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Kanban and Scrum making the most of both

Henrik Kniberg & Mattias Skarin

Forewords by Mary Poppendieck and David Anderson

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Contents

FOREWORD BY MARY POPPENDIECK.....	v
FOREWORD BY DAVID ANDERSON.....	vii
INTRODUCTION.....	xi
PART I – COMPARISON.....	1
1. What is Scrum and Kanban anyway?	3
2. How do Scrum and Kanban relate to each other?.....	7
3. Scrum prescribes roles.....	11
4. Scrum prescribes timeboxed iterations.....	13
5. Kanban limits WIP per workflow state, Scrum limits WIP per iteration.....	15
6. Both are empirical	17
7. Scrum resists change within an iteration	23
8. Scrum board is reset between each iteration	25
9. Scrum prescribes cross-functional teams	27
10. Scrum backlog items must fit in a sprint	29
11. Scrum prescribes estimation and velocity	31
12. Both allow working on multiple products simultaneously	33
13. Both are Lean and Agile.....	35
14. Minor differences	37
15. Scrum board vs Kanban board – a less trivial example.....	41
16. Summary of Scrum vs Kanban.....	49
PART II – CASE STUDY.....	53
17. The nature of technical operations	55
18. Why on earth change?	57
19. Where do we start?	59
20. Getting going.....	61
21. Starting up the teams	63
22. Addressing stakeholders.....	64
23. Constructing the first board.....	67
24. Setting the first Work In Progress (WIP) limit.....	71

KANBAN AND SCRUM - MAKING THE MOST OF BOTH

25. Honoring the Work In Progress (WIP) limit.....	73
26. Which tasks get on the board?	75
27. How to estimate?.....	77
28. So how did we work, really?.....	79
29. Finding a planning concept that worked	83
30. What to measure?.....	87
31. How things started to change	91
32. General lessons learned.....	97
FINAL TAKE-AWAY POINTS	101
ABOUT THE AUTHORS	103

Foreword by Mary Poppendieck

Henrik Kniberg is one of those rare people who can extract the essence of a complicated situation, sort out the core ideas from the incidental distractions, and provide a crystal clear explanation that is incredibly easy to understand. In this book, Henrik does a brilliant job of explaining the difference between Scrum and Kanban. He makes it clear that these are just tools, and what you really want to do is have a full toolkit, understand the strengths and limitations of each tool and how to use them all.

In this book you will learn what Kanban is all about, its strengths and limitations, and when to use it. You will also get a good lesson on how and when to improve upon Scrum, or any other tool you may happen to be using. Henrik makes it clear that the important thing is not the tool you start with, but the way you constantly improve your use of that tool and expand your toolset over time.

The second part of this book by Mattias Skarin makes the book even more effective by walking you through the application of Scrum and Kanban in a real life situation. Here you will see an example of how the tools were used both separately and in combination to improve a software development process. You will notice that there isn't a single "best" way to do things; you have to think for yourself and figure out – based on your situation – your next step toward better software development.

Mary Poppendieck

Foreword by David Anderson

Kanban is based on a very simple idea. Work In Progress (WIP) should be limited and something new should be started only when an existing piece of work is delivered or pulled by a downstream function. The kanban (or signal card) implies that a visual signal is produced to indicate that new work can be pulled because current work does not equal the agreed limit. This doesn't sound very revolutionary nor does it sound like it would profoundly affect the performance, culture, capability and maturity of a team and its surrounding organization. What's amazing is that it does! Kanban seems like such a small change and yet it changes everything about a business.

What we've come to realize about Kanban is that it is an approach to change management. It isn't a software development or project management lifecycle or process. Kanban is an approach to introducing change to an existing software development lifecycle or project management methodology. The principle of Kanban is that you start with whatever you are doing now. You understand your current process by mapping the value stream and then you agree to WIP limits for each stage in that process. You then start to flow work through the system by pulling it when kanban signals are generated.

Kanban is proving useful to teams doing Agile software development but equally it is gaining traction with teams taking a more traditional approach. Kanban is being introduced as part of a Lean initiative to morph the culture of organizations and encourage continuous improvement.

Because WIP is limited in a Kanban system, anything that becomes blocked for any reason tends to clog up the system. If enough work items become blocked the whole process grinds to a halt. This has the effect of focusing the whole team and the wider organization on solving the problem, unblocking the item and restoring flow.

KANBAN AND SCRUM - MAKING THE MOST OF BOTH

Kanban uses a visual control mechanism to track work as it flows through the various stages of the value stream. Typically, a whiteboard with sticky notes, or an electronic card wall system, is used. The best practice is probably to do both. The transparency that this generates also contributes to cultural change. Agile methods have been good about providing transparency into the WIP, completed work and reporting metrics such as velocity (the quantity of work done in an iteration). However, Kanban goes a step further and provides transparency into the process and its flow. Kanban exposes bottlenecks, queues, variability and waste – all of which are things which impact the performance of the organization in terms of the quantity of valuable work delivered and the cycle time required to deliver it. Kanban provides team members and external stakeholders with visibility into the effect of their actions (or inactions.) As such, early case studies are showing that Kanban changes behavior and encourages greater collaboration within the workplace. The visibility into and impact on bottlenecks, waste and variability also encourages discussion about improvements, and teams quickly start implementing improvements to their process.

As a result, Kanban encourages incremental evolution of existing processes and evolution that is generally aligned with Agile and Lean values. Kanban does not ask for a sweeping revolution of how people work, rather it encourages gradual change. It's change that is understood and agreed by consensus amongst the workers and their collaborators.

Through the nature of the pull system, Kanban also encourages delayed commitment on both prioritization of new work and delivery of existing work. Typically, teams will agree to a prioritization cadence for meeting with upstream stakeholders and decide what to work on next. These meetings can be held often because they are usually very short. A very simple question has to be answered, e.g. "Since our last meeting two slots have become free. Our current cycle time is 6 weeks to delivery. Which 2 things would you most like delivered 6 weeks from now?" This has a two-fold affect: asking a simple question generally in a quickly-derived, high-quality answer and also keeps the meeting short. The nature of question means that commitment on what to work on is delayed until the last responsible moment. This improves agility by managing expectations, shortening cycle times from commitment to delivery and eliminating rework since the chance that priorities will change is minimized.

One final word on Kanban is that the effect of limiting WIP provides predictability of cycle time and makes deliverables more reliable. The “stop the line” approach to impediments and bugs also appears to encourage very high levels of quality and a rapid drop in rework.

While all of this will become evident from the wonderfully clear explanations in this book, how we got here will remain opaque. Kanban was not conceived in a single afternoon through some incredible epiphany - instead it emerged over several years. Many of the profound psychological and sociological effects that change the culture, capability and maturity of organizations were never imagined. Rather, they were discovered. Many of the results with Kanban are counter-intuitive. What appears to be a very mechanical approach – limit WIP and pull work – actually has profound effects on people and how they interact and collaborate with one another. I, nor anyone else involved with Kanban in the early days, anticipated this.

I pursued what became Kanban as an approach to change which would meet with minimal resistance. This was clear to me as early as 2003. I also pursued it for the mechanical benefits. As I was discovering through application of Lean techniques around that time, if managing WIP made sense, then limiting it made more sense: it took the management overhead out of managing it. So in 2004, I decided to try implementing a pull system from first principles. I got the opportunity when a manager at Microsoft approached me and asked me to help him manage change on his team doing maintenance upgrades on internal IT applications. The first implementation was based on the Theory of Constraints pull system solution known as Drum-Buffer-Rope. It was a huge success: cycle time dropped by 92%; throughput increased by more than 3 times; and predictability (due date performance) was a very acceptable 98%.

In 2005, Donald Reinertsen persuaded me to implement a full-blown Kanban system. I got the opportunity in 2006 when I took charge of the software engineering department at Corbis in Seattle. In 2007, I began to report the results. The first presentation was at the Lean New Product Development Summit in Chicago in May 2007. I followed this with an open space at Agile 2007 in Washington DC in August that year. 25 people attended and 3 of them were from Yahoo!: Aaron Sanders, Karl Scotland and Joe Arnold. They went home to California, India and the UK

KANBAN AND SCRUM - MAKING THE MOST OF BOTH

and implemented Kanban with their teams, which were already struggling with Scrum. They also started a Yahoo! discussion group which, at the time of this writing, has almost 800 members. Kanban was beginning to spread and early adopters were talking about their experiences.

Now in 2009, Kanban is really growing in adoption and more and more field reports are coming in. We've learned a lot about Kanban in the past 5 years and we all continue to learn more every day. I've focused my own work on doing Kanban, writing about Kanban, speaking about Kanban and thinking about Kanban in order to better understand it and explain it to others. I've deliberately stepped back from comparing Kanban to existing Agile methods, though some effort was spent in 2008 explaining why Kanban deserved to be considered an Agile-compatible approach.

I've left it to others with a wider experience to answer questions like "How does Kanban compare to Scrum?" I am so glad that Henrik Kniberg and Mattias Skarin have emerged as leaders in this regard. You, the knowledge worker in the field, need information in order to make informed decisions and move forward with your work. Henrik and Mattias are serving your needs in a way that I never could. I am particularly impressed with Henrik's thoughtful approach to comparison and his factual and un-opinionated, balanced delivery. His cartoons and illustrations are particularly insightful and often save you reading many pages of text. Mattias' field case study is important because it demonstrates that Kanban is much more than theory and it shows you by example how it might be useful for you in your organization.

I hope that you enjoy this book comparing Kanban with Scrum and that it gives you greater insight into Agile in general and both Kanban and Scrum in particular. If you would like to learn more about Kanban please visit our community website, The Limited WIP Society,
<http://www.limitedwipsociety.org/>

David J. Anderson

Sequim, Washington, USA
July 8th, 2009

Introduction

We don't normally write books. We prefer spending our time deep in the trenches helping clients optimize, debug, and refactor their development process and organization. We've noticed a clear trend lately, though, and would like to share some thoughts on that. Here's a typical case:

- **Jim:** “Now we've finally gone all-out Scrum!”
- **Fred:** “So how's it going?”
- **Jim:** “Well, it's a lot better than what we had before...”
- **Fred:** “...but?”
- **Jim:** “... but you see we are a support & maintenance team.”
- **Fred:** “yes, and?”
- **Jim:** “Well, we love the whole thing about sorting priorities in a product backlog, self-organizing teams, daily scrums, retrospectives, etc....”
- **Fred:** “So what's the problem?”
- **Jim:** “We keep failing our sprints”
- **Fred:** “Why?”
- **Jim:** “Because we find it hard to commit to a 2 week plan. Iterations don't make much sense to us, we just work on whatever is most urgent for today. Should we do 1 week iterations perhaps?”
- **Fred:** “Could you commit to 1 week of work? Will you be allowed to focus and work in peace for 1 week?”

KANBAN AND SCRUM - MAKING THE MOST OF BOTH

- **Jim:** “Not really, we get issues popping up on a daily basis. Maybe if we did 1 day sprints...”
- **Fred:** “Do your issues take less than a day to fix?”
- **Jim:** “No, they sometimes take several days”
- **Fred:** “So 1-day sprints wouldn’t work either. Have you considered ditching sprints entirely?”
- **Jim:** “Well, frankly, we would like that. But isn’t that against Scrum?”
- **Fred:** “Scrum is just a tool. You choose when and how to use it. Don’t be a slave to it!”
- **Jim:** “So what should we do then?”
- **Fred:** “Have you heard of Kanban?”
- **Jim:** “What’s that? What’s the difference between that and Scrum?”
- **Fred:** “Here, read this book!”
- **Jim:** “But I really like the rest of Scrum though, do I have to switch now?”
- **Fred:** “No, you can combine the techniques!”
- **Jim:** “What? How?”
- **Fred:** “Just read on...”

Purpose of this book

If you're interested in agile software development you've probably heard about Scrum, and you may also have heard about Kanban. A question that we hear more and more often is "so what is Kanban, and how does it compare to Scrum?" Where do they complement each other? Are there any potential conflicts?

The purpose of this book is to clear up the fog, so you can figure out how Kanban and Scrum might be useful in your environment.

Let us know if we succeed!

Part I – Comparison

This first part of the book is an attempt to make an objective and practical comparison of Scrum and Kanban. It is a slightly updated version of the original article “Kanban vs. Scrum” from April 2009. That article became popular, so I decided to turn it into a book and ask my colleague Mattias to spice it up with a “from the trenches” case study from one of our clients. Great stuff! Feel free to skip ahead to Part II if you prefer starting with the case study, I won’t be offended.

Well, maybe just a little.

/Henrik Kniberg

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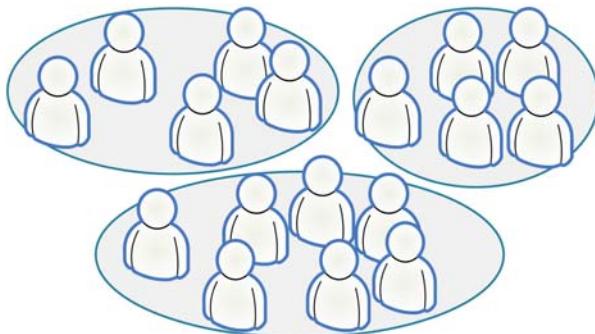
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What are Scrum and Kanban anyway?

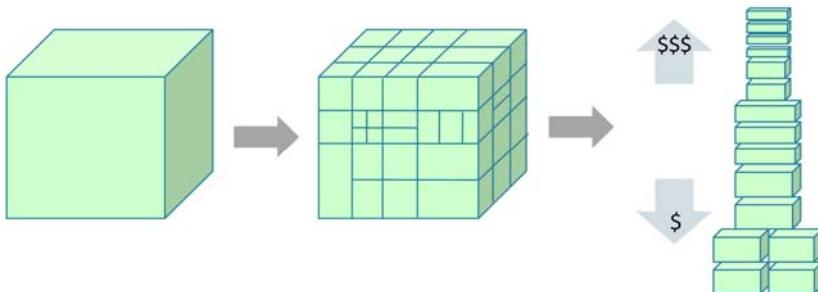
OK let's try to summarize Scrum and Kanban in less than 100 words each.

Scrum in a nutshell

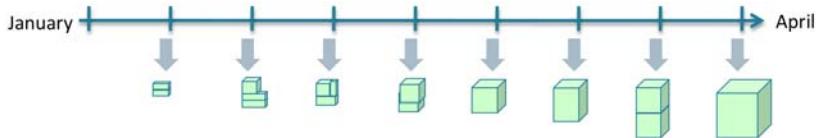
- **Split your organization** into small, cross-functional, self-organizing teams.



- **Split your work** into a list of small, concrete deliverables. Sort the list by priority and estimate the relative effort of each item.



- **Split time** into short fixed-length iterations (usually 1 – 4 weeks), with potentially shippable code demonstrated after each iteration.



- **Optimize the release plan** and update priorities in collaboration with the customer, based on insights gained by inspecting the release after each iteration.
- **Optimize the process** by having a retrospective after each iteration.

So instead of a **large group** spending a **long time** building a **big thing**, we have a **small team** spending a **short time** building a **small thing**. But **integrating regularly** to see the whole.

121 words... close enough.

For more details check out “Scrum and XP from the Trenches”. The book is a free read online. I know the author, he’s a nice guy :o)

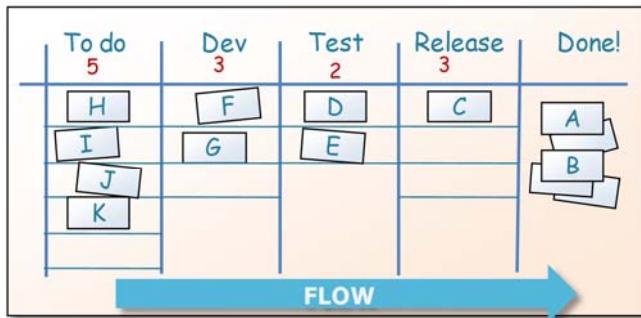
<http://www.crisp.se/ScrumAndXpFromTheTrenches.html>

For more Scrum links check out <http://www.crisp.se/scrum>

Kanban in a nutshell

- **Visualize the workflow**
 - Split the work into pieces, write each item on a card and put on the wall.
 - Use named columns to illustrate where each item is in the workflow.
- **Limit Work In Progress (WIP)** – assign explicit limits to how many items may be in progress at each workflow state.

- **Measure the lead time** (average time to complete one item, sometimes called “cycle time”), optimize the process to make lead time as small and predictable as possible.



We collect useful Kanban links at: <http://www.crisp.se/kanban>

2

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How do Scrum and Kanban relate to each other?

Scrum and Kanban are both process tools

Tool = anything used as a means of accomplishing a task or purpose.
Process = how you work.

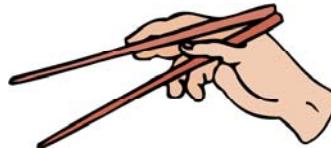
Scrum and Kanban are *process tools* in that they help you work more effectively by, to a certain extent, telling you what to do. Java is also a tool, it gives you a simpler way to program a computer. A toothbrush is also a tool, it helps you reach your teeth so you can clean them.

Compare tools for understanding, not judgment

Knife or fork – which tool is better?



Pretty meaningless question right? Because the answer depends on your context. For eating meatballs the fork is probably best. For chopping mushrooms the knife is probably best. For drumming on the table either will do fine. For eating a steak you probably want to use both tools together. For eating rice... well... some prefer a fork while others prefer chopsticks.



So when we compare tools we should be careful. Compare for understanding, not for judgment.

No tool is complete, no tool is perfect

Like any tools, Scrum and Kanban are neither perfect nor complete. They don't tell you *everything* that you need to do, they just provide certain constraints & guidelines. For example, Scrum constrains you to have timeboxed iterations and cross-functional teams, and Kanban constrains you to use visible boards and limit the size of your queues.

Interestingly enough, the value of a tool is that it *limits your options*. A process tool that lets you do anything is not very useful. We might call that process “Do Whatever” or how about “Do The Right Thing”. The “Do The Right Thing” process is guaranteed to work, it's a silver bullet! Because if it doesn't work, you obviously weren't following the process :o)

Using the right tools will help you succeed, but will not guarantee success. It's easy to confuse *project* success/failure with *tool* success/failure.

- A project may succeed because of a great tool.
- A project may succeed despite a lousy tool.
- A project may fail because of a lousy tool.
- A project may fail despite a great tool.

Scrum is more prescriptive than Kanban

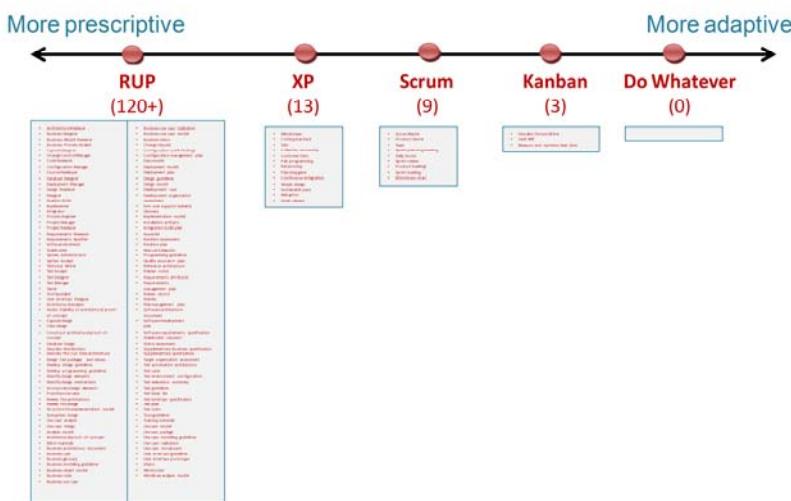
We can compare tools by looking at how many rules they provide. *Prescriptive* means “more rules to follow” and *adaptive* means “fewer rules to follow”. 100% prescriptive means you don't get to use your brain, there is a rule for everything. 100% adaptive means Do Whatever, there are no rules or constraints at all. As you can see, both extremes of the scale are kind of ridiculous.

SO HOW DO SCRUM AND KANBAN RELATE TO EACH OTHER? | 9

Agile methods are sometimes called *lightweight* methods, specifically because they are less prescriptive than traditional methods. In fact, the first tenet of the Agile Manifesto is “Individuals and Interactions over Processes and Tools”.

Scrum and Kanban are both highly adaptive, but *relatively speaking* Scrum is more prescriptive than Kanban. Scrum gives you more constraints, and thereby leaves fewer options open. For example Scrum prescribes the use of timeboxed iterations, Kanban doesn't.

Let's compare some more process tools on the prescriptive vs adaptive scale:



RUP is pretty prescriptive – it has over 30 roles, over 20 activities, and over 70 artifacts; an overwhelming amount of stuff to learn. You aren't really supposed to use all of that though; you are supposed to select a suitable subset for your project. Unfortunately this seems to be hard in practice. “Hmmmm... will we need *Configuration audit findings* artifacts? Will we need a *Change control manager* role? Not sure, so we better keep them just in case.” This may be one of the reasons why RUP implementations often end up quite heavy-weight compared to Agile methods such as Scrum and XP.

XP (eXtreme Programming) is pretty prescriptive compared to Scrum. It includes most of Scrum + a bunch of fairly specific engineering practices such as test-driven development and pair programming.

Scrum is less prescriptive than XP, since it doesn't prescribe any specific engineering practices. Scrum is more prescriptive than Kanban though, since it prescribes things such as iterations and cross-functional teams.

One of the main differences between Scrum and RUP is that in RUP you get too much, and you are supposed to remove the stuff you don't need. In Scrum you get too little, and you are supposed to add the stuff that is missing.

Kanban leaves almost everything open. The only constraints are Visualize Your Workflow and Limit Your WIP. Just inches from Do Whatever, but still surprisingly powerful.

Don't limit yourself to one tool!

Mix and match the tools as you need! I can hardly imagine a successful Scrum team that doesn't include most elements of XP for example. Many Kanban teams use daily standup meetings (a Scrum practice). Some Scrum teams write some of their backlog items as Use Cases (a RUP practice) or limit their queue sizes (a Kanban practice). Whatever works for you.

Miyamoto Musashi a 17th century Samurai who was famous for his twin-sword fighting technique, said it nicely:



Do not develop an attachment to
any one weapon or any one
school of fighting.

- Miyamoto Musashi

Pay attention to the constraints of each tool though. For example if you use Scrum and decide to stop using timeboxed iterations (or any other core aspect of Scrum), then don't say you're using Scrum. Scrum is minimalistic enough as it is, if you remove stuff and still call it Scrum then the word will become meaningless and confusing. Call it something like "Scrum-inspired" or "a subset of Scrum" or how about "Scrumish" :)

3

Scrum prescribes roles

Scrum prescribes 3 roles: Product Owner (sets product vision & priorities), Team (implements the product) and Scrum Master (removes impediments and provides process leadership).

Kanban doesn't prescribe any roles at all.

That doesn't mean you can't or shouldn't have a Product Owner role in Kanban! It just means you don't *have to*. In both Scrum and Kanban you are free to add whatever additional roles you need.

Be careful when adding roles though, make sure the additional roles actually add value and don't conflict with other elements of the process. Are you sure you need that Project Manager role? In a big project maybe that's a great idea, perhaps that's the guy who helps to synchronize multiple teams & product owners with one another. In a small project that role might be waste, or worse, might lead to sub-optimization and micromanagement.

The general mindset in both Scrum and Kanban is “less is more”. So when in doubt, start with less.

In the rest of the book I'm going to use the term “Product Owner” to represent whoever it is that sets the priorities of a team, regardless of the process used.

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4

Scrum prescribes timeboxed iterations

Scrum is based on timeboxed iterations. You can choose the length of the iteration, but the general idea is to keep the same length of iteration over a period of time and thereby establish a *cadence*.

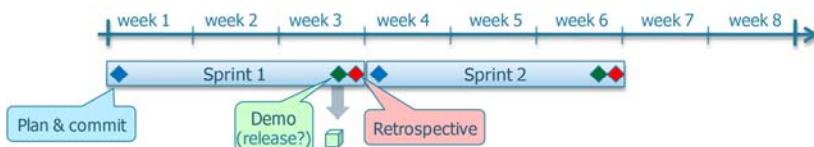
- **Beginning of iteration:** An iteration plan is created, i.e. team pulls out specific number items from the product backlog, based on the product owner's priorities and how much the team thinks they can complete in one iteration.
- **During iteration:** Team focuses on completing the items they committed to. The scope of the iteration is fixed.
- **End of iteration:** Team demonstrates working code to the relevant stakeholders, ideally this code should be *potentially shippable* (i.e. tested and ready to go). Then the team does a retrospective to discuss and improve their process.

So a Scrum iteration is one single timeboxed cadence combining three different activities: planning, process improvement, and (ideally) release.

In Kanban timeboxed iterations are not prescribed. You can choose when to do planning, process improvement, and release. You can choose to do these activities on a regular basis ("release every Monday") or on-demand ("release whenever we have something useful to release").

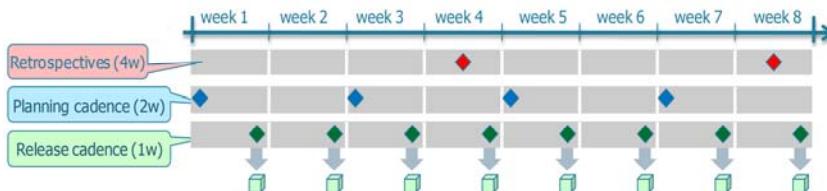
Team #1 (single cadence)

"We do Scrum iterations"



Team #2 (three cadences)

“We have three difference cadences. Every week we release whatever is ready for release. Every second week we have a planning meeting and update our priorities and release plans. Every fourth week we have a retrospective meeting to tweak and improve our process”



Team #3 (mostly event-driven)

“We trigger a planning meeting whenever we start running out of stuff to do. We trigger a release whenever there is a set of Minimum Marketable Features (MMFs) ready for release. We trigger a spontaneous quality circle whenever we bump into the same problem the second time. We also do a more in-depth retrospective every fourth week.”

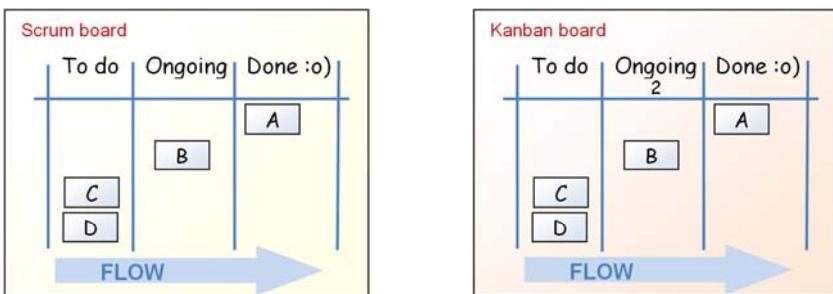


5

Kanban limits WIP per workflow state, Scrum limits WIP per iteration

In Scrum, the sprint backlog shows what tasks are to be executed during the current iteration (= “sprint” in Scrum-speak). This is commonly represented using cards on the wall, called a Scrum board or Task board.

So what’s the difference between a Scrum board and a Kanban board? Let’s start with a trivially simple project and compare the two:



In both cases we’re tracking a bunch of items as the progress through a workflow. We’ve selected three states: To Do, Ongoing, and Done. You can choose whatever states you like – some teams add states such as Integrate, Test, Release, etc. Don’t forget the *less is more* principle though.

So what’s the difference between these two sample boards then? Yep - the little 2 in the middle column on the kanban board. That’s all. That 2 means “there may be no more than 2 items in this column at any given moment”.

In Scrum there is no rule preventing the team from putting all items into the Ongoing column at the same time! However there is an implicit limit since the iteration itself has a fixed scope. In this case the implicit limit per column is 4, since there are only 4 items on the whole board. So Scrum limits WIP indirectly, while Kanban limits WIP directly.

Most Scrum teams eventually learn that it is a bad idea to have too many ongoing items, and evolve a culture of trying to get the current items done before starting new items. Some even decide to explicitly limit the number of items allowed in the Ongoing column and then – tadaaa! – the Scrum board has become a Kanban board!

So both Scrum and Kanban limit WIP, but in different ways. Scrum teams usually measure *velocity* – how many items (or corresponding units such as “story points”) get done per iteration. Once the team knows their velocity, that becomes their WIP limit (or at least a guideline). A team that has an average velocity of 10 will usually not pull in more than 10 items (or story points) to a sprint.

So in Scrum *WIP is limited per unit of time*.

In Kanban *WIP is limited per workflow state*.

In the above Kanban example, at most 2 items may be in the workflow state “Ongoing” at any given time, regardless of any cadence lengths. You need to choose what limit to apply to which workflow states, but the general idea is to limit WIP of *all* workflow states, starting as early as possible and ending as late as possible along the value stream. So in the example above we should consider adding a WIP limit to the “To do” state as well (or whatever you call your input queue). Once we have WIP limits in place we can start measuring and predicting lead time, i.e. the average time for an item to move all the way across the board. Having predictable lead times allows us to commit to SLAs (service-level agreements) and make realistic release plans.

If the item sizes vary dramatically then you might consider having WIP limits defined in terms of story points instead, or whatever unit of size you use. Some teams invest effort in breaking down items to roughly the same size to avoid these types of considerations and reduce time spent on estimating things (you might even consider estimation to be waste). It’s easier to create a smooth-flowing system if items are roughly equal-sized.

6

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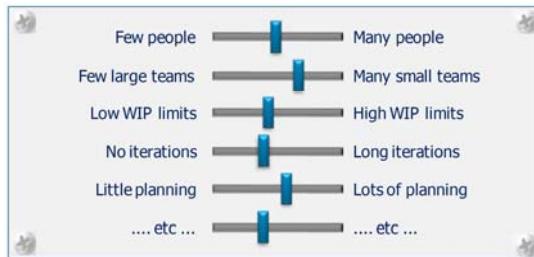
Both are empirical



Imagine if there were knobs on these meters, and you could configure your process by simply turning the knobs. “I want high capacity, low lead time, high quality, and high predictability. So I’ll turn the knobs to 10, 1, 10, 10 respectively.”

Wouldn’t that be great? Unfortunately there are no such direct controls. Not that I know of at least. Let me know if you find any.

Instead what we have is a bunch of *indirect* controls.



Scrum and Kanban are both empirical in the sense that you are expected to experiment with the process and customize it to your environment. In fact, you *have to* experiment. Neither Scrum nor Kanban provide all the answers – they just give you a basic set of constraints to drive your own process improvement.

- Scrum says you should have cross-functional teams. So who should be on what team? Don't know, experiment.
- Scrum says the team chooses how much work to pull into a sprint. So how much should they pull in? Don't know, experiment.
- Kanban says you should limit WIP. So what should the limit be? Don't know, experiment.

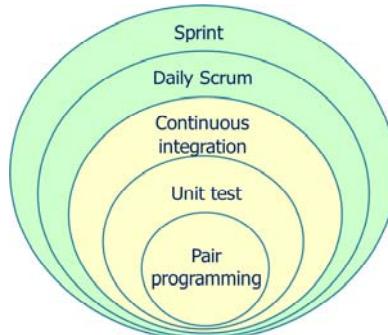
As I mentioned earlier, Kanban imposes fewer constraints than Scrum. This means you get more parameters to think about, more knobs to turn. That can be both a disadvantage and an advantage depending on your context. When you open up the configuration dialog of a software tool, do you prefer having 3 options to tweak, or 100 options to tweak? Probably somewhere in between. Depends on how much you need to tweak and how well you understand the tool.

So let's say we reduce a WIP limit, based on the hypothesis that this will improve our process. We then observe how things like capacity, lead time, quality, and predictability change. We draw conclusions from the results and then change some more things, continuously improving our process.

There are many names for this. Kaizen (continuous improvement in Lean-speak), Inspect & Adapt (Scrum-speak), Empirical Process Control, or why not The Scientific Method.

The most critical element of this is the *feedback loop*. Change something => Find out how it went => Learn from it => Change something again. Generally speaking you want as short a feedback loop as possible, so you can adapt your process quickly.

In Scrum, the basic feedback loop is the sprint. There are more, however, especially if you combine with XP (eXtreme programming):



When done correctly, Scrum + XP gives you a bunch of extremely valuable feedback loops.

The inner feedback loop, pair programming, is a feedback loop of a few seconds. Defects are found and fixed within seconds of creation ("Hey, isn't that variable supposed to be a 3?"). This is an "are we building the stuff **right?**" feedback cycle.

The outer feedback loop, the sprint, gives a feedback cycle of a few weeks. This is a "are we building the **right** stuff?" feedback cycle.

What about Kanban then? Well, first of all you can (and probably should) put all of the above feedback loops into your process whether or not you use Kanban. What Kanban then gives you is a few very useful real-time metrics:

- Average lead time. Updated every time an item reaches "Done" (or whatever you call your right-most column).
- Bottlenecks. Typical symptom is that Column X is crammed with items while column X+1 is empty. Look for "air bubbles" on your board.

The nice thing about real-time metrics is that you can choose the length of your feedback loop, based on how often you are willing to analyze the metrics and make changes. Too long feedback loop means your process improvement will be slow. Too short feedback loop means your process might not have time to stabilize between each change, which can cause thrashing.

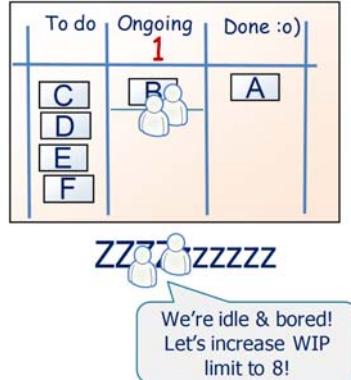
In fact, the length of the feedback loop itself is one of the things you can experiment with... sort of like a meta-feedback loop.

OK I'll stop now.

Example: Experimenting with WIP limits in Kanban

One of the typical "tweak points" of Kanban is the WIP limit. So how do we know if we got it right?

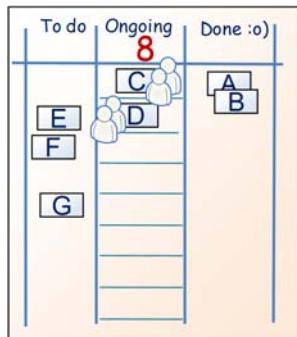
Let's say we have a 4 person team, and we decide to start with a WIP limit of 1.



Whenever we start working on one item, we can't start any new item until the first item is Done. So it will get done really quickly.

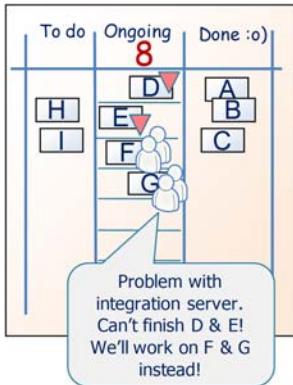
Great! But then it turns out that it's usually not feasible for all 4 people to work on the same item (in this sample context), so we have people sitting idle. If that only happens once in a while that's no problem, but if it happens regularly, the consequence is that the average lead time will increase. Basically, WIP of 1 means items will get through "Ongoing" really fast once they get in, but they will be stuck in "To Do" longer than necessary, so the total lead time across the whole workflow will be unnecessarily high.

So if WIP of 1 was too low, what about increasing it to 8?

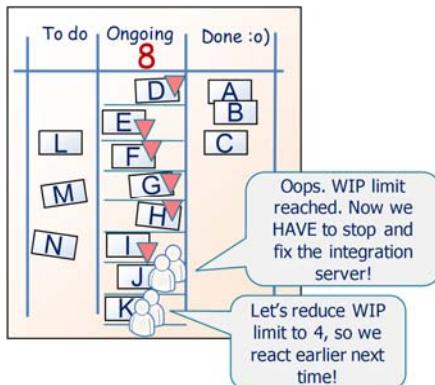


That works better for a while. We discover that, on average, working in pairs gets the work done most quickly. So with a 4 person team, we usually have 2 ongoing items at any given time. The WIP of 8 is just an upper limit, so having fewer items in progress is fine!

Imagine now, however, that we run into a problem with the integration server, so we can't fully complete any items (our definition of "Done" includes integration). That kind of stuff happens sometimes right?

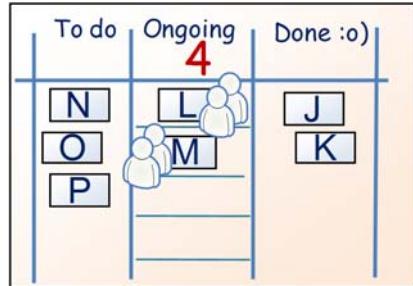


Since we can't complete item D or E, we start working on item F. We can't integrate that one either, so we pull in a new item G. After a while we hit our Kanban limit – 8 items in "Ongoing":



At that point we can't pull in any more items. Hey we better fix that danged integration server! The WIP limit has prompted us to react and fix the bottleneck instead of just piling up a whole bunch of unfinished work.

That's good. But if the WIP limit was 4 we would have reacted a lot earlier, thereby giving us a better average lead time. So it's a balance. We measure average lead time and keep optimizing our WIP limits to optimize the lead time:



After a while we might find that items pile up in “To do”. Maybe it’s time to add a WIP limit there as well then.

Why do we need a “To do” column anyway? Well, if the customer was always available to tell the team what to do next whenever they ask, then the “To do” column wouldn’t be needed. But in this case the customer is sometimes not available, so the “To Do” column gives the team a small buffer to pull work from in the meantime.

Experiment! Or, as the Scrumologists say, Inspect & Adapt!

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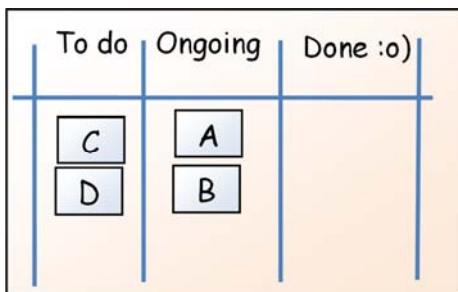
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7

Scrum resists change within an iteration

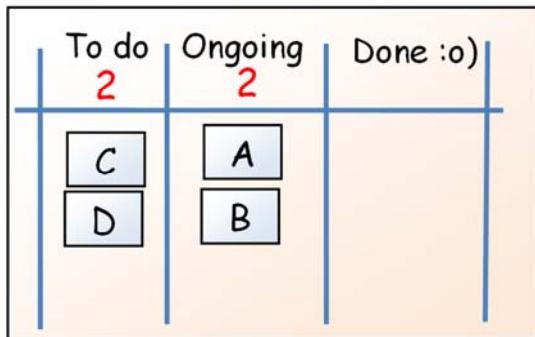
Let's say our Scrum board looks like this:



What if someone turns up and wants to add E to the board?

A Scrum team will typically say something like “No, sorry, we’ve committed to A+B+C+D this sprint. But feel free to add E to the product backlog. If the product owner considers it to be high priority we will pull this into next sprint.” Sprints of the right length give the team just enough focused time to get something done, while still allowing the product owner to manage and update priorities on a regular basis.

So what would the Kanban team say then?



A Kanban might say “Feel free to add E to the To Do column. But the limit is 2 for that column, so you will need to remove C or D in that case. We are working on A and B right now, but as soon as we have capacity we will pull in the top item from To Do”.

So the response time (how long it takes to respond to a change of priorities) of a Kanban team is however long it takes for capacity to become available, following the general principle of “one item out = one item in” (driven by the WIP limits).

In Scrum, the response time is half the sprint length on average.

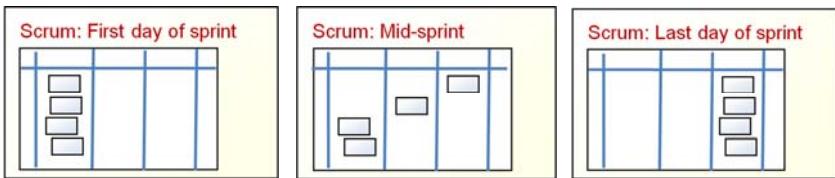
In Scrum, the product owner can't touch the Scrum board since the team has committed to a specific set of items in the iteration. In Kanban you have to set your own ground rules for who is allowed to change what on the board. Typically the product owner is given some kind of “To Do” or “Ready” or “Backlog” or “Proposed” column to the far left, where he can make changes whenever he likes.

These two approaches aren't exclusive though. A Scrum team *may* decide to allow a product owner to change priorities mid-sprint (although that would normally be considered an exception). And a Kanban team *may* decide to add restrictions about when priorities can be changed. A Kanban team may even decide to use timeboxed fixed-commitment iterations, just like Scrum.

8

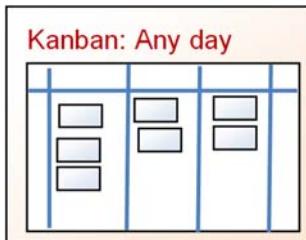
Scrum board is reset between each iteration

A Scrum board typically looks something like this during different stages of a sprint.



When the sprint is over, the board is cleared – all items are removed. A new sprint is started and after the sprint planning meeting we have a new Scrum board, with new items in the left-most column. Technically this is waste, but for experienced Scrum teams this usually doesn't take too long, and the process of resetting the board can give a nice sense of accomplishment and closure. Sort of like washing dishes after dinner – doing it is a pain but it feels nice afterwards.

In Kanban, the board is normally a persistent thing – you don't need to reset it and start over.



9

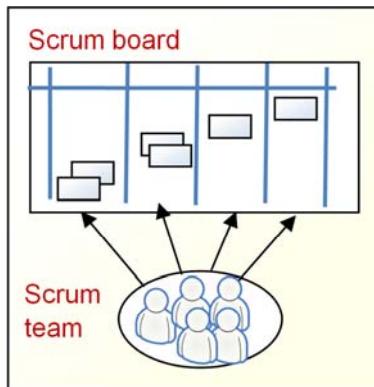
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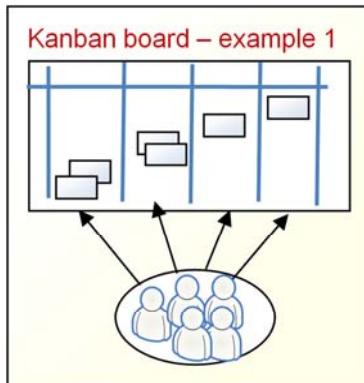
Scrum prescribes cross-functional teams

A Scrum board is owned by exactly one Scrum team. A Scrum team is cross-functional, it contains all the skills needed to complete all the items in the iteration. A Scrum board is usually visible to whoever is interested, but only the owning Scrum team may edit it – it is their tool to manage their commitment for this iteration.

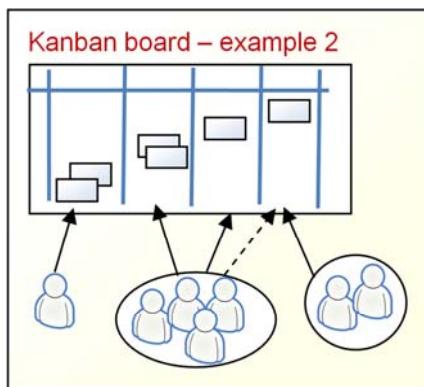


In Kanban, cross-functional teams are optional, and a board doesn't need to be owned by one specific team. A board is related to one workflow, not necessarily one team.

Here are two examples:



Example 1: The whole board is served by one cross-functional team. Just like Scrum.



Example 2: The product owner sets priorities in column 1. A cross-functional development team does development (column 2) and test (column 3). Release (column 4) is done by a specialist team. There is slight overlap in competencies, so if the release team becomes a bottleneck one of the developers will help them.

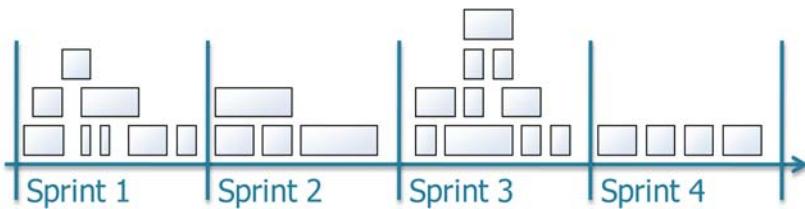
So in Kanban you need to establish some ground rules for who uses the board and how, then experiment with the rules to optimize flow.

10

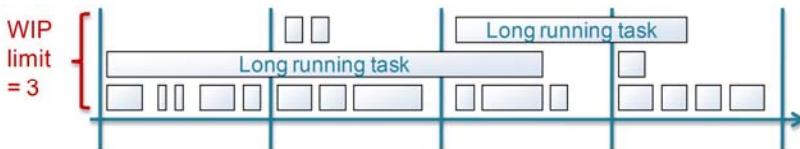
Scrum backlog items must fit in a sprint

Both Scrum and Kanban are based on incremental development, i.e. break the work into smaller pieces.

A Scrum team will only commit to items that they think they can complete within one iteration (based on the definition of “Done”). If an item is too big to fit in a sprint, the team and product owner will try to find ways to break it into smaller pieces until it does fit. If items tend to be big, iterations will be longer (although usually no longer than 4 weeks).



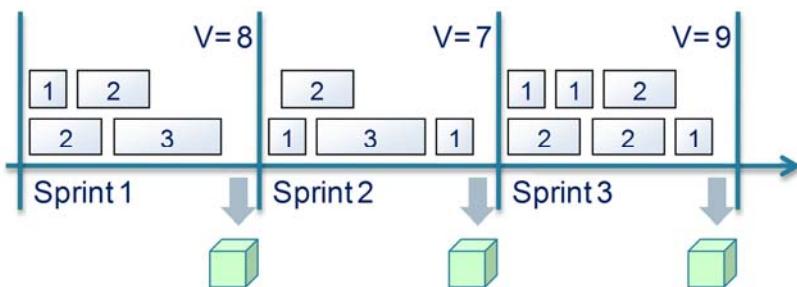
Kanban teams try to minimize lead time and level the flow, so that indirectly creates an incentive to break items into relatively small pieces. But there is no explicit rule stating that items must be small enough to fit into a specific time box. On the same board we might have one item that takes 1 month to complete and another item that takes 1 day.



11

Scrum prescribes estimation and velocity

In Scrum, teams are supposed to estimate the relative size (= amount of work) of each item that they commit to. By adding up the size of each item completed at the end of each sprint, we get velocity. Velocity is a measure of capacity – how much stuff we can deliver per sprint. Here's an example of a team with an average velocity of 8.



Knowing that the average velocity is 8 is nice, because then we can make realistic predictions about which items we can complete in upcoming sprints, and therefore make realistic release plans.

In Kanban, estimation is not prescribed. So if you need to make commitments you need to decide how to provide predictability.

Some teams choose to make estimates and measure velocity just like in Scrum. Other teams choose to skip estimation, but try to break each item into pieces of roughly the same size – then they can measure velocity simply in terms of how many items were completed per unit of time (for example features per week). Some teams group items into MMFs and measure the average lead time per MMF, and use that to establish Service-Level Agreements (SLAs) – for example “when we commit to an MMF it will always be delivered within 15 days”.

There's all kinds of interesting techniques for Kanban-style release planning and commitment management – but no specific technique is prescribed so go ahead and Google away and try some different techniques until you find one that suits your context. We'll probably see some "best practices" emerge over time.

12

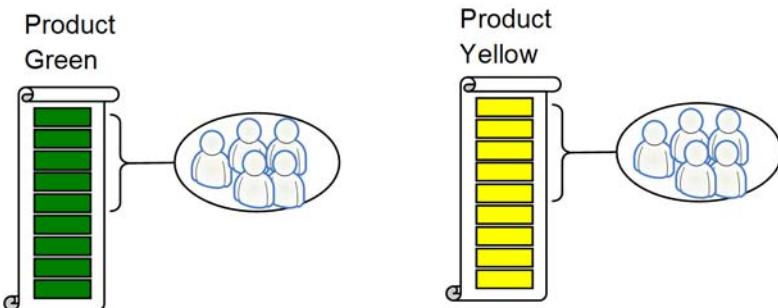
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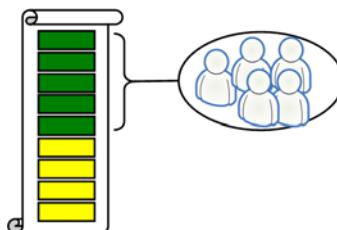
Both allow working on multiple products simultaneously

In Scrum, “Product Backlog” is a rather unfortunate name since it implies that all items have to be for the same product. Here are two products, green and yellow, each with their own product backlog and their own team:

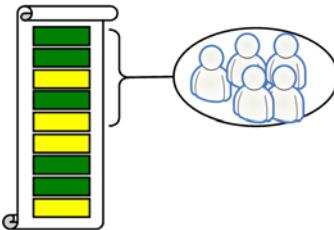


What if you only have one team then? Well, think of Product Backlog more like a Team Backlog. It lists the priorities for upcoming iterations for one particular team (or set of teams). So if that team is maintaining multiple products, merge both products into one list. That forces us to prioritize between the products, which is useful in some cases.

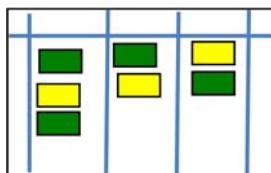
There are several ways of doing this in practice. One strategy would be to have the team focus on one product per sprint:



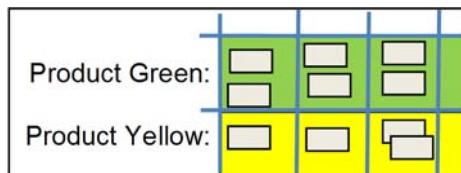
Another strategy would be to have the team work on features from both products each sprint:



It's the same in Kanban. We can have several products flowing across the same board. We might distinguish them using different colored cards:



... or by having “swimlanes” :



13

Both are Lean and Agile

I'm not going to go through Lean Thinking and the Agile Manifesto here, but generally speaking both Scrum and Kanban are well aligned with those values and principles. For example:

- Scrum and Kanban are both pull scheduling systems, which corresponds to the JIT (Just In Time) inventory management principle of Lean. This means that the team chooses when and how much work to commit to, they “pull” work when they are ready, rather than having it “pushed” in from the outside. Just like a printer pulls in the next page only when it is ready to print on it (although there is a small & limited batch of paper that it can pull from).
- Scrum and Kanban are based on continuous and empirical process optimization, which corresponds to the Kaizen principle of Lean.
- Scrum and Kanban emphasize responding to change over following a plan (although Kanban typically allows faster response than Scrum), one of the four values of the agile manifesto.

... and more.

From one perspective Scrum can be seen as not-so-lean because it prescribes batching items into timeboxed iterations. But that depends on the length of your iteration, and what you are comparing to. Compared to a more traditional process where we perhaps integrate and release something 2 – 4 times per year, a Scrum team producing shippable code every 2 weeks is extremely lean.

But then, if you keep making the iteration shorter and shorter you are essentially approaching Kanban. When you start talking about making the iteration shorter than 1 week you might consider ditching timeboxed iterations entirely.

I've said it before and I'll keep saying it: Experiment until you find something that works for you! And then keep experimenting :o)

14

Minor differences

Here are some differences that seem to be less relevant compared to the other ones mentioned before. It's good to be aware of them though.

Scrum prescribes a prioritized product backlog

In Scrum, prioritization is always done by sorting the product backlog, and changes to priorities take effect in the next sprint (not the current sprint). In Kanban you can choose any prioritization scheme (or even none), and changes take effect as soon as capacity becomes available (rather than at fixed times). There may or may not be a product backlog, and it may or may not be prioritized.

In practice, this makes little difference. On a Kanban board the left-most column typically fulfills the same purpose as a Scrum product backlog. Whether or not the list is sorted by priority, the team needs some kind of decision rule for which items to pull first. Examples of decision rules:

- Always take the top item.
- Always take the oldest item (so each item has a timestamp).
- Take any item.
- Spend approximately 20% on maintenance items and 80% on new features.
- Split the team's capacity roughly evenly between product A and product B.
- Always take red items first, if there are any.

In Scrum, a product backlog can also be used in a Kanban-ish way. We can limit the size of it, and create decision rules for how it should be prioritized.

In Scrum, daily meetings are prescribed

A Scrum team has a short meeting (at most 15 minutes) every day at the same time & same place. The purpose of the meeting is to spread information about what is going on, plan the current day's work, and identify any significant problems. This is sometimes called a daily standup, since it is usually done standing (to keep it short & maintain a high energy level).

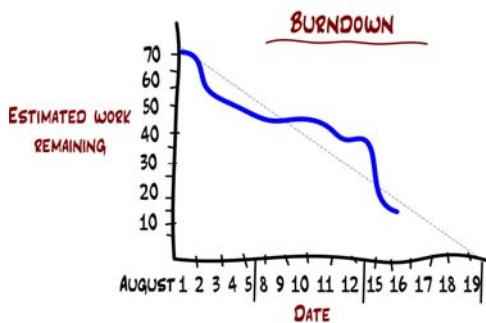
Daily standups are not prescribed in Kanban, but most Kanban teams seem to do it anyway. It's a great technique, regardless of which process you use.

In Scrum the format of the meeting is people-oriented - every person reports one by one. Many Kanban teams use a more board-oriented format, focusing on bottlenecks and other visible problems. This approach is more scalable. If you have 4 teams sharing the same board and doing their daily standup meeting together, we might not necessarily have to hear everyone speak as long as we focus on the bottleneck parts of the board.

In Scrum, burndown charts are prescribed

A sprint burndown chart shows, on a daily basis, how much work remains in the current iteration.

The unit of the Y-axis is the same as the unit used on the sprint tasks. Typically hours or days (if the team breaks backlog items into tasks) or story points (if the team doesn't). There are lots of variations of this though.



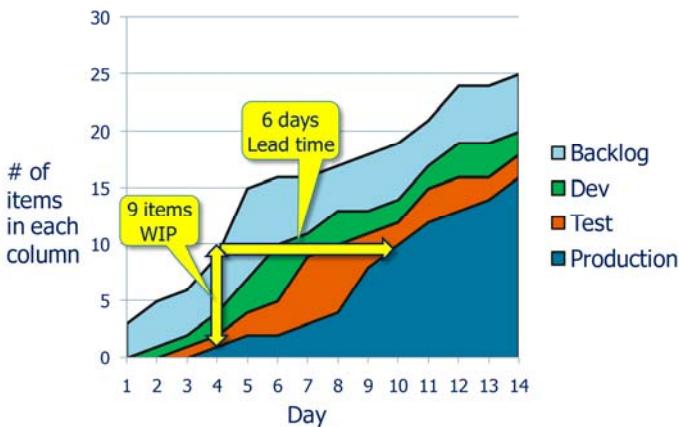
In Scrum, sprint burndown charts are used as one of the primary tools for tracking the progress of an iteration.

Some teams also use release burndown charts, which follows the same format but at a release level – it typically shows how many story points are left in the product backlog after each sprint.

The main purpose of a burndown chart is to easily find out as early as possible if we are behind or ahead of schedule, so that we can adapt.

In Kanban, burndown charts are not prescribed. In fact, no particular type of chart is prescribed. But you are of course allowed to use any type of chart you like (including burndowns).

Here's an example of a Cumulative Flow diagram. This type of chart illustrates nicely how smooth your flow is and how WIP affects your lead time.



Here's how it works. Every day, total up the number of items in each column on the Kanban board and stack these on the Y axis. So on day 4 there were 9 items in the board. Starting from the right-most column there was 1 item in Production, 1 item in Test, 2 items in Dev, and 5 items in the Backlog. If we plot these points every day and connect the dots we get a nice diagram like the one above. The vertical and horizontal arrows illustrate the relationship between WIP and lead time.

The horizontal arrow shows us that items added to the backlog on day 4 took on average 6 days to reach production. About half of that time was Test. We can see that if were to limit the WIP in Test and Backlog we would significantly reduce the total lead time.

The slope of the dark-blue area shows us the velocity (i.e. number of items deployed per day). Over time we can see how higher velocity reduces lead time, while higher WIP increases lead time.

Most organizations want to get stuff done faster (= reduce lead time). Unfortunately many fall into the trap of assuming that this means getting more people in or working overtime. Usually the most effective way to get stuff done faster is to smooth out the flow and limit work to capacity, *not* add more people or work harder. This type of diagram shows why, and thereby increases the likelihood that the team and management will collaborate effectively.

It gets even more clear if we distinguish between queuing states (such as “waiting for test”) and working states (such as “testing”). We want to absolutely minimize the number of items sitting around in queues, and a cumulative flow diagram helps provide the right incentives for this.

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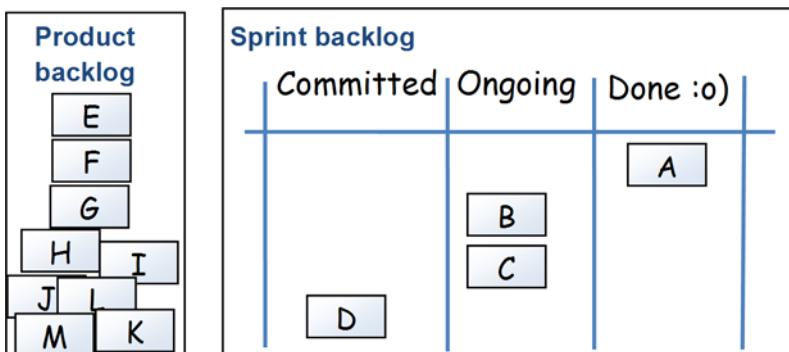
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15

Scrum board vs. Kanban board – a less trivial example

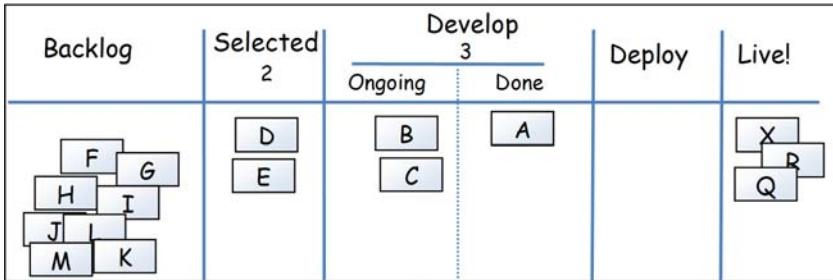
In Scrum, the sprint backlog is just one part of the picture – the part that shows what the team is doing during the current sprint. The other part is the product backlog – the list of stuff that the product owner wants to have done in future sprints.

The product owner can see but not touch the sprint backlog. He can change the product backlog any time he likes, but the changes don't take effect (i.e. change what work is being done) until next sprint.



When the sprint is done, the team “delivers potentially shippable code” to the product owner. So the team finishes the sprint, does a sprint review, and proudly demonstrates features A, B, C, and D to the product owner. The product owner can now decide whether or not to ship this. That last part – actually shipping the product – is usually not included in the sprint, and is therefore not visible in the sprint backlog.

Under this scenario, a Kanban board might instead look something like this:



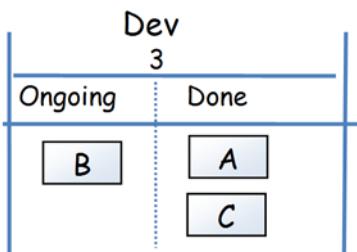
Now the whole workflow is on the same board – we're not just looking at what one Scrum team is doing in one iteration.

In the example above the “Backlog” column is just a general wish list, in no particular order. The “Selected” column contains the high priority items, with a Kanban limit of 2. So there may be only 2 high priority items at any given moment. Whenever the team is ready to start working on a new item, they will take the top item from “Selected”. The product owner can make changes to the “Backlog” and “Selected” columns any time he likes, but not the other columns.

The “Dev” column (split into two sub-columns) shows what is current being developed, with a Kanban limit of 3. In network terms, the Kanban limit corresponds to “bandwidth” and lead time corresponds to “ping” (or response time).

Why have we split the “Dev” column into two sub-columns “Ongoing” and “Done”? That's to give the production team a chance to know which items they can pull into production.

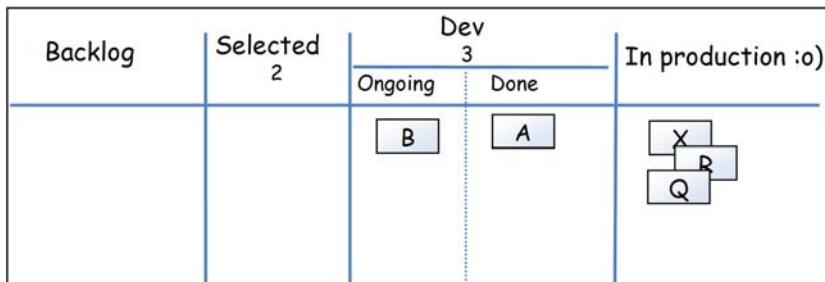
The “Dev” limit of 3 is shared among the two sub-columns. Why? Let's say there are 2 items in “Done”:



That means there can only be 1 item in “Ongoing”. That means there will be excess capacity, developers who *could* start a new item, but aren’t allowed to because of the Kanban limit. That gives them a strong incentive to focus their efforts and helping to get stuff into production, to clear the “Done” column and maximize the flow. This effect is nice and gradual – the more stuff in “Done”, the less stuff is allowed in “Ongoing” – which helps the team focus on the right things.

One-piece flow

One-piece flow is a kind of “perfect flow” scenario, where an item flows across the board without ever getting stuck in a queue. This means at every moment there is somebody working on that item. Here’s how the board might look in that case:

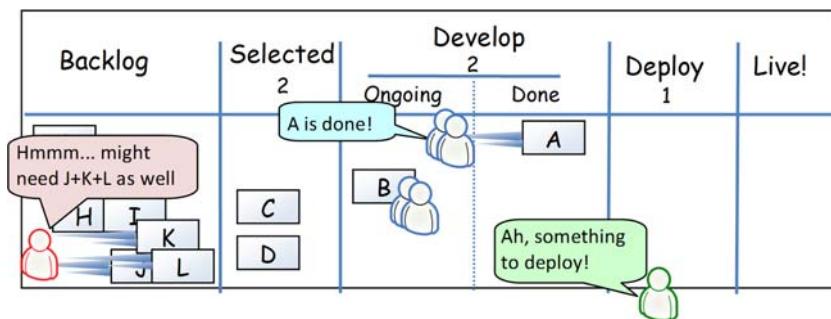
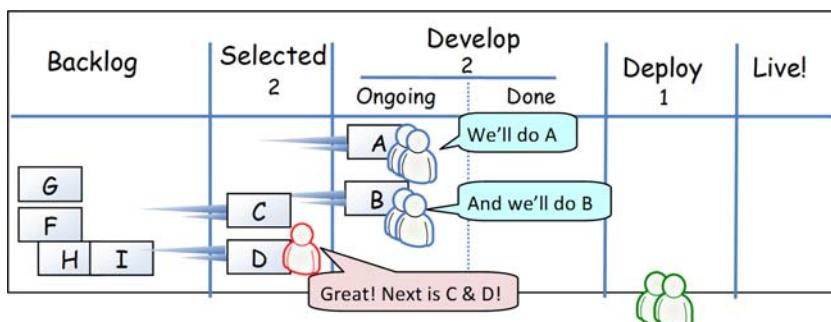
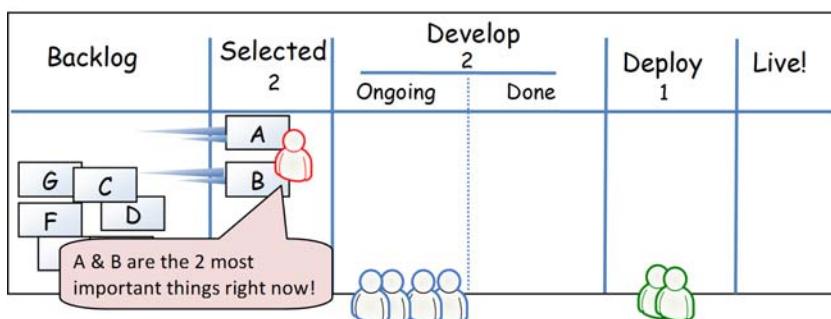
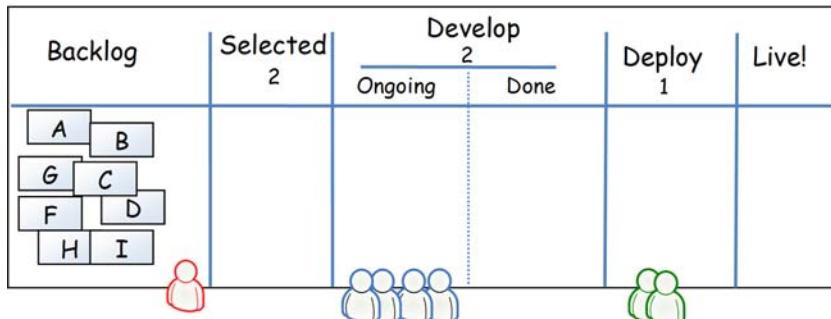


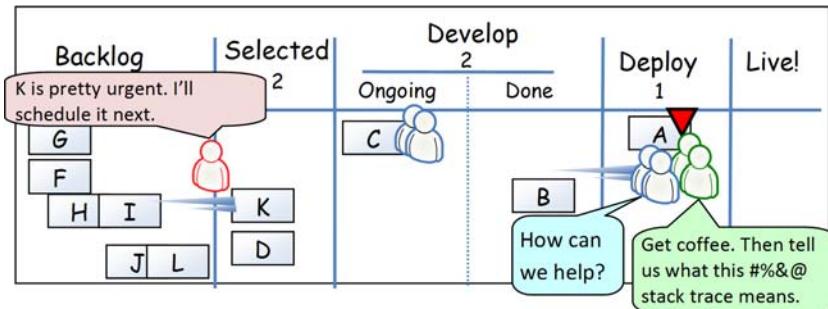
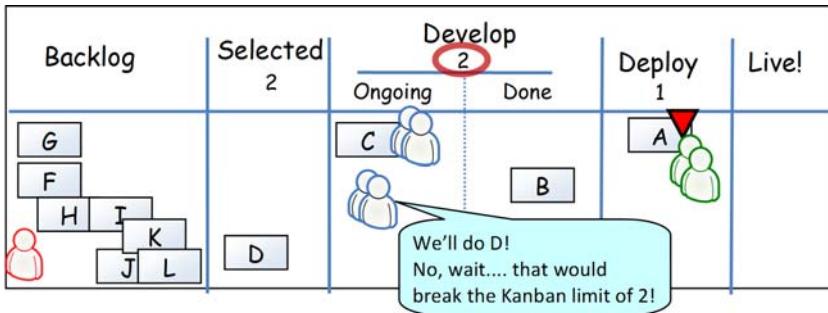
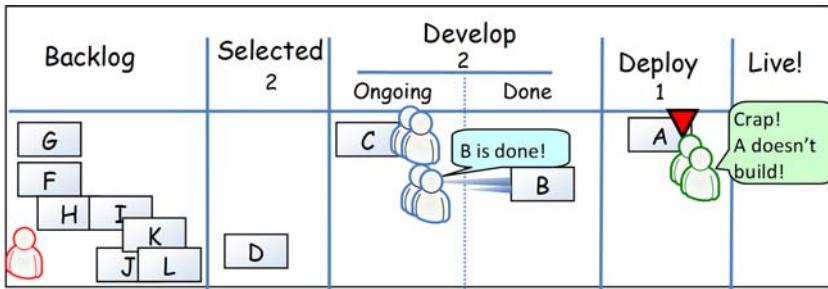
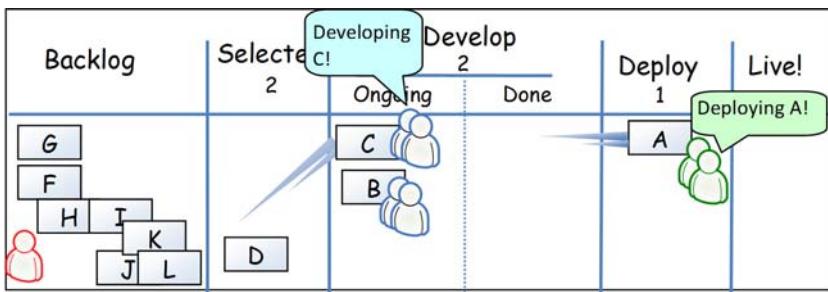
B is being developed at the moment, A is being put in production at the moment. Whenever the team is ready for the next item they ask the product owner that is most important, and get an instance response. If this ideal scenario persists we can get rid of the two queues “Backlog” and “Selected” and get a *really* short lead time!

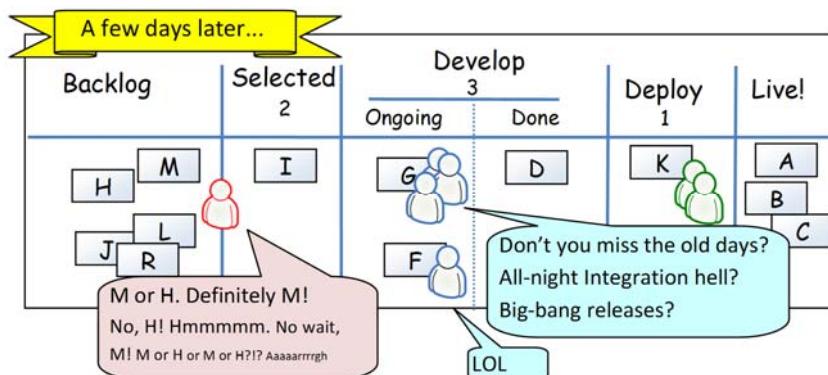
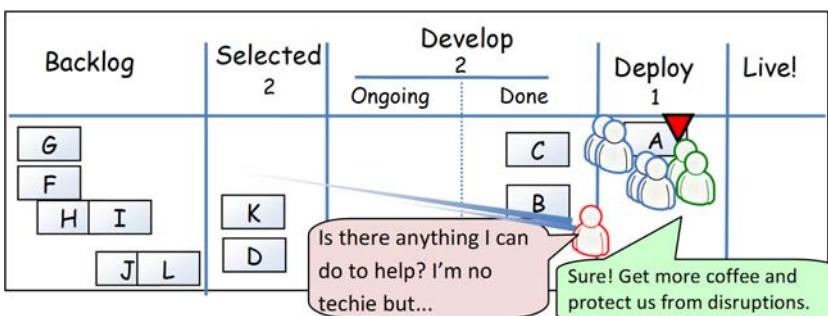
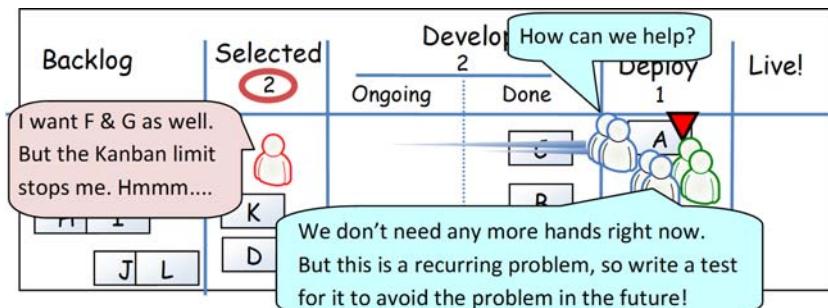
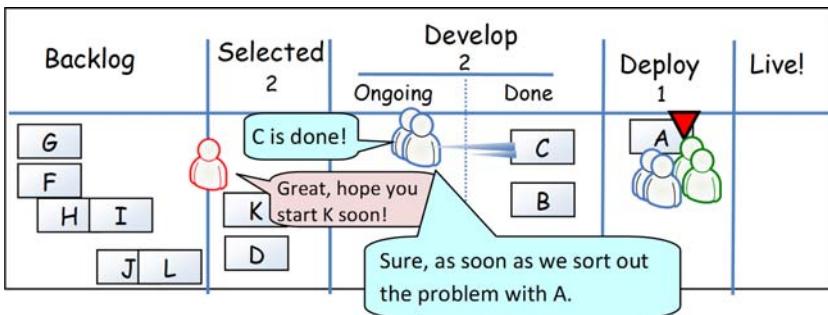
Cory Ladas puts it nicely: “The ideal work planning process should always provide the development team with best thing to work on next, no more and no less”.

The WIP limits are there to stop problems from getting out of hand, so if things are flowing smoothly the WIP limits aren’t really used.

One day in Kanban-land







Does the Kanban board have to look like this?

No, the board above was just an example!

The only thing that Kanban prescribes is that the work flow should be visual, and that WIP should be limited. The purpose is to create a smooth flow through the system and minimize lead time. So you need to regularly bring up questions such as:

Which columns should we have?

Each column represents one workflow state, or a queue (buffer) between two workflow states. Start simple and add columns as necessary.

What should the Kanban limits be?

When the Kanban limit for “your” column has been reached and you don’t have anything to do, start looking for a bottleneck downstream (i.e. items piling up to the right on the board) and help fix the bottleneck. If there is no bottleneck that is an indication that the Kanban limit might be too low, since the reason for having the limit was to reduce the risk of feeding bottlenecks downstream.

If you notice that many items sit still for a long time without being worked on, that is an indication that the Kanban limit might be too high.

- Too low kanban limit => idle people => bad productivity
- Too high kanban limit => idle tasks => bad lead time

How strict are the Kanban limits?

Some teams treat them as strict rules (i.e. the team may not exceed a limit), some teams treat them as guidelines or discussion triggers (i.e. breaking a kanban limit is allowed, but should be an intentional decision with a concrete reason). So once again, it’s up to you. I told you Kanban wasn’t very prescriptive right?

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16

Summary of Scrum vs. Kanban

Similarities

- Both are Lean and Agile.
- Both use pull scheduling.
- Both limit WIP.
- Both use transparency to drive process improvement.
- Both focus on delivering releasable software early and often.
- Both are based on self-organizing teams.
- Both require breaking the work into pieces.
- In both, the release plan is continuously optimized based on empirical data (velocity / lead time).

Differences

Scrum	Kanban
Timeboxed iterations prescribed.	Timeboxed iterations optional. Can have separate cadences for planning, release, and process improvement. Can be event-driven instead of timeboxed.
Team commits to a specific amount of work for this iteration.	Commitment optional.
Uses Velocity as default metric for planning and process improvement.	Uses Lead time as default metric for planning and process improvement.
Cross-functional teams prescribed.	Cross-functional teams optional. Specialist teams allowed.
Items must be broken down so they can be completed within 1 sprint.	No particular item size is prescribed.
Burndown chart prescribed	No particular type of diagram is prescribed
WIP limited indirectly (per sprint)	WIP limited directly (per workflow state)
Estimation prescribed	Estimation optional
Cannot add items to ongoing iteration.	Can add new items whenever capacity is available
A sprint backlog is owned by one specific team	A kanban board may be shared by multiple teams or individuals
Prescribes 3 roles (PO/SM/Team)	Doesn't prescribe any roles
A Scrum board is reset between each sprint	A kanban board is persistent
Prescribes a prioritized product backlog	Prioritization is optional.

There. That's it. Now you know the differences.

But it ain't over yet, now it's time for the best part! Put on your boots, it's time to jump into the trenches with Mattias and see what this looks like in practice!