



Agile Game Development Tutorial

Introduction

Clinton Keith
CTO,
High Moon Studios



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What are we doing today?

- Defining "agile"
- Describe two agile methodologies
 - Scrum (this morning)
 - XP (this afternoon)
- Agile for non-programmers
 - Scrum evolved for programmers
 - XP coevolved to support engineering in an agile environment
 - What will we need for other disciplines?
- Discuss how agile alters roles for
 - Producers, artists and designers
 - Engine/Middleware providers (Epic)
- How agile planning works




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What are we doing today?

- It's just methodology
 - It's about identifying and removing the impediments for talented teams making great games
 - We don't compete based on process
 - Poor process is hurting our industry
 - It's not easy. This will take a lot of effort and sharing to get the full benefit




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Assumptions

- 30 minute presentations
- 10 minutes of Q&A
- All levels of agile experience
- Side-discussions encouraged
 - But well off to the side, so we don't interrupt speakers




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Schedule

Topic	Start	End
Introduction	10:00 AM	10:15 AM
What is Agile?	10:15 AM	10:45 AM
Break	11:00 AM	11:15 AM
Scrum	11:15 AM	11:45 AM
Agile Game Design	11:55 AM	12:25 PM
Lunch	12:35 PM	2:00 PM
Agile Art Creation	2:00 PM	2:30 PM
Agile Production	2:40 PM	3:10 PM
Break	3:30 PM	3:45 PM
Agile Planning	3:45 PM	4:15 PM
XP/TDD	4:25 PM	4:55 PM
Scrum & Middleware	5:05 PM	5:35 PM
Closing comments	5:45 PM	6:00 PM

Handouts available



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What it means to be agile

Mike Cohn




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A defined process

• Every task must be completely understood.
 • When given a well-defined set of inputs, the same outputs are generated every time.

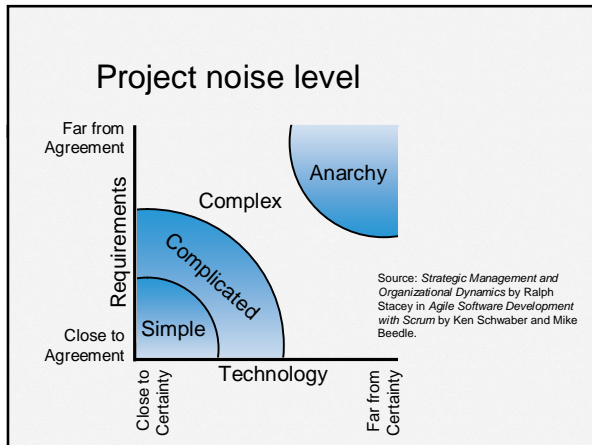
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Is game development a defined process?

- Is every task completely understood?
 - Are we even getting closer?
- Given the exact same inputs (including people)
 - Will we get the same results every time?
 - Can we even have the exact same inputs?

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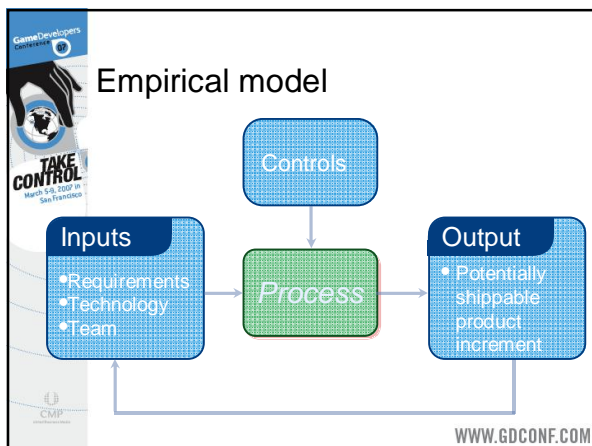


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Empirical process control

- Useful when
 - Process cannot be sufficiently described to ensure repeatability
 - There is so much complexity or noise that the process leads to different outcomes
- Expects the unexpected
- Exercises control through frequent inspection and adaptation

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Three key words

Inspect and Adapt

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Agile is about shifting the balance

Anticipation

Adaptation

Agile

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The Agile Manifesto

- Individuals and Interactions over Process and Tools
- Working software over Comprehensive documentation
- Customer collaboration over Contract negotiation
- Responding to change over Following a plan

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Scrum for game development

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What is Scrum?

- People and communication
- Working game
- Customer collaboration
- Responding to change

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What is Scrum? How is it different?

- Iterative
- Results oriented
- Collaborative
- Self disciplined
- Commitment oriented

- Not plan based
- Not management based

About making things visible so you can apply common sense

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The Scrum Cast

Product Owner

Anyone. Not a lead role

Scrum Master

The Team

- Artist
- Artist
- QA
- Designer
- Animator
- Programmer

Director

Marketing

Publisher Producer

Customers

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Product Backlog

Product Backlog as prioritized by Product Owner
 Defined as *User Stories* with conditions of satisfaction
 Estimated with relative *User Story Points* that help track progress

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Sprints (Iteration)

Change
 Sprint Backlog broken out by team
 Sprint (Fixed Duration)
 New Game (Vertical Slice Added)

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Review and Planning

Review and Planning

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Daily Scrum

Daily Scrum

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The War Room

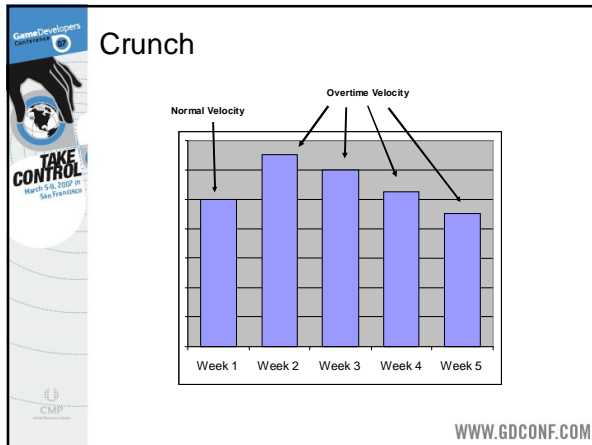
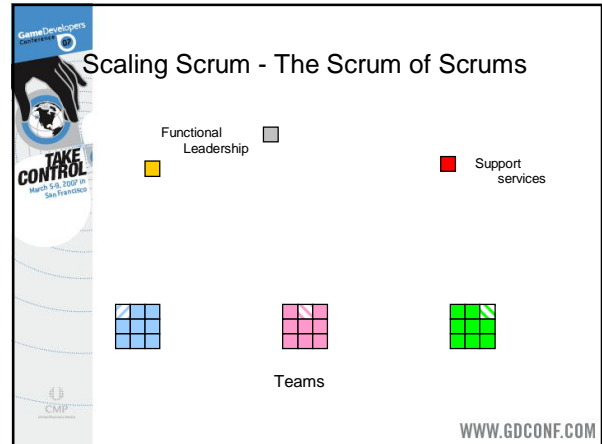
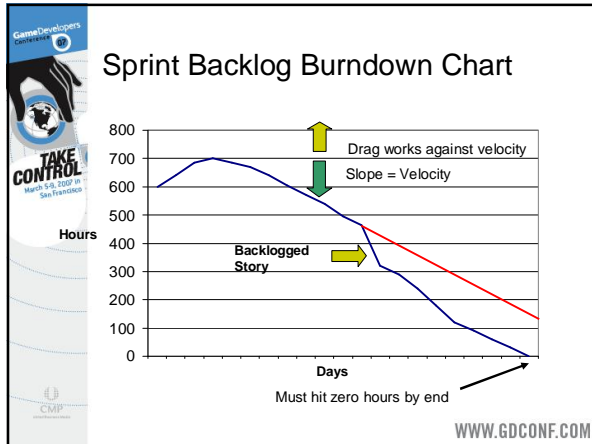
User Stories (Sprint Backlog)
 Tasks
 Completed Tasks
 Burndown Chart

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Jump User Story

Task	Mon.	Tues.	Wed.	Thurs.
Jump Input Control	8	3	0	0
Jump Tuning	16	16	10	4
Jump Animation	8	16	16	4
New task		8	8	0

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Starting agile – some advice

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Questions?

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Agile Game Design

- Rory McGuire
 - Senior Game Designer
 - High Moon Studios

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What are we talking about?

- Agile Game Design At High Moon Studios
- Structure
- Benefits
- Challenges

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Design Department At High Moon

- Define specific gameplay vision and participate in setting project goals.
- Own the creation of levels and mechanics.
- Contribute ideas and enhancements to the game backlog.
- Are advocates for the player, helping to assess and focus feedback from testers and publishing partners.


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Designers at High Moon

- Focus on agile implementation of the vision, not on out-of-date design documentation
- Work with multi-disciplinary teams to achieve vertical slice goals, whether this is a level, a mechanic or an in-game cinematic.


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What is a Customer?

- Projects are broken up into areas of activity with demonstrable goals.
- Every scrum team has a customer who is the keeper of the vision for a particular goal and establishes what "done" means.


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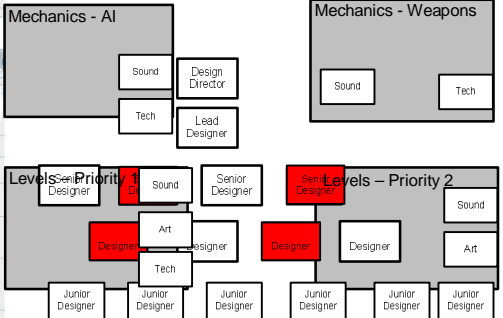
Product Owners and Design Customers

- A Product Owner is the communicator of the vision for the entire project.
- Scrum answers the "How" question, but the "What" and "Why" needs to be answered by focused direction and vision.
- Design Customers carry the vision on specific scrum goals (levels, mechanics, etc)

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How are they structured?



The diagram illustrates the team structure across four project areas:

- Mechanics - AI:** Includes Sound, Design Director, Tech, and Lead Designer.
- Mechanics - Weapons:** Includes Sound and Tech.
- Levels - Priority 1:** Includes Senior Designer, Sound, Art, Designer, Tech, and Junior Designer.
- Levels - Priority 2:** Includes Senior Designer, Designer, Sound, Art, Designer, and Junior Designer.

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How are they structured?

Jumping needs a tuning pass

The mall level needs better pacing

We'll do a bit of AI population.

We'll do a pass today.

Design Director
 Lead Designer
 Senior Designer
 Designer

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Traditional Structure

Producer

Lead Artist
 Senior Artist
 Junior Artist

Junior Designer

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Scrum Structure

Producer

Lead Designer
 Junior Designer

Senior Artist
 Junior Artist

Junior Tech

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Scrum Structure

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How do we plan?

- Focused "stories" replace design documentation
- Focus Test

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How do we plan?

- Focused "stories" replace design documentation
- Focus Test
- Focus on Action/Reaction
 - Let team determine path

Player Action

World/AI Reaction

Player Experience

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How do we plan?

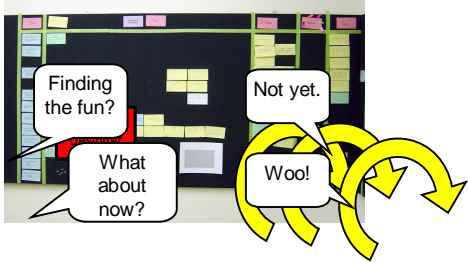
- Focused "stories" replace design documentation
- Focus Test
- Focus on Action/Reaction
 - Let team determine path
- Come Prepared
 - But Respond to change



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Benefits: Iteration Loop



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Iteration + Focus = Quality




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Benefits: Project Stability



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Project Stability

- Time spent fighting the game is time where the product value decreases





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Project Stability





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Additional Benefits

- Project visibility to design team
- Increased focus
- Identify problems and opportunities early

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Challenges

- Designers must cope with high rates of change.
- Short and long-term
- Responsibility increases
 - Members of the team
 - Management




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Conclusion

- Product Value
- Stability
- Transparency
- Iteration
- Focused Goals
- Find the fun as early as possible




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Additional Reading

- Gamasutra.com: "Paper Burns"
- These slides available on AgileGameDevelopment.com





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The Art of Using SCRUM in the Creative Process

Emmanuel Valdez
Chief Creative Officer

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Introduction

- Co-founder of Sammy Studios/ High Moon Studios
- 14 years of experience in videogame industry
- Manage and supervise:
 - Art department
 - Audio department
 - Motion Capture
 - Cinematics department
 - Outsourcing




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Agenda

- SCRUM in art production
- How we use SCRUM
- Challenges
- Benefits
- Evolution of SCRUM


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Art Production is NOT Agile!



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Traditional Creative Goals

- **Creativity**- how unique?
- **Efficiency**- how fast?
- **Consistency**- is this the same game?
- **Effectiveness**- is it good enough?
- **Quality**- how good?

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Creativity

This phase is usually 2 weeks


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Pre-production Phase

- Smaller teams focus on creating and exploring new features
- Iterative and exploratory
- Concept art department
- Identifying risks

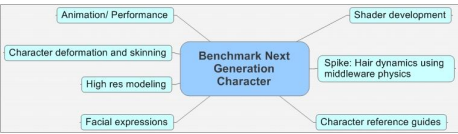


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Product Backlog



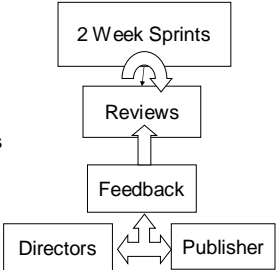
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Short Sprints (2 weeks)

- Incremental
- Focus
- Velocity
- Flexibility
- Limiting resources



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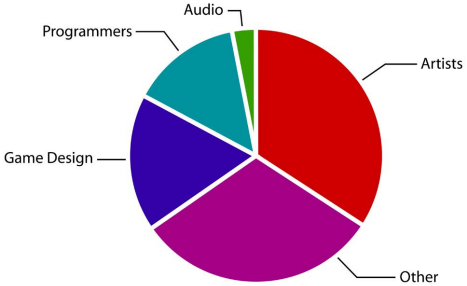
Efficiency

This phase is usually 2 weeks

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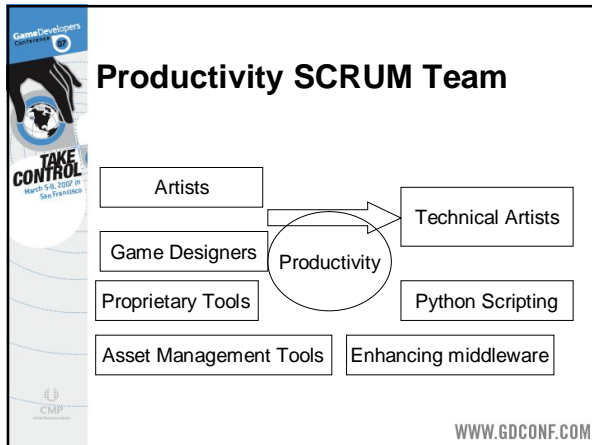
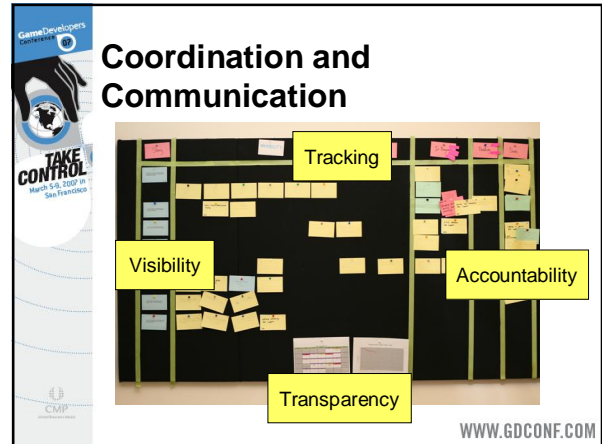
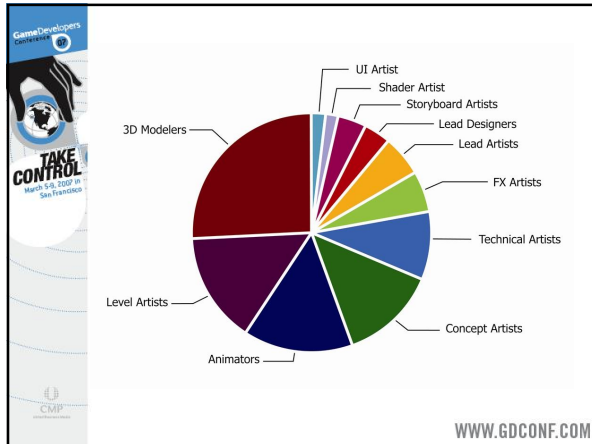
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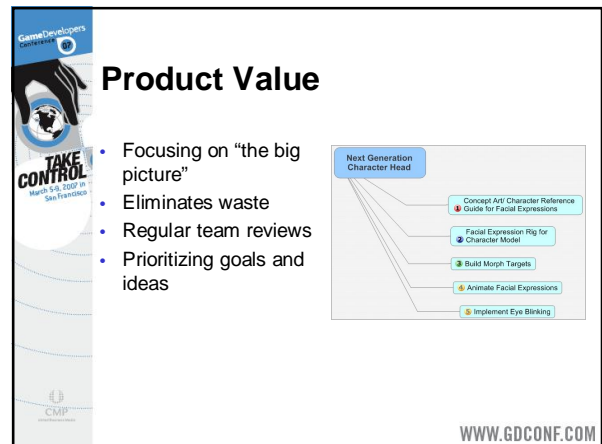
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Consistency

This phase is usually 2 weeks

- ### The Agile Lead Artist
- Redefined roles and responsibilities
 - Focus on art creation and direction
 - No scheduling
 - Delegates authority
 - Mentoring and not managing
 - Still executes on Art Director's vision



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Effectiveness

This phase is usually 2 weeks

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Vertical Slice



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Collaboration


- Continuous input and feedback from Art Director and Product Owners
- Product Owner's responsibilities:
 - Verifies work through leads
 - Aligns expectations with Art Director
 - Takes ownership over SCRUM teams goals and stories



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The Agile Artist



- Takes ownership
- Communicates and coordinates with the other disciplines
- References COS
- Core of art production

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Quality

This phase is usually 2 weeks

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The Agile Art Director



- Compliments vision of game design
- Not a manager
- Focus on big picture
- Sets the bar to achieve goals

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Using SCRUM to Achieve Quality

- Visual prototyping
- Specialists
- Adding polish tasks
- Detailed C.O.S.
- Regular spot checks
- Focus on product value



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SCRUM Creative Goals

<p>Creativity Iterative and incremental Flexibility Velocity Focus</p> <p>Efficiency Tracking dependencies Enhanced communication Visibility Accountability Transparency</p> <p>Consistency Redefining Lead Roles Focus on art direction Product value Productivity goals Regular reviews</p>	<p>Effectiveness Vertical slices Redefining role of artists Interdisciplinary coordination</p> <p>Quality Redefining Art Director Role Focus on the big picture Specialists Polish Detailed conditions of satisfaction Regular spot checks</p>
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Conclusion

- Commitment
- Teamwork
- Talent
- Having people in the right key positions
- Facilities
- Don't be afraid of changes
- Faith

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Thank You!

- Email address: evaldez@highmoonstudios.com
- Visit us at GDC Expo! We are in Career Pavilion booth #1209 (Vivendi Games).
- For company information online: www.highmoonstudios.com
- Press inquiries: pr@highmoonstudios.com
- Meelad Sadat
- meelad@highmoonstudios.com
- (310) 346-5325
- "The Art of Darkwatch", www.designstudiopress.com

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Working with Agile: A Production Perspective

- Steve Sargent
- Executive Producer
- High Moon Studios

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Discussion Points

- What the Producers do at HMS in relation to:
 - Daily Scrum
 - Sprints
 - Reviews & Planning
 - Releases
 - And a few other areas as well...

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My Production Philosophy:

- If the team is a rock band...



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My Production Philosophy:

- ... Production is the Road Crew
 - (and the Producer the Band Manager)

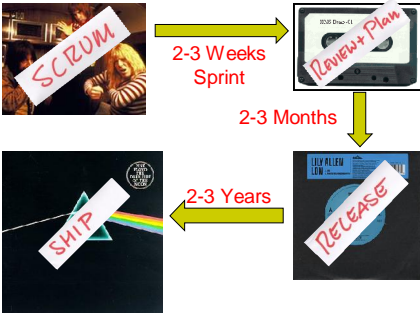


- Our daily goal is to let the creative people focus most on being creative

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Our Development Cycle



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Daily Scrum



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Producers @ Daily Scrum



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Daily Scrum: IMPEDIMENTS!



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Sprint Reviews



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Producers @ Sprint Reviews

- Producers are not Product Owners
- Get the build ready for review
 - Haven't blown it (yet!)
- Review paperwork
- Managing review day
- Retrospectives: Mini Post-Mortems

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Producers @ Sprint Reviews: Backlog Maintenance

- Producer "looks after" Product Backlog
- Backlog maintenance: Before the review
 - Team leads update & estimate Backlog
- Backlog maintenance: Before planning
 - Leads meet with Product Owner post review & prioritize the Product Backlog
 - Producer presents schedule and budgetary risks

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Producers @ Sprint Planning

As a Heavy Metal band I want a stage set that imparts a sense of power and awe to the audience so they regard us as metal gods - not middle-aged has-beens.

COS:
Must resemble ancient monument "Stonehenge"
Must tower over the band in an imposing fashion
Must be capable of surviving kicking by dwarves


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Releases



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Producers and Releases



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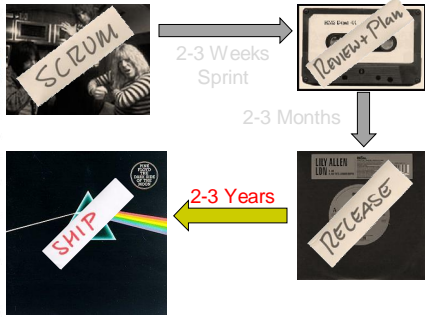
Some other Production tasks

- General external liaison
- Q.A.
- Outsourcing
- Motion Capture
- Dealing with H.R. (Calendar)
- Longer term planning

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After a couple of years...



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What we learned today

- The role Producers play at each stage of the Scrum process at High Moon Studios
- Producers do not micro-manage
- Instead, we spend more time on mentorship, inter-team communication and long term planning

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What we learned today

- We try to let the team spend as much of its time working on the game content...
- ...by handling (almost) everything required to release a game except creating the content

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What next?

- I'll answer any questions now
- If you have any questions later, you can contact me at:
 - ssargent@highmoonstudios.com
 - sargiedev@sargie.net
- You can also contact me through the IGDA Production mailing list

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Agile Planning

Mike Cohn

MOUNTAIN GOAT SOFTWARE

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Imagine...

- That you're fed up with software development as a career
- And you decide to go into the landscaping business
- Your first job is moving this pile of rock from the front of my house to the back

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How might you estimate this?

- One way:
 - Look at the pile of rock and estimate how many wheelbarrow loads it represents
 - After an hour, see how many wheelbarrow loads you've moved then extrapolate the total duration

I think that's 80 wheelbarrow loads
 After an hour I've moved 20 loads
 So, I'll be done in a total of 4 hours

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My landscaping

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- An iteration is a short, constrained period of time
- Typically 1-4 weeks

Velocity is the amount of work planned or completed in an iteration.

A release typically comprises more than one iteration

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Relating the different planning levels

Product Backlog		Iteration Backlog	
As a frequent flyer, I want to...	3	Code the UI	8
As a frequent flyer, I want to...	5	Write test fixture	6
As a frequent flyer, I want to...	5	Code middle tier	12
As a frequent flyer, I want to...	2	Write tests	5
As a frequent flyer, I want to...	2	Automate tests	4

Yesterday I started on the UI; I should finish before the end of today.

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Story points

- Probably the most commonly used estimating unit among agile teams today
- Name is derived from agile teams commonly expressing requirements as "user stories"
- Based on a combination of the size and complexity of the work
- Unitless but numerically relevant estimates
 - A 10-point user story is expected to take twice as long as a 5-point user story

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Consider these two piles of work



What story point values might we put on these?

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Zoo points

Assign "zoo points" to these animals

- Lion
- Kangaroo
- Rhinocerus
- Bear
- Giraffe
- Gorilla
- Hippopotamus
- Tiger

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Three key advantages to estimating in story points:

- Forces the use of relative estimating
 - Studies have shown we're better at this[†]
- Focuses us on estimating the size, not the duration
 - We derive duration empirically by seeing how much we complete per iteration
- Puts estimates in units that we can add together
 - Time based estimates are not additive

†Lederer and Prasad, 1998. A Causal Model for Software Cost Estimating Error and Vicinanza et al., 1991. Software Effort Estimation: An Exploratory Study of Expert Performance.

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Comparing apples to apples

Product Backlog		Iteration Backlog	
As a frequent flyer, I want to...	30	Code the UI	8
As a frequent flyer, I want to...	50	Write test fixture	6
As a frequent flyer, I want to...	50	Code middle tier	12
As a frequent flyer, I want to...	20	Write tests	5
As a frequent flyer, I want to...	20	Automate tests	4

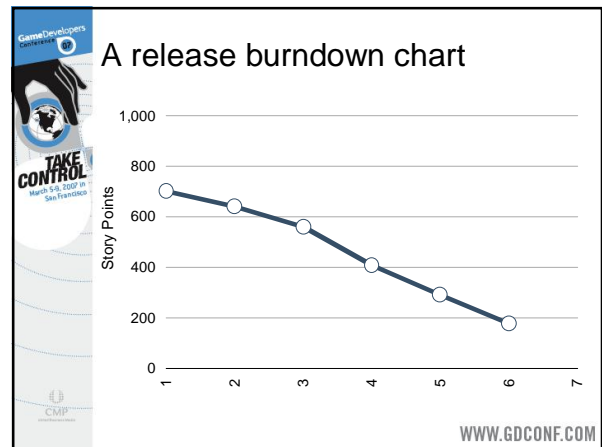
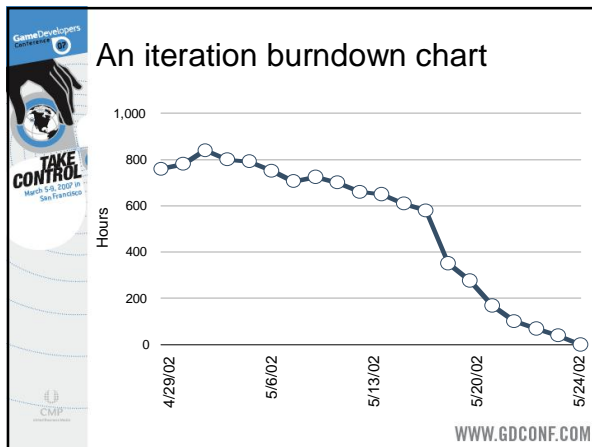
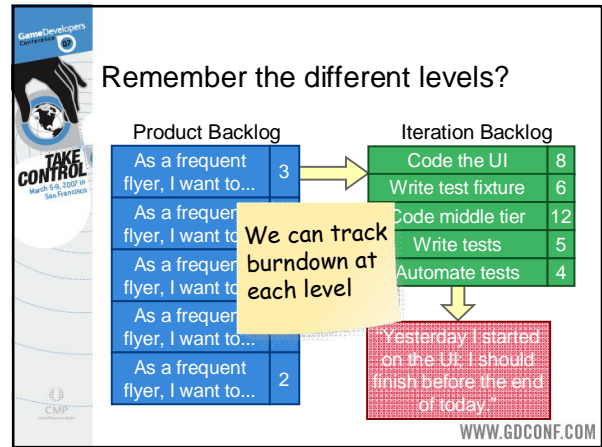
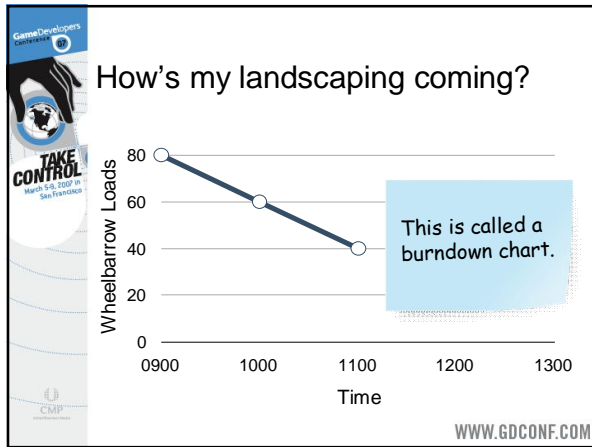
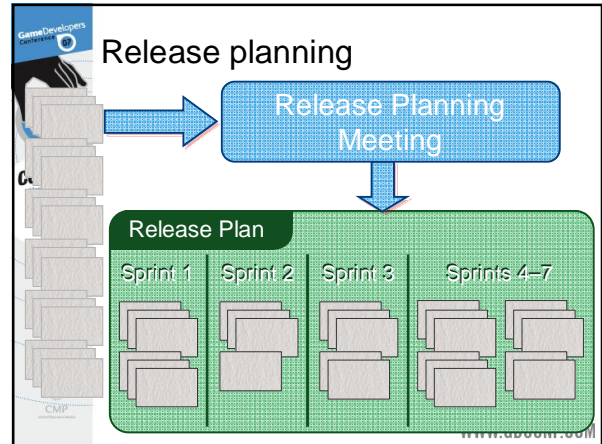
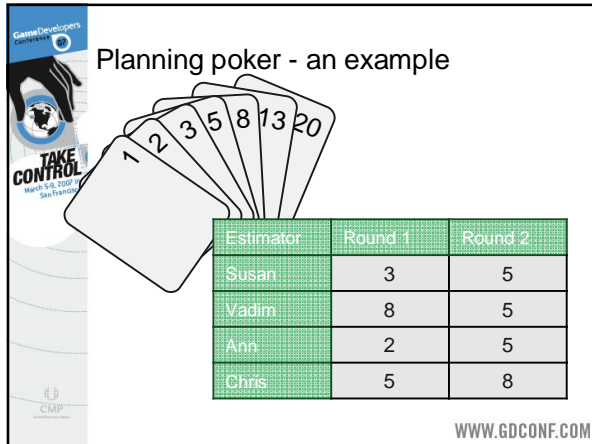
"Yesterday I started on the UI. I should finish before the end of today."

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Planning poker for estimating

- An iterative approach to estimating, loosely based on wideband Delphi
- Steps
 - Each estimator is given a deck of cards, each card has a valid estimate written on it
 - Customer/Product owner reads a story and it's discussed briefly
 - Each estimator selects a card that's his or her estimate
 - Cards are turned over so all can see them
 - Discuss differences (especially outliers)
 - Re-estimate until estimates converge

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XP

Noel Llopis
 Senior Architect
 High Moon Studios

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Agile Practices

XP Practices

www2Programming.com

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Agile Practices

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Automated Builds

- This should be common practice everywhere by now.
- One-button full builds. No complex process.
- Required foundation for other techniques.

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Automated Builds

- **Warning:**
 - Build needs to be robust and reliable.
 - Bonus points for being fast.
 - Do both code and assets. Full game.
- **Don't use if:**
 - ??? Just do it. Never any reason not to.

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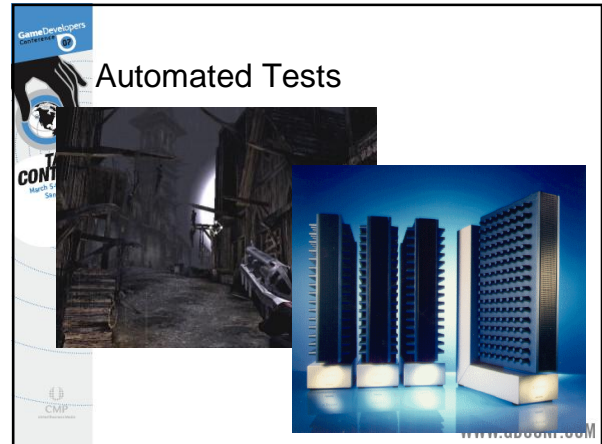
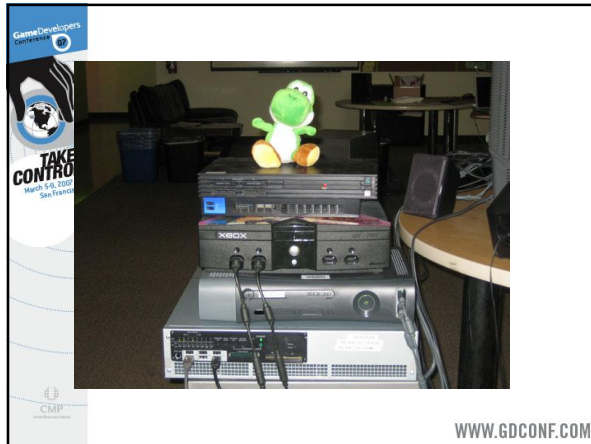
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Automated Tests

- Unit tests: Test a single function or class.
- Functional tests: Test whole program or parts of it
- Fully automated. Run them on the build server at least once a day (we have them running every couple of hours).
- Run them on your target platforms as well.

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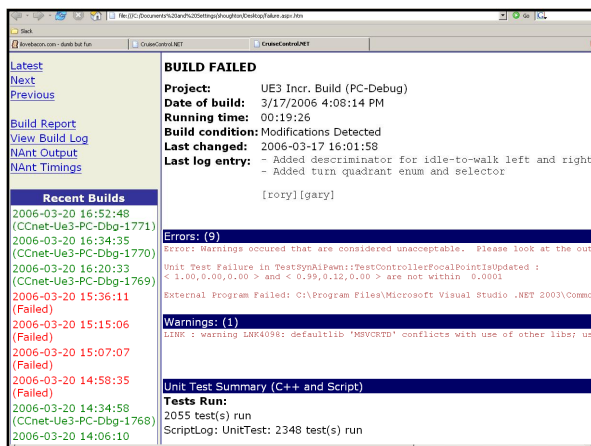


Automated Tests

- Warning:**
 - Need to be reliable enough to be trusted.
 - Must be run frequently and everybody help responsible for making sure they pass.
- Don't use if:**
 - Game is unstable or tests are expected to be broken.
 - Lots and lots of cheap manpower (maybe).

Continuous Integration

- Many small, very frequent check-ins (maybe every 3-5 minutes).
- As soon as any code is checked-in, build is triggered.
- People are notified right away of any failed builds
- Unit tests very useful keeping things stable.



Continuous Integration

- House rule: Nobody leaves without making sure his last check-in resulted in a successful build.
- The faster your builds, the better, so pay attention to logical and physical dependencies (feedback time for normal checkins is around 10-20 seconds).
- Much slower for Unreal projects.

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Continuous Integration

- **Warning:**
 - Need to have automated builds and tests in place.
- **Don't use if:**
 - Main branch is unstable (fix it!)
 - Must work on many different branches.

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Team Co-Location



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Team Co-Location

- **Warning:**
 - Avoid noisy environments. Move personal areas away from work area. Encourage quiet culture.
- **Don't use if:**
 - You have distributed teams.


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Collective Code Ownership

- True collective code ownership, not "no code ownership".
- Really relies on unit tests and shared knowledge.



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Collective Code Ownership

- **Warning:**
 - Avoid "no code ownership"!
 - People need to take pride in the codebase, even if they didn't write all of it.
- **Don't use if:**
 - You have no unit tests.
 - Team is only made out of specialists.

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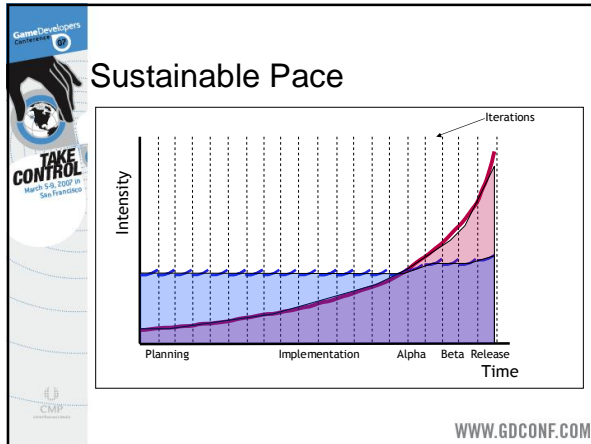
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Sustainable Pace

- All about maximizing long-term productivity.
- Intense, focused workdays and then go home.

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- ## Sustainable Pace
- **Warning:**
 - Avoid punch card mentality.
 - Need tighter core hours to have team together.
 - **Don't use if:**
 - Don't care for the long term or have an unlimited supply of junior developers.
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- ## Pair Programming
- Is output 2x of what one programmer can do? Not quite.
 - It's a bit less (around 1.7x), but also has other major benefits:
 - Much higher quality
 - Spread knowledge/philosophy
 - Team spirit
 - In the long term is a huge win
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- ## Pair Programming
- Another benefit: Intensity and concentration. You never have low moments, little breaks, or anything. You work 8 hours and you end up exhausted!
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Pair Programming

- Warning:**
 - Some people don't like it.
 - Not everything has to be done with pair programming.
- Don't use if:**
 - Have a small team made up of very senior programmers.

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Test-Driven Development

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TDD Benefits: Simplicity, Modularity

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TDD Benefits: Safety Net

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TDD Benefits: Documentation

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TDD != Unit tests
 TDD != Testing strategy

TDD == Development technique

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I'd like to use TDD but...

WORKING EFFECTIVELY WITH LEGACY CODE
Michael C. Feathers

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Test-Driven Development

- Warning:**
 - You'll take an initial productivity hit.
 - Hard and discouraging with a bad codebase.
 - Everybody must be on board.
- Don't use if:**
 - You're writing throwaway code and nothing depends on it.
 - Can't afford to take the initial hit.

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Outline

- Background of Epic
- The Problem: Epic's Unique Challenges
- The Solution: Epic's Flavor of Scrum
- The Fallout: Experience So Far

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Epic Games

Founded 16 years ago by CEO Tim Sweeney
About 80 employees (18 engine devs)

- Early success with Jill of the Jungle and Epic Pinball
- Multiple hits in the Unreal and Unreal Tournament series
- Recently shipped Gears of War, the fastest and highest selling 360 title


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Unreal Engine History

In active development for 12 years
Licensed to external developers since 1997
More than 50 games have used Unreal Engine

- Unreal Engine 1 (1997-2000)
 - PC First-Person Shooters
 - Deus Ex, Rune, Undying, Harry Potter
- Unreal Engine 2 (2000-2004)
 - PC, Xbox, PS2, Mac, Linux; mostly First-Person Shooters
 - Splinter Cell, America's Army, Lineage II, Rainbow 6

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Unreal Engine 3

- Unreal Engine 3 (2006-??)
 - next-generation consoles and PCs
 - supports any game type, even massive multiplayer and fighting games
 - work began 4.5 years and 55 man years ago
 - Game Developer Magazine award for best engine/middleware 3 years running


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UE3 Games in Development

- A few licensees:
 - Atari
 - Bioware
 - Disney / BVG
 - Electronic Arts
 - EIDOS
 - Gearbox Software
 - Microsoft
 - Midway
 - NC Soft
 - Real Time Worlds
 - Sony Online
 - Square Enix
 - Take Two
 - THQ
 - Ubisoft
 - US Army
 - Vivendi
 - Webzen


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Outline

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Internal and external customers

- Licensees whose game schedules, and thus their entire business, depends on our engine
- Very large range of needs
 - From Wheelman to Mortal Kombat – and that's one company
- Multiple internal game teams with competing needs

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Decision Making

Prioritizing tasks is quite complex when balancing internal teams, external teams, competition, marketing needs, etc.

'agile' in that we would switch tasks quickly as priorities changed

- Task backlog was so large that we had a "do it now or it'll never get done" attitude that voided prioritization schemes
- Internal customers took advantage of this by direct discussion with programmers


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Quality Assured Builds

- We give licensees up-to-the-minute source code access
 - Which means they can easily access broken code
- Thus we would regularly checkpoint with 'Quality Assured' builds which go through full regression testing
- Our goal was to do this every 1-2 weeks
 - In practice there was a negative feedback loop that made delivery vary from 2-8 weeks


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Internal Communication

- Bug tasks stored in a bug database
- Features listed on an internal wiki page with estimates
- Weekly meeting that would run an hour or more for complex topics
- Daily status emails from each engineer that would often spark discussion. Read by game team coding leads / producers.

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External Communication

Licensees get a regular report from bug database to see which bugs have been closed

Licensees given list of large-scale 'planned features' with months/quarters attached

- Many tasks slipped significantly – usually due not to bad estimation, but to unplanned tasks taking precedence
- No way to learn timeframe/priority of smaller tasks without direct inquiry


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Outline

- Background of Epic
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Our brand of scrum

- 20 work days per sprint
- High specialization prevents dynamic task shuffling
- Lots of unscheduled time (28% average, up to 40% max)
- Code lockdown at end for QA release
- Highly favor release date over feature set, punting tasks to next sprint but never dropping entirely


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Scrum Tools

- Sprint backlog managed via Excel and TestTrack Pro (TTP)
- Project backlog managed via TTP
- Coarse view of project backlog available to licensees via road map UDN page
- Future sprint Excel sheet contains all major roadmap items in combination with high priority smaller tasks from project backlog


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Outline

- Background of Epic
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Pros

- Convenient communication with licensees
- Progress tracking (motivating)
- Easier for us to schedule larger tasks!
- Gives name to what we've been doing
- Reduces randomization, increasing efficiency
- Game teams involvement with scheduling
- Daily status emails


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Cons

- Treadmill effect
- Increased minimum time between QA builds, in practice increased frequency
- Increased minimum latency for non-blocking issues
- Code locking has impact on game teams
- Crash report spike after lock is lifted
- No penalty for over/ under- estimating due to punting

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Questions?


- Thanks for staying until the end of the day! Any Questions?
- [Yes, we're hiring, visit our job fair booth or contact jobs@epicgames.com]
- More info at:
 - www.epicgames.com
 - www.unrealtechnology.com

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Clinton Keith – Closing Comments


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Closing Comments

- Benefits of agile
- What still needs to be addressed
- Where to go from here

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Benefits of agile

- Improved...
 - Productivity
 - Especially for leads
 - Reliability of build
 - Quality of game
 - Morale
 - Ownership
 - Team work
 - Communication
- Enables low-cost executive awareness
 - Which means you don't have to work hard to find out what's going on
- Makes us constantly see and think about what we are doing. Encourages common sense.

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Going forward....

- Production is not as agile
 - Minimum content required to ship
 - "Lean" principles have value
- Large teams need more leadership
 - Self-organization breaks down
 - Ownership/commitment much more difficult
- Vertical slices are hard
 - Debt sneaks in
 - Releases can be mini-waterfalls
 - These cause crunch
- Agile makes us constantly see and think about what we are doing so we can make common sense decisions.



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Where to go for more info?

- www.agilegamedevelopment.com
- www.gamesfromwithin.com
- www.mountaingoatsoftware.com
- www.epicgames.com
- www.unrealtechnology.com




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Thanks for attending!



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