

CFD Instructions

Purpose

The Cumulative Flow Diagram (CFD) will show over time how much work has passed through each stage of our system. The top (brown) line will show arrivals into the system (into Ready). The bottom (orange) line will show departures from our system (from Test into Deployed). The middle two lines will show the amount of work that has completed design (red) and development (blue) respectively.

Before Tracking the CFD

At the end of each day, before tracking the CFD, make sure that all stories are in the right places, i.e. that stories have been pulled as far right as they can be while still honoring WIP limits, and that the Ready queue is filled to its WIP limit.

Updating the CFD

At the end of each day, hereafter referred to as 'today,' count up the total number of stories that have been deployed since the previous day. Add this number to the orange point on the CFD from the previous day, and track an orange point for today.

Join the orange points with an orange line.

Count up the number of stories in Development Done and Test today (the columns with blue borders on the game board). Add this number to the orange data point for today, and track a blue point for today. Join the blue points with a blue line.

Count up the number of stories in Design Done and Development Doing (the columns with red borders on the game board). Add this number to the blue data point for today, and track a red point for today. Join the red points with a red line.

Count up the number of stories in Ready and Design Doing (the columns with brown borders on the game board). Add this number to the red data point for today, and track a brown point for today. Join the brown points with a brown line.

Notice the instructions provided as an aid at the bottom of the columns on the game board.

Make note of any significant events that occurred on the day as described in the Event Card.

If Things Go Wrong

If you think you might have made a mistake, you can recreate the bottom (orange) line from the information on the stack of deployed story cards. Each deployed story card has a Day Deployed field from which you can determine how many stories were deployed on each day.

Similarly, you can recreate the top (brown) line from the information on all the story cards that have passed through the

Ready queue so far (which includes all stories on the board, and all stories deployed so far). Each such story has a Day Ready field from which you can determine how many stories entered the system on each day.

We did not collect data on the other transitions, so they cannot be recreated. If things go very wrong, just make sure your chart is correct as at today (by counting up stories with Day Ready and Day Deployed fields completed, and counting the stories in the red and blue columns on the board), and continue the game.

The Starting State

To save startup time, we are beginning the game at the start of day 9 of the project, so the board reflects the state of the work as at the end of day 8:

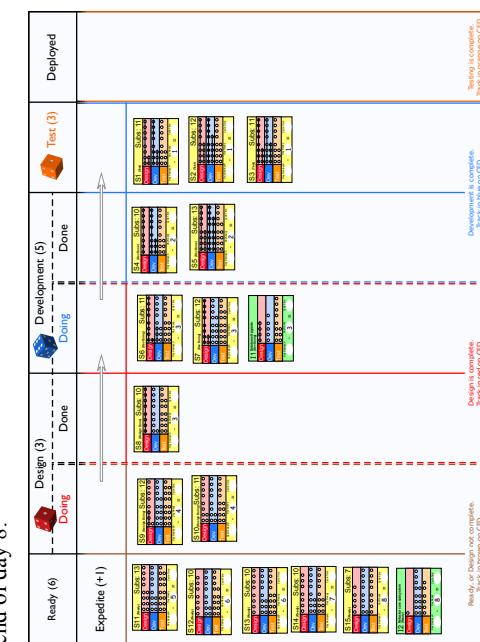


Figure 1.

There are 4 stories in the red columns on the board. These stories have either finished design and are waiting for development, or they are currently in development. The 5 stories that were tracked in blue have already finished design and development. Altogether $4 + 5 = 9$ stories have finished design, so there is a red point at 9.

There are 8 stories in the brown columns on the board. These stories are either waiting in the Ready queue, or are currently being designed. They have not yet finished design. The 9 stories in the columns to the right have all passed through the Ready queue and have been through design. Altogether $8 + 9 = 17$ stories have been pulled into the Ready queue at some stage in their existence by day 8, so there is a brown point at 17.

Example: Day 9

Our facilitator will guide us through day 9. At the end of day 9, our board should look like this:

Figure 2.

There were 0 (zero) stories deployed at the end of the previous day (day 8), and 1 story was deployed on day 9. $0 + 1 = 1$, so on day 9 we track an orange point at 1, and join the orange points.

Now on day 9 there is an orange point at 1, and there are 5 stories in the blue columns. $1 + 5 = 6$, so we track a blue point at 6, and join the blue points.

There is a blue point at 6 and there are 4 stories in the red columns. $6 + 4 = 10$, so we track a red point at 10, and join the two red points.

There are 8 stories in the brown columns. $10 + 8 = 18$, so we track a brown point at 18 and join the brown points. At the end of day 9 our CFD should look like Figure 4.

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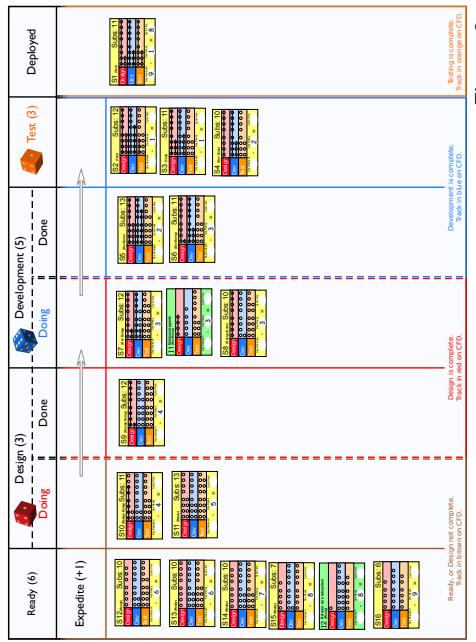


Figure 3.

There were 0 (zero) stories deployed at the end of the previous day (day 8), and 1 story was deployed on day 9. $0 + 1 = 1$, so on day 9 we track an orange point at 1, and join the orange points.

Now on day 9 there is an orange point at 1, and there are 5 stories in the blue columns. $1 + 5 = 6$, so we track a blue point at 6, and join the blue points.

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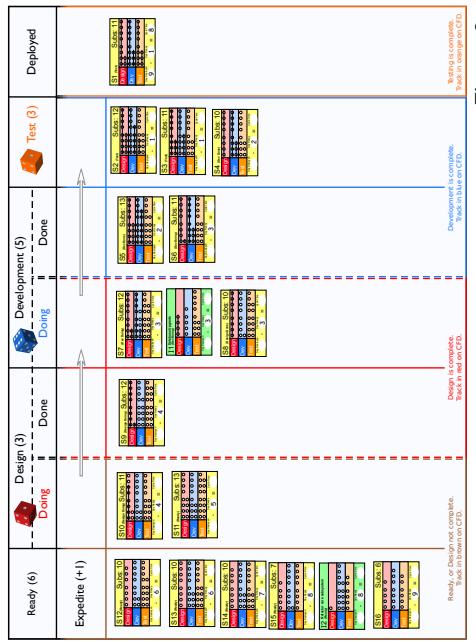


Figure 4.

20

19

18

17

16

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

0

Control Chart

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Day:

Notes:

Control Chart Instructions

Example: Day 9

Our facilitator will guide us through day 9. Story S1 will be deployed during day 9. For this story, Day Ready is 1, Day Deployed will be 9, resulting in a Cycle Time of 8:

S1 (test)	Subs: 11
Design	○○○○○○○○○○
Dev	○○○○○○○○○○
Test	○○○○○○○○○○

Cycle Time
At the end of each day, any deployed stories must have their Day Deployed and Cycle Time fields updated. Cycle Time is Day Deployed minus Day Ready.

Updating the Control Chart

At the end of each day, for each story deployed on that day, track the cycle time on a new vertical line on the chart. Use the same color marker as the story, except use brown for Standard stories (since yellow is difficult to see) and black for the Expedite story.

Do not join the points. At the end of the game you will add a moving average line.

Below the chart, indicate which day the story was deployed on, and if multiple stories are deployed on one day, indicate with a bracket and day number.

Make note of any significant events that occurred on that day as described in the Event Card for the day.

If Things Go Wrong

If you think you might have made a mistake, all of the information required is recorded on the deployed story cards. You can always look back through the stack of deployed stories and check the Day Deployed and Cycle Time fields against your chart.

At the End of the Game

At the end of the game, track an approximate 3-point moving average line through the brown points on the chart (i.e. the points for Standard stories). This is to hide some of the noise and highlight any trends over time.

Figure 2. Notes: Day: 9 You will have added



Hypothetical Example: Day 10
You will be playing the game from day 10, so we can't be sure what will happen, but let's assume that we deploy a further two stories, a Standard (yellow) story with a Cycle Time of 9, and an Intangible (green) story with a Cycle Time of 8. Further, let's assume that the Event Card for day 10 informs us that one of the Designers has gone home with a migraine, and won't be back at work until further notice.

At the end of day 10, our chart would look like this:

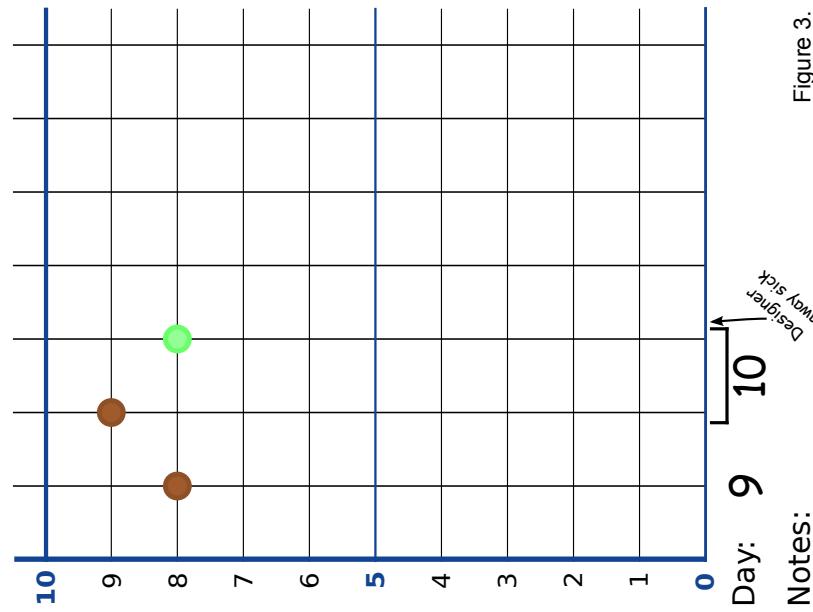


Figure 3. Notes: Day: 10 Designer gone

Financial Summaries: Three Day Billing Cycle

Tick off days as they are completed

8 9 10 11 12 13 14 15 16 17 18 19 20 21

Billing cycle ended day

9 12 15 18 21

Billing cycle new subscribers
(add up Subs from stories deployed in billing cycle)

9A 12A 15A 18A Did you finish F2 by day 20?
If so, make sure you include the
25 additional subscribers.

Total subscribers to date

Copy 9A 9B + 12A 12B 15B 18B 12B + 15A 15B + 18A 21B 18B + 21A

Billing cycle subscriber revenue

9B x \$100 12C 15C 18C 15B x \$100 18B x \$100 21C 21B x \$100 21D Did you finish E1 by day 21?
If so, put your \$5,000 payment here.

Billing cycle fines or cash payments

15D - 15D 15E 18C Copy 18C 21C + 21D 21E Did you finish E1 by day 21?
If not, put your \$2,200 fine here.

Billing cycle gross profit

Copy 9C 9E 12E 15E 18E Copy 18C 21C + 21D 21E

Total gross profit to date
(notify facilitator when calculated)

Copy 9E 9F + 12E 12F 15F 18F 12F + 15E 15F + 18E 18F + 21E 21F

Gather up the stories deployed at the end of each billing cycle, and set aside.

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Game Instructions

Background and Objective

Our company, MoreSubs Inc, offers a subscription-based software product. We begin the game on day 9 of a project that is already underway. Our objective is to maximize profit.

Game Setup

We need to layout the board and arrange ourselves around it as shown in Figure 1.

Roles

Everyone is a Team Member. There are four specific roles: Project Manager, Financial Analyst, CFD Tracker, and Control Chart Tracker. Nominate people to fill these roles now. This will help people to focus on their specific responsibilities through the remainder of the instructions.

People in specific roles should locate and familiarize themselves with their tools as follows:

Role	Tool
Project Manager	Daily Steps
Financial Analyst	Financial Summaries
CFD Tracker	CFD Chart
Control Chart Tracker	Control Chart

Chart Trackers will find instructions on the reverse of their charts.

Revenue and Profit

As we complete work in the form of stories we add to our product's capabilities, and attract new subscribers. Our company has a three-day billing cycle. Every three days, we charge each subscriber \$100 for using our product. In order to grow our revenue stream, we want to attract as many subscribers as quickly as we can. Our profit will be calculated by the Financial Analyst at the end of each billing cycle.

User Stories

There are four categories of story (or four classes of service):

Standard (S) stories are yellow and are for product features which attract subscribers and hence revenue. The number of new subscribers a story will attract is indicated in the top right corner of the story card. Standard stories should be completed in FIFO order (details in section *Gameplay — Daily Steps*).

Intangible (I) stories are green and are for work that needs to be done, but that does not directly attract subscribers.

Fixed Delivery Date (F) stories are purple. There are two of these stories and they are described in detail in section *Fixed Delivery Date Stories*. We want to deliver these before their due dates, but not too early or we will sacrifice too many standard stories, and therefore revenue.

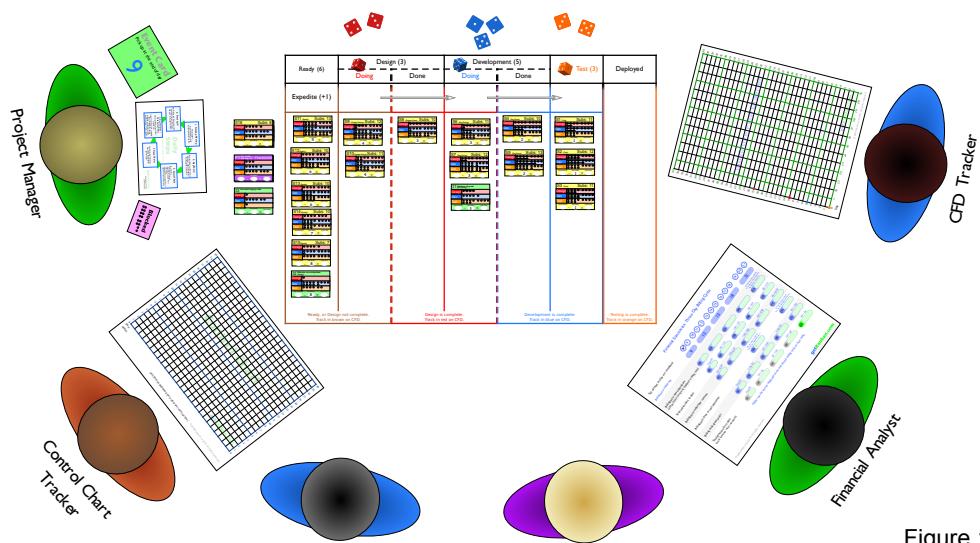


Figure 1.

There is a white Expedite (E) story that will come into play later in the game. This story must be left at the back of the deck of Standard stories until called into play. We will use the Expedite lane at the top of the board to move this story through as quickly as possible.

Each story has design work, development work, and test work, represented by white dots. Each story has Day Ready, Day Deployed, and Cycle Time fields. The Project Manager is responsible for ensuring that these fields are completed. Cycle Time is Day Deployed minus Day Ready.

The Board

Our facilitator will have given us an introduction to limiting WIP and how a Kanban board works. On this board, stories enter the board in the Ready queue, and are pulled into subsequent stations. WIP limits are indicated in parentheses. For Design and Development, WIP limits apply across both Doing and Done columns. E.g. there should never be more than three stories in total across Design Doing and Design Done (unless there is an Expedite story in play).

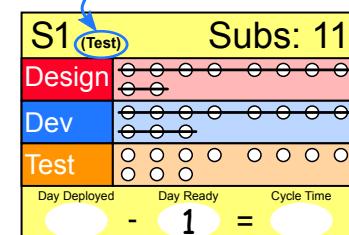


Figure 2.

Place these story cards in their correct positions as shown in Figure 3.

Continued on reverse ↗

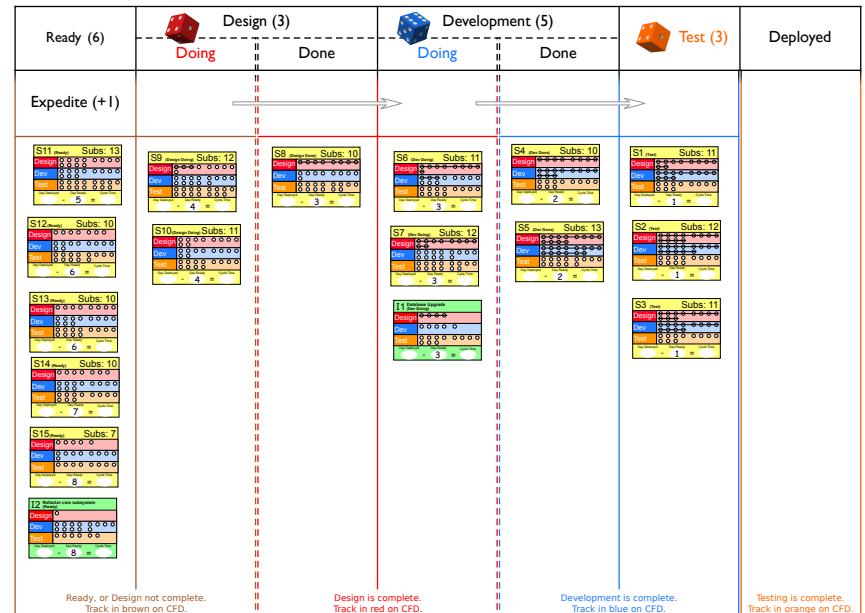


Figure 3.

Dice

The dice represent people on our team. The colors indicate their specializations. Red dice represent Designers, blue dice Developers, and orange dice Testers.

Each day we will roll the dice and reduce work on stories. If a person works in their area of specialization, they are more effective, and achieve double the face value of their die.

Gameplay — Daily Steps

The Project Manager ensures that the following steps are completed accurately each day. The Daily Steps card should be referred to as a guide.

1. Standup Meeting

The Project Manager facilitates a "standup" meeting during which the team observes the state of the work, and briefly discusses strategy for the day. Fixed Delivery Date stories and Intangible stories can be reprioritized within their current stations during this meeting.

2. Play Board

Take one die of each remaining color, declare in which specialization each will be played (Design, Development, or Test), then roll the dice, calculate the work done in each specialization, and reduce work on the stories by that amount. Stories should be worked on in the order they are arranged in the stations, not selected based on knowledge of the dice roll.

Repeat until all dice have been rolled for the day. At the start of the game, the last roll of the day will be a single blue die.

Alternative: Our facilitator may decide to require all dice to be declared and rolled at once. This makes the game slightly faster, but slightly less realistic. Rolling in sets simulates the passage of time during the day.

If a die is played in its area of specialization, its face value is doubled. For example, if we had the following stories in Design Doing:

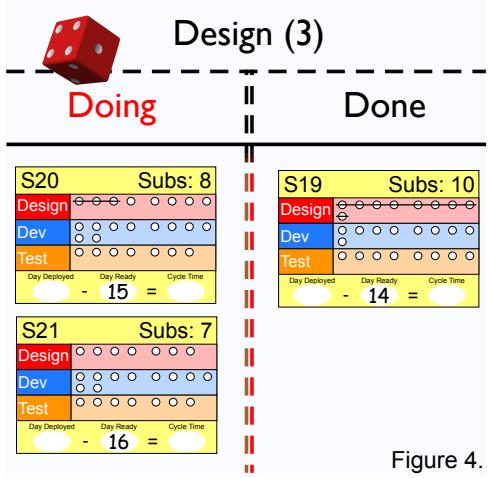


Figure 4.

and if we had taken one of each color die, and declared the red and blue dice to be played in Design, then the face value of the red die would

be doubled, because it is being played in its area of specialization. The value of the blue die would not be doubled because it is not being played in its area of specialization.

If the dice were rolled with the following result, then the total work to be done in Design from this roll would be 7:



$$3 \times 2 + 1 = 7$$

This would allow us to strike off the remaining five dots of Design work on story S20, and move it immediately to Design Done, then strike off two of the dots of Design work on story S21:

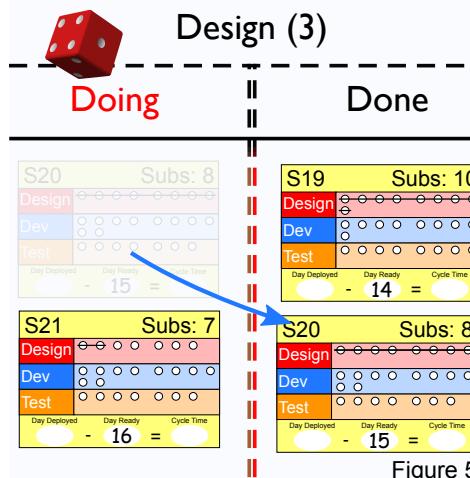


Figure 5.

We can pull stories from upstream at any time, as long as WIP limits are honored. E.g. from any deck of story cards into the Ready queue; from Ready into Design Doing; from Design Done into Development Doing, etc.

Intangible stories and Fixed Delivery Date stories can be reprioritized as they are pulled downstream.

Standard stories are stacked in business-priority order. They should flow across the board in order, and be deployed in order (FIFO: first in, first out). If a story is held up by a pink blocker, other stories may flow past it. When the story is unblocked, it will continue in flow with the other stories around it.

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The Project Manager ensures WIP limits are honored, and all story cards are up to date: the Day Ready field is complete on all stories pulled into Ready; the Day Deployed and Cycle Time fields are complete on all deployed stories.

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Chart Trackers update their charts.

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The Project Manager picks up the Event Card for the day, reads aloud, and actions if necessary.

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F1: Security Audit. Following a flurry of high-profile security breaches, new regulations require regular audits of customer data security. This story is to correct a design flaw that would cause us to fail the audit. If we don't finish the story by the end of day 15 we will be fined \$2,200.

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If multiple teams are playing at once, the first team to finish the game (i.e. complete day 21) receives an in-game cash prize bonus of \$10,000.

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Our facilitator will guide us through day 9 shortly, then the game will begin.

Frequently Asked Questions

What happens when we have reached our WIP limit and we have more work available from the roll of our dice? Can we start more work?

No, we cannot start more work. With respect to this project, the extra work is wasted. Consider what the impact would be of starting more work. Consider what other activities might be useful and appropriate for people in this situation.

When does the game finish?

At the end of day 21.

Where can I purchase copies of this game?

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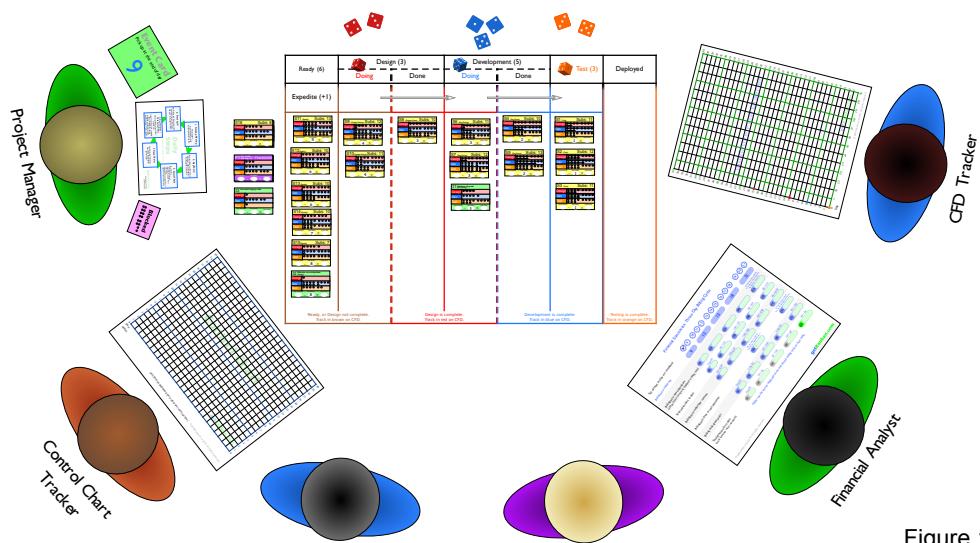


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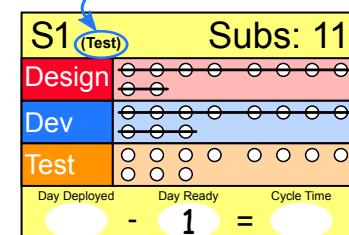


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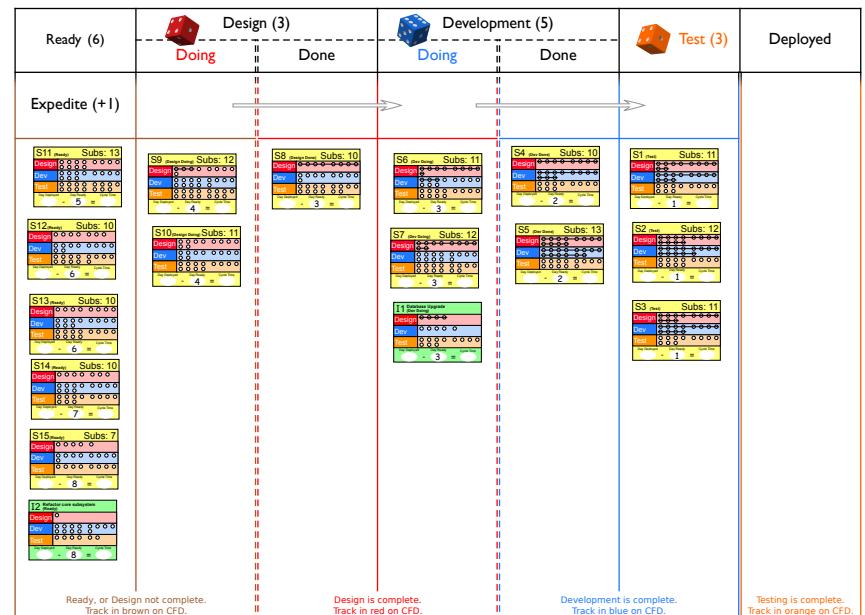


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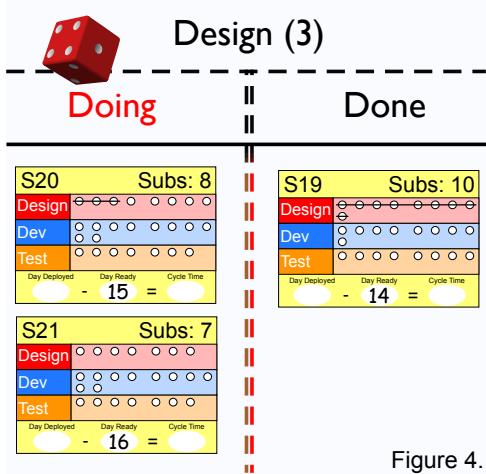


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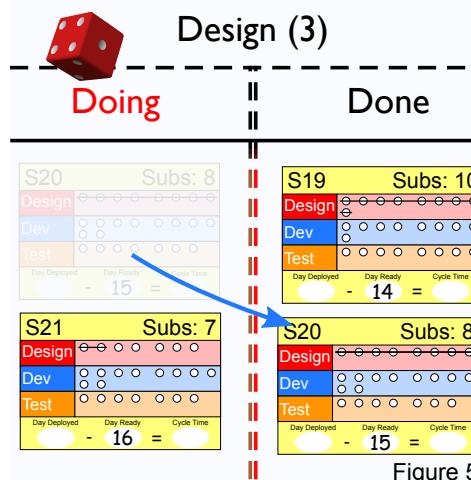


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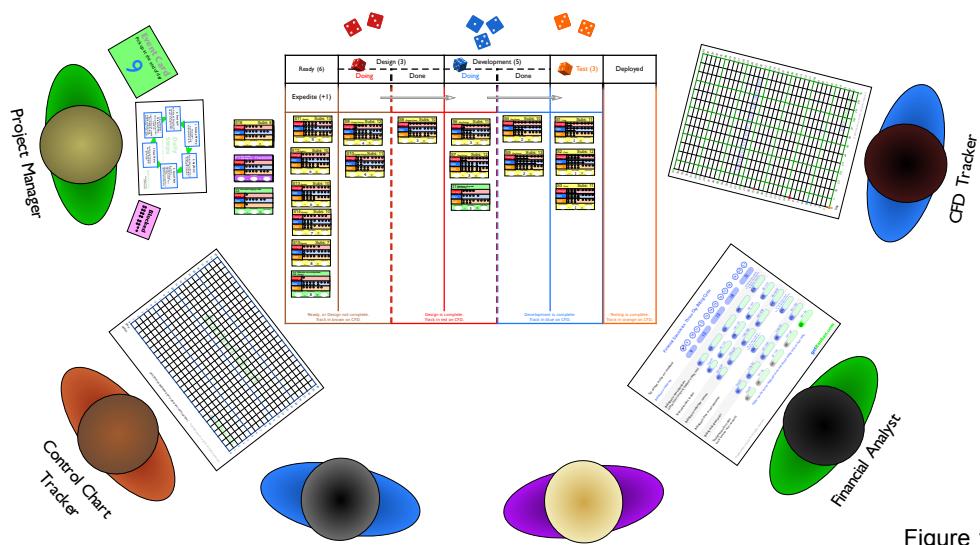


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Each story has design work, development work, and test work, represented by white dots. Each story has Day Ready, Day Deployed, and Cycle Time fields. The Project Manager is responsible for ensuring that these fields are completed. Cycle Time is Day Deployed minus Day Ready.

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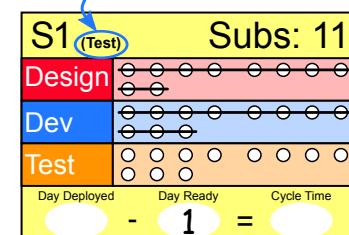


Figure 2.

Place these story cards in their correct positions as shown in Figure 3.

Continued on reverse ↗

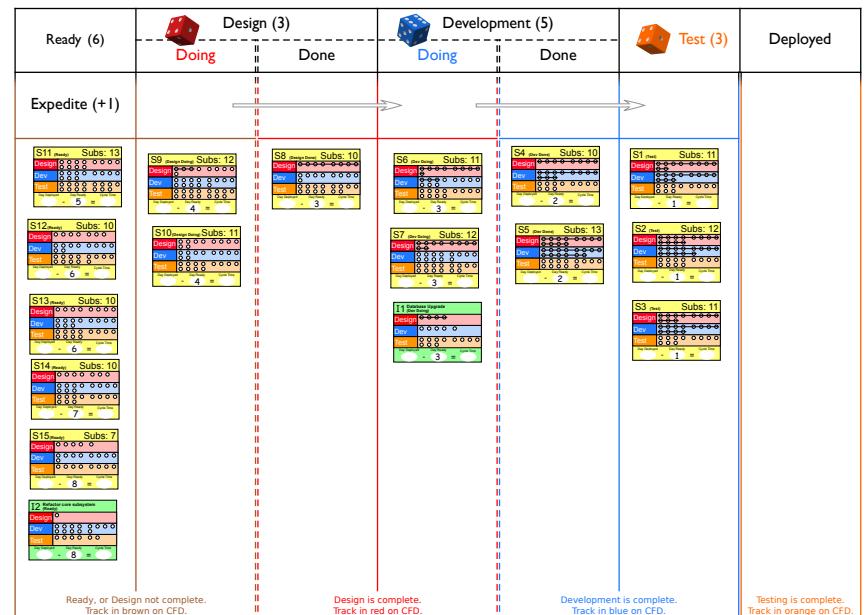


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Dice

The dice represent people on our team. The colors indicate their specializations. Red dice represent Designers, blue dice Developers, and orange dice Testers.

Each day we will roll the dice and reduce work on stories. If a person works in their area of specialization, they are more effective, and achieve double the face value of their die.

Gameplay — Daily Steps

The Project Manager ensures that the following steps are completed accurately each day. The Daily Steps card should be referred to as a guide.

1. Standup Meeting

The Project Manager facilitates a "standup" meeting during which the team observes the state of the work, and briefly discusses strategy for the day. Fixed Delivery Date stories and Intangible stories can be reprioritized within their current stations during this meeting.

2. Play Board

Take one die of each remaining color, declare in which specialization each will be played (Design, Development, or Test), then roll the dice, calculate the work done in each specialization, and reduce work on the stories by that amount. Stories should be worked on in the order they are arranged in the stations, not selected based on knowledge of the dice roll.

Repeat until all dice have been rolled for the day. At the start of the game, the last roll of the day will be a single blue die.

Alternative: Our facilitator may decide to require all dice to be declared and rolled at once. This makes the game slightly faster, but slightly less realistic. Rolling in sets simulates the passage of time during the day.

If a die is played in its area of specialization, its face value is doubled. For example, if we had the following stories in Design Doing:

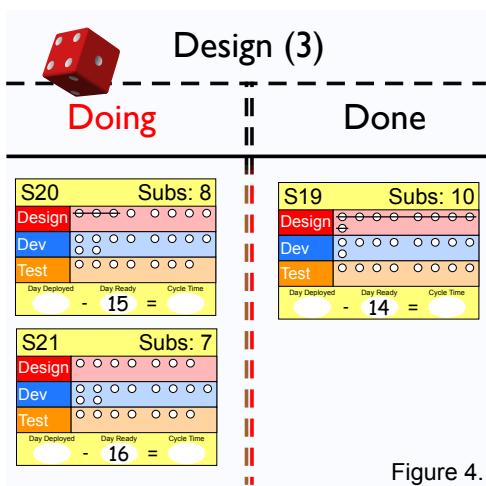


Figure 4.

and if we had taken one of each color die, and declared the red and blue dice to be played in Design, then the face value of the red die would

be doubled, because it is being played in its area of specialization. The value of the blue die would not be doubled because it is not being played in its area of specialization.

If the dice were rolled with the following result, then the total work to be done in Design from this roll would be 7:



$$3 \times 2 + 1 = 7$$

This would allow us to strike off the remaining five dots of Design work on story S20, and move it immediately to Design Done, then strike off two of the dots of Design work on story S21:

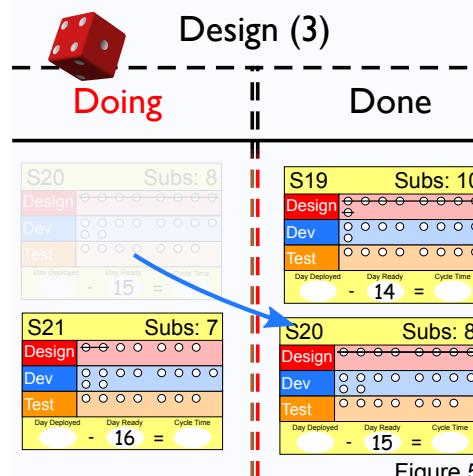


Figure 5.

We can pull stories from upstream at any time, as long as WIP limits are honored. E.g. from any deck of story cards into the Ready queue; from Ready into Design Doing; from Design Done into Development Doing, etc.

Intangible stories and Fixed Delivery Date stories can be reprioritized as they are pulled downstream.

Standard stories are stacked in business-priority order. They should flow across the board in order, and be deployed in order (FIFO: first in, first out). If a story is held up by a pink blocker, other stories may flow past it. When the story is unblocked, it will continue in flow with the other stories around it.

3. Sanity Check

The Project Manager ensures WIP limits are honored, and all story cards are up to date: the Day Ready field is complete on all stories pulled into Ready; the Day Deployed and Cycle Time fields are complete on all deployed stories.

4. Track Charts

Chart Trackers update their charts.

5. Day Complete / Financial Summary

The Financial Analyst ticks off the day on the Financial Summaries sheet to indicate it is complete.

If it is the end of a billing cycle, the Financial Analyst completes the financial summary, gathers the deployed stories and sets them aside. The Financial Analyst notifies the facilitator of the total gross profit to date.

6. Event Card

The Project Manager picks up the Event Card for the day, reads aloud, and actions if necessary.

Fixed Delivery Date Stories

F1: Security Audit. Following a flurry of high-profile security breaches, new regulations require regular audits of customer data security. This story is to correct a design flaw that would cause us to fail the audit. If we don't finish the story by the end of day 15 we will be fined \$2,200.

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Cash Bonus

If multiple teams are playing at once, the first team to finish the game (i.e. complete day 21) receives an in-game cash prize bonus of \$10,000.

Day 9

Our facilitator will guide us through day 9 shortly, then the game will begin.

Frequently Asked Questions

What happens when we have reached our WIP limit and we have more work available from the roll of our dice? Can we start more work?

No, we cannot start more work. With respect to this project, the extra work is wasted. Consider what the impact would be of starting more work. Consider what other activities might be useful and appropriate for people in this situation.

When does the game finish?

At the end of day 21.

Where can I purchase copies of this game?

Visit www.getkanban.com

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Game Instructions

Background and Objective

Our company, MoreSubs Inc, offers a subscription-based software product. We begin the game on day 9 of a project that is already underway. Our objective is to maximize profit.

Game Setup

We need to layout the board and arrange ourselves around it as shown in Figure 1.

Roles

Everyone is a Team Member. There are four specific roles: Project Manager, Financial Analyst, CFD Tracker, and Control Chart Tracker. Nominate people to fill these roles now. This will help people to focus on their specific responsibilities through the remainder of the instructions.

People in specific roles should locate and familiarize themselves with their tools as follows:

Role	Tool
Project Manager	Daily Steps
Financial Analyst	Financial Summaries
CFD Tracker	CFD Chart
Control Chart Tracker	Control Chart

Chart Trackers will find instructions on the reverse of their charts.

Revenue and Profit

As we complete work in the form of stories we add to our product's capabilities, and attract new subscribers. Our company has a three-day billing cycle. Every three days, we charge each subscriber \$100 for using our product. In order to grow our revenue stream, we want to attract as many subscribers as quickly as we can. Our profit will be calculated by the Financial Analyst at the end of each billing cycle.

User Stories

There are four categories of story (or four classes of service):

Standard (S) stories are yellow and are for product features which attract subscribers and hence revenue. The number of new subscribers a story will attract is indicated in the top right corner of the story card. Standard stories should be completed in FIFO order (details in section *Gameplay — Daily Steps*).

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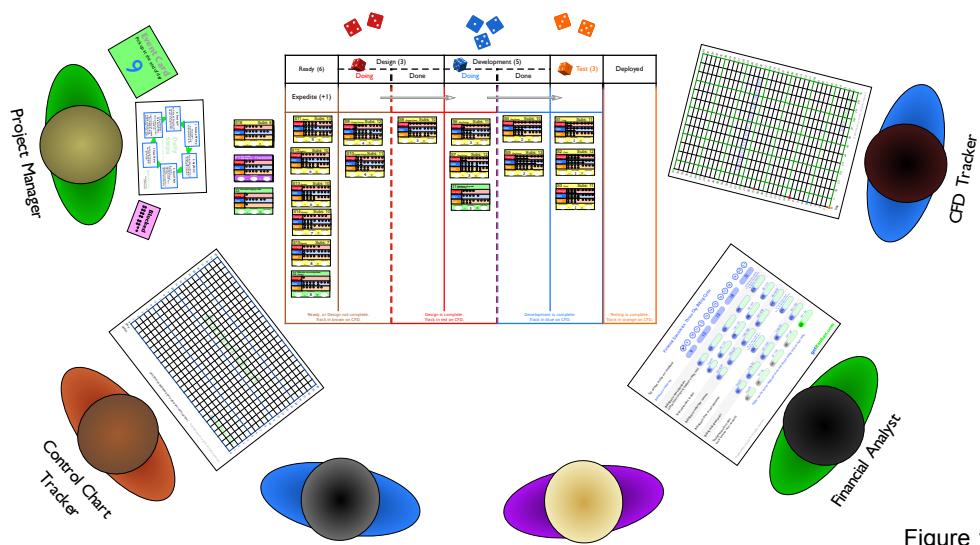


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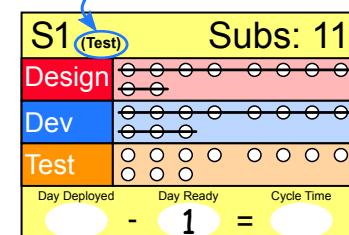


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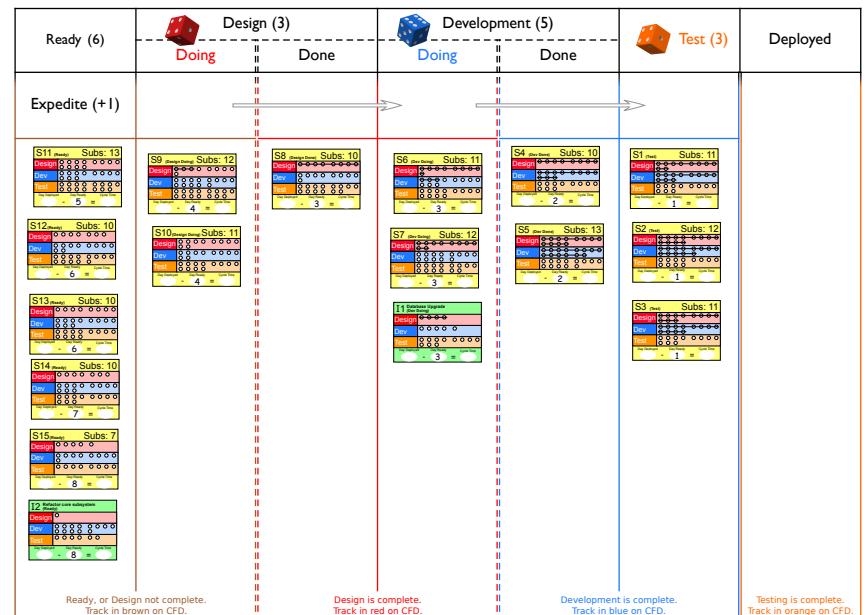


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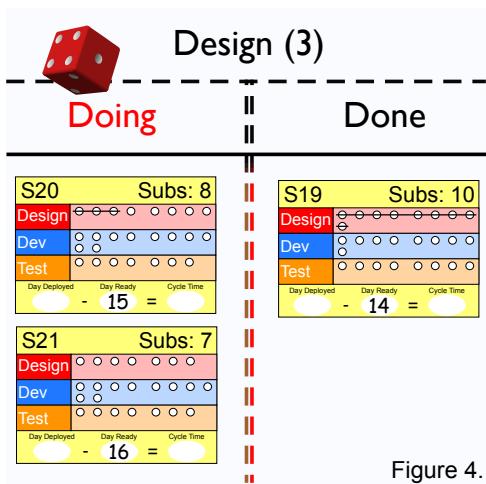


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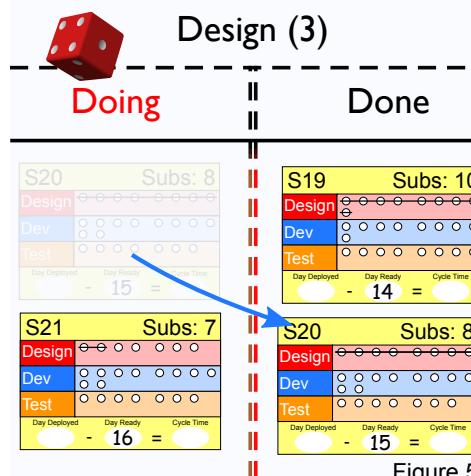


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