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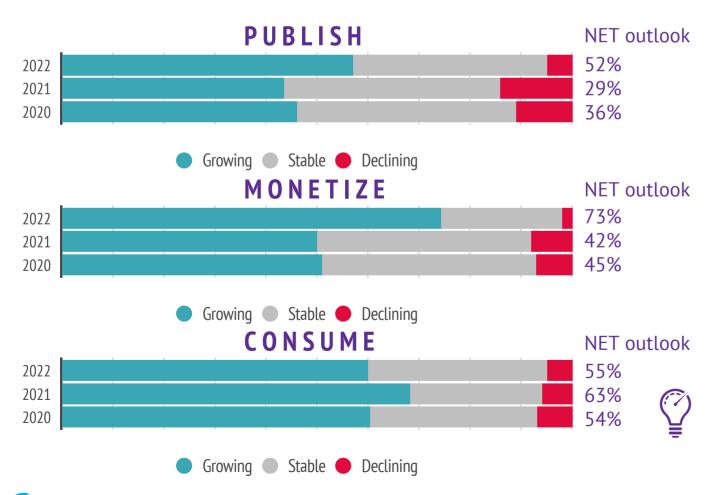


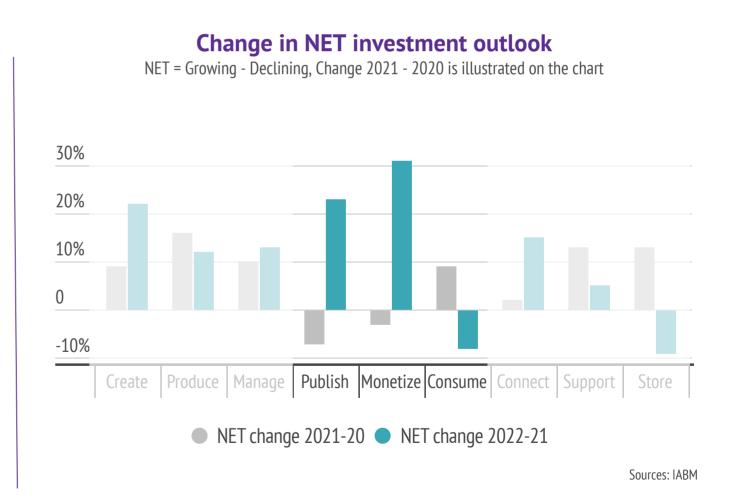




Investment in Publish, Monetize, and Consume

Investment in Publish and Monetize recovered in 2022 after the decline in 2021, making Monetize and Consume the top investment areas in the BaM Content Chain.



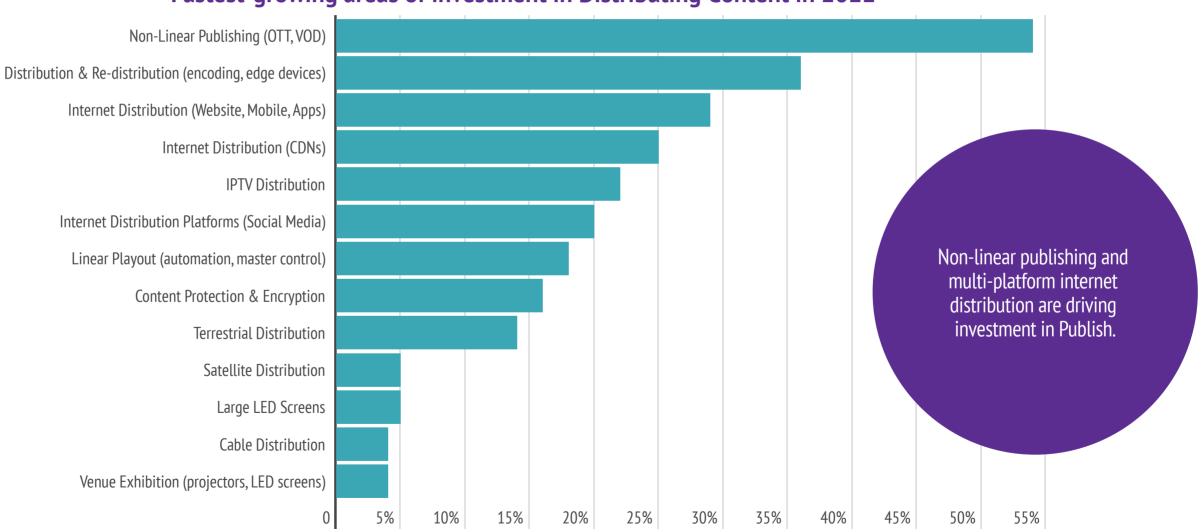






Investment in Publish

Fastest-growing areas of investment in Distributing Content in 2022



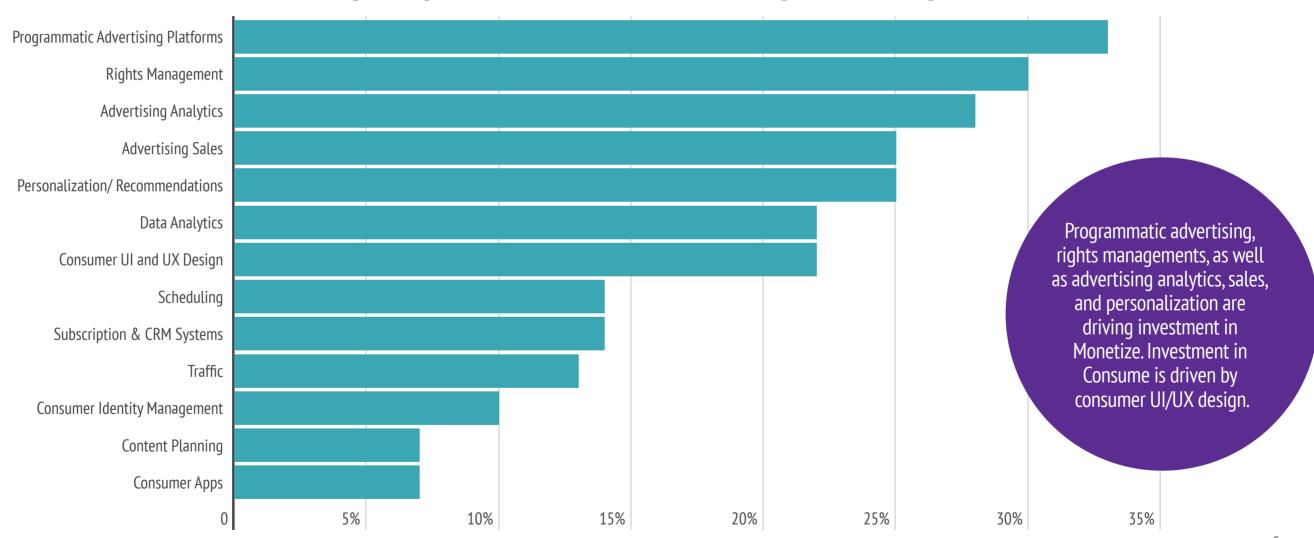






Investment in Monetize and Consume

Fastest-growing areas of investment in Monetizing & Consuming Content in 2022



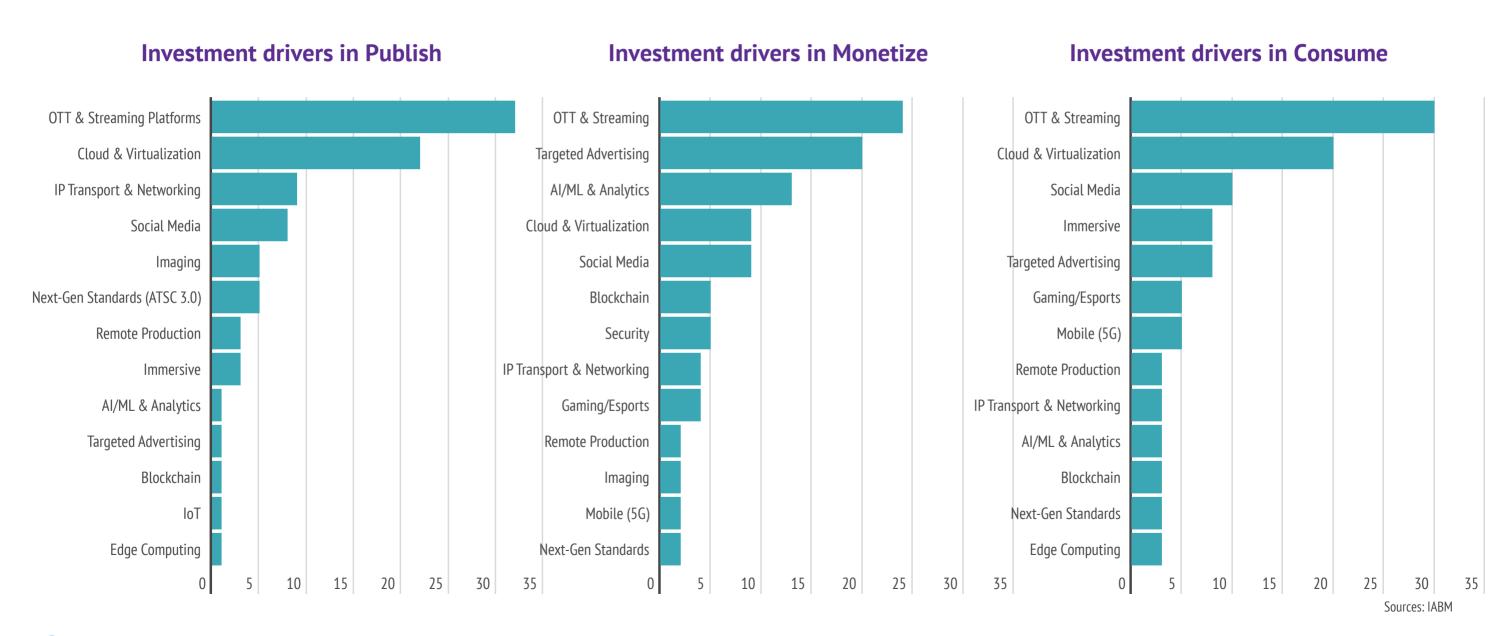








Technology drivers









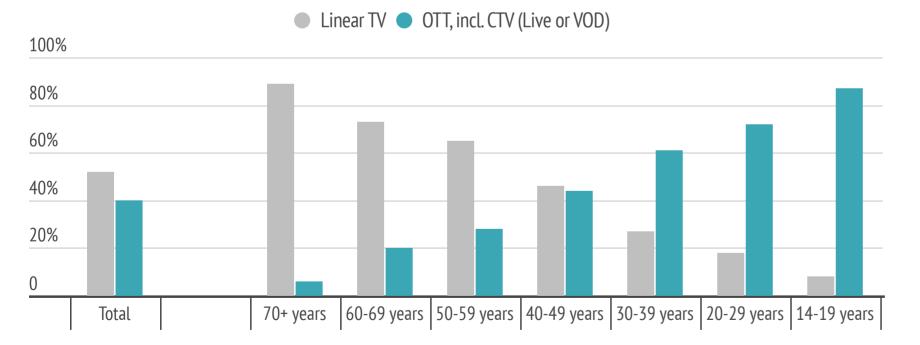




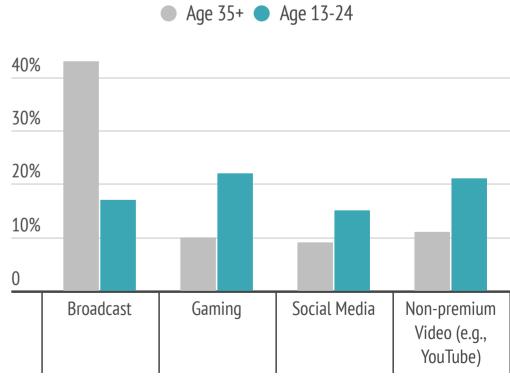
Changing viewing habits

Viewing and entertainment habits are changing as a result of the ongoing digital transformation. There is a clear generational shift, with younger viewers preferring to watch content via OTT channels. However, as noted by ProSiebenSat.1 in their presentation, the decline of traditional TV doesn't mean the decline of TV content, which is increasingly used via OTT platforms.

Primary "source of supply" of video content in Germany, 2022



Entertainment habits in 2022, by generation



Sources: IABM, Source: Digitalisierungsbericht Video 2022, die Medienanstalten, Hub Entertainment Research

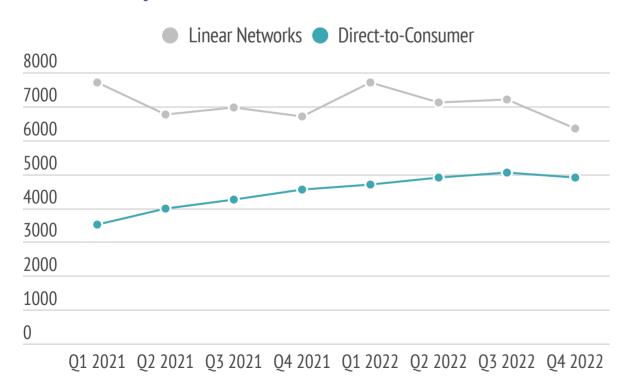




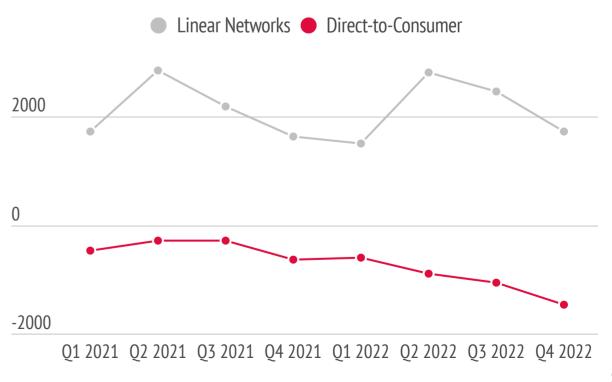
Digital transformation

The increasing preference for OTT channels puts pressure on traditional media businesses' revenue streams, and they are responding by launching their own OTT services, therefore streamlining investment in linear technology in favor of streaming tech, even though the direct-to-consumer segment has been loss-making for many media businesses until now.

Disney's DTC and linear revenue over 2021-22



Disney's DTC and linear operating income/loss over 2021-22



Sources: IABM





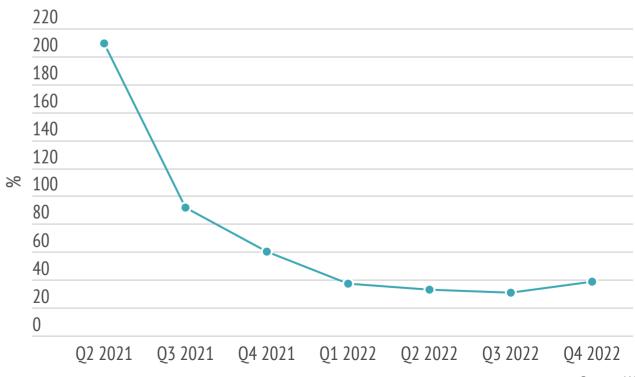
Streaming maturity

The streaming boom, driven by the pandemic, resulted in a highly fragmented OTT space. Streaming competition forced viewers to stack subscriptions to access content scattered around different platforms, which, coupled with inflation, led to a subscriber growth slowdown at the largest SVOD platforms, such as Netflix and Disney+.

Netflix subscribers' growth



Disney+ subscribers' growth





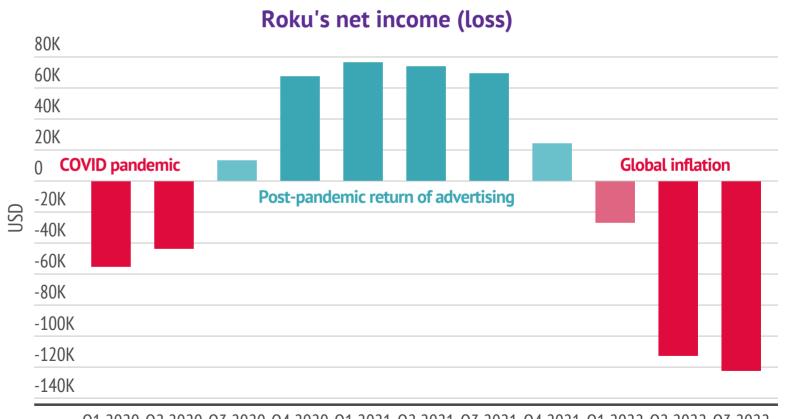




Streaming maturity

SVOD platforms are responding to consumer churn by diversifying revenue streams and launching ad-supported offerings, compensating for consumers' reduction of discretionary spending, driven by macro headwinds. For example, Kantar's consumer research finding states that 38% of Netflix cancellations in Q3 2022 were due to cost.

AVoD and FAST (free ad-supported streaming television) remain the fastest-growing business models in streaming. According to Kantar's research, while SVoD declined 1% quarter-onquarter to reach 82% of U.S. households in 2022, both AVoD and FAST grew by 1 percentage point, to 28% and 24% household penetration, respectively. However, the profitability of ad-supported streaming platforms is also facing headwinds with global inflation, as evidenced by Roku's losses in 2022.



Q1 2020 Q2 2020 Q3 2020 Q4 2020 Q1 2021 Q2 2021 Q3 2021 Q4 2021 Q1 2022 Q2 2022 Q3 2022

Sources: IABM, Company's Filings





Streaming maturity

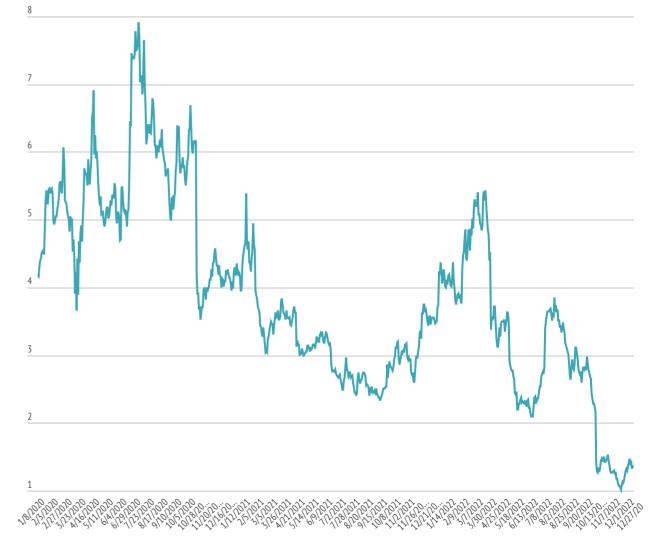
The stock price of Edgio (former Limelight Networks) highlights the effects of volatile streaming patterns on media tech suppliers. It boomed again in the first quarter of 2022, retreating in the second quarter after subscriber growth slowdown in Q1 2022 was reported, and Netflix's subscriber growth continued to decline - from 7% in Q1 2022 to 5% in Q2 2022 down from 9% in Q4 2021.

"

Our largely fixed cost structure, coupled with a concentration of large video streaming clients results in the suboptimal network utilization. Our network has a high demand for a relatively short period of 4 to 6 hours each evening in each region. While this remains true, our cash gross margin will have a high sensitivity to overall demand patterns and network utilization.

Daniel Boncel, Limelight CFO, Q2 2021 earnings call

Edgio (Limelight Networks) stock price, 2020-2022



Sources: IABM, Company Filings

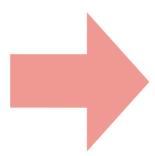




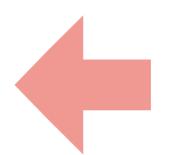
Convergence

The generational shift in media consumption discussed earlier in this report puts gaming and consumer interactivity at the center of the media ecosystem, improving user engagement and generating new revenue streams. Interactive features require the exchange of a variety of data types, and this data can be utilized, and monetized, as well as create value by sharing cross-platform data.

Demand for interactivity has soared



Consumer Interactivity



While supply has never been in a better shape

Social isolation has been driving increasing demand for interactivity







Tech enablers such as AI/ML, 5G/edge, XR facilitate effective supply

The increasing demand for interactivity is reflected by the soaring usage of social platforms such as Twitch and Clubhouse, while supply now has the tools to cater to it, which it didn't in the past.

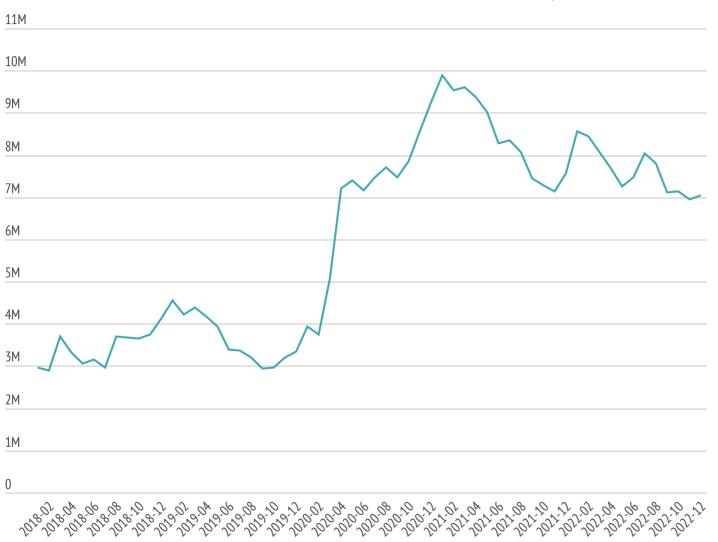
Sources: IABM



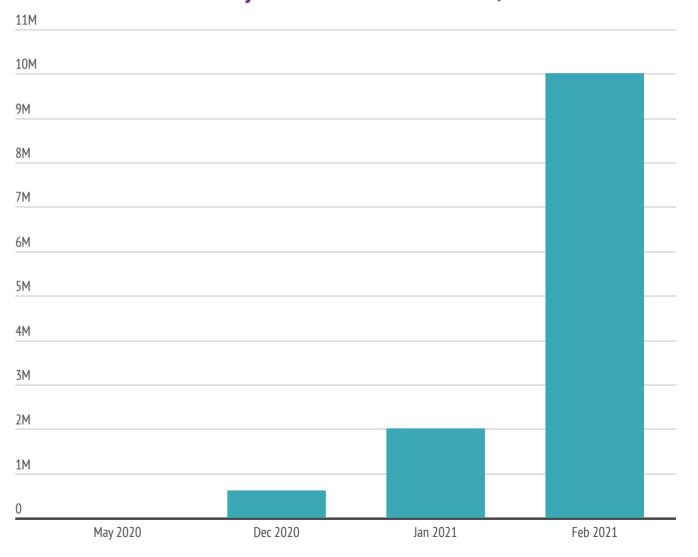
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Convergence

Number of active streamers on Twitch worldwide, 2018-2022



Number of weekly active Clubhouse users, 2020-2021



Sources: IABM, Companies' Filings





Convergence

The convergence of different sectors of the M&E industry, such as gaming, betting, social media, etc., is driving investment in technologies that are not media-specific – either by acquiring complementary tech businesses or by developing technology internally.

NETFLIX

Bally





Acquisitions of Boss Fight, Night School and Next Games to launch gaming offering free to existing subscribers and rollout of interactive content

Acquisitions of Telescope, GamesysGroup and SportsCaller with a particular focus on gaming and betting for consumer engagement

Acquisition of Texel, launch of DAZN X and appointment of new CTO to increasingly focus on betting, gaming and e-commerce

Hired gaming exec from Apple to lead its next-gen division and is developing an app and wider engagement proposition for ESPN

Most initiatives aim to augment/diversify revenues through better engagement







Aggregation

Recently, several media companies have moved toward super aggregation and launched their own smart TVs and streaming devices. For example, Sky launched its own smart TV, Sky Glass, in October 2021, providing its subscribers access to a collection of top streaming services like Netflix, Amazon Prime, and Disney+, as well as content from other UK broadcasters like the BBC, ITV and Channel 4. Amazon also launched its first branded TV sets - Amazon Fire TV Omni and Amazon Fire TV 4 - in October 2021. These initiatives show how the living room has become the key contact point with viewers because those content providers who control the device-based data analytics also control the whole UX/UI - and the whole media supply chain. Accordingly, broadcasters and Pay-TV operators are coming together to create bundled SVOD services, which add value through their combined brands. For example, the BBC and ITV are partnering around Britbox and the FreeWheel app, uniting all the UK's terrestrial broadcasters on iOS and Android. Many Pay-TV operators are onboarding SVODs to their platforms to provide viewers the convenience of content all in one place. By onboarding new, smaller SVODs, Pay-TV operators can extend their content libraries while offering a large audience for these SVOD newcomers in exchange. Super aggregators attract viewers with direct billing options to control payment terms, margins, and viewer data. Such "hard" bundling, where subscribers only pay for the SVOD service through their aggregator, is becoming increasingly popular.









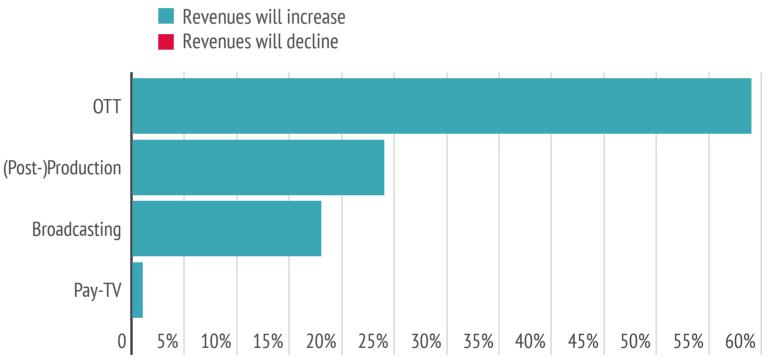




Linear Playout

The streaming boom has strengthened digital polarization in the post-pandemic period, which is reflected in our data on media businesses' revenue outlook – very positive for OTT players and moderate for broadcasters and Pay-TV operators. To respond to the changing viewing habits, broadcasters and Pay-TV operators are embracing cloud technology, which allows them to deliver their content to various platforms, both linear and OTT.

Revenue outlook by media businesses, 2021-22



Until recently, OTT was a synonym for on-demand content, with SVOD and AVOD being the two main business models in OTT. However, with the increasing fragmentation and competition in the streaming space, coupled with global inflation, subscription stacking is reaching the ceiling, paving the way for the FAST channels (live ad-funded TV channels delivered over the top).





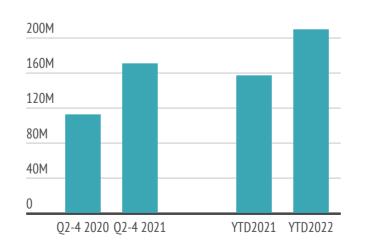
Linear playout

Cloud playout allows broadcasters and Pay-TV operators to deliver content to various distribution platforms across traditional broadcast and OTT platforms, including connected devices (aggregators of linear and on-demand content). Cloud playout allows broadcasters to roll out new channels quickly on an OPEX basis rather than investing in hardware. The ability to implement changes on the go helps broadcasters and Pay-TV operators to react to new market conditions faster, localize their content better, and deliver personalized programming. Cloud playout plays an important role for FAST channels, as it allows the creation of the linear playout by stitching VOD content, replicating traditional linear TV.

Roku's global active accounts



Pluto TV's global active accounts



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Pay-TV providers everywhere are recognizing the advantages of cloud TV as the optimal engine for offering Over-The-Top (OTT) services as part of a super-aggregation strategy, and the best way to reach audiences wherever they are.

Nuno Sanches, GM of Media and Telecom, Kaltura, December, 2021

Sources: IABM

^{*} YTD (year-to-date) - first 9 months of the year (Q1-Q3)



Non-linear publishing

Changing viewing habits and the growing number and variety of delivery platforms are driving investment in non-linear content delivery.

As media companies are speeding up their migrations to the cloud, public cloud service providers like AWS are launching their own media-specific offerings dedicated to different distribution platforms. In the US, the adoption of ATSC 3.0 is incentivizing broadcasters to move their operations to the cloud, as many key features of NextGen TV require flexibility and agility.

With the streaming space getting more crowded, broadcasters are speeding up their move to OTT and Software-as-a-Service (SaaS) business models, spurred on by cloud computing. Accordingly, many broadcasters are investing in hosted, cloud-based OTT video platforms offering ready-made tools for uploading, managing, monetizing, and securing content. For example, Kaltura TV enables customers to boost engagement and interactivity with personalized multi-screen access to linear, VOD, time-shifted TV, and third-party content.



Sources: IABM



Content Protection

OTT content delivery is more vulnerable to piracy threats, and the transition to OTT drives investment in content protection media technology. Live sports is very lucrative content that is moving to OTT, with streaming platforms starting to acquire sports rights. These two factors combined make the streaming space an attractive target for piracy of live (and non-live) content.

According to the Motion Picture Association of America, pirated video generates upwards of 230 billion views yearly, with 80% of global online piracy due to illegal streaming services.

MediaTech suppliers are partnering to develop content protection solutions. An example of this is a recent partnership between Harmonic and NAGRA for developing a watermarking-as-aservice solution.



For the video segment, we're driving the rapid expansion of our streaming SaaS brand and customer base. We're further extending our streaming SaaS technology and service differentiation, particularly for live sports, and we're leveraging the traditional broadcast appliance business to profitably enable these transformations.

Patrick J. Harshman, Harmonic's President, CEO & Director, Q3 2022 earnings call

Sources: IABM, Company Company Filings





Content Protection

As noted by DAZN regarding the extension of its partnership with Irdeto for multi-DRM services, the damaging effects of piracy range from reducing investment in sports to security risks for consumers.

"

DAZN is committed to creating a global sports streaming service that delivers for fans and partners alike. To do that takes significant investment in acquiring rights and developing technology. The damaging effects of piracy are clear – potentially reducing investment for sports at all levels, exposing fans to privacy and security risks, and funding organized crime. Working with Irdeto, DAZN can more effectively tackle the pirates through enforcement and better use of technology, while educating fans of the risks of accessing pirated content

Sandeep Tiku, Group CTO, DAZN



Sources: IABM, Company Press Release



Content Protection

Blockchain is an emerging technology that is effective in preserving intellectual copyrights and can be used:



To guarantee copyright compliance of media assets by smart contracts or with a cryptocurrency-based digital copyright management system, in which content creators can deal with viewers directly, without any centralized authorities.



To track assets by content owners. For example, Blokur offers artists of such labels as Universal, Warner, and BMG music rights management platforms, through which they can be paid fairly when third parties use their songs. Flixxo, Treeti, and LiveTree have also launched content delivery platforms that provide content creators with real-time analytics based on blockchain transaction data.

Smart Contracts

Smart contracts represent a potential tool for enforcement (and automation) in rights management. Smart contracts automatically enforce the terms of a relationship through code stored on the blockchain without relying on third parties (like law enforcement agencies) to do so. In rights management, a content licensor can monitor its licenses via smart contracts that automatically enforce some of the contract terms, such as geographical exclusivity or termination dates. AdChain - launched by MetaX and the Data Marketing Association in 2017 - is an example of a blockchain-based rights management solution using an open protocol. This enables users to track who views a certain media asset and what actions they take after having viewed it.

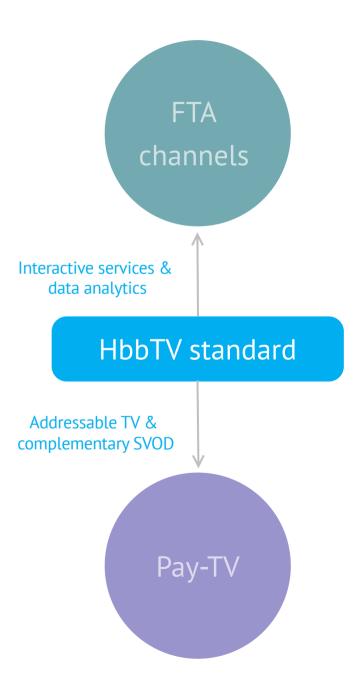






Linear Signal Distribution - Terrestrial (DTT) & Pay-TV

The convergence of linear and digital is reflected not only in the "linearization" of the streaming space but also in the borrowing by traditional media businesses of some OTT features, such as interactivity, data analytics, and addressable advertising. HbbTV (Hybrid broadcast broadband TV) is an open standard for delivering advanced interactive TV features via hybrid broadband and broadcast networks to CTVs and settop boxes. In many countries, broadcasters deliver targeted advertising on HbbTVbased connected TVs (i.e., Addressable TV) using the new DVB-TA (Targeted Advertising) standard. The latest HbbTV symposium's key topics included the involvement of HbbTV in the new DVB-I standard, which combines linear TV channels and streaming services in a unified channel list. Some media companies - like Digita in Finland - have adopted a model where they produce HbbTV platform services for other TV broadcasters.







Linear Signal Distribution - Terrestrial (DTT) & Pay-TV

The advantage of HbbTV is that it can be used in different ways for FTA, Pay-TV, and online streaming. When used in FTA, HbbTV allows a broadcaster to deploy several engagement services, such as voting in live programs. A commercial broadcaster can use the same standard for adding interactive parts to linear advertising, get real-time data on ad campaigns, and complement their linear Pay-TV services with SVOD services by using a HbbTV service platform to create direct links from linear programming to SVOD.

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One important trend which surfaced at the Symposium is the engagement by industry players in various initiatives to better use and implement the HbbTV specifications and make the HbbTV ecosystem more practical and efficient, as HbbTV is now a true business enabler for many companies and not just an innovation area. The foundation of ATVI is the perfect illustration of that

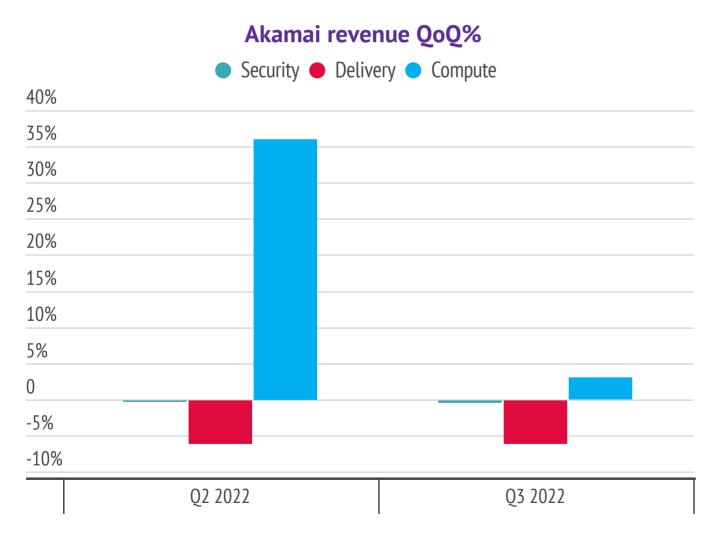
Vincent Grivet, Chairman, HbbTV, November 2022





Internet Distribution - CDNs

The pandemic-induced spike in daily traffic increased the demand for CDN services in 2020, with a decline in the following two years as streaming approached maturity.



"

These results reflect continued deceleration in traffic growth among our largest customers and the impact of some large renewals that we completed in the first half of the year.

As we said at our Analyst Day in May, we've aligned our pricing strategy with the slower traffic growth rates we've experienced this year.

F. Thompson Leighton, Akamai, November 2022



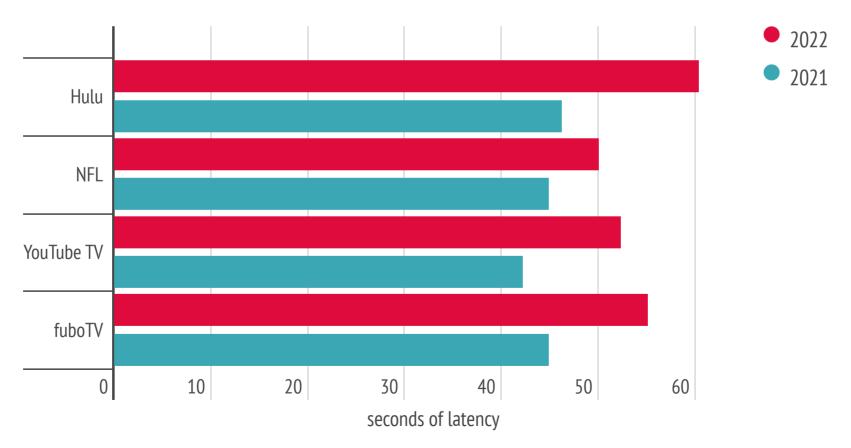




Internet Distribution - CDNs

Convergence is burdening latency, as interactivity requires more data to be transferred. When combined with large-scale events, such as the Super Bowl, the effect is even greater due to many people streaming the live event and betting on it.

Super Bowl: Measured lag behind real-time for selected services





Sources: IABM, Akamai



Internet Distribution - CDNs

Recently, media technology investments in content delivery were largely focused on solutions to reduce latency in live streaming.

For example, Israeli operator Cellcom recently used Synamedia's Vivid workflow-as-a-service to reduce the previous latency of FIFA World Cup's streaming of up to 30 seconds to under 3 seconds from ingest to playout. At the start of the tournament, Synamedia supported streaming video on AWS. The solution included support for ABR, transcoding, origination, packaging, and content delivery using Amazon CloudFront CDN.

In January 2023, Ateme claimed that it managed to reduce latency to under 4 seconds in Cyprus.

In February 2023, Cellcom partnered with Viaccess-Orca and Broadpeak to achieve 3-second latency for live sports OTT delivery.

Sources: IABM, Akamai





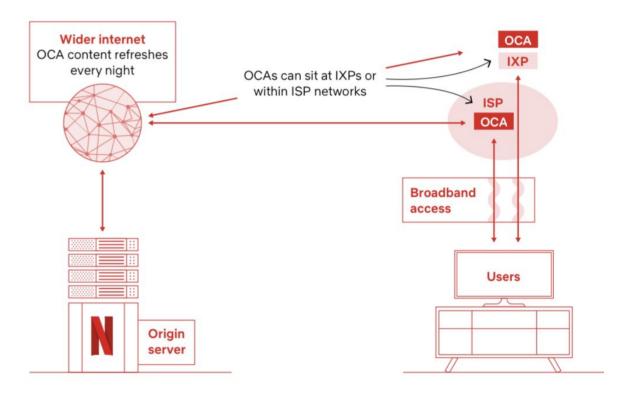
Internet Distribution - Al in CDNs

Content delivery networks (CDNs) are playing a crucial role in the rise of OTT and thus increasingly becoming a focus of distributors of linear and non-linear content. Al/ML tools can predict usage and automatically scale resources up or down in a cloud-based CDN environment such as Amazon Cloudfront. This is useful for minimizing delay and better budgeting for costs. For example, Netflix uses Al/ML tools to optimize the performance of its CDN, Open Connect.

As the amount of high-quality content on VOD and OTT platforms continues to skyrocket, the routing decision(s) made by the CDN becomes very complex. In these circumstances, AI/ML can be used to make the routing decisions more efficient and intelligent by proactively identifying network traffic patterns and traffic demand (e.g., network bottlenecks) and then communicating them to the network operators.

To improve viewer engagement, media companies - mimicking gaming companies - are increasingly using digital feedback loops, communities and engagement platforms to improve viewer retention. Particularly, sports leagues and clubs have started to set up AI-enriched digital fan engagement platforms that combine physical and digital universes, making their first steps towards the metaverse.

Netflix's Open Connect CDN architecture









Internet Distribution - Blockchain-based CDNs

Blockchain enables decentralized content distribution instead of conventional centralized and distributed content delivery.

Centralized content delivery





Distributed content delivery

CDN spreads across the world through nodes however one entity has control over the entire network through the distributed nodes.



Decentralized (blockchain-based) content delivery

Blockchain helps to eliminate intermediaries in content distribution, with no single entity having control over the entire network.



Benefits of blockchain-based CDNs

With blockchain-based CDNs, content providers deliver content directly to their audiences without intermediaries, such as central servers, with no single entity controlling the content delivery network. This helps optimize storage space, reduce latency, and enable micro-distribution channels.



Storage optimization



Reducing latency



Enabling microdistribution channels

Sources: IABM





Internet Distribution - Blockchain-based CDNs



Storage optimization

Blockchain-based CDN enables optimizing content

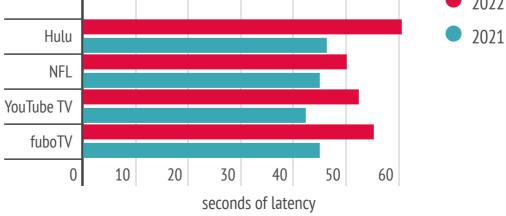
storage space by converting the collective unused space into a P2P cloud storage and data delivery system. With a P2P network, the probability of one stream splitting and getting scattered is higher because the replication rate of the video streaming is higher in P2P than in the client-server CDN structure. By leveraging blockchain to decentralize CDNs, content providers are spreading downtime risk across network nodes run by independent companies. Some media companies, such as Rewarded TV and Script.TV reward viewers in cryptocurrency for sharing their unused storage space.



Reducing latency

Media convergence is increasing latency as more viewers stream video content with interactivity features, resulting in larger data volumes transferred over the top. For example, this chart shows that latency increased at the recent Super Bowl due to more people streaming the event and betting on it. By eliminating intermediaries in delivering content to viewers, decentralized content delivery reduces latency.







Micro-distribution channels

Blockchain assists the creator economy by enabling micro-distribution channels.

Telcos are looking at leveraging blockchain to optimize resources, such as bandwidth, in an automated way through smart contracts as they launch their 5G networks .

Sources: IABM











Advertising Systems

As broadcasters' TV ratings become volatile and their linear ad inventory smaller, advertisers are moving money to streaming.

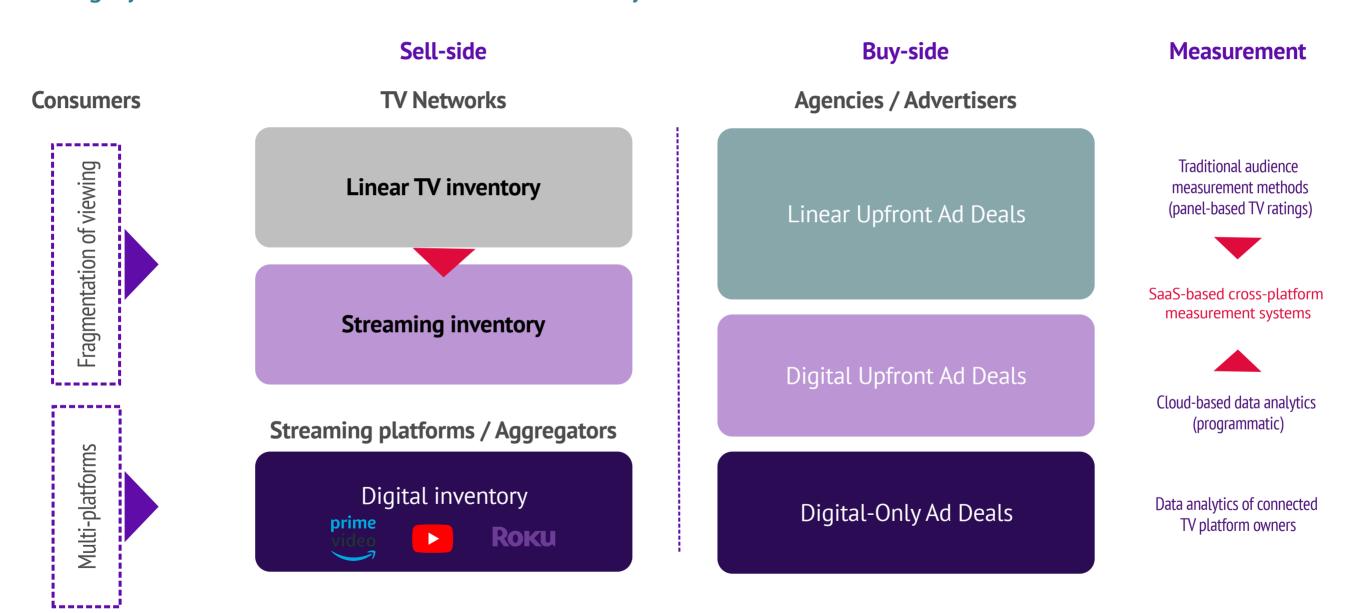
TV networks are increasingly capping the amount of money going to a show's linear airing (i.e., linear TV inventory) to incentivize advertisers to redirect a bigger share of their ad budgets to the show's streaming distribution, leaving broadcasters room for last-minute - and more expensive - premium "scatter*" deals for linear ad inventory.

The coupling of linear and digital is shaping the future of advertising.





Advertising Systems - Diversification of video inventory





Sources: IABM, IBC365, Shyamal Madura Patabendige/ Twitter

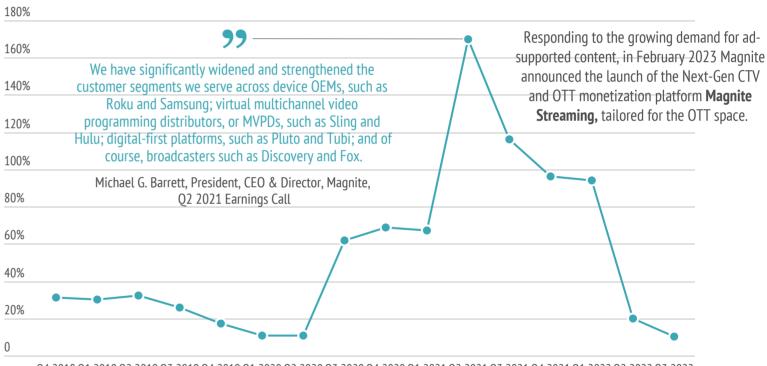


Advertising Systems - Programmatic advertising

Programmatic advertising is actively deployed in digital ad buying, mainly focusing on streaming services and premium VOD sold across digital video channels and connected (smart) TVs.

Sell-side companies like Sky, Comcast, Hulu, RTL, and Channel 4 are investing in programmatic platforms and marketplaces designed for advertisers and agencies who can programmatically purchase video ads on their platforms. These platforms (e.g., NBCUniversal's One Platform) simplify and standardize the process of buying TV ad campaigns across different ad inventory pools.

Magnite's Quarterly Revenue YoY % growth



 $Q4\ 2018\ Q1\ 2019\ Q2\ 2019\ Q3\ 2019\ Q4\ 2019\ Q1\ 2020\ Q2\ 2020\ Q3\ 2020\ Q4\ 2020\ Q1\ 2021\ Q2\ 2021\ Q3\ 2021\ Q4\ 2021\ Q1\ 2022\ Q2\ 2022\ Q3\ 2022\ Q3\$

Magnite is the world's largest independent sell-side programmatic advertising platform that provides publishers technology to monetize their content across all screens and formats including CTV, online video, display, and audio.







Advertising Systems - Programmatic advertising

Programmatic advertising is the fastest-growing segment in the digital advertising space, with a complex value chain and a lack of transparency on transactions. Blockchain technology can be particularly effective when combined with AI/ML for content monetization. For example, blockchain can capture identity-related data, while AI can assess the delivery paths and identify the most suitable ones to reach ad campaign goals. An example is AdLedger – a blockchain-backed peer-topeer consortium formed by advertisers, publishers, and other related parties that uses blockchain to lock-up data with cryptographic keys, providing transparency and data security, thus facilitating a fairer programmatic advertising market.

Seeing their linear ad revenues declining, broadcasters are seeking new ad tech solutions to take advantage of the rapid growth of digital advertising globally. Some big media companies have already used blockchain as their ad tech strategy.

Comcast collaborates with NBC Universal, Channel 4, and Disney to match audience datasets without sharing data to improve planning, targeting, executing, and measuring advertising. Comcast's Blockchain Insights Platform, launched in 2018, was rebranded as Blockgraph in 2019. Blockgraph is a peer-to-peer ad tech platform for digital, broadcast, and streaming.

Viacom and Charter Communications (Spectrum Reach) recently joined the initiative. Using Blockgraph, the initiative's partners can share data more directly with each other while the data remains secured via encryption and blockchain protocols.

Sources: IABM, IBM Institute for Business Value, Ad Ledger





Advertising Systems - SaaS-based cross-platform ad measurement

The diversification of ad inventory and the shift from upfront linear ad deals to streaming has made traditional audience measurement systems ineffective and revealed the lack of collaboration between sell-side and buy-side platforms.

Media companies - moving their operations to the cloud - are now investing in SaaS-based cross-platform measurement systems and developing marketplaces automating workflows and decisioning across the buy and sell sides of the market.

These platforms unify media companies' own user data with advertisers' datasets, improving the personalization and targeting of ads. By investing in cross-platform measurement systems, media companies can attract new advertisers who can improve their efficiency and cross-platform campaign management.

"

BVOD services are still works-in-progress, but we're making a lot of progress quickly. At ITV, we're building out our new marketplace to support programmatic trading and custom audience targeting, using both our own registered user data and advertisers' own datasets. We're creating a common TV identity solution and a marketplace for data to provide greater agility for both incumbent and prospective clients.

Rhys McLachlan, Director Of Advanced Advertising, ITV

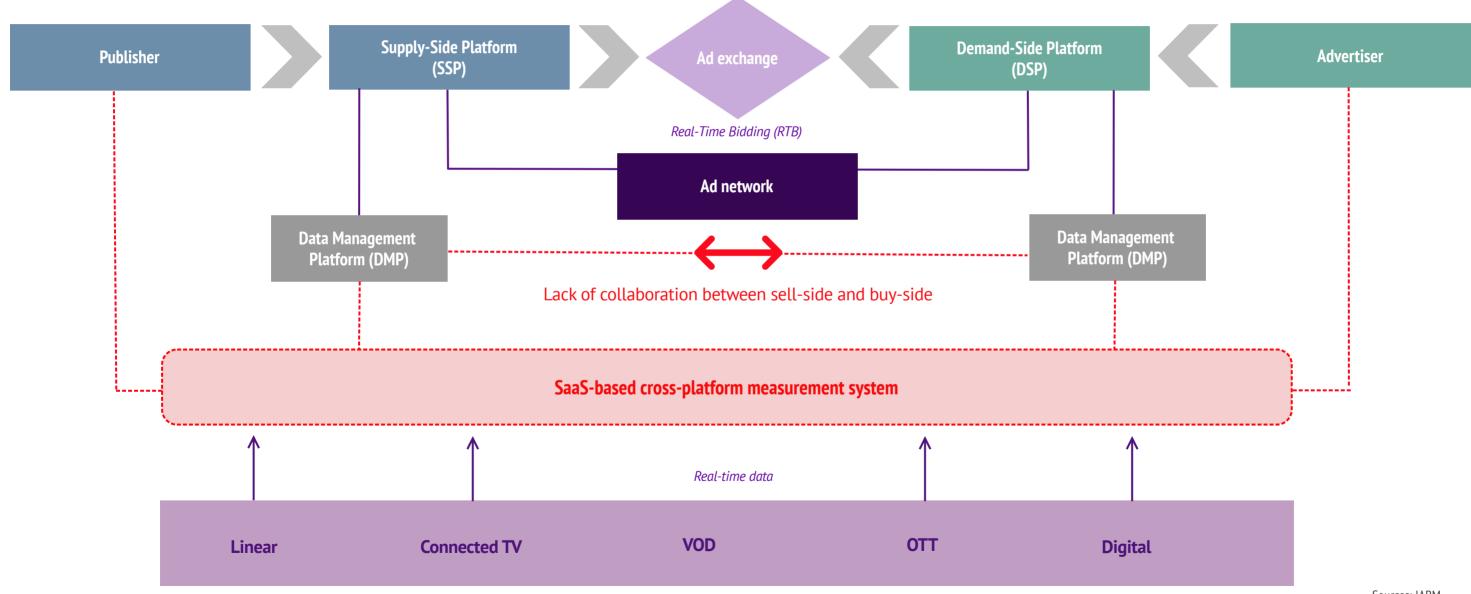


Sources: IABM, ITV





Advertising Systems - SaaS-based cross-platform ad measurement









Micro-payments

Micro-payments'

Properties

&

Benefits

Based on predefined smart contracts

Decentralized infrastructure

Distribution of ad revenues becomes fully automated

Payment transactions become cheaper

By making micro-payments efficient in the DTC space, blockchain helps publishers and advertisers challenge the current hegemony of global internet giants in advertising; in 2020, Google and Facebook formed a duopoly that accounted for 73% of the US digital advertising market, according to IBM. These platforms have closed measurement systems, which make it difficult to estimate the real value of their transactions, suppressing the margins of advertisers and publishers.







Micro-payments

Crypto payments enable smart contracts that automatically generate payments in real-time, eliminating the time spent managing these payments.

In February 2022, Sling TV enabled crypto payments via BitPay – a crypto payments provider.

Rewarded TV – an ad-free and subscription-free OTT platform launched by blockchain video tracking and payments platform Replay – rewards their viewers with crypto for watching content and engaging with it, for example, by sharing a particular piece of content or creating a playlist featuring certain movies. Viewers can also buy NFTs on the platform.

Script.TV also rewards viewers with crypto for watching content. However, unlike Rewarded TV, it delivers content in a linear fashion, becoming a distributed, decentralized online base of content storage and playout, where content providers are paid based on how much their content is watched.





Content Consumption Tech Trends



User Experience

As the OTT market matures and competition grows, streaming platforms increasingly rely on better user engagement through improved user experience to reduce churn.

UI/UX becomes a key differentiator for streaming players in the highly competitive OTT space

Content discoverability

Content discoverability is among the key priorities for consumers at a time of growing consumer churn at OTT platforms. According to the Nielsen Total Audience Report, 33% of consumers struggle with choosing content when they turn on their TVs. The same share of subscribers to streaming services expresses an interest in being able to manage and search for their available content from one place, according to another study conducted by Interpret, confirming Nielsen's results. According to the latter study, consumers expect bundled offerings to improve account management, discovery, and content recommendation functionality. The challenge of better personalization and content discoverability lies in the lack of metadata standardization and common recommendation algorithms. With an open standard of content metadata, recommendations across all platforms would align, resulting in better consumer retention.

Consumer identity management

Streaming aggregation adds complexity to consumer identity management across platforms, as content partners are reluctant to share consumer data with third parties, thus hindering progress in streaming aggregation.



Sources: IABM