



GAME DEVELOPERS CONFERENCE
SAN FRANCISCO, CA
MARCH 5-9, 2012
EXPO DATES: MARCH 7-9

2012

FORZA MOTORSPORT 4

racing to the finish

tatyana dyshlova, lead producer (engine)
arthur shek, technical art director



Introduction of Tatyana and Arthur

FORZA MOTORSPORT 4

about turn 10 (microsoft studios)



Forza Motorsport

2005 - 92 rating



Forza Motorsport 2

2007 - 90 rating



Forza Motorsport 3

2009 - 92 rating



Forza Motorsport 4

2011 - 91 rating

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Turn 10 is known for the Forza Motorsport franchise, which has a history of hitting a high quality bar with a 90+ metacritic rating with our first 4 titles.



FORZA MOTORSPORT 4

overview

What are we going to talk about?

The Challenge

Measuring Success

Our Approach

Why are we giving this talk?

Share ideas for future content production improvements

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What are we going to talk about?

- Our challenges faced in producing large amounts of content

- What we have learned over the last four versions of Forza Motorsport about content production

- The best practices we've implemented

Who's this presentation for?

- Game development directors, project/program managers, producers; take your pick of title...

- Content has a vast reach with many dependencies on a game

What do we want you to leave with?

- Knowledge – "If I had known what I know now back when we started FM1"

- Nothing here is rocket science. This is what worked for Turn 10; your studio's mileage may vary

CHALLENGE

FORZA MOTORSPORT 4

what we created

In < 2 years:

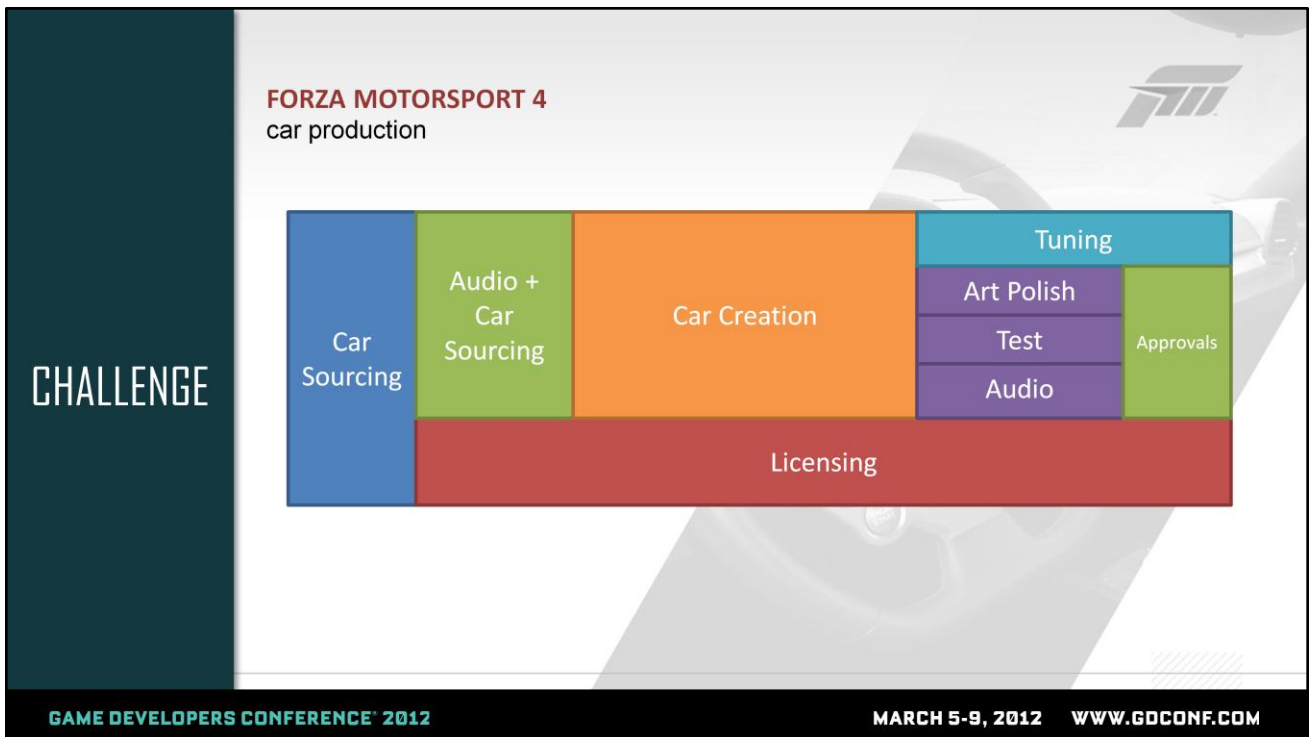
- 500+ cars on disk (400,000+ polys/car)
- 25 Autovista experiences (1,000,000 polys/car)
- 26 environments (avg. 3000 objects/scene)
- 300+ artists world-wide in 24 hr/day production (across 4 time zones)

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For Forza 4, we generated lots of content in a very short amount of time (stats on slide).

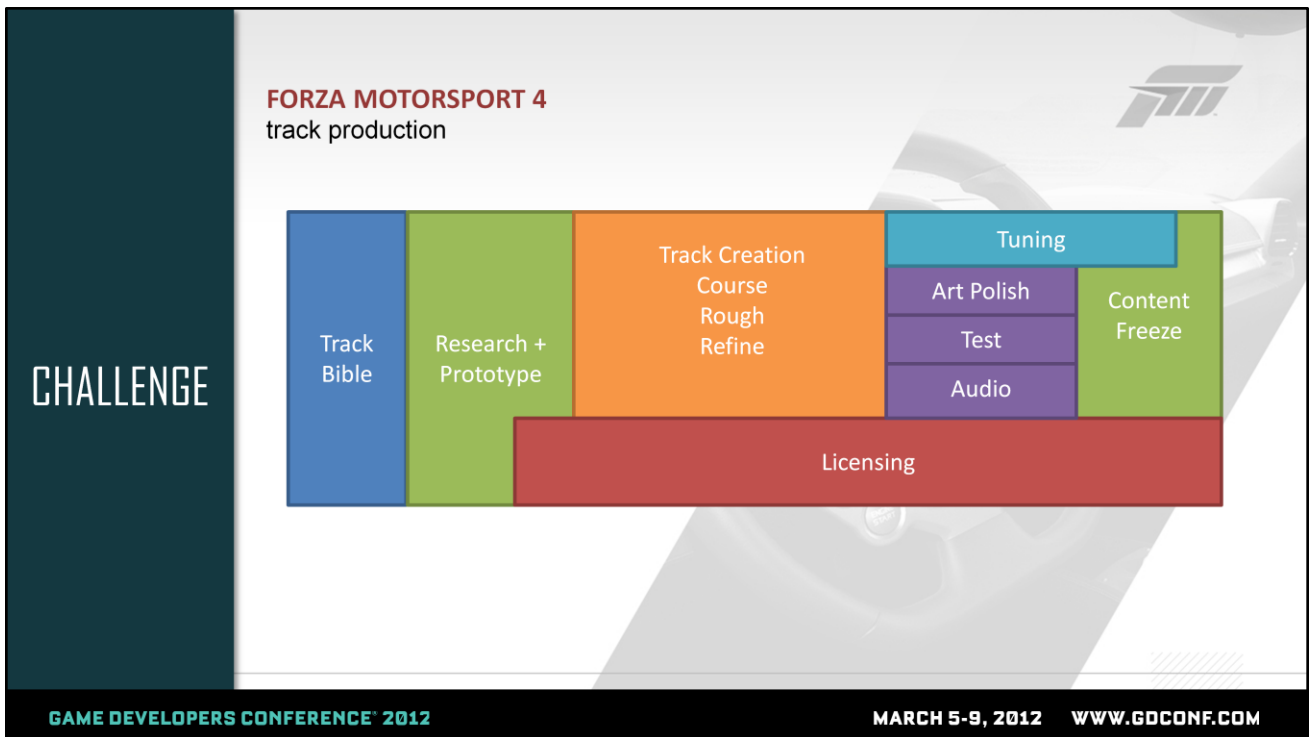
In addition to the standard car and track fare, we also introduced the Autovista experience. For those that are not familiar with Forza, it's a super high poly car model that allows the customer to walk around the car, interactively explore interesting tidbits, open doors and hoods, get in and out and start the car. It is a virtual car showroom for the hottest cars in the world.



To give you an idea of the scope of our content, this is the work it takes to generate just a single car, utilizing outsourced modeling work and around 10 internal people in various roles across the studio.



At the end, we get this... ooh, shiny!



Track environments have many more steps and elements; here is a rough diagram outlining the process of creating one track.

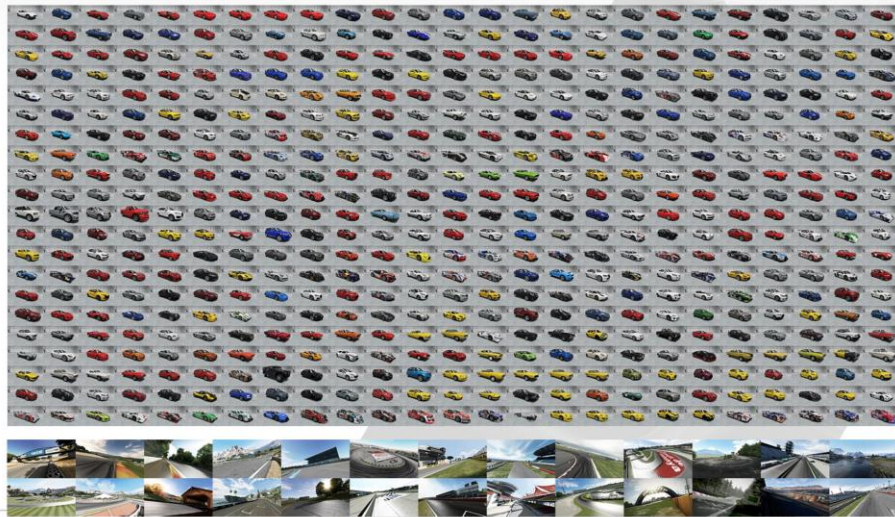
Tracks vary in creation time – depends on a lot of variables, including track length, if the track is fictional or authentic, etc. – our longest tracks take over a year to create with multiple artists.



When it's all over, we end up with one track, like our showcase Alps fictional track..

CHALLENGE

FORZA MOTORSPORT 4
at this scale...



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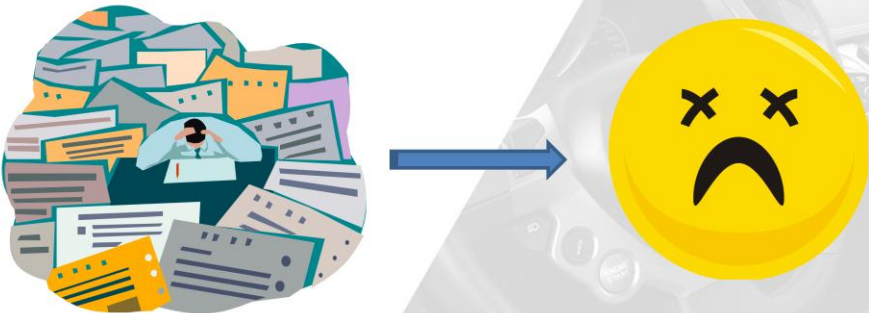
Now imagine those single asset diagrams at the scale of our game – repeated 500x for cars and 26x for tracks. It takes a disciplined team to keep all the pieces aligned and on rails to meet a successful content delivery date in time for the game to ship.

~530 cars from scratch is 3,180 months, or 265 man years of car work in our game!

Production staff needs to know the status of all of this content, each content is had unique idea and spans multiple internal and external teams = crazy producer.

CHALLENGE

FORZA MOTORSPORT 4
production management



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Producers are not as happy if they don't have the right tools to juggle all of this content, which is an issue we ran into during of the initial production review... more on that later



CHALLENGE

1 Quality

2 Time

3 Cost



We're going to frame our discussion for success in terms familiar to producers – the classic project triangle of quality, time, cost. Of course the joke is that with every project, you only get to choose two to do right.

Anyone who has been through the Microsoft business reviews can attest to the fact that we don't have the luxury of picking two. In fact, we're quite lucky to leave the room without a project square or pentagon!

In our content production process, we diligently keep track of all the minute details with carefully measured *metrics* – as you'll see in subsequent slides as we talk about each of these topics with specific examples, we believe this data is the key to our content production success and allows us to be nimble when making choices for the project and serve all three masters well.

1

QUALITY

FORZA MOTORSPORT 4 quality

#1 studio goal

- History of 90+ rated AAA games

Methods

- structured pre-prod
- multiple check-points
- tracking



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One the most important things is understanding your team's success criteria. We spent a lot of time trying to define what that means, how much content we wanted to/could create, and just what does it mean for it to be "good"? We invested a lot of time in defining the visual bar and vendor specs. Everyone needs to be on the same page in terms of what we are targeting; this will define how the art is created and features across the studio. This needs to be officially rolled out and updated. With so many people, word of mouth doesn't work.

Constant check-ins and meetings are the cost of large scale production. Goals change, expectations are different - you can't afford to wait too long before adjusting the course of action.

With so much content, we need to make sure we are tracking things correctly. If we need to skimp on quality, we need a way to make educated decisions based on priority of specific pieces of content, what stage it's in, what else is in the pipe, etc.

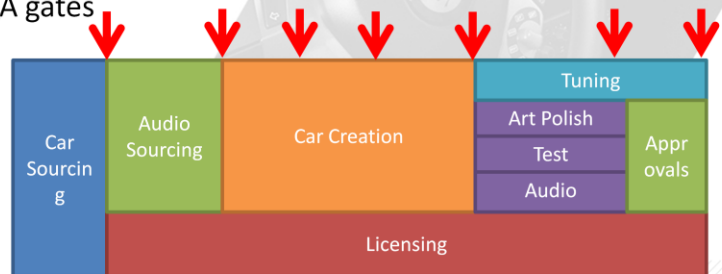
1

QUALITY

FORZA MOTORSPORT 4 car quality

Cars

- reference spec
- vendor spec
- SME staff
- multiple QA gates



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For cars, our car team clearly defined a spec for reference gathering and for vendor production. What was expected from vendors in terms of polygon budget, areas of detail, etc. were clearly laid out in these specs. We built up a team of subject matter experts, or SME's, who know every single detail about cars going through our production pipeline.

<Anecdote here>

Finally, we set up multiple QA gates where we track how production is heading towards our ideal goals.

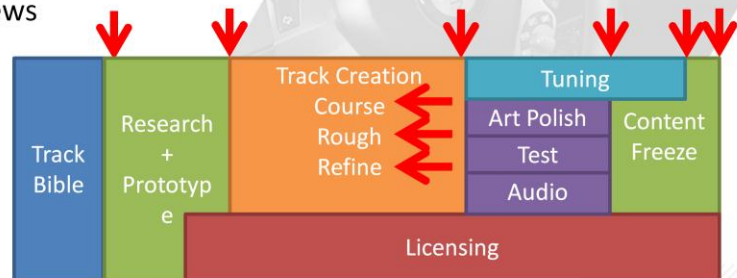
1

QUALITY

FORZA MOTORSPORT 4 track quality

Tracks

- visual targets
- artist track reviews
- multiple QA gates
- lead reviews



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The track team also creates visual targets, but that proved to be a difficult problem with the volume of environments that we had to produce. We supplemented these targets with regular artist track reviews and the same multiple QA gates for tracking.

Once environments were in the polish phase, studio management had regular opportunities to review how everything was coming together.

1

QUALITY

FORZA MOTORSPORT 4 milestones

Milestones

- Production Entry
- Vendor Complete
- Content Complete
- Content Freeze



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Because these assets go through complex creation methods, it's important to have reviews at the correct time. If you review too early, people get bogged down in pieces that aren't ready to be looked at. If you review too late, it's past the point of making significant changes.

We found that one of the most important things is locking down parts of production. This list shows milestones that we hold sacred. When we review the progress of the content across the studio, we define it as the items that have passed through these gates - everyone should have a shared understanding of what that means and we found ourselves getting into trouble when the milestones weren't clearly defined.



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Time is an important concept for our studio and one of the main accountabilities on producers. A few years ago, we gave a GDC presentation about how adopting the Agile Scrum process helped the development side of our studio – it allowed our development team to be predictable and respond to changes during production and still hit our milestones. Unfortunately, because content production is inherently waterfall, those Scrum efforts didn't significantly make content production any more predictable.

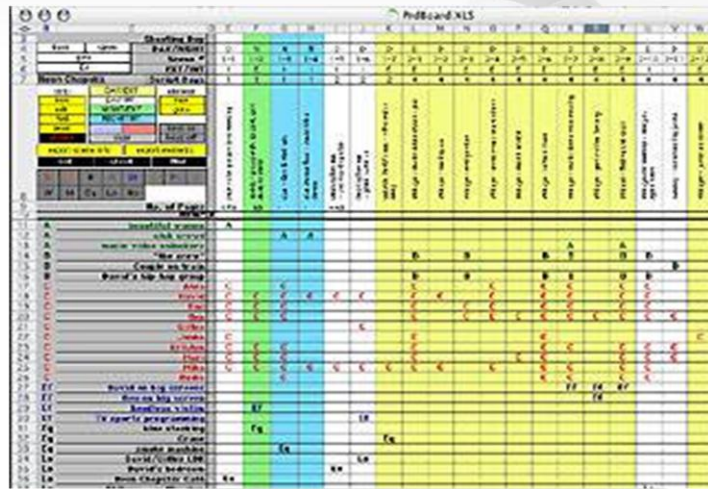
Our studio wanted to focus on improving our content production practices for Forza 4 to make them equally predictable.

We created a Content Business Group at our studio and teamed up with folks from various disciplines to help drive the push for predictable content tracking. At this point, I'm going to bring up Arthur Shek, our studio's Technical Art Director, who helped champion a lot of these processes.

2

TIME

FORZA MOTORSPORT 4 the spreadsheet of doom



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When I was first asked to help move the needle on content production and predictability, I immediately asked for data on our car and track production timelines to see what pieces of production had the most variation, took the longest time, etc.

I was pointed at the so-called “spreadsheet of doom” which had been used by various content PM’s in past productions. Whenever data needed to be collected to present to studio management, the PM would huddle in the corner with this magical spreadsheet, mumble some incantations for several days, and then come out with the desired statistics. This age-old tried-and-true mechanism for tracking content production did not scale well – without the producer wizard, I couldn’t make heads or tails of the data and neither could our management.

It quickly became apparent that that was the first piece that needed greater inspection – our estimates for content production for Forza 4 were based off of institutional knowledge and intuition more than actual data. Moreover, what data exists wasn’t easily visible to everyone.

Our studio management wanted to know:

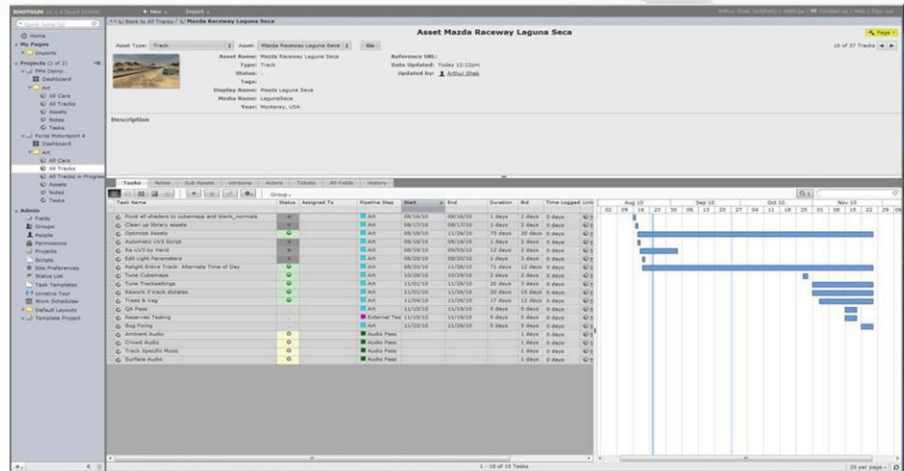
- Do we have the time to make the content we want to make?
- Later, how are we tracking to our anticipated schedule?
- What percentage of cars are done (high level)?
- What cars are behind and where are we being held up?

To organize the data in a way that made more sense and accessibility than the standard Excel bug database combo, we made it a priority to look at options that would help us better organize the data and present it in a way that made us more predictable.

2

TIME

FORZA MOTORSPORT 4 shotgun



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We wanted to explore a way of tracking assets that helped us track assets as an entity with assignable tasks instead of a huge bucket of bugs in a software database and manual tracking via Excel. There are many options for doing this, including writing your own system; for various reasons, we went with a third party solution called Shotgun.

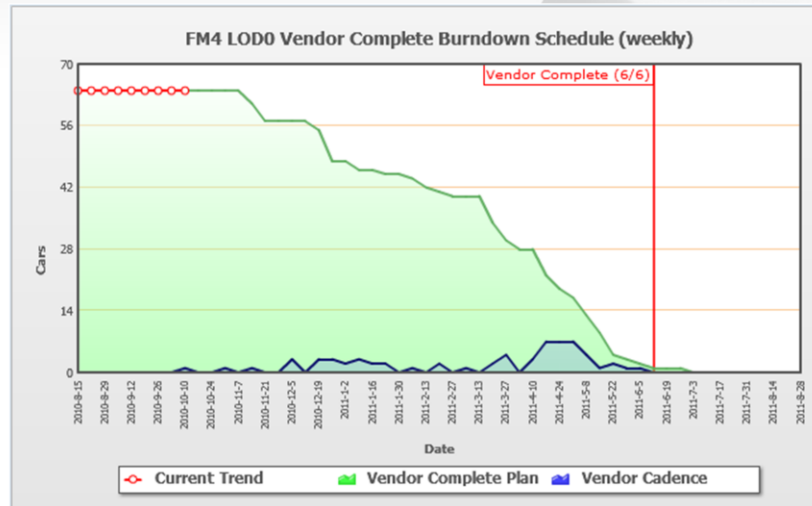
Shotgun gives us the ability to create an asset, track specific tasks related to those tasks through a pipeline, and roll that all up into trackable and queryable data. Our PM's can add arbitrary fields per asset or create custom reports without requiring developer intervention. All this is served via a web app so anyone with a login at the studio can view the instantaneous data. Additionally, we have an API to do our own custom enhancements and roll the data up into forms that make sense to higher ups.

One of the nice things is because this is a unified web interface, artists are able to update their tasks and have the data automatically rolled up into the globally visible data and fancy charts that we created. All the charts and graphs you see in subsequent pages are fed by this same data so we have a living data-driven view of our production heartbeat.

2

TIME

FORZA MOTORSPORT 4 burndown



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Seeing the Shotgun data helped us to identify a few key time-related problems almost as soon as they happened.

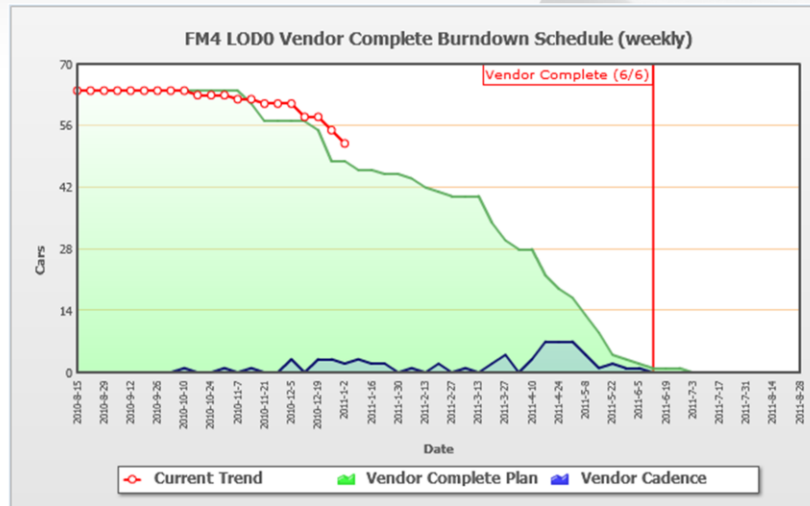
500 cars is tough to roll up into a high-level view. But, we need this to figure out if there is enough time to create the content and still meet our time deadlines. Using the Shotgun API and the commercial FusionCharts graphing package, we wrote a process that would data-mine the data and create a burndown chart that would show us how we were hitting our goal (or slipping from it). Here, we see the early happy days of production when we were just starting – we're perfectly in sync at this point! This chart shows one of our milestone phases, which involves getting models delivered back from vendors.

2

TIME

FORZA MOTORSPORT 4

uh oh



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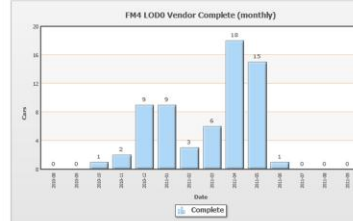
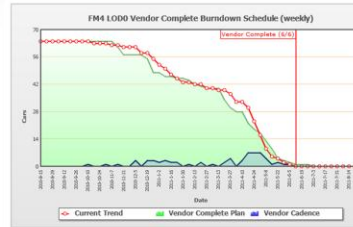
Now, midway through production, we hit a situation that is all too common – the dreaded “not on target”. We had a detail page with this report that would highlight any cars that were late in delivery so the PM’s would know exactly what the culprits were and account for them. In this case, we noticed that the delays were coming from one of our outsource vendors. After a nice “talk”, we found out that the vendor was holding assets to keep their inventory flat, not aware how it was impacting our schedule. We could see these problems almost immediately because of the real-time data, although it took a number of weeks to address these issues during production.

TIME

FORZA MOTORSPORT 4

talking points

FM4 LOD0 Vendor Complete Burndown



Year	Model	Year	Model	Year	Model
2008-2009	Dodge Raptor ACR	2010-10-15 (12 days early)	Verano		
2009-2010					
	General Electric	2010-01-15 (14 days early)	Verano		
	Pontiac Solstice GP	2010-10-19 (13 days early)	Verano		
2010-2011					
	Pontiac GTO (2006)	2010-07-07 (22 days late)	Verano		
	Subaru Impreza	2010-07-23 (26 days late)	Verano		
	Ford F150 FXT	2010-09-29 (23 days early)	Verano		
	Toyota Prius	2010-02-21 (45 days early)	Verano		
	Honda Civic Type R	2010-08-22 (2 days late)	Verano		
	Subaru Outback	2010-09-28 (23 days early)	Verano		
	Ford Mustang Mach 1	2010-09-28 (23 days early)	Verano		
	Pontiac GTO Judge	2010-09-30 (20 days late)	Verano		
	Pontiac Firebird Trans Am (1977)	2010-09-21 (20 days early)	Verano		
2011-2012					
	Subaru Impreza	2011-01-04 (33 days late)	Verano		
	Subaru Outback	2011-01-04 (33 days late)	Verano		
	BMW 320i Coupe	2011-01-12 (22 days early)	Verano		
	BMW 320i	2011-01-13 (20 days late)	Verano		
	Subaru Outback	2011-01-13 (20 days late)	Verano		
	Honda Accord	2011-01-20 (20 days late)	Verano		
	Chrysler Allie S&V	2011-01-20 (20 days late)	Verano		
	Subaru Outback	2011-01-24 (24 days late)	Verano		
	Pontiac Firebird Trans Am (1968)	2011-01-24 (24 days early)	Verano		
2012-2013					
	Chrysler Camaro Z28 (1970)	2012-10-11 (21 days early)	Verano		
	BMW 228i	2012-10-11 (21 days early)	Verano		
	Subaru Outback	2012-10-25 (15 days late)	Verano		
2013-2014					
	Honda Civic Sedan EX	2013-01-08 (41 days early)	Verano		
	ALFA Romeo 159	2013-01-22 (5 days late)	Verano		
	BMW 328i	2013-01-22 (5 days late)	Verano		
	BMW 328i	2013-01-29 (20 days late)	Verano		
	Chrysler V6	2013-01-30 (20 days early)	Verano		
	BMW 247GT	2013-01-31 (23 days late)	Verano		
2014-2015					
	Subaru Impreza	2014-01-01 (32 days late)	Verano		
	Ford Escort EC Greenleaf	2014-01-11 (22 days late)	Verano		



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The nagging has had the desired effects and things are back on track. This is the full report page... at the bottom, you can see the actual cadence of cars coming back per month from vendors. In an ideal production world, this is completely flat so it's important that we have this data captured so that we can mine it for info during the project post-mortem. Our big deficit in February was due to the lunar new year in Asia. On the right, we can see the detail view that alerts us when specific cars are late.

3

COST

FORZA MOTORSPORT 4
cost



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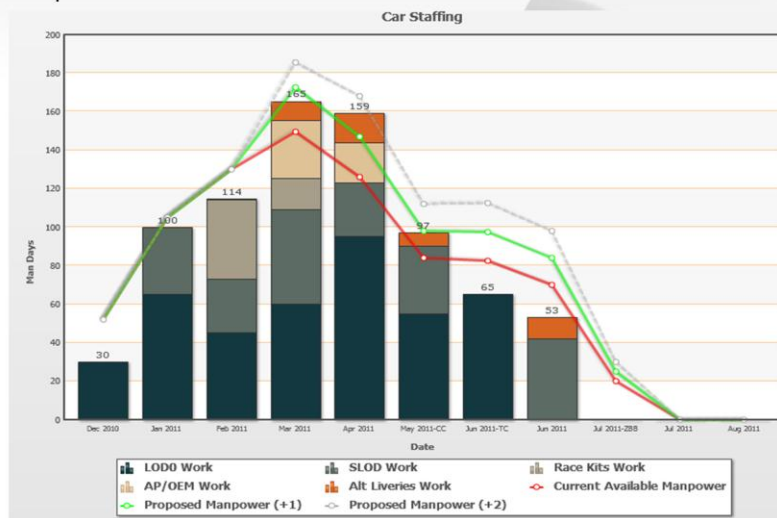
Cost is the final corner of our project triangle. As anyone in production is aware, manpower is the significant contributor to the expense of producing content. To reduce dramatic goodbyes and shed tears from a dramatically fluctuating studio size over the course of multiple shipping cycles, Turn 10 makes heavy use of outsource partners to bear the scaling cost while maintaining a tightly managed internal art team.

To assist with this vendor rollout, we partnered with our Pipeline team to make targeted investments in setting up a vendor pipeline that mimicked our internal artist pipeline as closely as possible. To be specific, we moved our art team to a source control system called TFS (Microsoft's Team Foundation Server), which allowed our outsource vendors to check assets directly into the same repository as our internal artists. As a result, assets could be viewed and feedback given immediately without requiring a complex sequence of events to happen to pull in vendor art.

3

COST

FORZA MOTORSPORT 4 predicting manpower



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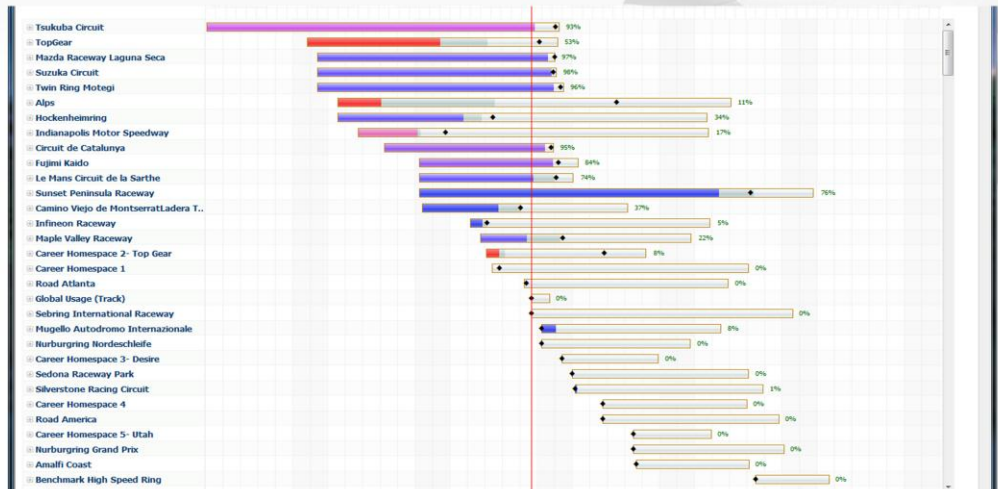
At Turn 10, we pride ourselves on running a tight ship. How many producers out there have folks come up and say “we need one more dude to help ship the game” and you don’t know whether to buy it or not?

Midway through production, we helped our car lead justify manpower with this “exciting” bar chart. Because of how our tasks were setup for tracking, when tasks inevitably slipped, we could see how that affected our internal staffing plans and cost. Here, we can see that for the added up hours of tasks that we had, our current staffing plan suddenly looks insufficient, as indicated by the red line. If we strategically added one person, we reach the more ideal green line. There’s a little under-staffing in April, but we felt like there would be appropriate padding in the critical June timeframe. Finally, we can also see why adding 2 folks leaves us with too many hours of thumb twiddling, as indicated by the dotted grey line.

3

COST

FORZA MOTORSPORT 4 shuffling manpower



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We had many fewer tracks than cars, so we made a custom track reporting page that would show us all the task data rolled up into a color-coded Gantt chart. As with cars, this was driven by querying Shotgun data and displaying the data via a heavily modified open source Javascript library called jsGantt. Blue good, red bad.

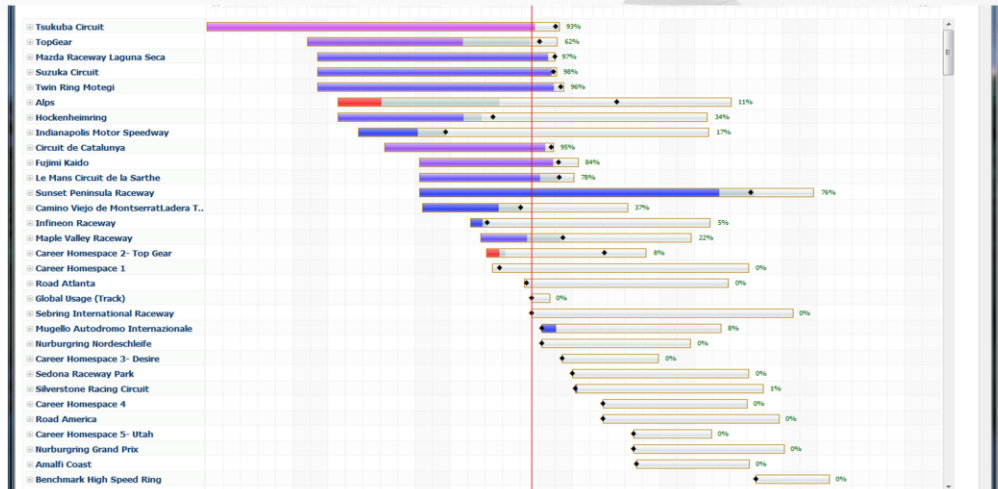
Every three weeks we sat in front of our studio management and were able to show them a view of what was happening and show them a view that would quickly let them know what questions to ask.

Here, we see several of our tracks going “off track”. Alps was a particular concern at this time because it had been identified as our visual showcase track and was part of the initial experience of the game. Having this data handy let us know that we needed to reallocate internal resources and trigger extra outsourcing work without relying on our “feelings”.

3

COST

FORZA MOTORSPORT 4 shuffling manpower



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After making some moves, we reduced the reddish glow that was coming off our studio managements' faces.

As you can see from our slides today, making informed decisions around actual production data metrics has been a huge push for us at Turn 10. We feel that this is the key to predictably hitting production milestones.

Now, I'm going to hand it back to Tatyana to leave you with some concluding words.



Define success criteria

Invest in the right tools for the scale of work

Know where you are and adapt quickly

Learn from the past

It's important to define success criteria

- Quality bar

- Timeline

- Budget

It's important to choose and invest in the right tools for the scope of work

- Excel doesn't work as well for 500 items that each have over 2 dozen check points

With our process we were able to quickly

- Quickly visualize our current problems quickly,

- Plan for their impact in the future

- Scale our production to fit our success criteria

Because of this emphasis on metrics during Forza Motorsport 4, the data we gathered

is bearing fruit now in planning for future titles. With the data we tracked, we have exact measurements of what the most time consuming portions of creating cars and tracks are, and are able to dedicate development and tools efforts around those areas to hone our production even more.



Questions?