

AGILE SCRUMBAN PROJECT MANAGEMENT IN  
IT AUDIT

by

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A THESIS

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## **An Abstract of the Thesis of**

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Title: Agile Scrumban Project Management in IT Audit

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This thesis will explore how IT Audits can be made more efficient. I will assess the improvement of IT Audits completed with an Agile Scrumban project management methodology versus the currently used Waterfall methodology. To introduce this hybrid methodology, I will first explain Agile Scrum and Kanban separately. Finally, my solution will show how Agile Scrum and Kanban project management methodologies can be combined to form Agile Scrumban and applied to IT Audit project management. Price, Time, and Quality will be key performance indicators used to show that Agile Scrumban is more efficient than the Waterfall methodology. I have chosen to customize Agile Scrumban to IT Audits because the methodology is successful in software development, a field that shares the underlying needs of adaptability due to insufficient set of requirements at the early stages of the project, and with requirements solidifying as a project progresses. A glossary is provided at the end of this Thesis to elaborate on various terms used.

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## **Introduction**

### **Internal Controls**

Committee of Sponsoring Organizations (COSO) is a joint commission formed in the United States to combat fraud. They are made up of five organizations with business expertise, consisting of the AICPA, AAA, FEI, IIA, and IMA. These organizations collaborate to create frameworks that help businesses develop internal controls and identify malpractice. According to COSO, “Internal control is broadly defined as a process, effected by an entity’s board of directors, management and other personnel, designed to provide reasonable assurance regarding the achievement of objectives...” (COSO). Establishing and adhering to guidelines enable a business to function properly. Internal controls serve that function by reducing risk and ensuring compliance. Broadly speaking, businesses use internal controls much like a pilot uses a pre-flight checklist; both parties want to ensure smooth and predictable results.

### **IT Audits**

There are over 30 regulations that require audits of internal controls. Examples include HIPAA compliance pertaining to the handling of confidential healthcare information, like hospital patient records, and PCI standards governing the processing, storage, and transmission of credit card information. Regulations require a business to show evidence of operational integrity and internal controls that protect assets. However, multiple parties, including clients, stakeholders, or the government also need evidence that a business is complying with regulations. This is known as reassurance.

There are three roles in an audit:

1. Auditor: An individual that is part of an Audit team and is competent enough to carry out the audit e.g., a staff member at a public accounting firm. Table 1 outlines the members of an audit team:

<b>Audit Team Members</b>	<b>Planning</b>	<b>Fieldwork</b>	<b>Assessment</b>
<b>Partner</b>	Oversee the audit plan	Supervise audit team fieldwork	Assess final evidence/sign the final audit report
<b>Manager</b>	Plan the audit and schedule appropriate team members	Supervise and assist in fieldwork	Review the audit report
<b>Senior</b>	Help develop audit plan and budgets	Assign tasks to Staff and manage day-to-day audit fieldwork	Inform Manager about problems
<b>Staff</b>	Read and understand planning document	Perform assigned audit procedures	Inform Senior about problems

Table 1: Audit Team Members, as referenced in the textbook Auditing and Assurance Services: A Systematic Approach (Messier)

2. Auditee: These are the subjects of an audit e.g., a data center service provider that the client uses.
3. Client: This is an individual or organization who requested the audit e.g., a healthcare provider wanting to ensure their data center is adhering to internal controls

This thesis will focus on Independent Audits that are provided by a third party, specifically, public accounting firms. Independent Audits are performed by a firm that is independent from the auditee, providing relevant parties with assurance that regulations and best practices are followed. Specifically, Auditor independence is necessary in this type of audit to reporting findings without bias, requiring that the audit team is not related in an organizational, professional, or personal manner to the Auditee. Independence conflicts threaten the objectivity of an Auditor's results and must be discussed and evaluated in scope and severity before starting an audit.



## **SOC Audits**

To keep the thesis focused, I will work with a specific type of Independent IT Audit, the Service Organization Control (SOC) audit. This audit is growing in demand due to an increase in outsourcing by businesses to service organizations. Examples of service organizations include cloud computing providers, Software as a Service (SaaS) providers, and credit card processing platforms.

## Current Project Management Methodology Used - Waterfall Model

The Waterfall model is a sequential process that divides a project into a sequence of distinct phases. However, it allows for some revisions and iterations, as shown by the bidirectional arrows in Figure 1. The first phase in an IT Audit is planning the project. Next, fieldwork is performed to gather evidence. Finally, the auditor must assess their findings. Figure 1 provides a visual of such a process.

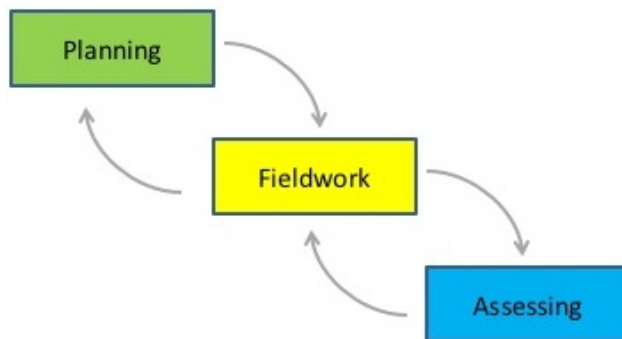


Figure 1: Traditional 'Waterfall' model depends on a thorough understanding of project requirements at the outset and minimal errors when executing each phase

### Challenges with the Waterfall Model

Although the Waterfall model provides a clear and structured way to approach and manage the project and identify milestones for progress tracking, it is inefficient where requirements are more uncertain or fluid.

Challenges with a Waterfall methodology in the context of IT Audit could include:

- Priority is placed on working sequentially, which reduces flexibility and adaptability to ongoing changes. In practice, the client's requirements are likely to change over time and should be revised in a specific and organized way
- Strong reliance on the client to define its requirements in a clear and unambiguous way at the start of the project, which is not always feasible

## Solution Part 1: Agile Scrum Project Management Model

Metaphorically speaking, I am suggesting a better way to make a wheel instead of reinventing one. “Agile” is an umbrella term used for different software development models including Scrum, Extreme Programming (XP), Crystal Clear, and Dynamic Systems Development Model (DSDM). However, the common underlying feature of these models is their iterative focus. In other words, they involve short, frequent development cycles, and deliver working software at the end of each cycle.

To understand how the Agile model works, it is important to understand the Agile Manifesto as shown in Table 2.

Agile Manifesto		
<b>Individuals and interactions</b>	Over	<b>Process and tools</b>
<b>Working software</b>	Over	<b>Comprehensive documentation</b>
<b>Customer collaboration</b>	Over	<b>Contract negotiation</b>
<b>Responding to change</b>	Over	<b>Following a plan</b>

Table 2: Items on the left are valued more than those on the right (Silveira)

Since Agile Scrum has become the project management methodology of choice in the software industry, it can also be used to develop focused and risk-based processes in IT Audit that are responsive and flexible to a client’s requirements. Risk-based processes consider known risks and anticipate future ones when constructing a logical process to reach a result. This model, if properly applied, can provide a competitive advantage in the IT Audit market.

As mentioned previously, the key to the Agile Scrum model is that an overall project is broken into a series of short cycles or iterations of approximately 2 to 4 weeks each. Figures 2 and 3 compare the Waterfall and Agile Scrum models. Note that the Agile

Scrum model comprises the same sequence of phases, but broken into repeatable iterations.

In Figure 3, I customized the Agile model for IT Audit referencing “The Art of Agile Development,” by James Shore and Shane Warden where they used the phases of planning, design, coding, testing, and deployment, which are relevant to software development. The Waterfall model displayed in Figure 2 is limited in ability to revise and iterate due to its sequential nature. Since gathering and testing evidence requires the most iterative flexibility, the Agile Scrum model is only applied to the Fieldwork portion of a SOC Audit. Kanban Project Management will also be introduced to form the complete Agile Scrumban model applicable to the entire SOC Audit process. In the Agile Scrum model, note that the first iteration is explorative and identifies key risk areas and missing parts of the audits, which are the gaps in requirements. The middle iterations continue to fill gaps in the SOC Audit by incorporating continuous client feedback. Lastly, the final iteration is meant to fine tune and complete the audit.

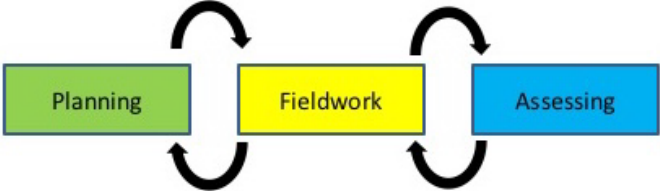


Figure 2: The Waterfall Model

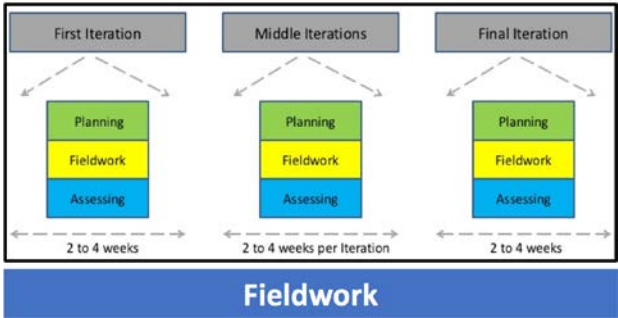


Figure 3: The Agile Scrum Model

By using such a model, an IT Auditor can operate in an environment where client requirements, especially at the start of the project, are ambiguous and/or the client’s

management claims change due to incomplete information. As the iterations progress, the client's requirements and management claims become more streamlined, making the IT Audit project output more focused and reliable.

## Scrum Model

Agile encompasses many different models with Scrum being the most popular. For this thesis, I will use concepts and language from the Scrum model. Figure 4 shows some of the key concepts used in Scrum and how the model works in practice. Each potentially shippable product increment reflects 2-4 week iterations, as seen in the previous Figure 3.

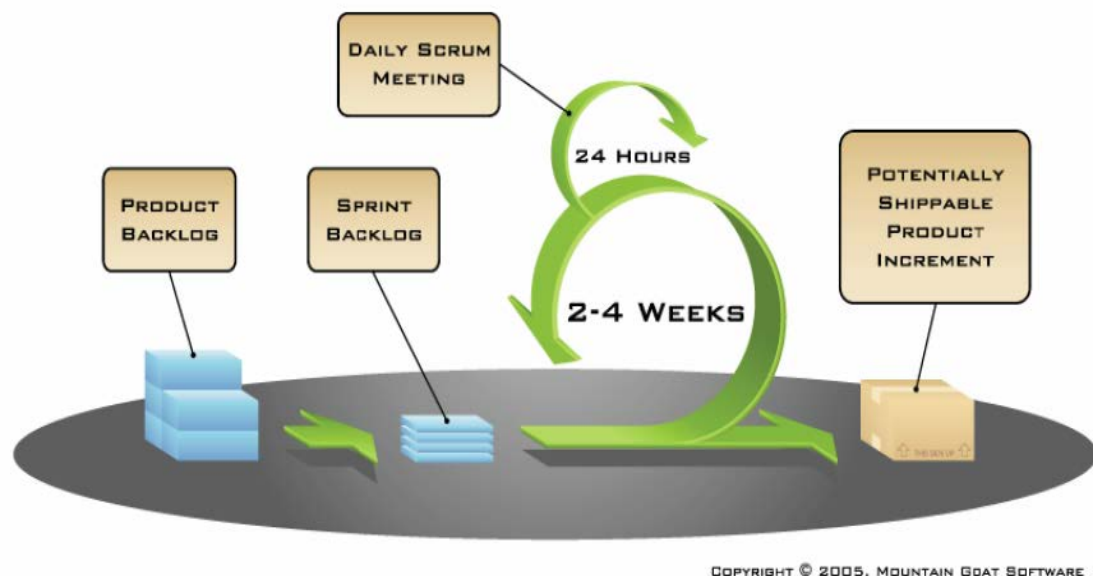


Figure 4: The Scrum model (Mountain Goat Software)

Key terms in the model include:

- *Product Backlog*: This is a prioritized list of each individual item that needs to be completed in the overall project, such as individual tasks within the Planning, Fieldwork, and Assessing steps of a SOC Audit. The Product Owner (Manager in an IT Audit context) prioritizes individual items, with a goal of achieving the best business outcome.

- *Sprint*: Each development iteration within the project, which runs for 2-4 weeks, is called a Sprint. It uses a Sprint backlog, which is a select list of prioritized items from the product backlog that need to be completed by the end of the Sprint. The Scrum Master (Senior Staff in an IT Audit Context) facilitates the Sprint, as well as daily scrum meetings. The Team (Staff in an IT Audit Context) executes the tasks.
- *Minimum Viable Product*: Each Sprint has the objective of achieving a ‘minimum viable product’ or MVP, such as a set of internal controls tested for design, which is delivered to the client for feedback.

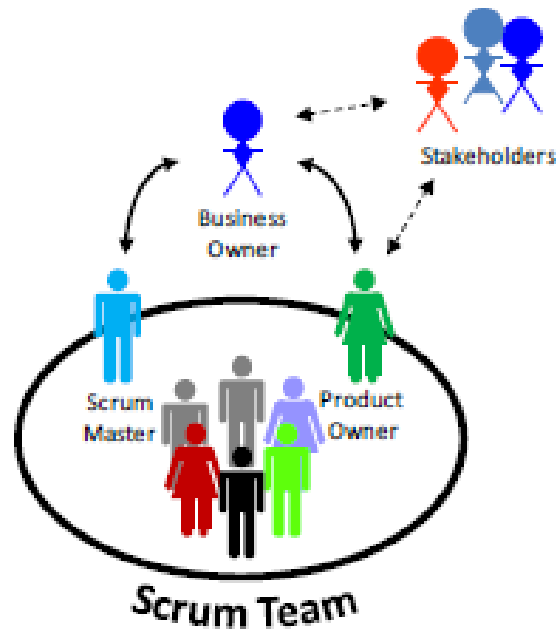


Figure 5: The Scrum team (Shimp and Rawsthorne)

The most significant part of Scrum are the Stakeholders because they requested the project and ultimately validate it. A Business Owner is not part of a Scrum team, although they manage the budget of a team and initially form the team, ultimately facilitating the interaction between a Scrum Team and Stakeholders. As show in in Figure 5, the Scrum Team includes individuals in the oval, comprised of a Product Owner, Scrum Master, and Team Members. The Product Owner manages the product backlog, Scrum Master facilitates the sprint, and Team Members perform the work needed to complete the project. These roles can be mapped to the parties involved in an Audit, as shown in Table 3:

Parties involved in an Audit	Scrum Team Members
<b>Client:</b> Request an audit	<b>Stakeholder:</b> Request the project and validate it based on needs
<b>Partner:</b> Oversee audit at a high-level	<b>Business Owner:</b> Facilitate interaction between team and stakeholder, form the team, and manage team’s budget
<b>Manager:</b> Manage the audit at an operational-level	<b>Product Owner:</b> Prioritize the list of items in a project to achieve the best business outcome
<b>Senior:</b> Manage the staff performing the audit	<b>Scrum Master:</b> Responsible for the Sprint
<b>Staff:</b> Perform work for the audit	<b>Team Member:</b> Perform work requested by Product Owner

Table 3: Audit Roles mapped to Scrum Roles

## Solution Part 2: Kanban Project Management Model

Agile Scrum is the first part of this hybrid project management system. The Agile Scrum methodology best applies to Fieldwork, which is highly iterative. Including the Kanban methodology creates an overall improvement across all three steps in the audit. The “ban” in Scrumban stands for Kanban, a project management methodology used for over 50 years. In the 1940s, Toyota sought to match inventory levels to consumption of materials. They created a system where workers passed a card, known as a “Kanban”, between different teams indicating the type/amount of materials needed. This system limited the amount of materials stuck in the WIP (work-in-process) stage by transferring materials JIT (just in time) for the next step of production (Atlassian).

Kanban is also used extensively in software development, much like Agile Scrum. It excels in matching the amount of WIP to a team’s capacity to finish work. Figure 6 shows a Kanban Board, which helps Kanban teams to visualize and optimize workflow. This tool is the main form of communication in a Kanban team because the Kanban methodology has two requirements: work must be transparently communicated and shown in real-time. The sticky notes in Figure 6 represent Kanban cards, acting like visual cues for tracking the progress of work items. Note that each column represents a vertical swimlane (step in the workflow): To do, Doing, and Done is the most basic example of a Kanban board.

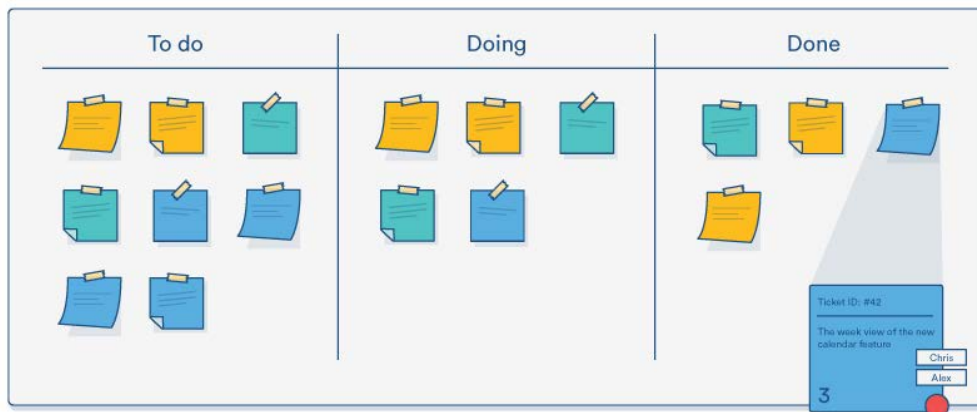


Figure 6: The Kanban model (Atlassian)



Kanban has 3 key benefits:

- Kanban helps teams to effectively plan by focusing only on work that is in progress and relying on a prioritized list of work in a backlog, like Agile Scrum. Unlike Agile Scrum, Kanban does not require fixed-length iterations, since the Product Owner simply begins work on the next item in the backlog.
- Kanban also relieves bottlenecks by limiting the amount of WIP, which reduces multitasking. Multitasking involves frequently switching between work, which decreases a team's focus by requiring additional time to set up for a new task and mentally switch contexts. Reducing multitasking in an IT Audit context will require increased collaboration with the client to ensure that the auditee provides evidence in a timely manner.
- Kanban promotes CD (continuous delivery) of work by frequently updating customers regarding the project. This advantage aligns with Kanban's JIT (just in time) philosophy of communicating work in real-time, avoiding infrequent customer updates and large amounts of unsatisfactory work.

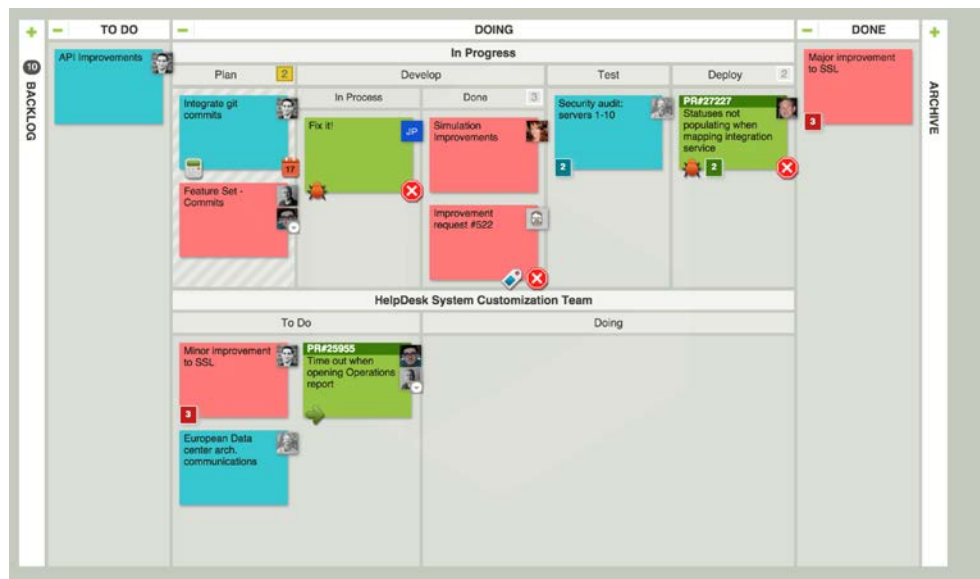


Figure 7: Vertical and Horizontal Swimlanes in Kanban (Leankit)

Swimlanes are a key part of the Kanban methodology, and they categorize the project workflow in either vertical or horizontal configurations. Vertical swimlanes represent the steps in a workflow e.g., *To Do, Doing, and Done*. Horizontal swimlanes support parallel processing for the same task, making Kanban especially useful in an IT Audit context. In the Figure 7 Kanban board example, note that two teams are working in parallel in the *Doing* step of the workflow. This lets the teams share the same *To Do* and *Done* lanes, while having the flexibility to approach the *Doing* lane in different, but appropriate ways.

Planning	Fieldwork	Assessment
Partner	Partner	Partner
Manager	Manager	Manager
Senior	Senior	Senior
Staff	Staff	Staff

Table 4: Vertical and Horizontal Swimlanes adapted to IT Audit

Broadly speaking, IT Audits have three vertical swimlanes: Planning, Fieldwork, and Assessment. However, each member of the audit team has different responsibilities within these vertical swimlanes; members work in four parallel horizontal swimlanes because each rank is responsible for different functions. For example, Partners and Managers oversee work in the planning phase, while Seniors actively work on the audit plan, and Staff perform front-end work like filling out planning documents. Each member participates in Fieldwork, with oversight assigned to Partner/Manager/Senior roles and a front-end focus for Staff roles. During Assessment, Partners assess the final evidence/sign the audit report, Managers review the audit report, and Senior/Staff roles play a supporting role.

### Solution Part 3: Agile Scrum vs Kanban

Agile Scrum and Kanban approach project management in different ways. Table 5 compares the two project management methodologies.

Characteristics	Agile Scrum	Kanban
<b>Prescribes roles</b>	<b>Prescribes 3 Roles</b> <ol style="list-style-type: none"> <li>1. Product Owner: Set product vision and prioritize backlog</li> <li>2. Team: Implement the product</li> <li>3. Scrum Master: Deals with challenges and leads the process</li> </ol>	<b>Does not prescribe roles</b>
<b>Prescribes rules to follow</b>	<b>More constraints</b> e.g., fixed-length sprint iterations	<b>Few constraints</b> (only visualize workflow and limit WIP)
<b>Empirical (require experimentation)</b>	<b>Experiment by changing many constraints</b>	<b>Experiment by changing fewer constraints</b>
<b>Prescribe timebox iterations</b>	<b>Prescribes a fixed-length for sprint iterations</b> to establish a cadence, which is a consistent pace	<b>No prescribed iterations</b> e.g., freedom to choose when to do activities and for how long
<b>Dealing with WIP</b>	<b>Limits WIP per Iteration</b>	<b>Limits WIP per vertical swimlane</b>

<b>Lean and Agile</b>	<p><b>Both are pull schedule based and correspond to just in time Lean inventory management</b> (Team pulls work based on their own desired pace vs having work pushed in from the outside)</p> <p><b>Both prioritize responding to change instead of following a plan</b> (Refer to the Agile Manifesto in Table 2)</p>
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Table 5: Agile Scrum vs Kanban (Kniberg)

### **Agile Scrum + Kanban = Agile Scrumban**

Agile Scrum and Kanban can be combined to form Agile Scrumban, a more well-rounded project management methodology for IT Audits. As per Figure 8, Kanban can make up the framework of vertical and horizontal swimlanes. Particularly, horizontal swimlanes are utilized to tailor activities to each rank in the audit team, while working in parallel within each vertical swimlane. However, as per Figure 8, Agile Scrum can be used in the Fieldwork vertical swimlane because it aligns with the iterative nature of gathering/testing evidence. After each iteration, the audit team will present a minimum viable product to the client for feedback.

Fieldwork begins with spending time at the client site to gather and test evidence. This fits the first iteration of an Agile Scrum model because planned controls are being reevaluated, fieldwork is being performed, and evidence is being assessed for deficiencies in controls. This first iteration is weighted towards planning/fieldwork, and will create a minimum viable product by completing enough of the audit to gauge the performance of controls within a control section. The middle iteration is weighted towards fieldwork/assessing, and will take approximately the same amount of time and test most the controls within a control section. The final iteration is weighted towards assessing, since most of the controls would be tested, although the audit team should refer to the plan and perform any final fieldwork. Although Kanban does not require

that these iterations are performed by the same team, Agile Scrum would utilize one consistent Audit team to perform the fieldwork component.

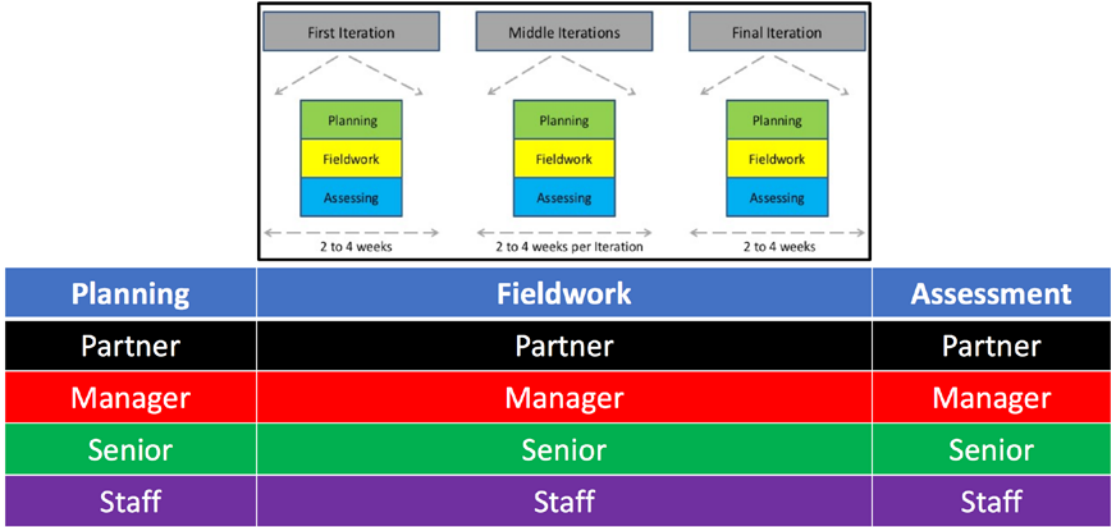


Figure 8: Agile Scrumban in IT Audit

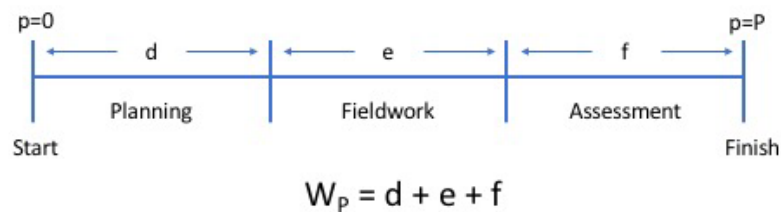
## **Comparing Agile Scrumban to Waterfall Methodology**

When comparing Agile Scrumban to Waterfall project management methodology, three Key Performance Indicators (KPIs) of Price, Time, and Quality were selected. I have developed a mathematical model and called it the “PTQ Model” to show that an Agile Scrumban project management methodology is superior to the Waterfall project management methodology for managing an IT Audit project.

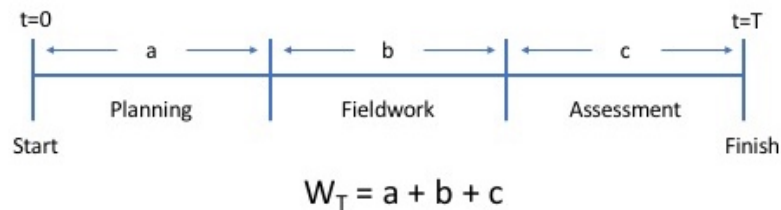
## PTQ Model

PTQ stands for the three KPIs of Price, Time, and Quality. The variables of this formula will be defined as follows (W denotes Waterfall project management):

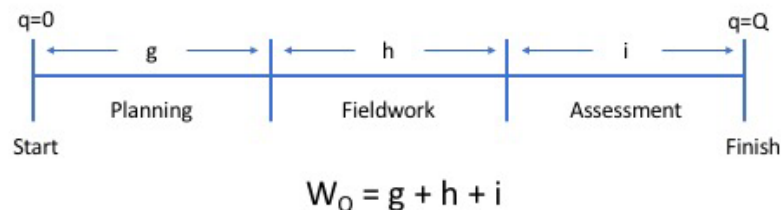
- Price to complete a SOC Audit using Waterfall project management, where  $p$  = variance in dollars from the project's estimated budget at any time during the project, and  $P$  is the total variance in dollars from the project's estimated budget at completion.



- Time to complete a SOC Audit using Waterfall project management, where  $t$  = time in months during the project, and  $T$  is the total number of months worked on the project.



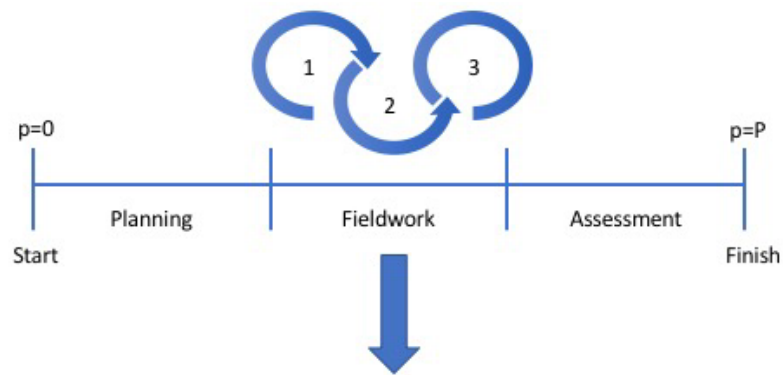
- Quality of a SOC Audit, where  $q$  = number of mistakes made during the project, and  $Q$  is the total number of mistakes in the project.



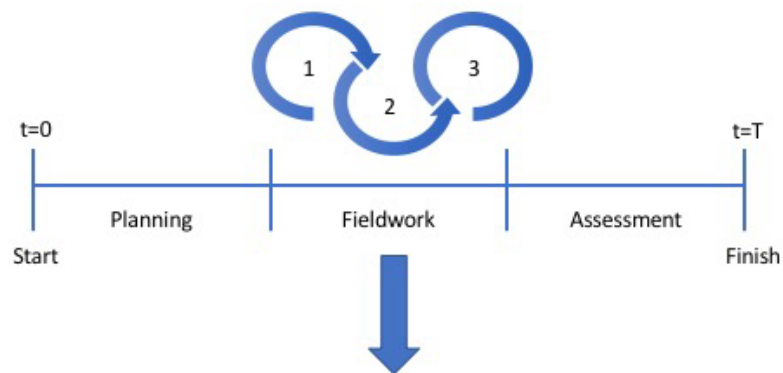
- Since the Kanban component of Scrumban will apply horizontal and vertical swimlanes throughout the entire project, as seen in Figure 8, it will be defined as

the constant,  $K$ . Because of the three main benefits of Kanban outlined in Solution Part 2: Kanban Project Management Model, the constant  $K$  will be subtracted from each KPI to denote an improvement over Waterfall project management.

- The Agile Scrum component of Scrumban applies to the Fieldwork portion of a SOC Audit, as seen in Figure 8. Because Agile Scrum has the benefits of regular client feedback, adaptability to obstacles, and high visibility of project progress, the following coefficients can be included in this formula (circles denoting three iterations):

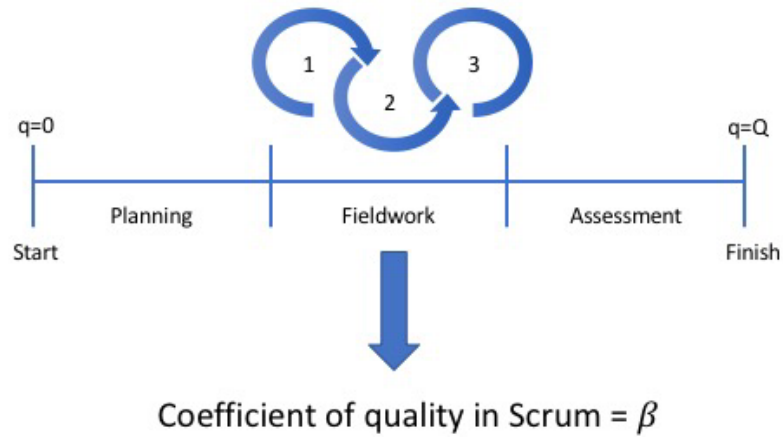


Coefficient of price in Scrum =  $\alpha$



Coefficient of time in Scrum =  $\delta$





$\alpha < 1$ ,  $\delta < 1$ , and  $\beta < 1$  reflect Agile Scrum's benefits and an improvement over Waterfall project management. The following equations will show the mathematical model (lower number is better):

### The Default State: Waterfall Project Management

The letter  $A$  denotes the SOC Audit project. The first three equations represent the default state of the three KPIs in a waterfall methodology.

$$P_A = W_P = 1$$

$$T_A = W_T = 1$$

$$Q_A = W_Q = 1$$

### Including the Kanban Constant

Next, the Kanban constant ( $K$ ) will be included in the model. As mentioned earlier,  $K$  will be subtracted from each KPI to denote an improvement. Note that  $0 < K < 1$ . The letters  $A+K$  denote a SOC Audit project using Kanban.

$$P_{A+K} = W_P - K$$

$$T_{A+K} = W_T - K$$

$$Q_{A+K} = W_Q - K$$

$$W_P - K < 1$$

$$W_T - K < 1$$

$$W_Q - K < 1$$

### Including Scrum Coefficients

Finally, the Scrum coefficients will be included in the model. Since each  $\alpha < 1$ ,  $\delta < 1$ , and  $\beta < 1$ , each KPI will be further improved. Note that the letters  $A+K+S$  denote a SOC Audit project that uses Kanban + Agile Scrum (Agile Scrumban).

$$P_{A+K+S} = \alpha W_P - K$$

$$T_{A+K+S} = \delta W_T - K$$

$$Q_{A+K+S} = \beta W_Q - K$$

$$\text{Since } W_P - K < 1,$$

$$\text{Since } W_T - K < 1$$

$$W_Q - K < 1$$

$$\alpha W_P - K \ll 1$$

$$\delta W_T - K \ll 1$$

$$\beta W_Q - K \ll 1$$

### The Complete PTQ Model

With Agile Scrumban, individual KPIs of Price, Time, and Quality are dramatically improved compared to the Waterfall methodology. The equation can be further simplified:

$$(PTQ)_{A+K+S} = (\alpha\delta\beta)(PTQ)_A - K' \quad \text{where } K' > K$$

Let us denote the product of KPI coefficients,  $(\alpha\delta\beta) = \sigma$

$\sigma =$  Scrum factor

$$(PTQ)_{A+K+S} = \sigma(PTQ)_A - K'$$

$$\sigma(PTQ)_A - K' \ll 1$$

$$\text{Hence, } \boxed{(PTQ)_{A+K+S} \ll 1}$$

## **Results and Conclusions**

The PTQ Model shows that Agile Scrumban significantly improves the KPIs of Price, Time, and Quality in a SOC Audit, compared to the Waterfall project management methodology. Agile Scrumban can significantly reduce variance from a SOC Audit's budget, decrease the amount of time a project takes, and reduce the number of mistakes made on an audit engagement. These improvements are based on the benefits derived from Agile Scrum and Kanban. The scope of this thesis is to present a novel application of Agile Scrumban project management in IT Audit and gauge its efficacy using a mathematical model.

Beyond the scope of this thesis, a next step is to pilot the Agile Scrumban methodology in a SOC Audit at a Public Accounting firm. Public Accounting firms set aside money for innovation; this methodology is a solid candidate for the "proof of concept" stage, based on the PTQ Model. Of course, the next step would require the expertise of individuals performing SOC Audits, experts in Agile Scrumban, and experienced project managers to apply the thesis to audit engagements.

## Glossary of Terms

**Agile** - A development model that describe a set of principles under which requirements and solutions evolve through the collaborative effort of self-organizing cross-functional teams.

**Cloud Computing** - The practice of using a network of remote servers hosted on the internet to store, manage, and process data, rather than on a local server or a personal computer.

**IT Audit** - It involves examination and evaluation of an organization's information technology infrastructure, policies, and operations. Information technology audits determine whether IT controls protect corporate assets, ensure data integrity, and are aligned with the business's overall goals.

**PCI DSS** - Payment Card Industry Data Security Standard is a set of requirements designed to ensure that all companies that process, store, or transmit credit card information maintain a secure environment.

**SaaS** - Software as a Service. A software licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted.

**Scrum** - An Agile methodology that involves short iterative cycles called Sprints.

**SOC** - Service Organization Controls. These are a series of accounting standards that measure the control of financial information for a service organization.

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