

University of Groningen

Engineering culture

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Published in:
Review of Communication

DOI:
[10.1080/15358593.2021.1934522](https://doi.org/10.1080/15358593.2021.1934522)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Morris, J. W., Prey, R., & Nieborg, D. B. (2021). Engineering culture: Logics of optimization in music, games, and apps. *Review of Communication*, 21(2), 161-175.
<https://doi.org/10.1080/15358593.2021.1934522>

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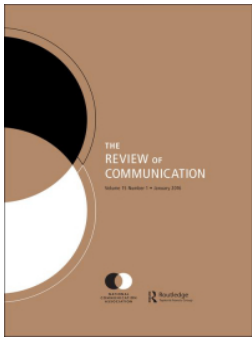
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To cite this article: Jeremy Wade Morris, Robert Prey & David B. Nieborg (2021) Engineering culture: logics of optimization in music, games, and apps, Review of Communication, 21:2, 161-175, DOI: [10.1080/15358593.2021.1934522](https://doi.org/10.1080/15358593.2021.1934522)

To link to this article: <https://doi.org/10.1080/15358593.2021.1934522>



Published online: 25 Jun 2021.



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Engineering culture: logics of optimization in music, games, and apps

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ABSTRACT

This article investigates the ways content producers, marketers, and other promotional stakeholders work to optimize cultural goods and services for platform-dependent production, distribution, and monetization. We are particularly interested in how content creators find novel ways to work within, around, and even against platform politics and policies by manipulating algorithms, business models, and guidelines, or otherwise readying their content for optimal circulation on multiple platforms. Through comparative cases of music, games, and apps that draw on trade press and industry discourse, institutional and financial analysis, and select interviews with musicians, we consider various forms of, and strategies for, what we call *cultural optimization*. We draw on these instances to better understand the similarities and differences in the optimization of cultural content and metadata for economic or cultural gains. We hope our comparative approach reveals different conceptions of the term optimization, and that this term—in all its digital, financial, and cybernetic connotations—might prompt new ways of thinking about the interactions between content, (meta)data, platforms, and culture that have long shaped the circulation of cultural goods.

ARTICLE HISTORY

Received 29 November 2019
Accepted 20 May 2021

KEYWORDS

cultural optimization;
platformization; music;
games; apps

Introduction: optimizing optimization

The *CyberPR* post “YouTube Optimization For Musicians” offers nine ways for musicians to optimize their video’s potential on YouTube.¹ Mobile game studios are encouraged to adjust their “game’s app icon, app name, app preview video, screenshots and app description” to improve a game’s chance of being seen and played.² “The Beginner’s Guide to App Store Optimization” from *Forbes* likewise helps software developers achieve a higher ranking in Apple’s iOS Store or Google Play searches with the promise that “some basic optimization can go a long way.”³ Countless similar blog posts and webinars call out to musicians, game developers, and app makers, reminding them that in a world of seemingly limitless digital content, their song, game, or app is only as good as it is discoverable.

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While these headlines point to the role optimization plays in shaping the cultural industries, they illustrate the murkiness that surrounds the term “optimization.” Above, optimization is almost synonymous with regimes of visibility or prominence in discovery; it helps musicians, game developers, and app producers to stand out, and to secure appearances on front pages and other high-traffic areas. Yet optimization also makes the production, circulation, and monetization of cultural goods more contingent and platform-dependent.

Optimization has become a key business strategy for both platform providers and content producers spurred by the competitive nature of the cultural industries, the abundance of digital content, and the growth of platform markets. The emergence of platforms such as YouTube, Steam, the iOS App Store, and Spotify signal changes in economic, industrial, aesthetic, and cultural conventions that accompany the production and circulation of cultural goods. This process of “platformization”⁴ and the shift from “platform-independent” to “platform-dependent” modes of cultural production⁵ means that platform companies create and maintain governance frameworks (rules, policies, guidelines) as well as the interface affordances and features that govern the flow of content on their platforms.⁶ As a result, content producers such as musicians and software developers must contend with algorithms that shape selective promotion of content, user interfaces that mediate how songs are heard and games are played, licensing and royalty arrangements that administer new remuneration practices, and myriad mechanics that directly impact the number of streams, downloads, or clicks. In this way, the logics of optimization, and the particular ways they are folded back into the creative practices of cultural producers, position optimization as a kind of cultural disposition: culture is optimized, and culture optimizes back.

We investigate the ways content producers, marketers, and other promotional stakeholders work within these parameters to optimize cultural goods and services for platform-dependent production, distribution, and monetization. We focus specifically on how content creators react to the logics of optimization that platform politics and policies impose, sometimes by embracing them while at other times subverting or even flat out rejecting them. Although the drive to optimize cultural products is not in itself new—the cultural industries have long worked to maximize the exposure and discovery of cultural products⁷—we argue that the ways optimization takes place on platforms embeds logics of optimization more deeply into the cultural goods themselves, which has a significant impact on the practices of cultural producers. We examine three comparative cases—music, games, and apps—to illustrate various examples of optimization that exist across a range of digital cultural goods and platforms. We draw on these instances to better understand the similarities and differences in the optimization of cultural content and (meta)data for economic or cultural gains.

Logics of optimization

Although the term “optimization” typically conjures research in engineering, math, and computer science, we are particularly interested in what we are calling *cultural optimization*: the process of measuring, engineering, altering, and designing elements (e.g., interfaces, metadata, features, functions, etc.) of digital cultural goods (i.e., music, games, apps, podcasts, etc.) to make them more searchable, discoverable, usable, and valuable

in both economic and cultural senses. As Fenwick McKelvey and Joshua Neves argue in the Introduction to this themed issue, optimization has never been just a mathematical technique; it is also a social practice supported by regimes of cultural and industrial legitimation. Cultural optimization involves seeing cultural products as datafied content and producing cultural products in ways that will be specifically visible to the myriad of discovery engines and interfaces that content must circulate through on contemporary digital platforms. Although cultural optimization may sound like a technical process of making content more efficient, visibly prominent, streamlined, or ready to use, the innocuous-sounding techniques involved in search engine optimization (SEO), like “editing on-page text to foreground certain keywords, restructuring entire websites to make them ‘search-friendly,’ or building links from other websites to increase a page’s ranking,” produce results that are hardly innocuous or simply technical.⁸

Building on recent work in critical platform studies,⁹ we are particularly interested in optimization at the infrastructural layer (content producers who tweak content to negotiate a platform’s technical affordances), the economic layer (content producers who optimize the monetization of products), and at the governmental/visibility layer (navigating platform guidelines to engineer cultural and social discoverability).¹⁰ These layers, we argue, help distinguish current practices of cultural optimization from previous/historical forms of marketing or cultural production that sought to make cultural products more visible and discoverable. We are not arguing that the use of algorithms somehow makes cultural optimization a wholly novel practice. Cultural production has long involved marketing, retail, distribution, and tools like “genre” to help streamline cultural products into “sellable” categories.¹¹ Content producers have also become more adept at making modifications to television shows, movies, games, and book covers in response to audience feedback. Instead, we argue that cultural optimization goes beyond these earlier forms of organizing content to make goods more discoverable because of the deep integration between a platform-dependent cultural commodity and its discovery via algorithms, as well as the reliance on some form of computational calculation that underpins the process of optimization.

Cultural producers now make cultural goods expressly with search engines, platform economics, and discovery algorithms in mind—or at least with the *perception* of these regimes, models, and frameworks.¹² They seek to capitalize on and undermine the media power that platforms wield as nodes that “coordinate users, content creators, and software to make content more or less engaging.”¹³ Cultural producers are incentivized to see their products as computational content that can be tweaked at the level of data and code to increase discoverability, engagement, and in some cases monetization. Given that the display, search, discovery, and consumption of cultural goods now all take place through the same software platforms that distribute cultural content, content needs to be crafted with the mechanics and infrastructure of the platform in mind. Even when content creators are not borrowing optimization “solutions” directly from math or engineering, they are still taking on a calculative mindset;¹⁴ they are trying to see their content as the computer platform sees them. Our case studies explore how the norms and practices of optimization shape the tools and techniques involved in that process. We turn now to explore how the logics of optimization—and perceptions of these logics—shape our three cases and what new pressures cultural optimization puts on producers and cultural products.

Music: “finding optimization” and “engagement optimization”

In 2019, British indie band The Pocket Gods released an album called *300×30—My Life as a Playlist*. The album contained 298 songs, each one clocking in at slightly more than 30 seconds. With bizarre keyword-stuffing song titles such as “Liam Gallagher Is Jealous of My Clever Turn of Phrase” and “Phil Collins!”, it is easy to dismiss this collection—and the band’s earlier series of *100×30* albums—as clever attention-seeking stunts. However, these peculiar projects also provide insight into what “optimizing” music for digital platforms may look like from the vantage point of the creator.

The rise of streaming as the dominant music consumption model throughout much of the world¹⁵ necessitates a look at how musicians and recording industry professionals optimize music for platforms such as Spotify and Apple Music. While most artists do not name their tracks after famous musicians or employ other blatant SEO tactics, there is a propensity to “think of song titles and lyrics not just as signatures of their creative processes, but as keywords that might direct traffic to their content.”¹⁶ Alongside such practices of “metadata optimization,” we can also detect pressure to engage in “sonic optimization.”¹⁷ While it is difficult to empirically demonstrate a direct causal connection between streaming and shifts in music production,¹⁸ interviews conducted with musicians and music industry insiders indicate widespread discussion about how to produce “songs that stream.” As one Dutch pop musician and producer explains:

I know for a fact that in the New Music Friday playlist (on Spotify), a user, I think, listens to a song for about 5 seconds before they skip. So you have to catch their attention in 5 seconds. So whenever I do a session with musicians, I try to make the intro as fast or as interesting as possible. So from the top it should grab your attention.¹⁹

This is a widespread perception: To optimize a track for streaming requires the listener to be hit early and hard with a succession of repeated hooks. It is also common knowledge among musicians that a track only registers as a “stream” on Spotify once it is played for 30 seconds. Only then does it begin to generate royalty payments and count on music charts. It is thus critical to maintain the listener’s attention until the half-minute mark of a track. The Pocket Gods cheekily reasoned that once a stream was counted, there was no need to carry on much beyond this point. While most musicians would reject outright the suggestion to “optimize” their music in this way, there is some evidence that in recent years songs are getting shorter and choruses are coming in earlier.²⁰ “Don’t bore us—get to the chorus” is of course a long-standing pop music adage. The difference is that now, a platform algorithm rather than a record executive or radio DJ rejects and demotes the “boring” track.

Artists are optimizing more than just individual music tracks for streaming; albums also appear to be undergoing reinvention. While few artists would attempt to fit as many tracks onto one album as The Pocket Gods, albums do appear to be expanding in length.²¹ Again, the logic of the longer album can be attributed to new payment structures and chart calculations introduced by streaming. While a retail album generates the same royalties regardless of length, the streaming pay-per-play monetization model rewards tracks with more plays and albums with more tracks. This is particularly true for chart-competitive artists. When *Billboard* began incorporating streaming into its chart calculations in 2014, it became advantageous for artists to add tracks to an

album since more tracks enable more total streams—with 1,500 on-demand streams equivalent to one album—which in turn helps the album to move up the charts.²² As a marketing manager for Atlantic Records put it, “[s]tacking albums with extra songs is a strategic way to achieve certain goals.”²³

Perhaps an even more significant trend in the optimization of the album is its replacement. As suggested by the title of The Pocket Gods’ mega album *300×30—My Life as a Playlist*, the playlist has become the central form of music consumption on music streaming platforms.²⁴ There are over three billion user-generated playlists on Spotify, and thousands of playlists created by the platform itself. Playlist consumption accounts for approximately two-thirds of monthly content hours on Spotify.²⁵

To understand what is driving the rise of the playlist format, it is useful to distinguish between two interdependent modes of optimization: what Emanuele Arielli calls “finding optimization” and “engagement optimization.”²⁶ The first refers to the expectation that a search for information be “flawlessly respondent to a user’s interest and needs.”²⁷ The replacement of albums by mood-based playlists can be attributed to this expectation. “We’re not in the music space,” Spotify CEO Daniel Ek famously said; “we’re in the moment space.”²⁸ As illustrated by the vast number of Spotify playlists with the word “chill” in their title (e.g., “Acoustic Chill”; “Chill Vibes”), users search playlists for those moments over and above artist names or traditional music genres. (According to Spotify’s internal data, “chill” is the top listening moment among Millennials.²⁹)

Optimizing engagement builds on these “finding optimization” practices. “Engagement optimization” is “the maximization of the users’ decision to use the service, spend time on it, attend to its products, and share them with others.”³⁰ To optimize that outcome, platforms push music artists to build, update, and promote their own playlists to attract new listeners and retain existing fans. For example, Spotify offers the following tip to musicians: “Ask your fans who you should check out and add their suggestions to your own playlists. This is useful between shows/releases when you’re looking for ways to keep your fans engaged.”³¹

Of course, there is nothing new about packaging and promoting new songs with genres, moods, contexts, and brands, or repackaging “old songs in a new wrapping”³² to optimize discoverability and profit. Editorial playlists—curated by human editors—on streaming platforms trace their lineage to radio playlists first introduced by AM DJs to keep listeners tuned to a particular station.³³ These early playlists were the radio version of what Raymond Williams called “planned flow.”³⁴ However, algorithmic streaming playlists represent a shift from planned or “programmed flow” to “programmability.”³⁵ Platforms collect and generate behavioral and performance data in real time, allowing algorithmic playlists to be dynamically personalized and recombined in a myriad of ways. While there are ongoing experiments to “shape-change” individual tracks to fit listener contexts, algorithmic playlists represent the most prominent way that music is made “contingent” and “platform-dependent.”³⁶ In doing so, playlists facilitate economic optimization by permitting the recycling of older tracks, aligning them with new releases or alternative compilations and extending the shelf-life of the digital music commodity.³⁷ Like a shipping container or standardized food packaging, the playlist, as Maria Eriksson writes, “functions as a stabilizing device that prepares music for mathematical calculation and transport optimization.”³⁸ On contemporary streaming platforms, then, “the techniques of standing out are becoming increasingly

computational.”³⁹ Thus, “optimization” identifies a process whereby musicians, record labels, and other stakeholders in the recording industry are pressured to see music as datafied content—to assume the view of a computer.

Games: from *ex ante* to *ex post* game optimization

For the developers and publishers of digital games, optimization has always been a deeply necessary, if not innate, part of game production. After all, games are “component-based software, their malleability and modularity allow for easy upgrading, extension, and recirculation.”⁴⁰ Any aspect of a game, from how it is played (e.g., difficulty, progression) to how it looks (e.g., characters, menus), can be altered at any time, and this mutability lends itself to optimization practices. Historically, economic imperatives and technological affordances each had a different impact on what parts of a game were deemed worthy of optimization and who was doing the optimization. In retracing the history of game optimization as an industry practice, three broader categories emerge: technological optimization, engagement optimization, and economic optimization. While we untangle these categories here for analytical purposes, in practice they are deeply intertwined. Moreover, institutional shifts and innovations, such as digital distribution and new business models, coupled with the opening up of new consumer markets, has resulted in a shift in optimization categories.

Technological optimization makes game development historically distinct from analog forms of cultural production, such as music. Arguably, there is no clear distinction between game development and technological optimization. As an instance of software development, game development is an inherently iterative process, which involves rapid prototyping and constant testing.⁴¹ As creators of prototypical “platform-dependent” cultural commodities, game developers had to account for the numerous affordances and constraints of platform hardware and their associated modules and components. Game development for the first generation of dedicated game consoles, the Atari VCS launched in 1977, is indicative of the longer history of technological optimization. Nick Montfort and Ian Bogost describe not only how the more obvious technological limitations of joysticks (i.e., game controllers) dictated game development, but also the more subtle challenges, such as “the idioms of programming that a language supports,” or “transistor-level decisions made in video and audio hardware.”⁴² These technological constraints again show that game production is rooted in engineering and computer science discourses and practices in a way that music is not.

A distinct division of labor emerged within game development teams when game designers became primarily responsible for *engagement optimization*. Initially, the roles of programmer (writing computer code), game designer (designing rules), and artist (designing visuals), were embodied in one person. However, the industry’s rapid pace of technological innovation meant that development tasks have become more complex and more specialized. Consider the problem of how to balance a game’s level of difficulty. For a game to be engaging or “fun,” it not only needs rules, but also obstacles and challenges to overcome. Whether the goal is to devise a level, a quest, or an end-boss to defeat, game designers seek to add or strip away complexity in search of an optimal experience. In this instance, rather than the quantified, more binary world of programmers and technological optimization, game design hews more closely to the practices and

discourses of artists and corresponds with Arielli's understanding of engagement optimization.⁴³

The third optimization category inherent to game production is *economic optimization*. Game development is as much constrained by the economic realities of for-profit development as by technology. This was true for the first arcade video games introduced to North American markets in the 1970s. For those developing coin-operated machines—the arcade cabinets that afforded public, communal play in arcade halls—the question of a game's difficulty was intertwined with the arcade's political economy.⁴⁴ Players faced a straightforward value proposition: Drop a 25-cent coin in a cabinet and play until the lives or plays run out.

Notably, these early cases of technological, engagement, and economic game optimization should all be considered *ex ante* practices. Whereas the rules of chess and checkers are non-negotiable (i.e., they are culturally fixed), the rules of arcade games are technologically fixed, hardcoded into a logic board hidden inside a cabinet. The same can be said of the first generations of dedicated console hardware. Each subsequent hardware generation afforded developers with more storage and computing power, thus allowing for greater design complexity. Likewise, business models have changed, as have the practices associated with economic optimization. Whereas arcade games were akin to a service wherein one pays for a single session, video games distributed via cartridges were sold as premium-priced products one could own. Thus, with the introduction of new game hardware, game designers started to compromise on accessibility, allowing for more sustained play sessions.

In a testament to the industry's vibrancy and relentless focus on harnessing technological innovations, the introduction of ubiquitous internet connectivity radically transformed game production.⁴⁵ In the mid-2000s, game devices such as the Xbox 360 and PlayStation 3 came equipped with full internet access capabilities. As a result, *ex post* optimization came to complement *ex ante* strategies as it allowed developers to provide technological and engagement optimization via remote updates, patches, or hotfixes after a disc-based game release.⁴⁶ Additionally, digital distribution provided game publishers with novel business models that offered an unprecedented level of granularity in terms of economic optimization. Game publishers, driven by a clear business rationale, started to experiment heavily with new commodity forms, such as downloadable content containing additional modules with maps, worlds, and/or levels.

In the early 2010s, the introduction of “social games” on Facebook and mobile game apps distributed via app stores solidified the contingent nature of digital games. Social and mobile games such as *FarmVille*, *Candy Crush Saga*, and *Subway Surfers* attracted hundreds of millions of players, many of them new to the industry. General purpose platforms (e.g., phones, tablets, and social media networks) introduced a slew of new business models. In less than a decade, the freemium business model dethroned premium pricing, lowering the barrier to play. Instead of paying up front, freemium or “free-to-play” games “monetize” players via a mix of advertising and optional micro-transactions (e.g., virtual coins, boosts, hats, etc.). Put differently, the smallest viable monetizable unit was reduced from content modules to individually priced in-game items or mechanics.

The freemium model's popularity was spurred by the PC distribution platform Steam. Its diffusion intensified technological, engagement, and economic optimization, and

further blurred its already porous boundaries. To elicit a potential payment, players of freemium games need to be engaged for as long as possible. Similar to coin-operated arcade games, the first time playing has to be instantly fun. Second, to increase the chance of eliciting payments or to being served in-game advertisements, freemium developers focus on player aggregation, retention, and ultimately, monetization.⁴⁷ Game designers have started to create more open-ended experiences, mixing “time-based monetization strategies” with retention mechanics, such as limited-time offers and in-game timers.⁴⁸ A slew of “key performance indicators” (KPIs) entered the game development lexicon: average revenue per daily active user, day 1 and day 30 retention (D1 and D30), and cost per install. Guided by these KPIs, game studios started to invest heavily in, and subsequently optimize, elaborate “user acquisition” advertising campaigns, which target players with demographic profiles similar to paying players. While designing and prototyping a new freemium game will always be a case of *ex ante* optimization, the moment a title has any traction, a studio will shift towards *ex post* improvements. While most freemium games will never reach critical mass, the enduring popularity of a handful of freemium titles suggests that game optimization of individual titles can last a decade, if not longer.

App stores: meta-platform optimization

Musicians and game developers focus their optimization strategies *within* platforms such as Spotify, PlayStation, or Facebook. However, there is yet another level of cultural optimization they must account for: the app stores that distribute the apps through which many of these services/products are available. The policies and mechanics governing discoverability and measurability on Apple’s iOS Store or Google Play also shape the success and failure of cultural content. In addition to content platforms, then, app stores as retail platforms structure the business and distribution models of cultural content. In other words, there are ways for musicians to stand out on Spotify or for game developers to engineer the optimal experience with *Candy Crush Saga*, but both these processes of optimization first rely on users finding and interacting with the Spotify app or the *Candy Crush Saga* app, via app stores.

Although app store optimization occurred informally before Apple and Google launched their app stores in 2008, the rise of these centralized platforms intensified the incentive to optimize. While the first year or two of app stores produced a number of high profile success stories of independent developers who had shot to the top of a particular category or section of the app store, it did not take long for developers to feel the golden years were over.⁴⁹ Once it was open to third-party developers, Apple’s iOS Store debuted with just over 500 apps; that number grew close to 500,000 by 2011.⁵⁰ There are now several million apps across dozens of app stores, and this increase has brought with it the challenge of getting noticed on these newly dominant platforms.⁵¹

The term “app store optimization” dates back to these early years of growth around 2009.⁵² Given that content creators and marketing companies were, by the late 2000s, well-versed in the strategies of search engine optimization, it was not long before spin-off services, agencies, and consultants began cropping up to assist developers in making their apps more discoverable by repurposing SEO tactics. So, if musicians and game developers are balancing between multiple forms of optimization (i.e., finding/

engagement optimization, technological/economic optimization) and toying with the timing of that optimization (i.e., *ex ante* and *ex post*), what can we learn from the strategies content producers are employing in the meta-platform of app stores?

While early attempts to optimize for app stores were largely focused on finding and discoverability, App Store Optimization (ASO) has evolved into a thriving para-industry that adds new pressures on app developers and puts platforms and users into conflict over competing ideas of optimization. Early attempts at ASO targeted keywords. ASO companies pooled data on the frequency of search terms, which they would then sell or offer freely to app publishers.⁵³ Although this data was often speciously compiled from third-party services (since Apple and Google did not share their data), in the absence of other similar statistics, these keyword data became valuable metrics for app store hopefuls. ASO companies could then recommend to app publishers what metadata they could tweak by adding more highly valuable search terms and discarding the less common ones. A screenshot from one of these early services, for example, suggests tips such as “You have spaces in between your keywords, in addition to commas. For extra room, use commas without spaces” and “Whenever possible, include both the singular and plural versions of all keywords” before recommending popular keywords like “Sudoku,” “Games, Puzzles,” and “Sudoku Games.”⁵⁴

As the interfaces of app stores evolved to include different options for presenting apps (i.e., screenshots, video trailers, ratings, reviews, etc.), ASO companies have expanded their range of advice. Search visibility is now just one part of a suite of optimization offerings, including tactics for improving the number of successful installs (conversion optimization), preview video and screenshot optimization, marketing copy optimization, and sentiment analysis.⁵⁵ Following Apple’s and Google’s introduction of search ad features that let publishers buy and place ads for their apps based on the keywords that users search,⁵⁶ ASO companies now offer similar services. Finally, given the prominence and profit that can come from being featured in an app store’s highlighted sections (e.g., landing pages, trending apps, editorially promoted “apps we love right now”), ASO companies often promise and measure their success by their ability to push apps into these desired sections of app stores.

The search algorithms that Apple, Google, and other app store platforms use are opaque and proprietary, as are the formulae for determining which apps get featured or promoted. This lack of transparency has bred a host of folk theories about what does and does not work. Recommendations usually involve “optimizing” an app by adjusting consumer facing (meta)data (e.g., app title, description, or category) and focusing on improving the number of installs, the quality of reviews, and the number of times an app is opened or engaged with.⁵⁷ As app stores age, the metrics they use to surface apps (e.g., click-through rate, discards, update frequency, number of crashes) are getting more fine-grained while keywords and other basic metadata are no longer as credible or valuable in ranking algorithms.⁵⁸

While these optimization tactics seem geared toward discoverability, ASO companies also make recommendations that subtly reconfigure an app’s production processes, timelines, and feature offerings. Take, for example, update frequency. Since it *appears* Apple’s and Google’s app stores factor in updates as part of whether an app ranks highly,⁵⁹ developers are implicitly encouraged to release more updates for their apps. For example, the app *Bible*, by developer Life.Church, has an update roughly every 15 days for a text that

one would assume is pretty stable. A closer look reveals these updates are almost exclusively new language localizations released on a fairly consistent schedule. Language updates boost the app's discoverability since the new localizations allow the developers to add even more keywords in their app descriptions.

Optimization, then, is circular; it has an impact on cultural production but at the same time culture profoundly impacts optimization. ASO companies and app publishers react to the metrics and features that platforms provide, and platforms react to how ASO companies and app publishers try to game or subvert their algorithmic and editorial processes. App stores “optimize” for their own needs (i.e., eliminate spoof apps, profit, interface updates, etc.). As they make these changes, they set new terms for how cultural producers might then need to optimize their cultural commodities. ASO companies then present their optimization solutions as a means for app publishers to stand out in these crowded markets; it is hard not to see the circular nature of these solutions. Informed intermediaries such as App Annie or SensorTower use data from their clients to produce app store rankings and create other proprietary data they need to legitimize their suites of ASO recommendations.⁶⁰ Once the techniques of optimization have been applied and adopted by others in the market, more optimization strategies are needed. Any solution for optimization, then, is only ever a temporary one. Since optimization is an iterative and never-ending process, the benefits of this logic fall squarely to ASO companies, who can continue to update their offerings and services, and prey on the hopes and dreams of developers looking for ways to make their app stand out. The challenges of this logic fall squarely to independent app developers or those without the resources to afford this pricey process of cultural optimization.

Discussion and conclusion

Cultural optimization is not just about finding, seeing, hearing, or playing cultural commodities; it is a contested negotiation between content producers, the cultural commodities they make, and the platform providers that shape how content is circulated, measured, monetized, and experienced. “Metric power” shapes not only what content gets displayed and discovered, but also the very possibilities of digital content by “marking out divisions, by defining value, by rendering visible, and by envisioning outcomes.”⁶¹ Because optimization shapes cultural commodities at their most fundamental levels—music, mobile games, and apps are all being optimized for discoverability, engagement, retention, and display—cultural optimization represents the internalization of logics that not only conform to platform policies, but also maximize the possibilities for economic or reputational gain.

For musicians, optimization might mean adjusting songs so they are more likely to be included on platforms' trending playlists. For mobile game developers, optimization involves not only tweaking game mechanics to ensure player engagement and retention, but also continuous adjustments to software and monetization models in tandem with user acquisition strategies. For app developers and publishers, optimization may mean converting users to longer-term subscription models or setting an update schedule with frequent and incremental changes so as to increase visibility to app store algorithms. The three cases we have discussed highlight how optimization occurs at the infrastructural, economic, and governmental layers of digital platforms. Along with discoverability

and visibility, studies of optimization should focus on the impact of retention, monetization, and engagement strategies on the cultural content in question.

Although there are similarities across the cases (most cultural creators want their work to be seen, found, and used), the differences between cultural products make for interesting particularities in the process of cultural optimization. To list just one example: What is the corollary of optimizing for engagement in music versus software? The model for maximizing profit on music streaming services rewards more frequent engagement with shorter tracks. The economic imperative for most freemium games relies on recurrent play while premium-priced console games rely on sustained play sessions. What more might we uncover by thinking broadly about cultural optimization across sectors and media commodities?

Regardless of the different tactics for cultural optimization, the process puts pressures on musicians, game designers, app developers, and other creative workers. First, it disproportionately favors incumbent cultural producers with existing structural advantages, including more time, expertise, and capital to spend on expensive optimization strategies. Second, it puts content producers/creative workers in an uneasy and contingent relationship with platform providers due to competing ideas of “optimization.”⁶² When a band like The Pocket Gods releases a 300-song album of 30-second tracks, they risk takedown notices or charges of policy violations if Spotify deems the album release tactic a form of “spam.”

Cultural optimization works to render traditionally platform-independent cultural content, such as music, platform-dependent through the foregrounding of playlists or other features that platforms promote. By doing so, optimization also reifies the uneasy and contingent relationship cultural producers have with platform providers, reinforcing the kinds of “contingent cultural commodities” that are integrated with the infrastructural, governmental features and affordances of dominant platform companies.⁶³ The rules and policies that govern platforms make explicit the tension between platform providers’ incentives to “optimize” culture, versus those of content producers. Ultimately, we argue that the optimization of culture at these various layers puts pressures on creative laborers such as musicians, game developers, and app developers. These pressures are constant, long-term, and rarely static or stable because, as McKelvey and Neves state in the Introduction to this themed issue, “the ends of optimization are without end.” Thus, we call for greater critical attention to the role optimization plays in platform-dependent cultural production as well as the very shapes and forms optimized music, games, and apps assume.

Acknowledgements

The authors would like to thank this themed issue’s Guest Editors, Fenwick McKelvey and Joshua Neves, for their guidance and feedback; thanks also to the others who reviewed and worked on this text. David thanks Rob. Rob thanks Jeremy. Jeremy thanks David.

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