OSEHRA

Open Source Electronic Health Record Alliance

Open Source Technical Support and Working Group Services for VA VistA

Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis

Contract Number: VA118-16-C-0841

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1. Introduction

1.1. Executive Summary

For the 2017 fourth quarter (Q4) deliverable cycle, a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis was performed for the following open source software (OSS) candidates, with the resulting intake recommendations:

- CPRS Note Title Display Bug Fix –Recommend proceeding with VA intake and OSEHRA Certification.
- REVAMP – Recommend to undergo OSEHRA Certification to ensure proper licensing and technical fit, in order to support roll out.
- Open mHealth – Recommend proceeding with VA intake into the TRM and potential OSEHRA review / certification.

The candidates included in this document were the highest scoring candidates (and best fit for Q4) reviewed during the 2017 Q4 OSS and Product Selection Criteria analysis.

Next steps include developing the Prioritization Description Document for these OSS candidates, which will incorporate additional candidate detail. The SWOT analysis for these candidates may be updated in subsequent quarters as additional information becomes available.

1.2. Overview

The purpose of this document is to provide a SWOT analysis to assess the strengths, weaknesses, opportunities, and threats to VA of OSS and products to be considered for VA VistA intake. The analysis includes an assessment of the candidates, with the highest functional strengths/opportunities and lowest weaknesses/threats in alignment to VistA 4 required functional Feature Sets.

Several factors are critical to the success of the OSS intake process. The emphasis must be on providing business value by filling functional and technical gaps, identifying applicable OSS, and working with VA to “lay the pathway” for integration of OSS into VistA to fill identified gaps.

2. Approach

To facilitate the SWOT analysis, evaluation criteria were established to objectively assess the strengths/weaknesses and opportunities/threats associated with each OSS candidate. Candidates are assessed as having either a high or low score within each analysis element, then key decisional elements for each candidate are identified. The SWOT analysis table and summary findings for each candidate product are presented in this document.

OSS candidates are reviewed using the Strengths/Weaknesses Dimension Definitions presented in Table 1.

SWOT Dimension	High Score Strength (1-5 Scale, 5 is High)	Low Score Weakness (1-5 Scale, 1 is Low)
Functional Fit with Requirement	Function fills substantive functionality gap and is of value to users.	Function is not needed or is a duplicate of existing functionality.
Technical Fit - Data	Code is a strong fit with data structures in VistA. Implementation would be low-risk regarding corrupting existing data.	Code is not a fit with data structures in VistA and would require re-architecting to implement.
Technical Fit - API	Code fits well with VistA API structures. Code would integrate with other VistA modules and would be easily callable.	Code is not a fit with API structures in VistA and would require re-architecting to implement.
Code Quality	Code is safe, compliant, and functional. Code is OSEHRA Level certified, fully tested, and highly reliable in providing function / feature. Test documentation is available for certification.	Code has bugs, limited or no documentation, or potentially unreliable. No test documentation is available.
VistA 4 Product Roadmap - Architectural Fit	Code will fit well into existing Roadmap plans and will continue to fit with anticipated evolution of VistA and the Roadmap.	Code will be quickly obsolete or will not work due to planned changes in the Roadmap.
Time-to-Value	Rapid, low-risk implementation. Use of code provides faster time-to-value than internal development and implementation by VA. Intake through the Existing Product Intake Program (EPIP) or bug fix maintenance release process would be faster than implementing a project requiring funding. Intake of bug fixes (patches), minor enhancements (patches), and tools is generally faster than application components, applications, applications with new data stores, and platforms.	Use of code will not improve time-to-value and may actually decrease time-to-value in VA overall due to implementation complexity / risk or other issues. Code requiring additional hardware / software or code that implements a new database will take more time to implement. Code that uses PII requires additional levels of security review, delaying implementation.

Table 1. Strengths/Weaknesses Dimension Definitions

OSS candidates are reviewed using the Opportunities/Threats Dimension Definitions presented in Table 2.

SWOT Dimension	High Score Opportunity (1-5 Scale, 5 is High)	Low Score Threat (1-5 Scale, 1 is Low)
Intellectual Property Rights / Copyright, Licensing Obligations	Use of code is free and clear with no IP / legal issue.	Use of code puts VA or open source community at risk of legal action.
Open Source Community Involvement	Use of code viewed as enhancing the value and engagement of the community.	Adoption of code could result in reduction of community involvement. Use of code not viewed as positive for the community.
Veteran Experience	Use of code will greatly enhance Veteran experience.	Use of code may damage Veteran experience.
Quality Risk	Code is high-quality; adoption provides the opportunity to add value from the open source community.	Code is of low or unproven quality, or is not an improvement over existing VA software quality, leaving VA vulnerable.
Political Risk	No political or competing concerns associated with adoption of open source code. If the code is already in limited use by VA, there is no known opposition to expansion of its use.	Political or competing concerns exist related to open source code. Other existing code already in use at VA. Could cause organizational issues for VA if open code is adopted.

Table 2. Opportunities/Threats Dimension Definitions

3. Analysis of CPRS Note Title Display Bug Fix

3.1. OSS Candidate Overview

The CPRS Note Title Display bug fix resolves an issue with how note titles are displayed in CPRS. An error in the code causes a faulty display of the full document names of the notes. VA's code uses the pointer into 8925 instead of the correct pointer into 8925.1 to retrieve the matched Text Integration Utilities (TIU) VHA Enterprise Standard Title in 8926.1.

The bug has been identified within VA and has an incident number - I17755863FY18 - Open – Software Vista Repair VHA R4.

The CPRS Note Title Display bug fix was developed by the open source community for use with VistA. It was posted to the VistA Hardhats forum and verified by OSEHRA staff. It has not been deployed within VA. The fix involves changing just two lines of code in the TIU module.

The primary benefit associated with intake of the CPRS Note Title Display bug fix is improvement of patient safety. Although the data is currently stored correctly, the display is corrupted, which could lead to a patient safety issue if a provider looking at the CPRS note misinterprets the purpose of the note.

The recommendation for the CPRS Note Title Display bug fix is to proceed with VA intake and OSEHRA Certification.

3.2. Strengths/Weaknesses

The Strengths and Weaknesses analysis elements for the CPRS Note Title Display bug fix are presented in Table 3, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Functional Fit with Requirement	5*	The CPRS Note Title Display bug fix resolves an issue with how note titles are displayed in CPRS. An error in the code causes a faulty display of the full document names of the notes. VA's code uses the pointer into 8925 instead of the correct pointer into 8925.1 to retrieve the matched Text Integration Utilities (TIU) VHA Enterprise Standard Title in 8926.1. Although the data is currently stored correctly, the display is corrupted and could lead to a patient safety issue if providers misinterpret the purpose of a note.
Technical Fit - Data	5*	No data issues are anticipated; this code has been developed specifically to resolve a bug within the TIU code that will correct the way CPRS note titles are displayed.
Technical Fit - API	5*	No architectural issues are anticipated; this code has been developed specifically to resolve a bug within the VistA TIU code. The proposed fix is relatively minor, impacting two lines of code within one TIU package.
Code Quality	4	This code corrects an existing bug within the TIU code. It has not been piloted or deployed within VA but is an extremely simple fix. Documentation and simple test cases will need to be developed to support the OSEHRA certification process.
VistA 4 Product Roadmap - Architectural Fit	3	This is a bug fix so is not referred to in the VistA Roadmap.
Time-to-Value	5*	CPRS Note Title Display Bug Fix is a bug fix with the potential for rapid intake. This candidate is relatively simple, with low complexity and no associated dependencies. The fix could potentially be implemented by internal TIU developers.

*Legend: *Decisional element*

Table 3. Strengths / Weaknesses Associated with the CPRS Note Title Display Bug Fix

3.3. Opportunities/Threats

The Opportunities and Threats analysis elements for the CPRS Note Title Display bug fix are presented in Table 4, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Intellectual Property Rights / Copyright, Licensing Obligations	5*	No licensing or copyright issues. The bug fix was developed by the open source community and will be contributed back to VA. It has not yet been certified by OSEHRA.
Open Source Community Involvement	5	Code is current and available to the open source community for use and comment. Code was posted on the VistA Hardhats forum for use by the VistA community.
Veteran Experience	4*	Code is not Veteran facing, and it is unlikely the Veteran experience would be visibly impacted by intake of this code, although it does resolve a patient safety risk that could arise if a provider looking at the CPRS note misinterprets the purpose of the note.
Quality Risk	4	This code corrects an existing bug within the TIU code. The candidate has not been piloted at VA. It was developed by the open source community and validated by users within the community. Additional testing is required prior to intake by VA.
Political Risk	5*	The limited scope / impact associated with this code provides for a low process and change risk.

*Legend: *Decisional element*

Table 4. Opportunities / Threats Associated with the CPRS Note Title Display Bug Fix

3.4. SWOT Analysis Summary

An overall summary of the CPRS Note Title Display bug fix SWOT analysis decisional elements are presented in Table 5.

	Helpful to achieving time to value	**Harmful** to achieving time to value
VA Perspective (VistA Fit, Business Value)	Strengths • Code corrects an existing bug in the Text Integration Utilities (TIU) code • Code fix is specifically for VistA, indicating a strong technical and data fit • Code has the potential for rapid intake	Weaknesses • None
External Impacts (Risks, Upside)	Opportunities • Resolves a potential patient safety issue • Low risk due to limited scope and impact • No licensing or copyright issues	Threats • None

Table 5. SWOT Analysis Summary of the CPRS Note Title Display Bug Fix

4. Analysis of REVAMP (Remote Veteran Apnea Management Platform)

4.1. OSS Candidate Overview

REVAMP (Remote Veteran Apnea Management Platform) is a personalized, interactive web application designed to improve management of Veterans with obstructive sleep apnea (OSA). The REVAMP VA-facing web application allows providers to monitor and treat sleep apnea in Veterans by retrieving data from the Veteran's CPAP machine and translating it into easy-to-read graphs. Providers can send messages to their patients or other providers from inside the application.

REVAMP is also a Patient Portal web application that allows Veterans to keep up with their sleep apnea patterns, view their treatment in graphical format, and keep in touch with their providers. The Remote Veterans Apnea Management Platform (REVAMP) App pairs with the Positive Airway Pressure (PAP) machine and enables the Veteran and the VA sleep care team to track the Veteran's sleep data. The Veteran can use the app to obtain educational information and troubleshooting support about sleep apnea as well as complete questionnaires regarding your sleep health. Additionally, a built-in message system allows the Veteran and the VA sleep care team to exchange secure messages.

REVAMP was developed through the VA Center for Innovation by Intellica Corporation. Inside VA, The REVAMP project was initially identified as VHA Innovation Project ID 687. The REVAMP GitHub postings all show last commit on October 23, 2014.

REVAMP was initially tested at the Philadelphia VAMC and San Diego VA in 2014-2015. Since then the software has been piloted at other VA sites.

The REVAMP App for Veterans is currently available at select VA Sleep Centers for Veterans who have been registered in the application by a member of their sleep care team. It is not available at all VA Sleep Centers. The web app is available on the VA mobile web site.

The primary benefits associated with intake of REVAMP are an improved patient health, experience and enhanced communication between the patient and the provider.

The REVAMP project was revitalized in 2017. There is currently a plan to roll REVAMP out to all VA sites by 2019, but funding has not been approved.

The recommendation for REVAMP is to undergo OSEHRA Certification to ensure proper licensing and technical fit, in order to support roll out.

4.2. Strengths/Weaknesses

The Strengths and Weaknesses analysis elements for the REVAMP candidate are presented in Table 6, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Functional Fit with Requirement	4	REVAMP allows providers to monitor and treat sleep apnea in Veterans by retrieving data from their CPAP machines and translating it graphically. Veterans can use the application to review their sleep apnea patterns and view their treatment graphically. This functionality currently does not exist in VistA. Although this is a niche application related to treatment of a specific disorder, this application adds value and fits the gap related to Innovations projects.
Technical Fit - Data	4	No significant data issues are anticipated. This code was developed as a website and appears easy to install. It is completely independent of VistA.
Technical Fit - API	4*	No significant architectural issues are anticipated. This code was developed as a website and appears easy to install. It is completely independent of VistA.
Code Quality	4*	The code is posted in GitHub as of three years ago and the web app is on the VA mobile web site and is in use at selected VA sleep centers. This implies the code is production quality. This code has not been reviewed or certified by OSEHRA.
VistA 4 Product Roadmap - Architectural Fit	3	This functionality is not specifically referenced in the Roadmap, but is also not in conflict with it.
Time-to-Value	4*	Code does not impact VistA; it is a website, and may qualify for intake through EPIP. Although personally identifiable information (PII) is not used extensively, its minimal use will need to be addressed and may require additional levels of security review that could delay implementation.

*Legend: *Decisional element, ** Additional analysis needed*

Table 6. Strengths / Weaknesses Associated with REVAMP

4.3. Opportunities/Threats

The Opportunities and Threats analysis elements for the REVAMP candidate are presented in Table 7, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Intellectual Property Rights / Copyright, Licensing Obligations	5*	No licensing or copyright issues; licensed under the Apache 2.0 License. Code was developed through the VA Center for Innovation (VACI).
Open Source Community Involvement	4	Code is posted to GitHub and appears to be well documented, although it appears it hasn't been updated in three years. Documentation available on GitHub includes the technical manual, analytical tool manual, VA-facing manual, and a Veteran-facing manual.
Veteran Experience	4*	Code has the potential to improve delivery of healthcare by allowing improved doctor / patient coordination regarding the progress and results of sleep apnea treatment.
Quality Risk	4	Implementation of this code involves setting up the website, and should be low technical risk.
Political Risk	4*	The limited scope / impact associated with this code provides for a low process and change risk. The code facilitates additional patient / doctor communication regarding sleep apnea treatment that is already on-going.

*Legend: *Decisional element*

Table 7. Opportunities / Threats Associated with REVAMP

4.4. SWOT Analysis Summary

An overall summary of the REVAMP SWOT analysis decisional elements are presented in Table 8.

	Helpful to achieving time to value	**Harmful** to achieving time to value
VA Perspective (VistA Fit, Business Value)	Strengths • The code is external to VistA so there is no need to fit with VistA architecture • Potential to deliver rapid time-to-value since the code does not need to be technically integrated with VistA • The code is available at select VA sleep centers implying that the code is of production quality	Weaknesses • None
External Impacts (Risks, Upside)	Opportunities • Improves doctor / patient coordination regarding the progress and results of sleep apnea treatment • Low process risk due to limited scope and technical impact • No licensing or copyright issues	Threats • None

Table 8. SWOT Analysis Summary of REVAMP

5. Analysis of Open mHealth

5.1. OSS Candidate Overview

Open mHealth is a non-profit organization that provides an open source platform for the standardization, storage, integration, sharing, processing, and visualization of mobile data. It allows for the integration of data from health apps and devices, EHRs, and Apple's HealthKit. All code produced by Open mHealth is open source through the Apache 2.0 license.

In 2010, Deborah Estrin and Ida Sim co-authored a policy paper in Science calling for an open 'mHealth' architecture. Building on these ideas, Open mHealth was launched in September 2011 as a non-profit organization funded through grants, sponsorship, and services. All funds go to supporting Open mHealth's core and promoting the open source platform and global community. In 2012, Open mHealth partnered with VA's Dr. Julia Hoffman to better utilize data being collected via the PTSD Coach mobile application. "Open mHealth developed a web app called ClinVis that translated data collected using PTSD Coach into trended subjective units of depression (SUD) scores. This allowed Dr. Hoffman and other clinicians to visually monitor a patient's depression levels over time and better understand when to intervene."[1]

The primary benefits associated with intake and usage of Open mHealth are improved developer efficiency and an improved patient health experience. Use of the Open mHealth platform and involvement in the community will bolster VA's ability to develop mobile applications and make use of the data available through mobile applications and wearables.

The recommend for Open mHealth is to proceed with VA intake into the TRM and potential OSEHRA review / certification. VA should also look into becoming more active in the Open mHealth organization as a platform like this will be key to integrating mobile data in Cerner and other mobile apps in the future.

[1] Case study: PTSD Explorer. (n.d.) Retrieved November 29, 2017 from http://www.openmhealth.org/features/case-studies/case-study-ptsd-explorer/

5.2. Strengths/Weaknesses

The Strengths and Weaknesses analysis elements for Open mHealth are presented in Table 9, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Functional Fit with Requirement	5*	Development of mobile applications and analysis of the data collected through apps and wearables is a current gap area that VA wants to address. Open mHealth provides an open source platform for the standardization, storage, integration, sharing, processing, and visualization of mobile data. It allows for the integration of data from health apps and devices, EHRs, and Apple's HealthKit.
Technical Fit - Data	4*	No significant data issues are anticipated. The platform is built on structured health data with common data schemas. Open mHealth's "Pulse" application allows for the import and export of EHR data. According to the product website, "Pulse helps you map HL7 data to Open mHealth's clinically meaningful schemas. This helps you get your application's data into EHRs – where providers are more likely to see it – in a more uniform way. It also helps you get data out of EHRs in a standard format, so that you can do whatever you need with it."
Technical Fit - API	4*	No significant architectural issues are anticipated. Open mHealth is designed to allow integration with third-party products and applications. According to the product website, "Open mHealth's open-source adapters pull in health and related data from the APIs of large providers like RunKeeper, Fitbit, Google, and Apple, and convert it to match our schemas. This data can then be processed or visualized regardless of where it came from, letting you quickly prototype ideas or build production-ready applications."
Code Quality	4	The Open mHealth platform and associated applications appear to be robust and of high quality. This code has not been reviewed or certified by OSEHRA.
VistA 4 Product Roadmap - Architectural Fit	3	This functionality is not specifically referenced in the Roadmap, but is also not in conflict with it.
Time-to-Value	4	Involvement with the Open mHealth community and intake of applicable code has the potential to rapidly advance VA's mobile capabilities beyond in-house development alone. The Intake and use of the Open mHealth platform across VA will likely take some time.

*Legend: *Decisional element*

Table 9. Strengths / Weaknesses Associated with Open mHealth

5.3. Opportunities/Threats

The Opportunities and Threats analysis elements for Open mHealth are presented in Table 10, along with a score, evaluation comments, and decisional element indicator for each dimension.

SWOT Dimension	Score	Evaluation Comments
Intellectual Property Rights / Copyright, Licensing Obligations	5*	No licensing or copyright issues; licensed under the Apache 2.0 License. This code has not been reviewed or certified by OSEHRA.
Open Source Community Involvement	4	Code is posted on GitHub for the open source community and appears to be stable. The Open mHealth organization appears to have a robust user community with activity on GitHub, participation in work groups, a YouTube channel, and established Meetup groups.
Veteran Experience	4*	Open mHealth provides a framework for future development. Implementation of mobile applications and the resulting analysis should improve delivery and access to healthcare.
Quality Risk	4	The Open mHealth platform and associated applications appear to be robust and of high quality. Implementing Open mHealth will be a change for VA involving a new architecture and requiring new development. However, the platform and applications are built around robust open standards which reduce overall risk.
Political Risk	2*	Moving towards mobile application integration with Open mHealth will involve major strategic architectural decisions and potential cultural change, but this change will be necessary irrespective of platform. For VA to move towards a larger mobile presence, these factors will need to be addressed. Open mHealth should be evaluated as part of an overarching strategy around VA's move to increased mobile functionality. Involvement in the Open mHealth community would be a significant change, but one that VA will need to address. The basic platform would not need modifications to be useful to VA.

*Legend: *Decisional element*

Table 10. Opportunities / Threats Associated with Open mHealth

5.4. SWOT Analysis Summary

An overall summary of the Open mHealth SWOT analysis decisional elements are presented in Table 11.

	Helpful to achieving time to value	**Harmful** to achieving time to value
VA Perspective (VistA Fit, Business Value)	Strengths • Fills key gap for VA – integration of mobile app data for improved healthcare • Built on structured health data with common data schemas • Allow integration with third-party products and applications	Weaknesses • None
External Impacts (Risks, Upside)	Opportunities • Provides a framework for future development of mobile applications that will enhance the Veteran experience • No licensing or copyright issues	Threats • Moving towards mobile application integration with Open mHealth will involve major strategic architectural decisions and potential cultural change, but this will be required irrespective of the platform chosen

Table 11. SWOT Analysis Summary of Open mHealth

6. Next Steps

The OSS candidates reviewed in this SWOT analysis will be included in the 2017 Q4 Prioritization Description Document, along with additional detail. Additionally, these candidates will be reviewed during the 2017 Q4 In-Progress Review (IPR).

This SWOT analysis may be updated in subsequent quarters as additional information becomes available.