Hampton Roads funding may only be used for new construction projects). The least allocation of new construction and maintenance funds is to existing infrastructure or projects of regional importance: high priority (projects that are significant for statewide corridors or regional networks), transportation operation services (which seek to improve the transportation system's mobility, safety security, and reliability of the time needed to travel through the transportation system), and state of good repairs (a program that rebuilds or replaces structurally deficient state-owned bridges. The program also rehabilitates interstate and primary road pavement).

ASSESSING INFORMATION TECHNOLOGY

> The challenge facing IT organizations is to optimize these factors [budget, infrastructure, resources] and achieve the maximum value for the organization.
> — Business Consultant (2014)

In December 2015 VDOT's staff received an email announcement from the Chief of Administration that a new leader of the Information Technology Division (ITD) would be starting at VDOT the next month. The announcement was not a usual personnel welcome where this newly announced leader was succeeding the current ITD leader. Instead, this leadership announcement was the culmination of over twenty-months planning into how to restructure ITD, i.e., how to align ITD's behaviors with VDOT executives' desirable behaviors for VDOT's information systems (IS) and information technology (IT) assets. VDOT's Information Technology Division has a long and proud history; as described by a VDOT executive:

> … When VDOT ran our ITD shop solely - I would say that there were times when we were great at IT and delivering projects: keeping project owners happy; having a help desk; just generally keeping the customer happy; having the newest desktop, whatever the newest thing was - always being on top of that in a leading edge way, while not using unnecessary things; and then being so forward thinking and on the cutting edge of what is out there in technology and always bringing that into VDOT. ...people would say we were number one for a long time. We may still be up there in the top five; but I would say, we are living on our old reputation because, in contrast, we no longer control all ITD decisions or projects or new technological advances that have application for VDOT.

The Governor, the Federal Highway Administration, and the transportation industry have recognized VDOT's Information Technology Division for its IT solutions. The most long-lasting of these recognitions have been VDOT's use of technology to improve the transparency for the public of VDOT's transportation projects. A decade ago, the agency needed the means to improve the perception of the public of its competence in managing and delivering transportation projects; it also needed to incentivize itself to improve its project delivery. ITD was enlisted to design and deploy VDOT's Dashboard, which is a website that provides project performance indicators. In responding to this strategic imperative, ITD created an innovative solution that foreshadowed contemporary business analytic technology.

Based on the Dashboard project (and other projects), ITD has benefited from its stakeholders' perception of the division's delivery effectiveness and inventiveness; however, this stakeholder perception has camouflaged the growing gap between the Information Technology Division's performance and VDOT's desired IT delivery performance. For instance, a VDOT senior manager explained that:

> Up to about two years ago, there was no governance; the IT Director [at that time] decided what projects ITD would do. An example of the problems with the old process is Virginia Roads; it was an idea of the Commissioner, and the IT Director decided that we would do it. He [the IT Director] authorized the project and had resources moved from projects that were underway. The business owners of the affected projects were not told of the new [Virginia Roads] project, and there were many questions about the delays to their project. They [the business owners] did not know that work on the Virginia Roads project would also give them features for their project. I believe that we thought the Virginia Roads project would be done in a couple of months; it took a year.

At the beginning of 2014, VDOT hired a business consulting firm to assess ITD and identify areas for improvement (Business Consultant, 2014, p. 5). In their final report, the consultants identified ITD's strengths, which included:

1. … [ITD has] demonstrated an ability to deliver quality solutions when given clear direction from agency leadership;
2. … [ITD has completed] several projects that have had a positive influence on the public's perception of the agency;
3. … [ITD] supports the largest user of information and technology within the Commonwealth of Virginia;
4. … [ITD has] a strong and dedicated management team who has a tremendous focus on customer satisfaction;
5. … [ITD has] managers that have a sense of accountability for when things have gone off track in the past;
6. …[ITD] participates in knowledge-sharing initiatives with other agencies in the Commonwealth, … as well as other departments of transportation and transportation organizations; and
7. … [ITD's] enterprise data management team supports all activities related to the compilation and reporting of performance data to the Federal Highway Administration (Business Consultant, 2014, p. 7).

The Consultants found several challenges within the IT Division in four broad areas: 1. strategic alignment (Henderson & Venkatraman, 1993), governance (Luftman, Papp, & Brier, 1999), and IT pipeline management; 2. organizational structure; 3. application delivery process; and 4. resource utilization and management. The strategic alignment and governance challenges included:

1. there is not a strategic vision for technology to support VDOT's overall agency strategic vision;
2. there is limited governance structure representing the perspectives of both the business and ITD to help approve and prioritize application delivery requests according to an agency strategic vision;
3. there are limited controls and workflows that govern the IT request approval process;
4. there is a lack of well-defined application architecture, guiding principles, and standard decision-making and prioritization criteria; and
5. there is a lack of an established set of information technology metrics and reporting mechanisms to provide agency leadership and business stakeholders with visibility into ITD's performance (Business Consultant, 2014, p. 8).

In assessing how ITD operated, a senior IT manager described ITD staff's perspective at the end of 2015 as follows:

> … you want to know what are the rules by which we are going to operate; … you found that there were very few rules that were there, and the rules that were there were very old and viewed with contempt and not viewed as serving the staff that needed to execute them. … we did not have that foundation by which to make decisions. We did have that baseline. So, what you have was more of an anarchy situation where every project was running its way, trying to make it work, trying to achieve outcomes and results as best they could without really having the guidance of a strong policy function to support them.

REIMAGINING THE INFORMATION TECHNOLOGY DIVISION

Among the interview data is an understanding from the participating executives and managers of VDOT's use of the consultant's assessment and recommendations for the ITD. Working with the consultant's report, VDOT's senior leadership worked to redefine the agency's approach to incorporating and using IT assets. The executives and senior managers (the senior management team) incorporated enterprise architecture, separated IT strategic planning from the ITD, and negotiated responsibilities and organization relationships. While the executives viewed the planning for the ITD to be a reimagining of IT governance and management, the senior management team viewed this effort as devising a new IT management structure; they did not consider their work as re-imagining VDOT's corporate governance. As a VDOT executive explained, "Technology is moving quicker now then we can keep up with … So, when you go in and say governance, it is very hard to separate governance from operations."

As the senior management team shaped the plans for the ITD, nothing changed within the ITD: the ITD staff continued reporting to the same managers, using the then existing processes, and working the in-progress projects. However, there were two organizational changes: VDOT did not initiate new projects; and the Commissioner announced the creation of the Office of Technology Strategic Planning (OTSP) on June 15, 2015. The Commissioner stated that OTSP

would be led by the then current ITD manager and would report to the Chief Deputy Commissioner. In the announcement, the Commissioner explained the responsibilities of OTSP as follows:

> In addition to business integration responsibilities, the Office will also develop the department's information technology strategic plan, strategic goals, and objectives, and will include the Information Security function to ensure effective assessment of technology security controls and eliminate any potential conflicts of interest (VDOT, 2015).

Concurrent with creating OTSP, VDOT's Enterprise Application Office[1] was transferred to the Virginia Department of Accounts. The Commissioner explained this Commonwealth-level IT organization change on VDOT's planning for ITD:

> VDOT is in the process of implementing recommendations from a 2014 study of Information Technology Division's delivery of technology solutions. One recommendation was to create a Business Integration Office to serve as a liaison between the application business user and the programmer/developer. … While VDOT hoped to evolve the Enterprise Application Office as the business integration function, the migration to DOA removed that option (VDOT, 2015).

In creating OTSP, VDOT divided IT responsibilities three ways: ITD is responsible for IT policies, implementing IT, and operating IT; OTSP is responsible for the IT security policies, IT portfolio curation, and the IT strategic plan; and the Strategic Technology Investment Board (STIB) is responsible for oversight of the IT portfolio, i.e., ITD and OTSP present IT initiatives to the STIB for approval to initiate the proposed IT effort. A Virginia Information Technologies Agency (VITA) staff member explained that VITA requires the IT Strategic Plan of all Executive-branch agencies and is a significant part of VITA's governance oversight. The IT Strategic Plan includes VDOT's significant IT initiatives for multiple fiscal years. The VITA staff member explained,

> The IT strategic planning includes multiple fiscal years, not just the current fiscal year. … We [VITA] have a group called the IT Investment Management Group where agencies must develop information technology strategic plans once a year. Now, they can modify those plans throughout the year, but we endeavor to get them to develop their strategic plan, which would be all contracts over $250,000 and all projects over $250,000 to be included in their strategic plan in advance.

Further, the IT Strategic Plan is intended to be a component of the agency's portfolio management. The VITA staff member observed:

> …Strategic planning should belong in the IT Division, done by both the person who has to balance current operations with new efforts. Just like on the construction side, the Chief Engineer has to balance current operations with new construction.

[1] VDOT partnered with the Department of Accounts to implement a fiscal management system, known as Cardinal. By 2014 over fifty percent of state agencies had transitioned to using Cardinal and VDOT's Enterprise Application Office was responsible for the technical support. Planned for some time, the Department of Accounts assumed full responsibility of Cardinal in the summer of 2015 and the VDOT staff in the Enterprise Application Office were transferred to the Department of Accounts. All state agencies were transitioned to Cardinal in early 2016.

In operationalizing OTSP, VDOT purposefully aligned the strategic planning and portfolio curation processes with VITA's processes. Further, in creating the STIB, VDOT mirrored the Chief Engineer's practice to work with many stakeholders, including senior VDOT managers and executives, to establish the strategic construction priorities.

By the end of 2015, the senior management team completed its planning and purposefully began recruiting leadership, which culminated with December's announcement of the Director of IT and an announcement in January of the hiring of an Enterprise Architect; the remainder of the IT Director's team would be in place by June 2016. In creating an Enterprise Architect, VDOT sought to provide forward-looking technology expertise that would ensure that the existing technology was leveraged throughout the organization and that the appropriate technology was brought in to VDOT to provide needed business capabilities.

QUESTIONS FOR DISCUSSION

- What should the senior management team do with respect to improving IT at VDOT?
- What should they do with respect to implementing governance?
- How should they align business and IT processes at VDOT?
- What are some steps VDOT could take to implement a new culture with respect to IT?
- How does VDOT prepare for the future and satisfy its stakeholders?

TEACHING NOTE

A detailed Teaching Note for this case study can be obtained by contacting the first author.

APPENDIX

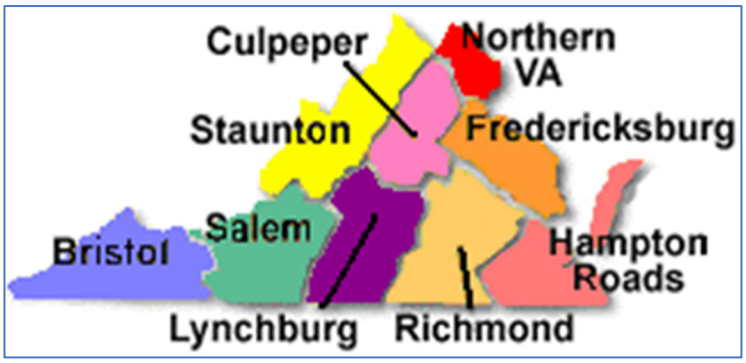

Figure 1. VDOT District Map (VDOT, 2014b)

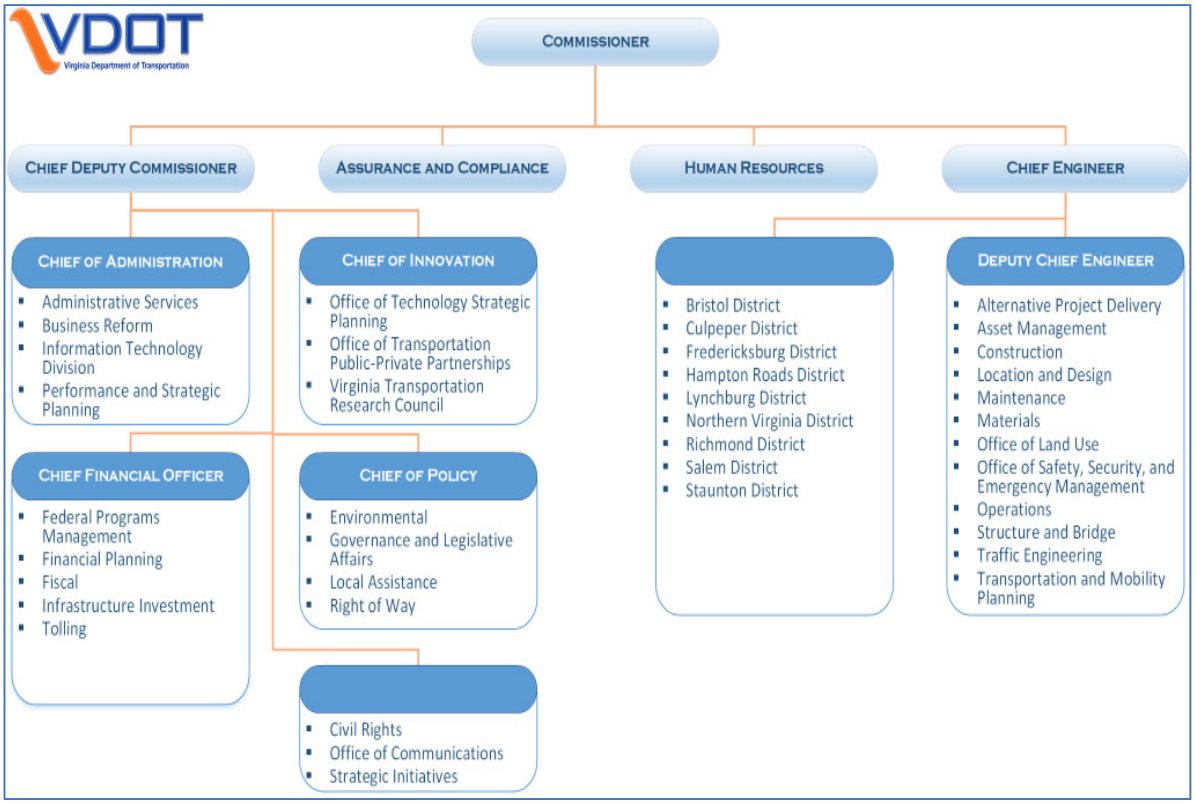

Figure 2. Organization of the Virginia Department of Transportation (adapted from VDOT (2017))

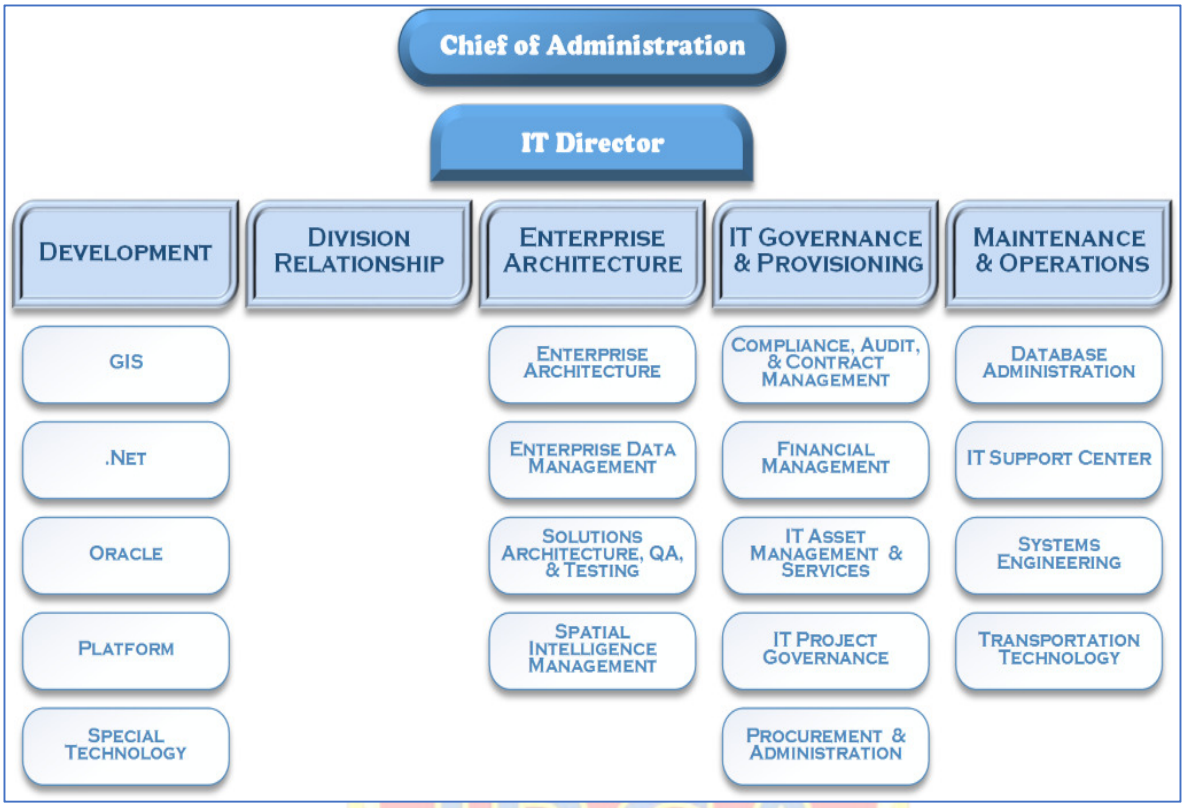

Figure 3. Organization of the VDOT Information Technology Division (adapted from VDOT (2017))

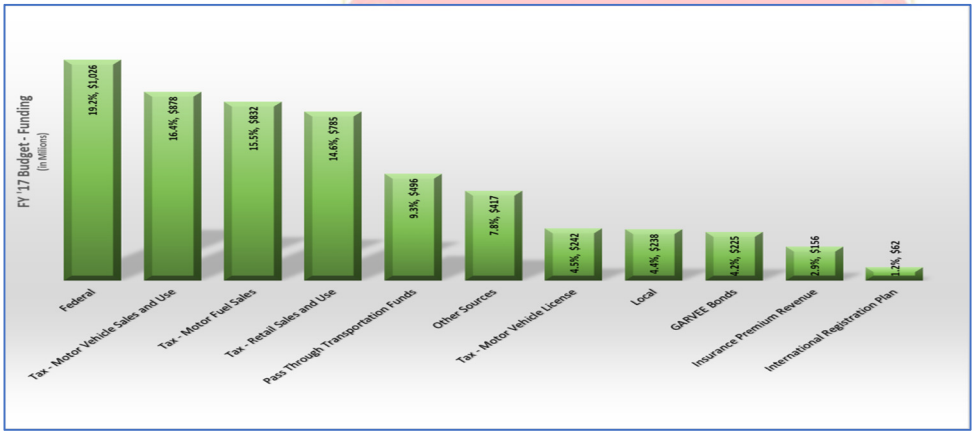

Figure 4. Fiscal Year 2017, Sources of Transportation Funds (adapted from VDOT (2016b))

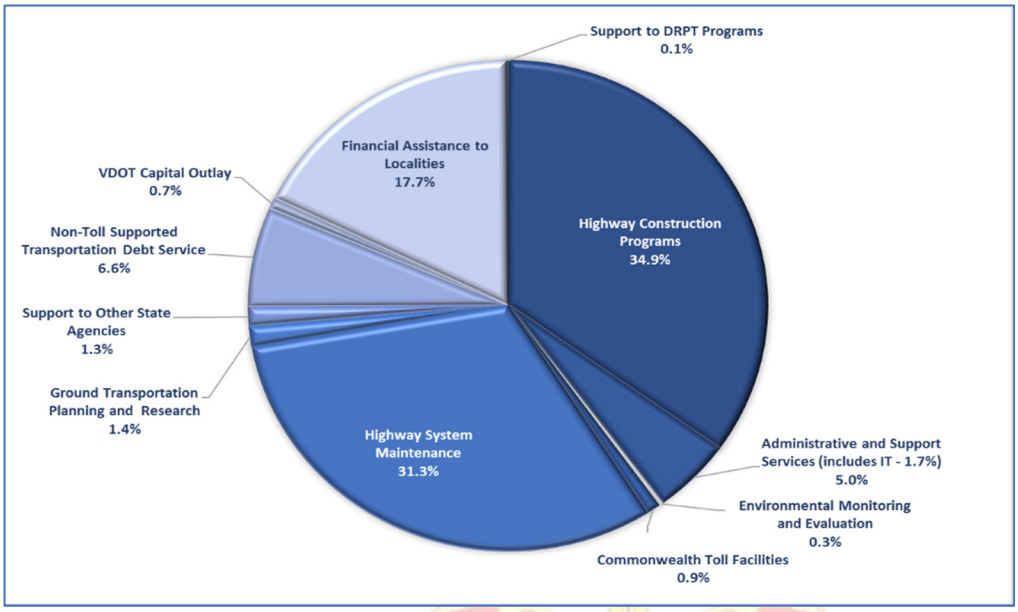

Figure 5. Use of Transportation Funds - Fiscal Year 2017 (adapted from VDOT (2016b))

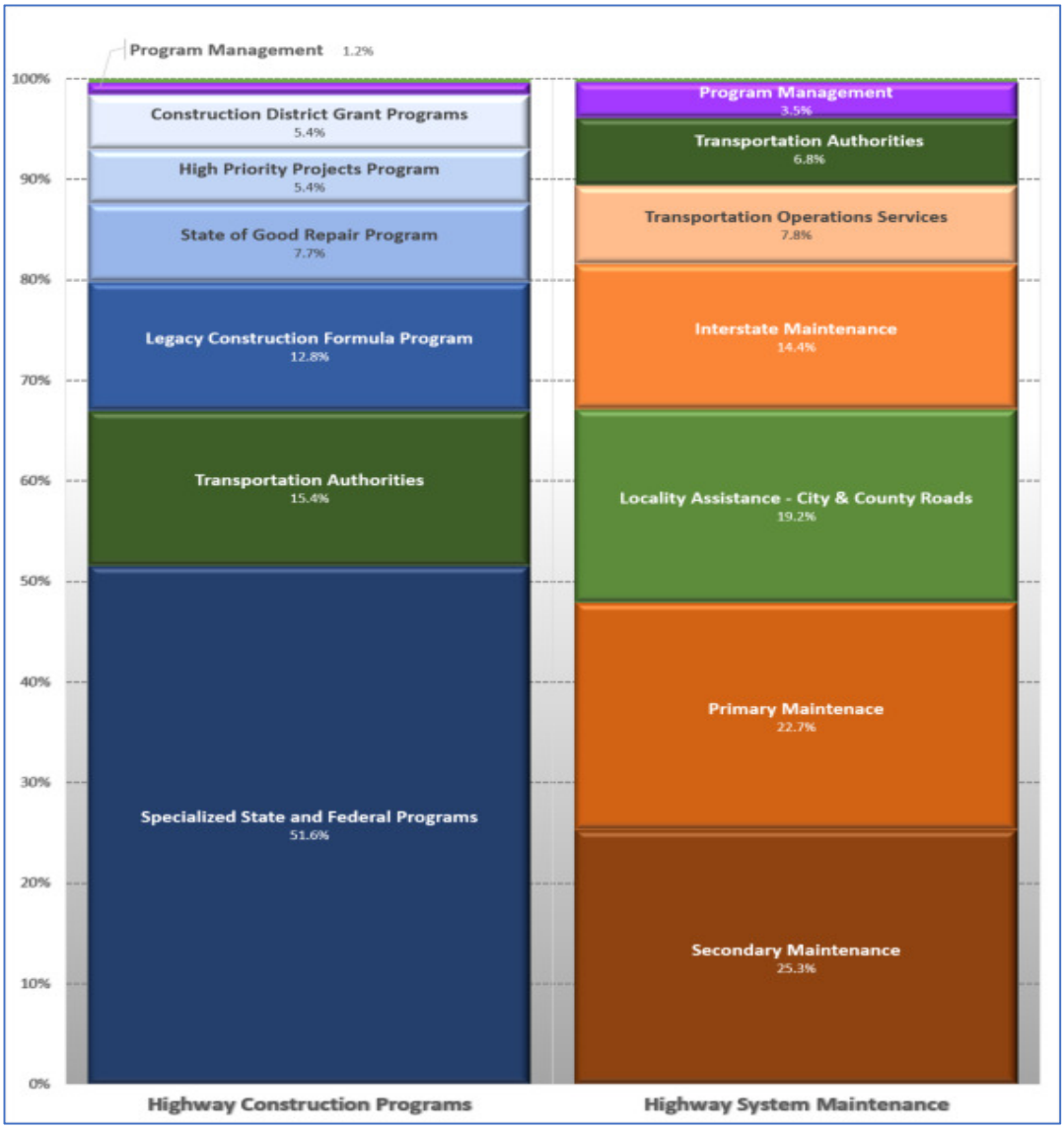

Figure 6. Highway Construction and System Maintenance Funding – Fiscal Year 2017 (adapted from VDOT (2016b))

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