

2023 GAME DEVELOPMENT REPORT

INTRODUCTION






We're at an interesting point in the games industry. **It's never been easier to start, nor harder to scale, a game.** New tools and technologies are removing the barrier to entry, giving developers and even gamers the power to create faster than ever before. At the same time, blockbuster AAAs continue to set the bar higher and higher with groundbreaking achievements in immersion, photorealism, and novel gameplay.

These dynamics are **catalyzing rapid evolution in game development**, drawing the attention of corporate teams, industry analysts, and investors. However, most of game development is institutional knowledge; while lowered barriers and rising bars of game development are an open secret, there isn't much specificity or data about why or how.

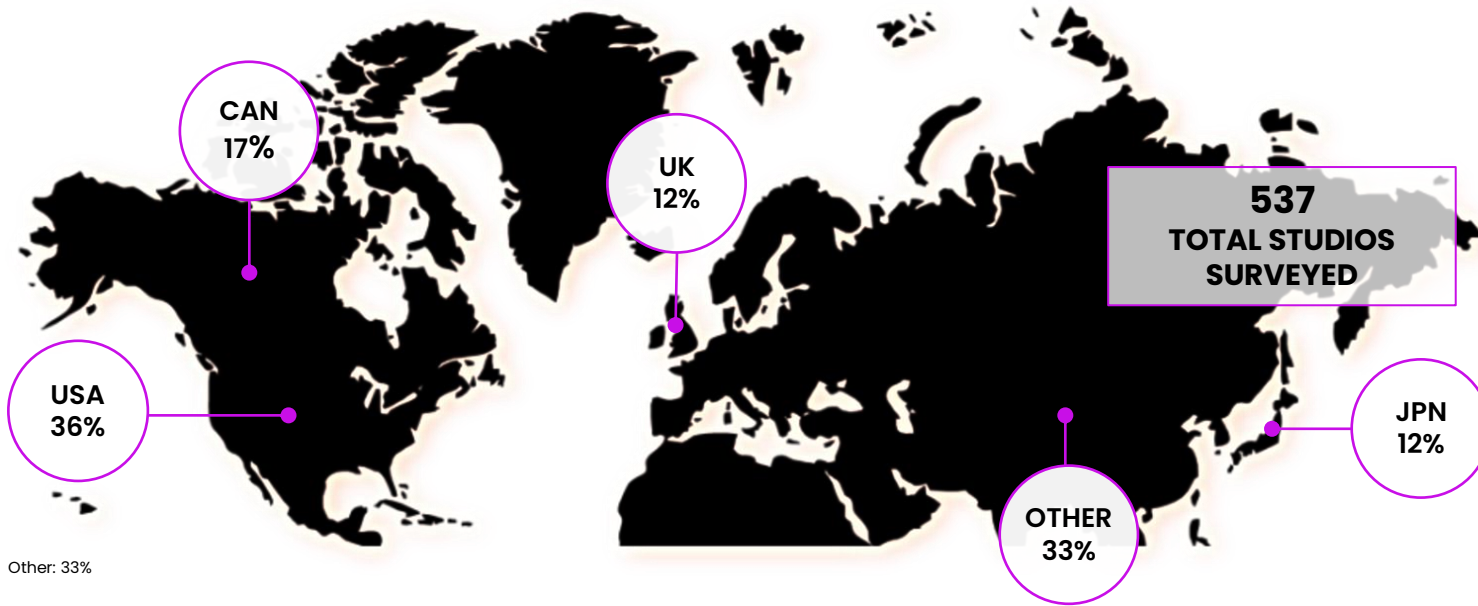
For this reason, we decided to publish research on the state of game development. We hope it serves as a **call to action for innovation and funding** in areas that improve the world of the creative and creator so that we, as players, continue to have a lifetime of joy with these incredible experiences.

We conducted our research and formed this analysis with two important caveats:

- Our focus was to examine the technology & practices behind game development. There are many other elements that govern the success of a game (i.e. gameplay, community, IP)
- We often present a market-level view. The reality is that game production looks vastly different across segments like genres or hardware platforms

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GEOGRAPHY



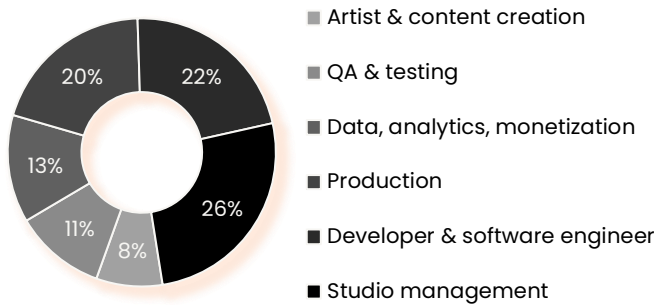
Other: 33%

THE DATA

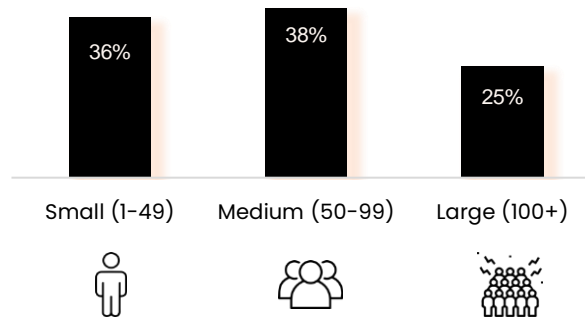
Our research methodology involved **60+ interviews** with industry experts to form hypotheses and validate survey questions, many who are quoted throughout the report.

We conducted a survey of **537 studios** across the globe to gather the data used in this report. To mitigate the risk of fraud or negligence in survey responses, participants underwent thorough vetting and verification using Imperium’s QualityScore and Dynata’s NQI data quality certification.

PARTICIPANT ROLE



STUDIO SIZE



THE DEMOGRAPHICS

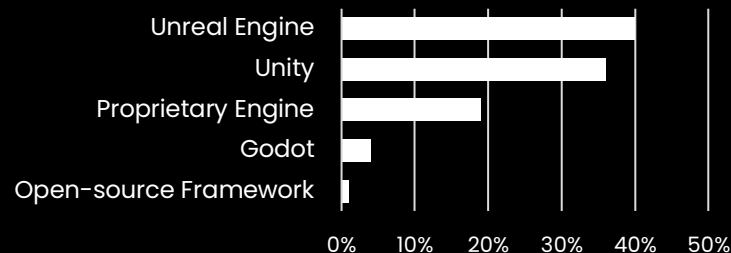
The survey was designed with overall industry questions as well as deep dive sections for **studio management, artists, producers, developers, data teams, and testers**. Respondents were asked demographic questions about studio size and geography to ensure a representative view of the industry.

THE GAMES

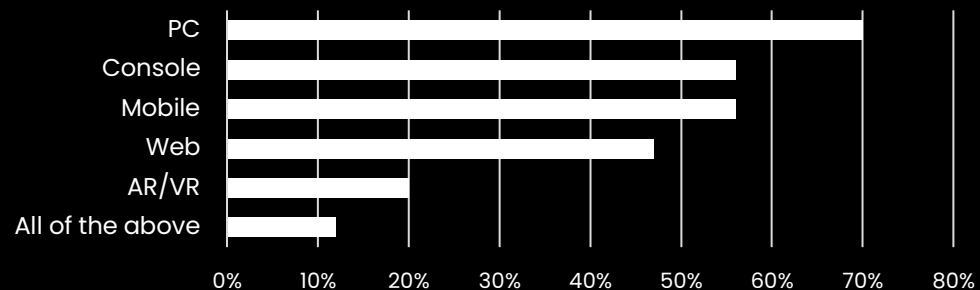
We gathered a comprehensive and inclusive sample size that represents a variety of game platforms, engines, and categories, aiming to improve the heterogeneity of our data.

Respondents were asked to identify their current game project's game engine, intended platform, and game type. This data was used to examine more granular trends that we observed through these market segments. No personally identifiable information was gathered during the survey, and respondents not able to identify themselves or their employer.

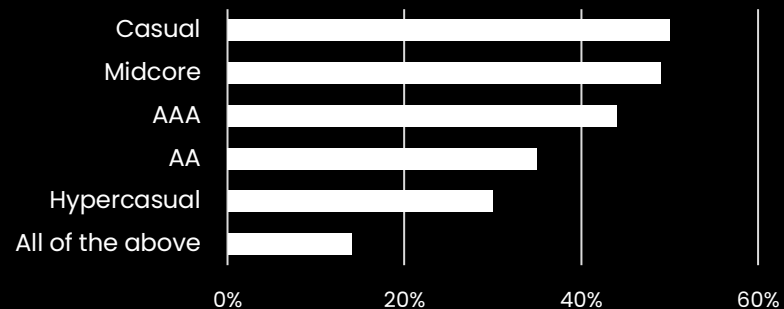
GAME ENGINE



PLATFORM



CATEGORY



ACKNOWLEDGEMENTS FROM THE EXPERTS



Julien Merceron
CHIEF TECHNOLOGY OFFICER
BANDAI NAMCO

"The games business is changing rapidly but few are looking at how it affects the foundation of game production and technology. This report casts a light on an underserved area in our industry, making it a must read."



Scott Forrest
CHIEF COMMERCIAL OFFICER
ELECTRONIC ARTS (EA)

"Releasing a great game isn't enough anymore. In an era of keeping content relevant to a global playerbase, we're constantly faced with new challenges, and we use research like this to continue honing our craft."



Ben Brode
CO-FOUNDER & CHIEF DEVELOPMENT OFFICER
SECOND DINNER

"Between making games, studying games, and running a studio, it gets tougher and tougher not to be 'in the weeds.' Reports like these help us pause, take a step back, and see the Forest for the Trees."



A futuristic cityscape at night, featuring tall, dark, metallic structures and a large, glowing planet in the sky. The scene is illuminated by a blue and purple light, creating a dramatic and atmospheric setting. The city is filled with intricate details, including balconies, windows, and various architectural elements. The overall tone is dark and mysterious, with a strong sense of advanced technology and urban complexity.

Level 1

MARKET DYNAMICS

**External forces that are changing
game development**

KEY TAKEAWAYS

TAKEAWAY ONE

Game development costs are increasing as studios strive to keep up with industry trends

77%

of studios reported that the cost of game development is continuing to rise

TAKEAWAY TWO

Studios of all sizes are focused on launching or transitioning to live service models

65%

of studios are currently working on a title with a regular update cadence for their game

TAKEAWAY THREE

Game technology doesn't meet the user needs of more demanding game projects

88%

of respondents are actively evaluating new tools to bring into their workflows

COMPETITIVE MARKET CONDITIONS ARE AFFECTING GAME STUDIO STRATEGY

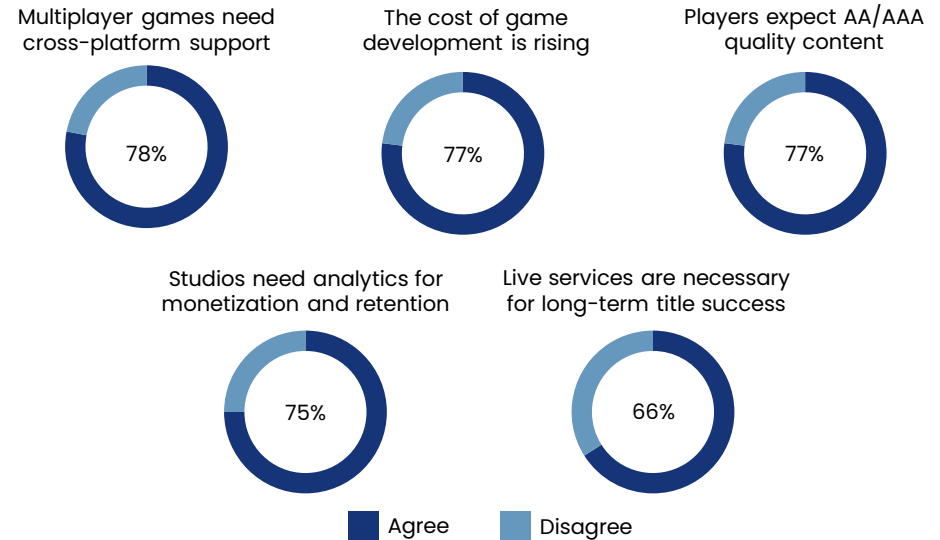
Rising market competition and escalating consumer expectations are changing the industry landscape. Large studios are struggling to rein in game budgets especially as projects become more ambitious. Meeting the high bar set by AAA titles for game quality is proving to be a significant hurdle, requiring sizeable teams. Additionally, providing cross-platform support for multiplayer games poses a particularly daunting task for smaller studios with limited resources.



Satoru Igita
GM OF MONSTER STRIKE, MIXI

"Users expect higher quality games, so production costs have increased to create that quality. Switching costs for users has an upwards trend, so acquiring new users can't be pursued without saving expenses by improving production efficiency. Creativity used to dominate game planning, but now it's becoming more and more important to add strategic thinking to our innovative ideas."

The charts below show whether respondents agree or disagree with the following industry trends



The chart below shows the most challenging industry trends for studios segmented by their current game project

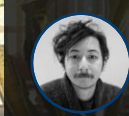
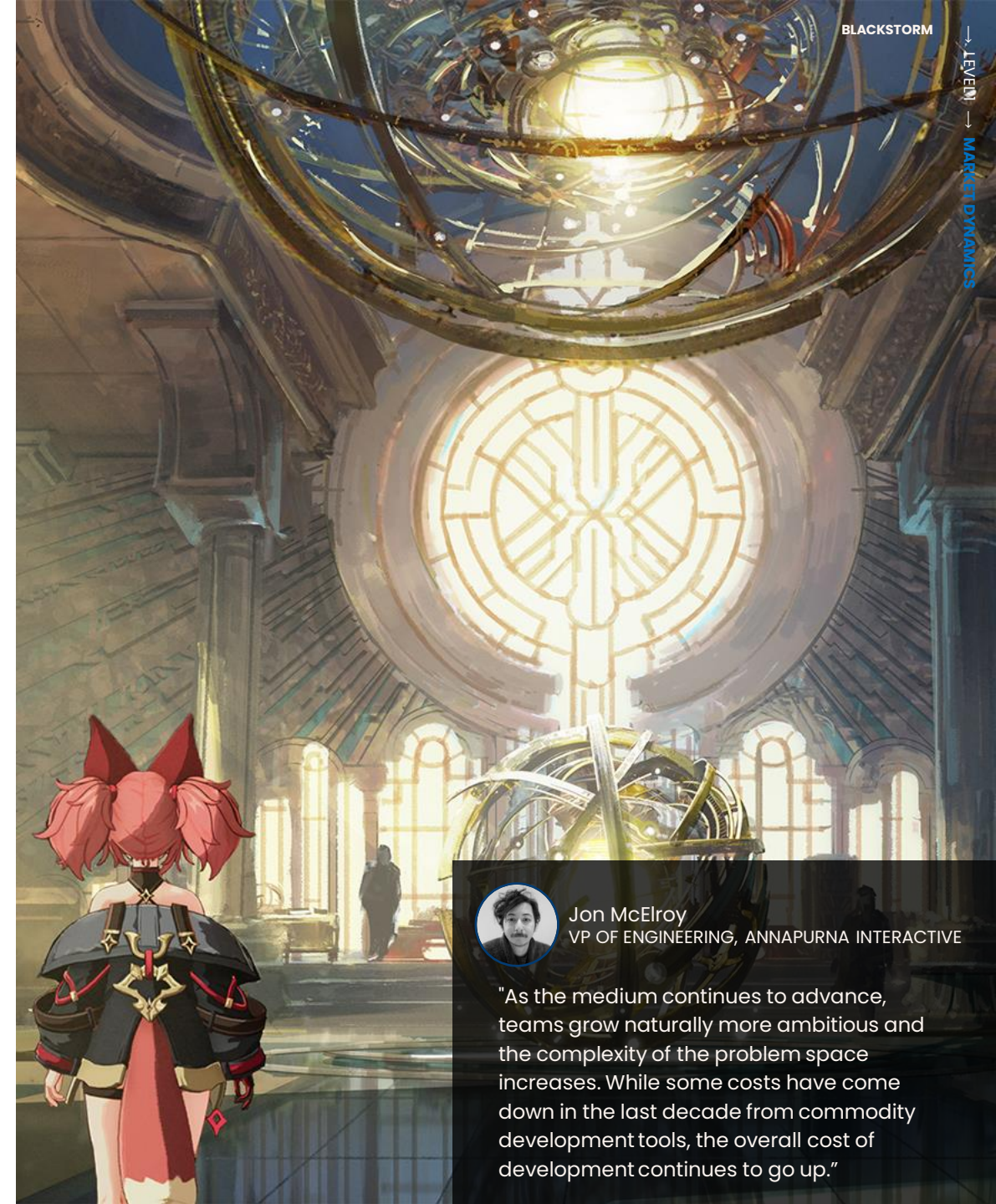
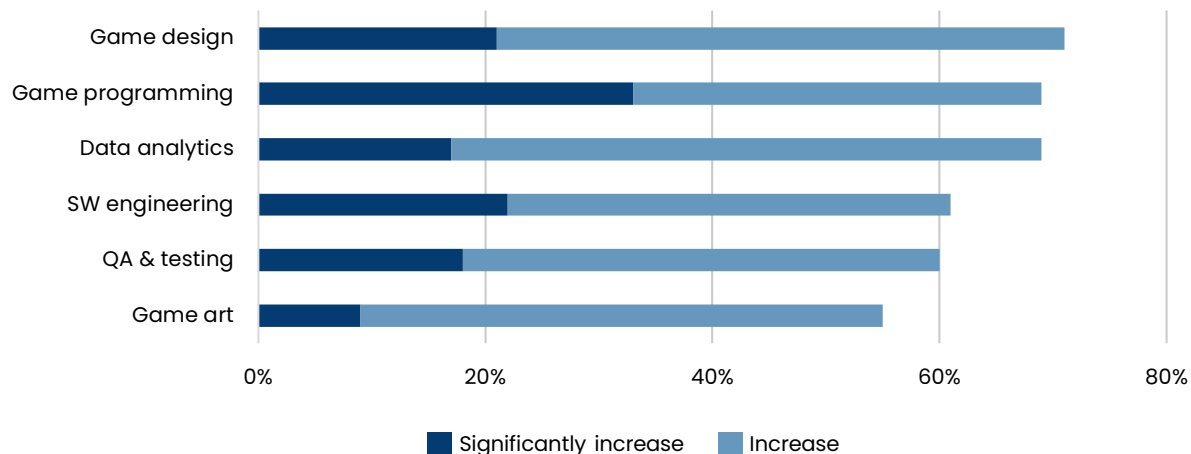
	Hypercasual	Casual	Midcore	AA	AAA
Rising game budgets	17%	18%	18%	16%	20%
Players expecting AA/AAA quality	18%	18%	22%	20%	19%
Supporting cross-platform gameplay	7%	13%	10%	10%	14%
Building robust data analytics	17%	14%	18%	15%	13%
Delivering live services	12%	16%	15%	17%	20%

Columns may not add up to 100% of the population due to the chart's omission of free response answers

GAME DEVELOPMENT CONTINUES TO BECOME MORE EXPENSIVE

Game budgets are climbing from the need to differentiate amidst the flood of new titles fighting for player attention. Technical departments like gameplay programming and software engineering are expected to see the most significant budget increases, primarily driven by project complexity and cost of talent. Studio teams are also expecting increased spend on game design and data analytics, although these total budget sizes are typically smaller than other areas (e.g. art).

The chart below shows which respondents expect an increase in their game budget, segmented by job function



Jon McElroy
VP OF ENGINEERING, ANNAPURNA INTERACTIVE

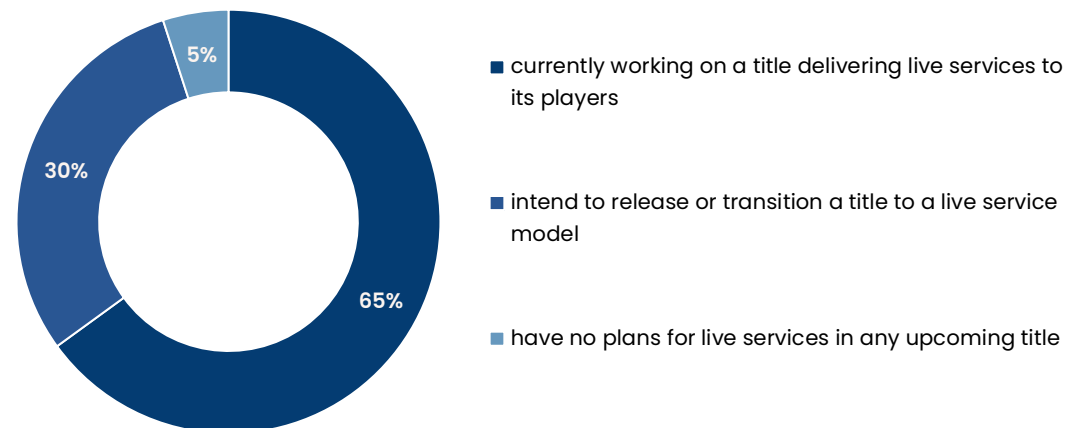
"As the medium continues to advance, teams grow naturally more ambitious and the complexity of the problem space increases. While some costs have come down in the last decade from commodity development tools, the overall cost of development continues to go up."

STUDIOS ARE EMBRACING LIVE SERVICE BUSINESS MODELS

Game studios are adopting live services in a strategic shift to pursue more lucrative business models. Games continuously evolve during live services through ongoing content releases, feature updates, and gameplay enhancements, aimed at raising player lifetime value. This contrasts with traditional game models that rely on sales or downloadable content (DLC) to maintain relevance.

Mobile game companies already live in this world (pg. 30 highlights how they have evolved to master this craft), but other market segments are still acclimating to the strategies needed to keep players engaged decades after a launch.

95% of studios are either working on or intend to release a live services* title



*Live services is defined as any regular update cadence planned for a game



Phil Mansell
CEO, JAGEX

"Every game we intend to make or acquire will have significant live service components, it's essential for our economic model now."

USERS NEED MORE FROM THEIR TOOLS AND TECHNOLOGY

These external forces and industry trends are having an impact across the various game development disciplines. Game projects are becoming more demanding, and teams are beginning to feel a gap between what they need to be successful and the current state of game technology.

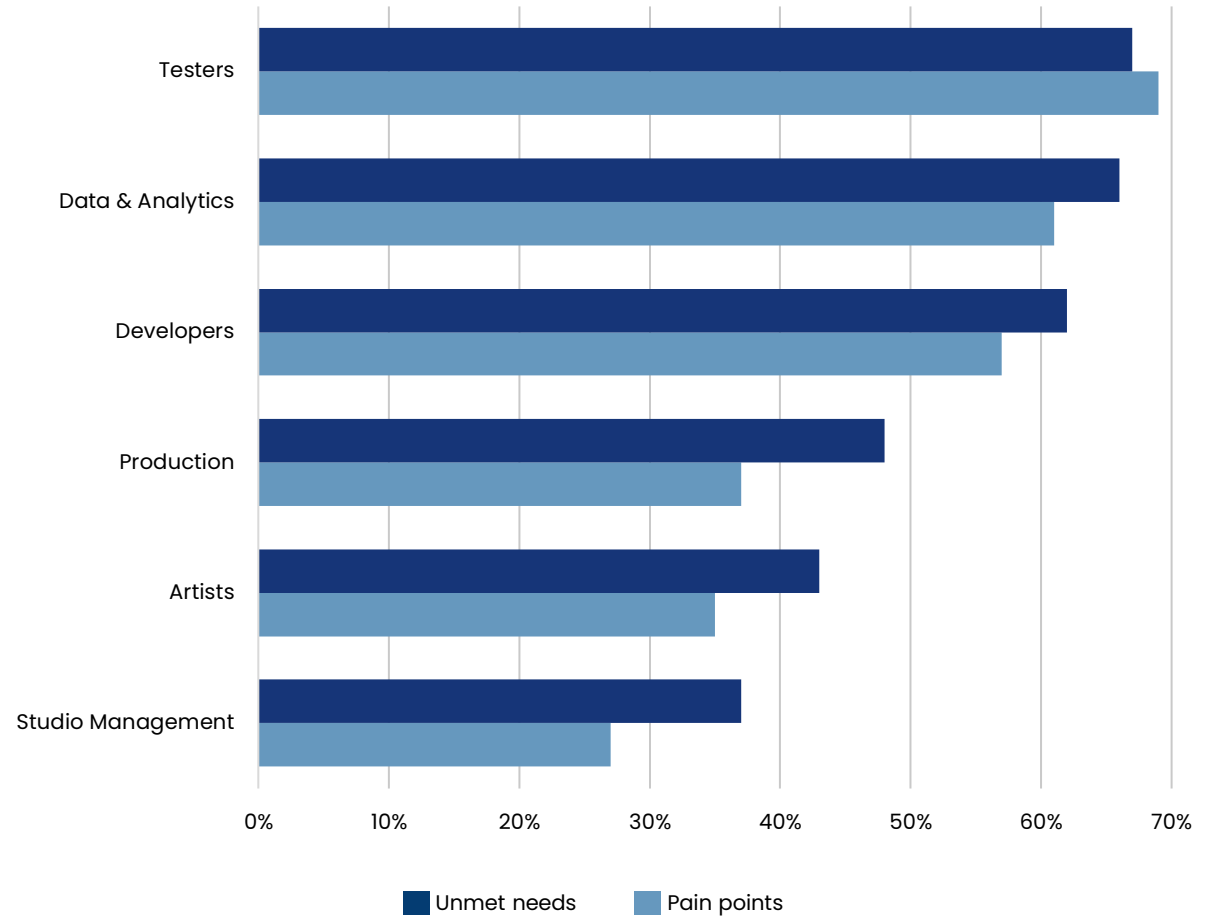
Every segment of our survey population indicated a high degree of unmet needs from their game development technology, with **88% of total respondents actively evaluating new tools** to bring into their workflows.



Gabriele Farina
SENIOR DIRECTOR, UNITY

“Looking to the future, game development faces a universal challenge: inadequate technology. Addressing this is crucial.”

The chart below shows how many respondents experience pain points or unmet needs with their game development technology, segmented by job function



Level 2

INDUSTRY CHALLENGES

**How game development disciplines
are affected by change**

KEY TRENDS

ARTISTS

3D art tools don't support a Figma-like workflow that artists need for more ambitious game projects

74%

of artists believe the cost of 3D content creation is becoming more expensive

DATA SCIENTISTS

Considering a game's analytics needs during development helps minimize data usability issues post-launch

32%

of data teams said data usability is the biggest challenge

DEVELOPERS

Games suffer from long build times, preventing efficient development processes needed for high quality releases

65%

of developers said they have 10+ minute iterative build times

PRODUCERS

Producers lack visibility into dependencies across a project, making it difficult to form accurate estimates and coordinate releases

63%

of producers find release coordination to be a painful task

TESTERS

More frequent and complex testing requirements are pushing teams to explore automation tools and strategies

43%

of QA/testing teams are using or evaluating the use of testing automation

STUDIO MANAGEMENT

Studios without tooldev teams struggle with custom middleware while large studios with tooldev teams are faced with technical debt

53%

Of large studios expect to struggle with managing their technical debt

THE COST OF CONTENT IS RISING AS GAME COMPLEXITY GROWS

Powerful technologies are helping artists raise the quality bar for game art while also helping smaller scope projects drive down their cost of content.

Despite new content creation tools for parametric assets, procedural editing, and prefab asset packs, **74% of artists believe the cost of 3D content creation is becoming more expensive.**

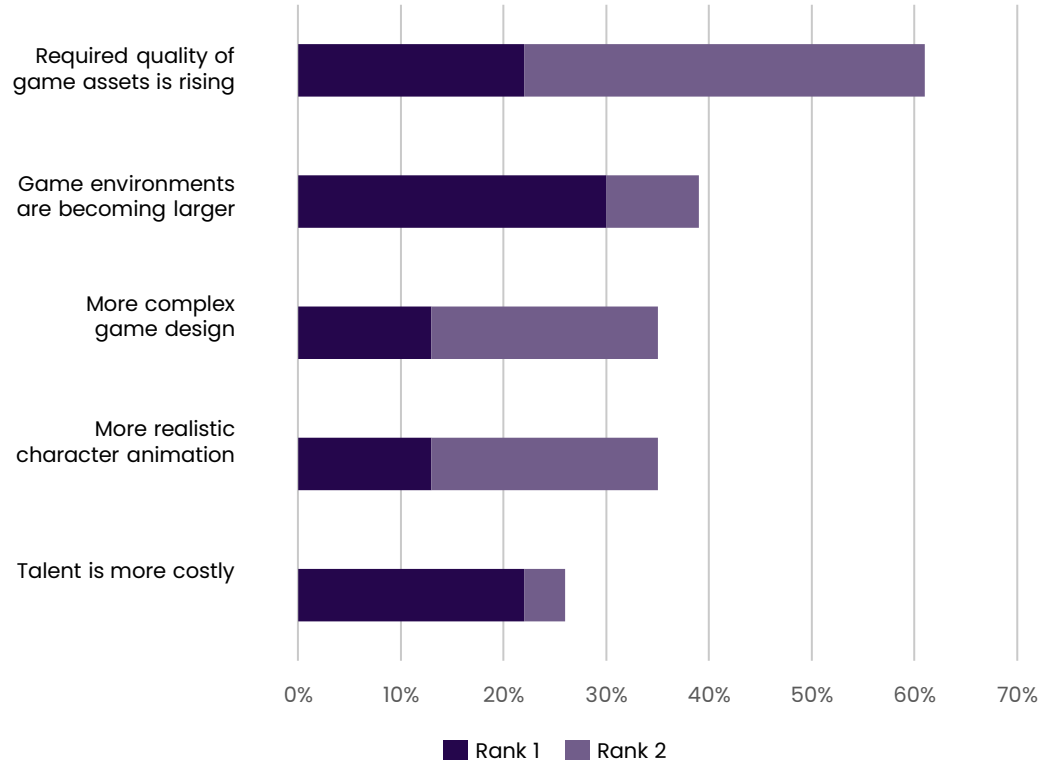
Teams that aim for photorealism utilize complex scanning workflows, high poly models, and high-resolution textures that require painstaking optimizations and validations to fit within the project's compute budget.



Rohan Knuckey
LEAD TECH ARTIST, EA

"Development studios relentlessly pursue larger scale games, higher fidelity, and intricate complexity to capture market share and keep players engaged. Of course, content creation time, effort, and costs go up."

The chart below shows which factors artists believe are most responsible for the increasing cost of content creation

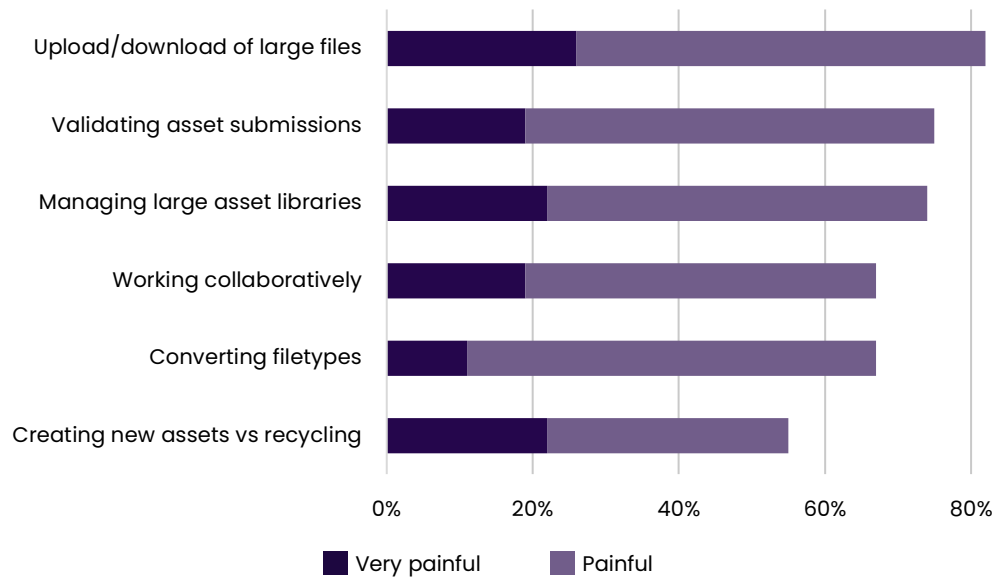


Plenty of games aren't shooting for photorealism, but even stylized projects are building more detailed environments and complex level designs. Animations, physics, and effects are important to give an immersive player experience.

ARTISTS DON'T HAVE ITERATIVE OR COLLABORATIVE WORKFLOWS

The world of a 3D artist is comprised of locally run programs, absent standards and massive filesizes, resulting in artist workflows that are powered by tedious manual processes to import/export, update, validate, or share data. 3D art tools are far away from the type of effective iteration and collaboration that 2D users enjoy via things like Figma or Miro. While 3D art tools are incredibly advanced at simulating reality, **artists report a high degree of pain points with the processes that surround the direct use of their tools: their workflow.**

The chart below shows the specific pain points in artists' day-to-day work



Jae Hyun Yoo
DIRECTOR/FOUNDER, STUDIO SAI

"The evolution of art assets in video games is increasingly complex, reflecting mature storytelling and versatility beyond traditional gameplay. However, a significant challenge is the lack of concurrent editability in content creation tools, hindering dynamic, immersive experiences and underscoring a key area for innovation."

LONG BUILD TIMES FORM INEFFICIENT DEVELOPER PROCESSES

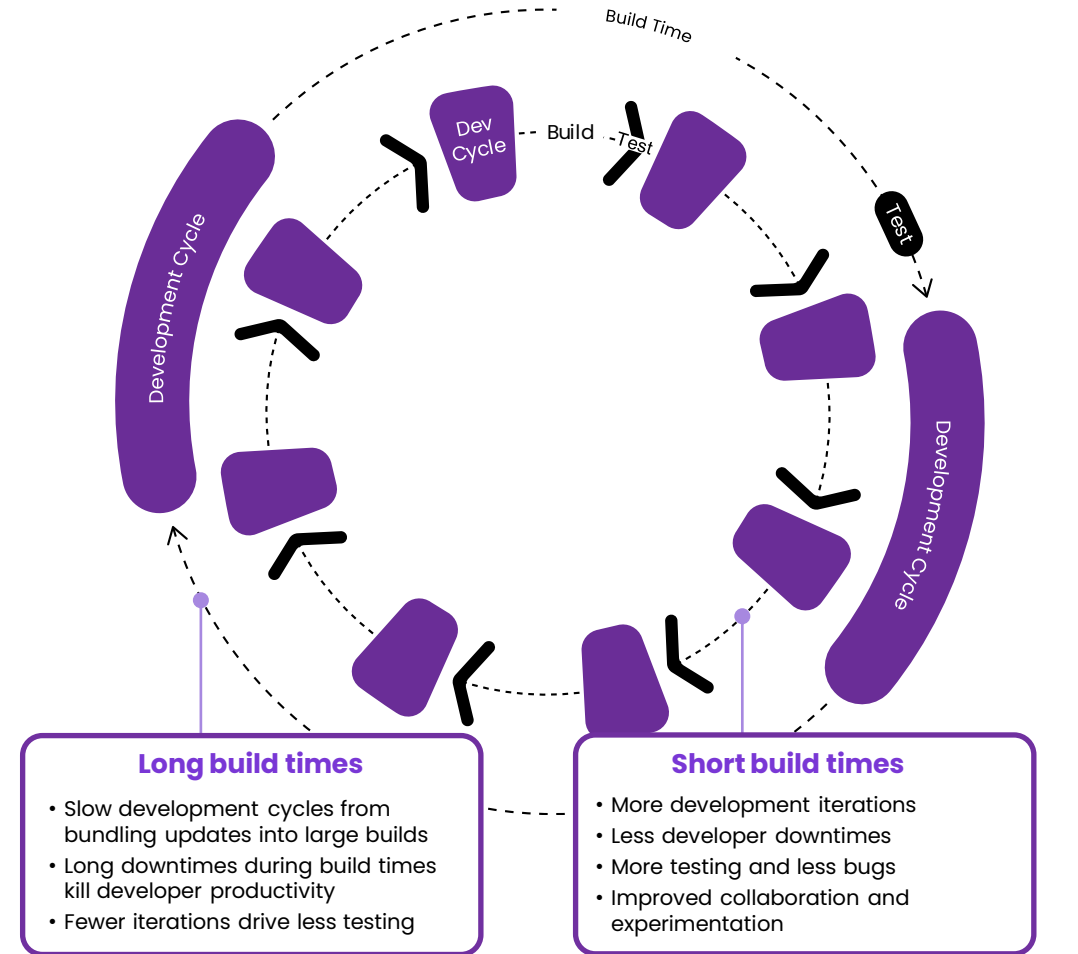
Long build times are endemic to the software architectures used in game development. Lengthy build times (which can be multiple hours on AAA projects) shape inefficient production processes by preventing iterative development, reducing the amount of bug testing, and wasting developer productivity with long downtimes.

Minimizing build times is essential in live service development when speed and quality are needed under short production timelines. Game development teams must actively explore various strategies to enhance build time efficiencies, spanning from critical code architecture choices to the implementation of tools designed to accelerate the build process.

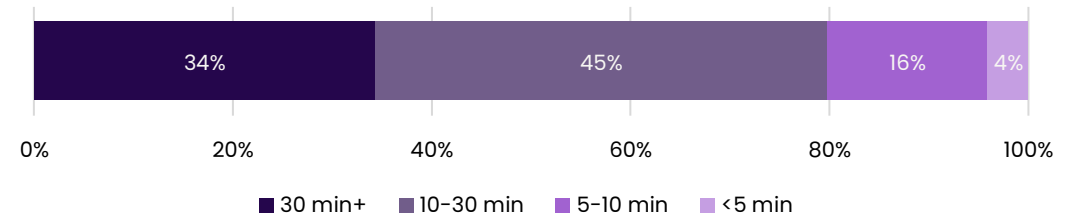


Francois Pelland
VP IEG GLOBAL, TENCENT

"Game teams that reduce, constrain, and streamline their build times will reduce project and operating cost, increase the quality of their games and most importantly, be closer to their players' needs."



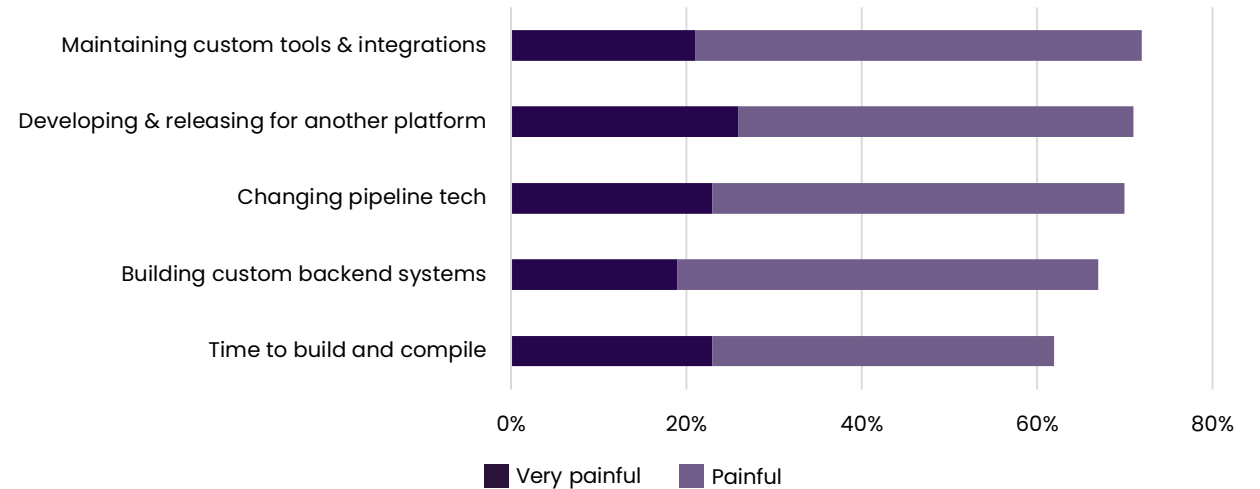
The chart below shows the iterative build times developers have on their current project



CUSTOM MIDDLEWARE AND PIPELINE FRAGILITY ARE FRUSTRATING FOR GAME DEVELOPERS

Game developers are frequently building custom tools and integrations between their tools to form a studio production pipeline. While the largest studios have dedicated tooldev teams, the presence of custom middleware creates a substantial burden for most other studios. Developers need to spend extra time and effort to maintain custom middleware, which often lacks proper documentation and breaks when a software update happens in the pipeline, taking away time that would otherwise be spent creating new player value.

The chart below shows the specific pain points in developers' day-to-day work



Yusuke Iida
DESIGN STUDIO AND VICE GENERAL MANAGER, LASENGLÉ

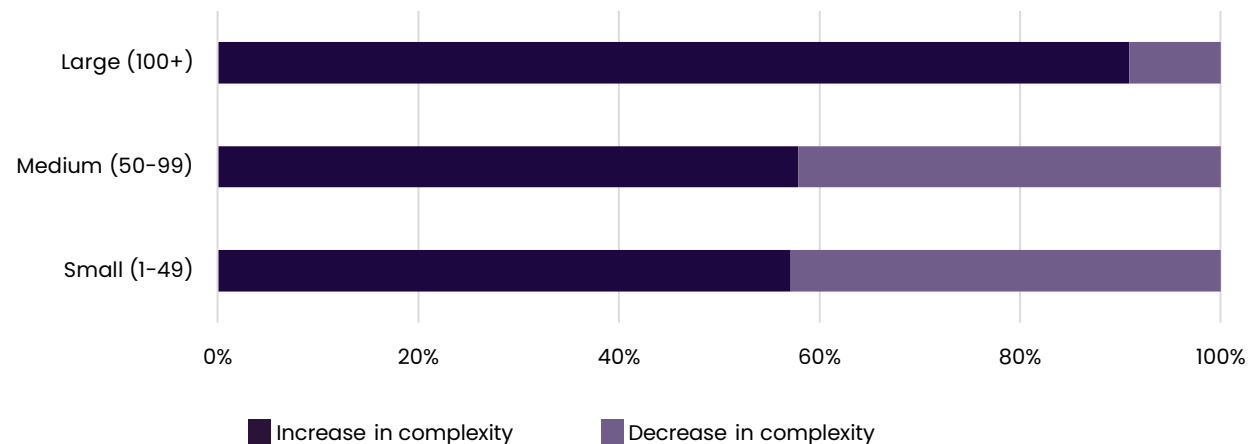
"In large-scale, long-term game development, teams must consider upgrades to their pipeline and tools even though it can be risky. Strategies that enhance flexibility during pipeline modifications become essential. One effective approach is to use a readable intermediate format for asset output, allowing data to be modified in bulk and avoiding the time-consuming process of re-exporting all asset data."

TESTING IS GETTING MORE CHALLENGING AS GAME COMPLEXITY RISES

As games projects become more ambitious with complex game design, sprawling environments, and realistic NPC behavior, more testing is needed to ensure a consistent and enjoyable player experience. Studios need to maintain a balance between encouraging creative exploration, maintaining production efficiency, and conducting thorough testing. Automated testing is critical for development teams to conduct more tests and enhance game quality without overwhelming production budgets and schedules.

43% of QA and testing teams reported that they are using or evaluating the use of testing automation for their current project. Successfully automating testing requires more than technology – it demands extensive process redesign in developer roles and studio operations.

The chart below shows how testers expect QA & Testing to change in the next 3-5 years, segmented by their game project team size



Joshua Romoff
R&D SCIENTIST AT UBISOFT LAFORGE

"Testing massive open-world games can be challenging. That's why we've been developing Machine Learning tools for automated testing."

LIVE SERVICE GAMES PRESENT NEW CHALLENGES FOR TESTERS

The number of tests that need to be run grows over the course of a game's lifecycle. Live service games drive increased testing complexity the longer the title lives on, as every update to the game project adds more functionality and logic.

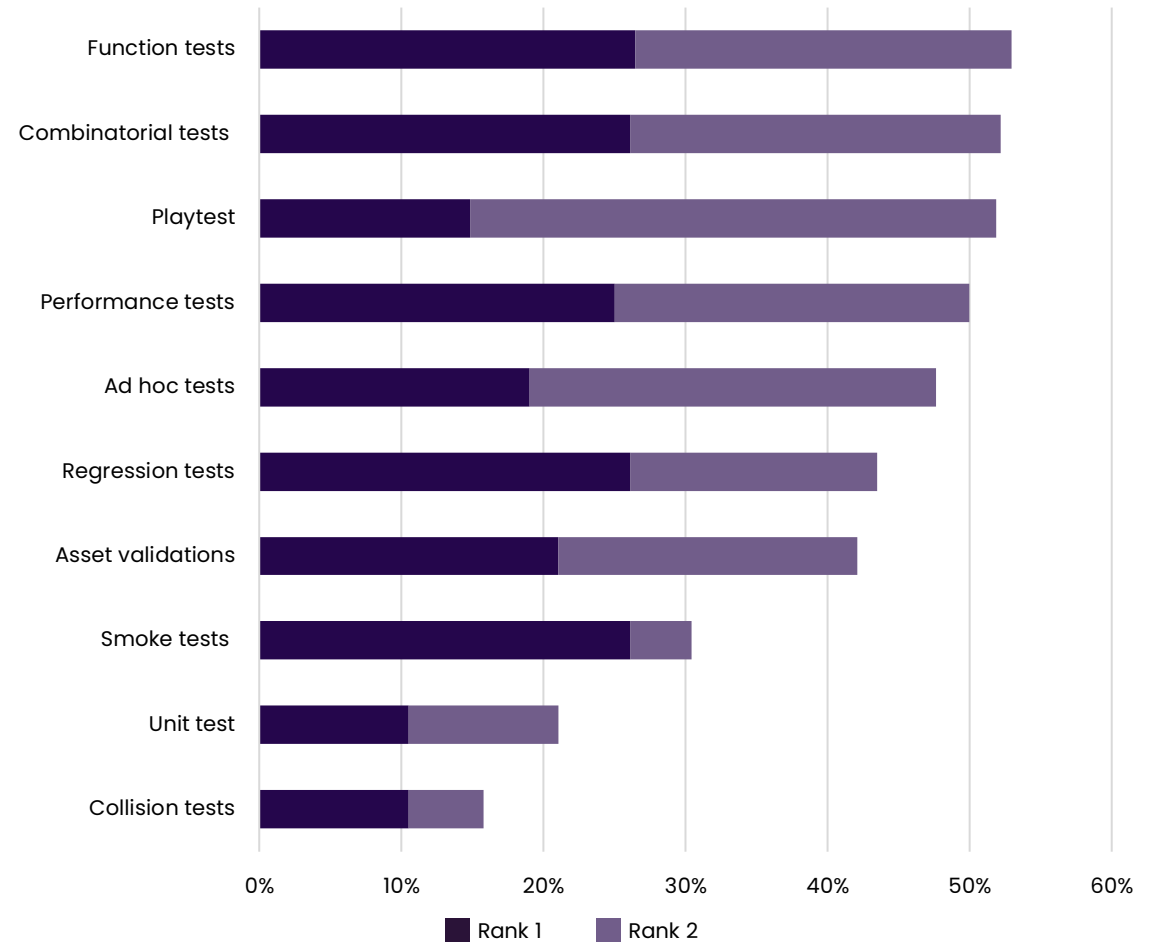
The reality is that players will run more hours on a game in its first week, or even day, than a testing team can ever hope to accomplish. Rather than trying to find and squash every last bug, testing teams need to develop best-practices to identify the most important gameplay features and prioritizing testing around those elements to create a playable and fun experience — and maybe even pass off a playable bug as a feature!



Christoffer Holmgård
CEO, MODLAI

"Game testing is a many-headed hydra. As a game grows over time, the project grows more complex and more fragile. The industry can't just throw bodies at the problem anymore. Teams need to form unique strategies and use specialized tools to manage the compounding complexity of game development."

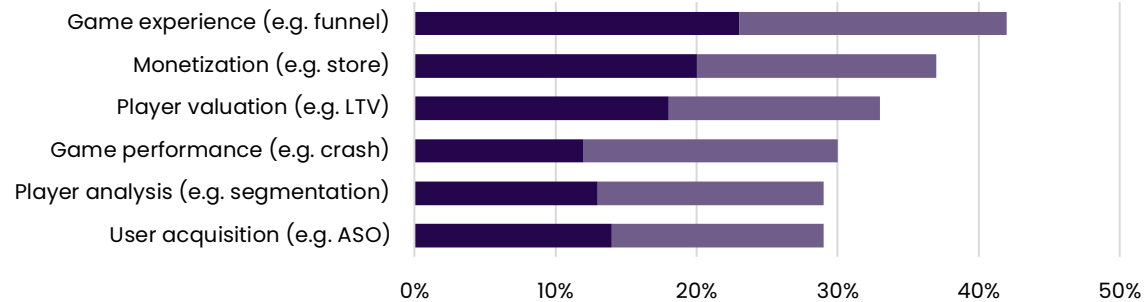
The chart below shows the tests that testers report to consume the most time & effort on their game project



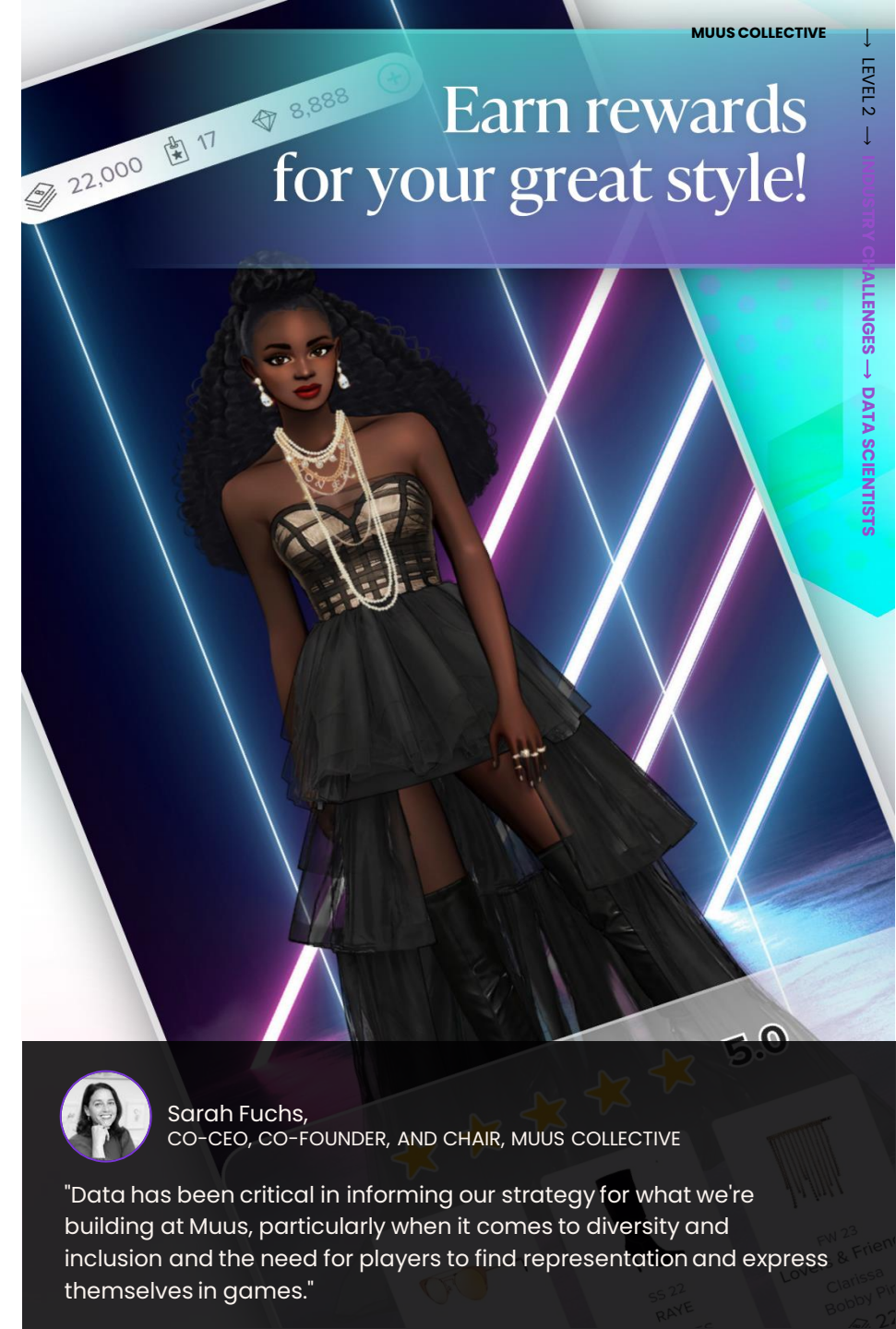
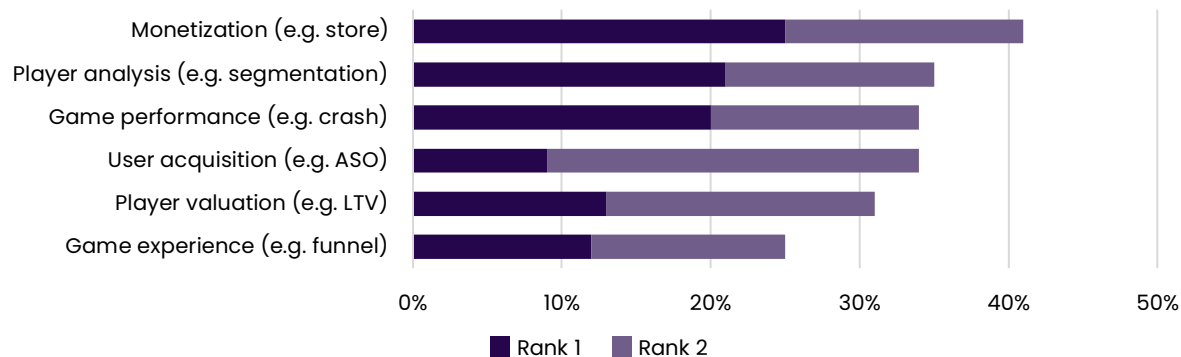
DATA-DRIVEN DECISIONS DRIVE BETTER GAME PERFORMANCE

Data analytics are incredibly valuable for shaping strategy and title management. Games that possess a clear understanding of their monetization strategies are well-positioned to fine-tune their in-game economies and boost their revenue streams. It can be especially powerful to use data analytics to shape a game's roadmap, but interpreting game data to inform game design was reported to be the most difficult analysis for data teams.

The chart below shows which analyses data teams report to be the most **challenging**



The chart below shows which analyses data teams report to be the most **valuable**



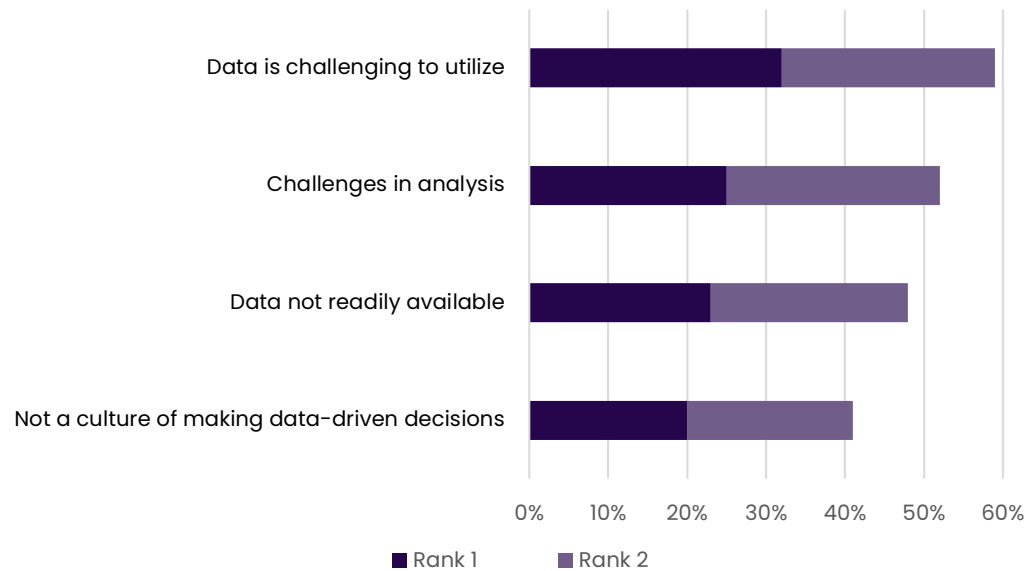
Sarah Fuchs,
CO-CEO, CO-FOUNDER, AND CHAIR, MUUS COLLECTIVE

"Data has been critical in informing our strategy for what we're building at Muus, particularly when it comes to diversity and inclusion and the need for players to find representation and express themselves in games."

AN EARLY FOCUS ON GAME DATA IS ESSENTIAL FOR POWERFUL ANALYTICS

It's critical to develop games with a focus on data from the start, rather than looking through a massive lake of game data after launch to determine what analyses can be drawn. Failing to consider LiveOps data needs during game development can lead to insufficient structure in the game data. This leads to ineffective data that is overwhelming and difficult to use, requiring significant effort to tag, merge, or transform.

The chart below shows the most challenging barrier data teams face with making data driven-decisions



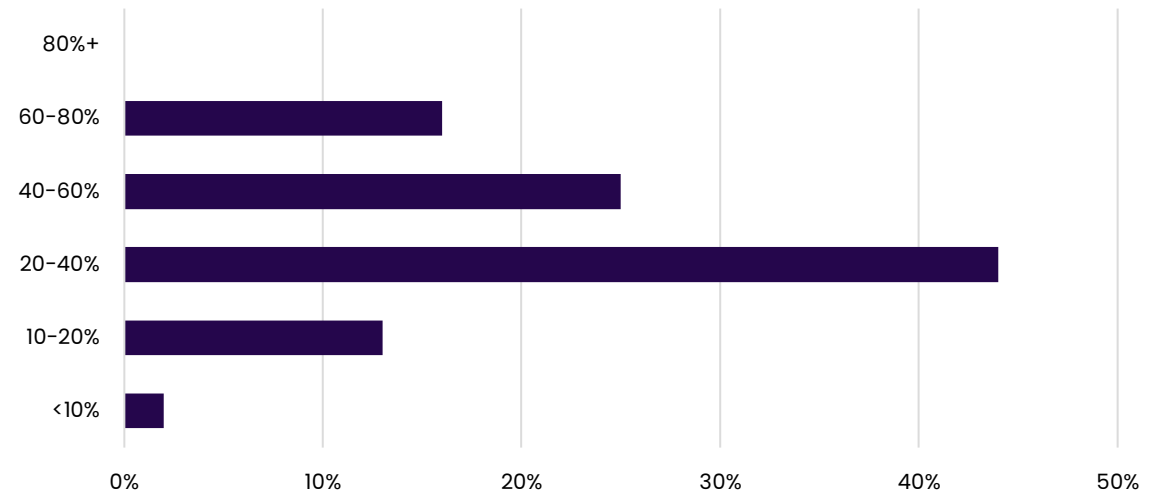
Michael Othen-Reeves
CREATIVE DIRECTOR, INCLUDED GAMES

"It's never too early to get the right eyes on your game's data. Scaling data operations post-production takes more effort to achieve less sophisticated results and limits your ability to respond effectively."

GAME PROJECTS LACK THE VISIBILITY NEEDED FOR ACCURATE PLANNING

The code and architectures used in game projects cause linkages between features that grow more complex over time, creating hidden costs during production. When producers form estimates to develop a new feature, or update an old one, they lack visibility into the maze of dependencies in the game code or game build and only discover them after development starts. Navigating this additional complexity eats up additional time and budget, and as a result, production estimates struggle with accuracy.

The chart below shows the extent to which studios exceeded their budget in their most recent game project



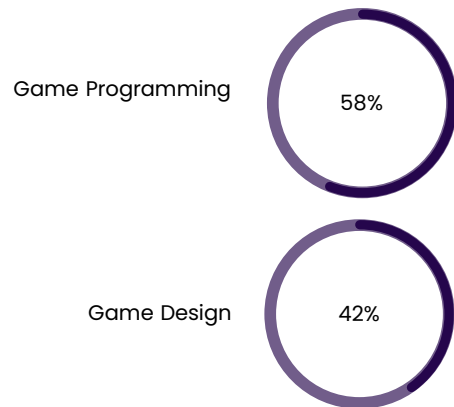
Guillaume Hansali
GM JAPAN, KEYWORDS STUDIOS

"Games have become so complex that estimating their cost is like trying to solve a puzzle without all the pieces and realizing halfway through that you've been solving the wrong puzzle. We try to estimate each feature independently to reduce complexity but tend to miss features' architectural dependencies."

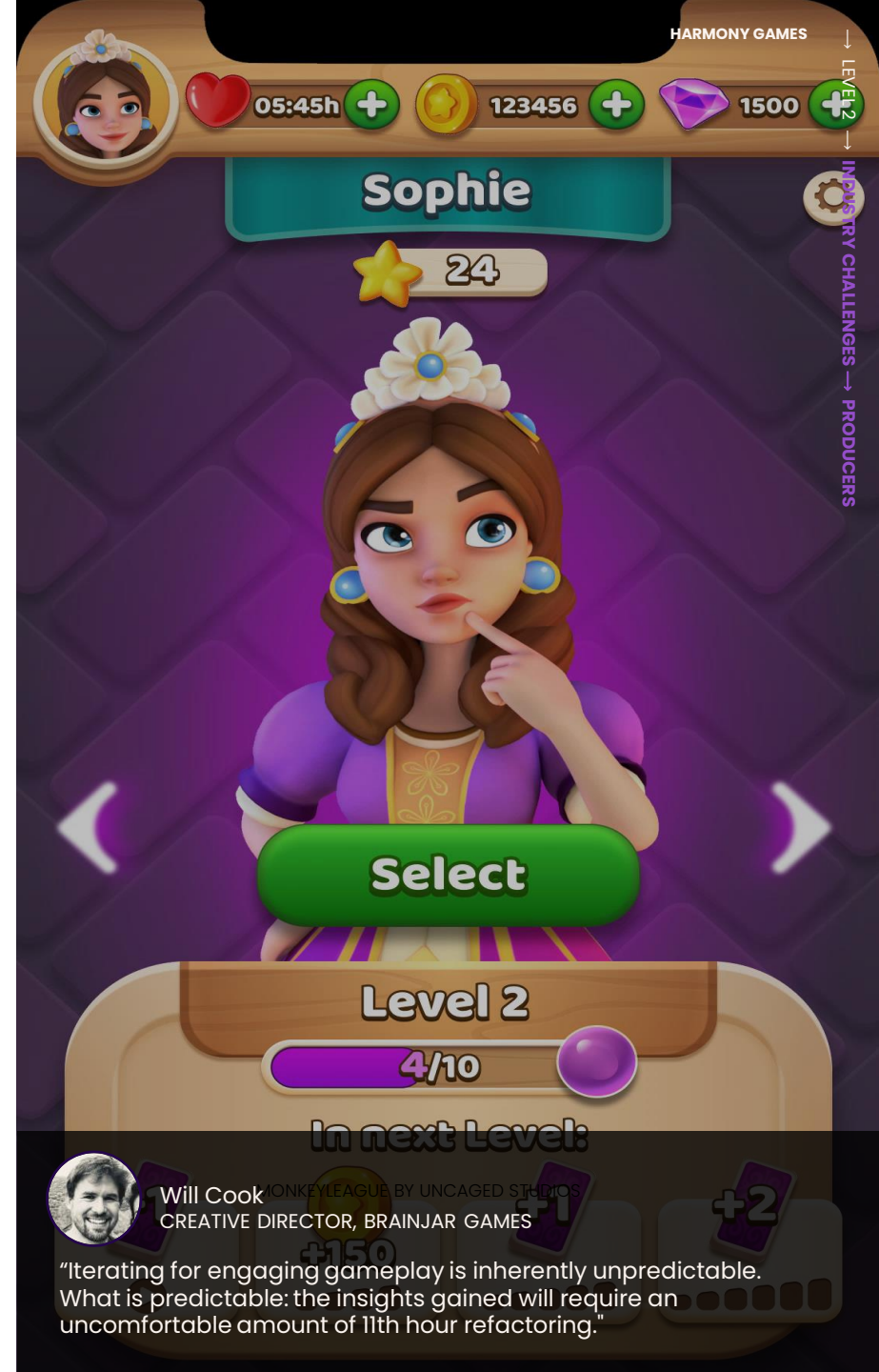
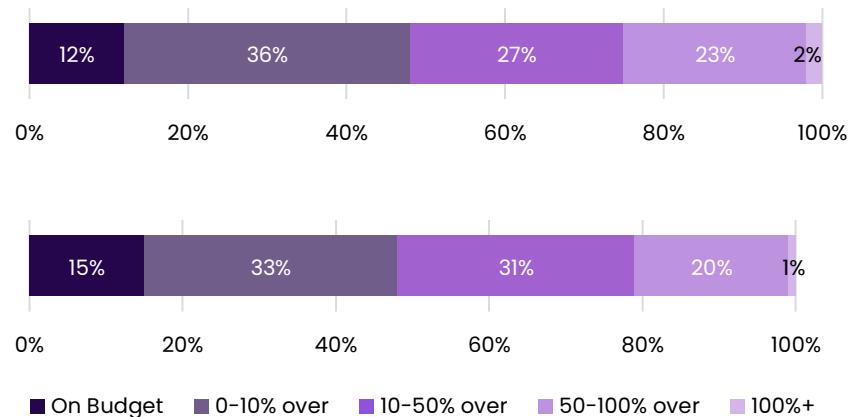
DEVELOPER AND DESIGN TEAMS ARE MOST LIKELY TO MISS ESTIMATES

Gameplay programming is most impacted by intricate code linkages that make accurate production schedule or budgets difficult. Game design teams are also prone to miss deadlines and budgets due to dependencies. Design teams have many roles that manage content, systems, narrative, audio, and more. These teams are all dependent on each other, constantly working to stay in concert as they explore new ideas that affect other team decisions. As design teams experiment or stumble upon emergent gameplay interactions, this constant state of adjustment cascades across team deadlines and budgets.

The chart below shows which teams producers experience the most **schedule delays**



The chart below shows which teams producers experience the most **budget overages**



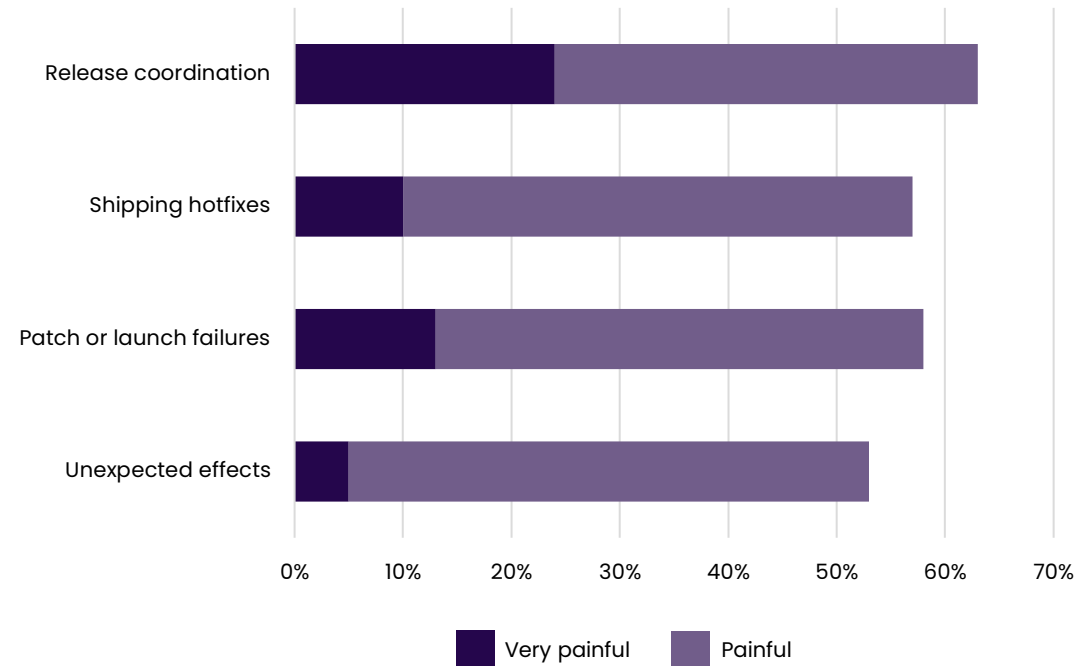
INTRODUCING MORE VARIABLES TO A PIPELINE ADDS TO PRODUCTION COMPLEXITY

A studio pipeline can consist of multiple version control systems that different departments use to store their data. A producer needs to navigate these systems and branches that individuals are building on in order to grab the correct inputs needed for a successful release.

Deploying more dedicated systems and using more subsequent branches helps make individual workflows more efficient, but also creates more variables that a producer needs to track and manage for.

Other variables can come from multiple deployment environments required for cross platform games. Preparing an on-time game release becomes more and more challenging as the number of these variables grow.

The chart below shows the specific pain points in producers' day-to-day work



Scott Hartsman
FORMER CEO, TRION WORLDS

"Teams that use multiple systems and branches to support individual workflows end up with a matrix of variables and unfortunate surprises to navigate. Rapidly deployed MMOs have learned that a single source of truth and constant iteration in the mainline is more than just a good idea, it's a way of life."

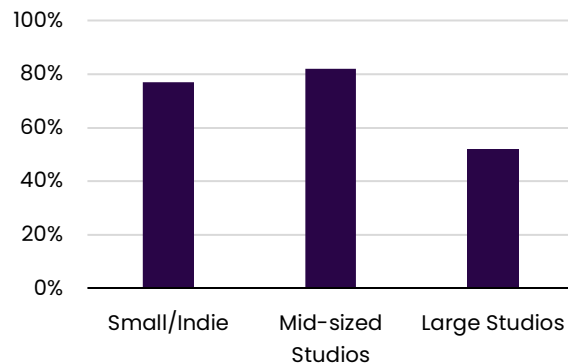


'BUILD IT YOURSELF' CULTURE IS A KEY DRIVER OF DEVELOPER OVERHEAD AND TECHNICAL DEBT

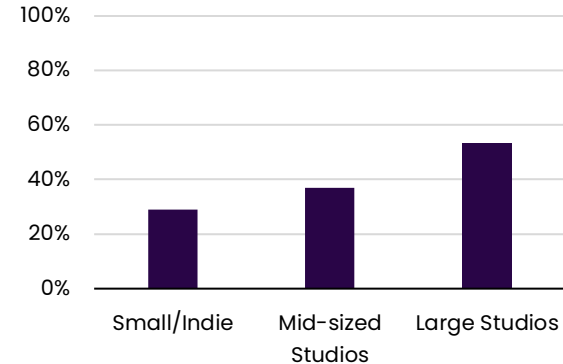
Smaller studios don't have dedicated teams to create and maintain custom middleware or integrations, a luxury enjoyed by larger studios. Small and mid-size studios must choose wisely when building custom software, as the ongoing maintenance pipelines or tool libraries add overhead to development teams already facing resource constraints.

Within larger studios with dedicated tool development teams, relying on tooldev teams can become a double-edged sword. While these studios can construct a fleet of custom plugins or middleware, they accrue technical debt that may spread to other game titles that tend to share the same tools or pipeline. Ultimately, this gives rise to long-term challenges at large studios that can impact the efficiency and flexibility of multiple projects.

The chart below studios facing challenges maintaining custom tools & pipeline software



The chart below shows studios expecting to struggle with technical debt on their game project



Dino Patti
CEO AND FOUNDER, COHERENCE

In multiplayer development today, the availability of new advanced tools has simplified the development process. Now the real challenge is pushing the boundaries of what these tools – and corresponding game experiences – can achieve.”



Level 3

EVOLVING PRODUCTION PROCESSES

The impact of live services

KEY TAKEAWAYS

TAKEAWAY ONE

Fast-paced live service production schedules make developer velocity and release stability a priority

51%–61%

of producers want to have a weekly or biweekly release cadence

In a live services world, games are competing to attract and retain their player attention. Production teams are leaning into fast-paced game updates to consistently offer new player value.

The speed at which features can be developed and stability when delivering updates are critical to player experience and title health

TAKEAWAY TWO

Game platforms, mobile, and MMO teams are pioneering scalable development practices

68%

of producers think their production pipelines are unfit for live services

Game development norms were formed around shipping a game once, not to support continuous improvement.

Live service leaders have turned to modern software development principles, such as modular architectures, DevOps practices, and automation infrastructure to build long term success for their flagship titles

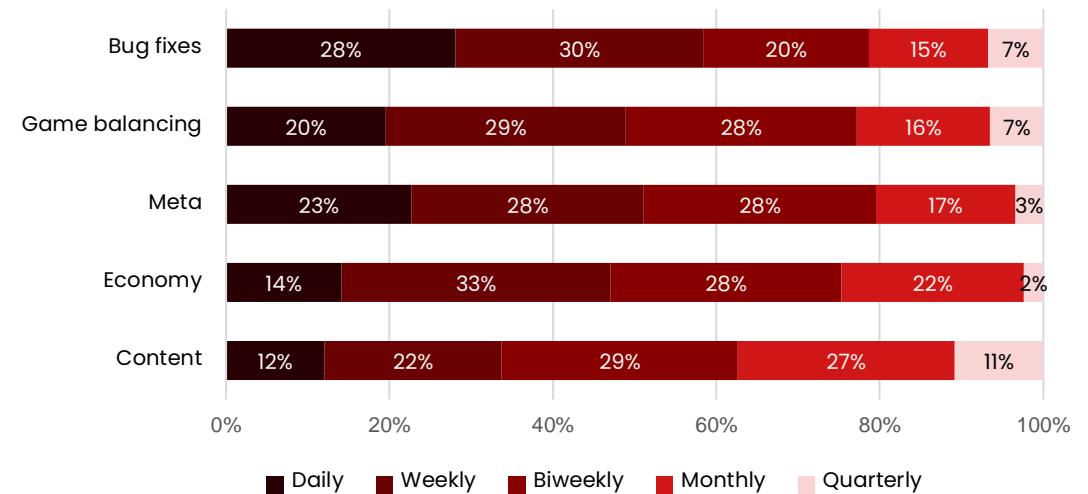
LIVE SERVICE TEAMS WANT FAST-PACED RELEASE SCHEDULES



Live service games need to keep their players interested and engaged amidst the sea of other titles competing for their attention. Production teams without a robust game update cadence can quickly find themselves at risk of losing their player base to games with constant player engagement and consistent new player value.

Across the industry, live service teams reported their ideal production schedules as weekly to biweekly for LiveOps cadences and biweekly to monthly for game content updates. In the context of game development, which typically spans multiple years, live service production schedules are moving at breakneck speed.

The chart below shows respondents ideal live service cadence for respondent's titles



Sasha Shams
PRODUCER, RIOT GAMES

"In a world of live service games, game teams stay competitive by building trust with their players through a consistent stream of content updates and balance adjustments to keep the game fresh. To keep up with player expectations, development teams are under increased pressure to continuously deliver new content while also juggling updates to quickly respond to player feedback or fix a game breaking bug."

GAME PRODUCTION IS EVOLVING TO PRIORITIZE VELOCITY AND STABILITY

Multi-year game development forms production processes and pipelines that are intended to deliver a few key milestones in what is essentially a waterfall process. Production in live services, however, is a constant state of planning & adjusting game parameters to enhance player experience while designing and deploying new features to add new player value.

68% of producers believe their pre-launch production pipelines are not suitable for live services.

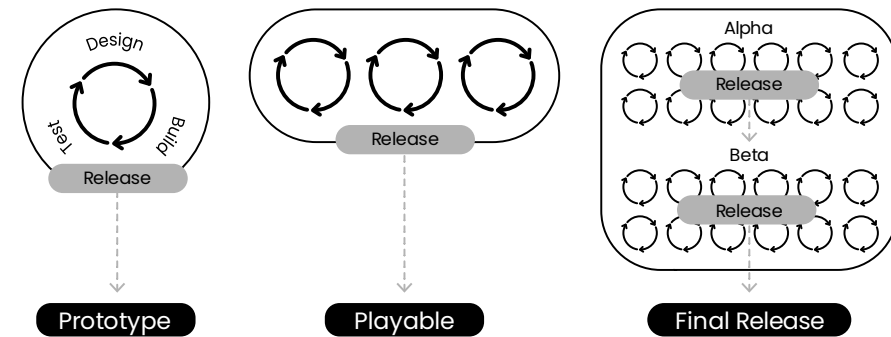
Successful live service teams are changing their studio operations and infrastructure to prioritize developer velocity and release stability needed in the live service era.



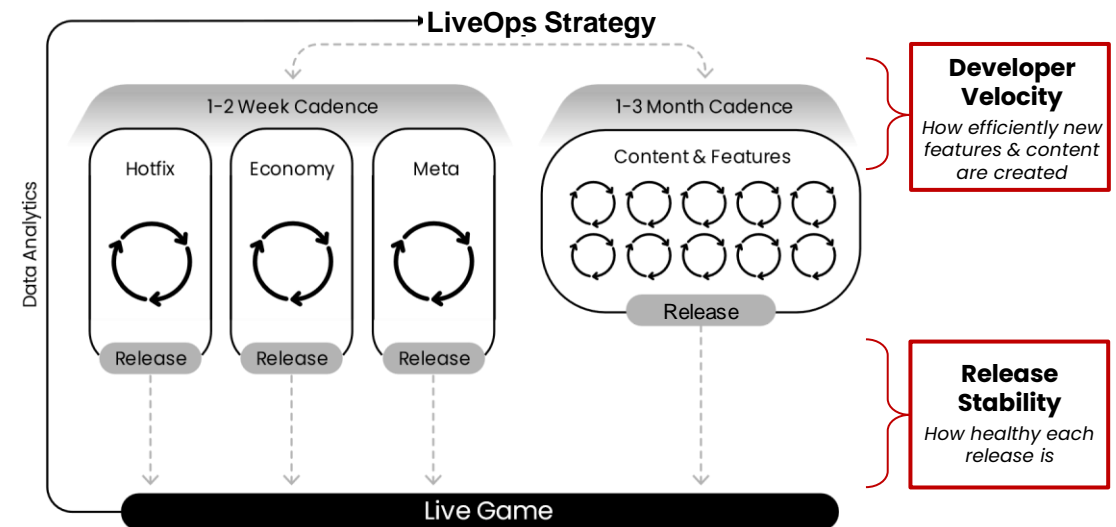
Maurizio de Pascale
CTO, IO INTERACTIVE

"Games aren't just content, they're software too. With live services, we're constantly delivering software to a living breathing product. Studios need to be ready and embrace the 'always shipping' mindset early on during development: use the same pipelines and workflows even for internal builds."

Traditional Game Development // 2-3 years



Live Service Game Production // 5+ Years



LEADERS BUILD DEVELOPER PRODUCTIVITY

Measuring developer efficiency is challenging when there are no standard KPIs and workflows that change drastically between building a small feature or a large system. Our research drew from SaaS frameworks (DORA) to focus on the update frequency, feature planning accuracy, rework rates, and lead times for an average game update.

The industry average has production estimates that are rarely accurate, updates that frequently require rework, and months between when a feature is designed and when it's deployed. Game developers tend to shortcut efficient and scalable workflows in favor of saving time or cost. This strategy works when a game ships once but falls short with games that grow over time.

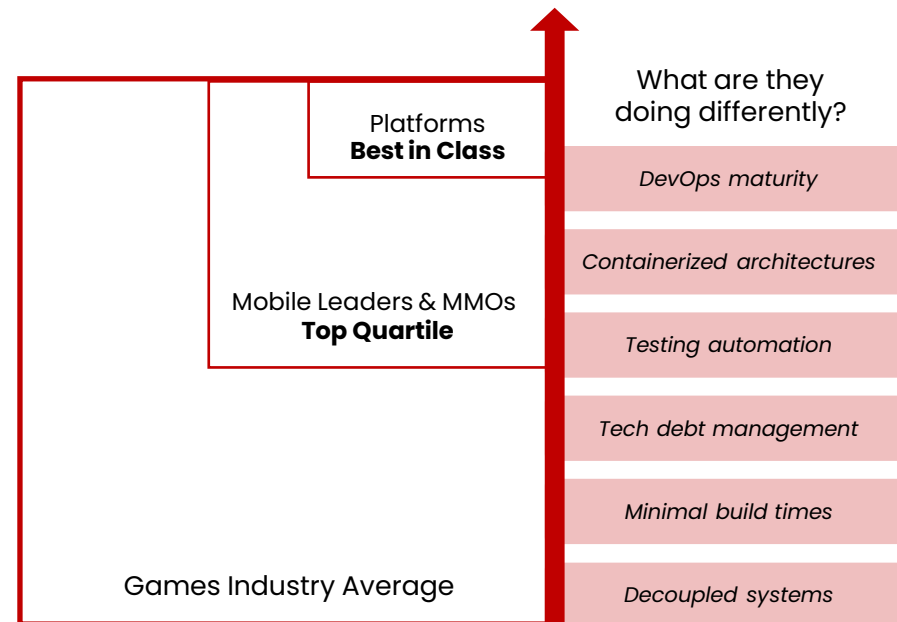
The top quartile is a different story. Mobile & MMO teams were early adopters of practices like DevOps and automation that support business models which rely on consistent updates to drive retention. Game platforms exhibit best-in-class developer productivity, with a SaaS-like mentality for player experience and uptime.



Rob Cameron
SR. TECHNICAL DIRECTOR, ROBLOX

"Moving from a monolithic code base to a microservices architecture was transformative for Roblox. We can release multiple services per day, scale them up, and enable new features dozens of times per day."

Developer Productivity

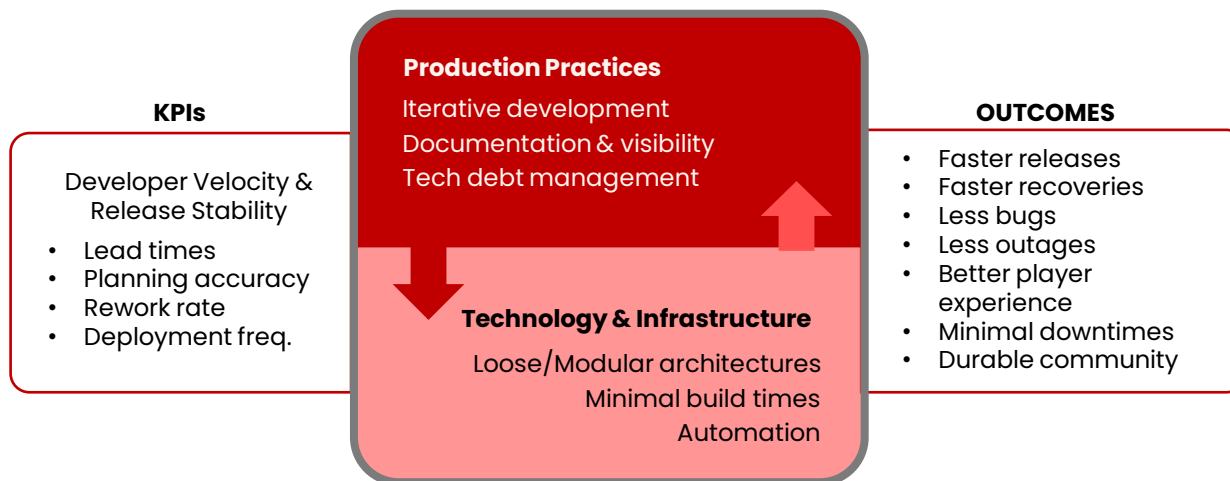


Developer KPIs	Games Industry Avg.	Top Quartile	Best-in-Class	Leading SaaS Orgs.
Deployment Frequency	1-2/week	1/week	1+/day	1+/day
Planning Accuracy	3%	33%	>75%	>80%
Rework Rate (noticeable defects)	61%	25%	<5%	<2%
Lead Time	3+ months	2+ months	<160 hours	<42 hours

TECH & INFRASTRUCTURE CREATE COMPETITIVE ADVANTAGES FOR STUDIOS IN GAME PRODUCTION

The root cause of most game production norms are the studio's underlying technology and infrastructure. Different games need to make different technology decisions and tradeoffs; a single player game with no ongoing plans for updates may choose to consciously incur technical debt to minimize development costs. Live service games need to build efficient production processes to quickly ship high quality releases, avoid service outages, and prevent team bloat. Loosely coupled architectures help minimize build times, which drive more iterative development that can properly leverage automation.

All things equal, teams with more efficient production processes end up with healthier titles. By establishing developer KPIs, studio management can better manage production risks and plan long-term strategies to improve a title's performance.



Ulas Karademir
GM, REALITY OS (FORMER VP
ENGINEERING, UNITY)

"Plan for the endgame. If your game's go to market will be driven by live services, it's crucial to integrate support for post-production liveops during pre-production development cycles to be successful."

THE IMPACT OF LIVE SERVICE FAILURES

Production efficacy in live services carries a material impact to business performance. When players encounter disruptions in their gameplay experience, they lose engagement, and their frustration drives churn. The longer it takes for development teams to address these issues, the more significant the financial impact becomes.

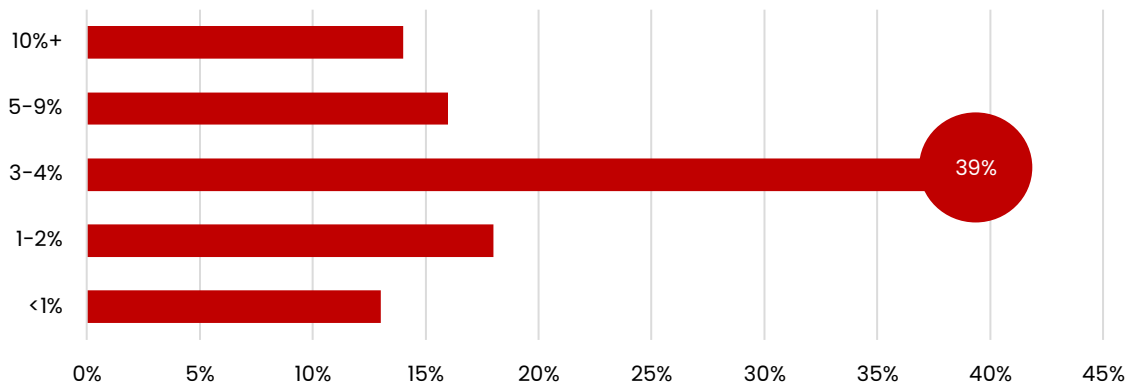
Teams that fail to optimize their production and release processes to meet fast-paced production timelines find themselves caught in a costly break/fix cycle, siphoning valuable developer resources away from delivering new player value and maintaining stable gameplay. In today's market, this is the difference between a good game and a truly great one — a distinction that can define a studio's success and longevity in the industry.



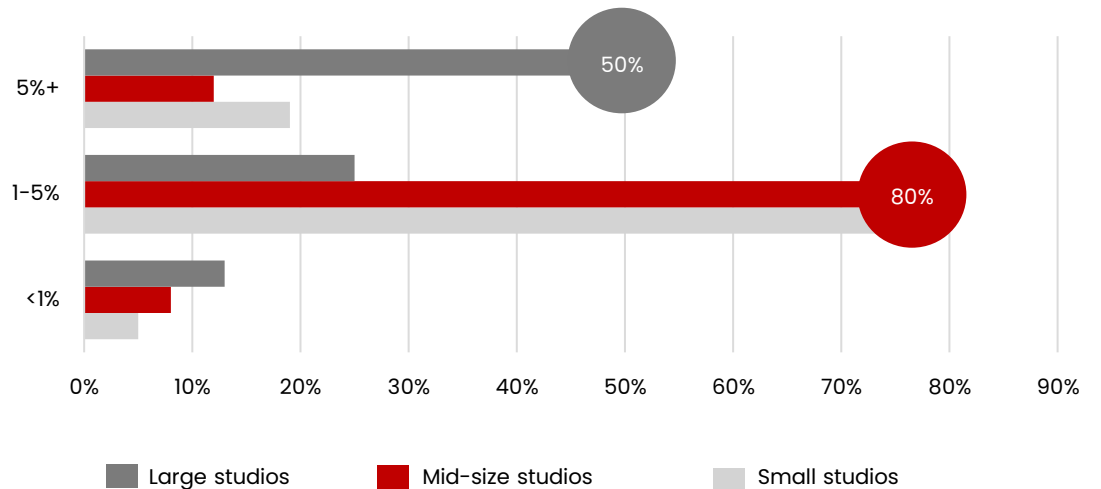
Zorbey Canturk
PRODUCT LEAD, ACTIVISION BLIZZARD KING

"AAA games are trying to tackle LiveOps like a Mobile F2P, and mobile studios are trying to deliver content more intricate than ever. Tech directors and producers are caught in the middle trying to make it work, and it's expensive when it doesn't."

The chart below shows additional player churn from noticeable defects or outages



The chart below shows monthly revenue loss from noticeable defects or outages



The background features a futuristic cityscape at dusk or dawn, with numerous tall, dark skyscrapers and a river or canal winding through the center. In the foreground, a large, circular, multi-level structure, possibly a futuristic arena or a large-scale architectural element, is visible. The structure has a dark, metallic appearance with some orange and yellow lighting accents. The overall atmosphere is dark and futuristic.

Level 4

EMERGING TECH TRENDS

What to expect on the road ahead

KEY TAKEAWAYS

TAKEAWAY ONE

Studios want to buy vs build

65%

of studios are planning to increase their use of off the shelf tools

Teams are excited about emerging game technology and tools that help them get to market faster

TAKEAWAY TWO

Cloud has a big role to play

94%

of studios are using or exploring the use of cloud infrastructure

Hyperscalers will play a bigger role as studios virtualize their infrastructure and support cloud streaming

TAKEAWAY THREE

AI is starting to make an impact

52%

of artists see AI creating as much value as a human artist within 2 years

While studios are excitedly exploring a wide range of AI use cases, artists are seeing the most benefit today

TAKEAWAY FOUR

Technical infrastructure is a priority

63%

of studios are prioritizing IT, engineering, or developer infrastructure investments

Technology innovation is becoming a critically important strategy for executive management teams

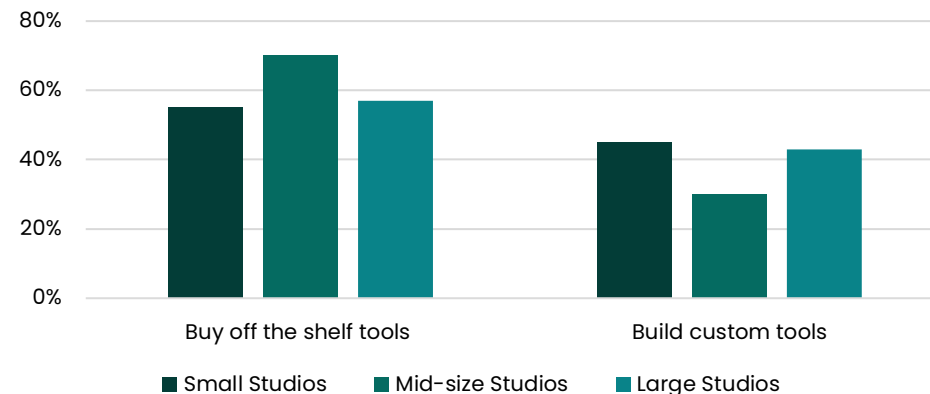
THE INDUSTRY ATTITUDE TOWARDS CUSTOM SOFTWARE IS CHANGING

Game studios are home to some of the most technically talented individuals and have traditionally built bespoke software tools, engines, backends, or anything else they needed in pursuit of the desire to push creative boundaries.

However, there's a shift mentality happening, with **65% of all studios now preferring to “buy vs build” their game technology.**

The game industry is in a much more mature state than over the previous decades, with well-funded companies ranging from startups to tech giants providing powerful solutions that simply weren't available before.

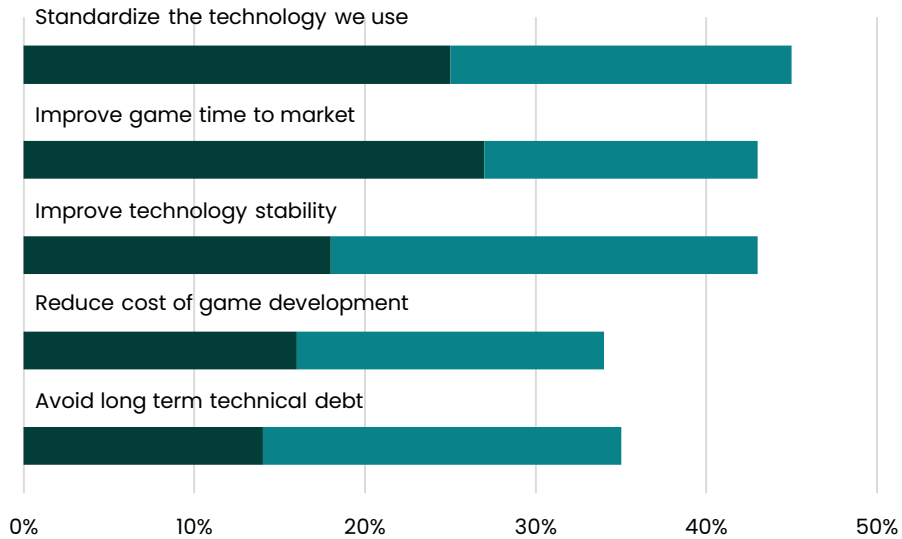
The chart below shows respondents' preference for building vs. buying their game development technology



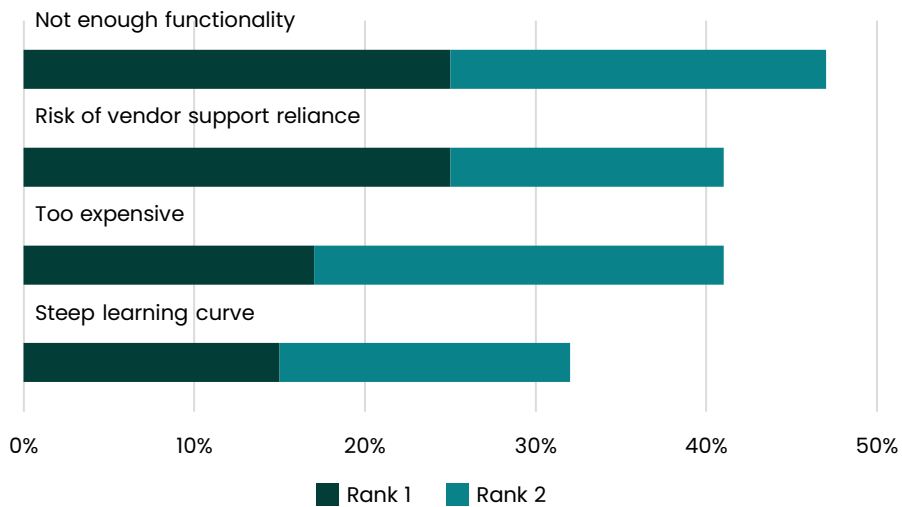
Reid Schneider
EXECUTIVE PRODUCER, RACCOON LOGIC

“We ALWAYS prefer to buy vs. build. When we buy, we know there's a team out there whose primary mandate is to support the tools/tech. As a development studio, we need to focus on what our players can feel, touch, and see. Spending time building custom tech is not our focus as an independent developer. We need laser-like focus on our content.”

The chart below shows the primary reason respondents would **buy** a solution instead of building their own



The chart below shows the primary reason respondents would **build** a custom solution instead of buying OTS



STUDIOS SEEK TO STANDARDIZE THEIR TECHNOLOGY & IMPROVE TIME-TO-MARKET

Studios are enthusiastic about shifting away from a culture of building and maintaining custom technology. **65% of respondents said they plan to increase their use of OTS technology over the next five years.**

A key value proposition for 'buying vs building' solutions is to make it easier to find and hire talent who use industry standard software, rather than spending months to onboard developers to a custom tool. However, studios remain cautious about whether off the shelf tools can meet their requirements, which vary widely across game types. Another key concern is becoming over-reliant on vendor support. In the event of mission-critical system failures, studios need to ensure swift issue resolution without the risk of being stuck waiting for a vendor's response.



Chris Bell
CREATIVE DIRECTOR, GARDENS INTERACTIVE

"Using widely adopted software lowers the barrier for teammates to quickly jump in and contribute to a project, while also helping us spend more time and resources on the development of the game itself."

GAME TECHNOLOGY VENDORS NEED TO OFFER MORE THAN JUST SOFTWARE

As customers, game studios buy more than just software licenses, especially with mission critical software and at large AAA teams. Solution vendors need to consider the technical support needs of their customers, as well as additional enterprise features that larger publisher IT teams typically require.

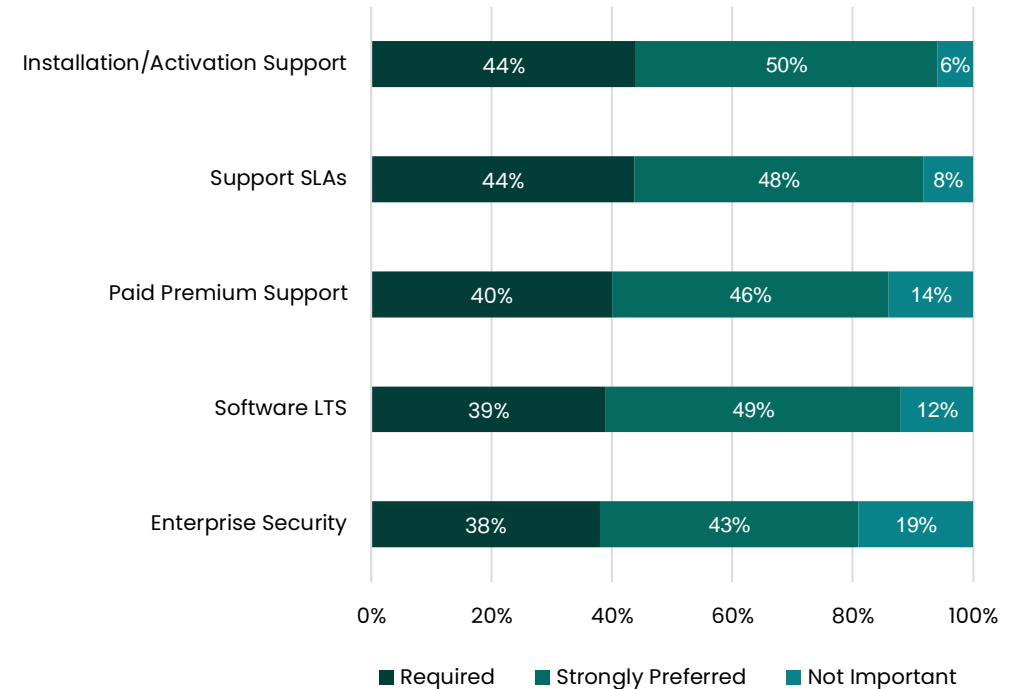
Technical Support

Offering installation and activation support, typically over the first 90 days, is essential to help onboard customers successfully help reduce problems a game team might face down the line. Studio customers also strongly prefer, if not require, vendors to provide license options with defined support level agreements (SLAs) that help establish support visibility and accountability for mission critical systems.

Enterprise Requirements

Larger companies often require extra support features to help unexpected problems from arising. For example, game teams often freeze their software versions to avoid breaking pipeline integrations which mean vendors need to offer continued bug fixes and enhancements even for legacy products via Long Term Support (LTS).

The chart below shows the technical support preferences of respondents



Maurizio Sciglio
DIRECTOR, TECHNOLOGY PARTNERSHIPS, EPIC GAMES

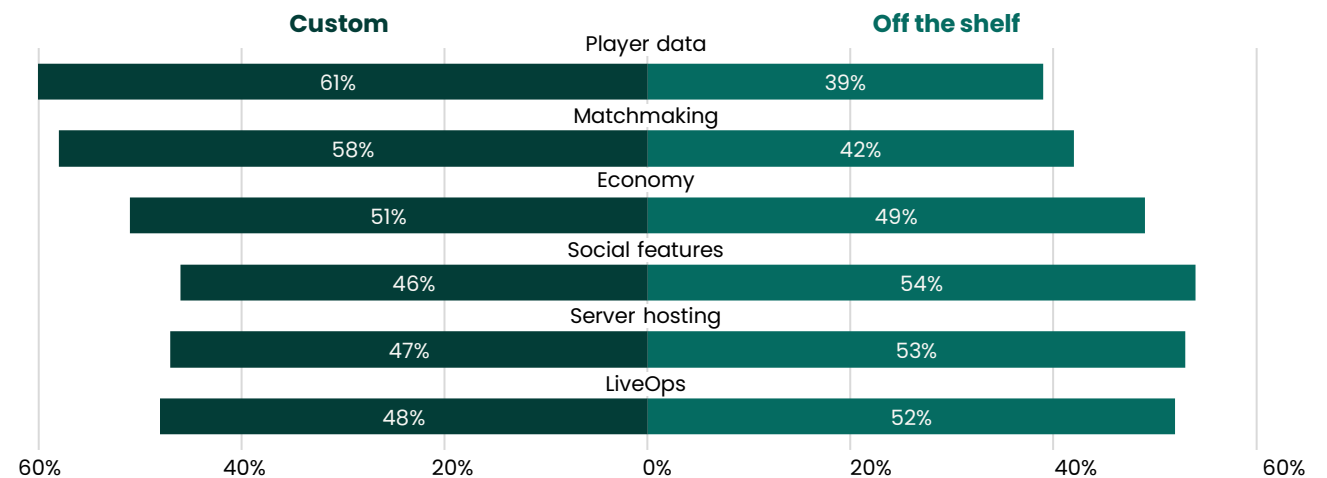
“Adopting a 3rd party solution is one of the most critical, existential decisions a studio makes. Developers must trust that the vendor is stable, credible, and has an adequate support structure in place for when things inevitably go wrong. After all they’re trusting the vendor with their most valuable assets: their money and creations!”

PRODUCTION TEAMS WANT TO USE THIRD PARTY SOLUTIONS FOR THEIR BACKEND SERVICES

Game backends have seen a major shift towards the use of 3rd party backend software, especially for services that do not require extensive customization. Developers are eager to avoid re-creating the wheel for more generic services like social features or server hosting. Game services that are more unique to a project's gameplay or logic, such as player data or matchmaking, are still likely to be custom built.

Ultimately studio teams are looking to save time and budget while enabling a rich set of meta-game features with minimal launch risk. **23% of developers would consider entirely relying on a 3rd party** backend provider, while **94% of studios are seeking to use at least one off the shelf** service in their backend stack.

The chart below shows what respondents are using for their backend services



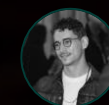
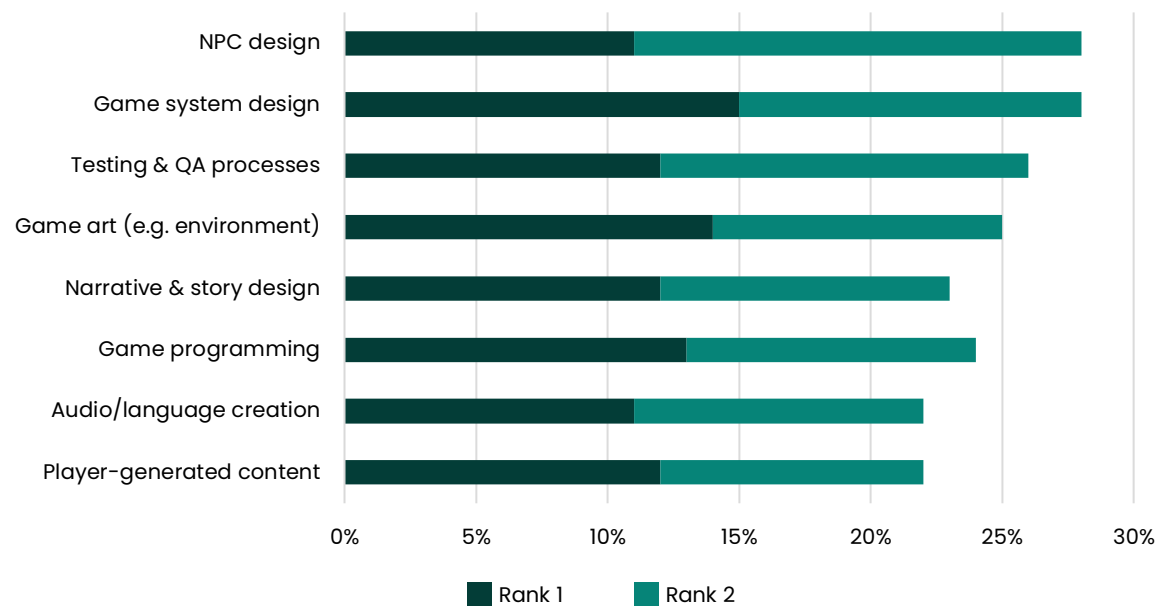
Eden Chen
CEO, PRAGMA

“Game studios at large are transitioning from expensive custom solutions that are costly to build and even costlier to maintain, to backend game engines which give studios a richer set of backend features out of the box, leading to more stable launches and better player retention.”

AI IS EXPECTED TO HAVE A SIGNIFICANT IMPACT ACROSS ALL ASPECTS OF GAME DEVELOPMENT

The industry is buzzing with excitement about the potential impact AI can have across the game development lifecycle. Emerging AI tools are expected to expand creativity, improve productivity, and lower skill barriers. With too many specific use cases to properly define, we decided to ask respondents which key domain of game development they expected AI to have the most impact.

The chart below shows which aspect of game development respondents expect to be most impacted by AI



Kylan Gibbs
CEO, INWORLD AI

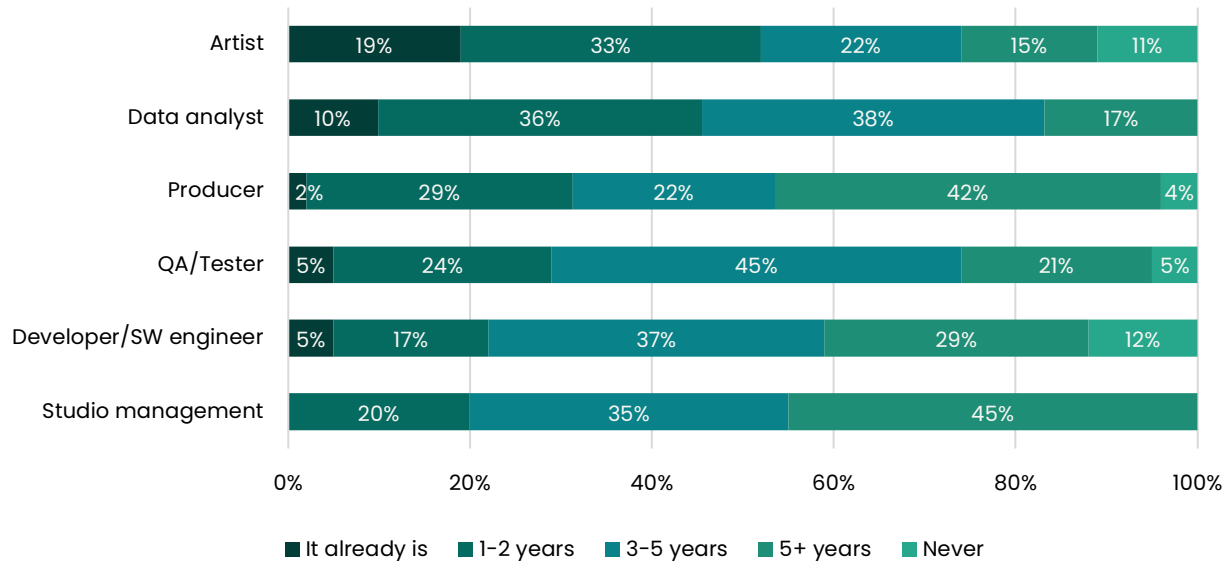
"Creating AAA-quality NPCs that are interactive, believable, and essential to core game loops is becoming accessible to studios of all sizes, with the help of AI character engines. Shifting from scripted dialogue to dynamic, player-driven narratives is just the first step in how AI NPCs will contribute to living, breathing game worlds."

TODAY'S AI TOOLS CATER MOSTLY TO ARTISTS

While the industry remains enthusiastic about the potential of AI, the usage and value creation of new AI tools are still in their early stages. For example, generative AI tools that generate 2D, or even rudimentary 3D, concept art still need to solve challenges with copyright protection before major studios feel comfortable bringing these assets into production workflows.

It is important to note that we do not see AI tools 'replacing' studio employees. Game development is a creativity maximizing industry. If a technology can save a project \$1M, teams are far more likely to reallocate that budget to more features than reduce the game budget by \$1M.

The chart below shows when respondents believe AI tools will provide as much value as a game studio employee



Matt Wyble
CHIEF OPERATING OFFICER, SECOND DINNER

"It's always been David vs. Goliath for small studios, and the rising costs of developing games make it harder every year. A new wave of tools and services, many AI-powered, give David a mecha suit to even the odds."

WORKFLOWS ARE MIGRATING TO THE CLOUD

Over the past decade, game studios have slowly been adopting cloud capabilities into their workflows and pipelines for use cases like virtual workstations, storage, and build servers. Common risks and considerations that studio teams consider between operating on-prem vs hybrid or public cloud infrastructure revolve around reliability, security, and performance. Mid-size studios tended to be the most cost-conscious while smaller studios were concerned with the learning curve of changing their technology.

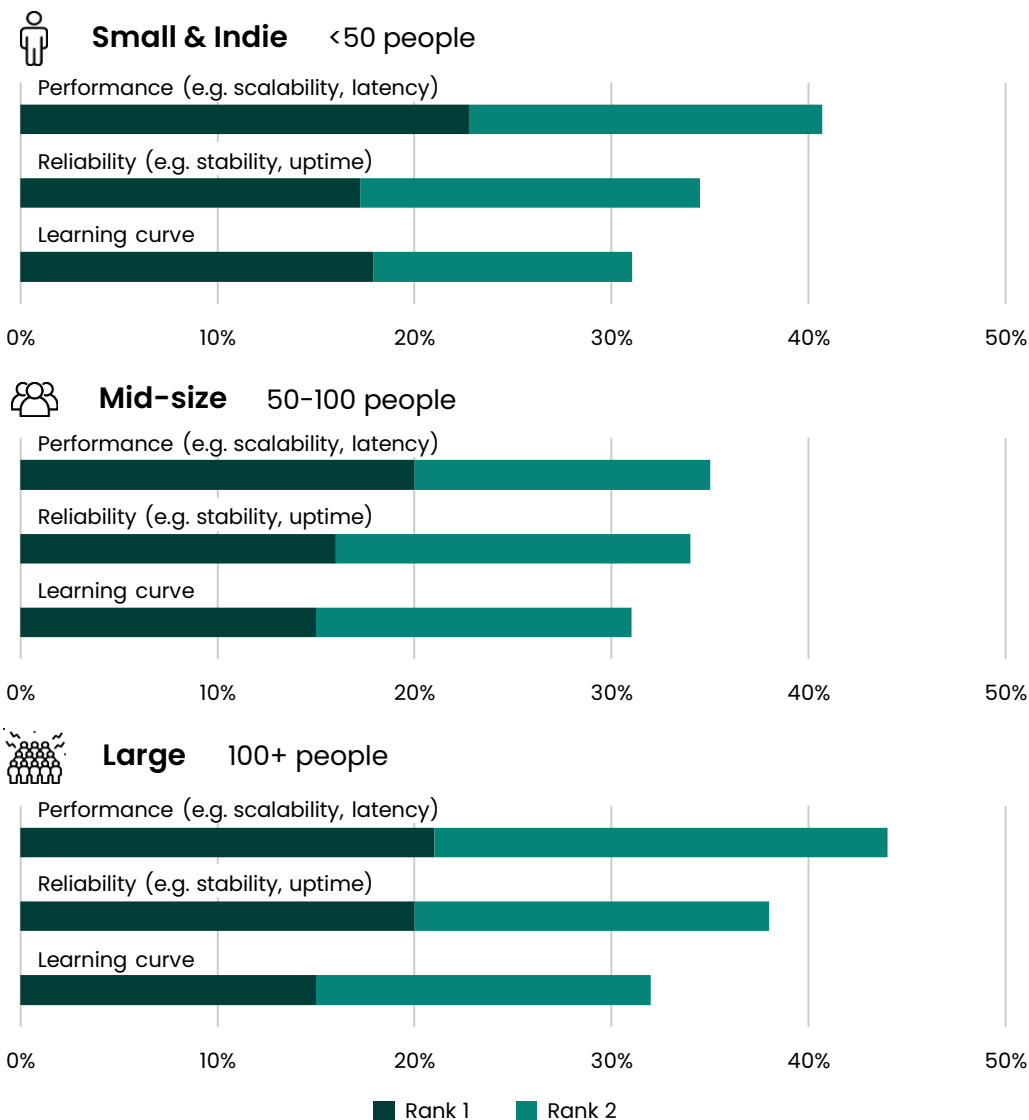
Long term, workflows and pipelines are expected to continue to embrace cloud capabilities, with **46% of studios using cloud infrastructure in production** and **48% exploring or using cloud infrastructure in R&D**.



Dan Carpenter
DIRECTOR, AWS FOR GAMES

“Game developers need to focus on building fun, innovative games that delight players versus spending time and effort handling infrastructure. Cloud technologies accelerate game production, improve developer efficiency, and enable remote work in ways that simply aren’t possible with legacy IT infrastructure.”

The charts below show respondents’ biggest concerns with migrating their studio workflows to the cloud

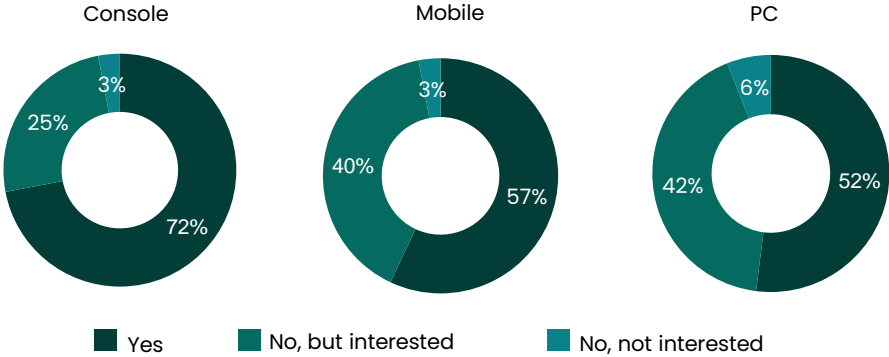




STUDIOS ARE EXCITED ABOUT TECHNOLOGY THAT HELPS REACH A WIDER AUDIENCE

Game studios are excited to implement cloud streaming for their upcoming projects. The technology is improving rapidly, making streaming easier for developers to support and more performant for players.

The chart below shows respondents' interest in supporting cloud streaming in an upcoming project



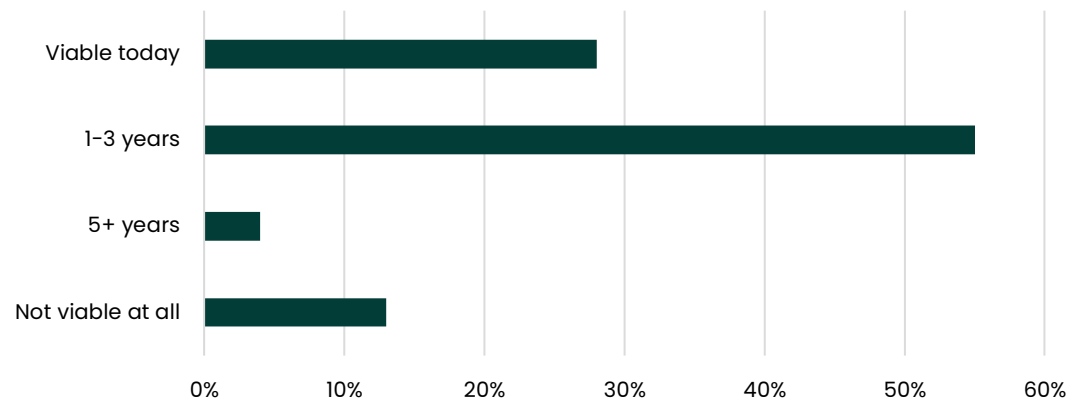
Cloud streaming has a strong value proposition for all developers. Eliminating constraints like storage or performance enable low-powered devices to have high-powered experiences and expand a title's playerbase to an audience without a high-end PC. While console developers express the most planned adoption, **65% of all game studios intend to support cloud streaming in their upcoming projects.**

BROWSERS UNLOCK NEW POSSIBILITIES FOR GAMES, ESPECIALLY ON MOBILE

The mobile browser is quickly becoming a viable game platform with the arrival of new technologies like WebGL and HTML5. There are a slew of benefits that developers are excited about, from near-native level graphics performance to inherent cross-platform support and streamlined game updates. Browser-based games also sidestep app stores' revenue cut, allowing for more lucrative economic models if games are successful.

83% of game developers think browsers could be a viable game platform in the next 3 years, indicating high confidence in where the technology is going.

The chart below shows when respondents would consider browser-based technologies (e.g. HTML5, WebGL) as a viable platform for an upcoming title



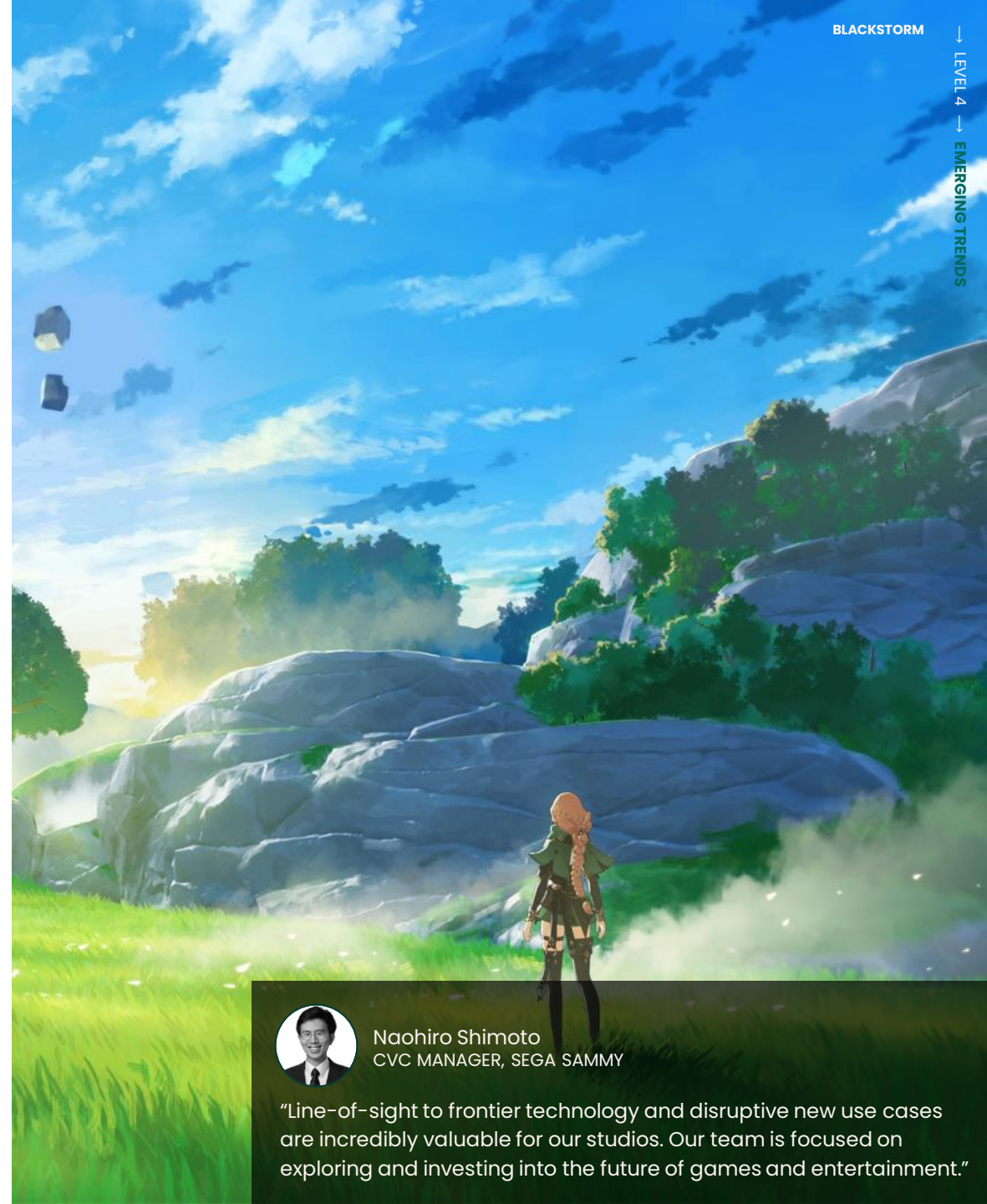
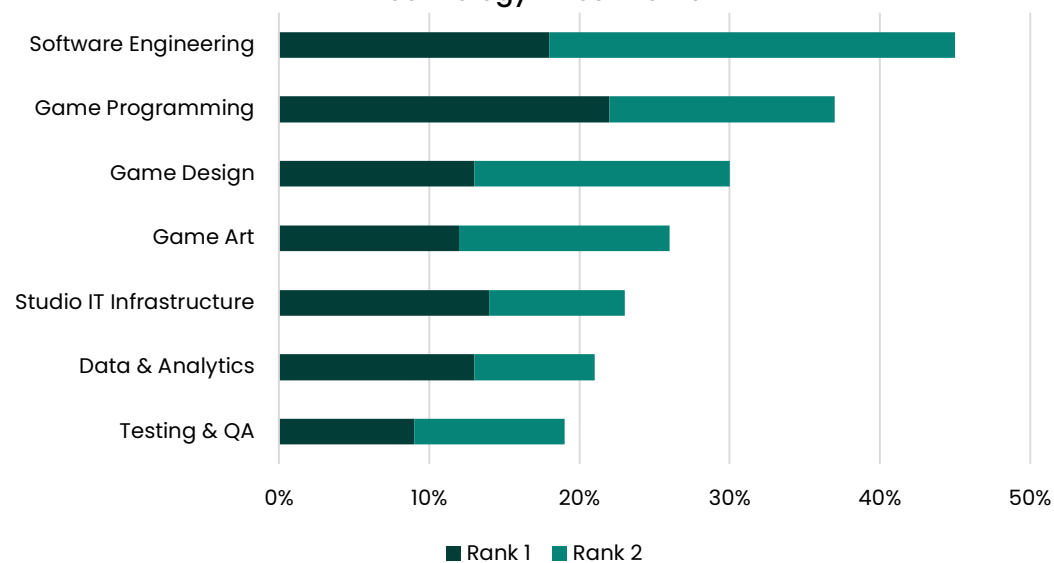
Brandon Wu
FOUNDER, GANGBUSTERS

"Web games aren't just released; they have a dynamic and responsive development cycle. We build them in the open with a live audience to iterate rapidly, gather feedback, and deploy updates and fixes daily. With the ability to distribute to a diverse distribution channels and devices with ease, it's a stark contrast to traditional platforms, giving us a unique go-to-market motion that is as agile and adaptable as our games."

MANAGEMENT TEAMS ARE PRIORITIZING STUDIO TECHNOLOGY INVESTMENTS

The technology a studio uses in-game development has become a key differentiator for game performance in the live services era. Management teams are realizing the role technology has in shaping processes that impact both the top and bottom line. Game companies are forming dedicated teams to scout and evaluate new tools as well as stepping up investments in technology that can help them move fast, capture attention, and deliver consistent player value.

The chart below shows which departments are a top priority for studio technology investments



Naohiro Shimoto
CVC MANAGER, SEGA SAMMY

“Line-of-sight to frontier technology and disruptive new use cases are incredibly valuable for our studios. Our team is focused on exploring and investing into the future of games and entertainment.”

A NEW MARKET LANDSCAPE IS EMERGING

PLANNING

Art



Animation & MOCAP



Asset Management & Optimization



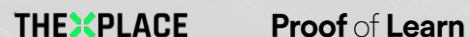
Character Engine



Social & Community



Talent / Operations Software



PRODUCTION

Engine



Backends



Multiplayer & Networking



Workflow & Collaboration



Version Control & IDE



QA / Testing



LAUNCH

Games Launcher



Fraud Deterrence



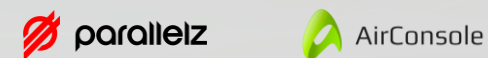
Content Moderation



UA / Creators



Cloud / Web Gaming



LIVE SERVICES

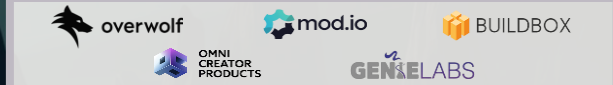
Revenue Optimization



Player Analytics



Modding



Marketplace & Rewards



"Game development has never been more technically and creatively demanding. From new design and development thinking to an evolving hardware and tool environment, game developers need to be more sophisticated than ever."



Sinjin Bain
EXECUTIVE PRODUCER, TENCENT



THE PATH FORWARD

The current state of the gaming industry is marked by a saturation of content, escalating costs, and a need for market correction by established players. Amidst these hurdles, developers that can leverage emerging technologies and build production advantages have ample opportunity for differentiation.

Technical innovations in game technologies like AI, automation, cloud services, and blockchain, have exciting potential to supercharge creativity, reduce production risk, and improve the player experience. While these technologies equip studios with new opportunities, it is important to acknowledge that the tools often require significant process innovation and a departure from legacy game production and operations norms.

This research indicates that improvements in game technology are driving an overall shift towards more agile and iterative production cycles, akin to the journey that modern software development experienced in the past decade. We expect these advancements to encourage risk-taking and foster innovation in genres, gameplay, and business models.

The historical success of such ingredients in fostering new category leaders and driving double-digit growth in the gaming market highlights an opportune moment for technology innovation. We have highlighted many of the leading companies already building modern and powerful capabilities on the market landscape slide. The 2023 Game Development Report aims to inform and inspire market leaders and emerging founders dedicated to creating the tools and solutions that will propel the gaming industry into its next phase of growth.

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