Office of the Inspector General
SOCIAL SECURITY ADMINISTRATION

Audit Report

Agile Software Development at the Social Security Administration

A-14-20-50947 August 2022

Office of the Inspector General
SOCIAL SECURITY ADMINISTRATION

MEMORANDUM

Date: August 24, 2022 **Refer To:** A-14-20-50947

To: Kilolo Kijakazi
Acting Commissioner

From: Gail S. Ennis,
Inspector General

Subject: Agile Software Development at the Social Security Administration

The attached final report presents the results of the Office of Audit's review. The objective was to determine whether the Social Security Administration implemented appropriate controls and practices to manage its Agile software development projects.

Please provide within 60 days a corrective action plan that addresses each recommendation. If you wish to discuss the final report, please call me or have your staff contact Michelle L. Anderson, Assistant Inspector General for Audit.

Agile Software Development at the Social Security Administration
A-14-20-50947

August 2022 **Office of Audit Report Summary**

Objective

To determine whether the Social Security Administration (SSA) implemented appropriate controls and practices to manage its Agile software development projects.

Background

The Agile software development methodology uses an iterative approach to deliver solutions incrementally through close collaboration and frequent reassessment. SSA uses Agile development to optimize processing, redesign workflows, reduce manual transactions, and improve program effectiveness and efficiency.

The Office of Management and Budget (OMB) requires that agency information technology (IT) investments ". . . implement an Agile development approach, as appropriate." OMB also requires that agencies use appropriate measurements ". . . to evaluate the cost, schedule, and overall performance variances of IT projects." In addition, the *Clinger-Cohen Act* requires that the process for IT acquisitions ". . . provide the means for senior management personnel of the executive agency to obtain timely information regarding the progress of an investment in an information system, including a system of milestones for measuring progress, on an independently verifiable basis, in terms of cost, capability of the system to meet specified requirements, timeliness, and quality."

Results

SSA implemented some appropriate controls and practices to manage its Agile software development projects. However, we identified opportunities for the Agency to improve its controls, implement additional controls, and mature its use of the Agile methodology. SSA developed flexible Agile development guidance for some areas, but it did not sufficiently mandate, and its quality assurance processes did not enforce, the use of some key Agile best practices. We identified instances where SSA did not follow key Agile development best practices related to delivery of planned work; appropriate development of system requirements, capabilities and features; size and composition of Agile development teams; definition of team policies and other basic practices; lessons learned; human-centered design practices; testing; and peer reviews.

There were instances where SSA did not meet the Agile principle of early and continuous delivery of valuable software to customers. Also, SSA did not ensure data the Agile project management tool provided were reliable. Further, SSA needed to improve Agile training at the team and executive levels. Finally, we identified opportunities for SSA to improve its decisionmaking, gain efficiencies, and better position staff for success using the Agile development methodology.

Improvements in these areas could provide greater benefits from the Agile development methodology, including higher quality software developed faster and at a lower cost.

Recommendations

We made 12 recommendations to revise Agency guidance, policies, and procedures; leverage strategic-level portfolio planning capabilities; create standardized reports to be used for all Agile projects; and institute a program of executive-level Agile coaching.

SSA agreed with all but one of our recommendations. SSA did not agree to strengthen its controls to more effectively enforce implementation of the updated Agile guidance among projects and teams. The Agency stated it has a formal quality assurance process that includes the best practices and artifacts noted as findings in our report. While this process plays an important role, we believe SSA may also be able to use other controls to strengthen its implementation of Agile guidance.

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ABBREVIATIONS

GAO	Government Accountability Office
HCD	Human-Centered Design
IMT	Investment Management Tool
IT	Information Technology
LeSS	Large-Scale Scrum
OIG	Office of the Inspector General
OMB	Office of Management and Budget
PID	Project Identification
SSA	Social Security Administration

OBJECTIVE

Our objective was to determine whether the Social Security Administration (SSA) has implemented appropriate controls and practices to manage its Agile software development projects.

BACKGROUND

The Agile software development methodology takes an iterative approach to incrementally deliver software. Organizations use Agile processes to concurrently gather requirements as well as design, develop, and test software in small iterations. According to the Government Accountability Office (GAO), "Information obtained during these frequent iterations can effectively assist in measuring progress and allowing developers to respond quickly to feedback from customers, thus reducing technical and programmatic risk. With its emphasis on early and continuous delivery of working software, Agile can be a valuable tool for organizations in helping to mitigate schedule and budget risks."[1]

The Office of Management and Budget (OMB) requires that agency information technology (IT) investments ". . . implement an Agile development approach, as appropriate."[2] OMB also requires that agencies use appropriate measurements ". . . to evaluate the cost, schedule, and overall performance variances of IT projects."[3] Further, the *Clinger-Cohen Act* requires that the process for IT acquisitions ". . . provide the means for senior management personnel of the executive agency to obtain timely information regarding the progress of an investment in an information system, including a system of milestones for measuring progress, on an independently verifiable basis, in terms of cost, capability of the system to meet specified requirements, timeliness, and quality."[4]

SSA first used Agile development practices in Fiscal Year 2014 (October 1, 2013 to September 30, 2014). The Agency continued increasing its use of Agile, and, within 5 years, SSA had trained thousands of employees in using the Agile development method and supported dozens of Agile teams. In support of its IT modernization, SSA used Agile development to optimize processing; redesign workflows; reduce manual transactions; and improve program effectiveness and efficiency. The Agency created an Agile Resource Center to support its Agile project teams. The Agile Resource Center and Agile Lifecycle Artifact Regulatory checklist[5] provide teams a focused understanding of SSA's Agile process and governing documents. The Agency uses VersionOne software[6] to manage Agile project activities. Teams use VersionOne for daily collaboration, and management uses VersionOne for planning and performance measurement.

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[1] GAO, *GAO Agile Assessment Guide (GAO-20-590G)*, p. 7 (September 2020).

[2] OMB, *Managing Information as a Strategic Resource*, Circular No. A-130, 5.d.3.c, p. 12 (2016).

[3] OMB, *Managing Information as a Strategic Resource*, Circular No. A-130, 5.b.2.c, p. 8 (2016).

[4] *Clinger-Cohen Act*, Pub. L. No. 104-106, § 5122(b)(6) 110 Stat. 186 (1996).

[5] A system artifact is a tangible document created through the system development process.

[6] While SSA still references VersionOne, the vendor has rebranded the tool as Digital.ai Agility.

To assist in auditing SSA's Agile practices and controls, we contracted with a firm with expertise in the Agile development method. To meet our objective, with the assistance of our contractor, we interviewed Agency staff and examined SSA's policies, guidance, practices, and tools for Agile development. We also met with eight project teams and sent an anonymous questionnaire to select team members to help focus our review. Finally, we conducted in-depth reviews of three SSA projects:

- The Consolidated Claims Experience project includes: (1) a preliminary claims interview process that considers all eligibility and entitlement factors;[7] (2) a streamlined initial claims process with real-time feedback; and (3) a streamlined record update and post-eligibility process to reduce the need for manual efforts.
- The Debt Management Product will modernize SSA's debt management systems with a comprehensive solution to enable the Agency to collect, store, monitor, manage, and report program debt activity with accuracy and timeliness.
- The Hearings and Appeals Case Processing System projects that SSA is developing aims to make significant strides in its disability workloads and processes while realizing improvements across all levels of the disability adjudication process.

See Appendix A for additional information about our scope and methodology.

RESULTS OF REVIEW

SSA implemented some appropriate controls and practices to manage its Agile software development projects. However, we identified opportunities for the Agency to improve its controls, implement additional controls, and mature its use of the Agile methodology. Specifically, we found the following:

- SSA's Agile guidance was incomplete, and projects did not always follow Agile best practices or enforce key controls.
- SSA did not meet one of the core Agile principles for early and continuous delivery of valuable software to customers.
- SSA did not ensure data from its Agile project management tool were reliable.
- SSA needs to improve Agile training for teams and executives.
- SSA needs to improve its decisionmaking, gain efficiencies, and better position staff for Agile success.

Improvements in these areas could provide SSA and taxpayers greater benefits from the Agile development method, including higher quality software developed faster and at a lower cost.

[7] SSA integrated its Preliminary Claims System project into its Consolidated Claims Experience project. We audited the Agency's development of its Preliminary Claims System to determine whether SSA complied with its Agile software development methods and industry best practices. Refer to SSA, OIG, *Development of the Preliminary Claims System, A-14-20-50912*.

The Agency Established Guidance and Controls to Manage Agile Development

SSA put substantial effort into implementing and managing Agile development and used many appropriate Agile practices Agencywide and within Agile teams. For example, SSA developed its Modern Development Environment to modernize the Agency's application-development practices.[8] SSA also invested in the VersionOne tool and its Agile Resource Center to provide staff with helpful guidance on the Agile lifecycle, standards, and best practices.

The Agency implemented controls related to quality assurance, such as establishing a team that reviewed Agile projects to ensure project managers complete mandatory documentation, including an Agile Best Practices checklist. Further, the Agency developed a Quality Assurance Review Checklist that included activities throughout the life of projects. Finally, SSA's VersionOne administrators developed a data integrity report to help manage projects by identifying potential issues with project data.

The Agency Had Not Developed Guidance on Agile Scaling Frameworks and Practices

Agile development uses small, focused teams to build software. However, the Government often faces large and complex challenges. Agile scaling frameworks[9] help larger, multi-team programs consistently and predictably deliver high-quality software in a predictable way. According to our contractor, most Agile practitioners agree that effectively coordinating work between multiple teams requires a scaling framework or collection of patterns[10] to implement Agile practices throughout the organization. Incomplete and counter-productive coordination could lead to delays and a low degree of accuracy in forecasting. For example, teams may deliver different pieces of functionality at different times, which makes it difficult for SSA to deploy coordinated software releases.

[8] The Modern Development Environment is a suite of tools that provides automated code management, testing, packaging, and deployment.

[9] Organizations use Agile scaling frameworks to apply Agile practices to large, complex organizational structures. Agile scaling frameworks prescribe a specific set of activities, documentation, and (sometimes) roles.

[10] "A repeatably applicable solution to a problem that arises in a specific context." Mohammed Rowther, *Scaling Patterns*, Efficient Agile, efficientagile.com (September 15, 2020).

Although SSA engaged in large, multi-team Agile projects, the Agency's guidance is focused on single team-level Agile frameworks and does not discuss how to scale beyond this level. We identified instances where teams assigned to large projects did not observe important scaling practices. For example, although teams for one project we reviewed coordinated with one another, they maintained multiple backlogs and schedules in the VersionOne tool. Agile scaling framework practices call for maintaining a single backlog across multiple teams.[11] According to our contractor, multiple schedules limit the possibilities for aggregated reporting, and multiple backlogs cause less effective coordination. In addition, teams for another project formed around software structural components, so no single team could independently deliver working software to a user.[12] Agile scaling frameworks propose cross-functional teams with a greater mix of skills and abilities to define, build, and test ideas in a working product.[13]

Agile scaling frameworks also call for a higher-level portfolio management system to track dependencies (for example, one system might require that another system be in place before the first system can be implemented) and help align strategy and execution by identifying, communicating, and governing the selection of large and strategic initiatives.[14] A large number of concurrent projects strain an organization's ability to support these efforts. Portfolio management systems use visualization and flow management to help leadership understand project capacity and demand. SSA had not leveraged the strategic portfolio planning capabilities of VersionOne or an alternative tool. Using these capabilities could improve management's strategic planning and allow management to better manage capacity and demand over time.

We recommend that SSA select and adopt an Agile scaling framework that defines roles and establishes minimum and recommended practices and documentation. We also recommend that the Agency leverage strategic-level portfolio planning capabilities like those of VersionOne to help ensure the Agency eliminates duplication of effort and optimizes its use of staff.

[11] For example, the Large-Scale Scrum (LeSS) framework states, "Multiple teams building a single product work from a single Product Backlog that defines all of the work to be done on the product. They do not each have their own Product Backlog." The LeSS Company B. V., *Product Backlog*, LeSS.works (February 8, 2022).

[12] Examples of architectural components include user interfaces, data access, and computations.

[13] *Agile Teams*, SAFe, scaledagileframework.com (September 27, 2021). The LeSS Company B. V., *Teams*, LeSS.works (May 4, 2022). GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 172 (September 2020).

[14] *Portfolio Kanban*, SAFe, scaledagileframework.com (May 4, 2021).

The Agency Did Not Always Apply Agile Best Practices

Best practices can help organizations manage and mitigate challenges when they transition to Agile development. According to GAO, "Agile, as a concept, is not prescriptive; however, when applied to an organization, it may be."[15] Agencies should be able to show that they have implemented best practice concepts or explain why excluding these concepts does not introduce unacceptable risk.[16] SSA developed flexible Agile guidance, but it did not sufficiently mandate, and its quality assurance processes did not sufficiently enforce, use of some key Agile best practices. Without consistent implementation of best practices, projects could face delays, inaccurate forecasts, quality control issues, and rework. SSA could also lose opportunities for continuous improvement. We identified instances where SSA did not follow key Agile best practices related to:

- delivery of planned work;
- appropriate development of system requirements, capabilities, and features;
- size and composition of Agile teams;
- definition of team policies and other basic practices;
- lessons learned;
- human-centered design practices;[17]
- testing; and
- peer reviews.

For more detailed conditions, effects, and applicable criteria, refer to Appendix B.

We recommend the Agency improve its Agile development guidance to address the key best practices we noted. In addition, we recommend that SSA strengthen its controls to more effectively enforce implementation of the updated Agile guidance among projects and teams.

The Agency Did Not Always Ensure Incremental Delivery

The Agile Manifesto includes frequent delivery of working software as one of its principles.[18] According to GAO, "Information obtained during these frequent iterations can effectively assist in measuring progress and allowing developers to respond quickly to feedback from customers, thus reducing technical and programmatic risk."[19]

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[15] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 10 (September 2020).

[16] GAO, *Agile Assessment Guide* (GAO-20-590G), p. 27 (September 2020).

[17] Sometimes referred to as user-centered design, human-centered design is a framework that integrates a set of practices to understand users.

[18] Agile Manifesto, *Principles Behind the Agile Manifesto*, agilemanifesto.org (May 4, 2022).

[19] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 7 (September 2020).

However, the Agency did not always plan to deploy functionality to end-users iteratively and incrementally. For example, SSA was building and testing one project we reviewed only up to a pre-production environment but did not plan to release the software to end-users until it developed functionality nearly equivalent to the corresponding legacy systems it was supposed to replace. SSA had considered using an Agile incremental approach to deliver new features sooner but concluded that technical constraints to synchronize the legacy and new systems would increase costs. However, our Agile experts believed SSA's selected approach was riskier and would cost more than SSA anticipated.

In addition, SSA did not effectively develop and incrementally deploy a second system we reviewed. The Agency deployed a pilot system into production but did not design the new system to be integrated into the legacy system. SSA subsequently withdrew the software from production and planned to incorporate it into the deployment of a future project.

New software could offer many benefits, from ease of use to improved reliability or faster processing. When organizations do not develop and deploy systems to end-users incrementally, the organizations bear increased development risks and forego the software's benefits until the new software is complete. If the Agency cannot complete a project or moves in a different direction, it could lose multi-year investments with no software in production to show for it. According to our contractor, the Agency should build software for legacy migration in a way that can be quickly deployed to end-users and then gradually and incrementally upgraded with new features, replacing legacy functionality piece by piece. Projects should also focus on operational cost and risk reduction. With its emphasis on early and continuous delivery of working software, Agile can be a valuable tool to help organizations mitigate schedule and budget risks.

We recommend SSA ensure its system environment, architecture, and design support incremental delivery to production. Further, we recommend the Agency revise its policies and procedures to require incremental delivery of systems to users whenever possible. Finally, we recommend SSA prioritize the incremental replacement and retirement of costly legacy systems and/or those approaching end-of-life for vendor support.

The Agency Could Improve VersionOne Data Reliability

SSA used VersionOne software to manage its Agile projects and established guidance for VersionOne data governance. However, the Agency lacked effective training and enforcement of standards to ensure data consistency. As a result, inconsistencies in VersionOne produced unreliable data that limited the Agency's ability to properly manage Agile projects from the team to executive levels.

SSA did not enforce some foundational elements for VersionOne data reliability and consistency, including:

- Teams did not always use strict and consistent structures of project features and requirements, which are foundational to VersionOne operations and on which developers based the software's more advanced capabilities.

- SSA's configuration of a VersionOne feature that allowed teams to skip some workflow steps, making it unclear whether certain progress data were accurate.[20] In addition, the Agency did not enforce teams' recording of estimated resource requirements in VersionOne. For example, some project staff did not record the estimated number of hours or level of effort for some completed requirements.[21] This lack of data could affect team planning and forecasting, since resources used to complete these requirements would not be reflected in certain team performance metrics. GAO's Agile Assessment Guide states:

> Management should ensure that the processes for measuring performance are established and used consistently over time, including establishing procedures, monitoring the establishment and use of performance metrics, and taking the necessary corrective actions . . . management needs to have information to hold an Agile program accountable."[22] "[M]etrics should be captured, to the greatest extent possible, by automated tools already in use by a program, such as Agile program management suites . . . The data collected should be evaluated for its completeness, comprehensiveness, and correctness to ensure that it is suitable for its intended purpose. Otherwise, data can mislead decision makers instead of accurately informing them about the program's status.[23]

VersionOne inconsistencies could cause teams to struggle with work commitments, dependencies, and coordination and could prevent the collection of reliable management information, leading to inaccurate estimates and reports. If the Agency does not properly estimate the amount of resources required for software releases, project teams may not be able to achieve milestone dates without working overtime or reducing the scope of releases, which could ultimately result in cost and schedule overruns.

High-quality VersionOne data could also improve the Agency's capital planning process and strategic decisionmaking. For example, SSA could use VersionOne data visualization and statistical methods to forecast key milestone dates, estimate budgetary needs, or capture strategic roadmaps. The Agency used its Investment Management Tool (IMT) to manage its IT investments, and the Agency had started to link VersionOne and IMT projects. By incorporating reliable VersionOne data into IMT, SSA could enhance the quality of investment management data and decisionmaking since VersionOne data would be based on real-time, actual project results. More consistent data between IMT and VersionOne could also improve efficiency and reduce overhead in maintaining data in the two systems. For example, the Agency could better align IMT work breakdown structures with VersionOne project structures.

We recommend SSA develop, document, implement, and enforce appropriate VersionOne standards informed by best practices, including those we identified. We also recommend SSA create a standard centralized set of VersionOne reports at the program and portfolio levels.

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[20] VersionOne's "quick close" feature can bypass workflow steps to quickly close or clean up tasks. Based on SSA's implementation of "quick close," we could not determine whether SSA properly accepted and completed tasks.

[21] SSA measures the level of effort using points. The Agency requires that teams estimate points for all "stories," which are high-level system requirements.

[22] GAO, *Agile Assessment Guide (GAO-20-590G)*, pp.158 and 159 (September 2020).

[23] GAO, *Agile Assessment Guide (GAO-20-590G)*, p.162 (September 2020).

The Agency Could Improve Agile Training and Coaching

GAO's *Agile Assessment Guide* states that all Agile team members should have appropriate training, since Agile techniques differ from those used under other development programs.[24] All team members and personnel involved in Agile development should understand Agile requirements and best practices to ensure they achieve Agile's full benefit.

Team-level Training and Agile Coaches

While SSA required some Agile training and made additional training available, it did not appear to sufficiently or consistently prepare some personnel to effectively engage in Agile practices and use Agile tools. For example, the level of training provided to new team members on one project did not sufficiently address the wide spectrum of skills needed to successfully deliver the project. Another project team had an onboarding guide and stated they had processes to ensure appropriate training. However, the project team had not created or mandated a formalized Agile training plan after the initial project kickoff. Stakeholders for another project indicated that VersionOne training was provided as needed, and SSA stated that team members may also attend the optional monthly VersionOne consultation days. Insufficient and inconsistent training may have contributed to staff not applying some Agile best practices and not using VersionOne to its full potential.

It also appeared that SSA over-depended on Agile coaches to provide teams with Agile-related knowledge, and there were no policy standards for coach involvement. In addition, there were indications that coaches did not spend sufficient time with their teams or have sufficient expertise in a particular Agile methodology used at SSA.[25] As a result, we noted a significant disparity in how well different teams adopted Agile practices. Further, SSA lacked technical practice coaches, which could help teams adopt new and highly effective techniques that improve quality and shorten learning curves.

During our fieldwork, SSA Agile project staff indicated it would be helpful to have a high-level training document available that explained the Agency's Agile process. Agile teams may need to engage with individuals who do not have Agile experience to address project needs, and such a document could facilitate working with these individuals.

We recommend SSA evaluate its Agile training content and requirements to ensure team members can apply Agile best practices to their work and meaningfully contribute to the development process. We further recommend the Agency institute a program of technical practice coaching and bolster the number of Agile coaches as well as knowledge and experience requirements.

[24] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 44 (September 2020).

[25] Kanban has distinct differences from other popular Agile methodologies, primarily the fact that it is not based on time boxed iterations, but rather allows for continuous prioritization and delivery of work. GAO, *Agile Assessment Guide* (GAO-20-590G), pp. 173 and 174 (September 2020).

Executive-level Coaching

The fact that SSA had not leveraged VersionOne's strategic-level portfolio planning capabilities may indicate a need for Agile training and coaching for strategic planning at the executive, project manager, and staff levels. In addition, insufficient executive-level Agile training and coaching reduces management's ability to plan an effective Agile transition on an Agency level. Such transformation could unlock the true potential of Agile methods at SSA. Leadership may not fully appreciate the need to adopt Agile methods and the extensive changes to mindsets, behaviors, and leadership style this entails.

We recommend SSA institute a program of executive-level Agile coaching. Such coaching should differ from practitioner-level training, and could emphasize, for example, mindsets and behaviors, delegating decisionmaking to the appropriate level based on risk, and scope, cultural change, and new Agile-related approaches.

CONCLUSION

SSA stated it plans to update its Agile guidance to include a scaling framework, a clearer definition of processes and roles, and additional guidance and training on VersionOne features. The Agency is researching best practices for the governance on a scaling framework. SSA is also reviewing Agile roles and identifying efforts and duties associated with those roles. Finally, the Agency is coordinating with VersionOne staff on SSA's configurations in the tool and planning additional training on VersionOne features. While SSA made a substantial commitment to Agile, we identified several areas where the Agency could improve its Agile development management and practices. By implementing the recommendations below, SSA can improve project data, decisionmaking, software, and public service.

RECOMMENDATIONS

We recommend that SSA: [26]

1. Select and adopt an Agile scaling framework that defines roles and establishes minimum and recommended practices and documentation.
2. Leverage strategic-level portfolio planning capabilities, like those of VersionOne.
3. Revise Agile development guidance to require implementation of and controls over key best practices, including those we described.
4. Strengthen its controls to more effectively enforce implementation of the updated Agile guidance among projects and teams.
5. Ensure its system environment, architecture, and design support incremental delivery to production.
6. Revise policies and procedures to require incremental delivery of systems to users whenever possible.

[26] Our audit of SSA's Preliminary Claims System project, which used Agile development, provides additional context for our recommendations. Refer to SSA, OIG, *Development of the Preliminary Claims System, A-14-20-50912*.

7. Prioritize the incremental replacement and retirement of costly legacy systems and/or those approaching end-of-life for vendor support.
8. Develop, document, implement, and enforce additional VersionOne standards informed by best practices, including those we identified.
9. Create a standard centralized set of reports at the program and portfolio level.
10. Evaluate its Agile training content and requirements to ensure team members can apply Agile best practices to their work and meaningfully contribute to the development process.
11. Institute a program of technical practice coaching and bolster the required knowledge and experience necessary to take on the role of Agile coach.
12. Institute a program of executive-level Agile coaching.

AGENCY COMMENTS

SSA agreed with all recommendations except Recommendation 4. The Agency stated it has a formal quality assurance process that includes the best practices and artifacts noted as findings in our report. See Appendix C for the full text of SSA's comments.

OIG RESPONSE

We recognize that SSA has a quality assurance process for Agile projects. However, as noted in Appendix B, we identified many instances where Agile teams had not followed best practices. Therefore, the Agency needs to strengthen its controls to ensure consistent implementation of Agile best practices. While SSA's quality assurance process plays an important role, the Agency may also be able to use other controls to strengthen its implementation of Agile guidance.

Michelle L. Anderson
Assistant Inspector General for Audit

APPENDICES

Appendix A –SCOPE AND METHODOLOGY

To accomplish our objective, we:

- Reviewed applicable Federal laws, regulations, and guidance related to use of Agile software development and project management, including the following:
  - The Government Accountability Office's (GAO) *Agile Assessment Guide*, *Best Practices for Agile Adoption and Implementation,* GAO-20-590G, September 2020.
  - GAO's *Cost Estimating and Assessment Guide, Best Practices for Developing and Managing Program Costs*, GAO-20-195G, March 2020.
  - GAO's *Schedule Assessment Guide, Best Practices for Project Schedules*, GAO-16-89G, December 2015.
  - Office of Management and Budget, Circular No. A-130, *Managing Information as a Strategic Source*, July 2016.
  - The *Clinger-Cohen Act*, Pub. L. No. 104-106, 110 Stat. 186 (1996).
- Reviewed the Social Security Administration's (SSA) policies, procedures, and documentation pertaining to Agile Software development, including the Office of Systems' *Project Management Guidebook*, August 2019, and those available on SSA's Agile Resource Center Intranet site.
- Reviewed Agile frameworks and industry best practices, including the following:
  - *Manifesto for Agile Software Development*, agilemanifesto.org.
  - *The Scrum Guide*, scrumguides.org.
  - *The Scaled Agile Framework*, www.scaledagileframework.com.
  - *Large Scale Scrum*, LeSS.works.
- Obtained information related to SSA's use of Agile from Agency staff from SSA's Office of Systems through interviews and email exchanges on these eight projects:
  - Consolidated Claims Experience (Project ID [PID] 9331).[1]
  - Data Exchange Product for eConsent Based SSN Verification (PID 9563).
  - Debt Management Product (PID 9653).
  - External Collection Operation/Billing/Remittance (PID 9919).
  - Employer Wage Reporting Journey (PID 9530).

[1] SSA integrated its Preliminary Claims System project into its Consolidated Claims Experience project. We audited SSA's development of its Preliminary Claims System to determine whether SSA complied with its Agile software development methods and industry best practices. Refer to SSA, OIG, *Development of the Preliminary Claims System, A-14-20-50912*.

- Enterprise Authentication & Authorization for Entities & Affiliates for eConsent Based Social Security Number Verification (PID 9549).
- Hearings and Appeals Case Processing System (PID 9320).
- *my* Social Security – Individual Dev (PID 9951).

- Met with SSA project teams for these eight projects and sent anonymous questionnaires to select team members to refine our methodology and review.

- Examined electronic project documentation in SharePoint, Confluence, the Investment Management Tool, VersionOne, Jenkins, and Bitbucket, including in-depth reviews of:

  - Consolidated Claims Experience (PID 9331),
  - Debt Management Product (PID 9653), and
  - Hearings and Appeals Case Processing System (PID 9320).

To assist in conducting our audit, we contracted with a firm with expertise in Agile. We also used our contractor's Agile Audit Framework and checklist, in combination with GAO's *Agile Assessment Guide*, to perform our fieldwork. The Agile Audit Framework and checklist document a collection of Agile best practices and controls. Together, these documents provided a methodology for performing audits on large-scale Agile software development efforts and facilitated testing of the following 11 control areas:

1. Agile Methods and Frameworks;
2. Agile Requirements;
3. Forecasting, Scheduling and Planning;
4. Metrics and Tracking;
5. Risk Management;
6. Human Resources Management / Staffing;
7. Human Centered Design / Stakeholder Management;
8. Quality and Test Automation;
9. DevOps;
10. Agile Architecture; and
11. Procurement Management.

Our experts evaluated SSA's project data to test the Agency's application of Agile best practices within its Agile development projects. We assessed the reliability of project data by examining data from the multiple sources identified above and interviewing Agency staff from project teams, Agile project management software administration, and Agile development governance. We also obtained written feedback through SSA's audit liaison as we developed our findings. Based on all of our work, we determined the data used for our audit were sufficiently reliable to meet our objective. We identified ambiguity in certain progress data and inconsistencies in VersionOne data regarding project structures and estimates that prevented the reliable aggregation of data across projects. We noted these findings within our report and provided recommendations for corrective action.

We conducted our audit from December 2020 through January 2022. The principal entity reviewed was the Office of the Deputy Commissioner for Systems.

We assessed the significance of internal controls necessary to satisfy the audit objective. This included an assessment of the five internal control components, including control environment, risk assessment, control activities, information and communication, and monitoring. In addition, we reviewed the principles of internal controls associated with the audit objective. We identified the following four components and five principles as significant to the audit objective.

- Component 1: Control Environment
  - Principle 4: Demonstrate Commitment to Competence
- Component 3: Control Activities
  - Principle 10: Design Control Activities
  - Principle 11: Design Activities for the Information System
  - Principle 12: Implement Control Activities
- Component 4: Information and Communication
  - Principle 13: Use Quality Information
- Component 5: Monitoring
  - Principle 16: Perform Monitoring Activities
  - Principle 17: Evaluate Issues and Remediate Deficiencies

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

Appendix B – Instances Where the Agency Did Not Apply Agile Best Practices

Use of best practices can help organizations manage and mitigate the challenges in transitioning to Agile development. Agencies should be able to demonstrate best-practice concepts have been implemented or explain why exclusion of these concepts does not introduce unacceptable risk.[1] The Social Security Administration (SSA) developed flexible Agile guidance but did not sufficiently mandate, and its quality assurance processes did not enforce, use of some key Agile best practices. Without consistent implementation of best practices, projects could face delays, inaccurate forecasts, quality control issues, and rework. SSA could also miss out on opportunities for continuous improvement.

We identified instances where SSA did not follow key Agile best practices related to:

- deliver planned work;
- appropriate development of system requirements, capabilities and features;
- the size and composition of Agile teams;
- the definition of team policies and other basic practices;
- lessons learned;
- human-centered design (HCD) practices;[2]
- testing; and
- peer reviews.

[1] Government Accountability Office (GAO), *Agile Assessment Guide* (GAO-20-590G), p. 27 (September 2020).

[2] Sometimes referred to as user-centered design, human-centered design is a framework that integrates a set of practices to understand users.

Deliver Planned Work

Condition

Agile teams did not consistently deliver planned work during sprints.[3] For example, one project had user stories[4] stuck in development for months without explanation. It appeared that another project had never fully met its sprint goals, consistently delivering between 60 and 75 percent of their sprint backlog items. VersionOne reports also indicated a significant gap between planned and completed work for another project we reviewed.

Effect

Unmet sprint commitments could delay the achievement of milestones, introduce quality control issues, and cause team apathy. Stories moved from sprint to sprint create inconsistencies in team velocity,[5] which could make forecasting less accurate.

Criteria

SSA's *Agile Resource Center* states that an output of sprint execution is meeting the sprint goal.[6] Both the Scrum and Extreme Programming[7] methods promote the principle of "sustainable delivery pace." The Scrum Guide states that ". . . the Scrum Team commits to achieving its goals and to supporting each other. Their primary focus is on the work of the sprint to make the best possible progress toward these goals."[8] GAO's *Agile Assessment Guide* states, "Development is broken down into time boxed iterations called sprints, where teams commit to complete specific requirements," and "Agile teams maintain a sustainable development pace."[9] According to our contractor, Kanban[10] is more flexible, but it requires specific disciplines to be observed.

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[3] Sprints are time-boxed iterations, where teams commit to complete specific requirements. GAO, *Agile Assessment Guide* (GAO-20-590G), p. 11 (September 2020).

[4] A user story is a high-level requirement definition written in everyday or business language. GAO, *Agile Assessment Guide* (GAO-20-590G), p. 178 (September 2020).

[5] Velocity measures the amount of work a development team can do during a sprint. Agile Academy, *Velocity in Scrum – Definition and how you can calculate it,* agile-academy.com (May 11, 2022).

[6] SSA, Agile Resource Center, Sprint Execution (May 5, 2022).

[7] Extreme Programming is an Agile software development framework that aims to produce higher quality software, and higher quality of life for the development team. Extreme Programming is the most specific of the Agile frameworks regarding appropriate engineering practices for software development.

[8] Schwaber, Ken and Jeff Sutherland, *The Scrum Guide*, p. 4 (November 2020).

[9] GAO, *Agile Assessment Guide (GAO-20-590G)*, pp. 11 and 64 (September 2020).

[10] Kanban's focus is to optimize the throughput of work by visualizing the flow of work through the process, limiting work in progress, and explicitly identifying policies for the flow of work. Kanban has distinct differences from other popular Agile methodologies, primarily the fact that it is not based on time-boxed iterations but, rather, allows for continuous prioritization and delivery of work. GAO, *Agile Assessment Guide* (GAO-20-590G), pp. 173 and 174 (September 2020).

Appropriate Development of System Requirements, Capabilities, and Features

Condition

Agile teams did not always develop requirements, capabilities, and features appropriately. Specifically, coarse-grained capabilities and features in VersionOne for two projects we reviewed did not capture the entire project scope and were not sized appropriately. Another team expressed many backlog items from a developer point of view, missing the business value to users.

Effect

Improperly formed user stories may be more fragile and difficult to test, which would likely reduce system quality. Inadequate definition of capabilities and features in VersionOne indicates projects may take longer than projected, and increased stress on teams could lead to reduced system quality. Without capturing entire project scopes, SSA cannot produce accurate forecasts. Further, when teams develop technology-focused user stories, they increase the risk of not "building the right thing," which could lead to significant rework when the system becomes available to users.

Criteria

SSA's *Agile Resource Center* states "Defining the scope of any project . . . is the most important step" and "The main objective of scope definition is . . . to define what the effort will deliver to meet the needs of the customers and the market."[11] GAO's *Agile Assessment Guide* states that "In an outcome-based Agile environment, the [work breakdown structure] is hierarchical, product-based, and contains the total program scope."[12] In *Scaling Software Agility*, Dean Leffingwell recommends that large Agile teams create two kinds of plan: (1) a coarse-grained plan: the release plan and (2) a series of fine-grained plans.[13] Finally, Max Rehkopf explains that "A user story is an informal, general explanation of a software feature written from the perspective of the end user. Its purpose is to articulate how a software feature will provide value to the customer."[14] SSA requires that user stories are "Fully written to include the proper format (who, what and why)."[15] The Agency also requires a story point estimate for each story.[16]

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[11] SSA, *Agile Resource Center, Scope and Product Roadmap* (May 5, 2022).

[12] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 119 (September 2020).

[13] Dean Leffingwell, *Scaling Software Agility: Best Practices for Large Enterprises* (2007).

[14] Rehkopf, Max, *User Stories with Examples and a Template*, Atlassian Agile Coach, atlassian.com (February 3, 2022).

[15] SSA, *Agile Resource Center, Sprint Planning* (May 5, 2022).

[16] SSA, *VersionOne Data Governance, Version 2.0*, p. 4 (October 2018).

Size and Composition of Agile Teams

Condition

SSA created large and imbalanced teams. For example, teams for one project had too many developers relative to the number of business analysts and subject-matter experts. Teams for another project had between 14 and 20 members,[17] and stakeholders identified risks that teams had too many developers for the number of subject matter experts. One projects' teams had as many as 48 full- and part-time members, and stakeholders identified a risk of "Not enough subject matter expert (developers and analysts) support for Benefit domain." For a different project, 6 of the 8 teams had at least 12 members, including a team with 18 members and a team with 24 members. Finally, some personnel worked on multiple teams.

Effect

Teams that are too large could suffer from coordination and collaboration challenges. When there are too many developers on a team, they may perform many different tasks simultaneously without being aware of one another's work. A large number of team members can make meetings long and unproductive. In addition, quality often suffers in larger teams. The senior team members may spend so much time coordinating that they do not have much time to spend reviewing other's work or mentoring them.

Imbalanced teams also pose serious risks. A lack of subject matter experts could lead to overbuilding and waste and require subsequent refactoring and replacement.

When personnel work on multiple projects and teams, inconsistent team size could cause inconsistent team velocity. Inconsistent velocity inhibits the ability to appropriately plan upcoming sprint workloads and manage expectations for milestone delivery and roadmaps.

Criteria

The Scrum Guide specifies that teams should have 3 to 10 people.[18] The Scaled Agile Framework increases that to 5 to 11 individuals.[19] According to our contractor, most Kanban experts strive for a team size of 20 or fewer individuals. GAO states "Team stability, where team members are dedicated to the team and do not move in and out of the team, is important to ensure consistent productivity. Frequently shifting resources within a team, or between teams, can undo learning and shift team dynamics and skills, thereby diminishing the team's ability to meet commitments."[20]

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[17] Team members do not all reflect a full-time dedication. To determine the team sizes, our approach was to pull all the Tasks associated with a given Team and given Sprint, then pivot to determine a list of participating Team members.

[18] Ken Schwaber and Jeff Sutherland, *The Scrum Guide*, p. 5 (November 2020).

[19] Scaled Agile, *Agile Teams*, SAFe, scaledagileframework.com (May 4, 2022).

[20] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 32 (September 2020).

Definition of Team Policies and Other Basic Practices

Condition

One project's Kanban teams did not observe basic Kanban practices, such as the following:

- Visualizing the work - It appeared that teams did not use visual blockers,[21] even in cases where a user story had been in development for longer than 300 days.
- Limiting work in process and managing flow – Teams had not addressed stories stuck "in development" for longer than 3 months (for example, by splitting out a spike[22] or splitting the story). All the team storyboards[23] we reviewed had several user stories or defects in development with cycle times that greatly exceeded the 10-day objective, without any blocking indicator or links or comments indicating the reason for the delay.
- Making policies explicit – Although the Kanban teams documented basic policies like the definitions of "done" and "ready," the teams needed additional policies since Kanban does not have the natural discipline of a sprint timebox. To illustrate, examples of the types of policies we looked for but did not identify include:
  - Before picking up a new piece of work, looking for something that is blocked or in danger of exceeding our cycle time targets and see if you can help.
  - Triaging new work before starting it to determine whether some later piece of the work might be blocked for some reason due to a down- or upstream dependency. If that is the case, do not start on that work.
  - Meeting with subject-matter experts 4 hours every Thursday morning to replenish the "next up" column (backlog refinement).
- Implementing feedback loops – Kanban teams did not appear to hold retrospective meetings to reflect on what went well and what could be improved.

[21] A blocker is a visual icon to represent a task that is unable to move forward. Arnab Chowduy, *Agile Metrics: The 15 That Actually Matter for Success*, Plutora, plutora.com (February 22, 2021).

[22] A spike can serve as a placeholder user story that represents research a team must undertake to better understand a user story and thereby more effectively estimate its size. GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 86 (September 2020).

[23] Storyboards show all stories in an iteration and track the status of stories in a highly visible way. *Using Storyboards*, Digital.ai Agility, (May 6, 2022).

Effect

The effects of not observing basic Kanban practices likely include:

- significant and ongoing quality problems;
- inability to meet milestones;
- the need to frequently back out production deployments and/or make emergency patches;
- apathy and lack of engagement on the part of the team members; and
- knowledgeable staff like product managers, product owners, and subject matter experts, becoming disillusioned and disengaged.

Criteria

SSA's Kanban Guidance included the following five core Kanban practices:

1. Visualize the workflow
2. Limit work in progress
3. Manage flow
4. Make process policies explicit
5. Improve continuously[24]

Lessons Learned

Condition

Some teams did not regularly hold lessons-learned meetings, called retrospectives under Agile. For example, as mentioned above, Kanban teams did not appear to be holding retrospectives. In addition, another project team stopped recording retrospectives in 2020. The Agency also did not have a centralized repository to aggregate lessons learned during Agile projects.

Effect

Teams miss out on opportunities for continuous improvement. Rather than finding and addressing root causes, the same issues may occur repeatedly.

[24] SSA, *Agile Resource Center, Kanban Guidance* (February 3, 2022).

Criteria

A principle of the Agile Manifesto states "At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly."[25] Also, according to GAO, teams should hold a retrospective meeting at the end of each iteration to reflect on what went well and what could be improved for the next iteration. For Kanban, retrospectives should be held at an agreed-on interval because work is not organized by iterations.[26] SSA requires sprint retrospectives at the end of every sprint. Teams must define and prioritize two to three actionable items based on each retrospective, but the Agency does not require posting outcomes in the team repository.[27]

Human-centered Design Practices

Condition

SSA did not consistently use key HCD practices. Although we noted very good customer discovery work early in a project, we did not identify continued use of journey maps[28] and personas[29] SSA had already defined. In addition, another project we reviewed did not appear to identify or weave personas into user stories.

Effect

Teams could develop technology-focused user stories, increasing the risk of not ". . . building the right thing," which could lead to significant rework when the system becomes available to users. Lack of persona use contributes to improperly formed user stories, which may be more fragile and difficult to test, likely reducing system quality.

Criteria

Our contractor defined HCD as an approach to interactive systems development that aims to make systems more usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, usability knowledge, and other specific practices. HCD is an important Agile discipline that is compatible with all team-level and scaled methods.

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[25] Agile Manifesto, *Manifesto for Agile Software Development*, agilemanifesto.org, last principle (May 4, 2022).

[26] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 44 (September 2020).

[27] SSA, *Agile Resource Center, Sprint Retrospective* (May 5, 2022).

[28] A journey map is a visualization of the process that a person goes through in order to accomplish a goal. Sarah Gibbons, *Journey Mapping 101*, Nielsen Normal Group, nngroup.com (December 9, 2018).

[29] A persona is a detailed real or hypothetical description of a typical end-user of the product the team is developing. Salimi Sohrab, *Persona*, Agile Academy, agile-academy.com (February 4, 2022).

Testing

Condition

Two of the projects we reviewed used minimal behavior-driven design tests, a test-first practice to provide built-in quality.[30] One project team stated it was trying to better assess the test coverage and status.

Effect

Testing could take longer and be less stable. A lack of behavior-driven design tests could also increase the risk of building features that do not precisely match the actual end-user requirements. Ultimately, system quality could be reduced.

Criteria

GAO identifies testing as a best practice for Agile requirements management.[31]
Without automated build and testing tools, programs may experience challenges in delivering the product on time and may have a limited assurance of product quality.[32]

Peer Reviews

Condition

Some teams could improve their peer review processes. Specifically, relatively few peer reviews for two projects generated comments.

Effect

Teams miss opportunities to improve developer skills and shorten learning curves.

Criteria

Our contractor identified implementation of effective static verification controls as a critical element for quality assurance. This includes ensuring that effective peer review practices exist. While GAO identified some limitations of peer reviews, they also explained that peer reviews can catch errors not conceived by the initial developer, provide assurance that code will function as intended, and enhance a collective feeling of code ownership.[33]

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[30] Scaled Agile, *Behavior-Driven Development*, SAFe, scaledagileframework.com (May 9, 2022).

[31] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 80 (September 2020).

[32] GAO, *Agile Assessment Guide (GAO-20-590G)*, pp. 40 and 41 (September 2020).

[33] GAO, *Agile Assessment Guide (GAO-20-590G)*, p. 42 (September 2020). Limitations of peer reviews include limited code coverage, resource intensiveness, and that coding issues are identified after the fact.

Appendix C –AGENCY COMMENTS

SOCIAL SECURITY

MEMORANDUM

Date: August 15, 2022 Refer To: TQA-1

To: Gail S. Ennis
Inspector General

From: Scott Frey
Chief of Staff

Subject: Office of the Inspector General Draft Report, "Agile Software Development at the Social Security Administration" (A-14-20-50947) — INFORMATION

Thank you for the opportunity to review the draft report. We agree with 11 of the 12 recommendations cited in the report.

We disagree with recommendation 4. We have a formalized quality assurance (QA) process that ensures we use the most current Agile guidance and best practices. Our QA process includes the best practices and artifacts OIG noted as findings in the report. A QA reviewer monitors projects from beginning to end and, if deficiencies are found, works with the project manager (or the project manager's management chain, if necessary) to ensure resolution of those deficiencies.

Please let me know if I can be of further assistance. You may direct staff inquiries to Trae Sommer at (410) 965-9102.

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