



Commonwealth of Virginia
Virginia Information Technologies Agency

NEXT GENERATION SOFTWARE ANALYTICS

Optional Use Contract

Date: December 30, 2015

Contract #: VA-150915-DELC

Authorized User: Authorized User (AU): All public bodies, including VITA, as defined by §2.2-4301 and referenced by §2.2-4304 of the *Code of Virginia*. Also includes private institutions of higher education chartered in Virginia and granted tax-exempt status under §501(c)(3) of the Internal Revenue Code. A list of the private institutions eligible to use this contract can be found at: <http://www.cicv.org/Our-Colleges/Profiles.aspx>.

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FIN: 06-1454513

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Pricing: Exhibit B

Term: September 15, 2015 – September 14, 2018

Payment: Net 30 days

For Additional Information, Please Contact:

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NOTES: Individual Commonwealth of Virginia employees are not authorized to purchase equipment or services for their personal use from this Contract.

For updates, please visit our Website at <http://vita2.virginia.gov/procurement/contracts.cfm>

VIRGINIA INFORMATION TECHNOLOGIES AGENCY (VITA): Prior review and approval by VITA for purchases in excess of \$100,000.00 is required for State Agencies and Institutions only.



Information Technology Solution Contract

between

The Virginia Information Technologies Agency

on behalf of

The Commonwealth of Virginia

and

Deloitte Consulting LLP

**INFORMATION TECHNOLOGY SOLUTION CONTRACT
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INFORMATION TECHNOLOGY SOLUTION CONTRACT

THIS INFORMATION TECHNOLOGY Solution CONTRACT ("Contract") is entered into by and between the Virginia Information Technologies Agency (VITA) pursuant to §2.2-2012 of the Code of Virginia and on behalf of the Commonwealth of Virginia (hereinafter referred to as "VITA"), and Deloitte Consulting LLP ("Supplier"), a limited liability partnership headquartered at 30 Rockefeller Center, New York, NY 10112 to be effective as of September 15, 2015 ("Effective Date").

1. PURPOSE AND SCOPE

This Contract sets forth the terms and conditions under which Supplier shall provide next generation software analytics services to the Authorized Users. This includes those services needed to deploy and tune next generation software analytics tools, and training services. These tool sets include Business Intelligence (BI), predictive, prescriptive, statistical analytics, simulation, data visualization, data quality, data governance, unstructured data, Hadoop, and MapReduce. This Contract shall only be used for services to support the above next generation software analytics tools. This Contract shall not be used for general staff augmentation or other unrelated services.

2. DEFINITIONS

A. Acceptance

Successful delivery and performance by the Supplier of its contractual commitments at the location(s) designated in the applicable Statement of Work or order, including completed and successful Acceptance testing in conformance with the Requirements as defined by the Authorized User and Supplier in the applicable Statement of Work or order.

B. Agent

Any third party independent agent of any Authorized User.

C. Authorized Users

Except for telecommunications contracts, means all public bodies, including VITA, as defined by §2.2-4301 and referenced by §2.2-4304 of the Code of Virginia. Authorized Users shall include private institutions of higher education that are listed at: <http://www.cicv.org/Our-Colleges/Profiles.aspx>.

D. Business Day/Hour

Normal operating hours for the Commonwealth of Virginia: Monday-Friday, 8 a.m.-5 p.m. Eastern Standard/Daylight Time, unless otherwise specified on the applicable order or Statement of Work, excluding Commonwealth-designated holidays.

E. Computer Virus

Any malicious code, program, or other internal component (e.g., computer virus, computer worm, computer time bomb, or similar component), which could damage, destroy, alter or disrupt any computer program, firmware, or hardware or which could, in any manner, reveal, damage, destroy, alter or disrupt any data or other information accessed through or processed by such software in any manner.

F. Confidential Information

Any confidential or proprietary information of a Party that is disclosed in any manner, including oral or written, graphic, machine readable or other tangible form, to any other Party in connection with or as a result of discussions related to this Contract or any order or SOW issued hereunder, and which at the time of disclosure either (i) is marked as being "Confidential" or "Proprietary", (ii) is otherwise reasonably identifiable as the confidential or proprietary information of the disclosing Party, or (iii) under the circumstances of disclosure should reasonably be considered as confidential or proprietary information of the disclosing Party or (iv)

is identifiable or should be reasonably considered as protected health information; (v) any personally identifiable information, including information about VITA's employees, contractors, and customers, that is protected by statute or other applicable law.

G. Deliverable

The tangible embodiment of the Services, Maintenance Services, Licensed Services, Solution, Component, Software, plans, reports, data, Product, Supplier Product and Updates created and provided by the Supplier in fulfilling its obligations under the Contract as identified in the applicable Statement of Work or order, including the development or creation of Work Product, if Work Product is authorized under the Contract.

H. Desktop Productivity Software

Commercial Off-The-Shelf software (COTS) general in nature, not broad enterprise applications, which can be purchased and used immediately "as is," without modification, in the same form in which it was sold in the commercial marketplace. Standard options are not considered modifications.

I. Documentation

Those materials (including user manuals, training materials, guides, product descriptions, technical manuals, product specifications, supporting materials and Updates) detailing the information and instructions needed in order to allow any Authorized User and its Agents or Application Users to make productive use of the Application, Software, Solution, Component, Product, Service, Licensed Services or Deliverable, and to implement and develop self-sufficiency with regard to the Application, Software, Solution, Component, Product, Service, Licensed Services or Deliverable, provided by Supplier in fulfilling its obligations under the Contract or as may be specified in any Statement of Work or order issued hereunder.

J. Electronic Self-Help

Any use of electronic means to exercise Supplier's license termination rights, if allowable pursuant to the Contract, upon breach or cancellation, termination or expiration of this Contract or any Statement of Work or order placed hereunder.

K. Health Record

"Health record" means any written, printed or electronically recorded material maintained by a health care entity in the course of providing health services to an individual concerning the individual and the services provided. "Health record" also includes the substance of any communication made by an individual to a health care entity in confidence during or in connection with the provision of health services or information otherwise acquired by the health care entity about an individual in confidence and in connection with the provision of health services to the individual. (§ 32.1-127.1:03, Code of Virginia)

L. Maintenance Coverage Period (MCP)

The term during which Maintenance is to be provided for a unit of Software or Product.

M. Maintenance Level

The defined parameters of Maintenance Services, including the times during which and time-frames in which Supplier shall respond to a request for Maintenance Services. The available Maintenance Levels shall be as defined herein or as defined in any Statement of Work or order issued hereunder. The actual Maintenance Level for a unit of Software or Product shall be set forth in the executed order or Statement of Work for Maintenance of that Software or Product referencing this Contract.

N. Maintenance Services (or “Maintenance” or “Software Maintenance”)

If authorized by the Contract, means those services, preventive and remedial, provided or performed by Supplier under the Contract or for an Authorized User in order to ensure continued operation of the Software or Product, including Software Updates. Maintenance Services shall include support services. Software Maintenance Services may include the development of Work Product, if so authorized in the Contract.

O. Party

Supplier, VITA or any Authorized User.

P. Protected Health Information

Protected health information means individually identifiable health information that is (i) transmitted in electronic media, (ii) maintained in electronic media, or (iii) transmitted or maintained in any other form or medium. Protected health information excludes individually identifiable health information in (a) education records covered by the Family Educational Rights and Privacy Act (20 U.S.C. § 1232g); (b) records of any student who is 18 years of age or older, or is attending a postsecondary school, that are made or maintained by a physician, psychiatrist, psychologist, or other recognized professional or paraprofessional acting in his professional or paraprofessional capacity, or assisting in that capacity, and that are made, maintained, or used only in connection with the provision of treatment to the student and are not available to anyone other than persons providing such treatment, except that such records may be personally reviewed by a physician or other appropriate professional of the student's choice; and (c) employment records held, in its role as employer, by a health plan, health care clearinghouse, or health care provider that transmits health information in electronic form. (§ 37.2-1032, Code of Virginia)

Q. Receipt

An Authorized User or its Agent has physically received or has unfettered access to any Deliverable at the correct “ship-to” or electronic location.

R. Requirements

The functional, performance, operational, compatibility, Acceptance testing criteria and other parameters and characteristics of the Product, Software, Solution, Component, Service(s), Application and Licensed Services and Deliverables, as authorized by the Contract and/or as set forth in Exhibit A and/or the applicable Statement of Work or order and such other parameters, characteristics, or performance standards that may be agreed upon in writing by the Parties.

S. Services

Any work performed or service provided by Supplier in fulfilling its obligations under the Contract or, as applicable, any Statement of Work or order issued under the Contract, including design, and development of software and modifications, software updates, solution, products, implementation, installation, maintenance, support, testing, training, or other provision to the Authorized User of any Deliverable described in the applicable Statement of Work or order, as authorized by the Contract scope. As permitted by the scope of the Contract, may include the creation, or development of Work Product, if any. If Work Product is authorized, refer to definition for Work Product. This definition does not include Licensed Services.

T. Software

If Software is authorized under the Contract, means the programs and code provided by Supplier under the Contract or any order or SOW issued hereunder as a component(s) of any Deliverable or Component of any Solution, and any subsequent modification of such programs and code, excluding Work Product. For COTS (boxed) software, means the programs and code, and any subsequent releases, provided by Supplier under this Contract as described on Supplier's US and International price lists in effect at time of Authorized User's placement of order or Statement of

Work. For Software Maintenance contracts Software also includes the programs and code provided by Supplier under the Contact or any order or SOW issued hereunder in the form of Software Updates.

U. Software Publisher

If Software is authorized under the Contract, means the licensor of the Software, other than Supplier, provided by Supplier under this Contract.

V. Statement of Work (SOW)

The document template attached as Exhibit D (describing the deliverables, due dates, assignment duration and payment obligations for a specific project, engagement, or assignment that Supplier commits to provide to an Authorized User), which, upon signing by both Parties, shall be deemed a part of the Contract.

W. Supplier

Means Deloitte Consulting LLP.

X. Update

As applicable, any update, modification or new release of the Software, System Software, Application, Documentation or Supplier Product that Supplier makes generally available to its customers at no additional cost. Software Updates include patches, fixes, upgrades, enhancements, improvements, or access mode, including without limitation additional capabilities to or otherwise improve the functionality, increase the speed, efficiency, or base operation of the Software.

Y. Supplier Technology

Works of authorship, materials, information and other intellectual property (i) created by Supplier or its subcontractors prior to or independently of the performance of the Services, or (ii) created by Supplier or its subcontractors as a general consulting tool for their use in performing the Services (but for clarification purposes, excluding Work Product and Deliverables), plus any modifications or enhancements to (i) and (ii) and derivative works based thereon.

Z. Work Product

Inventions, combinations, machines, methods, formulae, techniques, processes, improvements, software designs, computer programs, strategies, specific computer-related know-how, data and original works of authorship (collectively, the "Work Product") created, or developed by Supplier, or jointly by Supplier and an Authorized User(s), for the Authorized User in the performance of this Contract. Work Product shall not include configuration of software.

3. TERM AND TERMINATION

A. Contract Term

This Contract is effective and legally binding as of the Effective Date and, unless terminated as provided for in this Contract, shall continue to be effective and legally binding for a period of three (3) years. VITA, in its sole discretion, may extend this Contract for up to two (2) additional one (1) year periods after the expiration of the initial three (3) year period. VITA will issue a written notification to the Supplier stating the extension period thirty (30) days prior to the expiration of any current term. In addition, performance of an order or SOW issued during the term of this Contract may survive the expiration of the term of this Contract, in which case all contractual terms and conditions required for the operation of such order or SOW shall remain in full force and effect until all of Supplier's obligations pursuant to such order or SOW have met the final Acceptance criteria of the applicable Authorized User.

B. Termination for Convenience

VITA may terminate this Contract, in whole or in part, or any order or SOW issued hereunder, in whole or in part, or an Authorized User may terminate an order or SOW to which it is a party, in whole or in part, in each case upon not less than thirty (30) days prior written notice at any time for any reason.

C. Termination for Breach or Default

VITA shall have the right to terminate this Contract, in whole or in part, or any order or SOW issued hereunder, in whole or in part, or an Authorized User may terminate an order or SOW, in whole or in part, for breach and/or default of Supplier. Supplier shall be deemed in breach and/or default in the event that Supplier fails to meet any material obligation set forth in this Contract or in any order or SOW issued hereunder.

If VITA deems the Supplier to be in breach and/or default, VITA shall provide Supplier with notice of breach and/or default and allow Supplier fifteen (15) days to cure the breach and/or default. If Supplier fails to cure the breach as noted, VITA may immediately terminate this Contract or any order or SOW issued hereunder, in whole or in part. If an Authorized User deems the Supplier to be in breach and/or default of an order or SOW, such Authorized User shall provide Supplier with notice of breach and/or default and allow Supplier fifteen (15) days to cure the breach and/or default. If Supplier fails to cure the breach and/or default as noted, such Authorized User may immediately terminate its order or SOW, in whole or in part. Any such termination shall be deemed a Termination for Breach or Termination for Default. In addition, if Supplier is found by a court of competent jurisdiction to be in violation of or to have violated 31 USC 1352 or if Supplier becomes a party excluded from Federal Procurement and Nonprocurement Programs, VITA may immediately terminate this Contract, in whole or in part, for breach, and VITA shall provide written notice to Supplier of such termination. Supplier shall provide prompt written notice to VITA if Supplier is charged with violation of 31 USC 1352 or if federal debarment proceedings are instituted against Supplier.

D. Termination for Non-Appropriation of Funds

All payment obligations from public bodies under this Contract are subject to the availability of legislative appropriations at the federal, state, or local level, for this purpose. In the event of non-appropriation of funds, irrespective of the source of funds, for the items under this Contract, VITA may terminate this Contract, in whole or in part, or any order or SOW, in whole or in part, or an Authorized User may terminate an order or SOW, in whole or in part, for those goods or services for which funds have not been appropriated. Written notice will be provided to the Supplier as soon as possible after legislative action resulting in such non-appropriation is completed.

E. Effect of Termination

Upon termination, neither the Commonwealth, nor VITA, nor any Authorized User shall have any future liability except for Deliverables accepted by the Authorized User or Services, including as applicable, Licensed Services and Maintenance Services, rendered by Supplier and accepted by the Authorized User prior to the termination date.

In the event of a Termination for Breach or Termination for Default, Supplier shall accept return of any Deliverable that was not accepted by the Authorized User(s), and Supplier shall refund any monies paid by any Authorized User for such Deliverable, and all costs of de-installation and return of Deliverables shall be borne by Supplier.

F. Termination by Supplier

Termination by Supplier will not be considered.

G. Transition of Services

Prior to or upon expiration or termination of this Contract, or the applicable SOW, and at the request of VITA, Supplier shall provide all assistance as VITA or an Authorized User may reasonably require to transition the Supplier's contractual obligations, or any portion thereof, as requested by VITA or the Authorized User, to any other supplier with whom VITA or such Authorized User contracts for provision of same. This obligation may extend beyond expiration or termination of the Contract for a period not to exceed six (6) months. Supplier shall provide such assistance at the hourly rate or a charge agreed upon by Supplier and VITA or an Authorized User.

H. Contract Kick-Off Meeting

Within 30 days of Contract award, Supplier may be required to attend a contract orientation meeting, along with the VITA contract manager/administrator, the VITA and/or other agency project manager(s) or authorized representative(s), technical leads, VITA representatives for SWaM and Sales/IFA reporting, as applicable, and any other significant stakeholders who have a part in the successful performance of this Contract. The purpose of this meeting will be to review all contractual obligations for both parties, all administrative and reporting requirements, and to discuss any other relationship, responsibility, communication and performance criteria set forth in the Contract. The Supplier may be required to have its assigned account manager as specified in Section 6.0 and a representative from its contracts department in attendance. The time and location of this meeting will be coordinated with Supplier and other meeting participants by the VITA contract manager.

I. Contract Closeout

Prior to the contract's expiration date, Supplier may be provided contract close out documentation and shall complete, sign and return to VITA Supply Chain Management within 30 days of receipt. This documentation may include, but not be limited to: Patent/Royalty Certificate, Tangible Property/Asset Certificate, SWaM Reports Completion Certificate, other required Small Business (SWaM) Procurement Plan compliance/variance and non-SWaM spend documentation as described in the Reporting section of this Contract, Sales Reports/IFA Payments Completion Certificate, and Final Payment Certificate. Supplier is required to process these as requested to ensure completion of close-out administration and to maintain a positive performance reputation with the Commonwealth of Virginia. Any closeout documentation not received within 30 days of Supplier's receipt of the Commonwealth's request will be documented in the contract file as Supplier non-compliance. Supplier's non-compliance may affect any pending payments due the Supplier, including final payment, until the documentation is returned.

4. SUPPLIER PERSONNEL**A. Selection and Management of Supplier Personnel**

Supplier shall take such steps as may be necessary to ensure that all Supplier personnel performing under this Contract are competent and knowledgeable of this Contract and the applicable order or SOW between Authorized User and Supplier in order for them to comply with this Contract. As between the parties, Supplier shall be solely responsible for the conduct of its employees, agents, and subcontractors, including all acts and omissions of such employees, agents, and subcontractors, and shall require that such employees and subcontractors comply with the appropriate Authorized User's applicable site security (while on such Authorized User's premises), information security and personnel conduct rules (while on such Authorized User's premises), of which Supplier is apprised in writing in advance of execution hereof, as well as applicable federal, state and local laws, including export regulations. Authorized User reserves the right to require the immediate removal from such Authorized User's premises of any employee, subcontractor or agent of Supplier whom such Authorized User believes has failed to comply with the above or whose conduct or behavior is unacceptable or unprofessional or results in a security or safety breach.

B. Supplier Personnel Supervision

Supplier acknowledges that Supplier or any of its agents, contractors, or subcontractors, is and shall be the employer of Supplier personnel, and shall have sole responsibility to supervise, counsel, discipline, review, evaluate, set the pay rates of, provide (to the extent required by law) health care and other benefits for, and terminate the employment of Supplier personnel. Neither VITA nor an Authorized User shall have any such responsibilities for Supplier or subcontractor personnel.

C. Key Personnel

An order or SOW may designate certain of Supplier's personnel as Key Personnel or Project Managers. Supplier's obligations with respect to Key Personnel and Project Managers shall be described in the applicable order or SOW. Failure of Supplier to perform in accordance with such obligations may be deemed a default of this Contract or of the applicable order or SOW.

D. Subcontractors

Supplier shall not use subcontractors to perform its contractual obligations under the Contract or any order or SOW issued thereunder unless specifically authorized in writing to do so by the Authorized User. If an order or SOW issued pursuant to this Contract is supported in whole or in part with federal funds, Supplier shall not subcontract to any subcontractor that is a party excluded from Federal Procurement and Nonprocurement Programs. In no event shall Supplier subcontract to any subcontractor which is debarred by the Commonwealth of Virginia or which owes back taxes to the Commonwealth and has not made arrangements with the Commonwealth for payment of such back taxes.

If Supplier subcontracts the provision of any performance obligation under this Contract to any other party, Supplier will (i) act as prime contractor and shall be the sole point of contact with regard to all obligations under this Contract, and (ii) hereby agrees that it shall be responsible for any authorized subcontractors' performance in accordance with the warranties set forth in this Contract.

5. NEW TECHNOLOGY**A. Access to New Technology**

Supplier will bring to VITA's attention any new products or services within the scope of the Contract that it believes will be of interest to VITA and will work to develop proposals for the provision of any such products or services as VITA requests.

B. New Service Offerings Not Available from Supplier

If new or replacement product or service offerings become available to VITA under the scope of the Contract, and cannot be competitively provided by the Supplier, VITA may purchase such new or replacement products or services from a third party, and Supplier will reasonably assist VITA to migrate to such products or services, if VITA elects to use such new or replacement product or service offerings. Such assistance will be charged at Supplier's rates identified in Exhibit B, and performed as agreed to in a SOW.

If VITA elects to acquire new products or services as described in the above paragraph and such services replace existing Supplier-provided services, discount tiers and any commitments (as applicable per the Contract) will be reduced to reflect reductions in purchases of the replaced products or services.

6. SERVICES

A. Nature of Services and Engagement

This Contract is optional use and non-exclusive and all Authorized Users may, at their sole discretion, receive benefits from third party suppliers of services similar to, or in competition with, services provided by Supplier.

By operation of this Contract, any order or SOW resulting in a commitment of any individual employee or contractor of Supplier, whether employed by Supplier or a contractor or subcontractor of Supplier, for more than one thousand (1,000) hours of work during any six (6) month period or of any such individual employee or contractor for more than eight (8) months in any twelve (12) month period and VITA or Authorized User has co-employment concerns, Supplier shall cooperate to address these concerns, which may include removal/replacement of such individual employee or contractor of Supplier.

B. Acceptance

Service(s) shall be deemed accepted when the Authorized User determines that such Service(s) meets in all material respects the Requirements set forth in the applicable order or SOW. If applicable, Supplier shall be responsible for ensuring that any individual Deliverable functions with any other Deliverable provided pursuant to the order or SOW in conformity in all material respects with the Requirements. Until Acceptance of the final Deliverable under the applicable SOW, should a previously Accepted Deliverable require further modification in order to conform in all material respects to its Requirements regarding working properly with any other Deliverable or in order for the other Deliverable to conform in all material respects to its Requirements regarding working properly with such Deliverable, Supplier shall be responsible for all costs associated with such modification.

Authorized User shall commence Acceptance testing within three (3) business days, or within such other period as set forth in the applicable order or SOW, after receipt of the Service. Acceptance testing will be no longer than fifteen (15) business days, or such longer period as may be agreed in writing between Authorized User and Supplier, for each Deliverable or for the first instance of each Service type set forth in Exhibit B. Supplier agrees to provide to the Authorized User such assistance and advice as the Authorized User may reasonably require, at no additional cost, during such Acceptance testing. Authorized User shall provide to Supplier written notice of Acceptance or rejection, reasonably describing the basis thereof, within such Acceptance testing period. Should Authorized User fail to provide Supplier written notice of successful or unsuccessful Acceptance testing within the Acceptance testing period, the Service shall be deemed Accepted. In the event of a conflict, the most recent Accepted Deliverable documenting Requirements/designs/decisions shall take precedence over a previously Accepted Deliverable addressing those Requirements/designs/decisions.

C. Cure Period

Supplier shall correct any material non-conformities identified in the rejection notice during Acceptance testing and re-submit such non-conforming Service for re-testing within seven (7) days of the appropriate Authorized User's written notice of non-conformance, or as otherwise agreed between such Authorized User and Supplier in the applicable order or SOW. The Authorized User shall have five (5) days to review and accept or reject in writing such resubmitted Service, or as otherwise agreed between such Authorized User and Supplier in the applicable order or SOW. Should Supplier fail to cure the non-conformity after two correction attempts, the Authorized User may, in its sole discretion: (i) reject the Service in its entirety, and any Service rendered unusable due to the non-conforming Service, and recover amounts previously paid hereunder for all such Services; (ii) issue a "partial Acceptance" of the Service with an equitable adjustment in the price to account for such deficiency; or (iii) conditionally accept the applicable Service while reserving its right to revoke Acceptance if timely correction is not forthcoming. Failure of a Service to meet, in all material respects, the Requirements after

the second set of acceptance tests may constitute a default by Supplier. In the event of such default, the Authorized User may, at its sole discretion, terminate its order or SOW, in whole or in part, for the Services to be provided thereunder by Supplier.

7. RIGHTS TO WORK PRODUCT

If Authorized User is a state agency, board, commission, or other quasi-political entity of the Commonwealth of Virginia or other body referenced in Title 2.2 of the Code of Virginia, any license to Supplier Technology shall be held by, and all rights in, title to, and ownership of Work Product shall vest with the Commonwealth. If Authorized User is a locality, municipality, school, school system, college, university, local board, local commission, or local quasi-political entity, any license to Supplier Technology shall be held by, and all rights in, title to, and ownership of Work Product shall vest with that public body. If Authorized User is a private institution of higher education which is listed at: <http://www.cicv.org/Our-Colleges/Profiles.aspx>, any license to Supplier Technology shall be held by, and all rights in, title to, and ownership of Work Product shall vest with that private institution.

A. Work Product

VITA and Supplier each acknowledge that performance of this Contract may result in Work Product. The Parties shall document all Work Product specifications and such specifications shall be made an incorporated exhibit to this Contract. Supplier agrees that it shall promptly and fully disclose or deliver to the Commonwealth or the Authorized User any and all Work Product generated, conceived or reduced to practice by Supplier or any of its employees, either solely or jointly with others, during the term or performance of this Contract, which in any way relates to the business of the Commonwealth, VITA or any Authorized User. Supplier further agrees that neither Supplier nor Supplier's employees, contractors, agents or subcontractors, nor any party claiming through Supplier or Supplier's employees, shall, other than in the performance of this Contract, make use of or disclose to others any VITA or Authorized User proprietary information relating to the Work Product. All Services performed hereunder shall include delivery of all source and object code and all executables and documentation for all Work Product. Supplier shall at no time deny access to the Work Product, regardless of form, by the Commonwealth or the Authorized User.

B. Ownership

Rights and license granted under this Section "Rights to Work Product" are subject to payment to Supplier for the applicable Deliverable. Supplier agrees that, whether or not the Services are considered "works made for hire" or an employment to invent, all Work Product discovered, created or developed under this Contract shall be and remain the sole property of the Commonwealth and its assigns or the Authorized User and its assigns. Except as specifically set forth in writing and signed by both VITA and Supplier, or Authorized User and Supplier, Supplier agrees that the Commonwealth or the Authorized User shall have all rights with respect to any Work Product discovered, created or developed under this Contract without regard to the origin of the Work Product.

If and to the extent that Supplier may, under applicable law, be entitled to claim any ownership interest in the Work Product, Supplier hereby irrevocably transfers, grants, conveys, assigns and relinquishes exclusively to the Commonwealth or the Authorized User any and all right, title and interest it now has or may hereafter acquire in and to the Work Product under patent, copyright, trade secret and trademark law in perpetuity or for the longest period otherwise permitted by law. If any moral rights are created, Supplier waives such rights in the Work Product. Supplier further agrees as to the Work Product to assist the Commonwealth or the Authorized User in every reasonable way to obtain and, from time to time, enforce patents, copyrights, trade secrets and other rights and protection relating to the Work Product, and to that end, Supplier and its employees shall execute all documents for use in applying for and obtaining such patents, copyrights, and other rights and protection, and in protecting trade secrets, with respect to such

Work Product, as the Commonwealth or the Authorized User may reasonably request, together with any assignments thereof to the Commonwealth or the Authorized User or entities designated by the Commonwealth or the Authorized User.

C. Pre-existing Work

If and to the extent that any Supplier Technology rights are embodied or reflected in the Work Product, Supplier hereby grants to the Commonwealth or the Authorized User the irrevocable, perpetual, non-exclusive, worldwide, royalty-free right and license to (i) use, execute, reproduce, display, perform, distribute copies of and prepare derivative works based upon such Supplier Technology and any derivative works thereof, in connection with its internal use, execution, reproduction, display, performance, distribution, and preparation of derivative works of, as applicable, such Work Product, and (ii) authorize others to do any or all of the foregoing on its behalf.

D. Return of Materials

Upon termination of this Contract or in the event Authorized User terminates any order or SOW issued hereunder, Supplier shall immediately return to VITA or the appropriate Authorized User all copies, in whatever form, of any and all Confidential Information, Work Product and other properties provided by VITA or such Authorized User, which are in Supplier's possession, custody or control, except that Supplier may retain copies, subject at all times to Supplier's obligation to maintain confidentiality in accordance with the terms of this Contract. Any such retention of copies by Supplier excludes any personally identifiable information, including information about VITA's employees, contractors, and customers, that is protected by statute or other applicable law, or Protected Health Information.

8. GENERAL WARRANTY

Supplier warrants and represents to VITA the following:

A. Ownership

To the best of its knowledge, Supplier has the right to perform and provide all contractual obligations and provide all needed services and Deliverables without violating or infringing any law, rule, regulation, copyright, patent, trade secret or other proprietary right of any third party.

B. Reserved

C. Performance Warranty

Supplier warrants and represents the following with respect to Performance:

All contractual obligations shall be performed with care, skill and diligence, consistent with or above applicable professional standards currently recognized in Supplier's profession

D. Documentation and Deliverables

Supplier warrants the following as applicable to the Contract:

Supplier warrants that the Documentation and all modifications or amendments thereto which Supplier is required to provide under this Contract shall be sufficient in detail and content to allow a user/programmer to understand fully the Solution or Solution Component or to load/use/operate the Software without reference to any other materials or information.

E. Malicious Code

Supplier has used commercially reasonable efforts through quality assurance procedures to ensure that there are no Computer Viruses or undocumented features in any Solution, Solution Component, Deliverables, Product, Software, System Software, Update, Application and/or Licensed Service, as obligated and provided by Supplier under the order or SOW, at the time of delivery to the Authorized User. Supplier warrants that it has used commercially reasonable

efforts to avoid Supplier's inclusion in the Solution, Solution Components, Deliverables, Product, Software, System Software, Update, Application and/or Licensed Services, as obligated and provided by Supplier under the order or SOW does not contain any embedded device or code (e.g., time bomb) that is intended to obstruct or prevent any Authorized User's use of the Solution, Solution Components, Deliverables, Product, Software, System Software, Application and/or Licensed Service.

Notwithstanding any rights granted under this Contract or at law, Supplier hereby waives under any and all circumstances any right it may have or may hereafter have to exercise Electronic Self-Help. Supplier agrees that an Authorized User may pursue all remedies provided under law in the event of a breach or threatened breach of this Section, including injunctive or other equitable relief.

F. Open Source

Supplier will notify the applicable Authorized Users if the Solution, Solution Components, Deliverables, Product, Software, Updates, Application and/or Licensed Services, as obligated and provided by Supplier, contains any Open Source code and identify the specific Open Source License that applies to any embedded code dependent on Open Source code, provided by Supplier under this Contract.

G. Supplier's Viability

Supplier warrants that it has the financial capacity to perform its obligations under this Contract; that Supplier has no constructive or actual knowledge of a potential legal proceeding being brought against Supplier that could materially adversely affect performance of this Contract; and that entering into this Contract is not prohibited by any contract, or order by any court of competent jurisdiction.

H. Supplier's Experience

Supplier warrants that it will perform its contractual obligations and fulfill the Requirements as set forth in Exhibit A and in this Contract, with skill and experience.

THE OBLIGATIONS OF SUPPLIER UNDER THIS GENERAL WARRANTY SECTION ARE MATERIAL. SUPPLIER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY CONCERNING MERCHANTABILITY OR FITNESS FOR ANY OTHER PARTICULAR PURPOSE.

9. FEES, ORDERING AND PAYMENT PROCEDURE

A. Fees and Charges

As consideration for the Supplier's performance obligations and any additional products and services provided hereunder to an Authorized User in accordance with the scope of this Contract and the Requirements, as authorized by Exhibit A, and per the Authorized User's order or SOW, an Authorized User shall pay Supplier the fee(s) set forth on Exhibit B, which lists any and all fees and charges. The fees and any associated discounts shall be applicable throughout the term of this Contract; provided, however, that in the event the fees or discounts apply for any period less than the entire term, Supplier agrees that it shall not increase the fees more than once during any twelve (12) month period, commencing at the end of year one (1). No such increase shall exceed the lesser of three percent (3%) or the annual increase in the Consumer Price Index for All Urban Consumers (CPI-U), U.S. City Average, All Items, Not Seasonally Adjusted, as published by the Bureau of Labor Statistics of the Department of Labor (<http://www.bls.gov/cpi/home.htm>), for the effective date of the increase compared with the same index one (1) year prior. Any such change in price shall be submitted in writing to VITA and to the Authorized User if such change impacts any SOW or order and in accordance with the above and shall not become effective for sixty (60) days thereafter. Supplier agrees to offer price reductions to ensure compliance with the Competitive Pricing Section.

B. Ordering

Notwithstanding all Authorized User's rights to license or purchase Supplier's products or services under this Contract, an Authorized User is under no obligation to purchase or license from Supplier any of Supplier's products or services. This Contract is optional use and non-exclusive, and all Authorized Users may, at their sole discretion, purchase, license or otherwise receive benefits from third party suppliers of products and services similar to, or in competition with, the products and services provided by Supplier.

Supplier is required to accept any order or placed by an Authorized User through the eVA electronic procurement website portal (<http://www.eva.virginia.gov/>). eVA is the Commonwealth of Virginia's e-procurement system. State agencies, as defined in §2.2-2006 of the Code of Virginia, shall order through eVA. All other Authorized Users are encouraged to order through eVA, but may order through the following means:

- i. Purchase Order (PO): An official PO form issued by an Authorized User.
- ii. Any other order/payment charge or credit card process, such as AMEX, MASTERCARD, or VISA under contract for use by an Authorized User.

This ordering authority is limited to issuing orders or SOWs for the contractual offerings and Requirements available under the scope of this Contract. Under no circumstances shall any Authorized User have the authority to modify this Contract. An order or SOW from an Authorized User may contain additional terms and conditions; however, to the extent that the terms and conditions of the Authorized User's order or SOW are inconsistent with the terms and conditions of this Contract, the terms of this Contract shall supersede.

Notwithstanding the foregoing, Supplier shall not accept any order or SOW from an Authorized User if such order or SOW is to be funded, in whole or in part, by federal funds and if, at the time the order or SOW is placed, Supplier is not eligible to be the recipient of federal funds as may be noted on any of the Lists of Parties Excluded from Federal Procurement and Nonprocurement Programs.

ALL CONTRACTUAL OBLIGATIONS UNDER THIS CONTRACT IN CONNECTION WITH AN ORDER OR SOW PLACED BY ANY AUTHORIZED USER ARE THE SOLE OBLIGATION OF SUCH AUTHORIZED USER AND NOT THE RESPONSIBILITY OF VITA UNLESS SUCH AUTHORIZED USER IS VITA.

C. Reproduction Rights for Supplier-Provided Software

If applicable under a SOW, at the Authorized User's request, Supplier shall provide the Authorized User with a reproducible diskette or CD of Software and Updates. Such Authorized User shall be responsible for making copies and distributing the Software and Updates as required.

D. Reimbursement of Expenses

If allowable pursuant to an Authorized User's Statement of Work, such Authorized User shall pay, or reimburse Supplier, for all reasonable and actual travel-related expenses for greater than thirty (30) miles from portal to portal incurred by Supplier during the relevant period; provided, however, that such Authorized User shall only be liable to pay for Supplier's travel-related expenses, including transportation, meals, lodging and incidental expenses, that have been authorized by such Authorized User in advance in the Statement of Work and which will be reimbursable by such Authorized User at the then-current per diem amounts as published by the Virginia Department of Accounts (<http://www.doa.virginia.gov/>, or a successor URL(s)). Authorized Users who are not public bodies may have their own per diem amounts applicable to Supplier's pre-approved travel expenses.

All reimbursed expenses will be billed to the Authorized User on a pass-through basis without any markup by Supplier. At Authorized User's request, Supplier shall provide copies of receipts for all travel expenses over US\$30.00.

E. Reserved

F. Statement of Work

An SOW, the template provided in Exhibit D, shall be required for any orders placed by an Authorized User pursuant to this Contract. Supplier shall perform any and all contractual obligations at the times and locations set forth in the applicable SOW and at the rates set forth in Exhibit B herein. Unless VITA issues a written authorization for a time and materials type SOW, any SOW shall be of a fixed price type but may, with the written approval of VITA, contain a cost-reimbursable line item(s) for pre-approved travel expenses. In furtherance of compliance, invoicing, and auditing requirements, for time and materials type SOWs, Supplier personnel shall maintain daily time records of hours and tasks performed, which shall be submitted or made available for inspection by the Authorized User upon forty-eight (48) hours advance written notice.

Any change to an SOW must be described in a written change request (template provided as Exhibit E). Either Party to an SOW may issue a change request that will be subject to written approval of the other Party before it becomes part of this Contract. In no event shall any SOW or any modification thereto require the Supplier to provide any products or services that are beyond the scope of this Contract as such scope is defined in Exhibit A hereto.

G. Supplier Quote and Request for Quote

Should an Authorized User determine that a competitive process is required to ensure it receives the best value for its needed solution, product and/or services under this contract, such Authorized User may, at its sole discretion, on a case-by-case basis and upon approval by VITA, use a Request for Quote (RFQ) process to obtain identical or similar solutions, products and/or services to those provided by Supplier pursuant to this Contract. The RFQ process is typically used when an Authorized User requires a complete solution that may be fulfilled by Products and Services herein, but whose complexity or size may result in economies that could not be passed on to the Authorized User within the confines of the established contract catalog discount pricing. When an RFQ is used, the project timing and requirements will be clearly outlined in the RFQ document. In some situations, the Authorized User may not identify the exact specifications required. If that is the case, the RFQ respondents will be given the opportunity to identify and propose their recommended specifications.

Supplier may respond to the RFQ by providing a quote, which may, as applicable, include (a) a detailed description of each product or service proposed, including such product and services components, at the Exhibit B line item level, (b) the quantity of each such component, (c) the contract price, (d) any additional percentage discount offered, and (e) an extended price. If requested by the Authorized User, Supplier's quote shall also include a proposal describing the approach Supplier plans to take in developing, implementing, and maintaining its offering for the Authorized User. Should Supplier be unable or choose not to respond to the RFQ due, for example, to resource constraints, Supplier shall notify Authorized User in writing of its decision not to perform the work requested by such Authorized User prior to the due date for the submission of quotes in response to the RFQ.

H. Invoice Procedures

Supplier shall remit each invoice to the "bill-to" address provided with the order promptly after all Supplier's performance obligations have been accepted and in accordance with the milestone payment schedule, if any, in the applicable order or SOW. Payment for any software

maintenance/support services, as authorized in the Contract and the Authorized User's applicable order or SOW, shall be annually in arrears unless otherwise stated herein, or in any order or SOW referencing this Contract. No invoice shall include any costs other than those identified in the executed order or SOW, which costs shall be in accordance with Exhibit B. Without limiting the foregoing, all shipping costs are the Supplier's responsibility except to the extent such charges are identified in Exhibit B, or as noted in any executed order or SOW referencing this Contract. Invoices issued by the Supplier shall identify at a minimum:

- i. Dates/periods that invoice covers, including any service or subscription periods, as applicable.
- ii. Line item description of the Deliverable(s), Product(s), Software, Hardware, Services, Solution and Solution Components, Maintenance Services, and/or Licensed Services, as applicable to this Contract, including components thereof or service type, and, if applicable, the project milestone.
- iii. Quantity, charge and extended pricing for each line item
- iv. Applicable order and/or SOW date
- v. This Contract number and the applicable order number and/or SOW number
- vi. Supplier's Federal Employer Identification Number (FEIN)

Any terms included on Supplier's invoice shall have no force or effect and will in no way bind VITA or any Authorized User.

I. Purchase Payment Terms

Supplier is responsible for the accuracy of its billing information. Supplier agrees not to issue invoices hereunder until Supplier's performance obligations have been accepted in accordance with the milestone payment schedule, if any, in the applicable order or SOW, or until after services have been rendered. Charges for Deliverables, components or services accepted more than ninety (90) days prior to receipt of a valid invoice may not be paid. Should Supplier repeatedly over bill an Authorized User, such Authorized User may assess a one percent (1%) charge for the amount over-billed for each month that such over-billing continues and is not promptly returned or corrected.

Timing of payment will be pursuant to the terms incorporated in Section 23.B

10. REPORTING

Supplier is required to submit to VITA the following monthly reports:

- i. Report of Sales; and
- ii. Small Business Procurement and Subcontracting Report

These reports must be submitted using the instructions and further detailed requirements and templates found at the following URL: <http://www.vita.virginia.gov/scm/default.aspx?id=97>

Suppliers are encouraged to review the site periodically for updates on Supplier reporting requirements and methods.

In conjunction with the requirements in the Invoice Procedures section of this Contract, Supplier shall provide to VITA within 30 days of the date of expiration of the contract an accompanying statement certifying that Supplier has fully complied with the Contract's Small Business (SWaM) Procurement Plan, and if Supplier has not fully complied, provide a written explanation of any variances between such Plan and the actual participation. The Supplier's compliance confirmation and/or written explanation of variance shall be maintained by VITA, in the contract file.

Failure by Supplier to comply with its contractually obligated Small Business (SWaM) Procurement Plan may prohibit or delay any renewals of the Contract. Also, Supplier's failure to comply with its

Small Business (SWaM) Procurement Plan or to explain any variance between the proposed Plan and actual SWaM subcontracting spend may result in the withholding of any final payment due Supplier.

Failure to comply with all reporting requirements may result in default of the Contract.

11. STATUS MEETINGS

(Optional per Project)The Account Team will be prepared to conduct monthly stewardship meetings with VITA to provide a broad review of all services, projects and ongoing operations. Supplier should also be prepared to conduct semi-annual meetings/presentations to discuss new products and services and their potential benefit to VITA.

12. STEERING COMMITTEE

(Optional per Project)In order to facilitate mutually beneficial contractual relationships with suppliers, VITA has procedures for establishing a steering committee ("Steering Committee"), consisting of senior management personnel, including personnel involved in the contractual relationship, from VITA and Supplier.

Roles of the Steering Committee include but are not be limited to a) identifying potential issues which may arise during the performance of a contract, b) discussing and assigning roles and responsibilities, c) establishing methods for quickly resolving potential disputes, d) setting rules for communication and decision making, e) monitoring and measuring the business relationship between the parties, and f) acting as a final decision board for escalated problems.

A meeting of the Steering Committee is intended to be a forum for brainstorming and sharing ideas, emphasizing respect, cooperation, and access, with the end goal of developing relationships to avoid conflict. A facilitator may, but is not required to, conduct a meeting of the Steering Committee.

A Steering Committee for this Contract will be formed at VITA's option. Meetings may be held at any time during the Contract term, should VITA, at its sole discretion, determine that a meeting(s) would be beneficial to the contractual relationship, and Supplier agrees to participate in such meeting(s). In addition, Supplier may at any time submit a written request to VITA for a meeting of the Steering Committee, which VITA will not unreasonably deny.

Supplier shall ensure the availability of the appropriate personnel to meet with the VITA contract management team. Additional Steering Committee meetings involving representatives from VITA, the Supplier, and an Authorized User may be required prior to or during performance on any specific SOW issued pursuant to this Contract.

13. RESERVED

14. TRAINING AND DOCUMENTATION

A. Training

Any training needs will be addressed in the applicable SOW. Supplier shall provide personnel sufficiently experienced and qualified to conduct such training at a time and location mutually agreeable to Supplier and Authorized User. Available additional and optional training, and applicable pricing and discounts, are described in Exhibit B.

B. Documentation

If Documentation is a required Deliverable in an applicable SOW, Supplier shall deliver to Authorized User three (3), or such number as agreed upon between the parties under an order or SOW, complete hard copies or electronic media of Documentation applicable to Supplier's Deliverable provided to Authorized User, as requested by such Authorized User. Should Supplier revise or replace the Documentation, or should Documentation be modified to reflect Updates,

Supplier shall deliver to the Authorized User such updated or replacement Documentation, in the same quantity and media format as originally requested by such Authorized User, or as agreed upon between the parties. Any Authorized User shall have the right, as part of any license grant, to make as many additional copies of the Documentation, in whole or in part, for its own use as required. Such Documentation shall be revised to reflect any modifications, fixes or updates made by Supplier. Any Authorized User shall have the right, as part of the license granted by Supplier, at its own discretion, to take all or portions of the Documentation, modify or completely customize it in support of the authorized use of the licensed application or software and may duplicate such Documentation and include it in such Authorized User's document or platform. All Authorized Users shall continue to include Supplier's copyright notice.

15. AUTHORIZED USER SELF-SUFFICIENCY

Pursuant to an order or SOW an Authorized User may require that Supplier provide to Authorized User a detailed plan to develop Authorized User self-sufficiency and to transition operation and management to Authorized User or its Agent, which Agent may be VITA, or an agent of VITA, or a third party provider under contract with Authorized User. At Authorized User's request and pursuant to an order or SOW for Supplier's Services issued hereunder, Supplier shall provide all assistance reasonably required by Authorized User to develop Authorized User's self-sufficiency in operating and managing the Solution, Software, Products and/or Services that Supplier provided to Authorized User under the applicable order or SOW. During and/or after the transition period, Authorized User may, at its sole discretion, elect to order or continue Maintenance Services from Supplier, if authorized under the scope of the Contract, for any of the Software or hardware Product, components or Solution Components delivered to Authorized User by Supplier.

16. RESERVED

17. CONFIDENTIALITY

A. Treatment and Protection

Each Party shall (i) hold in strict confidence all Confidential Information of any other Party, (ii) use the Confidential Information solely to perform or to exercise its rights under this Contract, and (iii) not transfer, display, convey or otherwise disclose or make available all or any part of such Confidential Information to any third-party. However, an Authorized User may disclose the Confidential Information as delivered by Supplier to subcontractors, contractors or agents of such Authorized User that are bound by non-disclosure contracts with such Authorized User. Each Party shall take the same measures to protect against the disclosure or use of the Confidential Information as it takes to protect its own proprietary or confidential information (but in no event shall such measures be less than reasonable care).

B. Exclusions

The term "Confidential Information" shall not include information that is:

- i. in the public domain through no fault of the receiving Party or of any other person or entity that is similarly contractually or otherwise obligated;
- ii. obtained independently from a third-party without an obligation of confidentiality to the disclosing Party and without breach of this Contract;
- iii. developed independently by the receiving Party without reference to the Confidential Information of the other Party; or
- iv. required to be disclosed under The Virginia Freedom of Information Act (§§2.2-3700 et seq. of the Code of Virginia) or similar laws or pursuant to a court order.

C. Return or Destruction

Upon the termination or expiration of this Contract or upon the earlier request of the disclosing Authorized User, Supplier shall (i) at its own expense, (a) promptly return to the disclosing Authorized User all tangible Confidential Information (and all copies thereof except the record required by law and except pursuant to Section 7(D), Return of Materials, above) of the disclosing Authorized User, or (b) upon written request from the disclosing Authorized User, destroy such Confidential Information and provide the disclosing Authorized User with written certification of such destruction, and (ii) cease all further use of the Authorized User's Confidential Information, whether in tangible or intangible form.

VITA or the Authorized User shall retain and dispose of Supplier's Confidential Information in accordance with the Commonwealth of Virginia's records retention policies or, if Authorized User is not subject to such policies, in accordance with such Authorized User's own records retention policies.

D. Confidentiality Statement

All Supplier personnel, contractors, agents, and subcontractors performing Services pursuant to this Contract shall be required to sign a confidentiality statement or non-disclosure agreement. Any violation of such statement or agreement shall be deemed a breach of this Contract and may result in termination of the Contract or any order or SOW issued hereunder.

E. Health Insurance Portability and Accountability Act

Supplier agrees to comply with all applicable provisions of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and, as applicable to the performance of this Contract or to any SOW or order issued hereunder. Supplier shall:

- i. Not use or further disclose protected health information (PHI) other than as permitted or required by the terms of this Contract or any SOW or order issued hereunder or as required by law;
- ii. Use appropriate safeguards to prevent use or disclosure of PHI other than as permitted by this Contract or any SOW or order issued hereunder;
- iii. Report to VITA or Authorized User, as applicable, any use or disclosure of PHI not provided for by this Contract or the applicable SOW or order;
- iv. Mitigate, to the extent practicable, any harmful effect that is known to the Supplier of a use or disclosure of PHI by the Supplier or its employees, agents or subcontractors in violation of the requirements of this Contract or the applicable SOW or order;
- v. Impose the same requirements and restrictions contained in this provision on its employees, subcontractors and agents performing on this Contract or a SOW or order issued hereunder;
- vi. Provide access to PHI contained in its records to VITA or the requesting Authorized User, in the time and manner designated by VITA or the requesting Authorized User, or at the request of VITA or an Authorized User, to an individual in order to meet HIPAA access;
- vii. Make available PHI in its records to VITA or an Authorized User for amendment and incorporate any amendments to PHI in its records at VITA's or an Authorized User's request; (end of HIPAA additional language)

All Supplier documents now or later comprising the Contract may be required to be released in their entirety under the Virginia Freedom of Information Act, and Supplier agrees that any confidentiality or similar stamps or legends that are attached to any future documents or information may be ignored to the extent they claim confidentiality beyond that permitted herein or by applicable law.

18. INDEMNIFICATION AND LIABILITY

A. Indemnification

Supplier agrees to indemnify, defend and hold harmless the Commonwealth, VITA, any Authorized User, their officers, directors, agents and employees (collectively, "Commonwealth's Indemnified Parties") from and against any and all third party claims, demands, proceedings, suits and actions, including any related liabilities, obligations, losses, damages, assessments, fines, penalties (whether criminal or civil), judgments, settlements, expenses (including reasonable attorneys' and accountants' fees and disbursements) and costs (each, a "Claim" and collectively, "Claims"), incurred by, borne by or asserted against any of Commonwealth's Indemnified Parties to the extent such Claims arise out of or result from: (i) any bodily or personal injury, death, or damage to real or tangible personal property to the extent directly caused by the intentional or willful conduct or negligent acts or omissions of any employee, agent, or subcontractor of Supplier while engaged in the performance of the Services or while on VITA, Commonwealth, or Authorized User premises, or (ii) any actual or alleged infringement or misappropriation of any third party's intellectual property rights by any of the Supplier-provided Work Products or services, except to the extent such infringement or misappropriation arises from (i) modification of such Deliverable other than by Supplier or its subcontractors or use thereof in a manner not contemplated by this Contract, (ii) the failure of the indemnified party to use any corrections or modifications made available by Supplier to Authorized User at no additional cost; or (iii) materials provided by or on behalf of the indemnified party. As a condition to the foregoing indemnity obligations, the indemnified party shall provide Supplier with prompt notice of any Claim for which indemnification shall be sought hereunder and shall cooperate in all reasonable respects with the indemnifying party in connection with any such Claim. Selection and approval of counsel and approval of any settlement shall be accomplished in accordance with all applicable laws and regulations. For state agencies the applicable laws include §§ 2.2-510 and 2.2-514 of the Code of Virginia. In all cases involving the Commonwealth or state agencies, the selection and approval of counsel and approval of any settlement shall be satisfactory to the Commonwealth. In the event of a settlement between Supplier and a private institution of higher education who is an Authorized User of this contract, such settlement shall be satisfactory to that institution.

In the event that a Claim is commenced against any of Commonwealth's Indemnified Parties alleging that use of the Supplier-provided Work Products or services, including any components thereof, or that the Supplier's performance or delivery of any product or service under this Contract infringes any third party's intellectual property rights and Supplier is of the opinion that the allegations in such Claim in whole or in part are not covered by this indemnification provision, Supplier shall promptly notify VITA and the affected Authorized User(s) in writing, via certified mail, specifying to what extent Supplier believes it is obligated to defend and indemnify under the terms and conditions of this Contract. Supplier shall in such event protect the interests of the Commonwealth's Indemnified Parties and endeavor to secure a continuance to permit VITA and the affected Authorized User(s) to appear and defend their interests in cooperation with Supplier as is appropriate, including any jurisdictional defenses VITA or the affected Authorized User(s) may have.

In the event of a Claim pursuant to any actual or alleged infringement or misappropriation of any third party's intellectual property rights by any of the Supplier-provided Deliverables, Products, Software, Services, Solution, including Solution Components, Application and Licensed Services, as applicable, or Supplier's performance, and in addition to all other obligations of Supplier in this Section, Supplier shall at its expense, either (a) procure for such Authorized User the right to continue use of such infringing Deliverables, Products, Software, Services, Solution, including Solution Components, Application and Licensed Services, as applicable, or any component thereof; (b) replace or modify such infringing Deliverables, Products, Software, Services, Solution, including Solution Components, Application and Licensed Services, as applicable, or any component thereof, with non-infringing Deliverables, Products, Software, Services, Solution or

Solution Component(s), Application and Licensed Services, as applicable, satisfactory to VITA, or (c) reimburse VITA or any Authorized User for the reasonable costs incurred by VITA or such Authorized User in obtaining an alternative product or service, in each case in the event such Authorized User cannot use the affected Deliverable, Product, Software, Services, Solution or Solution Component(s), Application and Licensed Services, as applicable, or any component thereof. If Supplier cannot accomplish any of the foregoing within a reasonable time and at commercially reasonable rates, then Supplier shall accept the return of the infringing Deliverables, Products, Software, Services, Solution, Solution Component, Application and Licensed Services, as applicable, or any component thereof, along with any other components rendered unusable by the Authorized User as a result of the infringing component, and refund the price paid to Supplier for such components.

B. Liability

Except for liability with respect to (i) any intentional or willful misconduct or gross negligence of any employee, agent, or subcontractor of Supplier, (ii) claims for which Supplier has an obligation to indemnify under subsection (a) "Indemnification and Liability", above, (iii) Supplier's breach of its confidentiality obligations, and (iv) Supplier's disclosure of personally identifiable information, including information about VITA's employees, contractors, and customers, that is protected by state or other applicable law, or of Protected Health Information, in each case in breach of its data privacy and security obligations as specified under this Contract, Supplier's liability with respect to this Contract, an SOW and the Services thereunder shall be limited to the greater of: (1) \$1,000,000 or (2) the fees paid to Supplier by the Authorized User under the applicable SOW under this Contract.

FOR ALL CONTRACTUAL CLAIMS OTHER THAN THOSE CLAIMS FOR WHICH SUPPLIER IS OBLIGATED TO INDEMNIFY UNDER subsection (a) "Indemnification and Liability" above, IN NO EVENT WILL ANY PARTY BE LIABLE TO ANY OTHER PARTY FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, INCLUDING (WITHOUT LIMITATION) LOSS OF PROFIT, INCOME OR SAVINGS, EVEN IF ADVISED OF THE POSSIBILITY THEREOF, EXCEPT WHEN SUCH DAMAGES ARE CAUSED BY THE GROSS NEGLIGENCE OR WILLFUL MISCONDUCT OF THE PARTY, ITS EMPLOYEES, AGENTS OR SUBCONTRACTORS.

For purposes of this Section "INDEMNIFICATION AND LIABILITY", "gross negligence" shall be as currently defined under Virginia law, as "that degree of negligence which shows indifference to others as constitutes an utter disregard of prudence amounting to a complete neglect of the safety of [another]. It must be such a degree of negligence as would shock fair minded [people] although something less than willful recklessness."

19. INSURANCE

In addition to the insurance coverage required by law as referenced in the Incorporated Contractual Provisions section of this Contract, Supplier shall carry:

Errors and omissions insurance coverage in the amount of \$2,000,000 per occurrence.

20. SECURITY COMPLIANCE

Supplier agrees to comply with all provisions of the then-current Commonwealth of Virginia security procedures, published by the Virginia Information Technologies Agency (VITA) and which may be found at: (<http://www.vita.virginia.gov/library/default.aspx?id=537#securityPSGs>) or a successor URL(s), as are pertinent to Supplier's performance of the Services. Supplier further agrees to comply with all provisions of the relevant Authorized User's then-current security procedures as are pertinent

to Supplier's performance of the Services and which have been supplied to Supplier by such Authorized User prior to execution of the Contract. Supplier shall also comply with all federal, state and local laws and regulations applicable to its performance under an SOW. For any individual Authorized User location, such security procedures may include but not be limited to: background checks, records verification, photographing, and fingerprinting of Supplier's employees or agents. Supplier may, at any time, be required to execute and complete, for each individual Supplier employee or agent, additional forms which may include non-disclosure agreements to be signed by Supplier's employees or agents acknowledging that all Authorized User information with which such employees and agents come into contact while at the Authorized User site is confidential and proprietary pursuant to this Agreement. Any unauthorized release of proprietary or personal information in violation of this clause by the Supplier or an employee or agent of Supplier shall constitute a breach of its obligations under this Section and the Contract.

Supplier shall immediately notify VITA and Authorized User, if applicable, of any Breach of Unencrypted and Unredacted Personal Information obtained by Supplier from VITA or the applicable Authorized User in the course of performance of the Services under a SOW, as those terms are defined in Virginia Code 18.2-186.6, and other personally identifiable information, including information about VITA's employees, contractors, and customers, that is protected by statute or other applicable law. Supplier shall provide VITA the opportunity to participate in the investigation of the Breach and to exercise control over reporting the unauthorized disclosure, to the extent permitted by law. To the extent that such Breach arises out of Supplier's negligence, intentional misconduct, or breach of this Contract, then, to the extent such VITA notification is required by applicable law, Supplier shall reimburse VITA for (i) the reasonable out-of-pocket costs incurred by VITA in notifying such affected individuals, and (ii) credit monitoring service, if provided by VITA to such individual, for no more than twelve (12) months from the date the individual enrolls in credit monitoring, provided that such credit monitoring is an appropriate remedy given the circumstances of the breach (e.g., credit monitoring may be appropriate if social security numbers with other identifiers have been subject to unauthorized disclosure).

21. IMPORT/EXPORT

In addition to compliance by Supplier with all export laws and regulations, VITA requires that any data deemed "restricted" or "sensitive" by either federal or state authorities, and identified to Supplier in writing as such, must only be collected, developed, analyzed, or otherwise used or obtained by persons or entities working within the boundaries of the United States.

22. BANKRUPTCY

If Supplier becomes insolvent, takes any step leading to its cessation as a going concern, fails to pay its debts as they become due, or ceases business operations continuously for longer than fifteen (15) business days, then VITA may immediately terminate this Contract, and an Authorized User may terminate an order or SOW, on notice to Supplier unless Supplier immediately gives VITA or such Authorized User adequate assurance of the future performance of this Contract or the applicable order or SOW. If bankruptcy proceedings are commenced with respect to Supplier, and if this Contract has not otherwise terminated, then VITA may suspend all further performance of this Contract until Supplier assumes this Contract and provides adequate assurance of performance thereof or rejects this Contract pursuant to Section 365 of the Bankruptcy Code or any similar or successor provision, it being agreed by VITA and Supplier that this is an executory contract. Any such suspension of further performance by VITA or Authorized User pending Supplier's assumption or rejection shall not be a breach of this Contract, and shall not affect the rights of VITA or any Authorized User to pursue or enforce any of its rights under this Contract or otherwise.

23. GENERAL PROVISIONS

A. Relationship Between VITA and Authorized User and Supplier

Supplier has no authority to contract for VITA or any Authorized User or in any way to bind, to commit VITA or any Authorized User to any agreement of any kind, or to assume any liabilities of any nature in the name of or on behalf of VITA or any Authorized User. Under no circumstances shall Supplier, or any of its employees, hold itself out as or be considered an agent or an employee of VITA or any Authorized User, and neither VITA nor any Authorized User shall have any duty to provide or maintain any insurance or other employee benefits on behalf of Supplier or its employees. Supplier represents and agrees that it is an independent contractor for purposes of federal, state and local employment taxes and agrees that neither VITA nor any Authorized User is responsible to collect or withhold any federal, state or local employment taxes, including, but not limited to, income tax withholding and social security contributions, for Supplier. Any and all taxes, interest or penalties, (including, but not limited to, any federal, state or local withholding or employment taxes, and any penalties related to health care or employee benefits laws) that are imposed, assessed or levied as a result of this Contract or Services performed pursuant to this Contract with respect to Supplier or its personnel shall be paid or withheld by Supplier or, if assessed against and paid by VITA or any Authorized User, shall be reimbursed by Supplier upon demand by VITA or such Authorized User.

B. Incorporated Contractual Provisions

The then-current contractual provisions at the following URL are mandatory contractual provisions, required by law or by VITA, and that are hereby incorporated by reference: https://www.vita.virginia.gov/uploadedfiles/VITA_Main_Public/scm/StatutorilyMandatedTsandCs.pdf

The contractual claims provision §2.2-4363 of the Code of Virginia and the required eVA provisions at https://www.vita.virginia.gov/uploadedfiles/VITA_Main_Public/scm/eVATsandCs.pdf are also incorporated by reference.

The then-current terms and conditions in documents posted to the aforereferenced URLs are subject to change pursuant to action by the legislature of the Commonwealth of Virginia, change in VITA policy, or the adoption of revised eVA business requirements. If a change is made to the terms and conditions, a new effective date will be noted in the document title. Supplier is advised to check the URLs periodically.

C. Compliance with the Federal Lobbying Act

Supplier's signed certification of compliance with 31 USC 1352 (entitled "Limitation on use of appropriated funds to influence certain Federal Contracting and financial transactions") or by the regulations issued from time to time thereunder (together, the "Lobbying Act") is incorporated as Exhibit G to this Contract.

D. Governing Law

This Contract shall be governed by and construed in accordance with the laws of the Commonwealth of Virginia without regard to that body of law controlling choice of law. Any and all litigation shall be brought in the circuit courts of the Commonwealth of Virginia. The English language version of this Contract prevails when interpreting this Contract. The United Nations Convention on Contracts for the International Sale of Goods and all other laws and international treaties or conventions relating to the sale of goods are expressly disclaimed. UCITA shall apply to this Contract only to the extent required by §59.1-501.15 of the Code of Virginia.

E. Dispute Resolution

In accordance with §2.2-4363 of the Code of Virginia, Contractual claims, whether for money or other relief, shall be submitted in writing to the public body from whom the relief is sought no later than sixty (60) days after final payment; however, written notice of the Supplier's intention

to file such claim must be given to such public body at the time of the occurrence or beginning of the work upon which the claim is based. Pendency of claims shall not delay payment of amounts agreed due in the final payment. The relevant public body shall render a final decision in writing within thirty (30) days after its receipt of the Supplier's written claim.

The Supplier may not invoke any available administrative procedure under §2.2-4365 of the Code of Virginia nor institute legal action prior to receipt of the decision of the relevant public body on the claim, unless that public body fails to render its decision within thirty (30) days. The decision of the relevant public body shall be final and conclusive unless the Supplier, within six (6) months of the date of the final decision on the claim, invokes appropriate action under §2.2-4364, Code of Virginia or the administrative procedure authorized by §2.2-4365, Code of Virginia.

Upon request from the public body from whom the relief is sought, Supplier agrees to submit any and all contractual disputes arising from this Contract to such public body's alternative dispute resolution (ADR) procedures, if any. Supplier may invoke such public body's ADR procedures, if any, at any time and concurrently with any other statutory remedies prescribed by the Code of Virginia.

In the event of any breach by a public body or a private institution, Supplier's remedies shall be limited to claims for damages and Prompt Payment Act interest and, if available and warranted, equitable relief, all such claims to be processed pursuant to this Section. In no event shall Supplier's remedies include the right to terminate any license or support services hereunder.

F. Advertising and Use of Proprietary Marks

Supplier shall not use the name of VITA or any Authorized User or refer to VITA or any Authorized User, directly or indirectly, in any press release or formal advertisement without receiving prior written consent of VITA or such Authorized User. In no event may Supplier use a proprietary mark of VITA or an Authorized User without receiving the prior written consent of VITA or the Authorized User.

G. Notices

Any notice required or permitted to be given under this Contract shall be in writing and shall be deemed to have been sufficiently given if delivered in person, or if deposited in the U.S. mails, postage prepaid, for mailing by registered, certified mail, or overnight courier service addressed to:

- i. To VITA and to Supplier, if Supplier is incorporated in the Commonwealth of Virginia, to the addresses shown on the signature page.
- ii. To Supplier, if Supplier is incorporated outside the Commonwealth of Virginia, to the Registered Agent registered with the Virginia State Corporation Commission and to the address shown on the signature page.

Pursuant to Title 13.1 of the Code of Virginia, VITA or Supplier may change its address for notice purposes by giving the other notice of such change in accordance with this Section.

Administrative contract renewals, modifications or non-claim related notices are excluded from the above requirement. Such written and/or executed contract administration actions may be processed by the assigned VITA and Supplier points of contact for this Contract and may be given in person, via U.S. mail, courier service or electronically.

H. No Waiver

Any failure to enforce any terms of this Contract shall not constitute a waiver.

I. Assignment

This Contract shall be binding upon and shall inure to the benefit of the permitted successors and assigns of VITA and Supplier. Supplier may not assign, subcontract, delegate or otherwise

convey this Contract or any of its rights and obligations hereunder, to any entity without the prior written consent of VITA, and any such attempted assignment or subcontracting without consent shall be void. VITA may assign this Contract to any Virginia government entity, so long as the assignee agrees in writing to be bound by the all the terms and conditions of this Contract. VITA may assign this Contract to any other entity, so long as the assignee agrees in writing to be bound by the all the terms and conditions of this Contract, and so long as Supplier agrees to such assignment in writing, such agreement not to be unreasonably withheld.

If any law limits the right of VITA or Supplier to prohibit assignment or nonconsensual assignments, the effective date of the assignment shall be thirty (30) days after the Supplier gives VITA prompt written notice of the assignment, signed by authorized representatives of both the Supplier and the assignee. Any payments made prior to receipt of such notification shall not be covered by this assignment.

J. Captions

The captions are for convenience and in no way define, limit or enlarge the scope of this Contract or any of its Sections.

K. Severability

Invalidity of any term of this Contract, in whole or in part, shall not affect the validity of any other term. VITA and Supplier further agree that in the event such provision is an essential part of this Contract, they shall immediately begin negotiations for a suitable replacement provision.

L. Survival

Any provisions of this Contract regarding Software License, Rights To Work Product, Warranty, Confidentiality, Security Compliance, Liability, Indemnification, and the General Provisions shall survive the expiration or termination of this Contract.

M. Force Majeure

No Party shall be responsible for failure to meet its obligations under this Contract if the failure arises from causes beyond the control and without the fault or negligence of the non-performing Party. If any performance date under this Contract is postponed or extended pursuant to this section for longer than thirty (30) calendar days, VITA, by written notice given during the postponement or extension, may terminate Supplier's right to render further performance after the effective date of termination without liability for that termination, and in addition an Authorized User may terminate any order or SOW affected by such postponement or delay.

N. Remedies

The remedies set forth in this Contract are intended to be cumulative. In addition to any specific remedy, VITA and all Authorized Users reserve any and all other remedies that may be available at law or in equity.

O. Right to Audit

VITA reserves the right to audit those Supplier billing and payment records that relate to amounts due Supplier for such services under this Contract, copies of the Deliverables and Work Product, and other records relating to the Services under the Contract or any SOWs or orders issued hereunder that are required to be subject to audit hereunder by applicable law. VITA's right to audit shall be limited as follows:

- i. Three (3) years from end date of the applicable SOW;
- ii. Performed at Supplier's premises, during normal business hours at mutually agreed upon times; and
- iii. Excludes access to Supplier cost information. In no event shall Supplier have the right to audit, or require to have audited, VITA or any Authorized User.

P. Offers of Employment

During the first twelve (12) months of the Contract Supplier shall not hire an employee of any Authorized User who has substantially worked on any project covered by this Contract without prior written consent.

Q. Contract Administration

Supplier agrees that at all times during the term of this Contract an account executive, at Supplier's senior management level, shall be assigned and available to VITA. Supplier reserves the right to change such account executive upon reasonable advance written notice to VITA.

R. Entire Contract

The following Exhibits, including all subparts thereof, are attached to this Contract and are made a part of this Contract for all purposes: (Customize for project and QA references throughout document.)

Exhibit A - Requirements

Exhibit B - Options List; Fees, Service Charges, and Payment Schedule

Exhibit C - Reserved

Exhibit D - Statement of Work (SOW) Template

Exhibit E - Change Order Template

Exhibit F - Reserved

Exhibit G - Certification Regarding Lobbying

This Contract and its Exhibits constitute the entire agreement between VITA and Supplier and supersede any and all previous representations, understandings, discussions or agreements between VITA and Supplier as to the subject matter hereof. Any and all terms and conditions contained in, incorporated into, or referenced by the Supplier's Proposal shall be deemed invalid. The provisions of the Virginia Department of General Services, Division of Purchases and Supply Vendor's Manual shall not apply to this Contract or any order issued hereunder. This Contract may only be amended by an instrument in writing signed by VITA and Supplier. In the event of a conflict, the following order of precedence shall apply: this Contract document, any individual SOW, Exhibit A, Exhibit B.

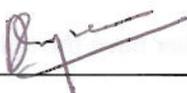
An Authorized User and Supplier may enter into an ordering agreement pursuant to this Contract. To the extent that such ordering agreement, or any order or SOW issued hereunder, include any terms and conditions inconsistent with the terms and conditions of this Contract, such terms and conditions shall be of no force and effect.

VITA and Supplier each acknowledge that it has had the opportunity to review this Contract and to obtain appropriate legal review if it so chose.

Executed as of the last date set forth below by the undersigned authorized representatives of VITA and Supplier.

Supplier

VITA

By:  _____

By:  _____

(Signature)

Name: Sundaravadivel Suguna

(Print)

Title: Principal

Date: 10/12/2015

Address for Notice:

901 East Byrd Street

Suite 820

Richmond, VA 23219

Attention: Supplier Contact

(Signature)

Name: Nelson P. Moore

(Print)

Title: CIO

Date: 11-19-2015

Address for Notice:

11751 Meadowville Lane

Chester, VA 23836

Attention: Contract Administrator



EXHIBIT A REQUIREMENTS
CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP

Exhibit A is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA” or “Commonwealth” or “State”) and Deloitte Consulting LLP (“Supplier”).

In the event of any discrepancy between this Exhibit A and the Contract, the provisions of the Contract shall control.

Detailed Description of Proposed Solution(S)

RFP Section 5

RFP Reference, Page 12

Supplier's response by item in the tables set forth in Section 5, clearly identifying and detailing the proposed Solution, and any processes, methodologies, and resources required by the Solution type defined in Section 5.

RFP Reference, Page 15

5. Functional and Technical Requirements

Suppliers are to indicate their capability of fulfilling each specific requirement below. Each Supplier's responses will be reviewed and compared across Suppliers in order to determine the best solution for the Commonwealth.

Detailed requirements are presented in questionnaire format to facilitate direct responses and establish accountability regarding delivery of Solution by the Supplier. To respond to each requirement, Supplier is asked to enter, in the space provided in Column A, a code that best corresponds to its intended response for the requirement listed.

The acceptable codes for Column A are as follows:

Y - "Yes" - Supplier can fully meet the requirement as documented with its current application or proposed solution. Supplier should provide in Column B an explanation of how it will fulfill the requirement. This may include use of alliances with other suppliers. Supplier may also use Column B to cross-reference a detailed explanation included in an attachment of its proposal.

F - "Yes, Future" - Supplier will be able to fully meet this requirement in the near future (not longer than six months). Supplier should provide a proposed start date and cross-reference any attached documentation in Column B.

N - "No" - Supplier cannot meet the requirement and has no firm plans to be in the position to meet this need within six months.

VITA has posed some open-ended questions. These are indicated with an "n/a" in Column A. In those instances, Supplier is to provide adequate information in Column B (or cross-referenced in Column B) to allow VITA to properly evaluate its proposal.

Following is our response to all items set forth in Section 5 of the RFP.

A. Product Specifications & Standards

Requirements	A	B
<p>1 Does your solution comply with all current COV ITRM Policies and Standards, as applicable, found at: http://www.vita.virginia.gov/library/default.aspx?id=537.</p> <p>If proposed solution does not, please provide details that specify the Standard/Policy and how Supplier's solution does not comply.</p>	Y*	We understand that our solutions need to comply with the relevant Commonwealth of Virginia Information Technology Resource Management (COV ITRM) Policies, Standards and Guidelines and needs to satisfy the overall objectives contained within each Statement of Work. For each individual Statement of Work,

	Requirements	A	B
			Deloitte will confirm that all COV ITRM Policies, Standards, and Guidelines are addressed as applicable.
2	<p>Do your proposed interfaces to Commonwealth systems comply with or have approved exceptions to all applicable Commonwealth Data Standards as found at http://www.vita.virginia.gov/oversight/default.aspx?id=10344</p> <p>If not, please explain.</p>	Y*	As part of our interface and integration approach on any Statement of Work, we will work with that agency in applying the standards and guidelines set under the Commonwealth Data Standards or will seek approved exceptions.
3	<p>Does your solution provide effective, interactive control and use with nonvisual means and provide 508 Compliance in accordance with the following standard regarding IT Accessibility and 508 Compliance: http://www.vita.virginia.gov/uploadedFiles/Library/AccessibilityStandard_GOV103-00_Eff_11-04-05.pdf</p> <p>(Refer to www.section508.gov and www.access-board.gov for further information)</p> <p>If yes, please describe how this functionality is achieved and include a completed Voluntary Product Accessibility Template (VPAT) with your proposal: (The VPAT template is located in APPENDIX C of the Accessibility Standard (GOV103-00)).</p> <p>If no, does your solution provide alternate accessibility functionality? Please describe.</p>	Y*	As the solutions that Deloitte will be providing as part of its services are yet to be defined, and have dependencies associated with the products selected by the Commonwealth, the 508 requirements will need to be assessed based on each solution. A number of products provide 508 compliance out of the box that may not require any further modification. Others may require additional modifications. Deloitte will work with VITA to review the 508 requirements for each of the solutions requested to determine their

Figure 5-1. Product Specifications and Standards.

B. General

	Requirements	A	B
1	Selected vendors, if asked, will need to perform a selected vendor proposed pilot within one year of contract award. Does your Solution meet this requirement?	Y	Deloitte has proposed 3 candidate pilots as part of our response and further detailed in the Detailed Description of Proposed Solution(s) section. Deloitte will discuss the candidate pilots with the Commonwealth to identify which pilot to pursue. The pilots that we have proposed have been implemented with other clients within VITA's prescribed 12 month implementation timeframe. Deloitte assumes that the Commonwealth will have procured the technology necessary to complete the pilot within 45 days of contract award in order to maintain the implementation timeline requested by the Commonwealth.
2	There will be no cost to the Commonwealth or the participating agencies for the use of tools or Supplier resources utilized during this evaluation and pilot(s). Does your Solution meet this requirement?	Y	Deloitte will provide human resources at no cost to the Commonwealth or participating agencies for professional services pertaining to the pilot or evaluation process. The resource positions that may be staffed to support the evaluation and pilot will align with those identified on our rate card detailed in the Pricing section of our proposal.
3	Vendors selected for pilots will need to work with any agency providing data to support that pilot to develop a mutually agreed upon document before a pilot can commence. That agreement needs to address exactly how the vendor intends to analyze any agency data and all of the controls and associated roles that will be applied to that data. Does your Solution meet this requirement?	Y	Deloitte's standard process before commencing any services is to formally document the scope of services that are to be provided, approach, roles and responsibilities, milestone dates/dependencies, detailed tasks, technology needed to support the provided services, controls, role based access restrictions, and assumptions. Deloitte will conduct a walkthrough session with the participating agency to review the information defined above and gain agreement from the participating agency prior to commencing any work.
4	All applicable state and federal laws concerning the protection of this data must be complied with. Does your Solution meet this requirement?	Y*	Deloitte shall work with the Commonwealth as part of the SOW development effort to identify which state and federal laws are applicable laws for the requested solution. As not all laws are relevant to each solution, the specific regulations will be translated into requirements for the solution. Deloitte's standard approach evaluates state and federal laws and follows industry standards for data protection as well as provides a baseline for the compatibility when exchanging information with other state agencies/departments and 3rd parties.
5	All Commonwealth data utilized during pilots must remain at the hosting agency. No Commonwealth data is to be analyzed offsite, copied, transformed to obscure Commonwealth's ownership, or transmitted in any way without formal agency approval. Does your Solution meet this requirement?	Y	Deloitte is able to provide resources to conduct a pilot onsite at the hosting agency. We are able to leverage either Deloitte supplied appliances or VITA supplied hardware loaded with necessary analytical software. Data for the pilot can remain onsite at the hosting agency. However, Deloitte maintains an extensive Analytics Data Center in Hartford loaded with predictive and statistical analytics accelerators, including predictive analytics software which can be used to augment the pilot. If the

VITA Supply Chain Management Division
Next-Generation Analytics
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	Requirements	A	B
			<p>Commonwealth allows relevant anonymized data to be transferred to this secure environment, Deloitte would be able to leverage a suite of tools to enhance the pilot. Additionally, Deloitte has the ability to append external datasets to support the pilot analyses based on relationships we maintain with data brokers and vendors. External data utilized on Deloitte hardware can be employed with no additional cost to the Commonwealth.</p>
6	<p>Pilots are to be performed on dedicated devices (laptops) supplied by VITA or on vendor supplied appliances. Vendor provided appliances will need an approved plan (by VITA & participating agencies) for protecting and deleting Commonwealth data. Does your Solution meet this requirement?</p>	Y	<p>Deloitte anticipates that end users will use VITA supplied laptops that are dedicated to the pilot. Deloitte assumes that VITA will be responsible for software installation on vendor supplied appliances and VITA supplied laptops.</p> <p>Deloitte will load dedicated laptops with additional customized analytics software and analytics accelerators to perform the predictive and statistical analytics on the pilot. Deloitte analytics resources performing data analytics will load data onto and utilize these laptops for analytics. Deloitte and VITA will develop a plan for protecting and deleting Commonwealth data through appropriate encryption and data retention methodologies.</p>
7	<p>VITA supplied laptops and vendor supplied appliances must be under full control of the pilot hosting agency for the duration of the pilot. Vendor will have no administrative rights to VITA supplied laptop. Agency or VITA staff will load any required software.</p> <p>Pilot should be accomplished with the minimum amount of Commonwealth data as possible/practical</p> <p>The agency may require that the analytic methods be demonstrated to agency staff by the vendor on agency provided test data and any analysis of actual agency data would only be performed by agency staff</p> <p>Vendor access to agency data may require vendor staff to attend specific training provided by the agency.</p> <p>Does your Solution meet these requirements?</p>	Y	<p>As Deloitte will not have administrative access to the VITA supplied laptops, Deloitte will work with the Commonwealth to document installation instructions for any software that may be needed on the laptops to support the pilot. Deloitte assumes that the Commonwealth will provide resources to produce needed data extracts from the source systems to the support the pilot. For pilots involving development of models to support predictive and prescriptive analytics higher fidelity models are developed with the use of actual agency data. We have developed models using test data as well. To enhance the models Deloitte will discuss with the selected agency and VITA if additional assistance is needed from the data scientists to support additional modeling efforts. Deloitte's team is fully prepared to attend agency specific training pertaining to data use.</p>
8	<p>Suppliers will provide subject matter experts as need to support the pilots. Does your Solution meet this requirement?</p>	Y	<p>Deloitte's subject matter specialists range from business specialists across health and human services, transportation, education, retirement, labor and other areas as well as specialists with respect to data governance, data visualization, data quality, business intelligence, advanced analytics (predictive, prescriptive and statistical), big data and other areas.</p>
9	<p>Does your Solution safeguard sensitive data? If yes, explain how.</p>	Y*	<p>Deloitte routinely deals with sensitive data including Personally Identifiable Information (PII), Confidential Information (CI), and Personal Health Information (PHI). If any sensitive data such as these types of data are required to perform the pilot, Deloitte will work</p>

	Requirements	A	B
			with VITA and the hosting agency to develop a plan for handling sensitive data including storage, encryption, access, and retention. We make every effort to avoid using these types of information including anonymization and hashing as appropriate. During the pilot we will work with VITA and the hosting agency to help confirm appropriate data protection practices are developed and followed.
10	Does your solution have mechanisms that will prevent one entity from viewing another entity's data if applicable if the toolset was deployed on a shared platform? If yes, explain how they work.	Y	Access to data sets is controlled at the application level and based on the overarching solution/data architecture. We have built different data marts that physically separate data sets or control access within the same data store through application level security.
11	Does your solution have the ability to extract data from multiple existing analytic tool sets (Cognos, SAS, Business Objects, MicroStrategy, Microsoft Analytics, etc.)? If so, please list.	Y*	As described in our Supplier Information section, Deloitte is a leading provider of analytics services. We have almost 4,000 practitioners dedicated to analytics, including experts in data cleansing, visualization, machine learning, and data science. Within that 4,000, we have nearly 400 data scientists, experts in exploratory data analysis, predictive modeling, simulation, optimization, behavioral science, and other advanced analytics methodologies used to derive deep insights from data. We are able to bring our extensive expertise from across the analytics spectrum to assist the Commonwealth analyze its move difficult problems.
12	Supplier staff will submit to background checks conducted and paid for by the Commonwealth. Does your Solution meet this requirement?	Y	As part of the contract negotiations Deloitte would like to confirm the background check process
13	Agencies may need expertise/resources in using these next-generation analytics tools to address business needs. Role examples include: Data Scientists, Data Analysts, Data Hygienists, Data Explorers, Data Visualizers, Does your Solution have the ability to provide these types of resources? If so, what roles can you provide?	Y	As described in our Supplier Information section, Deloitte is a leading provider of analytics services. We have almost 4,000 practitioners dedicated to analytics, including experts in data cleansing, visualization, machine learning, and data science. Within that 4,000, we have nearly 400 data scientists, experts in exploratory data analysis, predictive modeling, simulation, optimization, behavioral science, and other advanced analytics methodologies used to derive deep insights from data. We are able to bring our extensive expertise from across the analytics spectrum to assist the Commonwealth analyze its move difficult problems.

Figure 5-2. General Requirements.

* Deloitte interprets the requirement to be focused towards product vendors. That being said, as a services provider, Deloitte anticipates being able to address the requirement based on tool selection from the Commonwealth in tandem with Deloitte's approach. We will discuss this further with the Commonwealth through the development of an SOW stemming from this contact. In instances where the products selected by the Commonwealth do not meet the requirements out of the box, Deloitte will make recommendations to address the gaps (e.g., introduction of a security product to provide more coverage of specified security regulations).

c. Solution Information (by category)

SUPPLIERS NOTE: There are eight sub-sections to this RFP Section 5.C “Solution Information”. Suppliers do not need to respond to each of these sub-sections in order to be considered for award.

1. **Business Intelligence.** The set of techniques and tools for the transformation of raw data into meaningful and useful information for business analysis purposes. Common functions are querying, reporting, online analytical processing (OLAP), “alerts”, dashboards, process mining, complex event processing, business performance management, benchmarking, data warehousing, data marts, etc. This also includes:
 - a. **Descriptive Analytics** looks at past performance and understands that performance by mining historical data to look for the reasons behind past success or failure. Most management reporting - such as sales, marketing, operations, and finance - uses this type of post-mortem analysis.

Per the guidance provided by the Commonwealth at the Bidder’s Conference, Deloitte has responded with the code n/a to requirements in RFP section 5C that do not apply to professional services/systems integrators. We have interpreted requirements one through four for each of the solution categories to be specific to product vendors. For the remainder of the requirements requested in section 5C, we have described our services pertaining to the requirements requested.

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. Based on the VITA selected BI tool Deloitte has the experience, skills, and capabilities to deliver an array of BI services. Please reference section 3.0 below for details regarding our alliance partners and analytics tool sets, and section 2.0 for details on our Business Intelligence services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. Based on the VITA selected BI tool Deloitte has the experience, skills, and capabilities to support an array of deployment platforms. Please reference section 3.0 regarding our alliance partners and analytic tools sets and section 2.0 for details on our deployment approach.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. Based on the VITA selected BI tool Deloitte can help support vendor licensing conversations and evaluations. Please see section 2.0 below for details around our approach for aligning business needs with licensing structures.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Y	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. Based on the VITA selected BI tool(s) Deloitte can help support the Commonwealth of Virginia’s shared services vision. Please see the “Services in Action” section below for details around projects where we have delivered Business Intelligence solutions that have horizontally integrated cross-program/ agency data.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte provides extensive training based on the business need and BI solution being delivered. Details regarding our Business Intelligence Training services can be found in section 2.0.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. As detailed in Appendix A, Deloitte has extensive relationships working with an array of tools and vendors. Based on the selected tool, Deloitte can work through our alliance partnerships to provide installation services and support. Please see section 2.0 below for details related to our configuration and development services.

	Requirements	A	B
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	Deloitte is a provider of Business Intelligence services, and as such does not align with a single BI tool set. Deloitte has extensive experience working with an array of State Departments, Agencies, and program offices to deploy and implement a variety of BI solutions. Please see section 2.0 below for details related to our implementation services.
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Deloitte has extensive experience delivering Business Intelligence solutions and services to both Public Sector and Commercial clients. The details below provide insights into our experience implementing BI services (section 2.0), our approach to confirm a successful implementation (section 2.0), our perspective on the value of Business Intelligence (section 1.0), our BI service offerings (section 2.0), and relevant government examples of where we have delivered BI services in the past (Services in Action section).

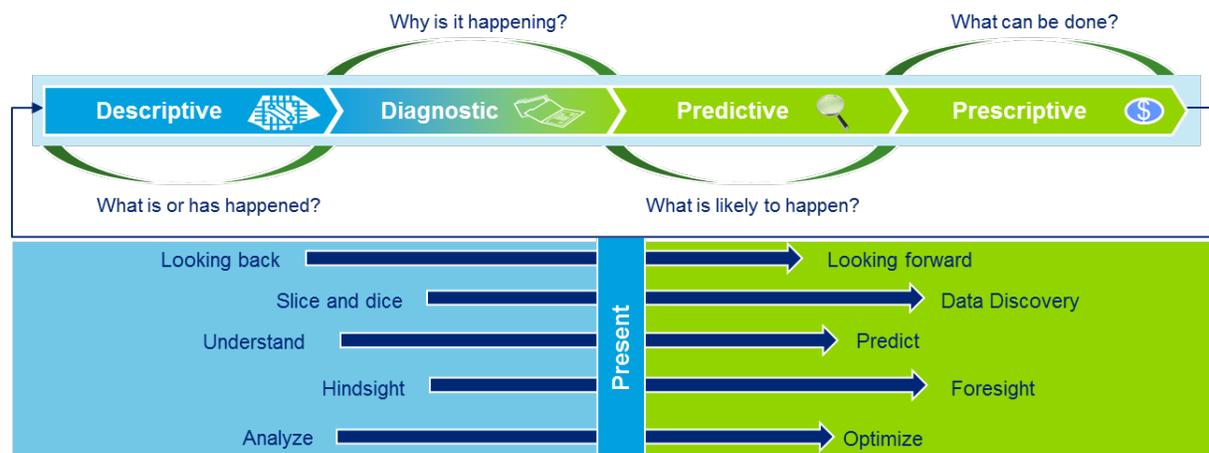
Figure 5-3. Solution Information (by Category) Requirements.

Deloitte’s Services Supporting Business Intelligence

1.0 Our Perspective – the Value of Business Intelligence

Business intelligence is the set of techniques and tools used to take the information assets of an organization and convert it into meaningful and useful information to truly assess performance and empower leaders to make better business decisions. It encompasses the organizational systems, information management tools, processes and governance to help organizations manage information more effectively – converting data from disparate sources into high-quality information that is consistent, actionable and useful.

Often times the term business intelligence gets thrown around when discussing everything from basic operational reporting to highly advanced decision and analytical models. In reality BI encompasses the entire breadth of reporting capabilities that exist in the marketplace and within organizations today. Where a company stands on that scale depends on their BI maturity. Based on Gartner’s BI and Analytics Report, an organization’s BI maturity can be categorized into four distinct phases: Descriptive, Diagnostic, Predictive, and Prescriptive Analytics.



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Figure 5-4. BI Maturity Curve.

For the purposes of this response we will focus on business intelligence as it relates to descriptive analytics (additional analytics capabilities such as diagnostic and predictive will be discussed in subsequent sections). Descriptive analytics serves as a foundation for more advanced analytics, helping you understand past and current business performance. It is the capabilities such as enterprise data warehousing, data profiling, generating operational and management reporting, online analytical processing (OLAP), executive scorecards and dashboards, business performance management, and process mining that enable the ability to answer the question “what has happened?”

All organizations today recognize the importance of leveraging business intelligence to determine what is happening within their business processes. The only real question is how to get it done. Unfortunately, many organizations barely have the capabilities or solutions in place to perform descriptive analytics. Their enterprise systems do a good job of handling day-to-day operations, but when it comes to analysis and insight into how the organization is truly performing, spreadsheets and manual processing are still business as usual. Each year organizations spend billions of dollars on manual number-crunching and ad hoc analysis. To make matters worse, the resulting numbers tend to be inconsistent and ambiguous, which often leaves decision-makers scratching their heads about which data is right.

2.0 Our Business Intelligence Service Details

Deloitte employs a robust Information Management (IM) practice comprised of over 1,700 practitioners with significant experience delivering Business Intelligence solutions to our clients across the US. In addition, Deloitte has more than 20 years of experience delivering Information Management and Analytic solutions to an array of Public Sector clients. We have partnered with numerous state agencies to design, develop, and implement Business Intelligence solutions to help state’s derive insight from one of their most important assets – their information. Our extensive Public Sector - State Government experience is summarized in the following figure.

**VITA Supply Chain Management Division
Next-Generation Analytics
Request for Proposal (RFP) 2015-12**

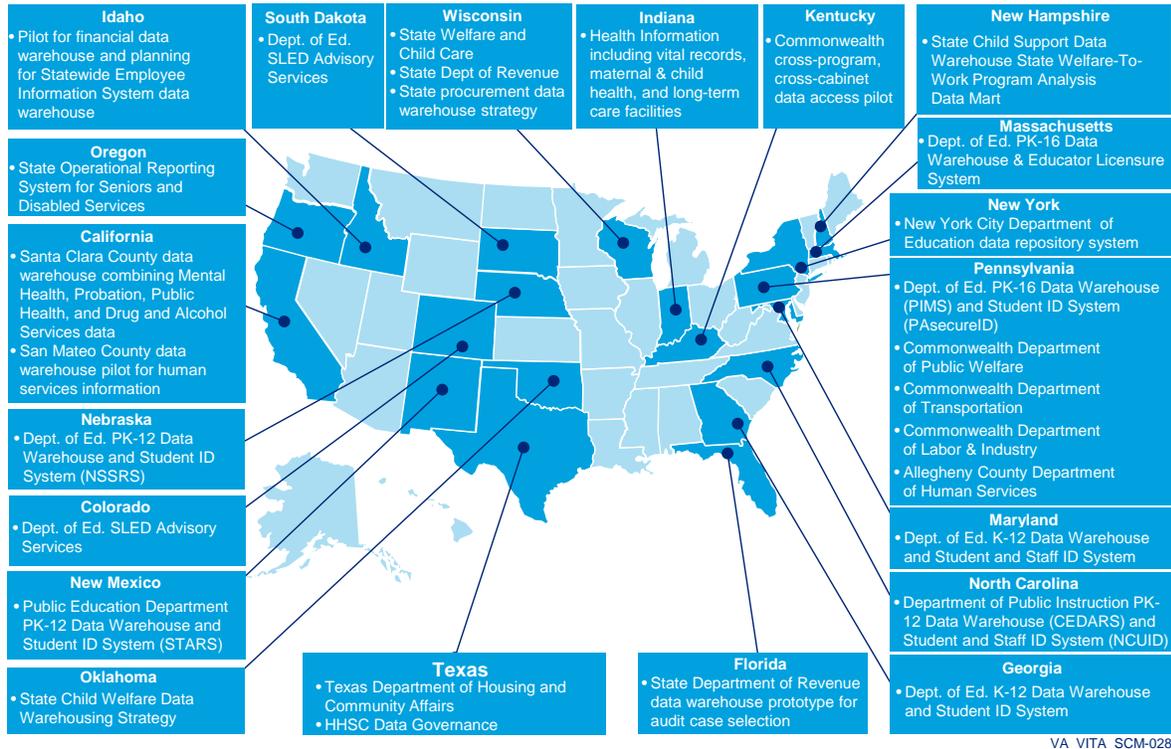


Figure 5-5. Public Sector Business Intelligence & Data Warehousing Experience.

In addition to providing the right resources with the right skills, Deloitte also brings a proven methodology to help achieve the Commonwealth’s goals and objectives. For implementation of Business Intelligence solutions, we will leverage our established Enterprise Value Delivery for Information Management (EVD) methodology shown in the figure to the right. This methodology provides a proven approach for structuring, managing, and delivering information management assessments, strategies, development, deployments, training, installation, and implementation services for Business Intelligence solutions.

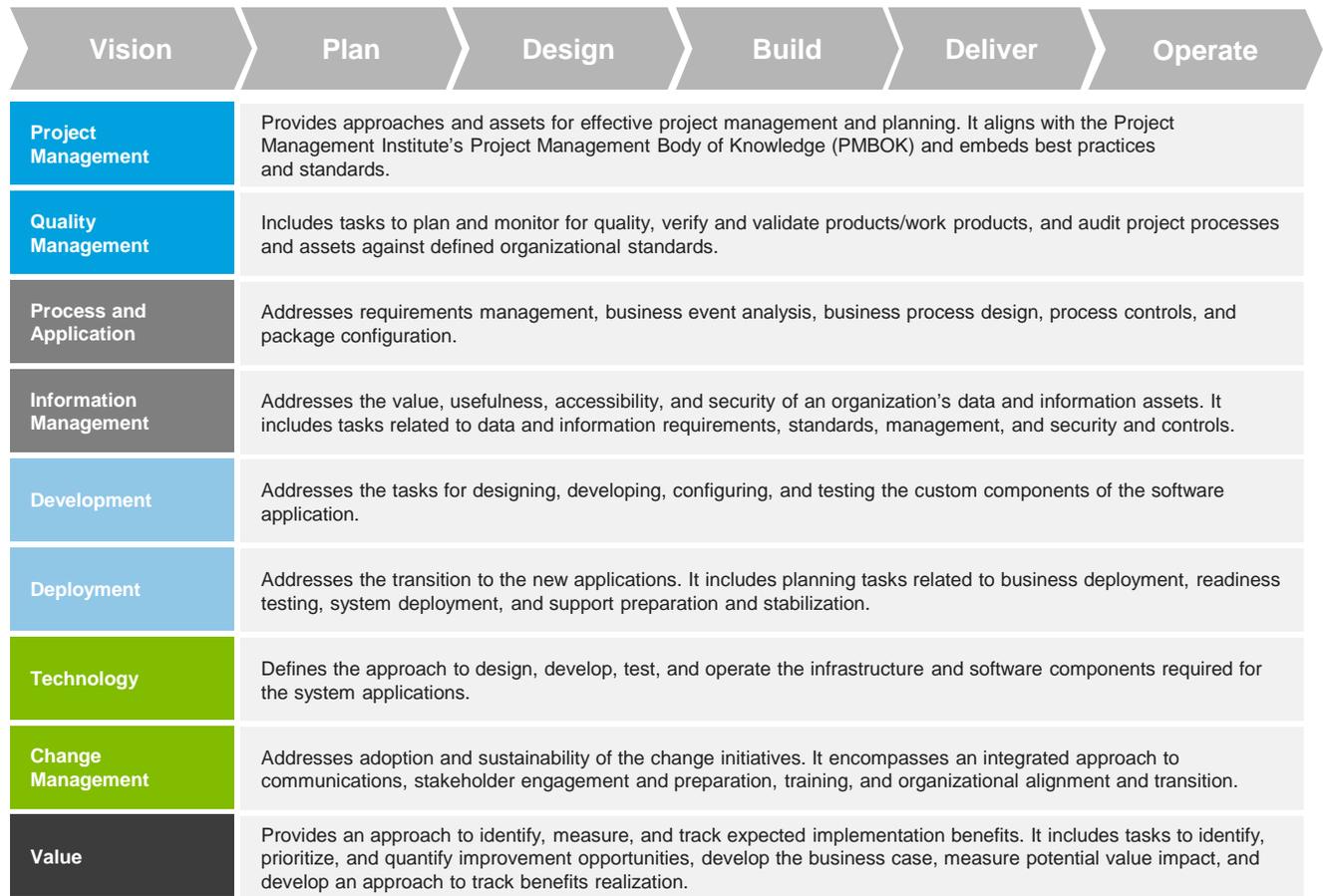


Enterprise Value Delivery for Information Management

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Figure 5-6. EVD Overview.

EVD was developed based on years of hands-on experience of our IM practice delivering business intelligence solutions. As indicated in the graphic below, the EVD methodology provides end-to-end guidance throughout distinct phases; beginning with Vision and Planning and moving through Delivery and Operate. Within each of these phases, the methodology provides a series of tools, processes, deliverables, and guidance documents to help our practitioners achieve our client’s objectives and deliver superior value. Not only does the methodology cover project implementations throughout the normal life cycle, but it also covers projects from a top-down perspective—considering all of the affected disciplines that must be managed throughout project execution. The figure below illustrates the nine key disciplines across the six phases included in our EVD methodology.



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Figure 5-7. Disciplines within Deloitte's EVD Methodology.

At Deloitte we combine our deep State and Local Government subject matter expertise, our extensive technical skill set and our proven methodology to deliver superior business intelligence solutions. Our practitioners plan, design, develop and implement Business Intelligence solutions which allow stakeholders to analyze and monitor a series of Key Performance Indicators to make informed, actionable business decisions. Our robust Business Intelligence services are organized into the following six core service areas: Strategy, Planning, Design, Development, Implementation, and Training. These comprehensive business intelligence services help organizations establish the essential analytics capabilities they need to make informed, actionable business decisions.

1. **Vision.** Deloitte helps organizations build a tailored vision of how business intelligence can help them achieve both their tactical and strategic business goals. This involves assessing where an organization is along the maturity scale, where they want to be, and the capabilities, processes and policies required to reach these goals. In addition, when we set out to help our clients develop a BI strategy, we look to not only address the current issues facing our clients, but also anticipate the organizational needs of tomorrow.

Deloitte has a unique perspective on business intelligence strategy because we have worked collaboratively with numerous public sector organizations. Deloitte has helped a number of these organizations identify and define the future state of their BI capabilities and the business value that they hope to achieve from enabling these capabilities. Our presence across such a large number of government entities and our thought leadership allow us to stay at the forefront of business intelligence trends. The success stories in the “Services in Action” section below detail several examples of where Deloitte has utilized public sector expertise, technical BI fluency and our proven methodology to develop organizational BI strategies that not only help our clients identify where they want to be, but also help them every step of the way to get there. Specific activities within BI strategy include; BI maturity assessments, establishing organizational data governance and standards, building out business cases and developing roadmaps for various planning horizons.

2. **Planning.** Before any work can begin on executing against a strategy, a series of planning activities need to take place to help confirm that the value identified in the business goals is realized. Deloitte takes a two pronged approach to business intelligence planning; portfolio planning and toolset selection. Within portfolio planning we identify the capability gaps within an organization, work with stakeholders to identify, define and prioritize requirements and leverage our EVD methodology to plan and execute the individual projects comprising the portfolio. For toolset selection, Deloitte confirms that the strategic goals of the organization match the business intelligence tools and licensing structures being utilized. This could include supporting BI tool evaluation and comparison, tool selection, vendor contract negotiations, license negotiations, and license procurements.
3. **Design.** Once a strategy is established and a plan is in place Deloitte can help organizations define and design the details of their business intelligence capabilities and solutions. We do not believe in building generic BI solutions, rather we believe in leveraging our deep industry experience and business acumen to design solutions that are tailored to the specific needs of the various stakeholder groups within an organization. In order to make sure that our solutions meet the needs of our stakeholders, our approach to BI design utilizes best practices around agile methodologies and solution prototyping. Agile BI design allows projects to adjust to changing requirements, and BI projects change more rapidly and more frequently than almost any other technology project. We believe in short project iterations that result in consumable business intelligence solutions, which allow projects to shift course where necessary to help confirm business needs are truly being met.

Prototyping is the perfect complement to agile BI design because it helps us to clarify requirements before a project or phase starts. Not only that, but prototyping is one of the best mechanisms to demonstrate the art of the possible. Seeing the possibilities of a BI solution helps our clients and project teams get their creative juices flowing, resulting in BI designs and eventual solutions that truly drive business value and user adoption. Specific capabilities within BI design include logical and physical data modeling, identifying and defining critical KPIs and metrics, designing data marts, operational data stores and enterprise warehouses, data profiling, rapid prototyping, infrastructure blueprinting, and making security accommodations to handle public, private and personally identifiable information assets and customer data.

4. **Development.** Deloitte has experience developing and delivering BI solutions across a multitude of industries and business needs, including over 20 different state government organizations. A sample of our experiences with our Pennsylvania, Georgia, West Virginia and Montana clients are detailed in the success stories in the “Services in Action” section below. We have delivered operational, managerial, executive and external/compliance focused reporting solutions through various delivery mechanisms, including detailed reports, OLAP cubes, scorecards, dashboards, and other advanced visualizations. A

sample of a TANF (Temporary Assistance for Needy Families) business intelligence solution is shown in the graphic below.

In addition our experience with developing various types of business intelligence solutions, Deloitte has the capabilities to deliver these solutions using nearly every tool available on the market today. Deloitte is truly tool agnostic. This is critical because it means that we can work with organizations to develop solutions that leverage the right tool set to meet their individual business needs, as opposed to forcing a solution simply because we are obligated to sell a specific tool. We can leverage whatever toolset VITA selects in order to develop value driving solutions for the various Virginia Agencies and Departments. Regardless of the tool selected, Deloitte has the right skills, experience, capabilities to develop a solution which meets the specific needs and requirements for the Commonwealth of Virginia.



Figure 5-8. Sample BI Dashboard.

5. **Implementation.** Deloitte offers a full range of BI implementation capabilities to help confirm that an organization's BI initiatives and programs are successful and achieve the identified business value. Our experience in offering testing, communications management, deployment, ongoing support and maintenance services enable Deloitte to be a true end-to-end BI implementation service provider for the Commonwealth of Virginia. Deloitte's capabilities provide a number of benefits to Virginia, including reduced overall project costs, faster time to market, increased user acceptance and adoption, and higher return on investment.
6. **Training.** Deloitte offers extensive training activities to our clients in order to help confirm that the developed solution is fully understood by all stakeholders Deloitte has established extensive training materials and programs with a proven approach and focus towards teaching our clients on the developed solution and empowering them to use the solution in their day-to-day activities. Deloitte works closely with our clients to make sure they come away with a full understanding of the solutions regardless if we are offering technical training or training for a functional business analyst. Our goal is that we can empower our clients to use BI solutions to make actionable, data driven business decisions.

3.0 Deloitte's Key Vendor Relationships

As mentioned in Column B of the Solution Category Requirements in Figure 5-3 at the top of this section, Deloitte is tool agnostic and works together with a multitude of strategic partners to deliver more value to our clients. We are aligned with more than 45 of the leading technology companies to develop services and solutions that help our joint clients create added value. Amongst these alliance partners are a number of providers of leading Business Intelligence and Analytics tools. We regularly team with the vendors detailed in the below table to develop solutions to meet our state government stakeholder's needs and objectives. Key alliances partners include:

	<p>Our alliance combines Deloitte's industry, business, and technical knowledge with IBM's leading technologies to help global enterprises solve tough business issues. For more than 12 years, our smarter teaming approach has generated even more value for our clients. IBM's Cognos software allows organizations to develop robust reports, dashboards and OLAP cubes that bring their data to life for analysis.</p>
	<p>The Deloitte and Oracle alliance provides effective and efficient implementations of Oracle services and solutions to help organizations drive revenue growth and improve operating margins. With 13,800 Oracle practitioners worldwide, we have extensive experience implementing Oracle solutions, including Oracle Business Intelligence Enterprise Edition (OBIEE) across geographic and organizational boundaries.</p>
	<p>With a worldwide practice of more than 12,500 SAP practitioners in more than 135 countries, we deliver SAP business results faster and better than any other vendor in the world. We have delivered numerous solutions that integrate the entire suite of SAP BI tools, including Business Objects NetWeaver and SAP HANA. We also hold the highest level of strategic alliance with SAP: Global Partner—Services.</p>
	<p>Deloitte works with EMC to build infrastructures that help our clients unleash the power of their digital information. Our joint offerings address IT strategy, information management, cloud, enabled business intelligence reporting, data protection, content management, and much more.</p>
	<p>The Deloitte and Informatica strategic alliance brings together Deloitte's deep experience in analytics, big data and master data management coupled with Informatica's data integration, data management and cloud capabilities. Together we deliver timely, relevant, and trustworthy data to support enterprise initiatives ranging from descriptive and prescriptive reporting, advanced analytics and ERP/CRM implementations to master data management.</p>
	<p>Deloitte and MicroStrategy work together to deliver business intelligence and analytics solutions. Our alliance combines Deloitte's analytic capabilities with MicroStrategy's technology offerings, which include integrated reporting, analysis, and monitoring software. Together, we help business leaders worldwide make more informed decisions.</p>
	<p>Deloitte's cross-functional advisory, assessment, strategy, and implementation services coupled with Teradata's enterprise data warehousing and analytic capabilities help companies make better, faster decisions that drive growth and profitability.</p>
	<p>Deloitte and Qlik work to provide clients with the ability to manage and analyze data into powerful visualizations that drive business performance, while helping to maintain data governance and control.</p>
	<p>Deloitte analytics professionals help our clients gain deeper insights into their data using Tableau desktop analytics and visualization software to distill and display massive amounts of data.</p>

Figure 5-9. Deloitte's Key Business Intelligence Alliances.

Deloitte's Business Intelligence Services in Action

At Deloitte, we do not just have strategies and approaches for delivering business intelligence capabilities to our public sector clients; we have the deep insight that can only be gained from actually designing, developing and implementing BI solutions. These BI solutions have helped state organizations achieve a multitude of key business objectives including; monitoring end-to-end P-20 academic performance and the impact on employment, enabling the ability to monitor and incentivize TANF work participation, improving operational efficiencies during the eligibility determination process, and providing an end-to-end view of the performance

of all the programs within a state Human Services department. Each of our various solutions have implemented a number of information management and business intelligence capabilities including enterprise data warehousing, executive dashboards and scorecards, operational dashboards, OLAP cubes, canned reports, and ad hoc reporting.

For the purposes of the Virginia Next-Generation Analytics RFP we have included a subset of some of the business intelligence solutions Deloitte has built for state agencies. The table below allows VITA to clearly visualize the solutions which were delivered and the services that were performed for each state. In addition, the table attempts to identify the specific services which align to the RFP’s business intelligence solution category requirements.

Select Deloitte State Government Experience				
Services/ Requirements	GA	WV	MT	PA
Strategy (Req. #8 Solution/ Services Examples)	✓		✓	✓
Planning (Req. #3 Licensing Details, Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
Design (Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
Development (Req. #4 Deployment; Req. #6 Installation, Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
Implementation (Req. #7 Implementation Services, Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
Training (Req. #5 Training, Req. #8 Solution/ Services Examples)	✓		✓	✓

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Figure 5-10. Deloitte’s Experience Delivering BI Services.

State of Georgia - Academic and Workforce Analysis and Research Data System (AWARDS)	
Methods Employed	Descriptive Analytics and Data Warehousing
Background	The Georgia Governor's Office of Student Achievement (GOSA) is tasked with increasing student achievement and school completion rates across Georgia through meaningful, transparent, and objective analysis and communication of statewide data. GOSA needed the ability to provide policy support to the Governor and to the citizens of Georgia through a BI solution that would forthrightly indicate the effectiveness of Georgia's education institutions, research initiatives on education programs, and various other initiatives. In order to achieve these goals GOSA engaged Deloitte to help consolidate information from Georgia's education agencies and deliver a business intelligence solution that supports their organizational mission.

State of Georgia - Academic and Workforce Analysis and Research Data System (AWARDS)

Solution Deloitte led the implementation of the Georgia Academic and Workforce Analysis and Research Data System (AWARDS) to integrate customer data from Pre-K through Post-Secondary and Teacher Certification data. As part of the project Deloitte performed requirements gathering and prioritization, data model and solution design, reporting development, implementation and end-user training services. This included gathering input from seven different state educational agencies including the Department of Education and University System of Georgia to define the scope and drive the overall solution. A comprehensive education data model was defined that includes a common integration layer for accepting disparate data from all agencies and a presentation layer that provides over twenty subject areas and serves as the access point for all ad hoc research analysis and standardized reporting. In order to achieve this, the statewide longitudinal data system (SLDS) leverages a wide variety of business intelligence toolsets including master data management (MDM), enterprise data warehouse and reporting software.

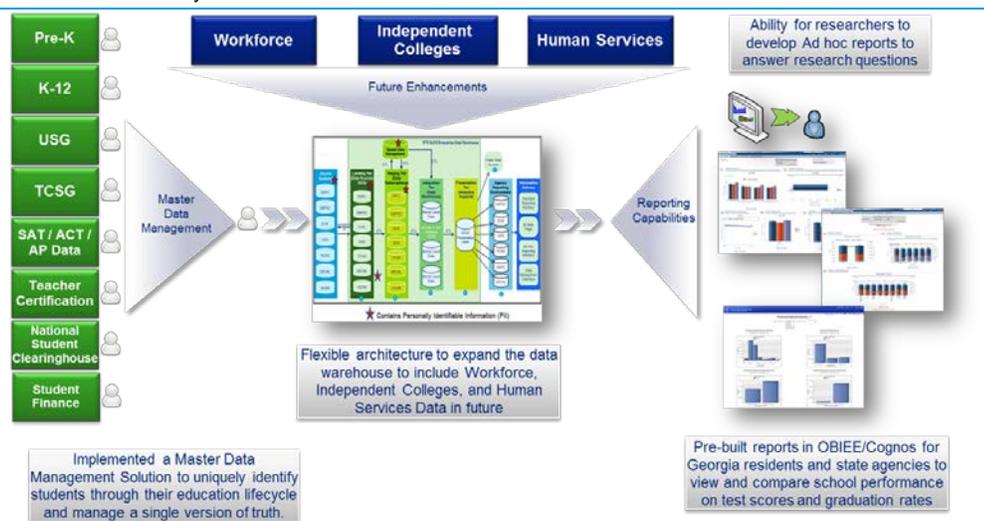


Georgia SLDS Dashboard

As a result of AWARDS, Georgia residents now have access to public facing dashboards and scorecards that provide insights into end-to-end school performance such as graduation rate, college admission rate, standard test scores, etc. that can be viewed across various dimensions, such as race, gender, geographical location, and socio-economic conditions. These insights also provide information to education researchers and policy makers that enables them to make better decisions around education funding, scholarships, charter approval, and other improvements to make students better prepared for the workforce.

Benefits Below is a summary of the benefits and enhancements that GA AWARDS provides to Georgia's education stakeholders:

- Foundation for a single data repository and model containing all records for a student from Pre-K through 20
- Master Data Management processes for linking student and teacher records across all agency data and enabling cross-agency data stewards to provide input into the matching process
- Increased visibility into agency-wide data
- Enhanced reporting and research capabilities
- Ability to track historical data
- Flexible architecture that allows additional capacity as the demand increases and additional agencies and users are added to the system



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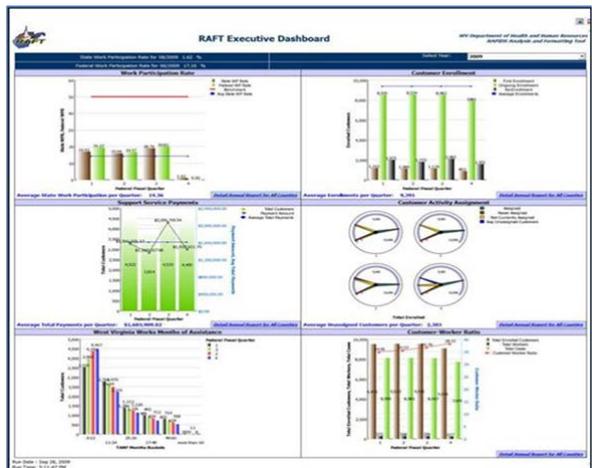
Overall GA AWARDS Solution.

Figure 5-11. State of Georgia AWARDS.

State of West Virginia - TANF Reporting Solution

Methods Employed Descriptive Analytics

Background Since the inception of the Personal Responsibility and Work Opportunity Act (PRWORA), TANF caseloads in the state of West Virginia were decreasing. This decrease in TANF caseload helped offset work participation requirements early on but, as caseloads began to stabilize, work participation rates had to increase to comply with federal requirements. However, due to low work participation rates the state was facing a \$6,000,000 sanction. While there was little the state could do in the short term, a long term solution was required to rectify this issue. Although there was work program and work participation reporting available on the mainframe system, the data was not in a format that was conducive for some levels of the organization to take action. To fully understand the work participation rate, each level of DHHR requires access to timely information, at the proper level of granularity for their role and in a format that can be easily disseminated to make effective business decisions.



West Virginia TANF Dashboard.

Solution The business intelligence solution delivered to West Virginia was tailored for effectively managing the work participation requirements of the TANF program. Each level of the organization received reporting and dashboarding capabilities that addressed their most important business questions. As a result of the improved decision making capabilities delivered by the solution, work participation rates saw significant improvements and the state was able to avoid additional sanctions.

Figure 5-12.State of West Virginia TANF Dashboard.

State of Montana - Workload and Case Management Reporting Solution

Methods Employed Descriptive Analytics

Background The Department of Public Health and Human Services (DPHHS) is the largest agency of the State of Montana's government with a biennial budget of about \$4 billion. With an increase in residents served by DPHHS and a growing backlog of cases, it became difficult to manage the workload using traditional standard reports. The State was seeking a solution to help them more intelligently and strategically approach field work. As such, Deloitte was engaged to build a business intelligence capability to improve the delivery of DPHHS services (specifically SNAP, TANF, and Medicaid) to Montana residents in need.

Solution Deloitte designed, delivered, and maintains an operational business intelligence solution to manage workload and case manager performance as it pertains to application processing, redeterminations/renewals, benefit issuance, and eligibility. The solution, MT BEAR, provides a series of reporting mechanisms to drive insight and better decision making:

- **Dashboards.** Deloitte delivered seven dashboards that visually depict key performance indicators such as application timeliness, the accuracy of benefits issued, projected workload for recertifications/renewals, and workload processing performance. Each dashboard allows users to interact with the data by clicking areas of interest to “drill down” from the statewide data to view specific region, office, supervisor, and even worker information.
- **Ad hoc Reporting.** Deloitte empowered business users with access to powerful ad hoc “slice-and-dice” capabilities through cubes that allow users to create customized reports using an intuitive drag-and-drop interface, or tailor one of the existing dashboards to meet their precise need. Reports can be exported in to a variety of formats including Microsoft Word and Excel to share with other parties. In addition the ad hoc reporting capabilities are often used to answer business questions or address any legislative or federal partner requests for information.
- **Canned Reports.** Deloitte developed a number of PDF and Excel reports designed to provide specific information better manage workload. These reports employed conditional formatting and business rules to help field staff better prioritize work activities.

Benefits MT BEAR is used by both executives and field staff to manage caseload, assess overall field performance, and identify trends in the data.



Montana Ad Hoc Report.



Montana Operational Dashboards.

Figure 5-13. State of Montana Operational Reporting Solution.

Commonwealth of Pennsylvania – Department of Human Services Executive Dashboard

Methods Employed Descriptive Analytics and Data Warehousing

Background The Pennsylvania Department of Human Services (DHS). DHS provides services to over 2.7 million of Pennsylvania's most vulnerable citizens. The Department's 16,000 employees administer programs through seven distinct program offices with a total operating budget of over \$63 billion. Deloitte has been doing work with the Pennsylvania DHS for over 20 years and one of our most successful projects which was recently delivered in 2013 was the Department of Human Services Executive Dashboard.

With the size of the Pennsylvania Department of Human Services and the volume of services delivered it was challenging for Department executives to monitor/ track agency performance. When a new administration took the reins at the Department one of the top priorities was to increase transparency and operational effectiveness of core Department programs. They desired enhanced access to timely metrics that showed a cross-program horizontal view of current DHS business trends. Deloitte assisted the Department in creating an executive dashboard which provides an "at a glance" view of trends on key performance metrics including enrollments, expenditure and recoveries for key programs, and a summary of performance on the key operational metrics at the Department. The dashboard provides a centralized view of information by bringing together data from over 20 disparate sources and presenting it in a standard and consistent format.

Solution The Executive Dashboard provides the DHS Executives (Secretary, Deputy Secretary, and Bureau Directors) with the ability to monitor and manage welfare program operations by viewing a series of critical business metrics in the form of an interactive dashboard report. In total, the Executive Dashboard provides the Executive Staff with access to over 250 distinct business metrics across 20 DHS programs enabling the ability to answer a wide variety of business questions for a series of different business functions. The dashboard provides DHS with a cost-effective, broad-reaching and a cross-program approach to monitoring the integrity of its programs. It assists DHS in reducing fraud, waste and abuse while protecting tax dollars for providing services to truly eligible and needy Pennsylvanians.

The technologies which were leveraged for the Executive Dashboard Initiative were as follows: Cognos 10.2, Informatica 10.1, and Oracle 11g database. Cognos provides the web front end which allows the Executive Staff to view and manipulate the various dashboard metrics. Informatica is primarily used to extract, transform and load data from a variety of source systems/ databases into a consolidated Enterprise Data Warehouse (EDW). Using Informatica, data from over twenty disparate source systems was loaded into the EDW and leveraged for the Executive Dashboard initiative. The executive dashboard provides an intuitive user interface which integrates data into one consolidated area for ease of analysis and monitoring.

Benefits The primary goal of the Executive Dashboard initiative was to give the DHS Secretary and Deputy Secretaries greater transparency into their program operations to facilitate monitoring and informed business decisions. Of critical importance to the executive staff was the ability to integrate data from a variety of separate HHS programs across the following critical business areas: Expenditures, Enrollments, Revenues, Integrated Eligibility, Employee/ Contractor Performance, Program Integrity, Cost Containment, and Operational Metrics. The Executive Staff's desire was that viewing the above critical business areas in a consistent, consolidated dashboard report would enable them to achieve the following key objectives:

- Drive individuals towards self-sufficiency
- Enhance eligibility and redetermination process efficiency
- Improve program integrity thus reducing fraud, waste and abuse
- Monitor program enrollments and expenditures

In order to achieve the above goals and objectives the Executive Dashboard initiative implemented a robust dashboard reporting solution which allows the Executive Staff to analyze a series of critical business metrics. These business metrics provided the DPW Secretary and Executive Secretaries the following key benefits:

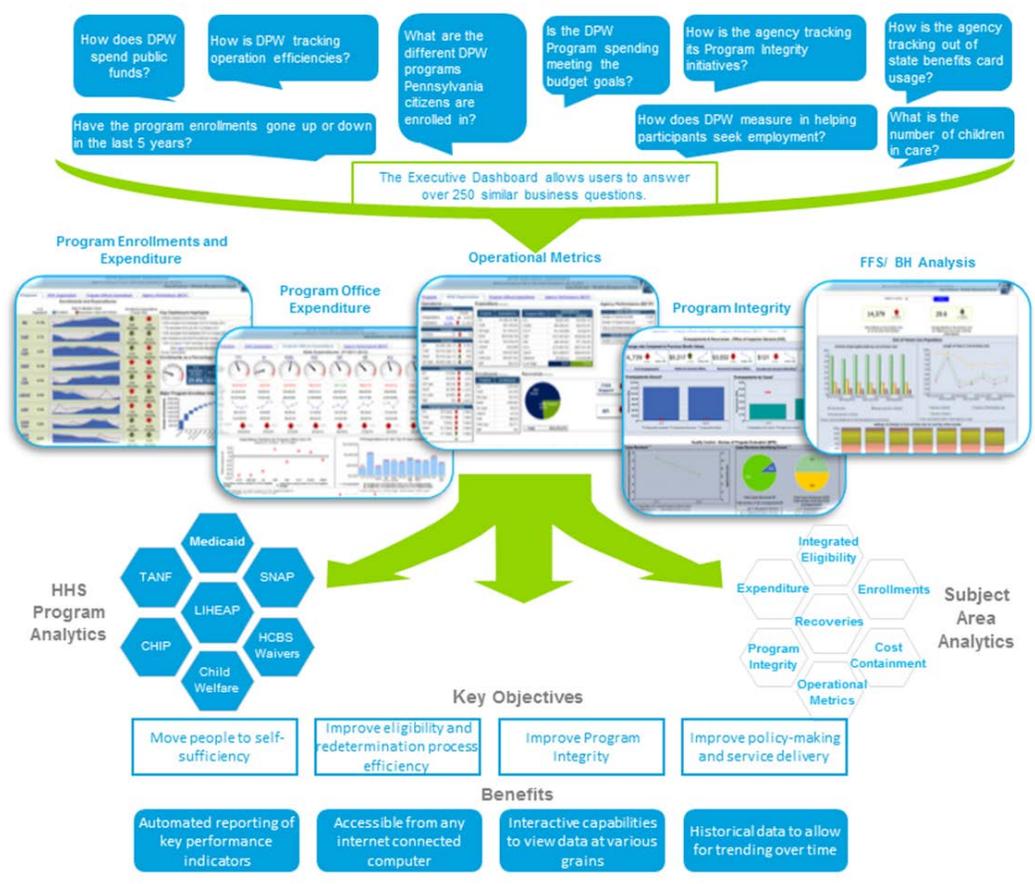
- Ability to track fraud, abuse and misallocation of funds
- Ability to track enrollments for the following programs: MA, TANF, SSI, SNAP, LIHEAP, CHIP, GA and Child Care
- Ability to track State and Federal expenditure for all the above programs
- Ability to track State expenditure for each of the DPW Program Offices
- Ability to track recoveries for Child Support, Third Party Liability and Fraud & Abuse
- Ability to track a variety of Operational metrics for instance Agency Performance based on the Bureau of Employment Training (BETP) program etc.
- Allow scrutiny of out-of-state electronic benefit cards use
- Ability to track overpayments and resulting recoveries and cost avoidance in various benefit programs
- Ability to track fraud and abuse tips.

The Executive Dashboard initiative achieved all outlined goals and objectives in the agreed timelines and within the defined budget. Furthermore, due to the significant benefits realized as part of this initiative the Executive Dashboard team has received numerous praise and recognition from PA stakeholders. In addition, the key stakeholder from the PA

Commonwealth of Pennsylvania – Department of Human Services Executive Dashboard

Bureau of Information Systems (BIS) which worked with Deloitte to lead the Executive Dashboard initiative was recognized with the Outstanding Leadership and Innovation (OLLIE) award from the Office of Information Technology and Governance for her efforts. The OLLIE award honors stellar achievements and innovations in the PA Public Sector industry.

The Executive Dashboard was initially planned for only three iterations but due to exceeding stakeholder expectations the Department requested three additional iterations. In total the Dashboard allows DHS leadership to track over 250 unique business metrics across and array of HHS programs. The diagram below depicts a subset of the business questions, dashboard screens, program areas, and benefits realized as a result of the DHS Executive Dashboard project.



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Commonwealth of PA Executive Dashboard Components.
Figure 5-14. Commonwealth of Pennsylvania DHS Executive Dashboard.

2. Predictive and Prescriptive analytics

- a. **Predictive Analytics.** The three basic cornerstones of predictive analytics are: Predictive modeling; Decision analysis and Optimization; Transaction profiling. Predictive analytics answers the question what will happen. This is when historical performance data is combined with rules, algorithms, and occasionally external data to determine the probable future outcome of an event or the likelihood of a situation occurring.
- b. **Prescriptive Analytics.** Ingests hybrid data, a combination of structured (numbers, categories) and unstructured data (videos, images, sounds, texts), and business rules to predict what lies ahead and to prescribe how to take advantage of this predicted future without compromising other priorities.

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. Within Deloitte we have analytics and data science professionals with deep experience and specialization across many predictive analytics tools, including those mentioned above. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of statistical analytics services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. We are product agnostic in order to deliver the optimal tool and solution to our clients' environment. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of predictive analytics services. We have deployed our solutions in cloud-based or on premise infrastructure.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte can help support vendor licensing conversations. For Deloitte also maintains its own licenses for many relevant analytics, data management, and external data tools necessary for conducting predictive analytics on Deloitte infrastructure. Analytics we perform in this environment do not require additional licensing.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Y	Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. Deloitte's analysis and any resulting tools can be implemented in multiple agencies, but may need to be customized as a result of differing business needs, datasets, and/or data structures.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte provides documentation, training and knowledge transfer to our clients both on the tools we develop and deliver. Additionally, we have eminent practitioners who deliver classes and training on statistical analysis and data science.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. Deloitte has extensive relationships working with an array of tools and vendors. Based on the selected tool, Deloitte can work with VITA and/or the respective agency to provide installation services and support. In addition, Solution Installation

Requirements	A	B	
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	packages may be provided that are comprised of deployment units, deploy scripts along with instructions for deployment as part of our solutions. Deloitte is a provider of predictive and prescriptive analytics services, and as such does not align with a single tool set. Deloitte provides extensive implementation services for assisting state agencies in deploying predictive and prescriptive analytics.
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Please refer to Deloitte's Predictive and Prescriptive Analytics Services in Actions for sample experiences from our government clients.

Figure 5-15. Predictive and Prescriptive Analytics Requirements.

Deloitte's Services Supporting Predictive and Prescriptive Analytics

Deloitte's portfolio of prescriptive and predictive analytics solutions are delivered in five key business domains namely: Customer, Finance, Risk, Supply Chain and Workforce. We believe these solutions can be used to assist the agencies of the Commonwealth of Virginia improve business outcomes. Below is a sample of the type of offerings delivered in each domain.



Figure 5-16. Deloitte Analytics Solution Offerings.

Solutions Offered by Domain

Customer Analytics	
Description	Predictive and prescriptive analytical solutions to better understand customer behavior. Predictive analytics from this domain can assist the Commonwealth in enhancing the customer experience for citizens of the Commonwealth. Examples include predicting customer complaints, segmentation to improve and customize communications, or improving customer relationships.
Social Insights	<ul style="list-style-type: none"> Identify key trends, opportunities, and correlations between structured marketing data and unstructured social data for products and services among customers
Customer Segmentation	<ul style="list-style-type: none"> Segment customer base logically in order to better analyze validation, behavior, and preferences Increase focus on high-value/high-potential customers
Customer Experience Sentiment Analytics	<ul style="list-style-type: none"> Enable better tracking of customer interaction, feedback, behavior and social media insights to improve acquisition, loyalty, and value from customer relationships

Figure 5-17. Customer Analytics.

Finance Analytics	
Description	Finance analytics include predictive and prescriptive analytics to enhance financial outcomes. As applicable to the Commonwealth of Virginia, this might include forecasting demand for public services, simulating potential outcomes in healthcare exchange markets, or simulating potential outcomes in pension plans.
Scorecards, dashboards and KPIs	<ul style="list-style-type: none"> • Improve business insights by mapping out the relevant KPIs that align to the corporate strategy • Implement integrated data architectures to accurately calculate performance measures • Faster availability of data for analysis
Visual analytics	<ul style="list-style-type: none"> • Develop interactive executive sessions supported by visual analytics tools – e.g. geospatial analysis • Leverage immersive environments for modeling multiple scenarios to arrive at business decisions in real time, versus working “offline” to run reports for a future meeting
Mobile analytics	<ul style="list-style-type: none"> • Implement secure mobile access to information providing executives with more immediate access to performance metrics that measure the execution of corporate strategies • Increase adoption of KPIs • Support real time discussions and shorter decision making cycles

Figure 5-18. Finance Analytics.

Risk Analytics	
Description	<p>Risk analytics includes using predictive and prescriptive modeling techniques to identify and quantify risk. These types of analytics include fraud detection, safety analytics, insurance risk modeling, and healthcare analytics.</p> <p>For the Commonwealth of Virginia, this might include detection of fraud in public services such as Revenue, Workers Compensation Unemployment Insurance, Medicaid, SNAP or other Human Service related programs. These types of models assist in focusing resources to work “smarter not harder” while simultaneously deterring fraud through the Sentinel Effect.</p>
Fraud and anomaly detection	<ul style="list-style-type: none"> • Uses advanced statistical methods for identifying and mitigating fraudulent and criminal behavior that results in the loss of assets <ul style="list-style-type: none"> – This includes organized rings, opportunistic (“soft”) fraud, and anomalous records
Predictive project analytics	Provides dynamic modeling based on real-time data to improve productivity and process efficiency through an analytical environment where relevant, actionable, accurate and timely information is provided to monitor cost take-out opportunities, identify profitable growth opportunities, solve problems faster, anticipate risk challenges and opportunities, and make intelligent decisions quicker
Anti-money laundering analytics consulting	Utilizes transactional data analysis and customer demographic information to address suspicious activity and currency reporting, assess customer and institutional risk, and modify and improve “business as usual” transaction monitoring

Figure 5-19. Risk Analytics.

Supply Chain Analytics	
Description	Supply Chain Analytics encompasses operations research and the activities to improve the delivery of goods and services. For the Commonwealth of Virginia, this might include resource allocation, delivery and routing services, scheduling and routing for inspectional services, assistance and analytics of traffic patterns in transportation.
Inventory Analytics and Optimization	<ul style="list-style-type: none"> • Increased efficiency for conducting inventory assessments and monitoring inventory performance • Identification of opportunities for reduction in inventory cost
AR/AP Optimization	<ul style="list-style-type: none"> • Enhanced insights into the vendors/customers collecting/paying behavior for different terms at a category, subcategory, tier-level • Enabling better decisions for generating AP/AR savings
Driver-Based Forecasting /Demand planning and	<ul style="list-style-type: none"> • Enhanced ability in predicting demand and revenue by identification of accurate drivers impacting demand

Supply Chain Analytics

forecasting/Free Demand Analysis

Figure 5-20. Supply Chain Analytics.

Workforce Analytics

Description	Workforce analytics includes a set of analytical offerings intended to assist organizations in meeting the supply and demand of employees and workforce. Many employers collect but under-use information on employees which can be used to forecast and predict attrition and identify issues with maintaining a strong and balanced workforce. For the Commonwealth of Virginia, this might include workforce planning, analytics to predict attrition and demand for key resources, and developing solutions to assist the Commonwealth mitigate workforce issues through analytics.
Workforce Optimization	Analyzes scenarios of different organizational models using visualization and predictive scoring techniques for enabling data-driven decision making
Retention Analytics	<ul style="list-style-type: none"> • Defines employee success attributes and creates a scoring engine that determines level of risk, reason for leaving and replacement costs • Reduces direct and indirect labor costs by identifying and addressing key internal and external drivers of employee attrition
Organization Design	Visualizes the organization with accurate data at the individual, function, department, and/or enterprise level to simulate the To-Be structures to right size the organization with optimal management layers and spans of control

Figure 5-21. Workforce Analytics.

Our Predictive and Prescriptive Service Details

Deloitte has designed, developed and implemented predictive analytics for a range of clients in the public and private sector. We collaborate closely with our clients to identify the necessary data and analytics to solve some of their most important business problems. For example, we have developed and delivered extensive predictive analytics solutions to detect and deter fraud in public service programs. One of our service offerings is uDetect™, a suite of predictive and prescriptive analytics solutions for detecting and deterring fraud and improper payments in the Unemployment Insurance space. Another example is in Child Support Enforcement (CSE) where we have designed, developed, and implemented predictive analytics to assist state agencies in managing non-custodial parents. A third example is our healthcare and lifestyle analytics. We have successfully assisted states with predictive modeling solutions to understand and forecast outcomes from regulatory changes and implementation of Health Insurance Exchanges (HIX). Examples of where we have successfully delivered these types of predictive and prescriptive analytics services are included in the section on Our Experience.



Deloitte employs rigorous methodology for custom model development and the end to end business implementation and technical systems integration, to deliver rapid business impact from predictive modeling initiatives. Deloitte’s Advanced Analytics & Modeling (AAM) practice has developed and leveraged this “Predictive Modeling Business Implementation Methodology” (PMBIM) over more than 15 years of developing and deploying predictive models for our clients.



Figure 5-22. Predictive Modeling Business Implementation Methodology.

The following figure represents Deloitte’s twelve step approach towards designing, building and testing predictive and prescriptive models.

Custom Predictive Model Development



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Figure 5-23.PMBIM Steps.

Deloitte's Predictive and Prescriptive Modeling Techniques

Deloitte has deep experience with predictive analytics across a wide variety of analytical techniques which can be used to improve business outcomes for the Commonwealth of Virginia. Broadly, these types of analytics can be categorized into Supervised Models and Unsupervised Models. We employ both Supervised and Unsupervised models to solve business problems for our clients and we anticipate using many of these methods in analyzing data from multiple state agencies during a pilot or project with the Commonwealth of Virginia.

Supervised Models. Supervised models are a subset of predictive models which use known cases as target variables, using associative patterns in predictors to locate claims with similar characteristics. These methods explore relationships and patterns using techniques, such as regression analysis, decision trees, neural networks, or other methods with a dependent variable.

Prediction approaches leverage supervised data mining methods that search for targets in the data, such as past claims found to be overpayments or fraud. These methods explore possible relationships and patterns that relate to explaining exceptions using techniques, such as decision trees, neural networks, probabilistic classifiers, multinomial logistic regression, and others. They produce probabilities that a particular claim reflects an exception. However, since we often “do not know what we do not know”, our solutions leverage information obtained from business experts to deliver powerful predictive analytics which can work for the Commonwealth. The team will employ intelligent approaches to defining targets for supervised data mining to solve each business problem.

Unsupervised Models. Unsupervised models are forms of predictive analytics which do not have a target or dependent variable. Rather, these methods provide a model for multivariate patterns in the underlying system. Examples of unsupervised analytical models include Principal Component Analysis (PCA), association rules, cluster analysis, network models and Benford's Law. Unsupervised and semi-supervised techniques form the backbone of the techniques necessary for detecting emerging and evolving fraud schemes.

Unsupervised analytics methods are critical to detecting fraud and improper payments. Due to the creativity of fraudsters and the dynamic nature of fraud, new patterns emerge which may be considered concept drift: evolution from prior observed fraud schemes. Our solutions use unsupervised detection methods to help identify new fraud schemes as they emerge. Unsupervised algorithms do not have a specific target variable, but can reveal structure and meaning behind data that can be useful for detecting fraud cases. As fraud schemes evolve, supervised detection methods may become less accurate, as the new schemes change the signature of fraud in the data. Unsupervised methods are better at identifying anomalies and focusing on suspicious behavior. A singular difficulty in algorithmic fraud detection is that the historical record is rarely complete. Many cases of fraud go uninvestigated and undetected, and thus fraud is often under-represented in historical data flagging fraudulent claims. Thus, a dataset with known fraud cases may flag many actual cases of fraud as non-fraud. Unsupervised methods provide a complement to supervised ones, helping to identify these previously unidentified fraudulent cases and thereby closing the gap of detecting new incidents as they emerge. The findings from unsupervised methods can be incorporated in fraud detection methods and often may be used to bolster and enhance supervised fraud detection algorithms.

The figure below includes a sample of the types of predictive and prescriptive analytics that Deloitte might use during projects and pilots with the Commonwealth of Virginia.

Predictive and Prescriptive Analytical Methods	
Supervised models	Supervised models such as regression models derive a mathematical relationship between a target data dimension and other data dimensions using conditional expectations. The nature of the models may be either linear or nonlinear parameterized equations. This category includes regression, generalized linear regression, hierarchical models, random and mixed effects models, generalized additive models, and time series models such as ARIMA. Additionally, this categories as well as machine learning techniques such as decision trees, support vector machines, random forest, and neural networks.
Constraint satisfaction	Constraint satisfaction methods use checks within the data to indicate compliance. For example, to locate logical inconsistencies in data observations.
Benchmarking	Benchmarking is the process of comparing one or more performance indicators across multiple entities. The utility of benchmarking is limited to the performance indicators developed.
Statistical profiling	Statistical profiling is the empirical study of the statistical distributions of the data dimensions. Statistical profiling can provide some insight into the variance of the observations.
Outlier detection	Outlier detection uses various methods to identify data observations that do not adhere with other data observations. Outlier detection methods are useful in detection of large-scale anomalies.
Social network analysis	Social Network Analysis looks at the relationships between the entities in a given transactional system. The nature and volume of the transactions can lead to insights into collusion between multiple entities.
Classification models	Classification models are guided training models that capture the information contained in the observation data necessary to predict a single target variable (data dimension). Classification models are widely used to predict the behavior of individual entities given historical data. Commonly used methods to build classification models include Decision Trees, Logistic Regression, Support Vector Machines, and Artificial Neural Networks.
Cluster models	Cluster models are self-learning models that group entities from the observation data into clusters that have some structural commonality. The nature of the commonality is typically defined for some business objective.
Bayesian Models	Bayesian statistical approaches are an alternative method for approaching understanding uncertainty during statistical modeling. Bayesian models can be used to provide a richer view of probability and likelihood of rare events or in situations where little data are available. Bayesian models form the backbone of many machine learning techniques.
Unstructured Data Analytics	Deloitte can support unstructured text from multiple sources, including emails, call center transcripts, free-form text narratives, and lengthy subject-specific documents (e.g. legal, medical). Our expertise includes use of an extensive library of classification models (e.g. name entity classifier, HMM tagger, linear SVC identification pipelines) in an ensemble approach combined with NLP (POS, grammar aware) to improve accuracy and performance. Deloitte's experience with Unstructured Data Analytics is described more thoroughly in the Unstructured Data portion of Section 5.

Figure 5-24. Sample Predictive and Prescriptive Analytical Methods

Deloitte's Spotlight on Behavioral Analytics

Deloitte is a thought leader in the emerging space of Behavioral Economics and using these principles to improve outcomes in the public sector. We employ these Behavioral Analytics techniques to assist public sector organizations communicate with their customers and workforce through better education, persuasive messaging, and leveraging choice architecture to enhance citizen and state outcomes.

Leveraging behavioral analytics in the public sector to enhance and improve messaging has been critical in reducing fraud, improving response rates to communication, and enhancing delivery of public services. We integrate these tools and techniques into our predictive and prescriptive analytics in the public sector. These

behavioral analytics capabilities are pioneered by our GovLab, Deloitte's flagship Federal think tank and innovation center.

The graphic is divided into two main vertical sections. The top section, titled '3 Goals', has a green background and lists three objectives: 1) Produce transformative research using new technologies to enhance federal operations; 2) Develop professionals to lead complex projects and provide new perspectives; 3) Deliver a broad range of services using industry-leading solutions. The bottom section, titled 'Research', has a blue background and describes GovLab fellows' collaborative work with government and industry leaders, listing recent endorsements from Harvard Business Review, Forbes Magazine, Wall Street Journal, and various conferences.

3 Goals

- Produce transformative **research**, using new technologies and approaches, with the power to radically enhance federal government operations
- Develop** professionals with the ability to lead complex projects, inspire teams, and provide new perspectives on emerging trends and the federal government
- Deliver a broad range of **services**, using industry leading solutions, to provide unique client experiences and share skills with Deloitte practitioners

Research

GovLab fellows collaborate with government and industry leaders to explore emerging trends which are translated into short, sharp, accessible studies, blogs, videos, and infographics. Recent endorsements include:

- Features in **Harvard Business Review**, **Forbes Magazine**, **Wall Street Journal**, Harvard Kennedy School Ash Center, the New America Foundation, Governing, and NextGov
- Presentations at several national and international conferences, including Social Capital Markets, Inside Augmented Reality, Drone & Aerial Robotics, Future of Money and Technology, and **Next Generation Government**. Invites to present half a dozen research topics at the **South by Southwest Interactive** (SxSWi) conference
- Produced the **top four pieces of eminence** in 2012/2013 as assessed by an independent review board that considered 80 reports produced by Deloitte US firms

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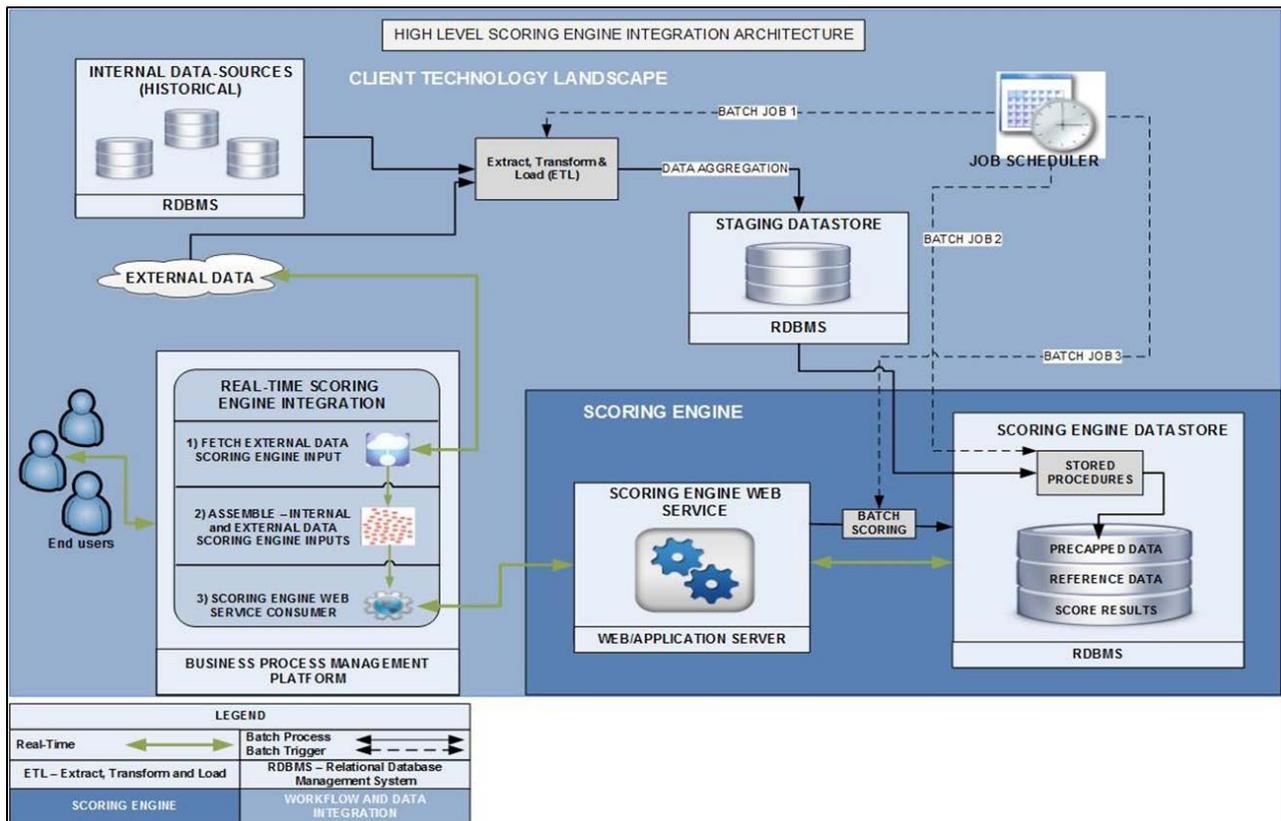
Figure 5-25. GovLab Overview.

Deloitte's Scoring Engine Integration Architecture

Deloitte has vast experience and extensive knowledge in the business deployment and technical integration of predictive analytics in operational systems. Deloitte has designed and developed a solution framework to support the operationalization of predictive and prescriptive analytics within an Enterprise Information Technology (EIT) architecture. Deloitte has employed the framework in deploying Predictive Models for a wide variety of clients in the private and public sector. Our services leverage this framework which provides the benefits of an off-the-shelf solution combined with the flexibility of custom solution. The core elements of the framework include:

- Reliable and scalable technology architecture framework to deploy predictive models in production systems.
- Modular building blocks to implement variety of predictive and prescriptive analytics techniques such as regression models, Bayesian models, and outlier detection.
- Customizable business requirement specification framework to enhance business process workflows using data-driven predictive model insights and monitor the performance of predictive models.

The technical component the solution framework called the Scoring Engine can be deployed as on premise application or cloud-based service. Scoring Engine is technology platform agnostic and can be implemented using open-source technology stack or proprietary technology platform or a combination. The diagram below depicts the high level Scoring Engine Integration technical architecture



VA_VITA_SCM-039

Figure 5-26. Scoring Engine Integration Architecture

The Scoring Engine is implemented using layered application architecture comprising of backend database layer, business logic layer and front-end layer. It requires upfront aggregation of data from diverse set of internal and possibly external data-sources. The Scoring Engine provides support for both real-time or batch interaction mode. It provides uniform data model to aggregate data from disparate data-stores along with well-defined web service interface to consume the service in near real-time.

Deloitte’s Predictive and Prescriptive Analytics Training Services

Deloitte’s experienced analytics practitioners provide training services on developing, delivering, and implementing predictive analytics services. Our data scientists and analytics strategy practitioners have delivered internal training for our clients to assist in developing analytics capabilities, enhance data science skills, and better understand emerging tools and techniques for predictive and prescriptive analytics.

The precise scope and content of the envisioned coaching and advanced training workshops will be customized as necessary for the Commonwealth of Virginia. We can assist with strategy of analytics such as whom to hire, train or re-train, and the appropriate mix of data analytic tools and methods to be included in the training. We can deliver different training and coaching modules as appropriate for different personnel. For example, Deloitte’s advanced business analytics and predictive modeling seminars for the actuarial societies regularly attract a variety of backgrounds, ranging from junior analyst to mathematics PhD, from insurance

company management to state insurance regulator. People in managerial roles attend to learn in detail the “language” of data analytics; working data scientists attend to master the practical nuts-and bolts.

Regardless of the precise details of the scope and content of the sessions, our training may contain a number of the following components:

The Strategy of Analytics

Audience	Forum	Sample Themes
Domain experts, technical managers, senior data scientists	Round-table conference room or facilitated ideation environment such as the Deloitte Greenhouse	<ul style="list-style-type: none"> • “Speaking analytics”: core concepts from business analytics, big data, data science, predictive modeling, machine learning, etc. • “Analytics war stories”: examples of successful open data, big data, and, predictive modeling, empirically informed regulation applications in government. (A mixture of Deloitte and non-Deloitte case studies could be included for discussion.) • Common themes underlying many applications of analytics. For example, predictive models to model efficiently deploy case workers; randomized controlled trials [RCTs] to evaluate intervention strategies; dashboard-style information visualization for more effective decisions. • The interplay between –data analytic indications and expert domain knowledge. • The behavioral “nudge” movement and bridging “the last mile” between data analytics indication and appropriate action. • Crowdsourced analytics and “asking the public” – traditional themes, recent findings, and emerging tools.

Figure 5-27. Strategy of Analytics Training

Data Wrangling

Audience	Forum	Sample Themes
Data engineers, data scientists, possible IT personnel	Interactive computer lab classroom-style setting	<ul style="list-style-type: none"> • Programming using such tools as R, Python and SQL • Working with data at different levels (transactional, household-level, zip code-level, etc.) • “Feature creation”: creating synthetic data elements • Working with unstructured text data • Web scraping and APIs

Figure 5-28. Data Wrangling Training

Data Exploration, Data Visualization, Dashboard Design

Audience	Forum	Sample Themes
Business analysts, data visualization experts (if any), data scientists	Interactive computer lab classroom-style setting	<ul style="list-style-type: none"> • Exploring data, preparing reports and dashboards using such tools as Tableau or Qlikview • Principles of effective information visualization for business communication (color choice, strengths and limitations of tools such as bar charts, pie charts) • Common data visualization pitfalls to avoid (“how not to lie with statistics”) • Geographical data visualization • Exploratory Data Analysis [EDA] as a mode of hypothesis generation, and prelude to confirmatory data analysis, predictive modeling, and machine learning.

Figure 5-29. Data Exploration, Data Visualization, Dashboard Design Training

Principles and Practice of Applied Data Analysis and Predictive Modeling

Audience	Forum	Sample Themes
Data scientists, technically-minded analytics managers and leaders	Interactive computer lab classroom-style setting	<ul style="list-style-type: none"> • Exploratory Data Analysis • Final data cleansing • Missing data and missing data imputation • Simulation, bootstrapping • Core supervised learning techniques. For example: <ul style="list-style-type: none"> – Regression analysis and Generalized Linear Models – Generalized Additive Models – Regularized Regression techniques (ridge, Lasso) – Machine learning techniques (such as CART, random forests) • Core unsupervised learning techniques. For example: <ul style="list-style-type: none"> – Variable clustering and correlation heat maps – Principal Components Analysis – Clustering techniques (at least two methods) – Association rule analysis • Special topics (client-determined, as requested). For example: <ul style="list-style-type: none"> – Time series analysis – Survival analysis – Social media/sentiment analysis – Social network analysis – Recommendation engines • Model validation: cross-validation, out-of-sample, out-of-time model validation

Figure 5-30. Principles and Practice of Applied Data Analysis and Predictive Modeling

Model Deployment, Monitoring

Audience	Forum	Sample Themes
Data scientists, technically-minded analytics managers and leaders, IT experts	Round-table conference room	<ul style="list-style-type: none"> • Converting predictive models and dashboards into software • Pseudo code • Documentation

Figure 5-31. Model Deployment, Monitoring

Deloitte’s Predictive and Prescriptive Analytics Services in Action

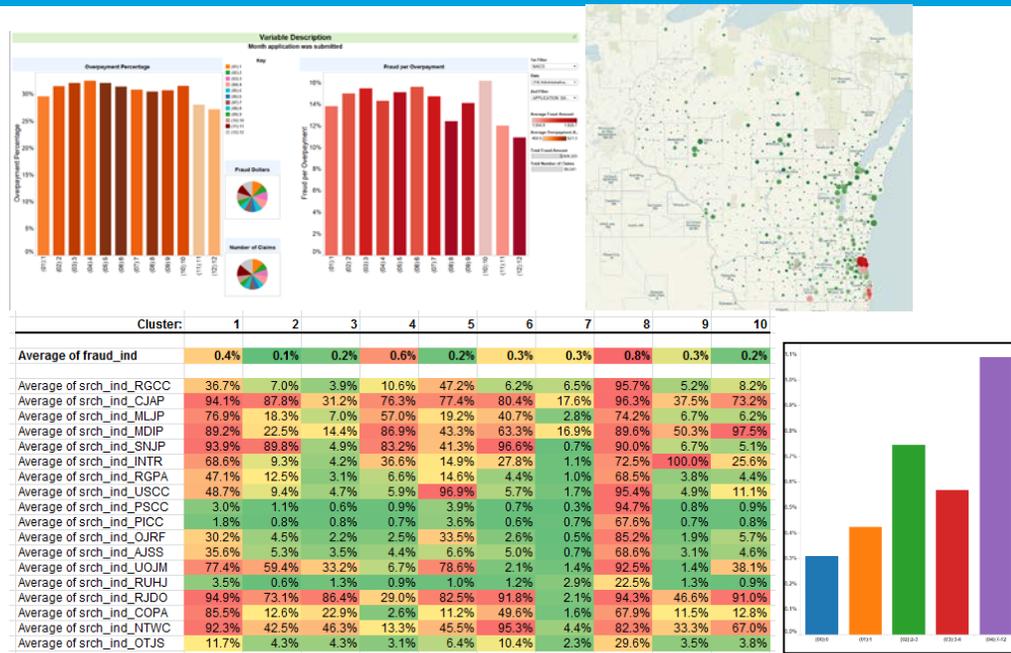
One of the key strengths that Deloitte brings to the table in response to VITA’s request for statewide analytics specialties is an extensive track record of analytics solutions implemented for government agencies. Listed below are three examples of such solutions dealing with a variety business issues each addressed by a tailored solution.

Detecting and Deterring Improper Payments in Unemployment Insurance	
Methods Employed	Predictive and Prescriptive Analytics, Statistical Programming, Simulation and Statistical Visualization

Detecting and Deterring Improper Payments in Unemployment Insurance

Background	<p>According to the US DOL, improper payments cost more than \$3.2B to UI trust funds in 2013. This cost represents more than 8% of the \$40B in benefits paid out during that year.</p> <p>Improper payments happen for a variety of reasons, including misreporting of separation reasons, benefit year earnings, and work search, not to mention the more complex fraud schemes which might involve identity theft or fictitious employers. Ironically, technology has helped combat improper payments and simultaneously opened the door for other ways to defraud the UI system.</p> <p>Cross matches are data validation tools that states use to combat improper payments. These data validation methods have helped states reduce improper payments dramatically. However, many common cross matches, such as earnings weekly wage and new hire databases, rely on a “pay and chase” approach; that is, pay the claim first, identify the issues later, and then try to recover the improper payments. Cross matches identify improper payments after the money has already gone out the door, often months after the payments are made.</p> <p>Unfortunately, once improper payments are made, it can be difficult to recover the costs. According to DOL figures, states recovered only 25% of improper payments in 2013.</p>
Solution	<p>Deloitte has developed uDetect™, a suite of advanced analytics tools to assist states in identifying and avoiding improper payments before the payments have been made. uDetect™ incorporates powerful predictive analytics and cognitive machine learning technology to identify the claims and associated employers with the highest risk for improper payments long before the payment is made – at the time of claim submission.</p>
Methods	<p>Predictive and Statistical Programming Methods and Techniques</p> <p>The uDetect™ solution includes multiple statistical and predictive modeling techniques. These methods are outlined in the section above on Deloitte’s Predictive analytics capabilities. Precise selection of technique will depend on the available data, business requirements, and potential implementation. Development and implementation of these techniques require deep experience in statistical programming.</p> <p>Simulation</p> <p>During analytics and implementation of uDetect™, Deloitte practitioners leverage simulation techniques in the development and construction of the analytical solution. Our practitioners commonly use techniques such as Monte Carlo Simulation and Markov Chain Monte Carlo (MCMC) methods to probe and estimate potential outcomes in modeling complex systems. Additionally, these simulation techniques assist in understanding of potential impact of introducing analytical solutions into the client environment.</p> <p>Statistical Visualization</p> <p>As part of uDetect™, we leverage our predictive modeling and advanced analytics accelerators to rapidly visualize patterns in the data, enabling us to quickly focus on patterns of improper payments and fraud. We have the ability to integrate our analytics into a variety of visualization platforms including Tableau, Qlikview, and Microsoft tools such as Excel or Access. We deliver interactive dashboards to our clients in order to facilitate investigation of suspicious patterns and enhance analytical model build efforts. Please refer to the section on Data Visualization for a full understanding of our data visualization capabilities.</p>

Detecting and Deterring Improper Payments in Unemployment Insurance



Prescriptive Analytics

As described in the section on capabilities with Behavioral Analytics, Deloitte has experience developing and tuning behavioral analytics and other prescriptive analytics solutions to drive business outcomes. uDetect™ includes a Treatment Stream Engine which recommend business actions or treatment streams to deter improper payments. These include delivering behavioral messaging, focusing work search and other audits, prioritizing investigatory resources to optimize internal efficiency, as well as case management for fraud detection and management.

Our results demonstrated to our client that they will be able to achieve significant savings by reducing overpayments and assist

Figure 5-32. Detecting and Deterring Improper Payments in Unemployment Insurance.

Driving Better Outcomes with a State Healthcare Insurance Exchange

Methods Employed	Predictive and prescriptive analytics, Statistical Programming, Simulation and Statistical Visualization
Background	The client had recently developed their State Healthcare Insurance Exchange and lacked the insight necessary for successful implementation and growth of the exchange. To gain insight, Deloitte was enlisted to analyze the entire market population in order to evaluate and identify options available to the client relating to the health exchange market and enrollment strategies for the State's Healthcare Exchange
Solution	<p>Solution Scope</p> <ul style="list-style-type: none"> Understand the health risk of the population using third party data: <ul style="list-style-type: none"> Profiled the health risk of individuals on and off the Exchange Compared the disease prevalence of individuals on and off the Exchange using non-claims data Calculated estimated claims cost by metal level for SHOP and Individual markets using third party data Individual and Small Group Exchange enrollment algorithms: <ul style="list-style-type: none"> Built algorithms to identify individuals who are more likely to enroll through the health exchange Identified small group employers more likely to offer insurance through the Small group marketplace and their preferred metal choice Review of 2015 rate filings for the Individual and Small Group marketplace Small Group expansion analysis identifying the impact of including Small groups of 51-100 employees into the Small Group marketplace

Driving Better Outcomes with a State Healthcare Insurance Exchange

Methods	During the project, we leveraged multiple methodologies for predictive and prescriptive analytics, including regression analysis, clustering, and simulation models. These techniques enabled the client to achieve powerful results in enhancing outcomes for the state and customers of the exchange.
Results	<ul style="list-style-type: none"> • Pricing: <ul style="list-style-type: none"> - More accurately price products in situations where there is little to no medical history • Marketing and Sales: <ul style="list-style-type: none"> - Move beyond traditional “likely to buy” models - Improvement in morbidity levels by targeting only those with lowest risks • Customer Retention: <ul style="list-style-type: none"> - Identify compounding components of at risk customers - Develop and deploy data driven retention strategies • Medical Management/Wellness: <ul style="list-style-type: none"> - Improved targeting of health events within a population; based on predicted propensity of having a certain medical condition - More in-depth understanding of the current & potential risks of customers - Understand the behaviors creating the risks and monitor and develop behavior related strategies to change customers risks

Figure 5-33. Driving Better Outcomes with a State Healthcare Insurance Exchange.

Reducing Tax Gap through Predictive Analytics

Methods Employed	Predictive and prescriptive analytics, Network Analysis, Anomaly Detection
Background	The IRS Revenue Return Program (RRP) aims to reduce the current tax \$345 billion tax gap (the difference between what taxpayers owe and what they pay voluntarily and on time). One focus area of RRP is to reduce tax fraud as IRS loses approximately \$12-14 billion in refund payments due to fraud. IRS plans to leverage advanced data analytics to detect and stop tax fraud. The system should be able to score 8 million filings against 50 different fraud models in 8 hours
Solution	<ul style="list-style-type: none"> • Developed a Fraud Analytics system that used a variety of business rules to investigate tax returns with anomaly detection, predictive modeling and social network analysis • Anomaly Detection used existing business rules to flag the data for any indication of fraud or error • Predictive modeling used historical behavioral information to identify suspicious behaviors similar to known fraud patterns. The models are being used to detect fraud in following categories - Identify Theft, Wage Income Withholding and Frivolous filing • The Link Return Analysis (LRA) system was based on Network theory and checked every incoming tax filing against 140 million filings to create clusters identifying links and relationships among tax filers that were Tax Payers Fraudster not known before • Implemented a Revenue Return Program (RRP) system using Greenplum (MPP Data warehouse), SAS Grid (Fraud Framework), FICO (Business Rules), Informatica (ETL), Business Objects (Reporting), and RedHat (Linux)
Methods	During the project, we leveraged multiple methodologies for predictive and prescriptive analytics network analysis and anomaly detection. These techniques enabled the client to uncover hidden relationships such as organized fraud rings, pinpoint suspicious tax-return patterns, prioritize and effectively assign fraud cases, and use predictive modeling to gain insight into historical behavioral information that can recognize repeat offenders

Figure 5-34. Reducing Tax Gap through Predictive Analytics.

Workers Compensation Predictive Modeling Implementation

Methods Employed	Predictive and Prescriptive Analytics; Statistical Programming; Simulation; Statistical Visualization
Background	Target is a substantial retail corporation that operates in 49 states within the United States and has over 1770 stores employing in excess of 300,000 employees. Target approached Deloitte needing support for a comprehensive review of the occupational claim handling process. Prior to employing Deloitte, Target was concerned with the level of costs

Workers Compensation Predictive Modeling Implementation

it was incurring in respect to their occupational claims handling process. They felt that the process was sub-optimal in segmenting claimants.

To effectively address this Target expressed their desire to use advanced analytics so as to ascertain the root cause of the inefficiencies. Through Deloitte's eminence in this field they sought to use analytics to assist with claims management, from identifying claims with high severity potential early in the assignment process and the routing of claims for further supervision and medical case management.

Solution Deloitte was engaged by Target to lead the development and implementation of an alternative service delivery model over a ten month period. To best address the concerns of Target, Deloitte's experienced subject matter experts recommended and consequently selected the WC Claims Predictive Model. The Claims Predictive Model has been very effective in segmenting Workers Comp Claims and is housed via Deloitte's Subscription Analytics platform: a platform that would enable Target to improve claims management processes/services related to claims administration, claims appeals, stay at work/return to work, health care provision, to administration/oversight.

Deloitte worked collaboratively with Target to design a meticulous three phased approach so as to effectively understand Target's unique work claimant challenges and propose a workable solution ensuring successful outputs. The WC Claims Predictive Model was successfully designed, developed and implemented, resulting in significant improvements to Target's claims management processes. The claim adjusters now are able to better examine all claims that come in under the guidance of the model outputs. In addition, the following benefits were realized across 49 states in the US:

Benefit: 13% reduction in average cost per claim, leading to total savings of over \$10M in the first two years

Methods Under Deloitte's three phased approach, the following activities were completed:

Phase 1: Specification, Customization and Validation of the Model:

- Reviewed claims processes, systems, data format and management practices;
- Developed implementation design, including integration points, triggers and message delivery;
- Conducted data meetings to document data requirements;
- Received, loaded and balanced historical data per Data Requirements; and
- Validated the Model using a blind sample of historical data.

Phase 2: Business Implementation:

- Developed detailed roadmap for interim and future state by application;
- Performed analysis to develop business rules for each application;
- Conducted focus groups to develop business requirements;
- Developed user display requirements and testing; and
- Created communications and training materials, and participated in training for claims examiners.

Phase 3: Platform Development and Integration:

- Documented the data transmission specifications and the scoring service design document
- Loaded client historical data into the production environment and perform initial scoring
- Migrated the test environment to the host production environment
- Compared results of test results to document and correct deficiencies
- Implemented model on scheduled go-live date.

Figure 5-35. Workers Compensation Predictive Modeling Implementation.

Pennsylvania Department of Public Welfare, PACSES Project

Methods Employed

- Predictive and Prescriptive Analytics
- Statistical Programming
- Simulation
- Statistical Visualization

Background The Commonwealth of Pennsylvania asked for assistance in improving the amount of child support collections. The majority of existing business processes for accomplishing these goals occurred only after a payer has become delinquent. The scope of work was to provide system functionality and user support that assists workers in prioritizing and improving early intervention business process that would occur before a payer becomes delinquent.

Solution Deloitte's approach to improving early intervention was to create a predictive model. To accomplish this goal, over 400 data elements from the PACSES mainframe were analyzed. Working closely with the Commonwealth, Deloitte ultimately narrowed down 400 data elements into 20 predictive variables that were included in the predictive model. Next, Deloitte incorporated this model into an existing open system application designed to improve federal

Pennsylvania Department of Public Welfare, PACSES Project	
	performance metrics, the Performance Improvement Module ("PIM"). Deloitte also created four early intervention business processes to help counties confirm that payers will make a payment.
Methods	<p>The predictive model calculates the likelihood of a payer to pay 80% of their current support (a federal benchmark) in the three months after their financial obligation is created or changed. Based on the score (1=least likely to pay, 4=most likely to pay), the worker takes proactive steps to encourage the non-custodial parent to pay. Information from these results was leveraged to:</p> <ul style="list-style-type: none"> • Help establish/modify cases where the end user was at a higher likelihood of delinquent payments • Improve the effectiveness of establishment and enforcement of support orders • Increase collections from payers • Increase federal funding for the agency

Figure 5-36. Pennsylvania Department of Public Welfare, PACSES Project.

Minnesota Enterprise Data Analytics Program	
Methods Employed	Predictive and Prescriptive Analytics
Background	<p>In the past, State agencies have attempted to develop systems and/or engage both internal and external resources independently in attempts to improve their individual capacities to make data driven decisions; however, the vision of the Enterprise Data Analytics Program is to develop a comprehensive statewide approach that could benefit multiple agencies' needs in a more cost-effective way.</p> <p>In the context of the State's budget crisis; there is a continuing obligation to manage State resources efficiently and a need to continually focus on quality improvement. With an Enterprise Data Analytics program, the State will have an opportunity to leverage analytics in a consistent and unified approach to make smart, timely decisions and understand the impact of those decisions on citizens and other stakeholders.</p>
Solution	<p>A cross functional team was assembled to respond to the State's RFP including leaders from across Deloitte's AERS Advisory, FAS, Consulting and Tax areas.</p> <p>Deloitte has been prequalified to provide analytic services in nine distinct subject matter areas including:</p> <ul style="list-style-type: none"> • Tax collection, fraud prevention and detection • Human services, medic aid payments, fraud prevention, detection and program integrity • Unemployment compensation • Workers compensation • Strategic sourcing • Customer focused data analytics • Continuous organizational and quality improvement • Strategic planning and data quality analysis • Additional subject areas including electronic discovery services and proactive fraud prevention
Methods	<p>The opportunity was driven by the heightened demand by both the State Legislature and Governor for better information and data-driven decision making capabilities as a means to increase agency efficiency and effectiveness and reduce the cost of delivering government services to citizens and other stakeholders.</p> <p>Deloitte was selected by the State of Minnesota to be a prequalified contractor to help develop and deploy an Enterprise Data Analytics Program. The scope of this program includes:</p> <ul style="list-style-type: none"> • Providing data analytics services • Tools • Software related to data • Statistical and quantitative analysis • Explanatory and predictive modeling • Training related to analytics and analytics tools • General consulting services • Analysis regarding how the use of data analytics can generate efficiencies and operational improvements for the State agencies and other government units

Figure 5-37. Minnesota Enterprise Data Analytics Program.

US Department of Veterans Affairs – IT Workforce Planning Predictive Model

Methods Employed	Predictive Modeling; Econometric Analysis; Simulation; Statistical Visualization
Background	<p>US, Department of Veterans Affairs (VA) Office of Information and Technology (OIT) is a large, complex organization with 8,000 IT professionals serving over 340,000 VA employees in 1,400 locations. To distribute IT field support specialists to locations of the greatest need, Deloitte created a predictive workforce demand model based on the number, type, and age of devices in VA facilities. This model demonstrated that some facilities were understaffed by as much as 35%, which helped the VA CIO realign resources to best support the VA mission.</p> <p>The VA had recently implemented a shared services model, centralizing IT work into regional Centers of Excellence (CoEs), however in some locations, trouble tickets in the incident management system were raising dramatically.</p> <p>Further investigation determined that some CoEs had moved headcount without process redesign or appropriately moving work from local facilities.</p> <p>As a result, customer satisfaction fell dramatically after the CoE implementation. The VA CIO knew that workforce realignment was required to get support back into the facilities.</p>
Solution	<p>A Deloitte team including expertise in workforce planning, IT strategy, IT asset management, and statistics and analytics conducted 30 focus groups and requested data calls from over 200 facilities to determine how much work was required to service each device (printers, laptops, cell phones, etc.) in a medical facility.</p> <p>Based on focus group input, the team built a partial least squares predictive model in both R and SAS to predict the IT Full Time Equivalent (FTE) to serve each device based on type and age.</p> <p>The analytic models were incorporated into an access database that served as the front-end user interface and allowed VA users to create what-if scenarios.</p>
Methods	<ul style="list-style-type: none"> • Identified true workforce demand in facilities, highlighting understaffing in critical medical facilities • Enabled movement of resources from administrative positions to front-line support • Improved customer satisfaction ratings and reduced IT ticket backlog • Created a reusable solution to model staffing and technology scenarios

Figure 5-38. US Department of Veterans Affairs IT Workforce Planning Predictive Model.

3. Statistical analysis and Simulation

1. **Statistical Programming.** Traditional analysis of variance and linear regression to exact methods and statistical visualization techniques, statistical programming is essential for making data-based decisions in every field.
2. **Econometrics.** Modeling, forecasting and simulating business processes for improved strategic and tactical planning. This method applies statistics to economics to forecast future trends.
3. **Operations Research.** Identifies the actions that will produce the best results - based on many possible options and outcomes. Scheduling, simulation, and related modeling processes are used to optimize business processes and management challenges.
4. **Matrix Programming.** Powerful computer techniques for implementing your own statistical methods and exploratory data analysis using row operation algorithms.
5. **Statistical Visualization.** Fast, interactive statistical analysis and exploratory capabilities in a visual interface can be used to understand data and build models.
6. **Statistical Quality Improvement.** Mathematical approach to reviewing the quality and safety characteristics for all aspects of production.
7. **High-Performance Statistics.** In-memory infrastructures and parallel processing can fit predictive models faster, perform more modeling iterations and use complex techniques for faster results.
8. **Simulation.** Tools that allow users to simulate and observe an operation without actually performing that operation.

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. Within Deloitte we have analytics and data science professionals with deep experience and specialization across many statistical and simulation tools, including those mentioned above. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of statistical analytics services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. We are product agnostic in order to deliver the optimal tool and solution to our clients' environment. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of statistical analytics services. We have deployed our solutions in cloud-based or on premise infrastructure.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte can help support vendor licensing conversations. For Deloitte also maintains its own licenses for many relevant analytics, data management, and external data tools necessary for conducting statistical analytics on Deloitte infrastructure. Analytics we perform in this environment do not require additional licensing.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Y	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. Deloitte's analysis and any resulting tools can be implemented in multiple agencies, but may need to be customized as a result of differing business needs, datasets, and/or data structures.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte provides documentation, training and knowledge transfer to our clients both on the tools we develop and deliver. Additionally, we have eminent practitioners who deliver classes and training on statistical analysis and data science.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set, Deloitte has extensive relationships working with an array of tools and vendors.

	Requirements	A	B
			Based on the selected tool, Deloitte can work with VITA and/or the respective agency to provide installation services and support. In addition, Solution Installation packages may be provided that are comprised of deployment units, deploy scripts along with instructions for deployment as part of our solutions.
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. Please refer to section <i>Deloitte's Services Supporting Statistical Analysis and Simulation</i> for details pertaining to our implementation services and capabilities.
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Deloitte is a provider of statistical analytics and simulation services, and as such does not align with a single tool set. For additional information on our training services for predictive, statistical, and simulation analytics please refer to <i>Deloitte's Predictive and Prescriptive Analytics Training Services</i> above. Please refer to section <i>Deloitte's Statistical Analysis and Simulation in Action</i> for sample experiences.

Figure 5-39. Statistical Analysis and Simulation Requirements.

Deloitte's Services Supporting Statistical Analysis and Simulation

Our Statistical Analysis and Simulation Services Details

The following sections describes Deloitte's services pertaining to statistical and simulation services.

1. **Statistical Programming** is a cornerstone of developing and delivering predictive analytics. Deloitte leverages skills and experience with statistical programming on most engagements where we design, develop, and implement predictive and statistical analytical solutions. Matrix operations are often considered a type of statistical programming, as matrix programming through linear algebra and vectorization are often used to speed calculations rather than leveraging simple conditional loops. We employ these practices when possible to optimize performance of statistical algorithms.

Our practitioners have deep experience with programming in SAS, R, Python, JAGS and other languages to fit predictive and statistical models. During projects, we leverage macros and core functionality in these software packages to develop statistical models, fit maximum likelihood models, generate predictions, and evaluate models. This includes developing and deploying both Frequentist and Bayesian models as well as machine learning techniques such as LASSO, decision trees, neural networks and random forest models.

When we deploy and implement predictive modeling solutions for our clients, our experienced deployment practitioners translate statistical and predictive algorithms into native languages such as .Net, Java, C# and PL-SQL. These practitioners have to develop deployment components through statistical programming methodologies to help our clients receive technically accurate statistical solutions.

A full list of the types of statistical and machine learning methodologies we practice are included in Section 5 on Predictive and Prescriptive Modeling. Additionally, for examples of where we have applied statistical programming, please see Deloitte's Predictive and Prescriptive Modeling Services in Action.

2. **Econometrics Analytics** are used by organizations in forecasting supply and demand, applying models from the economics literature. As described in Section 5 Predictive and Prescriptive Analytics, Deloitte delivers predictive modeling solutions for forecasting across multiple aspects of business needs.

For example, we assist organizations in forecasting supply and demand for specific workforce roles through our Workforce Analytics offering. We leverage time series models such as ARMA, ARIMA, and GARCH or Generalized Additive Models when necessary depending on auto-correlation in the data. For Commonwealth, we have the ability to assist agencies in forecasting demand for workers and predict individual attrition rates based on historical data using econometric algorithms.

Econometric analysis also includes estimating customer sensitivity to price and consumer reaction to changes which represent changes in demand. We have assisted many consumer products and retail organizations in estimating customer price sensitivity. We would be able to assist the Commonwealth in understanding price sensitivity to transportation costs, study the impact of license and DMV fees on purchase behavior, understand the impact of taxes on purchasing within the Commonwealth, the price sensitivity of students to changes in higher education fees or the public to changes in licensing and building permit fees.



Examples of our experience with econometric analyses are included below in the section Deloitte's Experience with Statistical and Simulation Analyses. Specifically refer to the case study on Demand Forecasting and Price Optimization.

3. **Operations Research** includes the field of statistical decision making as well as mathematical optimization. We have many practitioners with experience in optimization techniques such as those listed in the table below. We leverage optimization techniques and specialized software packages to assist organizations in improving business decisions such as maximizing pricing structures and enhancing supply chain routes.

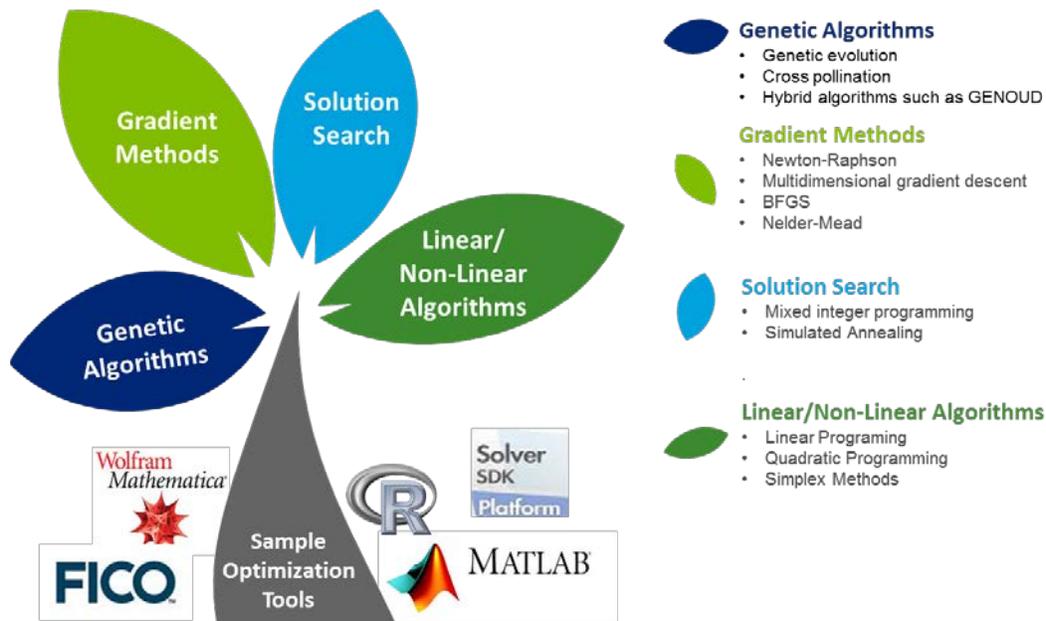


Figure 5-40. Optimization Methods and Sample Tool Suites.

We have successfully delivered many projects leveraging optimization algorithms such as those mentioned in the table above. Examples which are relevant to the Commonwealth could be optimization algorithms to assist in smoothing transportation issues, schedule optimization for hearings and appeals and DMV appointments, resource allocation models, or service delivery. An example of our work in operations research is provided below in the section Deloitte's Experience with Statistical and Simulation Analyses. Specifically refer to the case study on Demand Forecasting and Price Optimization.

1. **Statistical visualization** is used to help people understand the significance of data in a visual context. Even in its raw form, data holds valuable insights but they are often hidden in a format that is difficult to decipher. Statistical visualization techniques combine statistical analysis with high-impact communication, bringing these hidden insights to light and making it easy to discover trends, correlations, and outliers.

Deloitte practitioners have experience with many visualization techniques for both exploratory and confirmatory data analysis. With expertise across multiple platforms, including Tableau, Qlikview, ggplot among others, Deloitte can help transform data into intuitive, interactive visualizations to support prototype design, business case development, insight generation and dissemination. The innovative Analytics Visualization Studio at Deloitte is focused on developing visualization solutions that integrate advanced design techniques with practitioners' industry expertise.

For detailed examples of how we leverage statistical visualization, please see Deloitte's Predictive and Prescriptive Modeling Services in Action.

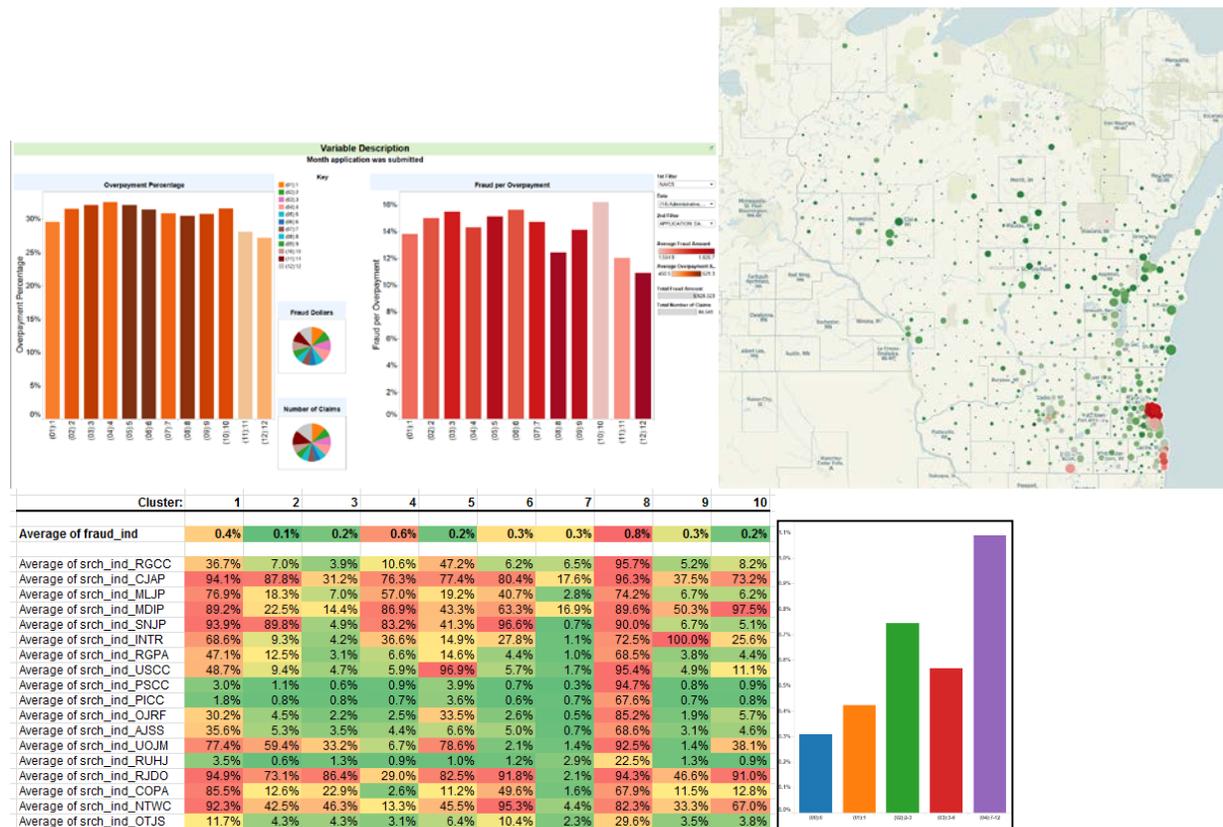


Figure 5-41. Sample Statistical Visualization Examples.

2. **Statistical Techniques** for analyzing data quality are used by organizations throughout the public and private sectors to analyze and enhance performance such as processing, manufacturing, and patient safety. Our services for statistical quality improvement include the ability to leverage statistical and probability models to detect errors and outliers, estimate the rates of data errors from samples of data and identify process improvements based on statistical methodologies.

We have assisted multiple organizations in analyzing data quality through statistical methods such as hierarchical models, Bayesian models, as well as traditional methods such as ANOVA, t-tests and Ordinary Least Squares regression. These methodologies can be used to identify the source of data quality issues, while informing programs on improving data quality in large databases and systems.

Examples of Deloitte’s expertise in statistical quality improvement are given below in the section describing our experience in action.

3. **High Performance Computing** makes it possible to generate insights from huge volumes of data, offering very high levels of performance by aggregating processing power. Cutting edge fields like genetics, transportation, financial trading, etc. use high performance computing to solve their most computationally demanding problems.

As state governments begin to leverage big data environments to generate and deliver statistical analytics, high performance computing methodologies and tools are required to meet analytics needs while continuing to deliver the customer experience for users of state services. Large scale analytics often

requires significant computational processing, requiring big data hardware, parallel computing, and specialized programming methodologies to produce statistical and simulation models while delivering results in reasonable timeframes.

Deloitte has experience managing the deployment of high performance computing, including both hardware and software solutions. Our experts across technology implementation, management, and strategy are well-versed in the latest system architectures, innovative applications of parallel computing, as well as associated programming and software tools. Our analytics practitioners have experience leveraging parallel computing algorithms and tools like MapReduce and Hadoop to solve big problems with big data.

As an example, Deloitte managed a large-scale high performance computing acquisition and integration project, which is detailed in Deloitte’s Predictive and Prescriptive Modeling Services in Action.

4. **Simulation.** Deloitte utilizes, designs and delivers simulation services assisting organizations in a variety of business contexts. Simulation methodologies are integral to performing the types of Risk Analytics service offering described in greater detail in Section 5 on Predictive and Prescriptive Analytics. Our practitioners provide services with Monte Carlo methods, forecasting, and war-gaming to develop understanding of the potential range of options which might occur under specific assumptions and business scenarios.

Examples of simulation are provided in Section 5 Predictive and Prescriptive Analytics case studies on implementing predictive analytics for fraud detection and Healthcare Insurance Exchanges. In these projects, we leverage simulation models to estimate the range of impact from business scenarios leveraging probability models, Monte Carlo simulations and Markov Chain Monte Carlo models to estimate Bayesian models. These techniques are often used by state governments to assess budgetary and financial impacts, model disease outbreaks such as pandemics and simulate impacts within public safety.

Deloitte’s Statistical Analyses and Simulation Services in Action

The following highlights samples of our experiences with implementation services associated with statistical analyses and simulation. The case studies provided below are examples of where we have delivered Statistical Analysis and Simulation Services to our clients.

Demand Forecasting and Price Optimization	
Methods Employed	Econometrics; Statistical Programming; Simulation; Operations Research; Statistical Visualization
Background	<p>Rising costs, saturated markets, consumer price sensitivity, and stakeholder demands have intensified the need for increased margins and profits. Companies understand that having an optimal pricing strategy is crucial to increase margins. In order to optimize pricing, organizations face multiple quantitative and analytical issues: need for big data processing to quantify demand, the challenges of scattered and imperfect data, and the need for significant mathematical programming and operations research skills for technical optimization.</p> <p>The Commonwealth could leverage demand forecasting and price optimization services to better set prices and estimate demand for state services such as lottery, licenses, fees, or transportation utilization. In these cases, consumers of state services choose to purchase or leverage these services based on unique drivers of price sensitivity. Minor adjustments to the cost can have varying impacts on the consumers and businesses which purchase these goods and services.</p>
Solution	We have developed a toolkit to make price optimization accessible to organizations needing a simple and intuitive interface for developing price optimization scenarios. Our solution enables business users to encode complex pricing constraints and run scenarios using an intuitive point-and-click interface, empowering the product expert to delve into the potential for improving pricing strategies.

Demand Forecasting and Price Optimization

Leveraging cutting edge optimization algorithms and tools, our solution brings the mathematical tools down to earth for the business user to put to use. Our solution includes:

- **Simplified Data Handling:** manipulate and create massive amounts of relevant pricing data and scenarios for optimization.
- **Constraint Architect:** build and test the impact of different business constraints and their impact on the top and bottom line.
- **Scenario Engine:** create multiple "What If" scenarios by including and excluding products, adjusting variable costs, and tweaking competitor behavior.
- **Debugger:** identify potential errors in the optimization process to locate and simply error checking.
- **Training:** onsite data science and training services provided for demand modeling and usage of optimization in achieving business goals.

Methods

Econometrics

During implementation of Next Generation Price Optimization, Deloitte practitioners construct sophisticated demand models to better understand customer sensitivity. Leveraging a combination of econometric, hierarchical models and Bayesian analytical techniques, we forecast product and customer demand for thousands of unique products under a range of price and discount scenarios. These forecasts are used to drive better decision making for product distribution, pricing, and discounting.

Operations Research

Next Generation Price Optimization simplifies the technical aspects of optimization and delivers timely insights required to make smarter pricing decisions and increase the bottom line and market share.

Our solution leverages deep advanced analytical modeling and optimization processes to provide a clear understanding of consumer and competitor behavior to assist organizations in developing pricing and promotion strategies. By bringing deep mathematical technical techniques to the business user, the solution enables product experts to make informed decisions around every day and promotional pricing.

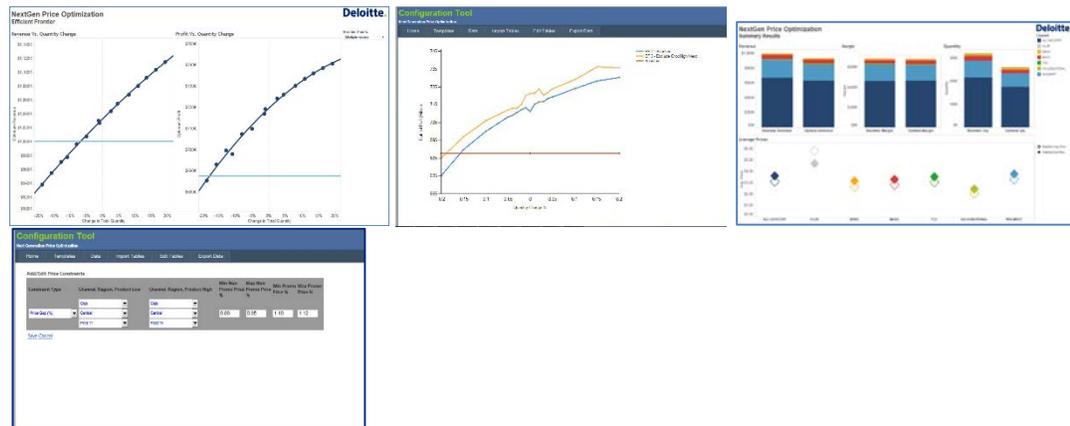


Figure 5-42. Example Case Study.

Exploring Healthcare M&A through Visualization

Methods Employed

Statistical Visualization

Background

Changing industry dynamics are leading health plans to explore inorganic growth strategies (e.g., offensive and defensive M&A activity) to create value. Offensive plays position plans for growth — in new markets, segments, or businesses. Defensive plays fortify existing positions through scale. However, it can be very difficult and time consuming to analyze potential targets, given the complexity of healthcare data, which can increase a health plan's lead time significantly.

Solution

To accelerate discussions on “where to grow” and “how to grow”, Deloitte hosted a Greenhouse Discovery lab for a health plan client during which they demonstrated an interactive data visualization tool (Tableau-enabled) that they developed to help identify attractive markets and potential partners and targets.

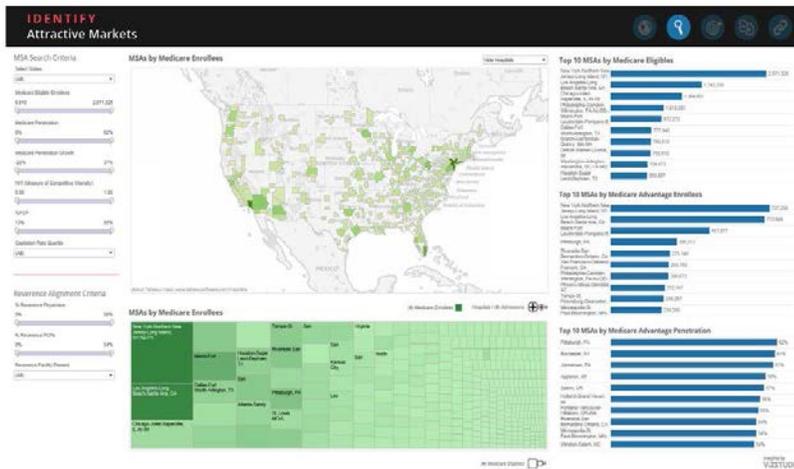
Exploring Healthcare M&A through Visualization

To drive insights, the team developed a prototype that allowed the user to explore surface target markets (Metropolitan Statistical Areas or MSA). The dashboard filters include market selection criteria such as Medicare eligible population, Medicare Advantage penetration, Medicare Advantage penetration growth, competitive intensity, and PCP (Primary Care Physician)/Specialist ratios, among others. These filters can be applied to an integrated set of various public data, including health plan enrollment, market demographics, CMS (Centers for Medicare & Medicaid Services) data, and health plan company characteristics, among others.

A complementary visualization displays characteristics and market share (by MSA) of health plans. Using filters on plan characteristics (e.g., profit status, lines of business concentration, total enrollment), the user narrows the list of plans that meet criteria for potential partnership or acquisition. This accelerates basic target identification activities. Having resonated with the client, this tool has been deployed to support additional business development and engagement specific activities. The team continues to add modules and enhance functionality.

Methods Statistical Visualization

This solution integrates disparate sources of publicly available data into one set, enabling health plans to see characteristics of various other plans and quickly identify them for further pursuit. Interactive dashboards with intuitive visualizations make comparison across plans very easy.



VA_VITA_SCM-016



VA_VITA_SCM-017

Figure 5-43. Exploring Healthcare M&A through Visualization

Lean Six Sigma Implementation

Methods Employed	Statistical Quality Improvement
Background	<p>Client Company was US based global leading metal packaging company, producing billions of recyclable metal containers, and a unique aerospace business, manufacturing on 4 continents. Client Companies Metal Beverage Packaging business expressed a desire to create a strong continuous improvement culture with increased standardization (Lean Enterprise) embraced by a global Business Excellence (BE) program. The business issues driving this included the following:</p> <ul style="list-style-type: none"> • Client Company faced the need to improve a) global standardization with respect to structured optimization approaches, b) lean thinking, culture and expertise and c) various existing (especially cross-functional) processes. • Increasing market requirements and strong demand in combination with extended lead times due to capacity constraints led to increasing customer dissatisfaction and complaint rates • Client Company initiated a so called “Drive for 10” strategy to grow the business and achieve long-term success. A key element of that strategy is to set-up a global lean transformation program to achieve business excellence.
Solution	<p>The program was supported by a global Deloitte team developing in a first phase for the foundation elements for the program including people strategy, a customized approach including toolbox and training academy and selection of pilot projects to be launched globally. In the subsequent project phase 7 pilots (6 thereof supported by Deloitte) were launched to fine-tune the methodology, start building the culture and skillset and to create a learning experience for the organization. 3 out of the 7 pilots were in Europe. Client Company’s European metal packaging footprint has a workforce of some 2,800 employees, 12 production plants for beverage cans and is headquartered in Switzerland.</p>
Methods	<p>The Deloitte-led initiatives include:</p> <ul style="list-style-type: none"> • Streamlining and harmonizing the graphics process across Europe, aimed at reducing costs and increasing customer satisfaction through operational improvements. • Improvement in asset utilization through reduction of conversion time, aimed at increasing capacity and enhancing flexibility • Definition and alignment of the European Business Excellence roadmap for the next three years including setup of required roles, responsibilities, trainings etc. • Training pilot project teams across the organization in Lean Six Sigma Yellow/Green Belt. <p>Over the duration of this effort, the Deloitte team succeeded in delivering value to the client in the following ways:</p> <ul style="list-style-type: none"> • Aligned and approved lean transformation roadmap for Europe across various dimensions, such as: Talent development, Governance, Change & Communication, Culture & Behaviors • Creation of a common visions and understanding about the Lean Transformation Program and the approach across Europe • >20 colleagues including the European Board trained to Yellow Belt level • 15 colleagues trained to Green Belt level including Train-the-Trainer concept (trained trainer already trained >20 colleagues to Green Belt across Europe) • Successfully supported two pilot projects and closely coached project teams • Achieved sustainable results and knowledge transfer • Graphics: a) Developed 45 improvement solutions including 3-phased implementation plan, which will free up capacities by more than 1600 hours, reduce outsourcing cost and lead-times and significantly improves transparency to prioritize, challenge and control, b) Supported implementation start incl. communication concept, roadshow, tracking process and audit process, c) Developed lead-time and workload dashboard • Asset Utilization: Reduced overall conversion time from 3.8 hours to 1.5 hours. Build-up additional production capacity and improved safety at work

Figure 5-44. Lean Six Sigma Implementation

Data Quality Analysis for 2D Barcoding Implementation in Vaccine Products	
Methods Employed	Statistical Quality Improvement ; Simulation; Statistical Programming; Econometrics; Statistical Visualization
Background	The Center for Disease Control and Prevention (CDC) has been spearheading a public-private partnership to improve the adoption of 2D barcodes on vaccines to enhance patient safety. The CDC retained Deloitte to assist in the analysis of the effects of 2D barcoding on the quality of data in electronic medical record and electronic health record (EMR/EHR) systems.
Solution	Deloitte collaborated with epidemiologists and experienced professionals in the vaccination community at the CDC, vaccine manufacturers, EMR/EHR vendors and other stakeholders to measure the changes in data quality during the adoption of 2D barcodes. Deloitte provided extensive services to measure attitudes towards adoption through survey design and statistical analysis as well as measuring and monitoring of efficiency and data quality during the adoption of 2D barcoded vaccines by the medical community.
Methods	Deloitte assisted the CDC by analyzing millions of vaccination records to measure the changes in data quality from 2D barcode adoption. The team leveraged hierarchical binomial logistic regression models to parse out the effects from 2D barcodes from other exogenous factors impacting data quality such as other initiatives from the VFC program and IIS communities.
	Our analysis and results are published by the CDC in a series of reports including the "Implementation Pilot for Two Dimensional (2D) Vaccine Barcode Utilization: Summary Report". The summary report can be found at the following link: http://www.cdc.gov/vaccines/programs/iis/2d-vaccine-barcodes/downloads/pilot-summary.pdf . An overview of the program and multiple reports stemming from our data quality analysis can be found at http://www.cdc.gov/vaccines/programs/iis/2d-vaccine-barcodes/ .

Figure 5-45. Data Quality Analysis for 2D Barcoding Implementation in Vaccine Products

High Performance Computing	
Methods Employed	High Performance Computing
Background	The client's office sought support for acquisition planning, project management, strategy, and communications, and asked Deloitte to help support the \$170 million acquisition of high performance computing capabilities. To manage the integration of computing into new facilities, also asked Deloitte to provide subject matter expertise in the area of Facilities construction. The program scope included the development of a Results Management Office (RMO) methodology and function, the development of organizational infrastructure, creation of a Risk Management plan, creation of a centralized communications support, management of an integrated schedule, and facilitation of the operations of the RMO.
Solution	Deloitte provided dedicated subject matter expert resources as necessary to support the High Performance Computing and Communication Program (HPCC). Deloitte had an experienced team in the functions of IT Strategy, Integrated Master Schedule Support, Communications Support, PMO, and Facilities to guide through this project.
Methods	Services were provided to support specific needs such as Transformation Management Office Support, Integrated Master Schedule Support, Communications Support, Planning, Analysis and Project Management Support, and Facilities Planning and Scheduling Support. Deloitte leveraged subject matter expertise in project management as the foundation for the RMO deliverables and customized the creation of the RMO to align with the culture, constraints, and capabilities. The RMO institutionalized its RM Methodology by managing the initiation and planning of multiple work streams on a large-scale project. Together, the work streams were required to support the acquisition of two supercomputers and the integration of additional high performance computing capabilities. Through improvements in management, oversight, communications, and integration, the RMO provided tangible proof of results management in each work stream and the overall project. The RMO instilled a culture of accountability and transparency into the client, which not only led to progress improvements but also accolades from senior leadership at client

Figure 5-46. High Performance Computing

4. **Data Visualization.** Pictorial representation of data that may take the form of an animation, a cloud, a map, a chart, or a simple picture. This also includes: infographics, dials and gauges, geographic maps, sparklines, heat maps, and detailed bar, pie and fever charts. The images may include interactive capabilities, enabling users to manipulate them or drill into the data for querying and analysis.

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of data visualization services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of visualization services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of data visualization services, and as such does not align with a single tool set. Based on the VITA selected visualization tool Deloitte has the experience, skills, and capabilities to support an array of deployment platforms, as detailed below in Section 3.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of data visualization services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte can help support vendor licensing conversations, as detailed in Section 2.2.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Y	Deloitte is a provider of data visualization services, and as such does not align with a single tool set. Based on the VITA selected tool(s) Deloitte can help support the Commonwealth of Virginia's shared services vision, as detailed in Section 2.5.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte provides extensive training based on the developed solution. Details regarding our Visualization Training services can be found below in Section 2.6.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of data visualization services, and as such does not align with a single tool set. As detailed in Section 2.4, Deloitte has extensive relationships working with an array of tools and vendors. Based on the selected tool, Deloitte can work through our alliance partnerships to provide installation services and support.
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	Deloitte is a provider of data visualization services, and as such does not align with a single BI tool set. As detailed in Section 2.5, Deloitte has extensive experience working with an array of State Departments, Agencies, and program offices to deploy and implement a variety of data visualization solutions.
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Deloitte has extensive experience delivering data visualization solutions and services to both Public Sector and Commercial clients. Section 2 fully details our experience implementing visualization services, our approach to confirm a successful implementation, our perspective on the value of visualization, our visualization service offerings, and relevant government examples of where we have delivered data visualization services in the past.

Figure 5-47. Data Visualization Requirements.

Deloitte's Services Supporting Visualization

1.0 Our Perspective – The Value of Data Visualization

Visualization provides the innovative use of images and interactive technology to explore large and often complex data sets. Through multi-touch interfaces, mobile device views, and social network communities, many organizations are enabling users to see, explore, and share relationships and insights in new ways. Spatial and temporal context add physical location and sequencing to the analysis over time, allowing patterns to be uncovered based on the source, flow, and evolution of information. Intuitive touch and on-the-fly relationship-mapping add immediacy to the analysis, encouraging manipulation and higher-order understanding instead of static or passive views. The underlying tools of visualization continue to evolve. In-memory databases and distributed MapReduce processing now allow trillions of records and petabytes of data to be sorted, joined, and queried. Visualization suites complement next-generation business intelligence and analytics platforms, offering rich graphics, 3-D perspectives, interactivity, and usability on par with leading consumer experiences – and often they can be deployed on smartphones, tablets, and other mobile devices.

Unstructured data presents a particularly rich opportunity, as organizations can tap into millions of internal emails, instant messages, and documents, as well as trillions of Facebook objects, Twitter tweets, text messages, blogs, and other content of potential concern to the enterprise. In the face of so many loose connections and non-intuitive correlations, visualization is proving to be an effective mechanism to make sense of unstructured data and feed it into decision-making and process.

Visualization is a largely untapped source of value, with current efforts typically focused on historical reporting, dashboards, or predictive modeling. It is often assumed that the analytics tools themselves will provide visualization capabilities out of the box, though they generally do not. What is more, the bar has been raised for information access, as consumerism and generational forces are driving radical new expectations from users. The good news: these new developments can yield better value for the organization, particularly when applied to the largely green-field terrain of unstructured data.

2.0 Our Visualization Services Details

Deloitte combines our experience with next-generation analytic technologies with a business-driven approach that allows us to deliver the most effective solutions for our clients. Our comprehensive Visualization services confirms that the developed solution meets the needs and requirements of the given organization and allows them to derive additional value from one of their most important assets – their data. The human brain is not naturally conditioned to view data in its raw, tabular form. Encoding data into visual representations allows us to make sense of data more quickly and easily, identify underlying trends, patterns and anomalies, and highlight the important aspects of large data sets. The easy-to-digest nature of visualizations also allows an audience to explore data using an interactive, iterative process and communicate findings more clearly to others. Our goal is to plan, design, develop and implement Visualization solutions which allow stakeholders to analyze and monitor a series of Key Performance Indicators to make informed, actionable business decisions. Our robust Visualization services are organized into the following 6 logical service areas:

1. **Assessment.** Before determining which visualizations are best for each situation, it is necessary to first understand the key business problems which need to be addressed. Choosing the right visualization technique also critically depends on an understanding of the audience and how they intend to use the solution. Is the intent to clearly convey findings? Or is it to enable others to discover their own insights? Will it be leisurely consumed from a desktop in a corner office or by someone in the field to help resolve immediate, pressing issues? Clearly understand your audience and their intended usage to guide scope and design. Deloitte has extensive experience helping government organizations to conduct visualization assessments in order to make sure the visualization plan meets the goals and objectives of the organization.

Deloitte has worked extensively with a number of state governments to help assess their existing reporting and visualization strategy. As detailed below in the 'Deloitte's Visualization Experience in Action' section we have designed delivered and implemented visualization solutions for state's such as Pennsylvania, Kentucky, and Arizona to name a few. An important step in the successful implementation of any visualization solution is assessing and understanding the "current state" of the visualization solution. Current state includes understanding the tools, technologies, and processes which an organization is currently leveraging to implement visualization capabilities as well as any current business problems or challenges. The next step is to understand the requested future state. The future state clearly identifies the tools, technologies and capabilities need to achieve the intended visualization goals and objectives. Once the current state and expected future state has been defined Deloitte works to conduct a gap assessment. The outcomes of the gap assessment are used as critical inputs in helping to establish a strategic visualization plan.

2. **Vendor Analysis and Evaluation.** Once armed with a full understanding of the business problem, the audience and the strategic plan, the organization is in a position to evaluate the array of next-generation visualization options that exist in the market today. Deloitte is experienced working with a variety of open source platforms for exploring the potential benefits of visualization, including: ManyEyes, Tableau Public, Google Public Data Explorer, and others to allow either exploration of public information or importing of private data for visualization and manipulation. Just keep in mind that normal security and privacy considerations apply for any sensitive intellectual property. In addition, Deloitte brings significant expertise working with proprietary visualization tools like Qlikview, Spotfire, Roambi, and offerings from IBM, SAP, Oracle, and others, who provide tools for rapid prototyping. Tool decisions should be based on existing technology footprints, expected use cases, the licensing options offered by each vendor, and the ability of the tool to support shared use across disparate stakeholder groups. By considering multiple platforms, the organization can be better educated on the art of the possible, driving an informed vision and investment roadmap. Deloitte is different from other organizations in that we have deep experience working with an array of tools and understand and acknowledge the pros and cons of each tool. We are not motivated to sell or deliver using a particular tool set, instead we are motivated by helping our clients analyze, evaluate and select the tool that best meets their unique needs.
3. **Prototype and Design.** Once the proper set of tools has been determined, developing an illustrative prototype is a great way to bring the art of the possible to life. To help facilitate this key step, Deloitte offers a state-of-the-art facility known as the Highly Immersive Visualization Experience (HIVE) demonstration and technology center located in Arlington, Virginia. For more details please refer to the *Supplier Info* section. Through intuitive touch screens and the ability to upload real data, this innovation center can truly simulate what the possibilities are for our clients. This center is an 8,000 square foot facility with next-generation analytic tools and a technical infrastructure located in Rosslyn, VA that is available to our clients to innovate, collaborate and deliver solutions for faster design and visualization. The HIVE provides

access to tools such as Tableau, Qlikview, Spotfire, d3, R, Google Earth, SAP Analytics, IBM Analytics (Cognos, SPSS), SAS, Oracle Analytics and custom frameworks, just to name a few.

If you or your data cannot make it to the HIVE, we have the ability to staff dedicated practitioners onsite to deliver an array of prototypes which will allow your stakeholders to analyze, interact, and collaborate on visualization design. The important of prototyping is to find the visualization capability that meets your organizations goals/ objectives, and efficiently conveys the intended purpose of the report or dashboard. Our visualization practitioners are skilled in working with a wide array of data sets to confirm that the solution: makes sense of data more quickly and easily; identifies underlying trends patterns and anomalies; and highlights important aspects of data sets. The nice part about prototyping is that data can be displayed in an array of different formats. As indicated in the graphic below the same data can take multiple different meanings when displayed in different visualization formats. While each graph below shows data related to enrollment fluctuations by year they each can alert or indicate different patterns or trends to the user. The most important part or prototyping is selecting the visualization that accurately and efficiently conveys your organizations message. Overall, visualization should help allocate one of the scarcest resources a decision-maker has - their **Attention**.



Figure 5-48. Prototype Styles.

4. **Development.** Deloitte develops solutions using cutting-edge techniques to provide the audience with visualizations that intuitively highlight key trends in the data to deliver maximum impact. During Development, Deloitte moves from design to production by completing development (e.g., ETL, BI, and visualization), unit testing, and integration/functional testing, all with a focus on quality assurance. The combination of our vision, approach and experience results in an adaptable, user-friendly visualization solution tailored to your specific requirements. Deloitte’s practitioners bring extensive experience working with a variety of visualization tools and techniques to confirm the developed solution quickly and accurately conveys critical metrics to their users. Deloitte’s visualization group has worked to install intuitive easy to understand data/report visualizations for over 20 different states, including Pennsylvania, Arizona, and Kentucky as detailed in the success stories below. We have delivered operational, managerial, executive and external/compliance focused visualization solutions through various delivery techniques, including infographics, dials and gauges, geographic maps, sparklines, heat maps, fever charts, and tree maps, among others. As previously mentioned, Deloitte has the capabilities to deliver these solutions using nearly every tool available on the market today. Deloitte has the right skills, experience, capabilities to develop a solution which meets the specific needs and requirements for the Commonwealth of Virginia.
5. **Implementation.** Deloitte offers a full range of visualization implementation capabilities to help confirm that an organization’s visualization initiatives and programs are successful and achieve the identified

business value. The importance of the Implementation service cannot be stressed enough in deploying the best-fit technology to our clients. Our approach to Implementation confirms the successful transition of the solution from testing activities to production use and serves as the culmination of the Development effort. Our experience in offering testing, training, communications management, deployment, and maintenance services enable Deloitte to be a true end-to-end visualization implementation service provider for the Commonwealth of Virginia. In addition, we offer the flexibility of delivering these services either onsite in Richmond or from our onshore delivery centers in Harrisburg, Pennsylvania and Orlando, Florida. Ultimately, Deloitte's capabilities and location flexibility provide a number of benefits to Virginia, including reduced overall project costs, faster time to market, increased user acceptance and adoption, and higher return on investment.

6. **Training.** Equally important as providing the right solution to the audience is teaching them how to properly consume it. The true power of many visualizations is the capabilities they provide to initially view enterprise information at a high-level, then dig deeper to unearth the root causes of the organization's overall trends and results. Deloitte works closely with our clients to make sure they come away with a full understanding of the interactive solutions that we develop and empower them to get the most out of their data during the implementation as well as long after. Deloitte works hand in hand with our client stakeholders to conduct extensive training sessions and reviews focused on empowering our clients to actively derive insight from an array of visualizations.

The benefits of intuitive, visual data are now being realized more effectively than ever due to the vast array of techniques that today's leading tools offer. The range of possibilities is enormous—from infographics, dials and gauges, geographic maps, sparklines, heat maps, fever charts, and tree maps just to name a few. The screenshots below display examples of some of these options.

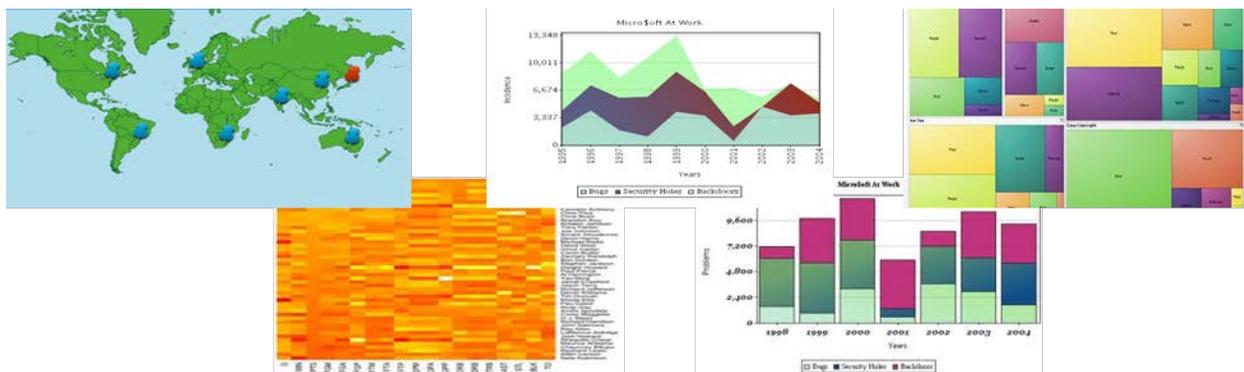


Figure 5-49. Visualization Examples.

Organizations with solid information foundations can use visualization to find new operational efficiencies. Laggards can use the allure of visualization as a strong reason to finally resolve data management shortcomings. Regardless of which category your organization falls into, your employees, constituents, and partners expect access and transparency to information that can be explored, manipulated, and acted upon. With the mix of rich new tools, the rising quality of enterprise information and analytics, the untapped potential of unstructured data, and the incentive of mobile use the deck is finally stacked to make good on that expectation.

3.0 Deloitte's Key Partnerships

Deloitte works together with our strategic partners to deliver more value to our clients. We are aligned with more than forty-five (45) of the leading technology companies to develop services and solutions that help our joint clients create added value. Amongst these alliance partners are a number of providers of leading visualization tools that we regularly team with to develop solutions for our state government clients (including the examples later detailed in Our Success Stories). Key alliances include:



Deloitte and Qlik work to provide clients with the ability to manage and analyze data into powerful visualizations that drive business performance, while helping to maintain data governance and control.



Deloitte analytics professionals help our clients gain deeper insights into their data using Tableau desktop analytics and visualization software to distill and display massive amounts of data.



Our alliance combines Deloitte's industry, business, and technical knowledge with IBM's leading technologies to help global enterprises solve tough business issues. For more than 12 years, our smarter teaming approach has generated even more value for our clients. IBM's Cognos software allows organizations to develop advanced visualizations that bring their data to life in leading formats for implementation and analysis.



Deloitte and MicroStrategy work together to deliver business intelligence and analytics solutions. Our alliance combines Deloitte's analytic capabilities with MicroStrategy's technology offerings, which include integrated reporting, visualization, analysis, and monitoring software. Together, we help business leaders worldwide make more informed decisions.



With a worldwide practice of more than 12,500 SAP practitioners in more than 135 countries, we deliver SAP business results faster and better than any other vendor in the world. We also hold the highest level of strategic alliance with SAP: Global Partner—Services. The SAP suite allows organizations to create cutting-edge visualizations through tools such as Business Objects and Lumira.



The Deloitte and Oracle alliance provides effective and efficient implementations of Oracle services and solutions to help organizations drive revenue growth and improve operating margins. With 13,800 Oracle practitioners worldwide, we have extensive experience implementing Oracle solutions across geographic and

organizational boundaries Oracle's data visualization tools support more than 50 types of visualizations, such as bar, pie, line, scatter, and stock graphs that allow you to evaluate data points on multiple axes in a variety of ways.

Figure 5-50. Key Alliances.

In addition to those alliances with proprietary vendors, Deloitte also provides deep experience in dealing with open source options such as Jaspersoft, Pentaho, and BIRT. The open source solutions provide several advantages, the key one being that they are significantly less expensive. Additionally, they are extremely developer friendly. They provide easy avenues to developers to integrate business intelligence features and functionalities. Most importantly, open source solutions help IT shops from getting locked into specific vendors.

Deloitte's Visualization Services in Action

Deloitte has vast experience providing an array of visualization solutions for a number of state and federal government agencies. These visualization solutions have helped state and federal government organizations achieve a multitude of key business objectives from monitoring fraud, waste and abuse to tracking and identifying high risk scenarios (e.g., population health, infrastructure, child safety, correctional population) or providing operational dashboards to support workload management efforts. Each of our various solutions have implemented a number of data visualization capabilities such as maps, charts, graphs, pivot tables, dials, gauges, etc. some of which you will see detailed below.

For the purposes of the Virginia Next-Generation Analytics RFP we have included a subset of some of the visualization solutions Deloitte has built for state and federal government agencies. The table below allows VITA to clearly visualize the solutions which are included by state/ federal government, and the services which were performed for each. In addition, the table attempts to identify the specific services which align to the RFP's visualization solution category requirements.

Deloitte State Government Experience				
Services/ Requirements	PA	KY	AZ	Federal
<i>Assessment</i> (Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
<i>Vendor Analysis</i> (Req. #3 Licensing Details, Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
<i>Prototype/ Design</i> (Req. #8 Solution/ Services Examples)	✓	✓	✓	✓
<i>Development</i> (Req. #4 Deployment; Req. #6 Installation, Req. #8 Solution/ Services Examples)	✓	✓		✓
<i>Implementation</i> (Req. #7 Implementation Services, Req. #8 Solution/ Services Examples)	✓	✓		✓
<i>Training</i> (Req. #5 Training, Req. #8 Solution/ Services Examples)	✓	✓		✓

Figure 5-51. Deloitte State Government Experience Matrix.

PA Department of Public Welfare

Methods Employed Data Visualization

Background The Program Policy Resource Review and Maximization (PPRRM) initiative was created by the PA Department of Public Welfare (DPW) with the goal of improving quality of service and service delivery efficiency across the DPW enterprise. With this goal in mind the initiative included the following three key elements:

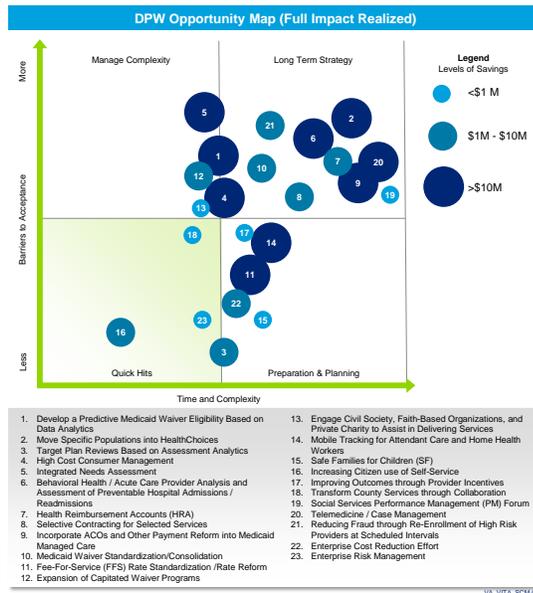
- **Element 1.** Program Initiatives: Provide innovative ideas, concepts and/or implementation suggestions of programs, policy, and resources that support the direction of the Department.
- **Element 2.** Data Analysis: Perform cross program data mining and data analysis to recognize trends and patterns within program office data to assist in identifying options for process efficiencies or suggesting additional innovations.
- **Element 3.** Focused Case Review: Select and review cases based on criteria defined by DPW. Criteria may vary based on the analysis, trends and/ or patterns identified during review.

Solution

Element 1 – Program Initiatives

As part of Element 1 – Program Initiatives, DPW requested a list of innovative ideas to achieve efficiencies while maintaining or improving the quality of services across DPW programs.

As part of our proposal Deloitte delivered a detailed list of innovative program initiatives targeted to improve performance and better outcomes, as well as reduce DPW costs. Each proposed initiative was evaluated based on the Time/ Complexity to Implement and on the Barriers to Acceptance. In addition, each proposed initiative was categorized based on the expected dollar savings for the Department. The graphic to the right visualizes these data points in order to effectively frame these key characteristics of the proposed initiatives and provide an intuitive and aesthetically pleasing comparison between them.



DPW Opportunity Map.

Element 2 – Data Analysis and Findings

DPW's goal as part of Element 2 – Data Analysis and Findings was to identify options to improve process efficiencies across program areas through the use of data mining services and analytics. DPW requested that a series of Data Mining and Analytics activities take place over a 90 day period.

Deloitte conducted a series of workshops with DPW Executive Staff and Program Directors to identify and understand the areas of research/ business questions which DPW would like addressed as part of this initiative. In total over 70 business questions were identified, of which 22 questions categorized into 5 areas of research were prioritized as part of this initiative.

In order to address each of the prioritized areas of research, Deloitte practitioners worked in collaboration with the Department to deliver a wide array of analytic processes including Actuarial Analysis, Geospatial Analysis, Advanced Visualizations, and Interactive QlikView Dashboards. In addition, a detailed PowerPoint deck summarizing the data analysis and findings related to each area of research/ business question was prepared and presented to DPW. The details of the analytic processes which were delivered as part of this initiative can be found in the graphic below.

PA Department of Public Welfare

Actuarial Analysis	<ul style="list-style-type: none"> Experience analysis was used to review the key enrollment, authorization and utilization patterns related to specific waiver programs Comparative analysis contrasted the key distinctions and identify similarities across specific waiver programs Tiered analysis was necessary to control one factor at a time while exploring other variables within the factor Internal benchmarking analysis helped to understand key patterns distinct to certain subsets of the population within specific waiver programs
Geospatial Analysis	<ul style="list-style-type: none"> Geographic Information Systems (GIS) applications were developed for each of the five priority areas of research Using ESRI's software, statistical analysis was performed on HCBS, MAWD, Child Welfare, and ETANF based on geographic factors in the data and externally available datasets These applications are demonstrated using desktop video and screenshots.
Advanced Visualizations	<ul style="list-style-type: none"> Advanced visualizations were used to graphically display data using Excel for each of the twenty-two questions
Interactive Dashboards	<ul style="list-style-type: none"> Interactive dashboards were created for HCBS and Extended TANF using QlikView, a business intelligence software QlikView dashboards are hosted in the Deloitte Managed Analytics Portal with usernames and passwords provided to designated DPW staff

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Data Analysis and Findings Processes.

The subsequent section details the interactive dashboards which were delivered as part of the PPRRM initiative. The interactive dashboards were developed using the data visualization tool QlikView. As part of this initiative two Dashboards addressing over 10 business questions were implemented. The dashboards allow DPW to interact with their data related to TANF (Temporary Assistance for Needy Families) and Home and Community Based Service (HCBS) Waivers. Users have the ability to apply custom filters and parameters to view both aggregate and granular level visualizations. The TANF and HCBS QlikView Dashboards were delivered to the PA Department of Public Welfare using Deloitte's Managed Analytics Portal.

The Dashboard depicted to the right allows the Department to view the following key metrics related to TANF program:

- Extended TANF Enrollments by Category and Eligibility Status
- Extended TANF Clock
- Number of Years on TANF
- Number of Months on TANF
- Number of Eligible TANF Recipient



TANF Interactive Dashboard.

As part of the TANF program individuals are only permitted to receive benefits for a total of 5 years unless a good cause exemption has been established. If individuals receive benefits for greater than 5 years they are categorized as Extended TANF (eTANF) recipients. Prior to the PPRRM initiative the Department was concerned that over 40,000 individuals were receiving Extended TANF benefits. Through this Dashboard, Deloitte was able to quantifiably show the Department that only ~10,000 individuals are receiving Extended TANF. In addition, 92% of the 10,000 individuals

PA Department of Public Welfare

receiving eTANF were being dis-enrolled within 90 days of reaching their 5 year TANF limit. This complies with PA's TANF requirements as there is a 90 day grace period for disenrollment.

The Dashboard depicted to the left allows the Department to view the following key metrics related to HCBS Waivers:

- Authorized vs. Utilized Amounts
- High Using Counties
- Enrollments and Expenditures
- High Cost Service Details
- One Person Group Home Locations

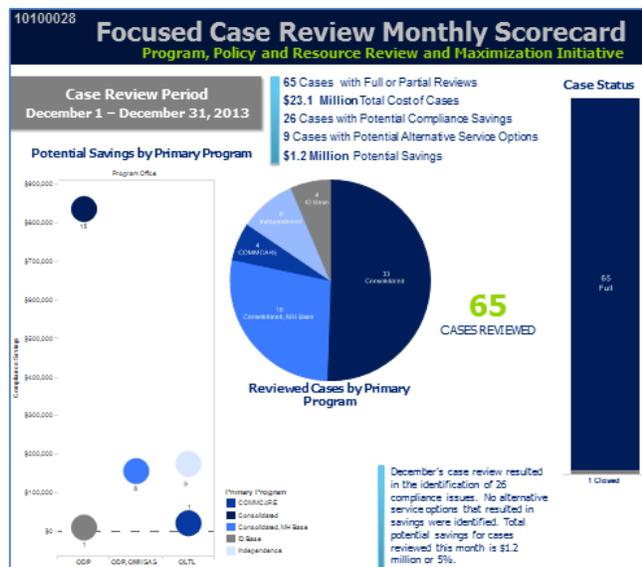
One of the key business cases related to the creation of the HCBS Dashboard was related to analyzing One Person Group Homes. One Person Group Homes are typically costly to administer and provide services. In order to drive savings and build service delivery efficiencies the Department was interested in exploring consolidating One Person Group Homes. In order to consolidate the Department needed the ability to view geographically where the Group Homes were located. In addition, they needed the ability to view which Providers were serving each group home and what services were being provided. Deloitte, leveraging Google Analytics, created a Dashboard that allows the Department to view all One Person Group Homes across the state. In addition, the Department can further analyze each group home by applying pre-built filters such as Demographics, Service Categories, Service Details, Utilization Amounts, Waiver Types, etc. in order to gain additional insight related to the group home. Furthermore through the Dashboard the Department has the ability to actually view a street level view of the building/ home where the group home was located (pictured above). Currently, the commonwealth is reviewing the Dashboard to determine which group homes are candidates for consolidation.



HCBS Interactive Dashboard – Street View.

Element 3 – Focused Case Review

DPW's goal as part of Element 3 – Focused Case Review is identify, review, and analyze high cost consumers across various Home and Community Based Service (HCBS) Waivers. The Department has requested that complex service plans be reviewed to panoramically evaluate program participant's needs and rebalance benefits, using the most efficient and effective means to meet the overall outcomes established for the individual.

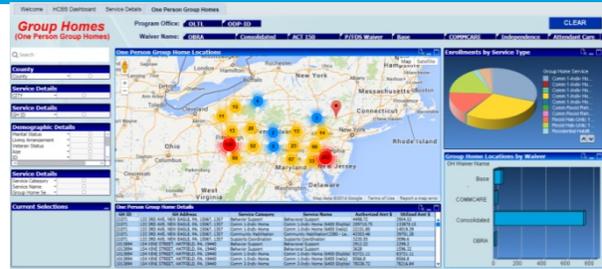


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Focused Case Review Monthly Scorecard.

PA Department of Public Welfare

The first step in the Focused Case Review process involves identifying and querying DPW information to identify HCBS cases for review. After the cases have been identified Deloitte follows a defined strategy to lead the focused case review. At the conclusion of the review a case profile is produced to illustrate details of each case, identify savings opportunities, and highlight patterns or trends found during the review.



HCBS Interactive Dashboard.

Each month, scorecard and analysis visualizations are generated using Tableau to detail the results of the focused case reviews in a concise, impact-driven layout. The Monthly Scorecard for December, 2013 is detailed in the graphic above. As indicated in the graphic, a total of 65 cases were identified and reviewed in December. Of these 65 cases, 26 cases were identified where cost savings could be realized from compliance savings and/ or alternative service options. The potential savings from these cases is approximately ~1.2 million dollars.

As indicated in the graphic, a total of 65 cases were identified and reviewed in December. Of these 65 cases, 26 cases were identified where cost savings could be realized from compliance savings and/ or alternative service options. The potential savings from these cases is approximately ~1.2 million dollars.

Benefits

Element 1 – Program Initiatives

Over 20 innovative ideas of various complexities were submitted with the proposal. DPW is currently evaluating the ideas and may request an idea be refined or implemented.

Element 2 – Data Analysis and Findings

Data Analysis and Findings was a 90 day data analysis and efficiency recommendation initiative. The Deloitte team worked with senior staff within DPW to identify areas of research where the Department seeks to improve the quality and effectiveness of services delivered throughout the state. Based on feedback from DPW leadership, the team met with data experts in 5 program offices to determine the availability and location of the data required to support analysis in the prioritized research areas. As summarized in Figure 4.2 above, Deloitte provided a series of analytic capabilities including Actuarial Analysis, Geospatial Analysis, Advanced Visualizations, and Interactive Dashboards to support the data analysis and findings for each area of research.

Element 3 – Focused Case Review

To date, Deloitte has reviewed 300 cases with complex service plans. In total over 7.25 million dollars in potential savings has been identified as part of the focused case review. Of this 7.25 million, 5.58 million was related to compliance savings, while the remaining 1.67 million in savings was related to alternative service options. Compliance savings typically involves the following activities: non-use of allocated services, outliers, service definition alignment, and Service limits being exceeded. The majority of the savings has been related to outliers (examples of outliers include typos and miscalculations). Alternative service options involve actually adjusting the mix of services of the level of service which is being provided. One common example of an alternative service option is related to shifting 24 hour care RN nursing to LPN nursing. The alternative service options would provide 12 hours of RN care and 12 hours of LPN care, thus drastically reducing the overall cost to serve. The Focused Case Review Element is expected to continue through October, 2014.

Figure 5-52. Pennsylvania Department of Public Welfare.

Office of National Coordinator of Health IT

Methods Employed

Data Visualization

Background

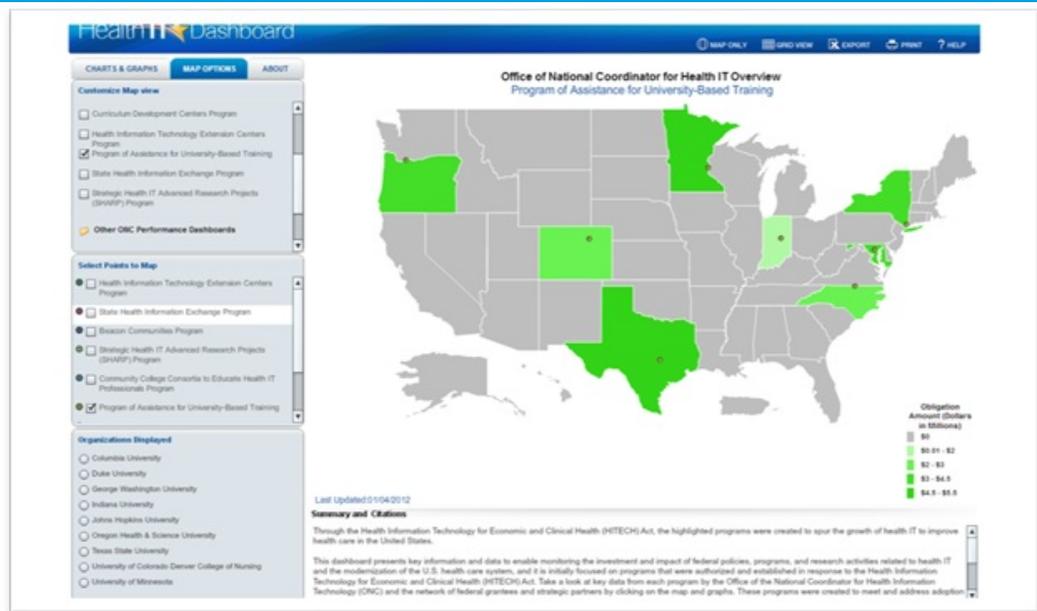
Working with the Office of National Coordinator (ONC) of Health IT, Deloitte developed a rapidly deployable Web-based dashboard designed to provide rich interactive geospatial and graphical visualizations of key performance measures and metrics for an organization. The dashboard uses Adobe Flex software combined with the reusable Deloitte EVD framework that accelerates development. There is no user license for the software application.

The tool can be used to support many different business decisions based on what the ONC is looking for. Specifically, this tool is being used in the health care sector to monitor and keep track of key performance data of electronic health records (EHR). Deloitte is using this tool to monitor the EHRs programs (about 8-10 of them) of the ONC Dashboard to track the performance, KPI, and funding of these programs against the program's original goals. The ONC then uses this data to determine which programs they may want to prioritize or what issues they may need to address to better achieve program goals.

Solution

The ONC IT Overview dashboard which is depicted below allows the user to view a geographic display of programs funded by the ONC. Each dot in the graph represents the location of an individual program, and the coloring of each state indicates the scale of the total funding amount of all programs within. Using the menus on the left side of the screen, users can also apply filters to which types of programs are displayed in the map at any given time.

Office of National Coordinator of Health IT



ONC IT Overview Dashboard.

Benefits The Health IT Open Government Dashboard has been implemented for the ONC and is publicly accessible at <http://dashboard.healthit.gov>.

Figure 5-53. Office of National Coordinator of Health IT.

Kentucky Health Benefit Exchange

Methods Employed Data Visualization

Background The state faces a healthcare crisis as it is considered one of the unhealthiest states in the union. The following are some of the statistics:

- 650,000+ uninsured Kentuckians
- 45 outcomes rank
- 43 overall rank
- 49 smoking rank
- 46 obesity ranks
- Nearly 600 million is spent on uncompensated care per year

Solution The Kentucky Health Benefit Exchange (HBE) solution provides the comprehensive analytical capability for Medicaid eligibility and enrollment, and health insurance exchange enrollment and sustainability. The solution allows state office staff, regional managers, office managers, and others to meet federal reporting requirements, support the information needs of Governor's office and media, and provide a comprehensive view of the application, enrollment, and cost information of users enrolled via state health insurance exchange.

The solution has following key features:

- Visualization solution provides access to the HBE wide data
- Provides information in intuitive visualizations such as Graphs and Charts
- Provides the trend of historical information
- Links to the actionable detail reports from summary
- Built using SAP Business Object suite
- Displays KPIs at various organization levels to support reporting needs of executives at various levels of the organization

Kentucky Health Benefit Exchange



HBE Dashboard.

Benefits

The HBE is:

- Known as the gold standard for state based exchanges
- Over 220,000 participants have selected a plan as of February 11, 2014
- Trained 2,000 state workers on the new policy and procedures and over 1,500 caseworkers on the new system
- Created certification training for client (In-Person Assistants, Insurance Agents, and Certified Application Counselors)
- Supported post-production by monitoring social media and providing answers to questions or complaints, allowing client's resources to post accurate responses

Figure 5-54. Kentucky Health Benefit Exchange.

Arizona Child Welfare Dashboards Prototype

Methods Employed

Data Visualization

Background

Deloitte worked with the State of Arizona – Department of Economic Security to develop a prototype designed to help state, county and caseworker stakeholders track key performance indicators related to Child Safety. In addition the prototype also includes a predictive analytics solution built using SPSS designed to help stakeholders proactively address and monitor at risk children. The dashboards which are illustrated below help the Department of Economic Security achieve the below key objectives:

- Monitor and Analyze compliance with Federal CFR outcomes
- Reduce child re-entry into care, specifically reduce re-entry within 1 year of leaving a care setting
- Identify, analyze, and predict children who are at high risk based on a series of defined safety metrics
- Prioritize caseworker activities to expedite investigation and intervention activities
- Reduce child mal treatment and thus improve child safety within the State of Arizona

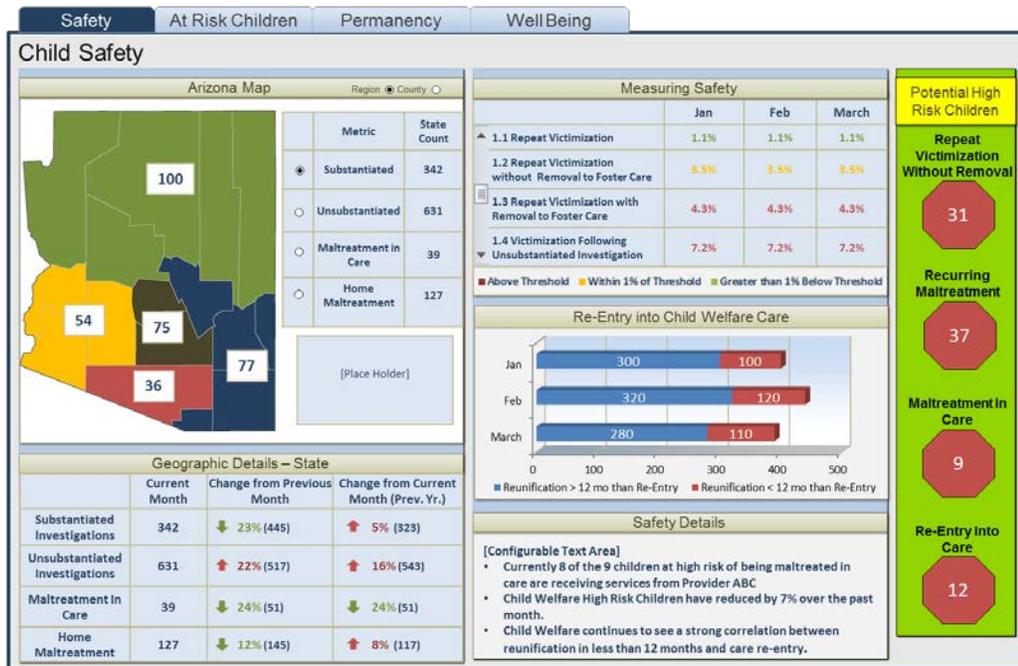
Solution

The Child Safety Dashboard allows state headquarter, county and caseworker stakeholders the ability to view and analyze their compliance with Child and Family Service Review (CFSR) outcomes. The Child and Family Services Reviews (CFSR) are conducted by the Children's Bureau, within the United States Department of Health and Human Services, to help States improve safety, permanency, and well-being outcomes for children and families who receive services through the child welfare system. States are audited on an annual basis and must comply with required CFR standards. As indicated in the dashboard Arizona stakeholders can quickly analyze/ monitor their compliance with CFR outcomes to determine if they are above or below the required threshold. This allows AZ Department of Economic Security to proactively monitor compliance with CFR standards.

In addition, this dashboard also allows users to quickly visualize high risk children across several key indicators including: Repeat Victimization, Recurring Maltreatment, Maltreatment in Care, and Re-Entry into Care. Behind the

Arizona Child Welfare Dashboards Prototype

scenes there is a predictive analytics statistical model that determines at risk children based on a series of pre-defined variables.



Executive Dashboard – Safety Business Questions.

If the stakeholder in the above dashboard selects any of the High Risk Children metrics they will be automatically re-directed to the below dashboard. The below dashboard allows stakeholders to quickly and efficiently visualize high, medium and low risk individuals. In addition, the dashboard also allows stakeholders to view a child's risk score and understand the key indicators which are included in the predictive model's multivariate analysis. The true value for this dashboard is it allows caseworkers to quickly analyze and prioritize their caseload in order to confirm that those children who are the highest safety risk are provided immediate intervention services.

Arizona Child Welfare Dashboards Prototype



Executive Dashboard – At Risk Children.

Benefits

The Dashboard prototypes above are intended to allow the State of Arizona – Department of Economic Security to actively monitor, analyze, and improve child safety. In addition, they help to confirm that Arizona is in compliance with federal Child and Family Services Reviews (CFSR) standards. The sections below detail the specific business questions which are addressed by each of the dashboards, broken down by each chart. In total over 25 separate business questions can be answered using the visualizations developed as part of this solution.

Key Business Questions - Executive Dashboard - Safety

Arizona Map

- What is the total count by child and percentage of substantiated investigations?
- What is the total count by child and percentage of unsubstantiated investigations?
- What is the percent change in substantiated and unsubstantiated investigations from the previous month and previous year?
- What is the total count by child and percentage of maltreatment in care?
- What is the total count by child and percentage of home maltreatment?
- What is the percent change in maltreatment in care and home maltreatments from the previous month and previous year?

Measuring Safety

- What is the percentage of the following KPIs?
 - Repeat Victimization
 - Repeat Victimization without Removal to Foster Care
 - Repeat Victimization with Removal to Foster Care
 - Victimization following Unsubstantiated Investigation
 - Victimization following an Investigative Response
 - Victimization in Foster Care

Re-Entry into Child Welfare Care

- What is the total count of children who re-enter into Child Welfare Care each month?

Arizona Child Welfare Dashboards Prototype

- What is the total count of children who re-enter into Child Welfare Care after reunification with their parents in less than 12 months?
- What is the total count of children who re-enter into Child Welfare Care after reunification with their parents in greater than 12 months?

Potential High Risk Children

- Which children have a high potential of repeat victimization without removal?
- Which children have a high potential of maltreatment occurring after reunification with their parents?
- Which children have a high potential of maltreatment occurring while in care?
- Which children have a high potential of re-entering back into Child Welfare care?

Key Business Questions - Executive Dashboard - At Risk Children

Predictive Bar Graph

- What is the current count of children who are predicted to fall into high risk, medium risk and low risk categories for the following metrics: Repeat Victimization without Removal, Recurring Maltreatment, Maltreatment in Care, Re-Entering into Child Welfare Care?

Trend Area

- What is the month to month count for children who were predicted to be at risk for the following metrics: Repeat Victimization without Removal, Recurring Maltreatment, Maltreatment in Care, Re-Entering into Child Welfare Care?
- What is the month to month count for the actual children in the following metrics: Repeat Victimization without Removal Maltreatment, Recurring Maltreatment, Maltreatment in Care, Re-Entering into Child Welfare Care?
- What is the month to month count for the number of investigations/ preventions in the following metrics: Repeat Victimization without Removal Maltreatment, Recurring Maltreatment, Maltreatment in Care, Re-Entering into Child Welfare Care?

Table Details

- What are the specific demographic details for the children who are predicted to fall into high, medium, and low risk for the predictive bar graph?
- What is the specific risk score for each child?
- What are the key risk factors used to determine the child's risk score?

Figure 5-55. Arizona Child Welfare Dashboards Prototype.

Kentucky Child Support Enforcement

Methods Employed Data Visualization

Background The Cabinet for Health and Family Services (CHFS) is responsible for providing a broad array of Health and Human Services to the citizens of Kentucky. The Child Support Enforcement (CSE) agency within CHFS is a service delivery agency that is responsible for the collection and distribution of Child Support to the custodial parents of the children of the Commonwealth. Currently, CSE is serving over a million Commonwealth citizens and children, and distributes nearly \$400 million annually.

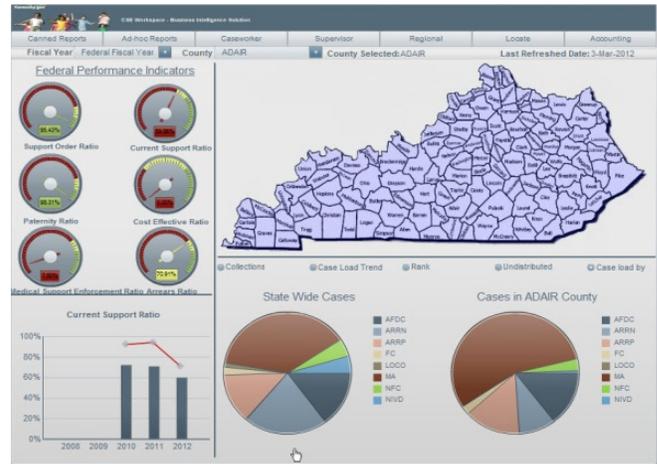
Child Support is an information-driven program requiring information from many disparate agencies, across dozens of external systems. In Kentucky these systems reside on multiple platforms. Furthermore, there has never been any client access to case information. A final hurdle for the program has been a complete inability to proactively monitor program performance on a timely basis at all levels, statewide, regionally, locally – the information just did not exist. Over the past few years, CHFS has endured declining budgets coupled with reductions in staffing while the demands for Child Support services continue to increase, and the information infrastructure has grown even more complex. Something needed to be done.

Kentucky Child Support Enforcement

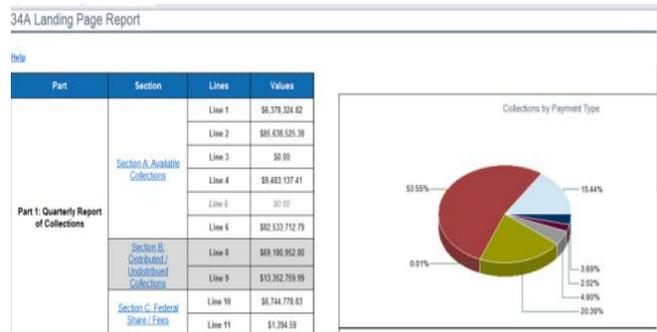
Solution As a result of the project, the CHFS has made great strides in efficiency, productivity, accuracy and customer service. The impact on the CSE program operations has been holistic and transformative.

Through the use of visualization, the CHFS now has enhanced visibility into program data, providing greater freedom and flexibility to conduct timely analysis without the need for IT involvement. Moreover, visualization has enabled the caseworker to analyze data specific to their case load, which fosters and encourages proactive measures, and increases the case workers productivity by reducing manual activity. At the CHFS Leadership level, visualization improves visibility into program data and communicates how the agency is performing against key child support enforcement performance measures.

Additionally, through the use of predictive analytics, the CHFS now has greater insight and visibility into their customer base, as well as their behaviors. Ultimately, this insight affords the CHFS with the ability to better answer these two fundamental questions, “what happened?” and “what will happen?” With this information CHFS can now identify new, strategic and targeted initiatives and opportunities to improve services to their customers.



CSE Dashboard.



CSE Collections Dashboard.

Benefits CHFS is anticipating the collection of an additional \$20 million dollars annually for the children of the Commonwealth due to the CSE Web Portals initiative. In a single year, the citizens of the Commonwealth will derive more in benefits than the total cost of the project. This does not count the enormous impact that may come from the tools, and the increased data visibility afforded by the other visualization tools. These may yield the greatest impact of all, both from increased collections and increased Federal incentive funding for the Commonwealth program due to increases in program performance.

The greatest intangible benefits of the project come from increased customer service realized by Child Support clients. Greater customer service leads to enhanced participation and ownership by the customers, which will ultimately make CSE a better agency by increasing its ability to serve its clients, and by extension to benefit the children of the Commonwealth.

Figure 5-56. Kentucky Child Support Enforcement.

5. Data Quality

- a. **Parsing and Standardization.** Decomposition of text fields into component parts and formatting of values into consistent layouts based on industry standards, local standards (for example, postal authority standards for address data), user-defined business rules, and knowledge bases of values and patterns.
- b. **Generalized “Cleansing”.** Modification of data values to meet domain restrictions, integrity constraints or other business rules that define sufficient data quality for the organization.
- c. **Matching.** Identification, linking or merging related entries within or across sets of data. This includes technologies that enable analysis of diverse depersonalized data sets (example: anonymization and resolution and the functions that support this type of technology: standardization, masking/hashing, encryption, linkage of records, etc.).
- d. **Profiling.** Analysis of data to capture statistics (metadata) that provide insight into the quality of the data and aid in the identification of data quality issues.
- e. **Monitoring.** Deployment of controls to confirm ongoing conformance of data to business rules that define data quality for the organization.
- f. **Enrichment.** Enhancing the value of internally held data by appending related attributes from external sources (for example, consumer demographic attributes or geographic descriptors).

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	n/a	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of data quality services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of data quality services.
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	Please refer to the section Deloitte’s Services Supporting Data Quality section below for details pertaining to our implementation services.

	Requirements	A	B
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Please refer to section Deloitte's Data Quality Services in Action below for sample experiences.

Figure 5-57. Data Visualization Requirements.

Deloitte's Services Supporting Data Quality

Our Perspective – 'Data First'

One of the main reasons agencies undergo a modernization transformation is to improve the management and quality of their data. Data conversion is a critical step towards improving data quality irrespective of the application being implemented within the Commonwealth. In order maximize the quality gains during data conversion and to sustain these gains over time data quality needs to be part of a comprehensive Enterprise Data Quality (EDQ) Program. Deloitte's 'Data First' approach places a strong emphasis on profiling and cleansing data as a critical first step towards successfully transforming an agency. Inversely, failing to apply the right data management approach could lead to less than desirable results.

Our Data Quality Services Details – Data Profiling Approach

Data profiling serves as the foundation for the data quality process. Data profiling enables the data cleansing process by providing the framework for analysis, determining the underlying quality of sources, and developing a basis for data rules collection.

The rules discovered during data profiling will facilitate the movement of data. This will be accomplished by reducing redundancies in the data and by ensuring that identical sets of data, duplicate values, and foreign keys are identified. In addition column profiling will provide results such as completeness/fill rates, data type, and size/length, list of unique values, frequency distribution, patterns, and max and min ranges. Column profiling will also enable the discovery of metadata and content quality. Table profiling will provide the discovery of relationships between columns within a table or file, as well as discover duplication, data structure, functional dependencies, primary keys, and data structure quality problems.

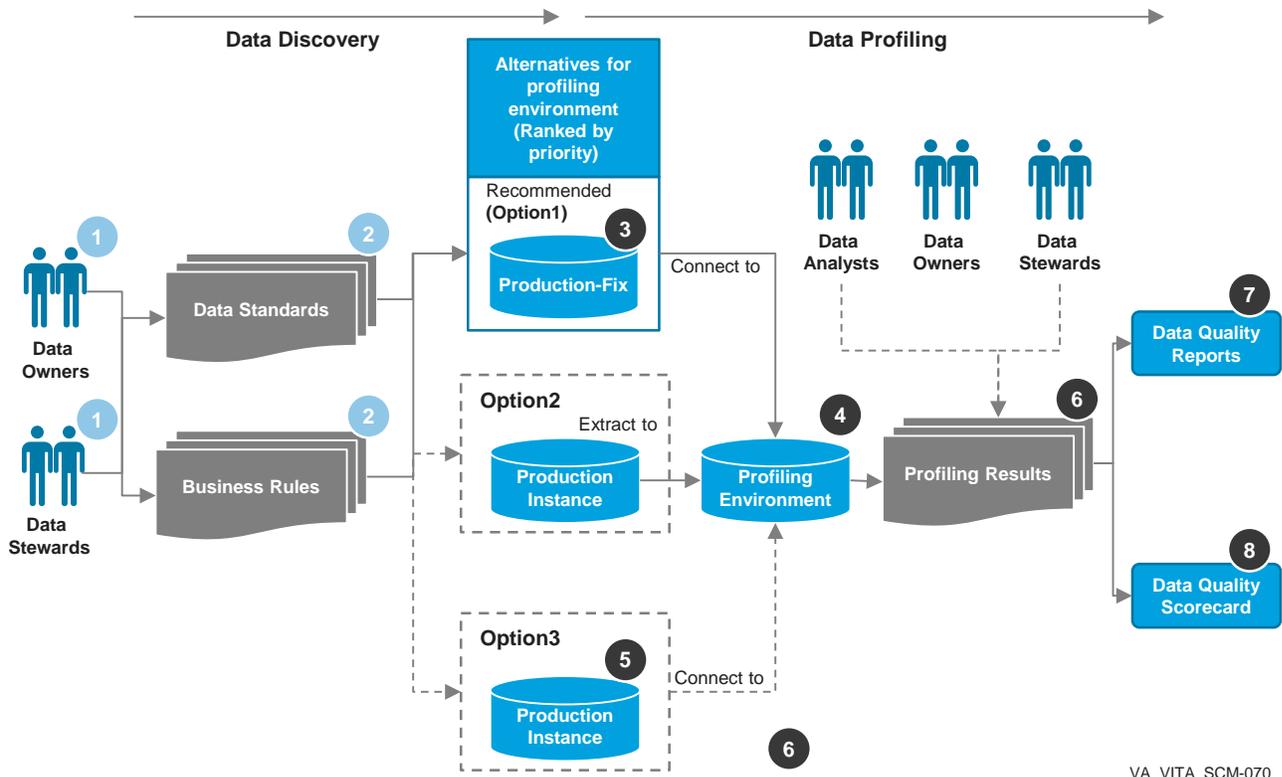
Key components of data profiling include Data Attribute Analysis and Business Rule Analysis.

- **Data Attribute Analysis.** Data profiling is an initial step in the data quality analysis that focuses on understanding the attributes of the data (such as completeness and range of values).
- **Business Rule Analysis.** The business rule analysis utilizes the output from data profiling along with key as-Is and To-Be business rules to identify specific data quality exceptions.

Data profiling begins with data discovery. Data discovery is the process of collecting any existing metadata and business rules. This metadata is collected by analyzing existing documentation and by interviewing identified data stewards and data owners. The identification of data stewards and owners is a key step while

establishing a data governance organization. Data Governance plays a critical role in EDQ. Please refer to the *Data Governance* sub-section of this *Solution* section for further details on our data governance services. Data profiling is the process of validating the metadata and rules collected in discovery. Additionally profiling will help to mine any new rules and data abnormalities.

An overview of Deloitte’s Data Discovery/Profiling approach is provided in the diagram below:



VA_VITA_SCM-070

Figure 5-58. Deloitte’s Data Discovery/Profiling Overview.

- 1. Stakeholders Identified.** Data Owners and Stewards are identified.
- 2. Define the Data Standard and Business Rules.** Data Standards and Business Rules are established, documented, and recorded in the profiling tools. A key initial step is to extract existing business rules and standards from current profiling activities and migrate them into the Data Quality tools.
- 3. Option Alternative 1.** Pre-Production a replica of production, used for testing and backup purposes, should be used for certain profiling activities if available. Pre-Production, a replica of production, is used for testing and backup purposes
- 4. Option Alternative 2.** If Pre-Production is unavailable, extract data from production into a Profiling/ Dev environment and then profile it.
- 5. Option Alternative 3.** As a last resort, profiling activities can be performed directly on the production instance.

6. **Perform Analysis.** Profiling results are analyzed by Data Owners and Stewards and results are reported to both the Data Governance Committee and the Data Governance Council. This analysis feeds planning for future profiling and future Data Analyst activities.
7. **Develop Data Quality Reports.** Data Quality Reports that include detailed analysis and preliminary recommendations are developed by the Data Analyst. The figure below contains a sample data quality parsing report.

TableName	Column Name	Description	Inferred Data Type	Minimum Length of Data Value before removing spaces and trailing zeros	Maximum Length of Data Value before removing spaces and trailing zeros	Average Length of Data Value before removing spaces and trailing zeros	Minimum Length of Data Value after removing spaces and trailing zeros	Maximum Length of Data Value after removing spaces and trailing zeros	Average Length of Data Value after removing spaces and trailing zeros	Precision (minimum length for numeric values)	Min (maximum length for numeric values)	Max (maximum length for numeric values)
mdf010aw_vss	Anticipate Date	Anticipated Delivery Date	Date	10	10	10	10	10	10			
mdf010aw_vss	Dpt	Department Code	Tinyint	5	5	5	1	3	2.187153285		1	3
mdf010aw_vss	HSTR	SHIP TO STORE NUMBER	Smallint	7	7	7	3	3	3		3	3
mdf010aw_vss	Opn Qty	Open Quantity	Integer	9	9	9	1	6	4.263357664		1	6
mdf010aw_vss	Order Dte	Order Date	Date	10	10	10	10	10	10			
mdf010aw_vss	PO#	PO NUMBER/CURRENT BLOCKOUT	Integer	5	5	5	5	5	5		5	5
mdf010aw_vss	Short Sku	SHORT SKU NUMBER	Integer	12	12	12	6	7	6.999708029		6	7
mdf010aw_vss	Vend Cst	Vendor Cost	Decimal	3	12	6.514452555	3	12	6.514452555		1	10
mdf010aw_vss	Vend#	Vendor Number	Smallint	7	7	7	3	5	4.000291971		3	5

VA_VITA_SCM-072

Figure 5-59. Sample Data Quality Parsing Report.

8. **Develop Data Quality Scorecards.** Data Quality Scorecards that illustrate the overall health of the data are developed by the Data Analyst and used for executive level reporting. Please refer to the *Deloitte's Data Quality Services in Action* section for sample scorecards.
9. Data quality parsing report format

Our Data Quality Services Details – Data Standardization and Parsing Approach

Deloitte will work with the Commonwealth's data owners and stewards to analyze profiling results, data standards, and impact to downstream applications. Deloitte will also work with the agency to determine rules for standardizing the profiled data.

Key challenges which needs to be addressed during standardization and parsing

- **Parsing.** Identifying key data elements in data files and separates them into different fields and providing more informed information.
- **Consistency and Standardization.** Delivering data that does not conform to defined formats and standards. Simple errors can lead to unnecessary costs and overhead.

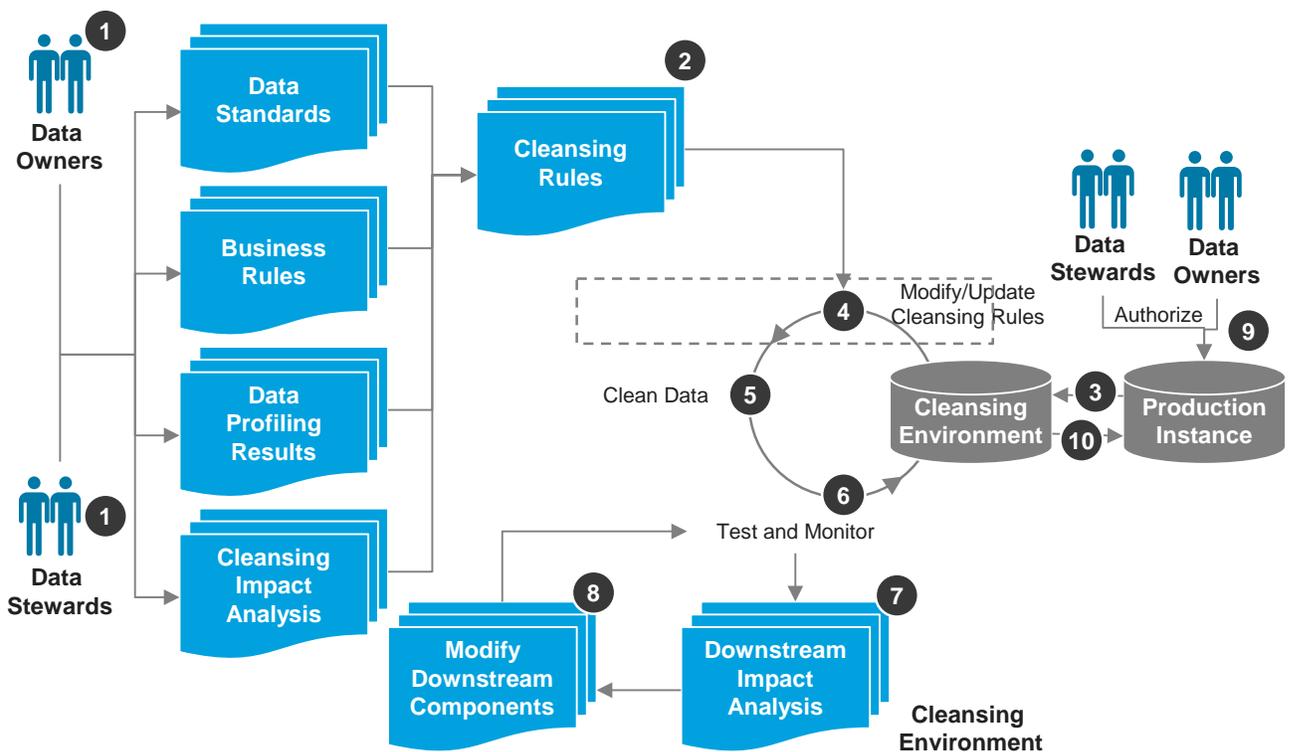
Our Data Quality Services Details – Data Cleansing Approach

Data cleansing is the process of standardizing and transforming legacy application data so that it can be converted into useable data. The end goal of having production-level quality data can only be achieved through a combination of engaging the business in cleansing the data and following a standard end-to-end cleansing and construction process.

Key challenges that need to be addressed by the data cleansing process include the following:

- **Accuracy.** Data must be consistent with the intended goal and usage in business processes
- **Accuracy of Hierarchical Relationships.** Overlooking parent-child relationships can lead to data quality issues
- **Integrity.** Absence of expected relationships between multiple data sets presents data integrity issues
- **Completeness.** Missing and invalid data can lead to problems such as the truncation of legacy client data
- **Timeliness.** An operational quality metric that addresses whether the delivery of data from one environment to another meets user expectations

An overview of the Data Cleansing process and architecture is provided in the diagram below:



VA_VITA_SCM-071

Figure 5-60. Data Cleansing Process and Architecture Overview.

1. **Identify Stakeholders.** Data Owners and Data Stewards are identified.
2. **Define the Cleansing Approach.** Cleansing Rules are developed using the following inputs – Data Standards, Business Rules, Data Profiling Results, and the Cleansing Impact Analysis.
3. **Load Data.** An extract of production is loaded in the cleansing environment to confirm that as little of an impact as possible is made to production.

4. **Refine Rules.** Cleansing Rules are modified/updated based on the initial analysis, testing, and the downstream impact analysis.
5. **Cleanse Data.** The data is cleansed in a sandbox environment using the rules defined in step 2.
6. **Test Data and Monitor.** Testing is performed on the cleansed data and all downstream components and monitoring takes place on an ongoing basis
7. **Analyze Data.** Analysis of cleansed data on downstream applications is performed.
8. **Modify Components.** Applicable downstream components are modified using results from Step 7.
9. **Release Production Data.** Data Owners and Stewards authorize the update of data back in the production environment.
10. **Migrate Data.** Clean data is then available in production for use (This includes scenarios where data is updated back into the legacy production system)

Our Data Quality Services Details – Matching Approach

Deloitte will work with the state's data owners and stewards to create matching rules which will identify duplicates in the data.

Matching can help identify key challenges in match such as

1. **Nicknames and Aliases.** Matching will help identify matches like Chris-Christine
2. **Sequence Errors.** Match can help identify sequence errors in names Mark Douglas or Douglas Mark
3. **Concatenated Names.** Match can help identify concatenated names as Ann Marie, AnnMarie
4. **Transposed Characters.** Match can help identify transposed characters such as Michael, Micheal
5. **Involuntart Correction.** Match can help identify between Graeme – Graham , Macdonald – Mcdonald
6. **Inaccurates Dates.** Match can help identify between 12/10/1915 and 21/10/1951

Our Data Quality Services Details – Data Enrichment

Deloitte will work with the state's data owners and stewards in incorporating value-added data from external sources for advanced analysis, such as using latitude and longitude to address, DNB data for vendors, Experian data for individuals.

Deloitte's Data Quality Key Relationships



Deloitte and Business objects work to provide clients with data quality services.



Deloitte and Data Flux work to provide clients with data quality services.

	Deloitte and IBM work to provide clients with data quality services.
	Deloitte and Informatica work to provide clients with data quality services.
	Deloitte and Trillium work to provide clients with data quality services.
	Deloitte and Pitney Bowes work to provide clients with data quality services.

Figure 5-61. Key Software Vendor Relationships.

Data Quality Best Practices

Data Profiling will focus on identifying data quality issues, anomalies, trends, and relationships based on defined data profiling strategy and business rules. Data Cleansing will include detecting and correcting erroneous data across the system, as either real-time or done afterwards.

One of the building blocks of an EDQ program is business buy-in and executive sponsorship. Similarly, Communication is another tenant of enterprise data quality. Communication channels must be open with continuous updates on progress and correlate with Data Governance processes. Data Governance Members must be apprised of progress and success and failure must be measured. Data Governance Members must have the ability to provide feedback to the enterprise data quality team.

Project Management and communication is integral to the success of the data quality initiative. The program needs to be scoped into clearly defined and manageable projects with a published regular schedule for project communications.

Data quality governance includes defining roles and responsibilities and assigning business and technical resources. Part of data quality governance is establishing business definitions, quality standards, and reporting metrics as well as defining data cleansing rules and exception handling conditions.

Deloitte's Quality Services in Action

Deloitte has vast experience providing an array of data quality solutions for a number of state and federal government agencies. These data quality solutions have helped state and federal government organizations achieve a multitude of key business objectives from improved customer service to monitoring fraud. Each of our various solutions have implemented a number of data quality capabilities such as data discovery, profiling, cleansing, address validation, customer/residents deduplication, etc.

West Virginia Department of Health and Human Services

Methods Employed Standardization, Cleansing, Matching, Enrichment and Profiling

Background Client service expectations and program policy are challenging the people, business processes and technology infrastructure that, in many state agencies, have been in place for many years. The rapid pace of change in recent years has been consistently layered on top of existing capabilities stretching many state agencies to their limit.

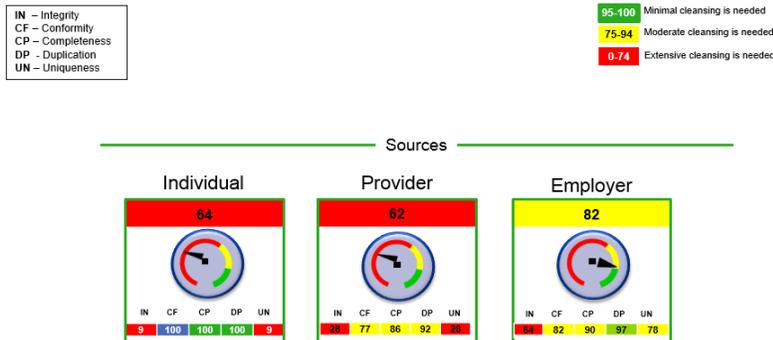
Department of health and human services (DHS) at West Virginia wanted to implement an MDM solution for its citizens so that it can implement a 360 view of the citizen across different agencies. WV DHS had been functioning with a set of core systems that have been around for a long time. These 'systems' were actually a compilation of isolated disparate 'sub-systems' supporting a specific function area within the agency. The data capture methodology and maintenance of the data by different agencies did not followed a process and hence the quality of data was not satisfactory. The state did not wanted to load a low quality data into a new MDM system which was going to host data from multiple agencies and going to be a single source of truth for data for citizens, providers and employers.

The employer creation process in DHS had so many gaps that anyone in the department could create a new employer with minimal efforts. This resulted in creation of the same employer multiple times and the DHS sometimes could not find out whom it has made the payments. Wal-Mart as an employer was created 100 times and more in the system.

Solution Because of these experiences, Deloitte is approaching system modernization and service improvement using a different perspective: A perspective that starts with and focuses on the data. This approach, what we call 'Data First' understands that enterprise data is one of your most important assets. Many of the problems facing the agency arise from data issues (e.g., data in silos, inaccurate and incomplete data, etc.). It also acknowledges that data problems are one of the foremost challenges that must be overcome in meeting modernization goals. 'Data First' means that you take a holistic approach towards modernization with a driving force towards storing and moving data. 'Data First' does not mean a bottom up approach towards modernization. Instead, 'Data First' is a foundational enabling architecture that gave WV DHS the nimbleness it requires to meet the business needs and shift the organization into a business-driven organization.

Deloitte as part of its approach first conducted a data profiling activity on individual, providers and employers. Profiling gave DHS a deep insight about the quality of their data. Data profiling reports with dashboards were provided to the DHS. The below figure gives a screen shot of the reports which were presented to the WV DHS.

Data Quality Dashboard



Deloitte.

- 2 -



Data Quality Dashboard.

West Virginia Department of Health and Human Services

Source Table: EMPLOYER

Number of records profiled: XXXXX

Attribute	Data Quality	Observations
Overall Score	IN CF CP DP UN 	
PKEY_SRC_CUST	Low 	1. Only 154 "PKEY_SRC_CUST" were unique across the file and had no null values 2. 91% of PKEY_SRC_CUST were DUPLICATES across the file
FULL_NAME	Low 	1. Only 154 "FULL_NAME" were unique across the file and had no null values 2. 91% of FULL_NAME were DUPLICATES across the file
PKEY_SRC_ADDR	Low 	1. Only 154 "PKEY_SRC_ADDR" were unique across the file and had no null values 2. 91% of PKEY_SRC_ADDR were DUPLICATES across the file
ADDR_LN_1	Low 	1. Only 154 "ADDR_LN_1" were unique across the file and had no null values 2. 91% of ADDR_LN_1 were DUPLICATES across the file
CITY	Low 	1. Only 154 "CITY" were unique across the file and had no null values 2. 91% of CITY were DUPLICATES across the file
STATE_CD	Low 	1. Only 154 "STATE_CD" were unique across the file and had no null values 2. 91% of STATE_CD were DUPLICATES across the file
ZIP	Low 	1. Only 154 "ZIP" were unique across the file and had no null values 2. 91% of ZIP were DUPLICATES across the file
	N/A N/A N/A N/A N/A	The below attached "Fields" were COMPLETELY BLANKS across the file.

Deloitte.

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Employer Source Table.

Deloitte's Data First approach helped WV DHS resolve data quality issues by applying data quality in every process of data creation and data maintenance. This made sure that data at every point when captured in the system had to pass through data quality rules and specifications.

Benefits

Element 1 – MDM Implementation

The data quality process helped the state go ahead and implement a Multi domain MDM system for Citizens, Providers and employers. The MDM system helps the DHS maintain a 360 degree view of their citizens, providers and employers.

Element 2 – Address standardization

Address data had major issues and data quality process implementation helped DHS to clean and main high standards of address data. This helps the state from big loss on mails which are sent to wrong addresses and are returned back to the agencies.

Element 3 – Employer data creation

The process for creation of employer was streamlined and data quality rules were introduced to prevent creation of duplicate employers. The exercise has brought down the number of employer creation from 100's in day to 10's in day.

Figure 5-62. West Virginia Department of Human Services.

Enterprise Data Strategy – Government Insurance Agency

Methods Employed Standardization, Cleansing, Matching and Profiling

Background The client's corporate mission is to reduce its total cost of insurable risk. A number of public sector, healthcare, technology and compliance trends and expectations changed the way the client views its clients' insurable risk. The client had the opportunity to respond to these shifts by better leveraging data, information and the associated technologies to make more informed operational and strategic business decisions.

Building on their recently established information management strategy, an Enterprise Data Strategy (EDS) was required to identify the data-related capabilities needed to improve the quality, analysis and use of data within the client organization, focusing on the reduction of adverse effects of preventable claims from a medical indemnity perspective.

Solution Deloitte worked collaboratively with the client to perform the following activities:

Enterprise Data Strategy – Government Insurance Agency

- Assessment of the client’s current state data governance and data capabilities engaging with a broad range of stakeholders in meetings, interviews and workshops
- Development of prioritized recommendations based on the current state assessment and through continued engagement with key internal stakeholders, Deloitte SMEs and external clients including the Department of Health
- High level cost benefit analysis of foundational initiatives required to commence implementation of the proposed EDS
- Facilitation of workshops with the broader stakeholder group to elicit feedback on proposed recommendations and gain enterprise-wide buy-in for the final EDS
- Socialization of key recommendations with working groups, executive groups and the medical indemnity steering committee to gain endorsement for the implementation of an EDS

Benefits In developing the EDS, Deloitte delivered the following value:

- An agreed roadmap for the implementation of data-related capabilities, encouraging the client to leverage its existing data capabilities and technologies to analyze long term trends, forecast risk and provide optimal risk management interventions to its customers, ultimately reducing the total cost of risk
- Executive endorsement of foundational recommendations that will deliver tangible short term benefits i.e. agreed data model that will increase enterprise visibility of data usage thereby reducing misinterpretation of data in key organizational reporting to reduce risk and promote increased governance with respect to regulatory requirements prior to implementation of longer term extensions to data capabilities such as enhanced data quality management

Figure 5-63. Enterprise Data Strategy – Governments Insurance Agency.

Data Quality Assessment – Regional Children Services Agency

Methods Employed Standardization, Cleansing, Matching and Profiling

Background The client selected Deloitte to perform data quality assessment of six Children Aid Society (CAS) sites towards providing data quality report, data cleansing requirements and remediation plan in preparation to migrate and amalgamate all provincial CAS site data to the newly incepted Child Protection Information Network (CPIN) system.

Solution Deloitte’s scope of services included:

- Assess the client’s data entry activities and associated business processes and rules
- Evaluate client site database design and data dictionary/map
- Obtain data extract and access to each site database
- Define and validate core data set
- Develop a master data dictionary based on core data set and target database design
- Determine key business rules and criteria for data profiling and analysis
- Perform data profiling to determine completeness, conformity, business rules and integrity
- Develop database queries to obtain metrics for each data profiling criteria
- Develop and present data quality scorecard
- Develop and present cross-site duplicate record metrics
- Develop and present a data remediation plan

Benefits Deloitte offered significant value to the client by first understanding the client’s complex children aid processes and associated challenges. Through this understanding, working closely with the client Deloitte performed focused, in-depth and relevant data quality and profiling tasks to obtain valuable metrics and supporting data outlining the strength and weaknesses of the client’s key data set. This was presented using a data quality scorecard which contributed to a providing a remediation plan assisting the client understand their key data challenges and providing an approach to resolve them. Deloitte also delivered a master data dictionary which provides a target state data dictionary and map. A combination of these deliverables provides insight to the client on the effort and scope of work required to cleanse their existing data before migration to the provincial CPIN solution.

Figure 5-64. Data Quality Assessment – Regional Children Services Agency.

6. **Data Governance.** A quality control discipline for assessing, managing, using, improving, monitoring, maintaining, and protecting information. It is a system of decision rights and accountabilities for information-related processes, executed according to agreed-upon models which describe who can take what actions with what information, and when, under what circumstances, using what methods. This also includes:
- a. **Metadata Management.** The end-to-end process and governance framework for creating, controlling, enhancing, attributing, defining and managing a metadata schema, model or other structured aggregation system, either independently or within a repository and the associated supporting processes (often to enable the management of content).

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	Deloitte is a provider of data governance services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte has the experience, skills, and capabilities to deliver an array of governance services.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte is a provider of data governance services, and as such does not align with a single tool set. Based on the VITA selected governance tool Deloitte has the experience, skills, and capabilities to support an array of deployment platforms, as detailed below in Section 3.
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a provider of data governance services, and as such does not align with a single tool set. Based on the VITA selected tool Deloitte can help support vendor licensing conversations, as detailed in Section 2.2.
4	Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Y	Deloitte is a provider of data governance services, and as such does not align with a single tool set. Based on the VITA selected tool(s) Deloitte can help support the Commonwealth of Virginia's shared services vision, as detailed in Section 2.5.
5	Do you provide training on your solution? If yes, please explain the options.	Y	Deloitte provides extensive training based on the developed solution. Details regarding our governance Training services can be found below in Section 2.6.
6	Do you provide installation (including configuration) services for these tool components above?	Y	Deloitte is a provider of governance services, and as such does not align with a single tool set. As detailed in Section 2.4, Deloitte has extensive relationships working with an array of tools and vendors. Based on the selected tool, Deloitte can work through our alliance partnerships to provide installation services and support.
7	Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Y	Deloitte is a provider of data governance services, and as such does not align with a single governance tool set. As detailed in Section 2.5, Deloitte has extensive experience working with an array of State Departments, Agencies, and program offices to deploy and implement a variety of data governance solutions.
8	For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Deloitte has extensive experience delivering data governance solutions and services to both Public Sector and Commercial clients. Section 2 fully details our experience implementing governance services, our approach to ensure successful implementation, our perspective on the value of governance, our governance service offerings, and relevant government examples of where we have delivered data governance services in the past.

Figure 5-x. Data Visualization Requirements.

Deloitte’s Services Supporting Data Governance

1.0 Our Perspective – Data Governance

It has been our experience that Data Governance is one of the most overused terms in data management. As a result there are many examples of poorly implemented data governance programs that fail to live up to expectations. Deloitte has developed a Data governance framework that will help the Commonwealth step through the process of implementing a functional data governance program.

Data Governance implements a data management organization to formalize data policies and procedures. Data Governance supports data integrity through people and process, while enabling the technology required to manage, maintain and leverage information as a resource. It is important to understand that Metadata Management is a technical enabler of the data governance organization and processes.

Sample data governance activities include metadata management, data profiling, data privileging and leveraging project learnings. Data Governance gives the Commonwealth the ability to make better informed decisions by leveraging data processes for managing the quality, consistency, usability, security, and availability of critical business data.

Data is a valuable asset. It is this data and information that drives critical decisions. Yet for all of its value, problems related to ineffective data governance plagues many organizations much like the states of Virginia. A lack of focus on data governance triggers a number of common organizational issues that can affect various areas in an agency. Example shortcomings are listed below:

Executive Leadership	<ul style="list-style-type: none"> • Often unaware of the magnitude of operational inefficiencies caused by data quality issues • Unable to measure the quality of data
Strategy	<ul style="list-style-type: none"> • Data governance has not been a priority or focus • Policies and standards are not clearly defined
Business Organization	<ul style="list-style-type: none"> • No accountability for adherence to data quality standards, policies and procedures • Some organizations see data quality as an IT issue
Processes	<ul style="list-style-type: none"> • Inconsistent and undefined data management processes • Lack of integration with business process and poorly-defined accessibility
Technology	<ul style="list-style-type: none"> • No technology integration resulting in widespread and duplicate data • Lack of workflow integration, making data management inefficient

Figure 5-65. Deloitte’s Data Governance Framework.

Data governance is also the collection of decision rights, processes, standards, policies and technologies required to manage, maintain and exploit information as a resource. An effective data governance program includes the process by which you manage the quality, consistency, usability, security and availability of the agency’s data.

2.0 Our Data Governance Services Details

Data Governance Framework

A comprehensive data governance approach will be used to deliver a data governance organization and capabilities for the Commonwealth. This holistic approach towards data governance supports the alignment of data management demands with data management capabilities. This data governance implementation approach focuses on widespread adoption across the commonwealth in order to deliver and sustain data quality.

Data governance is the process of managing quality, consistency, usability, security, and availability of enterprise wide data. The goal is to align information assets with VITA's strategic program data goals. This includes organization, technology, data architecture, policies, processes, and compliance required to maintain data.

Our Data Governance Framework provides an organized approach for establishing data governance. The framework is made up of six components (Organization, Policies & Standards, Governance Metrics, Processes & Practices, Technology, and Data Architecture). The purpose of this section is to provide an overview of the framework.

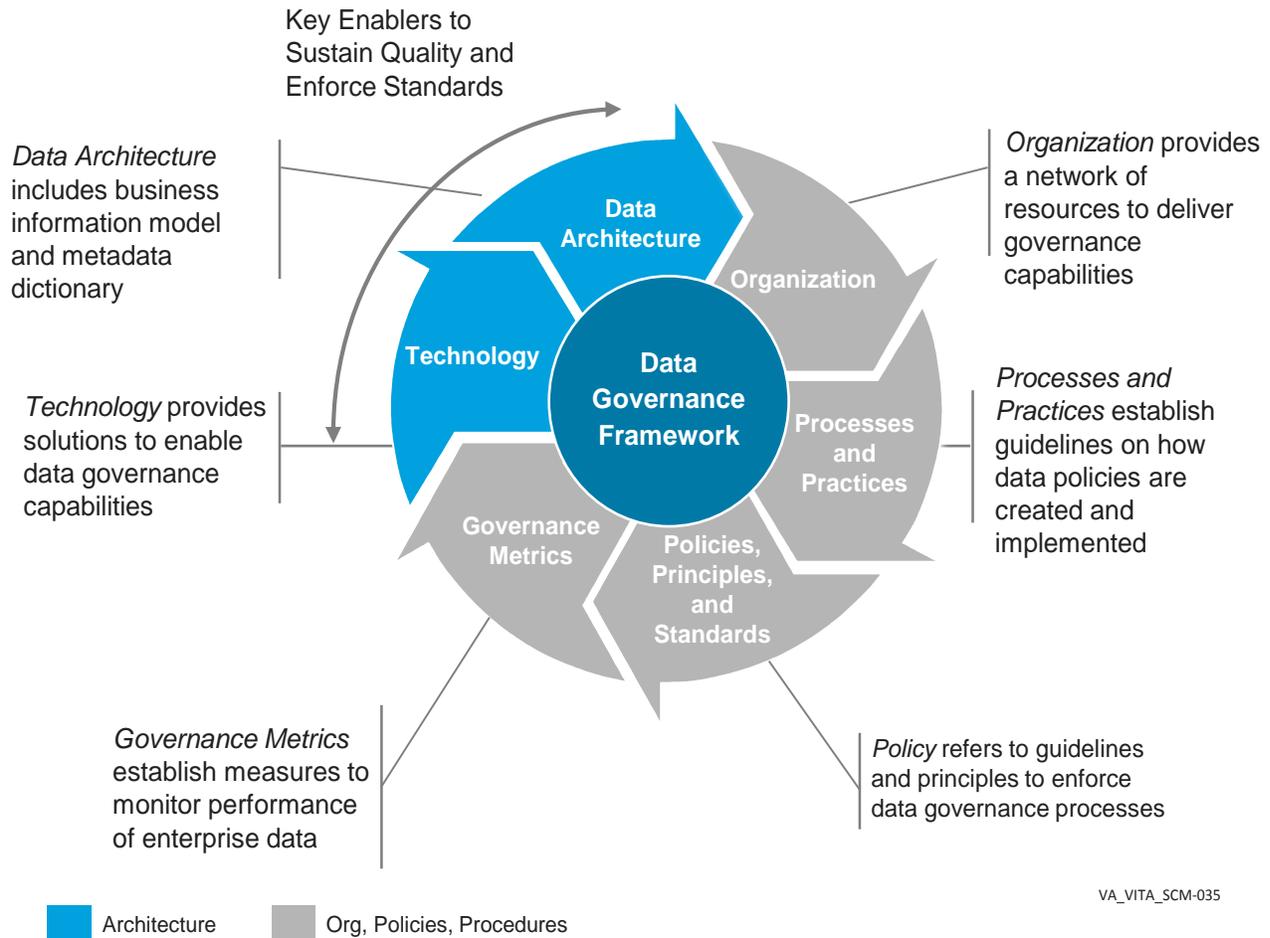


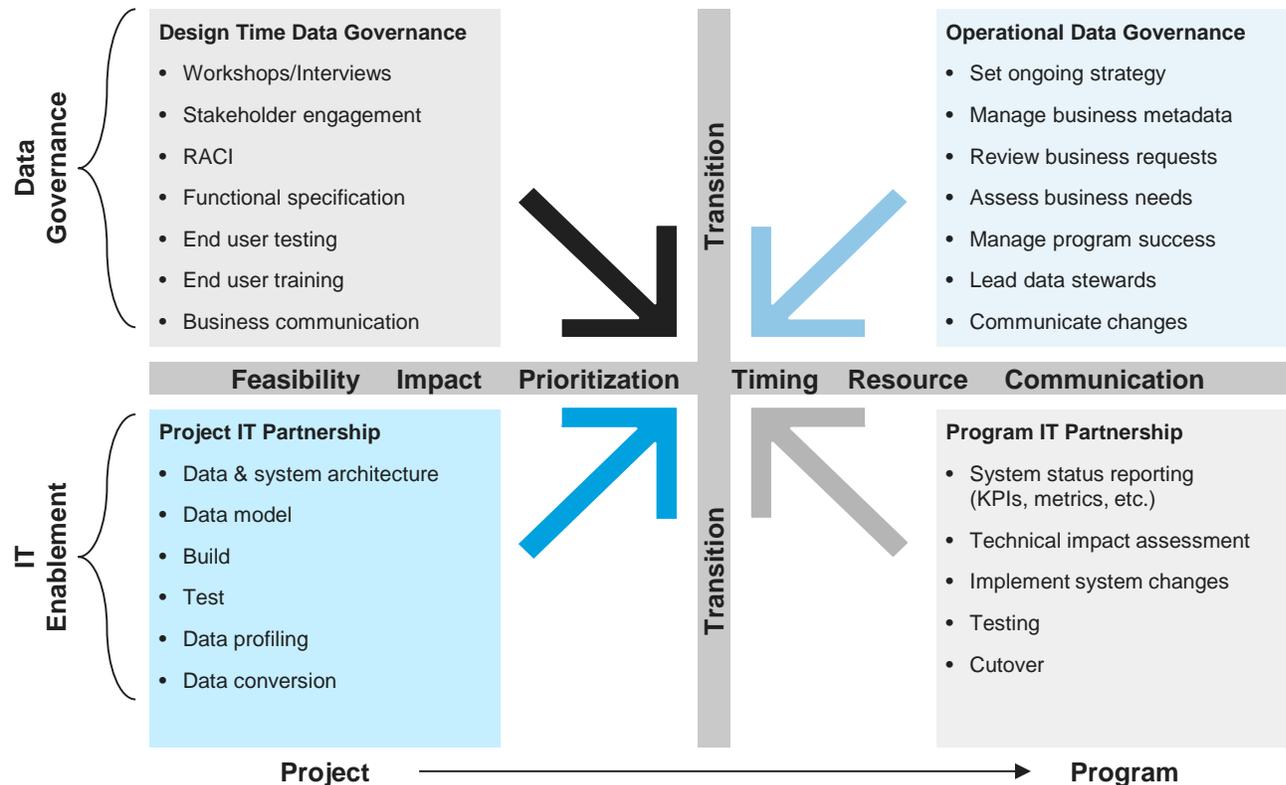
Figure 5-66. Deloitte's Data Governance Framework.

Data Governance Component	Definition
Organization	Organizations chartered with administering data management activities provide a responsible network of resources to deliver quality enterprise master data
Processes	Process establishes structures defining how data governance policies, processes, standards, and master data are created and modified
Policies	Policy refers to master data management guidelines and principles for enforcing data standards, processes, and policies
Metrics	Metrics establishes measures for monitoring data management performance and actions to continuously improve master data
Technology	Technology supporting common information exchange solutions, workflow and business rules functionality, and user presentation/portal
Data Architecture	Data Architecture includes enterprise data standards, business information model, metadata dictionary, and security & privacy

Figure 5-67. Deloitte's Data Governance Framework Component Definition.

'Design' Time vs Operational Data Governance

One of the misconceptions about data governance is that it is only required when a project is in progress. For example, data governance is required to make decisions on data conversion rules. The second Misconception is that data governance is only about processes and policies for managing 'in-production' data. For example, data governance manages processes for managing customer data. The reality is that data governance is both. There are two components to data governance 'design' time and 'operational'.



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Figure 5-68. Design-Time vs Operational Data Governance Components.

The proposed data governance model and framework is flexible enough to scale across functional areas, data domains and releases. Due to the nature of VITA, the data governance organization will need to scale up and down based on the number of 'in-production' releases and the releases in progress.

3.0 Data Governance at Work

To implement a successful Data Governance program, we recommend the establishment a governance body and commit to growing and nurturing data management expertise within the organization. This expertise is not limited to IT personnel, but to staff within the business community as well as executive commitment.

Data Governance policies and procedures are placed under the responsibility and authority of a data governing organization. Governance roles and responsibilities are best depicted by a ‘checks and balances’ model. The objective is to effectively manage multiple constituents, their objectives and needs into a controllable framework. The organization has a unique structure, wherein the business and IT functions are co-mingled to foster compliance with policies, procedures and standards.

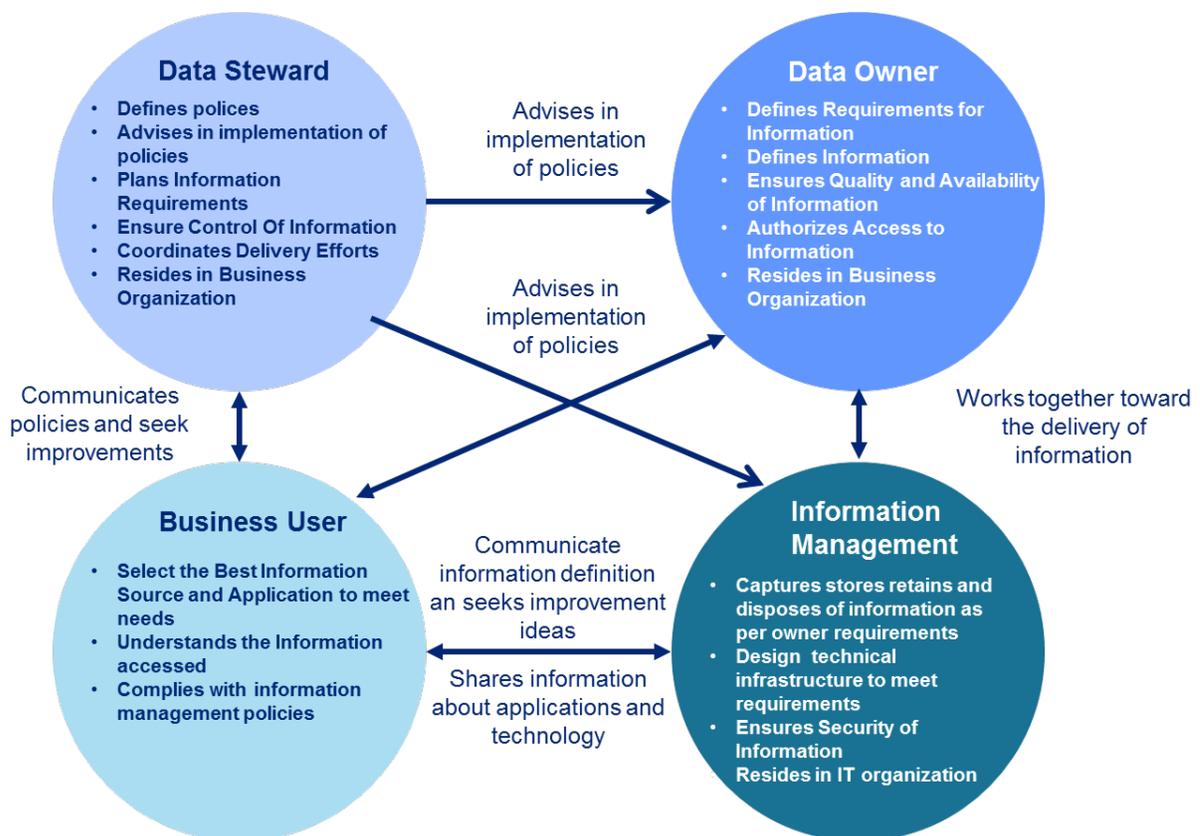


Figure 5-69. The Intersection of Different Actors in Data Governance.

4.0 Deloitte's Data Governance Key Alliance Relationships

	Deloitte and SAP work together to provide NetWeaver Master Data Management services.
	Deloitte and Data Flux work to provide clients with Master Data Management services.
	Deloitte and IBM work to provide clients with InfoSphere Master Data Management services.
	Deloitte and Informatica work to provide clients with Master Data Management services.
	Deloitte and Oracle work to provide clients with Master Data Management services/

Deloitte’s Data Governance Services in Action

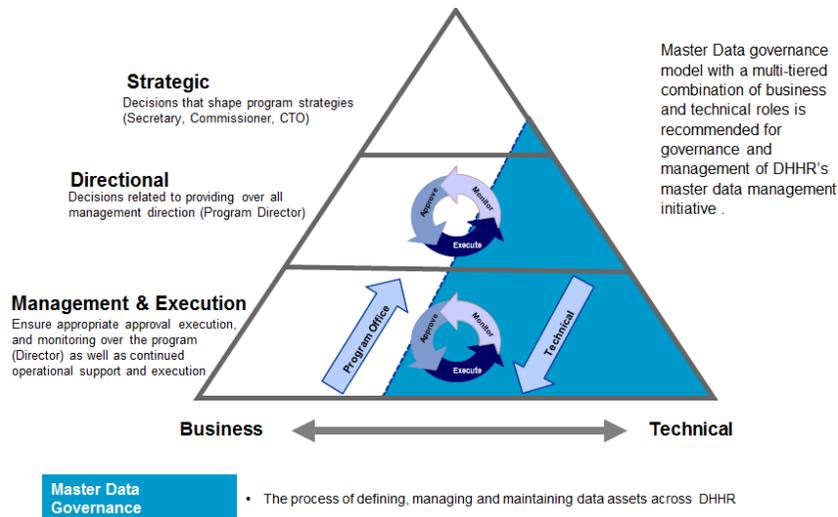
Deloitte has vast experience providing an array of data governance implementations for a number of state and federal government agencies. These data governance implementations have helped state and federal government organizations achieve a multitude of key business objectives from improved data quality to data lineage.

West Virginia Department of Health and Human Services (DHS)

Methods Employed Data Governance

Background The DHS multiple agencies under its umbrella. Each agency can uniquely identify common data, such as information on individuals, within the system itself. For example, an individual is assigned a Personal Identification Number (PIN) in the Agency A, which becomes the unique health identifier in agency A for the individual moving forward. While this process is convenient for agency A, this individual may exist in other agencies across DHS and will have a unique identifier per business system.

Solution Deloitte helped DHS to create a Master data governance organization. The newly formed organization had a structure that enables the business and Information Technology (IT) functions to work cooperatively to meet established policies, processes, and standards. The Master Data Governance organizational structure includes a multi-tiered combination of business and technical roles, such as DHS executive leadership, program directors, technology staff, data stewards, and data custodians who will be responsible for managing and administering master data domains for the agency. The diagram shows how data governance was structured with responsibilities.



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Benefits

Element 1 – MDM Implementation

The Master Data Governance Organization played a pivotal role in the requirements, design, development, and implementation of the MDM implementation for Citizens, providers and employers.

Element 2 – Data policy for various process

The master data governance organization created policy for data creation and maintenance which are now followed by all the agencies under DHS.

- **Data Security and Access.** This policy identifies and describes the data security and access requirements for the MDM including who has read/write/update privileges
- **Data Quality.** This policy identifies and describes the data quality requirements for participating business systems before their data is integrated into the MDM.
- **Confidential Information.** This policy identifies and describes how confidential data is dealt with in the MDM.
- **Duplicate SSN.** This policy identifies and describes how the MDM hub will handle Individual data.
- **Mergers and Acquisitions.** This policy identifies and describes how mergers and acquisitions of publicly and privately owned entities are handled in the MDM hub.

Figure 5-70. West Virginia Department of Health and Human Services.

Data Innovation Center of Excellence – Regional Government Agency	
Methods Employed	Data Governance
Background	<p>There is broad recognition of the value of public sector information and the potential it holds for improved transparency and citizen engagement, more efficient and effective service delivery by government and innovation and economic growth across a number of sectors. While the potential benefits of a centre to bring together public sector information are acknowledged, it is also recognized that the single most critical criterion for success is that this environment be secure and that it respect the privacy rights of citizens. There are numerous examples of facilities in Canada and internationally where these challenges are successfully addressed.</p>
Solution	<p>Deloitte was engaged to support a collaborative project between multiple provincial ministries to evaluate options for the creation of a provincial data research centre. This would provide a secure environment in which to accumulate, store, and link public sector data to support research and innovation, with a focus initially on health-related information.</p> <p>The project involved conducting an initial analysis of the current state within the province, undertaking an extensive jurisdictional review to determine how other jurisdictions have approached this opportunity and to identify key trends, leading practices and common challenges. This was followed by the development of a conceptual model for the centre that defined key stakeholders, technical components, analytical functionality and core processes (governance, security, privacy, etc.) for the centre. A series of recommendations, including short-, medium- and long-term initiatives was also developed to support the implementation of this vision.</p> <p>Deloitte's role was to provide subject matter expertise related to relevant technologies, information management and governance frameworks and security and privacy requirements. Deloitte also led the jurisdictional scan and connected the client team with teams in other jurisdictions pursuing similar initiatives in order to identify common challenges and leading practices. Finally, Deloitte's role was to work with the client to coordinate and align the above streams of work throughout the project and to report status on a regular basis to the project steering committee.</p>
Benefits	<p>This project delivered a Data Innovation Centre of Excellence conceptual model and roadmap for the client to build its capabilities and onboard new data providers or sectors. The expected benefits of a Data Innovation Centre of Excellence as mentioned above are improved transparency and citizen engagement, more efficient and effective service delivery by government and innovation and economic growth across a number of sectors.</p>

Figure 5-71. Data Innovation Center of Excellence – Regional Government Agency.

Enterprise Information Management Program Strategy – Public Sector Pension Administration

Methods Employed	Data Governance
Background	<p>The client is a public sector pension administration organization that is undergoing a nine-year transformational program to improve member experience through self-service and knowledge management, allowing easier and more secure access to information, and efficient processes. Recognizing an increasing volume of inquiries and member requests due to the impending retirement bubble, as well as the loss of knowledge through the retirement of their own staff, the client recognized the need to put in place an Enterprise Information Management (EIM) Program with appropriate initiatives to address key pain points and challenges that include:</p> <ul style="list-style-type: none"> • Difficulty in finding information due to the number of distributed information repositories and systems (email, images, shared network drives, websites, business source systems, etc.) and lack of properly defined metadata/taxonomy • Not having clear ownership and governance around information management capabilities – a lack of an enterprise view in managing information assets • Too many ad hoc and manual processes created a paper driven environment and reliance on knowledge stored in subject matter expert’s heads • Data quality and data integrity issues with pension contribution information being submitted • EIM systems (document management, WCM, records management, etc.) not being used to their full potential or being used incorrectly
Solution	<p>The client engaged Deloitte to develop an EIM Program Strategy that would achieve the following objectives:</p> <ul style="list-style-type: none"> • Address identified pain points and challenges around the management of information • Socialize and obtain buy-in for the EIM strategy across the organization • Educate the client on leading information management practices • Provide the practical and tactical insights required to move into an implementation of the EIM program • Alignment to the strategic direction and objectives of the broader transformational program <p>The following activities were delivered as part of the scope for the engagement:</p> <ul style="list-style-type: none"> • Current state review across lines of business to identify EIM pain points and challenges • Conduct a current state maturity assessment and define target state maturity using Deloitte’s EIM framework • Document system inventory and information maps that show the production and consumption of information assets across stakeholders and business capabilities • Collaboratively define future state vision with the client, incorporating leading practices and insights where appropriate • Develop EIM governance framework • Develop short term, medium term, and long term implementation roadmaps with prioritized initiatives to realize future state vision • Develop high level cost estimates and identify critical success factors • Develop a consolidated final report and executive summary • People and Change Management impacts and considerations <p>EIM domains being covered as part of the assessment included records management, document management, imaging, web content management, collaboration, knowledge management, enterprise search, enterprise portal, business intelligence and advanced analytics.</p>
Benefits	<p>Through this engagement, the client was able to have a clearly defined and actionable path over the short-term, medium-term, and long-term to execute on their EIM program and the defined future state vision (covering people, process, and technology perspectives) to realize a single source of truth to find and manage information/knowledge effectively. The EIM Program Strategy provided a path to address:</p> <ul style="list-style-type: none"> • Ability to find information effectively through a single consolidated view using enterprise search, portal, and metadata • Better management of knowledge through knowledge bases and knowledge communities • Shift towards more automation through defined EIM processes, standards, and policies • Having an enterprise view of information through governance structure, roles, and responsibilities • Moving towards a culture of knowledge sharing through change management and communications • Ability to provide better self-service through business intelligence and analytics tools

Figure 5-72. Enterprise Information Management Program Strategy – Public Sector Pension Administration

Enterprise Data Governance – State Health Services Agency

Methods Employed Data Governance

Background The client's oversees the operations of the health and human services system, provides administrative oversight of state's health and human services programs, and provides direct administration for the Medicaid program. Information governance is a cornerstone to the client's mission of providing high quality, cost-effective services to citizens as its Medicaid and program-related data drives program effectiveness, fraud detection, increased access to care, supports decision making and drives compliance in federal, state and local reporting requirements.

The vision for the EDG project is to provide the framework for an EDG program that allows the client to accurately interpret and analyze data from different Medicaid systems with confidence that data attributes and definitions conform to Medicaid enterprise standards established through data governance policies and procedures. The goals of the Medicaid EDG initiative include::

- Development of procedures and policies for improved quality, timeliness, and reliability of Medicaid data
- Facilitation of master data management capabilities to provide a holistic view of an entity across the client's Medicaid programs
- Development of guidelines for data interoperability and data sharing across the client's constituent agencies
- Alignment with Medicaid Information Technology Architecture (MITA) business processes
- Establishment of a data governance framework to support various Medicaid functions

Challenges:

- Non-existence of a central organization to manage, deliver and provide oversight to Medicaid master data across the five agencies
- Lack of ownership and accountability for master data
- Redundancy and duplication of efforts within and across agencies
- Inconsistent metadata standards, definitions and business rules
- Lack of standardized processes for data access and usability
- Low confidence in data quality and data integrity
- Limited use of metrics and performance measures for ongoing data monitoring

Solution Deloitte partnered with key stakeholders to identify the sponsors, establish core data governance functions and develop an effective data governance organization that is able to manage multiple constituents and their objectives, needs and expertise.

Deloitte used the Enterprise Information Management (EIM) method and leveraged State Health accelerators such as the MITA 3.0 reference documentation in preparation of materials for the user sessions. The project was delivered in the following phases:

- **Vision and Plan.** During the vision and plan-phase, the Deloitte team worked with the client to define business goals, conduct capability assessments and identify stakeholder groups and benefits of the EDG planning project. Through a series of workshops and surveys, the team performed an EDG Capability Maturity Assessment, EDG MITA Maturity Benefit Analysis, prepared EDG Capability Maturity Recommendations, defined EDG benefits and developed a strategic roadmap for the EDG program.
- **Design and build.** During the design and build-phase, Deloitte worked with the client to detail the proposed organization structure, define roles and responsibilities, and develop the framework for policies, processes and standards. This is the documentation and results finding-phase that culminated in preparation of the EDG organization structure design recommendations, EDG framework, change management procedure recommendations and documentation from interview sessions.
- **Deliver and operate.** During the deliver and operate-phase, the data governance areas are implemented and the EDG data governance structure is functional and operational. The Deloitte team was tasked with facilitating the data governance organization's stand-up meetings, implementing data governance processes and standards, developing a metadata business repository outline and providing knowledge transfer documentation.

Benefits Deloitte's holistic approach to data governance supports the alignment of Medicaid information demands with value delivery across individual the client agencies and the overall enterprise, driving visibility and awareness and contributing to the success of the program.

Deloitte engaged a cross-functional, experienced team of five members from the systems integration and information management service lines, having extensive public sector, Medicaid, data management and project management experience. Deloitte's approach involves working collaboratively with the client's stakeholders and subject matter experts to conduct information gathering, assessment, review and walkthrough of the proposed recommendations and solicit feedback from end users.

Significant benefits of the EDG program are:

Enterprise Data Governance – State Health Services Agency

- Improved enterprise data management and enhanced business benefits, focusing on an enterprise view of Medicaid data
- Enhanced data quality across the enterprise and consistent reporting
- Increased availability of high integrity data and reduced data redundancy
- Increased collaboration, sharing and communication of business data
- Better accountability for data use and reduced redundant efforts.

Figure 5-73. Enterprise Data Governance – State Health Services Agency.

7. **Hadoop, MapReduce etc.** Tools that address the analysis of collections of data sets that are so large and/or complex that it is difficult/expensive to process using traditional data management tools or approaches. This includes the ability to address, Volume, Velocity, Variety, Veracity and Value.
- a. Unstructured data analysis – the ability to analyze/process information that either does not have a pre-defined data model or is not organized in a pre-defined manner. Unstructured information is typically text-heavy, but may contain data such as dates, numbers, and facts as well. This results in irregularities and ambiguities that make it difficult to understand using traditional computer programs as compared to data stored in fielded form in databases or annotated (semantically tagged) in documents.

RFP Reference, Page 23

7. Hadoop, MapReduce etc. - tools that address the analysis of collections of data sets that are so large and/or complex that it is difficult/expensive to process using traditional data management

RFP Reference, Page 24

tools or approaches. This includes the ability to address, Volume, Velocity, Variety, Veracity and Value.

a. Unstructured data analysis – the ability to analyze/process information that either does not have a pre-defined data model or is not organized in a pre-defined manner. Unstructured information is typically text-heavy, but may contain data such as dates, numbers, and facts as well. This results in irregularities and ambiguities that make it difficult to understand using traditional computer programs as compared to data stored in fielded form in databases or annotated (semantically tagged) in documents.

Following is our response to all items set forth in Section 5 C.7 of the RFP.

	Requirements	A	B
1	Identify the components of your analytics tool set that fit this category	n/a	As part of Deloitte's big data platform as described in Section 1.3, Analytics and Discovery components provide a set of analytical tools optimized for Big Data processing in addition to analytical libraries to expedite analytical modelling processes. Our turnkey big data platform fully supports numerous visualization tools including Tableau, Spotfire, Qlikview, SAP Lumira, MicroStrategy and Jscript. Our platform provides a robust interplay between different layers of the Big Data stack – whatever may be the tool of choice for that layer.
2	Identify platforms for deployment (cloud, Intel, appliance, OSs, database versions etc.) for the tools you have included in this category	n/a	Deloitte's Big Data Platform (as described in the Section 1.3) provides options for data storage including horizontally scalable Hadoop Distributed File Systems (HDFS) (distributed clusters) as well as hybrid data stores such as Vertica, Hbase, Cassandra and MongoDB . Given the variety of data sets, analytic and performance needs, an implementation can require several tools and technologies to work together to be an effective platform for processing HDFS Based Clusters are designed to horizontally scale up, each offering local compute and storage. Our turnkey platform provides the scalability using commodity Hardware. Cloudera HDFS, Hortonworks Data Platform and Accumulo are some of the integrated storage systems in our platform that provide high throughput access to multivariate data sets NoSQL is a next generation hybrid database that is not relational but built to scale horizontally to hundreds of nodes with high availability and transparent load balancing Apache Hbase, Cassandra, HP Vertica, SAP HANA and MongoDB are pre-integrated in our turn key Big Data platform
3	Explain licensing options for the tools you have included in this category	n/a	Deloitte is a vendor agnostic company and partners with many vendors in addition to strategic alliances that Deloitte has developed across the Big Data landscape. Through the vendor alliance, we will be able to advise licensing options of the tools. If the commonwealth would like to leverage Deloitte's Intellectual Property (IP) models and solutions then the licensing will be addressed as part of future

Requirements	A	B
		discussions. Any other proprietary accelerators will be leveraged as part of Deloitte's delivery.
4 Does your Solution allow for your tool sets to be deployed in order to support shared use among Commonwealth agencies? Explain how.	Yes	Deloitte's Big Data platform can be deployed in the commonwealth's shared environment.
5 Do you provide training on your solution? If yes, please explain the options.	Yes	In addition to internal training program, Deloitte through their vendor partner channel provide opportunities to attend external vendor trainings to get hands on experience of working on the tools. Some sample training programs available are: <ul style="list-style-type: none"> • Cloudera. Cloudera certified developer and administrators • EMC2. Greenplum Architecture, Administration, and Implementation and Data Science and Big Data • IBM. Big Data Training Path • Oracle. Oracle Big Data Appliance Training; Introduction to Big Data Training • Teradata. Big Data program
6 Do you provide installation (including configuration) services for these tool components above?	Yes	Deloitte has experienced practitioner with certification in various Big Data platform tools to perform installation and configuration.
7 Do you provide implementation services for the above tool components? (working with an agency to deploy a solution based on these tools to meet a business need)	Yes	Deloitte offers a full range of Big Data implementation services to help confirm that an organization's Big Data initiatives and programs are successful and achieve the identified business value. Our experience in offering testing, communications management, deployment, ongoing support and maintenance services enable Deloitte to be a true end-to-end Big Data implementation service provider for the Commonwealth of Virginia. Deloitte has implemented numerous Big Data projects across all various industry sectors based the on approach mentioned in the section 1.3.1
8 For your Solution, provide examples of how the tools were used by both business and IT users and the level of training and skill required by each. Include what entity used the tools. If possible, use government related examples.	n/a	Deloitte has extensive experience delivering Big Data and Advanced solutions and services to both Public Sector and Commercial clients. Section 1.3.1 fully details our experience implementing services, our approach to support successful implementation. Deloitte's reference architecture is an open, big data platform capable of capturing, storing, and processing diverse information with the sole purpose of making that data available to advanced analytics capabilities. Section 1.3.2 details out how the tool capabilities enable business and IT user towards advanced analytics. Deloitte offers extensive training activities to our clients in order to support that the developed solution is fully understood by all stakeholders. Deloitte has established extensive training materials and programs with a proven approach and focus towards teaching our clients on the developed solution and empowering them to use the solution in their day-to-day activities.

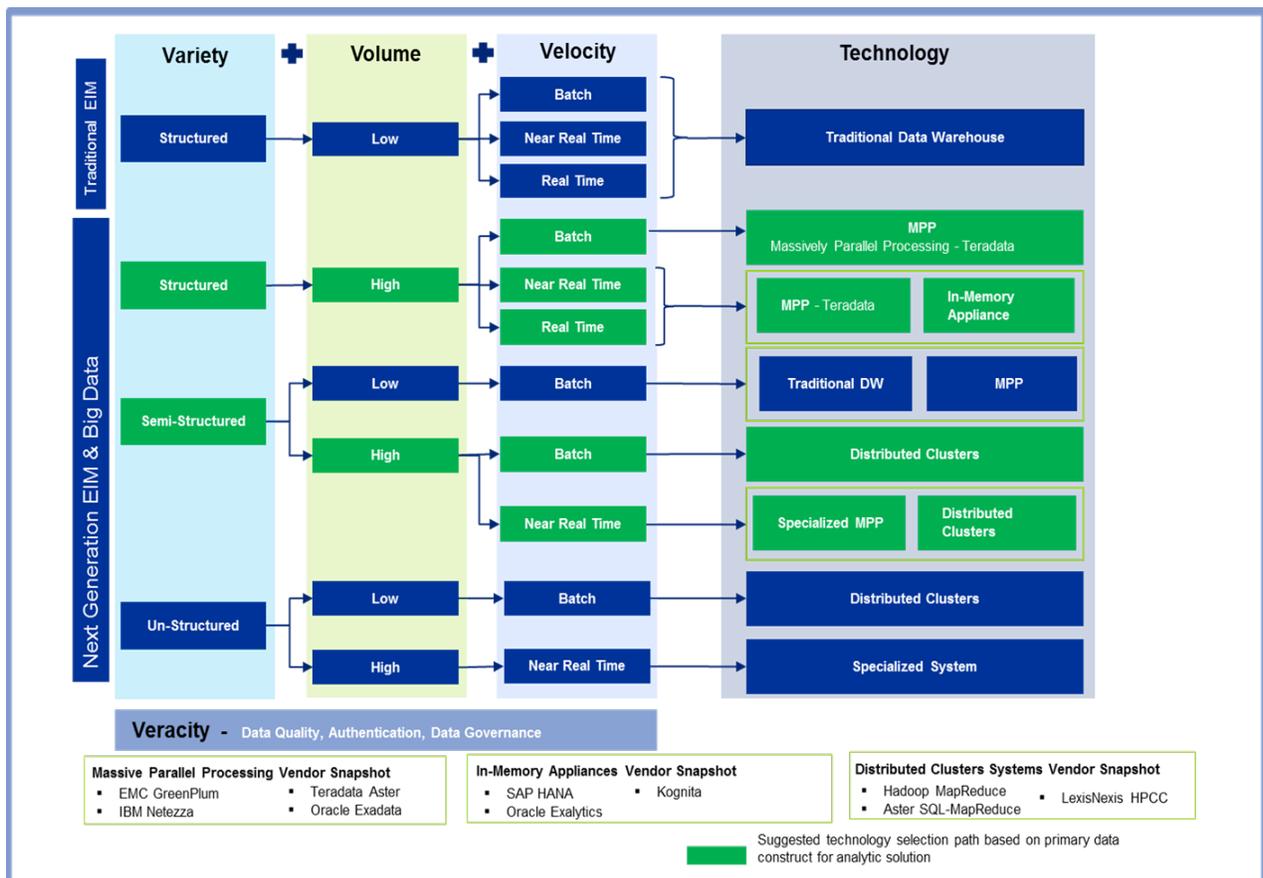
Figure 5-74.

Deloitte's Services Supporting Big Data

Our Perspective – the Value of Big Data

With rapidly growing data structured, unstructured and semi-structured, it is important to put both a business and technical strategy in place to make use of Big Data technology trend. Big Data can be described as large volumes of structured, unstructured and semi-structured data that can grow exponentially and be available for analysis. Deloitte's Big Data platform has ability to address volume, variety, velocity and veracity. Based on the use cases of VITA, technology solutions can be tailored to meet the requirement as illustrated in the following figure.

- **Volume.** Large Volumes of data that has lot of details.
- **Variety.** The combination of data sources and formats is what matters.
- **Velocity.** Speed at which information arrives and is analyzed and delivered.
- **Veracity.** The biases, noise and abnormality in data.



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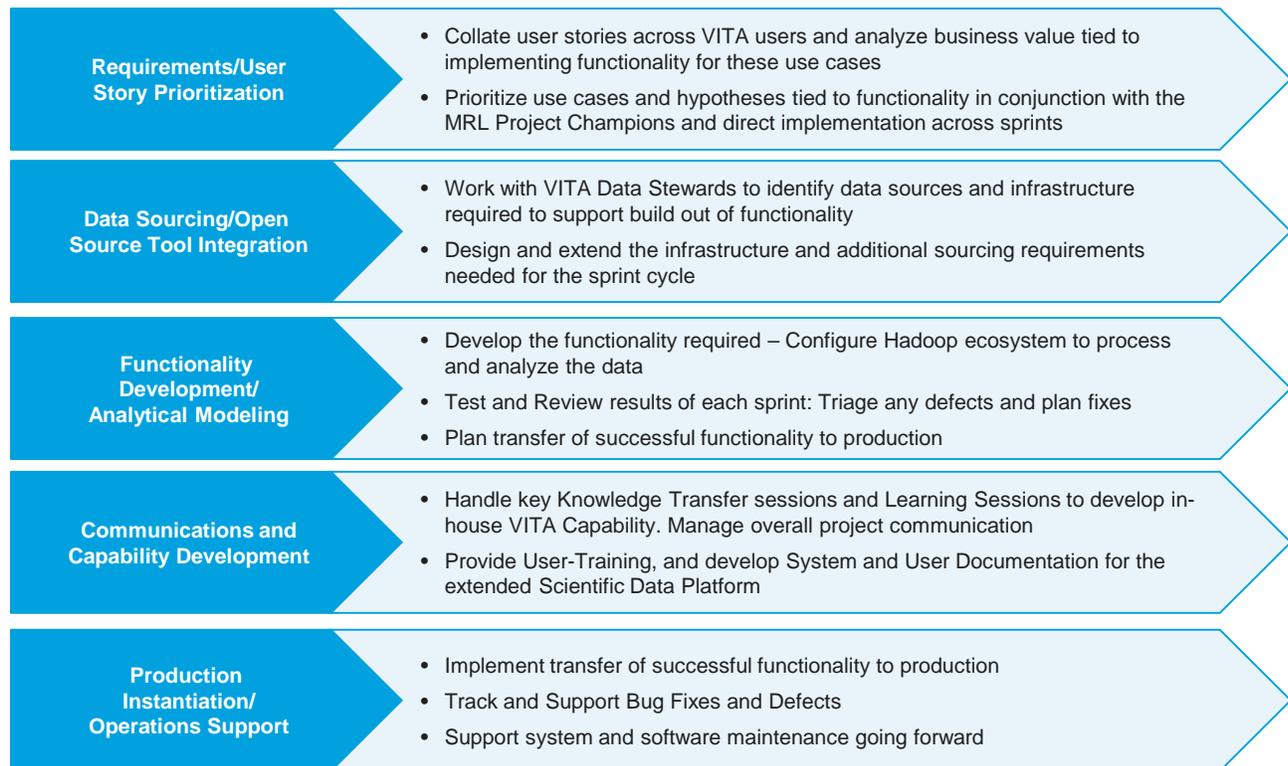
Figure 5-75. Technology solution type is tied to data constructs of variety, volume, velocity and veracity.

Deloitte can help the Commonwealth identify its intended position on the 4-parameter map, assist making strategic tool acquisition, develop a solution that addresses the common wealth’s strategic needs and train and coach government employees to support its advance analytics portfolio. Deloitte’s Risk and Advisory, Technology and Human Capital practices, as defined in the *Supplier Info* section, have deep rooted public services experiences in all these areas to be the enablers of acquired technology.

Our Big Data Services Details

In addition to providing the right resources with the right skills, Deloitte also brings a proven methodology to help achieve the Commonwealth’s goals and objectives. The implementation phases of the Big Data Platform will be supported by five concurrent threads of work each accomplishing the following outcomes for VITA

shown in the Figure below. The phases enable foundation for collating user stories, Data Sourcing/Data Integration, Functionality Development/Analytical Modeling, Capability Development, and Production Installation/Support.



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Figure 5-76. The implementation phases of the Big Data Platform.

Our proposed agile approach methodology shown in the Figure below. will match your specific requirements to the extendable, as an example Hadoop-based analytical platform to develop functionality for your desired user stories. Agile approach was developed based on years of hands-on experience of our global practice. As indicated in the graphic, methodology provides end-to-end guidance throughout identifying user stories, developing hypotheses and mapping user stories to hypotheses; beginning with Architecture Preparation and moving through Design & Build, Parallel Test and Launch.

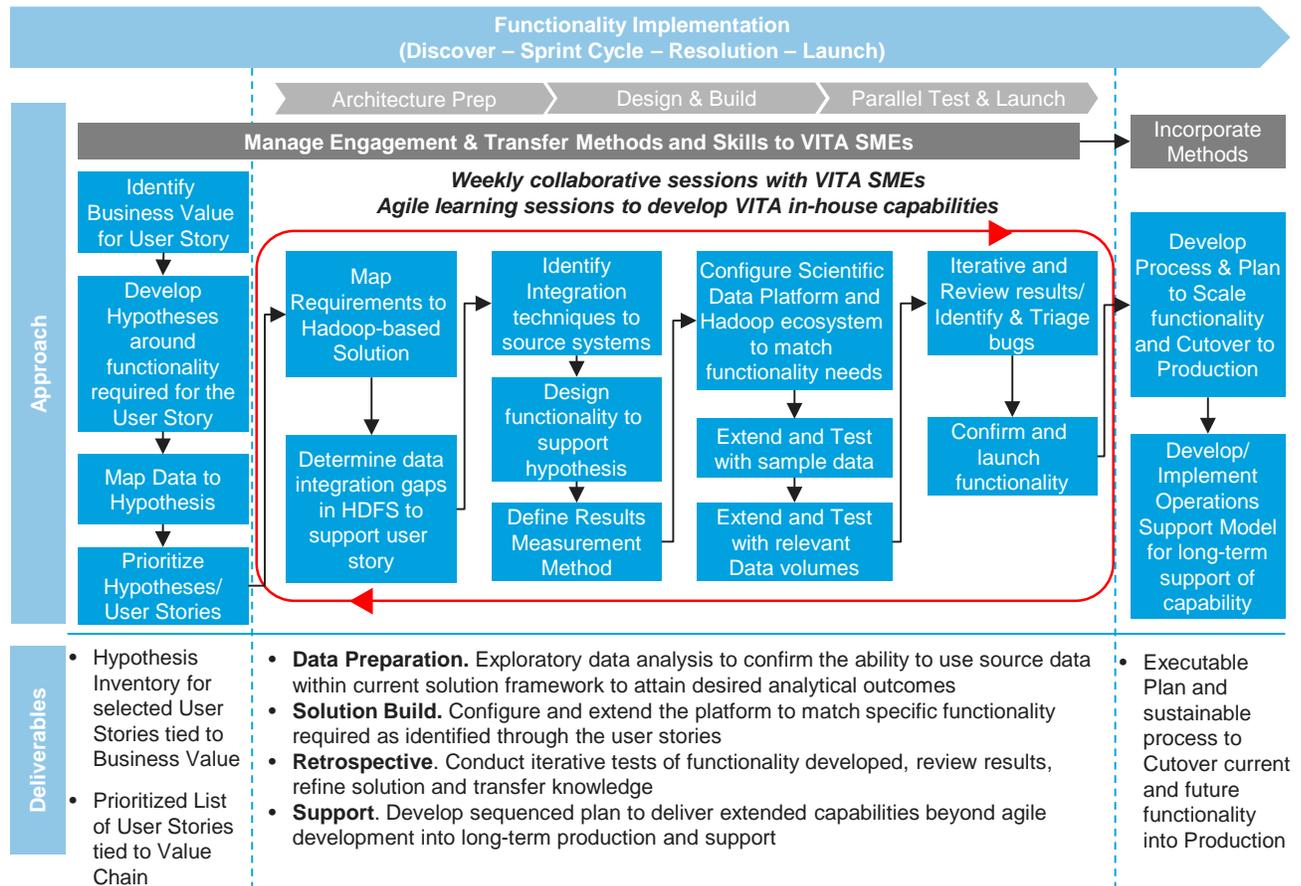


Figure 5-77. Agile Big Data Methodology.

Compliance and Information Security Services

Data privacy and protection risks associated with Big Data are complex and scale from security for the cluster and hardware for operational hygiene, to configuration management, identity and access management, network traffic encryption, database audit protection, data masking and tokenization and encryption. While Apache Sentry provides role based access for authorization to data and Apache Knox consolidates network access it is prudent to design security for the end to end stack as shown in the following slide.

Security in a Hadoop cluster is a continuum as shown and the ability to dial up and down for compliance policies can be enabled at several layers. If compliance policies need to be enforced they can be done at the Identity and Access Management layers and at the data masking and tokenization and encryption layers. Most Big Data Installs use a combination of approaches to achieve secure access and we at Deloitte through our Enterprise Risk Services practice can enable specific guidance for clients based on the type of data and desired protocols in line with Enterprise policies and PII considerations.

The platform capacity can be horizontally expanded by leveraging commodity hardware. Our turnkey platform capacity expansion is carefully planned to minimize disruption. The capacity expansion allows for analytics capabilities for both data at rest and data in motion.

Deloitte's Approach to Developing Big Data Risk Management Services

Significant sources of risk exist both outside and inside the organization, which can result in brand, reputation, financial, compliance, and operational damage. Protecting consumer data in a manner that mitigates risk exposure is critical to any Big Data effort. We recommend beginning with an assessment of the Big Data Risks to develop the roadmap for managing big data risks.

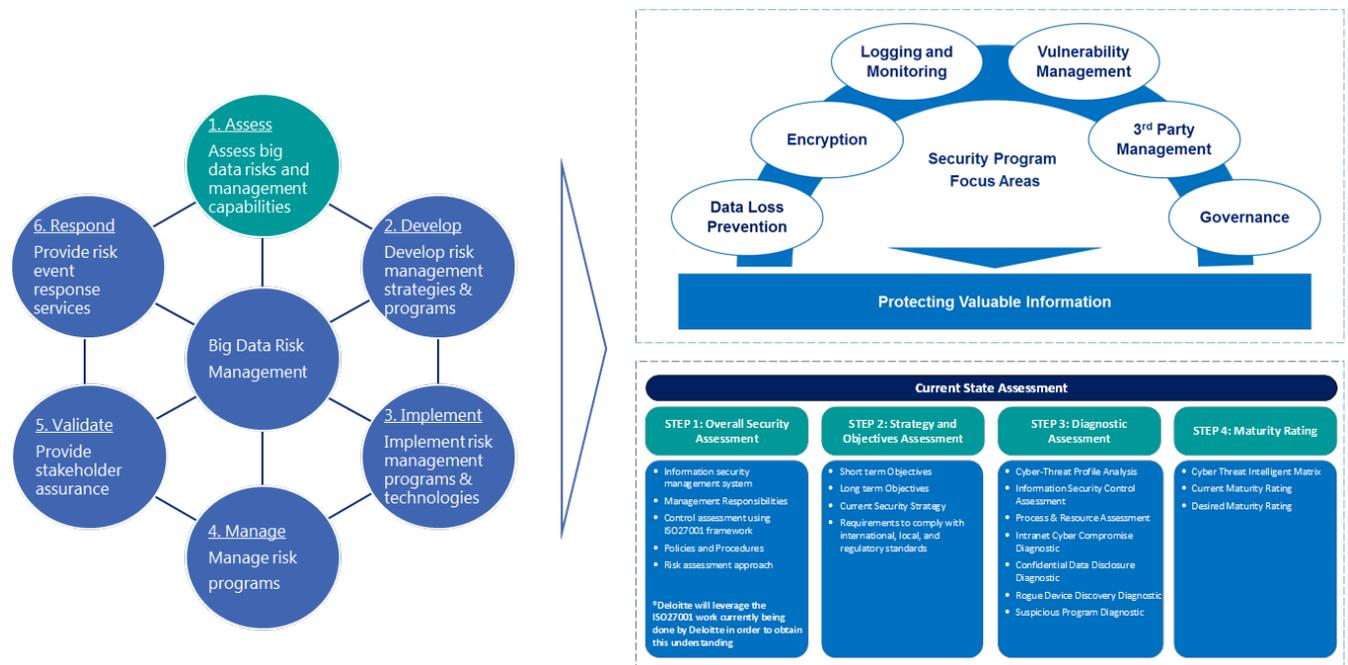


Figure 5-78. Big Data Risk Management Services.

2.1.2 Data Security with Big Data and Associated Reasons for Increased Risk

Data privacy and protection risks associated with Big Data are complex and can potentially impact the brand reputation of Companies as illustrated in the Figure below.

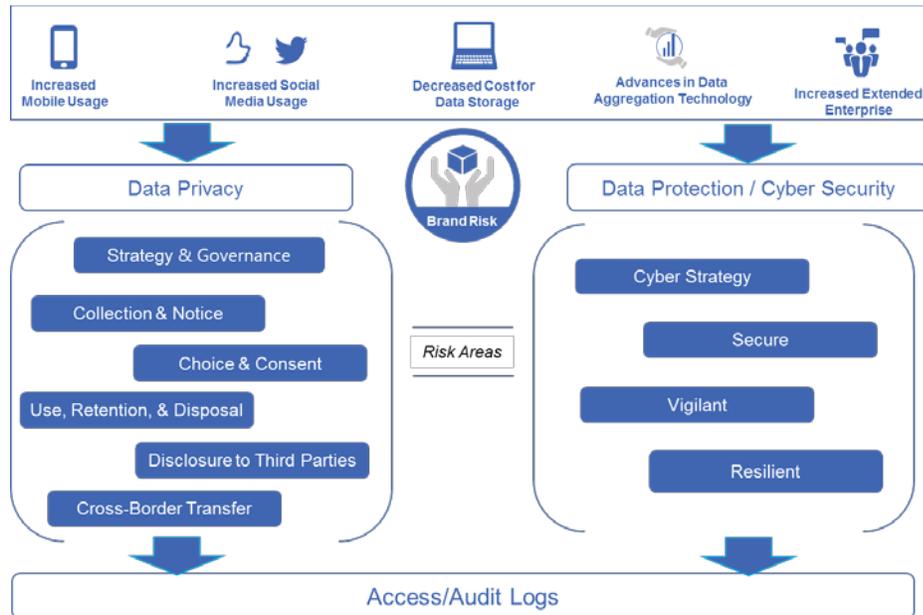


Figure 5-79. Data Security & Associated Risk areas.

Our approach to Hadoop Security starts with Operations Hygiene in the cluster coupled with configuration and accessibility management tied to identity and access management supported by data tokenization and encryption

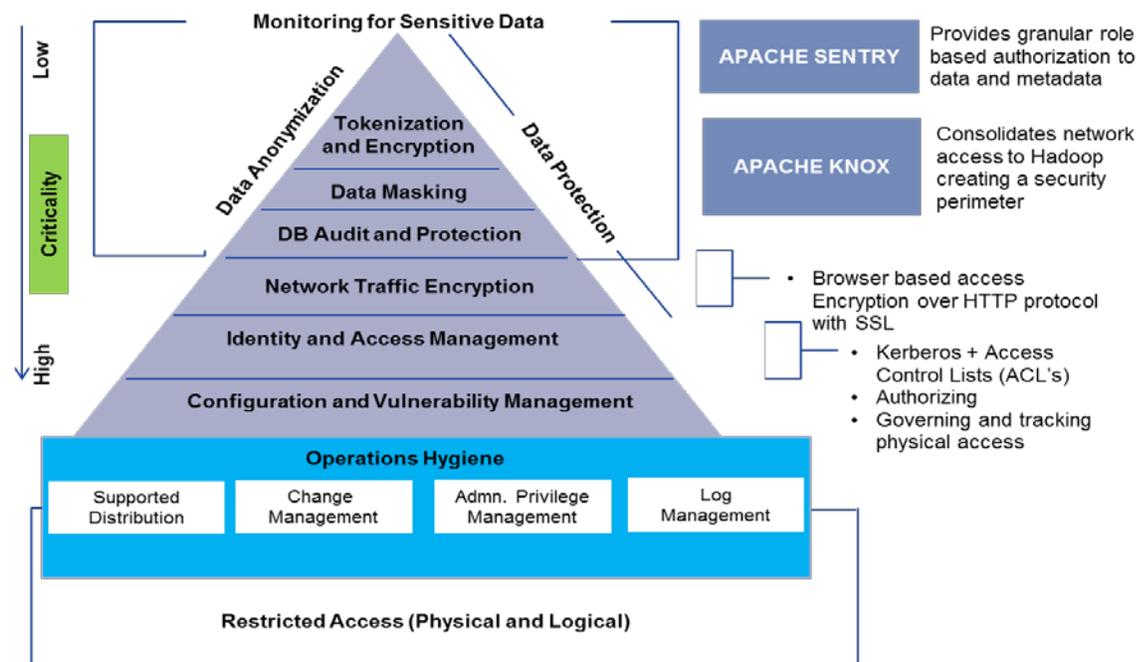


Figure 5-80. Security Considerations in Hadoop.

Our methodology takes into consideration an overall strategy/approach and supporting tools focus on monitoring, identifying and protecting electronic data as it moves to, from, and through an organization. Typically, data can be described as being in a state of use, motion or rest. Example controls for the various states of data that are considered for data security and regulatory requirements:

<ul style="list-style-type: none"> • Monitor user interactions with data to identify, for example, attempts to transfer sensitive content to a USB drive and apply policy • Common controls include disabling Copy, Print, Print Screen, Open, Paste, Save, Save As, and Notification 	<ul style="list-style-type: none"> • Analyze data traffic over the network to identify sensitive content being sent via e-mail, IM, HTTP, or FTP and apply policy • Often requires integration with mail transfer agents, network components and other infrastructure • Common controls include Allow, Audit, Quarantine, Block, Encrypt, and Notification 	<ul style="list-style-type: none"> • Scan and inspect enterprise data repositories to identify sensitive content and apply policy accordingly • Common controls include Encryption, Obfuscation, Quarantine, Deletion, and Notification
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Elements we evaluate as part of the strategy for Big Data program include:

▪ Data Classification	▪ Data Lifecycle Analysis
▪ Inventory	▪ Data Loss Prevention
▪ Encryption	▪ Data Retention & Destruction

Figure 5-81. Methodology to support data security and privacy.

Unstructured Data Analysis

Deloitte provides a broad customizable approach for Unstructured Data Analysis to allow focused use cases based on state of VA need; which can be implemented quickly and cost-effectively without the need to build an expensive and time-consuming data warehouse\pre-defined data model.

The approach is based on four key processes:

- Ingest Unstructured texts and ontologies/taxonomies
- Process Application of natural language processing (NLP) algorithms
- Classify Extensive library of classification models and machine learning algorithms
- Deliver Deployed, configurable engine instance to production for value delivery

The approach can support unstructured text from multiple sources, including emails, call center transcripts, free-form text narratives, notes, observations, interviews and lengthy subject-specific documents (e.g. legal, medical). It leverages an extensive library of classification models (e.g., name entity classifier, HMM tagger, linear SVC identification pipelines) in an ensemble approach combined with NLP (POS, grammar aware) to improve accuracy and performance. The solution also includes a visualization capability to assist in configuring and reporting of model results

I WAS PULLING INTO A PARKING SPACE & SLOWING DOWN. I TURNED LEFT INTO THE SPACE AND, OF COURSE, HAD MY FOOT ON THE BRAKE AND MY CAR SUDDENLY ACCELERATED ON IT'S OWN. I KEPT PUSHING ON THE BRAKE BUT IT KEPT GOING AND CRASHED. I WASN'T HURT BUT FILED A REPORTTHEY SENT ME A VERY NICE LETTER SAYING IT DID NOT HAPPEN. I DO NOT LIE. I WAS VERY DISAPPOINTED IN THE WAY THAT THIS WAS HANDLED.

Classifications

Voice: First Person
Location: Parking
Domain: Breaking, Equipment Failure, Acceleration
Outcome: Not Injured
Tone: Sarcastic, Disenchanted, MidAnger
Status: reported_and_responded

Additional Info: passive_voice,
5th_grade level,
spelling errors,
mid_american

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Figure 5-82. Sample Text-based Classifications.

Key Features

- Able to decipher context, identify informative keywords and determine the categories and classes of a text sample
- Contains features to process grammar, content, tone for in-depth analysis
- Capable of grouping similar text samples together to identify trends and patterns
- Easily consume results and output through the visualization elements
- Configurable to receive user input for initial set-up and user feedback to automatically improve performance
- Designed to accommodate additional enhancements and features
- Deployable in a real-time, high-volume production environment and is compatible with virtually any system

Key Benefits

- Identify patterns and trends that can quickly lead to opportunities to improve performance or mitigate risk
- Highly customizable and adaptable solution for a wide range of business applications
- Eliminate need for inefficient and time-consuming manual classification, increasing operational efficiency
- Scalable solution to handle rapid, increasing amounts of internal and external data about stakeholders, customers, suppliers

Deloitte's Key Vendor Relationships

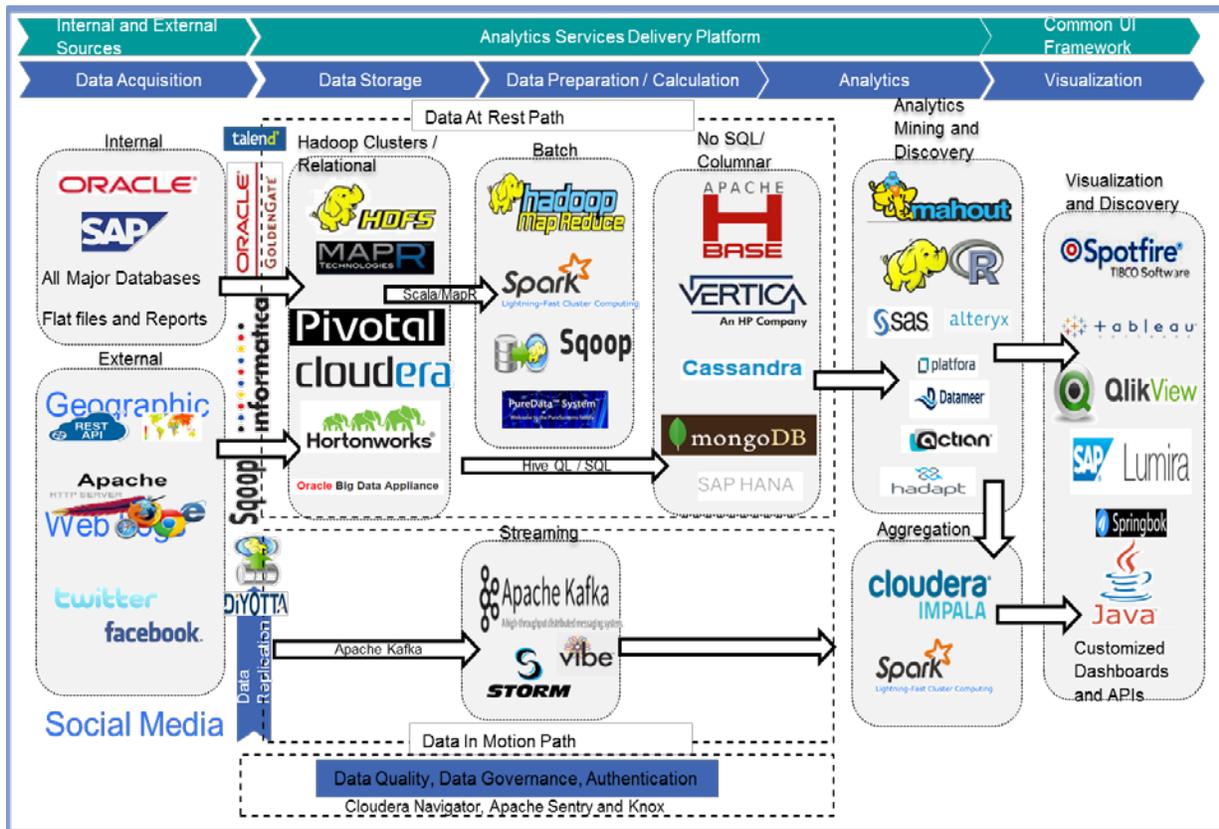
As mentioned in response to question 3 and 5 Requirements in the table above, Deloitte is tool agnostic and works together with a multitude of strategic partners to deliver more value to our clients. We are aligned with the leading technology companies to develop services and solutions that help our joint clients create added value. We regularly team with the vendors detailed in the below table to develop solutions to meet our state government stakeholder's needs and objectives. Key alliance partners include:

VITA Supply Chain Management Division
 Next-Generation Analytics
 Request for Proposal (RFP) 2015-12

Data Discovery	Collection & Ingestion		Storage			Modeling	Reporting & Visualization
	Streaming	Batch	Relational	Non-Relational	HDFS		
<ul style="list-style-type: none"> ▪ Datameer ▪ IBM ▪ Oracle ▪ SAP BO ▪ MicroStrategy ▪ SAS Visual Analytics ▪ Information Builder ▪ Microsoft PowerPivot 	<ul style="list-style-type: none"> ▪ Apache Storm ▪ Apache Flume ▪ MapR NFS ▪ IBM Streams ▪ Informatica – VIBE ▪ Amazon Kinesis ▪ GridGain ▪ Splunk Hadoop Connect 	<ul style="list-style-type: none"> ▪ Apache Sqoop ▪ Oracle Data Integrator ▪ Hadoop connector ▪ IBM BigInsights ▪ InfoSphere ▪ Informatica BDE ▪ Talend ▪ Kalido ▪ Information Engine ▪ Pentaho DI ▪ Syncsort DMX-h ETL 	<ul style="list-style-type: none"> ▪ Cloudera - Impala ▪ HP Vertica ▪ Oracle MySQL ▪ IBM Netezza ▪ Kognitio ▪ Oracle Exadata ▪ Oracle Exalytics ▪ SAP HANA ▪ Teradata Aster ▪ Hortonworks – Stinger ▪ ParAccel Analytic Database ▪ SAP Sybase ASE ▪ VoltDB 	<ul style="list-style-type: none"> ▪ Apache Hbase ▪ DSE Cassandra ▪ IBM BigInsights ▪ MongoDB ▪ Oracle NoSQL Database ▪ Windows Azure ▪ Basho's Riak ▪ Couchbase ▪ CouchDB ▪ HADAPT Adaptive Analytical Platform ▪ Redis ▪ Sqrl Enterprise ▪ Cloudant ▪ Raven DB 	<ul style="list-style-type: none"> ▪ Cloudera (Apache Hadoop) ▪ MapR File System ▪ Hortonworks ▪ Amazon EMR – S3 ▪ IBM GPFS ▪ Pivotal HD 	<ul style="list-style-type: none"> ▪ Revolution R Analytics ▪ Mahout Libraries ▪ IBM SPSS ▪ SAP Predictive Workbench ▪ SAS ▪ KXEN ▪ StatSoft – Statistica 	<ul style="list-style-type: none"> ▪ Tableau ▪ Revolution R Analytics ▪ QlikView ▪ TIBCO Spotfire ▪ SAP Lumira ▪ IBM PureData Analytics ▪ MicroStrategy ▪ SAS VA ▪ Splunk – Hunk ▪ Pentaho Business Analytics ▪ J Scripts ▪ KarmaSphere ▪ Platfora ▪ Jaspersoft
Metadata & Schema Management	<ul style="list-style-type: none"> ▪ Actian ParAccel Dataflow ▪ Anzo Metadata Management ▪ Apache Hcatalog 						
Cluster Management & Workflow	<ul style="list-style-type: none"> ▪ Ankush – Impetus Technologies ▪ Apache Ambari ▪ Apache Mesos 		<ul style="list-style-type: none"> ▪ Apache Oozie ▪ Apache Zookeeper ▪ Cisco Tidal Enterprise Scheduler 	<ul style="list-style-type: none"> ▪ OceanSync ▪ StackIQ ▪ Zettaset Orchestrator 			

Figure 5-83. Deloitte's Alliance Vendors that Support our Big Data Platform Solutions.

Deloitte's Big Data platform (as illustrated in the Figure below) integrate and extends traditional BI to analyze complex data and provide persistent analytical capabilities. Deloitte's Big Data Platform is an end to end data eco-system of pre-assembled, integrated and tested set of technologies to stage and analyze unstructured\ Semi structured information. The platform is supported on various Hadoop distributions (e.g. Cloudera, Horton Works etc.,) and uses a variety of integrated tools to provide specific functionality. Deloitte is a vendor agnostic company and partners with many vendors in addition to strategic alliances that Deloitte has developed across the Big Data landscape. Big Data tools which are part of the platform are proprieties of various vendors.



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Figure 5-84. Deloitte's Big Data platform.

Big Data Platform Component	Purpose
Data Sourcing	Data Sourcing ingests data from a variety of sources and works with hybrid architecture to create an eco-system that can handle data in motion (real-time) or data at rest, structured and unstructured data while providing capabilities for advanced analytics and visualization.
Data Storage	Our turnkey Big Data Platform provides options for data storage including horizontally scalable Hadoop Distributed File Systems (HDFS) (distributed clusters) as well as hybrid data stores such as Vertica, Hbase, Cassandra and MongoDB. Given the variety of data sets, analytic and performance needs, an implementation can require several tools and technologies to work together to be an effective platform for processing
Data Preparation/Calculation	Data preparation and calculation components provide data wrangling, integration and preparation capabilities for both data at rest and data in motion.
Analytics	Analytics and Discovery components provide a set of analytical tools optimized for Big Data processing in addition to analytical libraries to expedite analytical modelling processes.
Visualization	Deloitte provide extensive visualization capabilities by leveraging our Highly Immersive Visual Environment and design thinking approach. This is supported by a number of tools and innovations.

Figure 5-85. Big Data Platform and Components.

Deloitte's Big Data Services in Action

At Deloitte, we do not just offer advisory and strategic advice we also have deep execution insights to Design, Build, Test and Deploy Big Data solutions. Using an integrated approach we have been able to deliver multiple complex big data initiatives of various flavors.

Our experience prove that Big Data provides new innovative ways for state agencies to tackle their toughest issues and meet mission objectives amidst sequestration, budget constraints, and legislative challenges. Big Data combines data from within the organization confines with external data sources, such as social networks, to enable the agency to manage and mitigate risk more effectively, increase operational transparency, and create effective policies. The following applications of Big Data enhance the way state agencies can enhance the way they fulfil their individual missions:

- **Creating Citizen-Tailored Services.** Big Data allows agencies to tailor their services and policies to their constituent needs. Using data analytics and visualization, agencies can reduce unemployment by analyzing historical data on customers, histories of unemployed people, interventions, and their outcomes. This allowed the agency to tailor its interventions based on the customer segments.
- **Automating Decision Making.** Big Data can automate 'manual-intensive' processes that previously seemed unavoidable. Machine learning models allow agencies to streamline video surveillance processes to rapidly review video data and detect suspicious behavior through flags or indicators.
- **Leveraging Social Media Intelligence.** Big Data can integrate public data from social media websites, which allows agencies to proactively detect and respond quicker to issues. A health care agency paired analytics with social media data to monitor keywords to identify early warning signs of drug ineffectiveness, allowing the organization to provide better health care services to citizens.
- **Improving Data Quality and Availability to Enable Analysis.** Improved data quality and availability are allowing faster, more useful analysis, leading to better issue identification and resolution

For the purposes of the Virginia Next-Generation Analytics RFP we have included Federal and IRS case study.

Big Data has enabled the Financial Crimes Enforcement Network (FinCEN) to upgrade its analytics capabilities, IT infrastructure, and databases to better collect and analyze data from multiple sources and provide it to federal, state, and local law enforcement and regulatory authorities.

The Financial Crimes Enforcement Network (FinCEN)

Project Financial Crimes Enforcement Network (FinCEN)

Background The Financial Crimes Enforcement Network (FinCEN) is the largest overt collector of financial intelligence in the United States. Its mission is to safeguard the U.S. financial system from the abuses of financial crime, including terrorist financing, money laundering, and other illicit activities.

Solution Deloitte supported FinCEN to launch a mission critical modernization effort to provide the law enforcement, regulatory and intelligence communities with timely access to reliable financial crime data, as well as enhanced tools to support research and analytics. Deloitte has supported FinCEN from project inception through deployment with strategy, technology, operational, change management and financial intelligence services. The solution brought together disparate data systems and standardized the data into searchable, alert driven, advanced analytic user portals. Deloitte Implemented three releases of the advanced analytical platform (SAS Fraud Business Analytics Framework) that provides FinCEN analysts, law enforcement agency coordinators with more reliable and flexible tools and improved analytic capabilities. We designed and developed FinCEN Query – a custom-built web application that leverages COTS technologies to improve users’ ability to search, access, and analyze BSA data – which will replace WebCBRS in 2012. Also we deployed the FinCEN Portal that provides full identity and access management controls for internal and external users along with a comprehensive and integrated user workflow across Advanced Analytics, FinCEN Query, Alerts, Financial Intelligence Repository, and Customer Relationship Management.

Deloitte’s Solution Framework



Benefits FinCEN data management environment and tools that permitted users to generate predictive, prescriptive and descriptive insight as illustrated

Also, benefits include

- Improved FinCEN.gov domain users search and retrieval capabilities through the implementation of Google Search Appliance technology which provides end users a more user-friendly environment and the capability to locate and act on regulatory information.
- Web portal solution that provides a collaboration environment for FinCEN and its law enforcement and regulatory stakeholders to share information across organizations
- Information sharing with internal and external stakeholder groups (e.g., the Data Management Council, Business Transition Coordinators, the Investment Review Board, and Integrated Project Teams)
- Automated the transfer of BSA bulk data to law enforcement and other stakeholders
- Enhanced data protection and information assurance approach for critical organizational systems and increased network reliability and availability.
- Reduced the number of critical network outages and incidents from a weekly occurrence to a system availability of 99.999%.

Figure 5-86. FinCEN Project Example.

As part of the Revenue Return Program (RRP) project, IRS is implementing an advanced tax fraud system that involves creating 50 TB data warehouse with 700 tables and 40,000 variables. The system will use SAS Fraud Frameworks software on Greenplum DCA appliance as the core engine.

Fraud Analytics at Internal Revenue Service (IRS)	
Project	Revenue Return Program (RRP) project
Background	The Revenue Return Program (RRP) at IRS aims to reduce the current tax \$345 billion tax gap (the difference between what taxpayers owe and what they pay voluntarily and on time). One focus area of RRP is to reduce tax fraud as IRS loses approximately \$12-14 billion in refund payments due to fraud. Therefore, IRS plans to leverage advanced data analytics to detect and stop tax fraud. The system should be able to score 8 million filings against 50 different fraud models in 8 hours
Solution	Deloitte supported implementing a Revenue Return Program (RRP) system that is built using Greenplum (MPP Data warehouse), SAS Grid (Fraud Framework), FICO (Business Rules), Informatica (ETL), Business Objects (Reporting), and RedHat (Linux). The system uses a myriad of business rules to investigate tax returns with anomaly detection, predictive modeling and social network analysis. These capabilities are provided by the social network analysis, data integration, data mining, and business intelligence technologies.
Benefits	The IRS Fraud Analytics system will use a variety of business rules to investigate tax returns with anomaly detection, predictive modeling and social network analysis

Figure 5-87. IRS Project Example.

Also we have included a subset of some of the best in market Big Data solutions we have delivered for our commercial clients. We believe the Public Sector will derive a lot of value by leveraging our commercial learnings. Below is a short list of differentiated use cases from our commercial clients

	Use Case No.	Client	Project	Big Data	Advanced Analytics
Big Data Implementation	1	Large Telecom Company	Big Data Implementation – Hadoop, Sqoop, HIVE, MapReduce	✓	✓
	2	Fortune 100 Financial Services Company	Big Data Implementation – Cloudera Hadoop Processing to reduce cost	✓	
	3	Large Banking Company	Big Data – IBM Big Insights & Tableau – Marketing Analytics	✓	✓
	4	Large Multi Line Insurer	HortonWorks Big Data implementation leveraging SAS Grid	✓	✓

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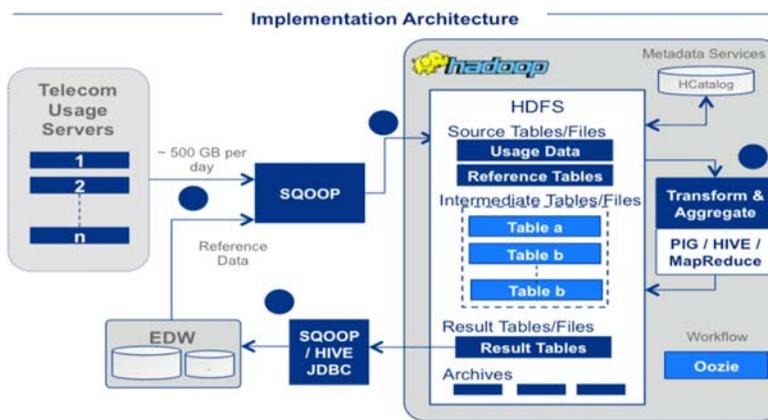
Figure 5-88. Deloitte Big Data and Analytics Use Case Summary.

Large Telecom Company

Project Big Data Implementation – Hadoop, Sqoop, HIVE, MapReduce

Background The client is the large telecom company, was looking for an alternative low cost solution that could handle large volumes of data without compromising the performance as their existing ETL processing for Telecom usage data was becoming expensive on traditional database infrastructure due to increasing volumes. Also, they wanted to off-load processing of large volumes of data from its current Teradata platform to a more cost optimized solution.

Solution Deloitte led the Big Data project by developing Apache Hadoop based Big Data solution to implement an extract, transform and load (ETL) process that could handle the volumes of usage data. The existing transformations and aggregations were enabled using a mix of Hadoop ecosystem tools like – PIG, HIVE and MapReduce. Usage data was sourced from both source system usage servers and reference data from EDW. SQOOP was used to ingest the data from the source systems and loaded to HDFS. Transformation, aggregations and cleansing were performed using PIG, HIVE and MapReduce depending the complexity of the operation. Results were transferred back to EDW and other data marts using either SQOOP or HIVE JDBC connection



- Benefits** Below is a summary of the benefits and enhancements that the project provided to the client:
- Storage costs were reduced from \$200K per TB to \$2K per TB by leveraging a Hadoop based Big Data solution
 - The platform enabled quick wins by making structured, semi-structured and unstructured data available for exploratory analytics

Figure 5-89. Telecom Project Example.

Fortune 100 Financial Services Company

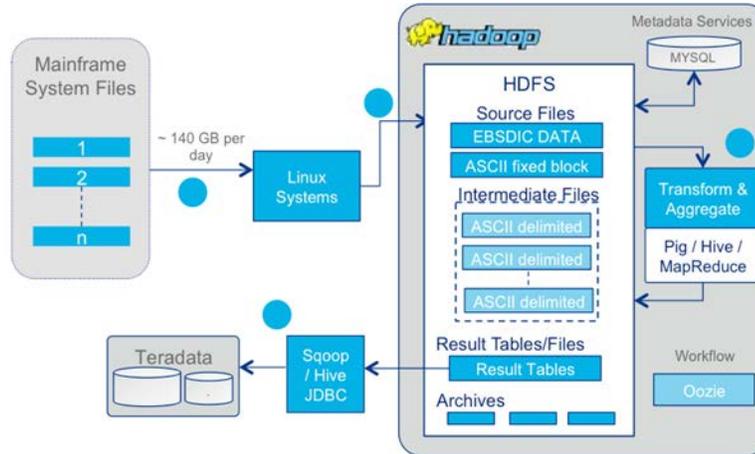
Project Big Data Implementation – Cloudera Hadoop Processing to reduce cost

Background The client is the Fortune 100 Financial Services Company, was running out of the production platform capacity on Teradata. Bank was looking for cost-effective data management platform that would provide solution for data growth and requirement of discovery and analytics on the stored data. Also Regulatory requirements required the bank to maintain active archival of data – daily, weekly, and monthly – for specified periods of time. Current retrieval of archived data from tapes was a multi-day process. Client needed an active archival solution, where data can be retrieved quickly.

Solution Deloitte led the Big Data project by developing Using Apache Hadoop for extract, transform, load (ETL) process that could handle the EBSDIC binary data and ASCII fixed block, convert into ASCII delimited format, run transformation using Pig, Hive and MapReduce and export summarized data to Teradata for computation purposes. Mainframe files – Binary and ASCII fixed block are pushed to Linux systems using NDM/FT. These files were then loaded onto HDFS. Using MapReduce, the files were converted into ASCII delimited files. Transformation, aggregations and cleansing were performed using Pig, Hive and MapReduce depending the complexity of the operation Results were transferred back to EDW and other data marts using either Sqoop or Hive JDBC connection

Fortune 100 Financial Services Company

Implementation Architecture



Benefits

Below is a summary of the benefits and enhancements that the project provided to the client:

- Client was able to save data platform costs by a factor 100x (\$188K/TB versus \$1.2K/TB)
- Deploying Hadoop enabled client, to offload processing from an expensive Teradata platform
- Batch jobs were moved to a Hadoop Cluster for non-real-time processing. Hadoop was leveraged to support overnight batch cycles

Figure 5-90. Financial Services Project Example.

Large Banking Company

Project

Big Data – IBM Big Insights & Tableau – Marketing Analytics & Visualization

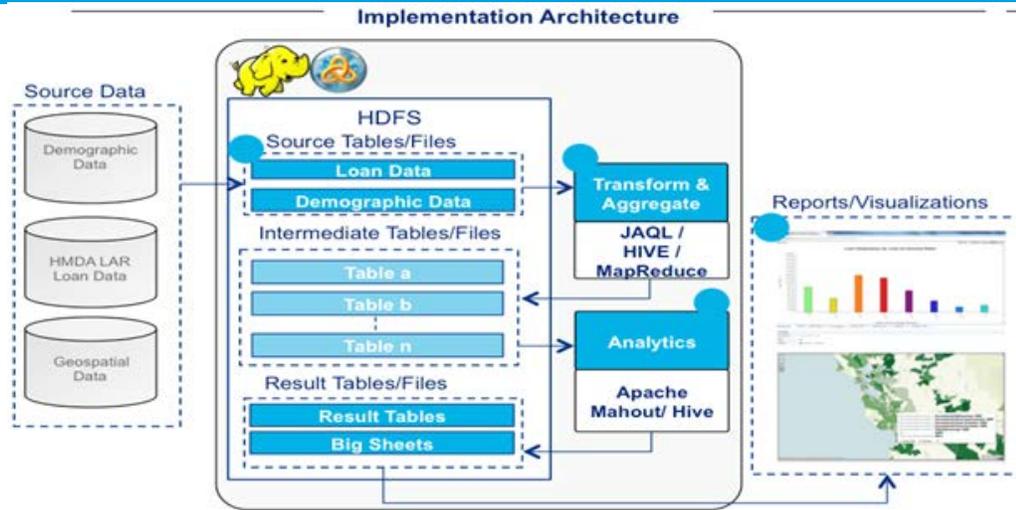
Background

The client is the large banking company, due to the decreasing refinance volume faced increasing pressure to become more effective marketers and target the right customers. Opportunities existed for financial services clients to leverage data from multiple sources to efficiently enable their marketing campaigns. Client sought to leverage emerging capabilities provided by Hadoop to create “analytical sandboxes” for mortgage analytics and customer marketing offers.

Solution

Deloitte created a proof of concept to demonstrate the capabilities of Apache Hadoop (enabled by IBM Big Insights) to run analytics on publically available mortgage origination data augmented with geospatial, and demographic data from private sources to help effectively individualize loan product offerings. Loan, geospatial and demographic data was loaded into HDFS. Data was transformed, cleansed and joined using JAQL, Hive and MapReduce. Analytics were run using Apache Mahout and Hive; results were stored in HDFS. Apache Mahout was used to run the recommendation algorithm. Tableau and IBM Big Sheets were used for the final visualization

Large Banking Company



- Benefits**
- Below is a summary of the benefits and enhancements that the project provided to the client:
- Enabled analytics of publically available mortgage origination data augmented with geospatial, and demographic data from private sources to help effectively individualize loan product offerings
 - Visualizing Mortgage origination opportunities was also a net result of the project

Figure 5-91. Banking Company Example.

Large Multi-Line Insurer

Project	HortonWorks Big Data implementation leveraging SAS Grid to reduce processing time
Background	The client is the larger multi line insurer, needed the ability define data integration and advanced analytics and Big Data shared services capabilities for enterprise data management to support the client’s response to changing regulation given its status as Systematically Important Financial Institution (SIFI). The client is also looking to enhance reporting transparency to regulators and investors by driving fact-based analytics and decision-making. In order to achieve these goals, the client engaged Deloitte to help develop their Big Data Enterprise Data Management (EDM) program
Solution	Deloitte led the implementation of Big Data Enterprise Data Management to build an Enterprise Information Hub that serves as the foundation of a global Advanced Analytics (Big Data) platform. This Platform leveraged multiple approaches/technologies, including ETL (DataStage), ELT (Hadoop), Data Virtualization (Composite) and provided data delivery services to fulfill various business needs. Deloitte helped client to developed use cases to showcase the new technologies while solving pressing business issues including structured /Unstructured data correlation, XML Shredding, Text Analytics, and data visualization. The implementation solution included hardware and software for driving business value through Advanced Analytics with Hortonworks, IBM Netezza (PureData for Analytics), SAS Grid (Analytics), Hortonworks and data visualization tools (SAS VA, QlikView)
Benefits	Below is a summary of the benefits and enhancements that the project provided to the client: <ul style="list-style-type: none"> • Full spectrum of analytics capabilities ranging from traditional Business Intelligence to next generation Advance Analytics, Visualization Tools, Hadoop (Big Data) engine and high performance Data Appliance for near real-time analytical processing. • The platform enabled quick wins by making structured, semi-structured and unstructured data available for exploratory analytics • Leveraging the in-database capabilities of the high performance data appliances and the SAS grid architecture, the client was able to reduce processing times to a great extent

Figure 5-92. Insurance Example.



EXHIBIT B PRICING
CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP

Exhibit B is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA” or “Commonwealth” or “State”) and Deloitte Consulting LLP (“Supplier”).

In the event of any discrepancy between this Exhibit B and the Contract, the provisions of the Contract shall control.

Resource	Hourly Rate Year 1	Hourly Rate Year 2	Hourly Rate Year 3	Hourly Rate Renewal 4	Hourly Rate Renewal 5
Project Management Staff					
Project Executive	\$320.00				
Project Manager	\$294.00				
Application Manager	\$268.00				
Security Manager	\$268.00				
Technical Manager	\$268.00				
Training/Implementation Manager	\$253.00				
Business/Systems Analysts Staff					
Business Analyst 1	\$121.00				
Business Analyst 2	\$168.00				
Technical Lead	\$193.00				
Functional Lead	\$193.00				
Implementation Specialist 1	\$120.00				
Implementation Specialist 2	\$149.00				
Developer Staff					
Senior Programmer Analyst	\$137.00				

Data Scientist 1	\$173.00
Data Scientist 2	\$243.00
Data Scientist 3	\$268.00
Programmer 1	\$71.00
Programmer 2	\$92.00
Programmer 3	\$117.00
Test Lead	\$127.00
Tester 1	\$60.00
Tester 2	\$78.00
Tester 3	\$99.00
Trainer 1	\$70.00
Trainer 2	\$89.00
Trainer 3	\$107.00
Help Desk Support Lead	\$82.00
Help Desk Support Staff	\$47.00
Technical Architect	\$138.00
Sr. Technical Architect	\$173.00
Database Administration 1	\$93.00
Database Administration 2	\$121.00
Project Controller	\$57.00
Project Administrator	\$49.00
Security Analyst	\$118.00
Security Specialist	\$168.00
Security Architect	\$258.00
Data Architect	\$138.00



**EXHIBIT D SOW TEMPLATE
CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP**

Exhibit D is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA” or “Commonwealth” or “State”) and Deloitte Consulting LLP (“Supplier”).

In the event of any discrepancy between this Exhibit D and the Contract, the provisions of the Contract shall control.

**EXHIBIT D-X STATEMENT OF WORK (SOW) TEMPLATE
BETWEEN (NAME OF AUTHORIZED USER) AND DELOITTE CONSULTING LLP**

ISSUED UNDER

**CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP**

Exhibit D-X, between (Name of Agency/Institution) and Deloitte Consulting LLP (“Supplier”) is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA”) on behalf of the Commonwealth of Virginia and Supplier.

In the event of any discrepancy between this Exhibit D-X and the Contract, the provisions of the Contract shall control.

Any Service, Licensed Services, Solution or Software provided under this SOW must comply with all COVA Security and Enterprise Architecture ITRM policies, standards and guidelines located at: <http://www.vita.virginia.gov/library/default.aspx?id=537> and all COVA Enterprise Architecture Data Standards and requirements located at: <http://www.vita.virginia.gov/oversight/default.aspx?id=10344>.

If Authorized User is a State Agency and determines any area of non-compliance with the ITRM PSGs at the above links in the Service, Licensed Services, Solution or Software to be provided by Supplier under this SOW, such Authorized User’s Project Manager must obtain written waiver from VITA in accordance

with the waiver process prior to placing any related order or authorizing Supplier to commence any work. Agency should collaborate with their designated Customer Account Manager to obtain such waiver.

*[Note to Template Users: Instructions for using this template to draft a Statement of Work are in gray highlight and **italics**. These instructions should be deleted after the appropriate text has been added to the Statement of Work. Contractual language is **not italicized** and should remain in the document. Text that is highlighted in **blue** is variable based on the nature of the project.]*

STATEMENT OF WORK

This Statement of Work (SOW) is issued by the **(Name of Agency/Institution)**, hereinafter referred to as "Authorized User" under the provisions of the Contract. The objective of the project described in this SOW is for the Supplier to provide the Authorized User with **a Solution ("Solution") or Services ("Services") or Software ("Software") or Hardware and Maintenance or Licensed Application Services** for **Authorized User Project Name**. *(Customize the last sentence to state what you are getting from the Supplier, based on the VITA Contract language, and with your project name.)*

1. PERIOD OF PERFORMANCE

The work authorized in this SOW will occur within **XX (XX) months** of execution of this Statement of Work. This includes **delivery, installation, implementation, integration, testing and acceptance all of products and services** necessary to implement the Authorized User's **Solution, training, and any support, other than on-going maintenance services**. The period of performance for **maintenance services shall be one (1) year after implementation or end of Warranty Period and may be extended for additional one (1) year periods**, pursuant to and unless otherwise specified in the Contract. *(Customize this section to match what you are getting from the Supplier, based on the allowable scope of the VITA Contract and your project's specific needs within that allowable scope.)*

2. PLACE OF PERFORMANCE

(Assign performance locations to major milestones or any other project granularity, depending on your transparency and governance needs, if needed.)

Tasks associated with this project will be performed at **the Authorized User's location(s) in City/State, at Supplier's location(s) in City/State**, or other locations as required by the effort.

3. PROJECT DEFINITIONS

Provide project unique definitions so that all stakeholders have the same understanding. Ensure these do not conflict with the Contract definition.)

All definitions of the Contract shall apply to and take precedence over this SOW. Authorized User's specific project definitions are listed below:

4. PROJECT SCOPE

(Provide a description of the scope of your project and carve out what is NOT in the scope of your project. Remember that it must fit within the VITA Contract scope.)

A. General Description of the Project Scope

B. Project Boundaries

5. AUTHORIZED USER'S SPECIFIC REQUIREMENTS

(Provide information about your project's and your agency's specific requirements for this particular project including, but not limited to the following subsections):

- A. Authorized User-Specific Requirements
- B. Special Considerations for Implementing Technology at Authorized User's Location(s)
- C. Other Project Characteristics to Insure Success

6. CURRENT SITUATION

(Provide enough background information to clearly state the current situation to Supplier so that Supplier cannot come back during performance claiming any unknowns or surprises. Some example subsections are provided below. You may collapse/expand as you feel is necessary to provide adequate information and detail.)

- A. Background of Authorized User's Business Situation
- B. Current Architecture and Operating System
- C. Current Work Flow/Business Flow and Processes
- D. Current Legacy Systems
- E. Current System Dependencies
- F. Current Infrastructure (Limitations, Restrictions)
- G. Usage/Audience Information

7. PRODUCTS AND SERVICES TO SUPPORT THE PROJECT REQUIREMENTS (AND/OR SOLUTION)

A. Required Products (or Solution Components)

(List the products, or if your project is for a Solution, the Solution components, (hardware, software, etc.) provided by Supplier that will be used to support your project requirements. Identify any special configuration requirements, and describe the system infrastructure to be provided by the Authorized User. Provide an overview that reflects how the system will be deployed within the Authorized User's environment. You are urged to refer to the VITA Contract for allowable scope and other guidance in drafting language for this section.)

B. Required Services

(List the services (e.g., requirements development, Solution design, configuration, interface design, data conversion, installation, implementation, testing, training, risk assessment, performance assessment, support and maintenance) that will be provided by Supplier in the performance of your project. You are urged to refer to the VITA Contract for the definition of Services and for the allowable scope in drafting language for this section. You will notice subsections "C" and "D" below offer areas for expanded detail on training, support and maintenance services. You may add other subsections in which you wish to expand the information/details/requirements for other service areas as well. It is likely some of this detail will be a combination of your known needs and the Supplier's proposal. In all cases the provisions should include all negotiated commitments by both parties, even if you reference by incorporation the Supplier's proposal in any subsection.)

C. Training Requirements and/or Authorized User Self-Sufficiency/Knowledge Transfer

(Provide an overview and details of training services to be provided for your project and any special requirements for specific knowledge transfer to support successful implementation of the Solution. If the intent is for the Authorized User to become self-sufficient in operating or maintaining the Solution, determine the type of training necessary, and develop a training plan, for such user self-sufficiency. Describe how the Supplier will complete knowledge transfer in the event this Statement of Work is not completed due to actions of Supplier or the non-appropriation of funds for completion affecting the Authorized User. You may refer to the VITA Contract for guidance on the allowable scope for this.

D. Support and Maintenance Requirements

(Document the level of support, as available under the Contract, required by your project to operate and maintain the Solution. This may include conversion support, legacy system integration, transition

assistance, Solution maintenance (including maintenance level), or other specialized consulting to facilitate delivery or use of the Solution.

E. Personnel Requirements

(Provide any supplier personnel qualifications, requirements, licenses, certifications or restrictions including project manager, key personnel, subcontractors, etc., but ensure they do not conflict with the VITA Contract terms.)

F. Transition Phase-In/Phase-Out Requirements

(Describe any specific requirements for orientation or phasing in and/or phasing out of the project with the Supplier. Be specific on what the project needs and expected results are, the duration and other pertinent detail, but ensure they do not conflict with the VITA Contract provision(s) regarding Transition of Services or with any other training requirements in the SOW.)

8. TOTAL PROJECT PRICE

The total Fixed Price for this Project shall not exceed \$US XXX.

Supplier's invoices shall show retainage of [redacted]. Following completion of Solution implementation, Supplier shall submit a final invoice to the Authorized User, for the final milestone payment amount shown in the table in section 9 below, plus the total amount retained by the Authorized User. If travel expenses are not included in the fixed price of the Solution, such expenses shall be reimbursed in accordance with Commonwealth of Virginia travel policies as published by the Virginia Department of Accounts (<http://www.doa.virginia.gov>). In order to be reimbursed for travel expenses, Supplier must submit an estimate of such expenses to Authorized User for approval prior to incurring such expenses.

(Sections 9 through 11 should be used or deleted depending on the project's complexity, risk and need for governance. For a simple project you may only need the section 10 table, but for a more complex project, or a major IT project, you may need a combination of or all of the tables for check and balance and redundancy.)

9. PROJECT DELIVERABLES

(Provide a list of Supplier's deliverable expectations. The table is to be customized for the Authorized User's project. You may want to categorize deliverables for each phase or major milestone of the project and then categorize other interim deliverables and/or performance and status reports under one of them or under an Administrative or Project Management section.)

The following deliverables are to be provided by Supplier under this SOW. Subsequent sections may include further detail on the content requirements for some deliverables.

No.	Title	Due Date	Format Required (i.e., electronic/hard copy/CD/DVD)	Distribution Recipients	Review Complete Due Date	Final Due Date
	Project Plan					
	Design Plan					
	Implementation Plan					
	Data Conversion Plan					
	Risk Assessment Plan					
	Test Plan					

Training Plan					
Performance Plan					
Contingency Plan					
Disaster Recovery Plan					
Cutover Plan					
Change Management Plan					
Transition Plan					
Monthly Status Reports					
Quarterly Performance /SLA Reports					
Training Manual					
Final Solution Submission Letter					
Final Acceptance Letter					

10. MILESTONES, DELIVERABLES, PAYMENT SCHEDULE, AND HOLDBACKS

(This table should include the project’s milestone events, associated deliverables, when due, milestone payments, any retainage amount to be held until final acceptance and the net payment you promise to pay for each completed and accepted milestone event. This table includes sample data only and must be customized for your project needs.)

The following table identifies milestone events and deliverables, the associated schedule, any associated payments, any retainage amounts, and net payments.

Milestone Event	Associated Milestone Deliverable(s)	Schedule	Payment	Retainage	Net Payment
Project kick-off meeting	---	-----	---	---	---
-----	-----	-----	---	---	---
-----	-----	-----	-----	-----	-----
	-----	-----			
-----		-----			
-----		-----	-----	-----	-----
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-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	--	-----
Final Acceptance		-----	--	--	-----

11. EVENTS AND TASKS FOR EACH MILESTONE

(If needed, provide a table of detailed project events and tasks to be accomplished to deliver the required milestones and deliverables for the complete Solution. Reference each with the relevant milestone. A Work Breakdown Structure can be used as shown in the table below or at the very least a Project Plan should have this granularity. The Supplier's proposal should be tailored to the level of detail desired by the Authorized User's business owner/project manager for project governance.)

The following table identifies project milestone events and deliverables in a Work Breakdown Structure format.

WBS No.	Milestone	Milestone Event	Milestone Task	Interim Task Deliverables	Duration
1.0					
1.1					
1.1.1					
1.1.2					
1.2					

12. ACCEPTANCE CRITERIA

(This section should reflect the mutually agreed upon UAT and Acceptance Criteria specific to this engagement. Please read the VITA contract definitions for the definitions or Requirements and Acceptance. Ensure the language in this section does not conflict with the VITA Contract language.)

Acceptance Criteria for this Solution will be based on a User Acceptance Test (UAT) designed by Supplier and accepted by the Authorized User. The UAT will ensure that all of the requirements and functionality required for the Solution have been successfully delivered. Supplier will provide the Authorized User with a detailed test plan and acceptance check list based on the mutually agreed upon UAT Plan. This UAT Plan check-list is incorporated into this SOW in Exhibit B-X.

Each deliverable created under this Statement of Work will be delivered to the Authorized User with a Deliverable Acceptance Receipt. This receipt will describe the deliverable and provide the Authorized User's Project Manager with space to indicate if the deliverable is accepted, rejected, or conditionally accepted. Conditionally Accepted deliverables will contain a list of deficiencies that need to be corrected in order for the deliverable to be accepted by the Project Manager. The Project Manager will have ten (10) days from receipt of the deliverable to provide Supplier with the signed Acceptance Receipt unless an alternative schedule is mutually agreed to between Supplier and the Authorized User in advance.

13. PROJECT ASSUMPTIONS AND PROJECT ROLES AND RESPONSIBILITIES

(This section contains areas to address project assumptions by both the Supplier and the Authorized User and to assign project-specific roles and responsibilities between the parties. Make sure that all assumptions are included to alleviate surprises during the project. Ensure that all primary and secondary (as needed) roles and responsibilities are included. You will tailor the Responsibility Matrix table below to fit your project's needs.)

A. Project Assumptions

The following assumptions are specific to this project:

B. Project Roles and Responsibilities

The following roles and responsibilities have been defined for this project:

(Sample Responsibility Matrix)

Responsibility Matrix	Supplier	Authorized User
Infrastructure – Preparing the system infrastructure that meets the		√

recommended configuration defined in Section 2B herein		
Server Hardware		√
Server Operating		√
Server Network Connectivity		√
Relational Database Management Software (Installation and Implementation)		√
Server Modules – Installation and Implementation	√	
PC Workstations – Hardware, Operating System, Network Connectivity		√
PC Workstations – Client Software		√
Application Installation on PC Workstations	√	
Wireless Network Access Points	√	
Cabling, Electric and User Network Connectivity from Access Points		√
Wireless Mobile Computing Products – Scanners, printers	√	
Project Planning and Management	√	√
Requirements Analysis	√	√
Application Design and Implementation	√	
Product Installation, Implementation and Testing	√	
Conversion Support	√	
Conversion Support -- Subject Matter Expertise		√
Documentation	√	
Training	√	
Product Maintenance and Support	√	
Problem Tracking	√	√
Troubleshooting – IT Infrastructure		√
Troubleshooting – Solution	√	

14. COMMONWEALTH AND SUPPLIER-FURNISHED MATERIALS, EQUIPMENT, FACILITIES AND PROPERTY

(In this section, provide details of any materials, equipment, facilities and property to be provided by your Agency or the Supplier in performance of this project. If none, so state so that the requirements are clear. If delivery of any of these is critical to the schedule, you may want to identify such delivery with hard due dates tied to “business days after project start” or “days after [event/milestone](#).” Be sure to specify the delivery and point of contact information.)

A. PROVIDED BY THE COMMONWEALTH

B. PROVIDED BY THE SUPPLIER

15. SECURITY REQUIREMENTS

(Provide (or reference as an Attachment) Authorized User’s security requirements.)

For any individual Authorized User location, security procedures may include but not be limited to: background checks, records verification, photographing, and fingerprinting of Supplier’s employees or agents. Supplier may, at any time, be required to execute and complete, for each individual Supplier employee or agent, additional forms which may include non-disclosure agreements to be signed by Supplier’s employees or agents acknowledging that all Authorized User information with which such employees and agents come into contact while at the Authorized User site is confidential and proprietary. Any unauthorized release of proprietary information by the Supplier or an employee or agent of Supplier shall constitute a breach of the Contract.

Supplier shall comply with all requirements in the Security Compliance section of the Contract

16. REQUIRED STANDARDS, CERTIFICATIONS AND SPECIFICATIONS

In addition to any standards and specifications included in the Contract, Supplier shall follow the standards and specifications listed below during performance of this effort.

(List any specific Commonwealth, VITA, Federal, engineering, trade/industry or professional standards, certifications and specifications that Supplier is required to follow or possess in performing this work. The first bullet includes a link to COVA-required standards for all Commonwealth technology projects. The rest are examples only and highlighted to reflect this. If you need an exception of any COVA-required standard, please follow the process located at this link: <http://www.vita.virginia.gov/oversight/default.aspx?id=10344> and select the Data Standards Guidance bulleted link. Your AITR can assist you.

- COV ITRM Policies and Standards: <http://www.vita.virginia.gov/library/default.aspx?id=537>
- IEEE 802®
- HIPAA
- SAS 70 Type II

17. U.S. ENVIRONMENTAL PROTECTION AGENCY'S AND DEPARTMENT OF ENERGY'S ENERGY STAR GUIDELINES RISK MANAGEMENT

(Risk is a function of the probability of an event occurring and the impact of the negative effects if it does occur. Negative effects include schedule delay, increased costs, failure of dependent legacy system interoperability, other project dependencies that don't align with this project's schedule, and poor quality of deliverables. Depending on the level of risk of this project, as assessed by your Project Manager and/or Steering Committee, this section may contain any or all of the following components, at a level of detail commensurate with the level of risk. Remember to add them to the Deliverables table.)

C. Initial Risk Assessment

Authorized User and Supplier shall each provide an initial assessment from their point of view.

D. Risk Management Strategy

(The list below is taken from VITA PMD template discussing what should go into a Risk Management Strategy. Don't forget to consider and plan for any budget contingencies to accommodate potential risks that are identified.)

1. **Risk Identification Process:** The processes for risk identification.
2. **Risk Evaluation and Prioritization:** How risks are evaluated and prioritized.
3. **Risk Mitigation Options:** Describe the risk mitigation options. They must be realistic and available to the project team.
4. **Risk Plan Maintenance:** Describe how the risk plan is maintained during the project lifecycle.
5. **Risk Management Responsibilities:** Identify all project team members with specific risk management responsibilities. (e.g., an individual responsible for updating the plan or an individual assigned as a manager).

E. Risk Management Plan

(Include a description of frequency and form of reviews, project team responsibilities, steering and oversight committee responsibilities and documentation. Be sure to add all deliverables associated with risk strategizing and planning to the list of Deliverables.)

18. DISASTER RECOVERY

Planning for disaster recovery for your project is paramount to ensure continuity of service. The criticalness and complexity of your project, including its workflow into other dependent systems of the Commonwealth or federal systems, will help you determine if you require a simple contingency plan or a full-blow contingency plan that follows the Commonwealth’s ITRM Guideline SEC508-00 found at this link:

http://www.vita.virginia.gov/uploadedFiles/Library/ContingencyPlanningGuideline04_18_2007.pdf

It is advisable that you visit the link before making your decision on how you need to address contingency planning and related deliverables in this SOW; as well as, how this will impact your planned budget. A likely deliverable for this section would be a Continuity of Operations Plan. You may choose to include the above link in your final SOW to describe what the Plan will entail. The same link includes the following processes, which you may choose to list in your final requirements for this section, to be performed by your team, the Supplier or both and/or a steering committee if your project warrants such oversight and approval:

- Development of the IT components of the Continuity of Operations Plan (COOP)
- Development and exercise of the IT Disaster Recovery Plan (IT DRP) within the COOP
- Development and exercise of the IT System Backup and Restoration Plan

19. PERFORMANCE BOND

(If your project is sizeable, complex and/or critical, and the VITA Contract does not already provide for a performance bond, you may want the Supplier to provide one. The VITA Contract may include an Errors and Omissions insurance requirement, which would cover the Supplier’s liability for any breach of the Contract or this SOW. Be sure to read the Contract for this information. However, if you feel that this project warrants further performance incentive due to the project or the Supplier’s viability, you may include the following language in this section.)

[Redacted]

20. OTHER TECHNICAL/FUNCTIONAL REQUIREMENTS

(Provide any other unique project technical and functional requirements and expectations in sufficient detail in this section. Ensure they do not conflict with existing requirements in the VITA Contract. Several examples are listed.)

F. [Redacted]

G. [Redacted]

H. [Redacted]

I. [Redacted]

21. REPORTING

(The following are examples of reporting requirements which may be included in your SOW depending on the project’s need for governance. In an effort to help VITA monitor Supplier performance, it is strongly recommended that the SOW include “Supplier Performance Assessments”. These assessments may be performed at the Project Manager’s discretion and are not mandated by VITA.)

A. Weekly/Bi-weekly Status Update.

The weekly/bi-weekly status report, to be submitted by Supplier to the Authorized User, should include: accomplishments to date as compared to the project plan; any changes in tasks, resources or schedule with new target dates, if necessary; all open issues or questions regarding the project; action plan for addressing open issues or questions and potential impacts on the project; risk management reporting.

B. Supplier Performance Self-Assessment.

Within thirty (30) days of execution of the project start, the Supplier and the Authorized User will agree on Supplier performance self-assessment criteria. Supplier shall prepare a monthly self-assessment to report on such criteria. Supplier shall submit its self-assessment to the Authorized User who will have five (5) days to respond to Supplier with any comments. If the Authorized User agrees with Supplier's self-assessment, such Authorized User will sign the self-assessment and submit a copy to the VITA Supplier Relationship Manager.

C. Performance Auditing

(If you have included service level requirements in the above section entitled, Other Technical/Functional Requirements, you will want to include a requirement here for your ability to audit the results of the Supplier's fulfillment of all requirements, Likewise, you may want to include your validation audit of the Supplier's performance reporting under this Reporting section. It is important, however, that you read the VITA contract prior to developing this section's content so that conflicts are avoided. Suggested language is provided below, but must be customized for your project.)

_____ (If none, you may add your escalation procedure in this section.)

D. Supplier Performance Assessments

(You may want to develop assessments of the Supplier's performance and disseminate such assessments to other Authorized Users of the VITA Contract. Prior to dissemination of such assessments, Supplier will have an opportunity to respond to the assessments, and independent verification of the assessment may be utilized in the case of disagreement.)

22. CHANGE MANAGEMENT

(Changes to the baseline SOW must be documented for proper project oversight. Depending on your project, you may need to manage and capture changes to configuration, incidents, deliverables, schedule, price or other factors your team designates as critical. Any price changes must be done in compliance with the Code of Virginia, § 2.2-4309. Modification of the contract, found at this link: <http://leg1.state.va.us/cgi-bin/legp504.exe?000+coh+2.2-4309+500825>. Changes to the scope of this SOW must stay within the boundaries of the scope of the VITA Contract.

For complex and/or major projects, it is recommended that you use the VITA PMD processes and templates located at: <http://www.vita.virginia.gov/oversight/projects/default.aspx?id=567>. Administrative or non-technical/functional changes (deliverables, schedule, point of contact, reporting, etc.) should extrapolate the affected sections of this SOW in a "from/to" format and be placed in a numbered modification letter referencing this SOW and date, with a new effective date. The VITA Contract may include a template for your use or you may obtain one from the VITA Contract's Point of Contact. It is very important that changes do not conflict with, but do comply with, the VITA Contract, which takes precedence. The following language may be included in this section, but additional language is needed to list any technical/functional change management areas specific to this SOW; i.e., configuration, incident, work flow, or any others of a technical/functional nature.)

All changes to this SOW must comply with the Contract. Price changes must comply with the Code of Virginia, § 2.2-4309. Modification of the contract, found at this link: <http://leg1.state.va.us/cgi-bin/legp504.exe?000+coh+2.2-4309+500825>

All changes to this SOW shall be in written form and fully executed between the Authorized User's and the Supplier's authorized representatives. For administrative changes, the parties agree to use the change template, attached to this SOW. For technical/functional change management requirements, listed below, the parties agree to follow the processes and use the templates provided at this link: <http://www.vita.virginia.gov/oversight/projects/default.aspx?id=567>

23. POINT OF CONTACT

For the duration of this project, the following project managers shall serve as the points of contact for day-to-day communication:

Authorized User: _____

Supplier: _____

By signing below, both parties agree to the terms of this Exhibit.

Supplier:

Authorized User:

(Name of Supplier)

(Name of Agency/Institution)

By: _____

By: _____

(Signature)

(Signature)

Name: _____

Name: _____

(Print)

(Print)

Title: _____

Title: _____

Date: _____

Date: _____



**EXHIBIT E CHANGE ORDER TEMPLATE
CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP**

Exhibit E is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA” or “Commonwealth” or “State”) and Deloitte Consulting LLP (“Supplier”).

In the event of any discrepancy between this Exhibit E and the Contract, the provisions of the Contract shall control.

This Change Order No. **XXX** hereby modifies and is made an integral part of Statement of Work **D-X** (“SOW”), between **NAME OF AGENCY/INSTITUTION** (“Authorized User”) and Deloitte Consulting LLP (“Supplier”), which was issued under Contract Number VA-150915-DELC (“Contract”) between the Virginia Information Technologies Agency (“VITA”) and Supplier, on behalf of the Commonwealth of Virginia and its Authorized Users.

[Note: Instructions for using this template to draft a Change Order are in gray. These instructions should be deleted after the appropriate text has been added to the Change Order. Contractual language is not in gray and should remain in the document. Text that is highlighted in blue is contractual language that is variable based on the nature of the project and in final form should not be highlighted. Agency/Institution should remove the first two lines of the heading, which pertain to this template as an Exhibit to the VITA Contract and remove the Exhibit reference from the header.]

CHANGE ORDER

This is Change Order No. **XXX** to a SOW issued by **Authorized User** to Supplier under which Supplier is to provide the Authorized User with a **Authorized User Project Name Solution (“Solution”)**.

The following item(s) is/are hereby modified as follows: *[Note: Include only the sections of the SOW that are being changed. Do not include sections not being modified. Changes should be clearly identified as “From” (copy/paste from current SOW section) and “To” (fully describe the change(s) to the referenced section). Here is an example, using SOW section 1.]*

1. PERIOD OF PERFORMANCE

[Redacted]

This Change Order No. **XXX** is issued pursuant to and, upon execution, shall become incorporated in the SOW, which is incorporated in the Contract. In the event of conflict, the following order of precedence shall apply:

- i). The Contract
- ii). Statement of Work E-X, as amended by this and previous Change Orders, with the more current Change Orders superseding older Change Orders.

The foregoing is the complete and final expression of the agreement between the parties to modify the SOW and cannot be modified, except by a writing signed by duly authorized representatives of both parties hereto.

ALL OTHER TERMS AND CONDITIONS OF THE REFERENCED SOW REMAIN UNCHANGED.

By signing below, the authorized parties agree to the terms of this Change Order No. XXX, effective (INSERT EFFECTIVE DATE).

Supplier

By: _____

(Signature)

Name: _____

(Print)

Title: _____

Date: _____

Authorized User

By: _____

(Signature)

Name: _____

(Print)

Title: _____

Date: _____



**EXHIBIT G LOBBYING CERTIFICATION
CONTRACT NUMBER VA-150915-DELC
BETWEEN
VIRGINIA INFORMATION TECHNOLOGIES AGENCY
AND
DELOITTE CONSULTING LLP**

Exhibit G is hereby incorporated into and made an integral part of Contract Number VA-150915-DELC ("Contract") between the Virginia Information Technologies Agency ("VITA" or "Commonwealth" or "State") and Deloitte Consulting LLP ("Supplier").

In the event of any discrepancy between this Exhibit G and the Contract, the provisions of the Contract shall control.

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

No Federal appropriated funds have been paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee or an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal Contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal Contract, grant, loan, or cooperative agreement.

If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, and Contracts under grants, loans and cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Signature:

A handwritten signature in black ink is written over a solid horizontal line. The signature is stylized and appears to be a first name followed by a last name.

Printed Name: Sundaravadivel Suguna

Organization: Deloitte Consulting, LLP

Date: 10/12/2015