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THIS IS THE STORY OF THE QUEST FOR A MYTHICAL TREASURE: THE HIDDEN gold of the ultimate cinematic action game. When Naughty Dog set out on our latest voyage at the end of 2007, we had a map of the territory in the form of our previous PlayStation 3 project, the contemporary pulp adventure *UNCHARTED: DRAKE'S FORTUNE*. We had a strong team of willing adventurers, and we knew we wanted to make an actively playable "summer blockbuster" that would keep the player in moment-to-moment control as much as possible. What transpired in the following 22 months was as much an adventure for the team at Naughty Dog as it is for players who follow our game's hero, Nathan Drake, into the world of *UNCHARTED*.

Naughty Dog, creator of the *CRASH BANDICOOT* and *JAK AND DAXTER* series of games, is a developer of around 90 people based in Santa Monica, California. It's an unusual studio in several ways. We don't have any dedicated producers in-house, and no one at the company, not even our studio co-presidents, only does management work. Everyone contributes directly to the creation of the game. Our games are produced by the game directors, game designers, discipline leads, and others who work with them. In fact, anyone who wants to take responsibility for some aspect of a game is encouraged to simply start organizing or building. This attitude naturally creates a meritocracy at Naughty Dog, as responsibility flows toward those who are doing the best job of keeping us on the right track and to those who make the most significant contributions to building out a given game.

As with every project that we set out to work on, we established a short list of design goals for *UNCHARTED 2*. We wanted to improve on the foundation we'd laid with *UNCHARTED: DRAKE'S FORTUNE* by creating a tighter mesh of character-driven story and adventure gameplay. Some of the sequences from *UNCHARTED: DRAKE'S FORTUNE* suggested to us that we were only beginning to scratch the surface of what was possible in terms of playable cinema. In particular, we knew that we could make our set pieces more epic with the application of more creativity and elbow grease.

We wanted to bring a larger cast of characters into play to act as "emotional satellites" and show Nathan Drake as more than the straightforward

hero. We also wanted *UNCHARTED 2* to work as a standalone adventure. We wanted the game to have a multiplayer component, and we knew we would be making a lot of changes and additions to our engine.

WHAT WENT RIGHT

1) CREATING AN ACTIVE CINEMATIC EXPERIENCE. One short sequence from *UNCHARTED: DRAKE'S FORTUNE* kept our attention: soon after Drake crash-landed on the island, a truckload of pirates pulls up on a broken bridge. When the player shoots a nearby explosive, the truck flips and falls, forming a bridge that opens the way. It was a simple set piece, but it played out almost entirely in gameplay and it got us thinking—what if we could do more to capture the flavor of the most impressive moments from our favorite adventure movies without taking control away from the player? This led us to what we came to call the "active cinematic experience" of *UNCHARTED 2: AMONG THIEVES*.

It turned out to be enormously time-consuming to put together scripted set pieces of that scale and complexity, but we started work on them early and staffed up to make sure we could get everything done on time. Even then, everyone involved had to work incredibly hard to make the sequences playable and polished.

We had an idea for a sequence where Drake climbs and fights along a train as it speeds through the countryside that we didn't want to fake. We wanted a chain of train cars moving continuously through a streaming series of environments, and the only way to do this was to create a major new piece of technology: our dynamic object traversal system. We had to give our player-character and all his allies and enemies the ability to use all their moves and abilities on any dynamic object in the game.

This was an enormous technical hurdle, and involved the re-implementation of many of the game's core systems, so we started work on it near the beginning of the project. The effort was well worth it. It paid dividends throughout the game—from major set pieces like the collapsing hotel in our fictional Nepalese city to incidental stumbles along collapsing balconies.

THIEVES

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We liked the “wide linear” gameplay style we used in *UNCHARTED: DRAKE’S FORTUNE*; our story is essentially linear, but the player has a good deal of choice about how they can tackle their moment-by-moment experience, especially in terms of combat. We decided to expand on that in *UNCHARTED 2* through the use of “stealth action” mechanics, which meant more player abilities in support of sneaking around, an expanded repertoire of surprise melee attacks from behind and below for Drake, and “investigate” and “hunt” AI routines that allow enemies to search for Drake if they think they’ve seen him.

We used sequences of play with Drake’s NPC allies to set up and pay off fairly complex emotions at carefully planned intervals throughout the game. We also did something similar, if emotionally simpler and more conventional for games, with climactic confrontations between Drake and vehicular enemies like helicopters and a tank.

We continued to improve the production pipeline for performance capture that we had developed for *UNCHARTED: DRAKE’S FORTUNE*, and we were able to do live capture of audio on the mocap stage for the first time. We made sure to keep our strong focus on the creative involvement of our terrific cast and superlative mocap director, Gordon Hunt, and people have responded positively to the character-driven story that resulted. One of the highest compliments that we get paid is that people like to watch their friends playing the *UNCHARTED* games almost as much as

they like to play themselves—we even used this idea in one of our television commercials.

2) GETTING ON WITH MAKING THE GAME. The most important lesson that we took away from making *UNCHARTED: DRAKE’S FORTUNE* was one we had to learn the hard way. We spent too long making plans and not enough time simply getting on and building things. This led to a crisis that resulted in a mid-project production reset. We’d lost sight of the fact that theorizing about process and tools can only take you so far, and that it’s only when you build something—whether it’s a game mechanic, a tool, or a level—that you make the really valuable discoveries about what you’re doing.

When we set out to make *UNCHARTED 2*, we kept this idea at the forefront of our minds the whole time and it served us well. For example, we shifted our level design process away from paper layout and toward iterating on prototype levels in simple “blockmesh” geometry. Our game director and one of our game designers would first sketch out an experiential flow for the player. The designer would rapidly build out an environment with a low level of detail to test on other team members, so we could see how navigable it was, what camera and line-of-sight issues arose, how long the experience would last, and so on. We would then start scripting interactive objects and placing enemies, and eventually give our art team the all clear to begin creating final art. This approach let us build out the game’s footprint

very quickly, although it wasn’t without some dangers: we ran the constant risk of becoming too committed to level designs that might need changes demanded by the maturing story.

We thought on our feet about the order in which we should tackle our new and expanded gameplay systems, and started with the ones that would have the most wide-reaching effect on the game. We took a similar approach with our tools and engine improvements, tackling the things that would give us the biggest leg-up first. By the time we finished with all the changes and improvements we made, we felt like we’d virtually reinvented our engine, and therefore dubbed it the “Naughty Dog engine 2.0.”

3) MULTIPLAYER METHODOLOGY. We decided early on in the development of *UNCHARTED 2* that we wanted our game to have a multiplayer component. We made the right decisions at the right times to make this happen, beginning with getting the attention of the right people on the team.

We wrote our networking code in-house, which gave us a solid base to work with. Near the start of the project we put one of our gameplay programmers in charge of multiplayer on a full-time basis. We hired a dedicated multiplayer designer in August of 2008, which meant that we had someone championing the multiplayer experience during the most important phase of its development. We later hired a co-op designer.

We essentially took Nathan Drake’s move set



from the single-player game and implemented it in a competitive multiplayer environment. It immediately felt right. Everything went fairly smoothly as we made choices about what kinds of game types and rule tweaks to make. The one sticking point was online melee combat, which took us about six months to get right. We iterated through every approach we could think of, from synched like the single-player game, to semi-synched, to a button-timing mini-game, before we finally settled on the simple “throw the punch, deal the damage” system we shipped with.

We chose to use the Amazon Elastic Compute Cloud (EC2) for our statistics and for the machinima cinema files that players would be able to upload because of its scalability and the vastly reduced cost to Naughty Dog across the lifetime of the game.

When we announced our multiplayer game in March of 2009, we heard rumblings that fans were concerned that the single-player game would suffer as a result of divided team resources. We’re happy to say that tightening up our combat mechanics to make them snappy enough for multiplayer really helped us with the feel of the single-player game.

4) THE BRAVE NEW WORLD OF OUTSOURCING. The outsourcing of art and animation became increasingly important while we were making UNCHARTED 2. We had good experiences outsourcing part of the work on the cutscenes for UNCHARTED: DRAKE’S FORTUNE, and for UNCHARTED 2 we cemented an excellent relationship with the animation department at SCE San Diego Studio, which staffed up to give us the extra capacity we needed to get everything done.

In the late spring of 2009, once it became clear to us just how much effort was required for the 90 minutes of complex pre-rendered scenes that UNCHARTED 2 includes, we brought Technicolor’s animation team back into the fold. Between Naughty Dog, Sony San Diego, and Technicolor, our cinematics team totaled 32 animators—more animators than on all of Naughty Dog’s previous projects combined.

We also took our first steps into the world of outsourced art assets. We had always been concerned that it would be hard for us to hit the right quality bar using outsourcing, but thanks to the efforts of the outsourcing studios we worked with (XPEC in Taiwan and Ladyluck in the Philippines), and the process we drove at Naughty Dog, we were happy with the results.

We had to be very diligent in staying on top of every aspect of the outsourcing process to ensure that we gave our outsourcing groups everything they needed to succeed. We essentially trained them to make art that we could use. We would provide a package of reference materials that included specifications and detailed construction instructions, screenshots of the locations where the assets would be used to show their context, and prototype level layout geometry to define the volumes the assets should occupy.



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We outsourced a great diversity of work, from environments and cutscene stages to characters and accessories, along with monotonous work like UVing and LODing. It's really thanks to our outsourcing teams that our game is as full of eye candy as it is. Outsourcing enabled us to create an amazing amount of art and animation while keeping our team small. Our level artists were able to spend more time iterating level design with our game designers and maintaining the levels while someone else sweated some of the details, and we could scale our team up and down when necessary without having to strain our internal infrastructure through costly expansion and the discomfort of layoffs.

5) PLAYTESTING AND METRICS. In the course of making UNCHARTED 2 we did more formal playtesting than we'd ever done before. We ran fifteen playtests over the last ten months of the project, compared to seven over the whole three years of the first game's development. This resulted in fewer rough edges in gameplay than in

any game we've ever shipped (although a couple still snuck through!).

We ran most of our playtests in a rather jury-rigged but functional playtest room in the Naughty Dog office. We had ten TVs, each with a PS3 test station that was hooked up via video capture boxes to a PC, to record events on screen. We didn't record video of the players' body language, though that would have been a good addition. The TVs had 2' by 3' pieces of card bought at a stationary store propped up between the TVs so that the players couldn't, even accidentally, see what their neighbor was doing in the game.

Running our playtests in-house had the enormous benefit of allowing all of our designers and QA leads to regularly see their levels in action with new players. Of course, there are few things better for a game's design than for the designers to watch it being played by people who have never played it before.

We got our playtesters to play through as much of the game as we had finished building, even to basic levels of completion. We didn't let

them talk to each other and were merciless about not giving them any help when they were stuck, unless we knew that something was broken.

As they played, we uploaded metrics about their actions to a database over the network—things like how long it took them to complete each part of the game, or how frequently they died between continue points. We put the data into a spreadsheet and looked at the median values for each group. After color-coding cells with values above or below certain targets, parts of the game that were potentially problematic immediately jumped out at us. We then started looking at the gameplay videos to investigate each potential problem.

Doing so much playtesting was particularly important because several complex sequences of gameplay only came together very late in the project, and to ensure that the things we added or changed didn't present unforeseen problems for our players, we conducted "sanity check" playtests right up to the end.

WHAT WENT WRONG

1) NOT QUITE ENOUGH PLANNING. One of the downsides of our philosophy of simply getting on and building the game was that the line between preproduction and full production became blurred. We hadn't really begun to plan ahead until we finished work on the first UNCHARTED, so we scrambled to solidify as many elements of the game's content and story as we could in order to stay ahead of the team as they started building assets that we hoped would find a home in the shipping game.

The story team made a lot of key decisions in a timely enough manner to provide a framework for our forward motion. What emerged from preproduction was our focus on Asia as a location for much of the story, Marco Polo's lost fleet as our real-life historical mystery, the idea of an old friend of Nathan Drake's who would ultimately betray him, and some big chunks of the game's macro design.

However, even in the absence of a story structure to frame them, the first levels took on a life of their own. Their footprints grew and their gameplay firmed up to a good degree. When the game macro was finished in the spring of 2008, the story beats that related to parts of the end of the game were still a little fuzzy. We couldn't quite decide how the threads of the story would twine back together as we neared the end of the game. We eventually worked it out, of course, but we couldn't quite fix all the issues that had arisen.

So even though a lot of people who play UNCHARTED 2 don't notice anything amiss with the end of the game, when we play it through we feel that there aren't quite enough strong story beats in the monastery to match the length and intensity of the gameplay there, and it's the first place in the game where the pace begins to flag. Hopefully we'll learn the lesson of this minor

misadventure and pay special attention to pacing issues for parts of the game whose level design starts early and whose story design finishes late.

2) RAN OUT OF TIME AND SPACE. UNCHARTED 2 was the biggest project Naughty Dog had ever attempted. We had aimed to make a substantially longer single-player game than UNCHARTED: DRAKE'S FORTUNE, which would feature nearly a motion picture's length of pre-rendered cutscenes. The game would include both competitive and cooperative multiplayer modes, tools for the machinima community, and lots of engine additions and improvements. However, by the end of the project, we were increasingly squeezed for time.

Critically, we ran out of time to animate our cutscenes, and everyone involved had to sweat bullets to get them finished. We should have gotten underway with their creation a lot earlier. Also, most of the visual effects for the cinematics were created in the last two weeks of the project by the same team that worked on our in-game visual effects, dependencies having forced them to leave the cutscenes until last.

The implementation of our in-game dialog was pushed until way late because of similar dependencies, and we made a lot of dangerous content and scripting additions to the game when we should have only been fixing bugs. The added dialog also had an impact on the difficulty of the game as the banter between the characters made the player's goals very clear, where they might previously have required more deduction on the part of the player.

We decided to add co-op partway through full production, which was quite a large feature to add mid-project. Looking back, deciding to reach for co-op might have been the point at which we began to seriously overextend ourselves, but our co-op designer and team did an amazing job and we're very happy with what we shipped.

In a scenario that's familiar to game developers but which is becoming increasingly financially and artistically untenable, we had no time for any kind of postproduction. Our particle artists, lighting artists, and sound designers had to scramble for every second of polish time they could grab, since the rest of the team—designers and artists in particular—were making changes and bug fixes that affected their work right up until the end. In the future we're determined to build proper postproduction time into our schedules so our games can have the level of aesthetic polish our audience expects.

Finally, we even ran out of space on the single-layer Blu-ray disc we were using. We hadn't planned ahead to use dual layer Blu-ray storage, so we had to remove some bonus content from the disc and compress some assets more than we would have liked.

3) BOSS DIFFICULTIES. Our bosses were difficult, both in the sense that a few of them provided too sudden an increase in challenge for players, and in terms of the difficulty to conceive and implement them.

We hadn't felt obliged to have a lot of traditional bosses in UNCHARTED 2. Boss monsters in the ZELDA vein that invite you to experiment with recently-acquired mechanics just don't work well in a game like ours. Those usually need to be able to soak up a lot of damage and have some gadgety attack or defense quirk, and that isn't a good fit for us in narrative terms, since UNCHARTED is set in a world that's mainly realistic. Any disruption of the consistent "grounding" can be really jarring to the player's suspension of disbelief.

Also, we don't hand out new play mechanics on a regular schedule like some other games, so we have to work a lot harder to help the player find novel ways to use play mechanics that have become familiar. Instead of traditional bosses, we mainly used elaborate set pieces to provide the same kind of climactic play and narrative experiences that create and punctuate the rhythmic flow of UNCHARTED 2. The confrontations with the helicopters and the tank are good examples of this.

However, we did want Drake to have a couple of fights against humans and we decided to tackle that challenge head on. Without giving away too much for readers who haven't finished the game, we got a narrative pass on one of these humans being a bullet-sponge thanks to events in the story. The other human proved trickier though, and as we did on UNCHARTED: DRAKE'S FORTUNE, we ran out of time to create special gameplay (and polish) for both humanoid bosses.

Neither boss turned out badly, but both are in danger of providing a difficulty spike and frustration for some players. By the time you read this we will already have implemented some boss ideas for our next project and we're determined not to make the same mistakes again.

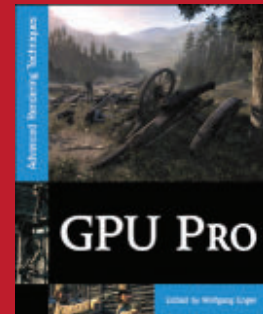
4) SOME SMALL STUFF WE COULDN'T SWEAT. We were relieved when reviewers started praising the amount of detail and polish that UNCHARTED 2 has, because there were a few things that we felt we hadn't polished well enough.

For example, we didn't put enough early focus on collaboration between design and art to establish a crystal-clear language for edges that Drake could grab onto and climb. When we did try, it was hard to reach a consensus, with each side pulling hard toward either function or aesthetics. Our game ended up with too many low "grabbable"-looking ledges that you couldn't grab, making things confusing and frustrating for the kind of player whose play style tended toward "perimeter scans" of any level in which they felt stuck, as they jumped up against every wall looking in vain for something to climb on.

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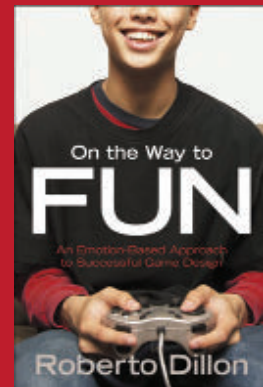
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Happily, because of the amount of playtesting that we did, we didn't end up with much of the opposite case—edges that you could grab that didn't clearly look grabbable. Every time a playtester couldn't see what to grab next because of texturing, modeling, camera position or lighting issues, we were able to spot it and fix it. We know from experience that these kinds of issues are the low-hanging fruit of what we call "progression brick walls," and that they're easy to catch with diligence and perseverance.

Also, while our game has a lot of "incidental breakables"—small objects that fall over when struck or shatter when shot—we didn't end up with an even distribution and density of them throughout the game. If you're eagle-eyed and looking out for it, you'll notice that a bottle that you can knock down in one area might be immovable in another. We simply ran out of time: we left the implementation of the incidental breakables until the very end, and as we all scrambled to get the game finished we didn't have the time to do a full pass of the game, removing the objects from the static environment and implementing them as breakable objects while keeping an eye on performance. We're planning to create tools that will help us speed up this relatively simple task so we can avoid running into the same problem next time.

5) CRUNCHTASTIC TIMES. As I mentioned earlier, UNCHARTED 2 was our most ambitious project to date, and by the spring of 2009 we realized just how much game we had bitten off, and that we were going to have to chew extra hard, make some cuts, or choke.

So we reduced the scope of several levels early enough that we hadn't invested too much in the way of art resources in the affected areas of the game. We also lived with our prototype levels and lists of gameplay ideas long enough that we could see fairly clearly what we should keep and what should be cut.

However, we didn't cut to the point where we would have been able to coast to the finish line, and life throughout 2009 was tough for almost everyone at our studio. We have never mandated crunch at Naughty Dog, but we have hired people with personality types that make them hard-working, willing to accept

responsibility, and perfectionists and that led to many months of long hours, late nights, and truncated or skipped weekends.

The demo we made for E3 2009 marked the true beginning of the long hours, although many people had been working extra-hard for much longer than that, leading to a summer of stress on people's family lives and personal health and the problem of reduced productivity of tired people.

While we don't think we'll ever be a studio that works nine-to-five year-round, we take the threat that crunch presents to the integrity of our studio and the wellbeing of the Naughty Dogs very seriously, and we're discussing ways we can avoid ever having to repeat the experience of UNCHARTED 2 in terms of the toll that the project's crunch took. We know we have to become more disciplined about setting and hitting internal deadlines to get traction on our projects earlier, and we're going to try other approaches like putting mandatory limits on the amount of time people can spend at the office.

WE STRUCK GOLD

» UNCHARTED 2: AMONG THIEVES has been a big success for us. We got it finished on time and on budget without any major disasters along the way, and we're all very happy with the finished game. Our initial sales have shown players are happy with it, too.

Looking back, one of the keys to the success of the project was that we continued to keep an open mind about process, adopting only those

ideas that were really working and jettisoning those that didn't. Knowing when to pull the plug on plans that weren't coming to fruition, but being tenacious about everything we approached, was another. Indeed, those are probably good ways to summarize what results from our "garage developer"-flavored studio culture of open communication and do-ocratic organization.

In the end, a lot of good old-fashioned hard work was needed to get everything done on time and to quality. The amount of passion, effort, tenacity, and talent that went into the design and production of UNCHARTED 2: AMONG THIEVES is its own tribute to everyone involved in the project, and a clear sign that we currently have the best team we've ever assembled under the Naughty Dog roof—and beyond.

We're very happy with the overwhelmingly positive critical reception we've gathered from both the press and the public—which is definitely the warmest welcome any game by Naughty Dog has received—and we're very excited about carrying the lessons we learned forward onto our next project. We hope that they're useful to you in your work, too, and we look forward to a bright future for the games we're all going to make. [G](#)

RICHARD LEMARCHAND is a game designer at Naughty Dog, and was the co-lead designer of UNCHARTED 2: AMONG THIEVES. Richard has worked on twelve award-winning and critically acclaimed console games in his 18-year career.

GAME DATA



PUBLISHER Sony Computer Entertainment

DEVELOPER Naughty Dog

NUMBER OF DEVELOPERS Approximately 90 full time plus around 15 contractors

LENGTH OF DEVELOPMENT 22 months

RELEASE DATE October 13, 2009 (North America)

LINES OF CODE Excluding external libraries and tools: 2,539 source files with a total of 1,110,817 lines of code, 3,703 script files (including render settings and particles), totaling 708,951 lines of code

SOFTWARE Autodesk Maya, Pixologic ZBrush, Autodesk Mudbox, Adobe Photoshop, Adobe Illustrator, Apple Final Cut Pro, headus UVLayout, E-on Software Vue, CrazyBump, Perforce, Cygwin, SCEA Nova, Microsoft Visual Studio, Emacs, Notepad ++, SlickEdit, Perforce, Git, ProDG

PLATFORM PlayStation 3