

GP Bullhound

# Technology Predictions 2023



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December 2022



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# The view

FROM GP BULLHOUND

In its 16th year, GP Bullhound's Technology Predictions report has established a reputation as an industry-leading analysis of the trends and innovations shaping the global technology sector. With nearly 90% accuracy in the past five years and over 80% in the past decade, our methodology in selecting the coming year's predictions is shaped directly by our experience in working with the world's leading entrepreneurs and cutting-edge technologies, balanced with unique market insight gathered across our global network.



## STATE OF THE MARKET

Technology continues to drive globalisation and its advancement remains fundamental to improving our productivity, capital, labour, and standard of living. Although we are in the midst of an economic downturn, technology has not failed us and it is never as good or as bad as valuations may imply.

Cloud tech still holds the key to connectivity and accessibility; new vaccine technology continues to drive research and development; artificial intelligence, machine learning and data analytics systems help us manage all aspects of our lives with more ease every day; and with the global population surpassing eight billion, software to accelerate sustainability is more crucial than ever.

As technology delivers on its promise, we look at what will drive the next 12 months – the blueprint to navigating what lies ahead – including expert views from RavenPack, HackerOne, Greenely and more. For 2023, we are bullish on cloud and artificial intelligence, energy efficiency and electric vehicles, and enterprise software and digital consumption to accelerate technology's progress in building the future with revolutionary products and solutions.

OUR 2023 PREDICTIONS

The world continues to look to technology for solutions, and we know it will deliver. Changes in semiconductor regulation are sending ripple effects across the landscape and massive cybersecurity breaches are seeing new public and private security practices. The ESG movement is catalysing innovation in energy technology, HR tech is tackling The Great Reshuffle, cutting-edge Natural Language Processing is revolutionising how we communicate with machines, and advancements in robotics are transforming infrastructure in all areas of life. Here's what's in store for 2023.



**Prediction 1: Natural language processing a watershed for business strategies**

- NLP is structuring the unstructured human mind; there are now two content types: human-created pre-2020 and machine-created "synthetic" thereafter
- A profound time for companies, those quick to adopt will gain a vital competitive edge and we look for still-high investment in a market enjoying a c30% CAGR<sup>(1)</sup>



**Prediction 2: TikTok the next king of social media advertising**

- One of the most used apps worldwide, with one billion users and growing – c20% of internet users – TikTok is changing the landscape for brands and creators
- Despite its recent ad revenue forecast cut to \$10bn (\$12bn) for 2022, TikTok remains poised to take significant market share from incumbents like Facebook and YouTube, but US regulation looms



**Prediction 3: Interactivity and channel selection are ad stream game-changers**

- Advertisers must swiftly adapt to ad-blockers, "ad-blindness", and decreased consumer attention spans
- CTV blends everything for marketers: brand building, targeted customer acquisition and sales, all with clear feedback for better ROI – expect increased M&A for CTV-related services, data/analytics and tech providers



**Prediction 4: Energy-saving apps and next-gen batteries powering the tech race**

- The ongoing energy crisis will galvanise consumer demand for home energy-saving systems, with market CAGR estimates as high as c19%<sup>(2)</sup>
- We expect electric vehicle demand to propel solid-state batteries to a new benchmark for quality energy storage, eventually replacing lithium-ion batteries



**Prediction 5: Tipping point of cybersecurity and broken circles of trust**

- We view cybersecurity spending as a secular growth area and in 2023 look for more consolidation with large providers providing full end-to-end solutions
- Expect smaller providers to expand offerings organically to meet increasing demand, but their profitability is key to watch as many rely on high salesforce expenses



**Prediction 6: Talent Management building the future of the workplace**

- With remote/hybrid work, The Great Reshuffle, and inflationary forces, employee engagement is critical
- The need for modern tools to streamline talent attraction, training, engagement, and retention will grow, and we foresee more market consolidation and development of powerful integrated platforms in 2023



**Prediction 7: Software driving sustainability**

- Climate tech funding represented more than a quarter of every venture dollar invested in 2022<sup>(3)</sup>
- From 2023, we look for increased funding in technologies that employ environmentally-friendly practices to improve sustainability, as well as companies with resource-efficient supply chain processes



**Prediction 8: Robotics no longer sci-fi**

- Advanced cognitive capabilities will propel robot use cases across all sectors, increasingly replacing skilled workers in existing manufacturing and service jobs
- In 2023, we expect increased M&A in a well-funded industry, separating successfully scaling robotic companies from innovator-only players



**Prediction 9: E-commerce, but make it social**

- We look for consumers to increasingly replace traditional e-commerce platforms with social media as their preferred point of sale; livestream shopping and group buying are the latest trends
- In 2023, we look for livestream shopping to enter the mainstream due to its high measurable ROI in a period of tightening advertising budgets



**Prediction 10: Semis rule the world**

- Geopolitics is playing a crucial role in semis domination, shifting the established balance of power
- The market expects a major downturn in semicap equipment spend, but we expect the battle for tech leadership, tech sovereignty and structural demand shortage in trailing edge nodes to result in spend above market expectations in 2023

Sources: GP Bullhound Global Insights and publicly available information. Note: 1) Market Research Future; 2) Research and Markets; 3) PwC; and 4) Accenture. See individual trends for further source information

# Recap of GP Bullhound's

## 2022 PREDICTIONS

From smarter devices and extended reality to further adoption of AI and ML, the technologies of 2022 are reshaping businesses and consumer behaviour in more meaningful ways. From the factory floor to the boardroom, businesses have taken advantage of new opportunities created by these technologies, while consumers have acted as change facilitators and recipients. Here's what we got right in 2022.

<b>THE CREATOR ECONOMY</b>	YES	<b>THE RISE OF DEFI</b>	YES
<p>Changing every aspect of culture and society, from the future of work to social causes to mental health, the creator economy continues to grow post-pandemic, from over 165 million creators in the past two years to more than 303 million today and is now a multi-billion dollar industry valued at more than \$100bn in 2022<sup>(1)</sup>. Offering creators many ways to monetise, influencer marketing grew from \$9.7bn in 2020 to \$13.8bn in 2021 and is likely to reach over \$16bn in 2022<sup>(2)</sup>. Financing continues in the space, with funding to venture-backed startups focused on content creators surpassing \$939m in 2021<sup>(3)</sup>.</p>		<p>The collapse of centralised finance (CeFi) platforms and exchanges like Celsius and FTX are a setback for the industry, but DeFi protocols are functioning smoothly. The decentralised exchange (DEX) Uniswap is the second-largest exchange for Ethereum trading after Binance, with \$4bn+ in daily trading volume. 2022 saw the institutionalisation of DeFi as major financial institutions like JP Morgan executed their first DeFi transactions on public blockchains. Ethereum's transition to proof-of-stake set the stage for scalability upgrades, whilst Layer 2 roll-ups like Offchain Labs and StarkWare raised mega rounds despite the challenging market.</p>	
<b>TECHNOLOGY SUPERCHARGING SUPPLY CHAINS</b>	YES	<b>THE ARMS RACE</b>	YES
<p>From the pandemic to the war in Ukraine, supply chain crises continue to force businesses and governments worldwide to look to technology for solutions. With increasing investments in warehouse automation and software systems, AI to improve productivity, cybersecurity, as well as ports, airports and other infrastructure, technology will continue to play a key role in global supply chains for the foreseeable future.</p>		<p>The development and adoption of ARM chips in personal and enterprise environments have steadily grown, with Apple doubling down on the M-series of chips. In Q1 2022 alone, ARM partners shipped over seven billion ARM-based chips, up nearly 10% YoY. More developers are releasing ARM/RISC-based builds of their software specially designed for this architecture. Microsoft announced plans to roll out Project Volterra by the end of 2022.</p>	
<b>THE NEW VIRTUAL PLAYGROUND</b>	YES	<b>TECH DRIVING DIVERSITY, EQUITY AND INCLUSION</b>	YES
<p>Metaverse continues to dominate headlines. The mixed reactions have spread to the NFT space, with the average price of an NFT down 70% from May 2022. As of November 2022, the average sale of virtual land on Decentraland was down 99% from its peak in November 2021. Despite this downturn, companies continue to brainstorm and invest in the future of the Metaverse. Meta recently rolled out a new Metaverse ID system and startup Ready Player Me raised \$56m in August of 2022. Additionally, Apple has indirectly hinted through recent job listings that they too are building a metaverse for their VR headsets.</p>		<p>With AI-powered tech that stimulates DEI recruiting and retention, many companies have become long-term service providers to mid-market and Fortune 500 companies in 2022. With more data than ever, HR have new opportunities for learning and improvement. M&amp;A activity is another indicator of the acceleration within tech-enabled DEI. SilkRoad Technology acquired Entelo in August 2022, and SAP and Boston Consulting Group are combining their expertise and technologies to bridge the gap in corporate diversity programmes.</p>	
<b>WEARABLES POWERED BY ARTIFICIAL INTELLIGENCE</b>	YES	<b>THE GLOBAL SEMICONDUCTOR SHORTAGE</b>	YES
<p>Wearables have seen major scientific backing and technical improvements. Having passed the hype stage, they've entered the "plateau of productivity era", proving increased usefulness through AI integrations in multiple verticals like healthcare, IoT, wellness, and psychology. With smaller chips, wearables have ramped up their AI efficiency. Wild.ai, which uses AI-sourced data from active women to analyse vital signs and performance, is a great example.</p>		<p>Secular trends like the demand for renewables and EVs are growing, leading to sustained semis supply shortages, especially at trailing edge nodes, where there has been little capacity build-out (and even reduction) in the past decade. These structural demand trends will continue and the need for semiconductor content will increase. While government initiatives to boost domestic production are underway, new manufacturing ramps take time and ongoing semiconductor equipment shortages will also limit capacity that can be added short-term.</p>	
<b>ARTIFICIAL INTELLIGENCE AUTOMATING HEALTHCARE</b>	YES NO	<b>THE FUTURE OF PAYMENT</b>	YES NO
<p>While progress has been made, it's slower than expected. Legacy healthcare systems and institutions struggle to effectively integrate and deploy AI technology and early adopters face risks associated with uncharted waters. Governments have also grappled with how AI fits within the complex regulatory landscape for healthcare, struggling to find a way to monitor the chain of responsibility. Regardless, pioneers are dreaming up new ways to improve healthcare outside of the specific activities performed by doctors, like clinic management.</p>		<p>Broader adoption and diversification away from e-commerce have increased. Interest rate analysis shows that BNPL models provide short-term interest-free consumer loans partially financed by floating-rate corporate debt. As interest rates increase, they are unable to pass along the higher cost of capital. Consumer credit risk, soaring inflation and higher interest rates could cause defaults to spike. Unlike established banks, BNPL providers do not have other income sources to counterbalance a fall in discretionary spending.</p>	

Sources: GP Bullhound Global Insights and publicly available information Note: 1-2) Influencer Marketing Hub (May and November 2022); 3) Crunchbase (July 2022); and 4) PwC Global Crypto Hedge Fund Report 2022



# Technology Predictions 2023

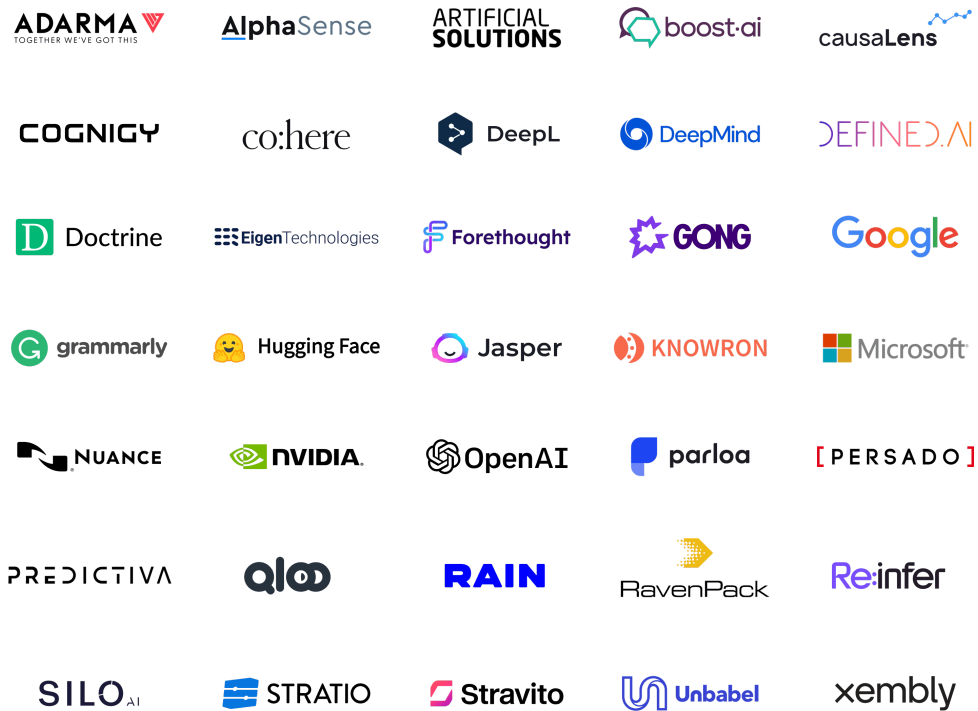


# A watershed for business strategies

Natural language processing (NLP) is one form of machine learning and artificial intelligence that allows software to fragment and process language like a human would. NLP runs on the backend of tools and applications used daily, from automated customer service to smart speakers and voice assistants. It is quickly advancing and experiencing increasing adoption across various technologies, and its development will continue to significantly affect how we collaborate with technology in the future. In the next year, companies rapidly investing in and adopting this technology will have a significant edge over competitors.

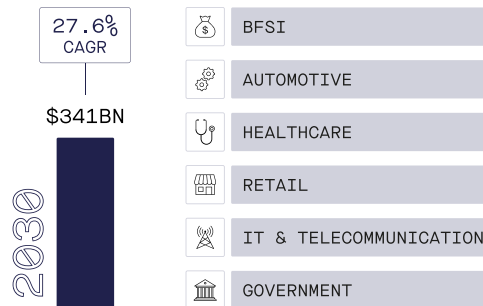
01

## COMPANIES TO WATCH



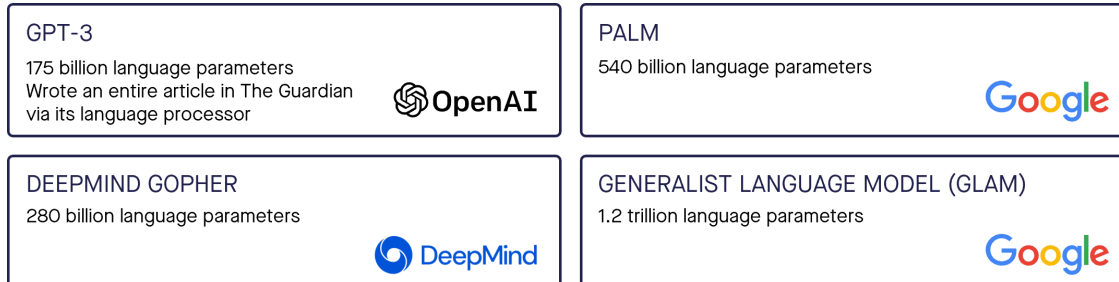
## MARKET SYNOPSIS

NLP is structuring the unstructured human mind and firms now analyse two types of content: human-created before 2020 and machine-created "synthetic content" thereafter. NLP adoption is driven by an increasing focus on consumer experience, businesses shifting towards automation, demand for big data, analytics, powerful computing, and enhanced algorithms. Previously driven by banking, financial services and insurance (BFSI), the NLP market is set to reach \$341bn by 2030<sup>(1)</sup> as digitisation increases across all verticals, such as governments, fueling adoption and application.



## THE RISE OF NLP

NLP has found its way into many consumer applications we use today, such as speech recognition software, grammar apps, chatbots, and voice prompts. Some of the biggest breakthroughs in systems that predict and generate text or solve complex mathematical problems are Open-AI’s GPT-3, Google’s Pathway Language Model (PaLM), DeepMind’s Gopher, and Microsoft’s Megatron-Turing Natural Language Generation (MT-NLG) in partnerships with NVIDIA. Recognising the scope and potential of NLP, tech giants are exploring further applications. Today, you can generate art via text-to-image software, like Open-AI’s much anticipated DALL-E 2, or outsource arduous tasks like managing job applications to a multilayered language processor. NLP is one of the few fields in AI which is not limited by data. Unlike training a self-driving car, NLP doesn’t require years of gathering data, like driving in different climates. With ongoing advancements in NLP, deep learning systems will continue to merge language, images, and real-life object detection to build models that replicate human intelligence.



## THE FUTURE OF NLP AND DISRUPTORS

Companies will continue to utilise NLP to improve their products and internal analysis capabilities, such as monitoring conversations about competitors, processing documents, and automating fraud detection. An area where NLPs can disrupt is government. Public bodies are typically full of unstructured, difficult-to-interpret data, which hinders lawmakers’ ability to provide citizen services effectively. About 80-90% of data collected by organisations and governments is unstructured<sup>(2)</sup>. Powerful NLP can allow governments to extract and categorise data faster, improve regulatory compliance, bolster national security, and analyse public feedback.

However, NLP is not without its challenges. The EU is worried that NLPs can be used to spy on citizens and mimic public officials through chatbots and deepfakes, or unethically collect and interpret conversations between workers by businesses. The EU drafted its first AI Act that regulates the use of NLPs in infrastructure, worker management, and law enforcement. As public sentiment grapples with the ethics of NLP and AI, government regulation will be a chief topic of discussion in the years to come. Lastly, one of the fastest-growing areas within NLP is natural language understanding (NLU). While NLP is the process of making the textual data machine-readable, NLU is the process of giving it meaning and is what allows voice assistants to understand humans. While we’re typing commands today, we are likely to use our voices much more in the future.

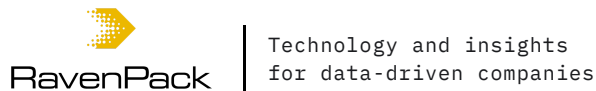
Sources: GP Bullhound Global Insights and publicly available information  
 Note: 1) Market Research Future, Natural Language Processing Market report (November 2022) and 2) MongoDB

## Expert view



CEO & CO-FOUNDER - RAVENPACK

Armando Gonzalez



### ■ HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR MACHINE LEARNING (ML) / NATURAL LANGUAGE PROCESSING (NLP)?

I think there's never been a more exciting time for the machine learning and natural language processing industry. We're at the tipping point of disrupting how we extract deeper knowledge from data to make more informed decisions. After decades of sluggish progress, we're seeing that large language models using transformer architectures or graph neural networks are fundamentally changing information analysis. We now live in a world of powerful computing, cheap storage, and vast amounts of data which, to a large extent – over 80% – is unstructured. Huge advancements in ML and NLP have made it possible for us to feed hyper-focused training sets into machines, thus enabling them to help solve specific problems across the finance, business, and public sectors.

### ■ WHAT ARE SOME OF THE INTERESTING THINGS THAT RAVENPACK IS DOING IN THIS SPACE?

The world needs reliable tools to denoise and extract knowledge from the large amount of data available. Our technology enables us to take big data and look at it from a myriad of angles –investment, sustainability, risk, competitive analysis, or macroeconomics, with endless other potential perspectives and crossover approaches. When you ask unprecedented questions, the data will give you unprecedented answers. For example, we discovered that systematically analysing all earnings calls across all companies and sectors is a valuable source of insights for macroeconomic models. Or that identifying ESG controversies in the media can considerably enhance corporate bonds investments strategies. More recently, we tapped into labour data – analysing every job posted by the world's largest employers. I think we are the first big data company to achieve a full, in-depth analysis of over 200 million job postings, uncovering valuable hiring trends and patterns with a large variety of applications from finance to HR.

■ HOW DO YOU THINK GOVERNMENT REGULATION COULD IMPACT THE DEVELOPMENT OR COMMERCIALISATION OF NLP-ENABLED PRODUCTS?

AI has become embedded in our day-to-day human activity and the benefits can be seen in cases like the fight against Covid and the Artemis project to get humans back on the moon. However, the technology does raise public concern with issues such as deepfakes and digital privacy in the spotlight. It's clear that the world is embracing AI as it becomes part of our lives, and it's likely that there will be a focus on regulation to help stimulate innovation while ensuring human rights protection. We think policymakers in the US and Europe will need our help to shape frameworks that drive forward the AI industry and our society overall.

■ HOW DO YOU THINK ETHICS WILL PLAY A ROLE IN NLP?

Ultimately, language AI models are only as good as the training data we feed them. We may be tempted to think of AI as a neutral, objective instance, but the truth is it is influenced by biases through human inputs. So racial, political or gender biases can find their way into NLP models. It's our task to create quality and accurate training sets that reflect the real world in all its diversity. It's also our task to ensure that NLP can have a positive impact. And there are more and more research papers looking into how NLP can detect stereotypes, hate speech, or misinformation. During the pandemic, the RavenPack team developed a free Coronavirus News Monitor to help navigate the vast amount of information available on Covid and its impact on world affairs. These indicators have become a reliable source for researchers and leveraged in over 100 research studies.

■ WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

Our mission is to democratise big data. Simply put, data-driven decisions are better. So, the ultimate goal is to empower everyone, from businesses to retail users, public and private companies, and governments to NGOs, to leverage the power of big data in making optimal and more sustainable decisions.



# The next king of social media advertising

Over the past two years, one social media platform in particular has taken the world by storm, and now TikTok's fast rise to dominance forecasts long-term advertising market share worldwide. Although TikTok recently cut its ad revenue forecast from \$12bn to \$10bn for 2022 due to the slowing digital advertising industry and despite its ongoing negotiations with US regulators, it is still one of the most used apps in the world. As TikTok changes the landscape for brands and creators, we expect it to increasingly challenge established players like Facebook, Instagram and YouTube.

02

## COMPANIES TO WATCH

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916

branch

Fohr

influencer

Intermate.

joli

MATADOR  
network

obviously

Openinfluence

Pixly

replai

Tailify.

tinuiti

TRILLER

vidmob

Vidsy.

VOICEMOD

winclap

TIKTOK'S DOMINANCE IN DIGITAL ADVERTISING

TikTok has grown to be one of the largest platforms in the world with more than one billion users but still trails other prominent social media platforms in its share of digital ad spending. As the app is expanding its ad offering through new engaging formats, live streaming and features sorted by location, we expect TikTok to vault over most of its competition to become a leader for many D2C businesses in digital advertising. Some estimates place TikTok to see c\$14bn by 2026<sup>(1)</sup>. Despite US regulators' repeated concerns about TikTok's ability to protect the data of American users from Chinese authorities, TikTok remains confident that it is on a path to satisfy those. The company has been negotiating with the US Committee on Foreign Investment, a group of federal agencies that reviews foreign investments in American entities to resolve these concerns, with further negotiations to follow in the next 12 months.

De facto app for social media advertisers?

Companies pay influencers \$200-\$20,000 per branded video based on follower count and target audience

Of 4.8 billion global internet users, 20.83% use TikTok<sup>(1)</sup>

Average time spent on TikTok per day, 2022<sup>(2)</sup>



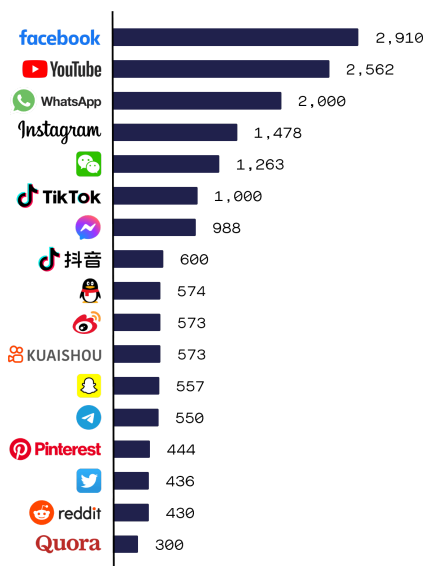
BEST-IN-CLASS ALGORITHM

By understanding TikTok's algorithm, influencers can target specific hashtags, songs, captions, and more to increase their chances of going viral. Brands often insert themselves into existing viral TikTok trends to convert attention into dollars. TikTok's main differentiator is that its algorithm is "interests-based", unlike Facebook and Instagram, which are – or at least started as – being "connections-based". TikTok's creators realised that interests and buying behaviours aren't the same even among close friends, focusing more on curated content recommendations for each user based on their activity on the app. This helps users discover relevant accounts more quickly. TikTok also can understand how different videos are received across different audiences by showing videos to gradually larger audiences to gather reactions.

CHANGING THE GAME FOR ADVERTISERS

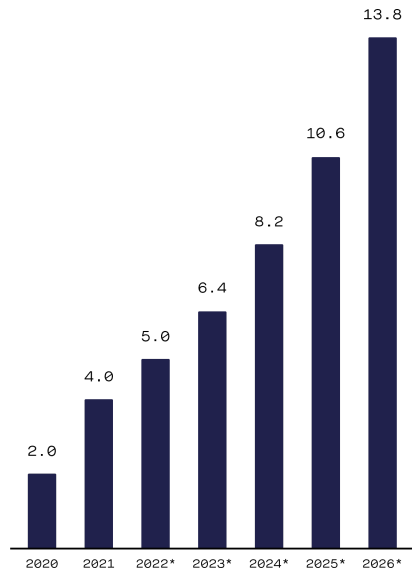
TikTok's robust algorithm allows brands to gain a myriad of actionable insights into their customers' online profiles. This presents a tremendous opportunity for advertisers to target individuals more likely to be interested in their offering based on data. TikTok's profiling is a significant step change in terms of specificity versus the targeting utilised in the early days of Facebook and Google – which were largely siloed into broad demographic buckets. TikTok's marketing advantage roots in a combination of the long daily session times of its users – almost an hour a day per user, and its widespread Gen-Z influencer demographic. Time spent, likes, follows, and more, allow TikTok to imply what users should like, and brands have seized upon these predictions and utilised TikTok with growing frequency.

SOCIAL NETWORKS BY MONTHLY ACTIVE USERS (M)



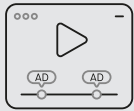
Sources: GP Bullhound Global Insights and Statista

TIKTOK AD REVENUE, 2020-2026 (\$BN)



Sources: GP Bullhound Global Insights and Statista

Sources: GP Bullhound Global Insights and publicly available information  
 Note: 1) Statista (September 2022) and 2) Renolon



# Advertising game-changers: interactivity and channel selection

With an ever-growing number of digital advertising channels, advertisers face the challenge of determining which platforms produce the best performance and must swiftly adapt to ad-blockers, "ad-blindness", and decreased consumer attention spans. Alongside channel variety, the digital arena has also constructed more complex user preferences. Brands are looking at ever more creative ways and new technology to increase ad exposure without breaking the viewer experience, such as interactive ads and connected TV (CTV). CTV blends everything for marketers: brand building, targeted customer acquisition and sales, all with clear feedback for better ROI. We expect increased M&A for CTV-related services, data/analytics and technology providers in the next 12 months.

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## COMPANIES TO WATCH

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THE NEED TO CONVERT: MOST ADVERTISING GETS SKIPPED

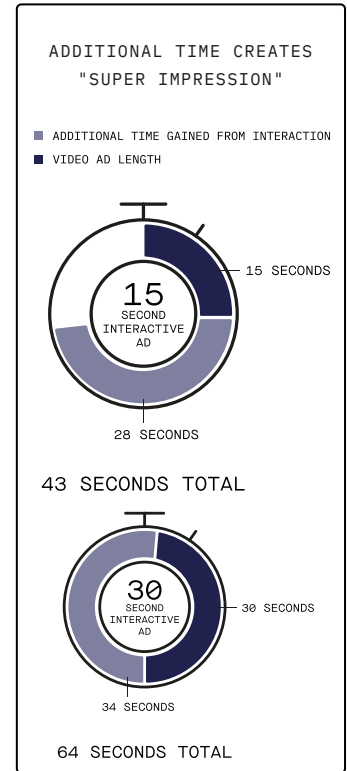
As more consumers use ad blockers or ad-free subscription models, the digital advertising landscape faces a severe conversion problem called “ad blindness”, when viewers subconsciously tune out during an ad. Almost 100% of Generation Z viewers skip ads, with up to 63% utilising an ad-blocker<sup>(1)</sup>. As attention spans decrease, achieving performance in advertising takes more than it used to and advertisers are discovering new ways of interacting with the consumer, especially through personalised experiences or where audience attention is the highest, namely CTV.

INTERACTIVITY KEY TO PASSING THE HURDLE

Interactive ads allow users to actively participate or view a product as part of the content they are experiencing. Some examples are in-app playable ads, in-game advertising, display ads, augmented reality, and interactive open-web ads, including trivia and polls. Interactive ads turn users into "participants", with a 47% increase in viewing time versus non-interactive ads<sup>(2)</sup>. Interactive ads also develop brand familiarity significantly more than static ads, increasing the chances of conversion the second or third time the viewer encounters the same brand. In-app playable ads are a great example, where the user becomes increasingly engaged with the advertised game, eventually becoming more likely to download it. Due to growing popularity and material performance outcomes, global interactive advertising spending is likely to increase significantly in the coming year. With in-game advertising companies like Anzu, Admix, Bidstack, Frameplay, and Gadsme raising over \$100m combined in the past year alone, much more activity is likely in the space in 2023.

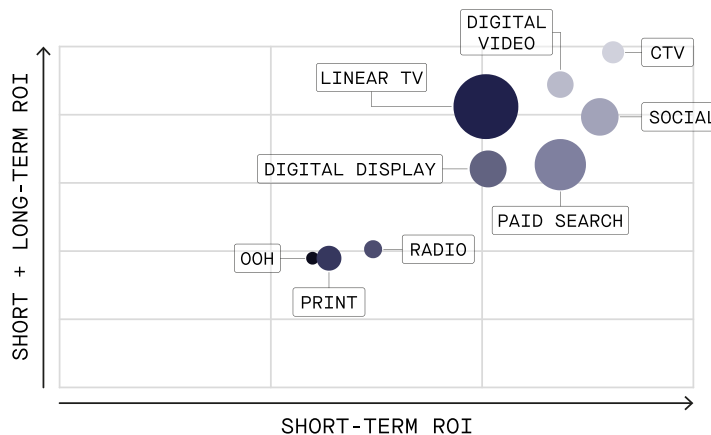
THE SUPERIOR PERFORMANCE MARKETING MEDIA: CTV

CTV has become a prime marketing channel by enabling superior consumer engagement, better unit economics, and higher ROI. CTV ads are less likely to be skipped as ad-blockers are not common within OTT devices, and viewers tend to be more committed to ads within the content they have chosen to watch. The thirty-seconds video ad completion rate on CTV devices was 79%<sup>(3)</sup>, significantly higher than any other platform. Via CTV, advertisers can laser-target audiences and generate better investment returns without the use of cookies. By offering wider data-collection capabilities, CTV has become the centre of advertising measurement solutions. Google’s recent adoption of Nielsen Digital Ad Ratings (DAR) to improve CTV measurability on YouTube is a defining example of this movement. Advertisers are now looking to inject CTV exposure into their media mix while utilising next-gen tools to best measure performance. This uptick in demand is likely to positively affect M&A and private placement activity in the coming year, especially in digital services verticals where proprietary CTV-enabling technologies are present. Tinuiti’s acquisition of Bliss Point Media, Bridgepoint’s investment in MiQ, Mediaocean’s acquisition of Imposium, Xperi’s acquisition of Vewd, and Tataris acquisition of TheViewPoint are early examples of a much larger trend that is set to take off in 2023.



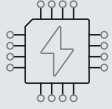
Sources: GP Bullhound Global Insights and Magna Global, The Interactive Effect

CTV SEES HIGHER ROI, EVEN WITH LOWER AD SPEND



Sources: GP Bullhound Global Insights and Analytic Partners ROI Genome

Sources: GP Bullhound Global Insights, Analytic Partners ROI Genome, and publicly available information  
 Note: 1) Bulbshare (March 2022); 2) Tremor, Magna, IPG Media Lab 2017 and 2021 studies; and 3) Extreme Reach (May 2022)



# Energy-saving apps and next-gen batteries power the tech race

The ongoing energy crisis is creating opportunities for clean energy startups aiming to decelerate climate change and amend climate effects. Energy management applications and solid-state batteries serve as the new solution for efficient energy consumption and lower electricity bills. With the rise in energy costs globally, companies that offer applications assisting with energy management or energy saving will continue to grow in importance. In the next year, we expect electric vehicle demand to propel solid-state batteries to a new benchmark for quality energy storage, and long-term replace lithium-ion batteries.

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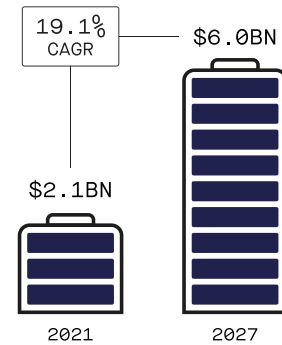
## COMPANIES TO WATCH



### REDUCING BILLS THROUGH EFFICIENT ENERGY CONSUMPTION

The growing demand for energy-efficient devices is driven by consumers aiming to reduce energy output and secure cheaper electrical bills. Energy management applications alert users when electricity rates are at a high point, signalling to minimise energy output. Energy management systems can collect, measure, and analyse energy output, providing optimised energy schedules that improve efficiency for homes and businesses. Greenely, a provider of multiple smart energy-saving solutions including in-house consumption and electric vehicle charging capabilities, helps homes save up to 25% in electrical costs. Tibber, an energy management platform, is helping 10 million Europeans reduce their energy consumption by 20%<sup>(1)</sup>.

GLOBAL HOME ENERGY MANAGEMENT SYSTEMS MARKET

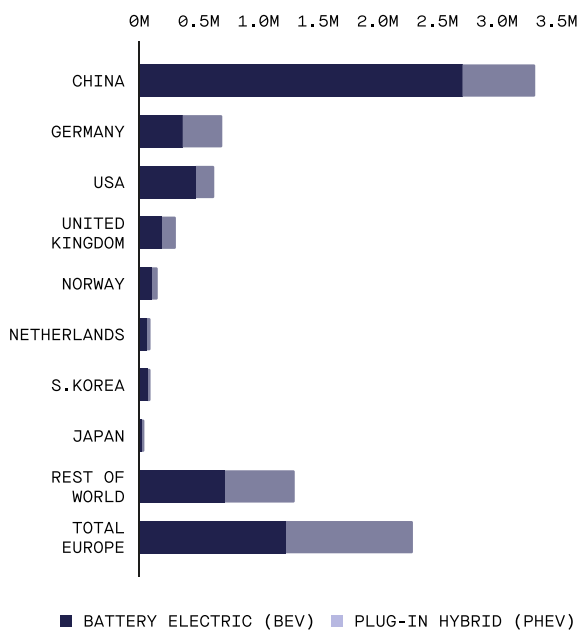


Sources: GP Bullhound Global Insights and Research and Markets

### SOLID-STATE BATTERIES THE NEW BENCHMARK FOR QUALITY ENERGY STORAGE

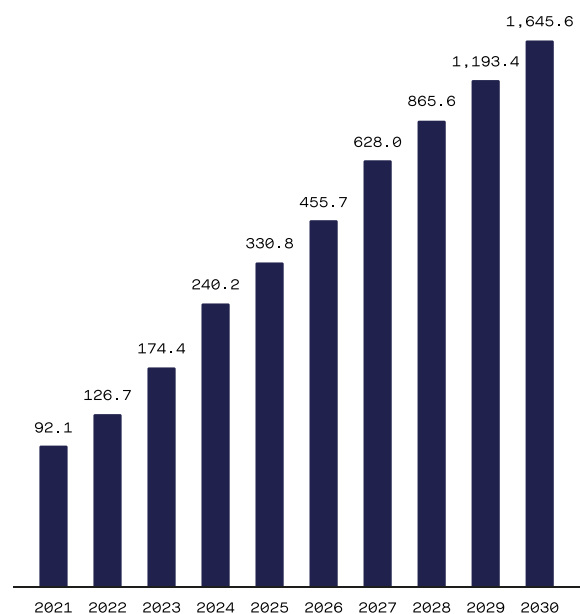
Due to their superior capabilities, solid-state batteries are set to replace lithium-ion batteries as consumers seek to save on gas. Compared to lithium-ion batteries, solid-state batteries are light, fire-proof, charge at rapid speeds, and are durable in changing climates. Electric vehicles (EV) market share in the US climbed from 2.5% in Q1 2021 to 6% in Q3 2022 due to an increase in EV adoption<sup>(2)</sup>. Battery developers and manufacturers like Ilika are attempting to get ahead of the energy crisis and meet the high consumer demand for EVs. Through a £25m raise in 2021 from existing shareholders, Ilika accelerated the development of its Goliath solid-state battery, creating a product with high energy density per mass and volume, rapid charge capabilities, and high-temperature reliability. Ilika plans to start commercial sales of Goliath batteries in 2025, working to institute electric vehicle deployment programmes.

NUMBER OF EV SALES IN KEY MARKETS



Sources: GP Bullhound Global Insights and International Energy Agency 2021

SOLID STATE BATTERY MARKET (\$M)



Sources: GP Bullhound Global Insights and Precedence Research

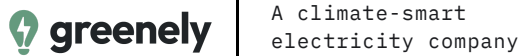
Sources: GP Bullhound Global Insights, Research and Markets, International Energy Agency, Precedence Research, and publicly available information  
 Note: 1) Tibber Impact Report 2021 and 2) Electrek (October 2022)

## Expert view



CO-FOUNDER AND CEO - GREENELY

Tanmoy Bari



### ■ HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR ENERGY-EFFICIENT DEVICES/CLIMATE-SMART COMPANIES?

Most companies are hardware players that provide electric vehicle (EV) chargers, solar installers, heating pumps, thermostats, and other smart home devices. Many of them offer some type of app and energy optimisation for their device. There are also “smart hubs” and “smart speakers” that connect to various smart home devices and allow the consumer to set schedules. Then there are the pure software companies such as Greenely and Tibber that connect to all the different home energy appliances such as EVs, heating systems, solar systems, thermostats, EV-chargers, smart meters, and others, and optimise the energy consumption automatically.

### ■ WHAT ARE SOME OF THE INTERESTING THINGS THAT GREENELY IS DOING IN THIS SPACE?

By only using software, we are helping consumers manage their home’s energy usage and optimising it automatically. Greenely is like a Fitbit for your energy home but without any hardware needed. So we provide consumers with a lot of insights into how they consume energy and how they could reduce it. But we are also connecting all types of things inside the home so we can automatically optimise consumption based on future prices and the preferences of the consumer. We use these connections as an aggregated virtual power source to also balance the electricity network.

■ ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

Legislation could be one thing. Massive changes in the market can lead to governments intervening with the market design, which could lead to changes for both consumers and companies; for instance, regulating the amount of competition in the market.

■ WHERE DO YOU SEE THE FUTURE OF ENERGY-EFFICIENT APPLICATIONS? DO YOU EXPECT TO SEE MASS ADOPTION OF ENERGY-EFFICIENT APPLICATIONS IN THE NEXT DECADE?

We do. We think Europe will break free from gas supply, including the whole value chain down to the consumers. We believe that homes will switch from traditional gas boilers to electric heat pumps, EV penetration will just continue to increase, and we are seeing the rapid development of rooftop solar. Other appliances, such as smart thermostats, will also continue to gain traction. We are already seeing trends in some countries where the governments are subsidising this to accelerate the penetration.

■ HOW ARE YOU CONVINCING COMPANIES THAT ENERGY-EFFICIENT DEVICES ARE A PRODUCT OF THE FUTURE?

Currently, our strategy to attract customers is very much product-oriented. We have a free tier of the app that anyone can use and download and most of the consumers are joining organically. We then communicate our full offer inside the app and allow consumers to convert over to us organically.

■ WHAT ARE SOME OF THE NEW INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

We think about the development of Vehicle to Grid (V2G) and Vehicle to Home (V2H) technology. This means that the car's battery, which is relatively big, could be used to power the home and be used to ship back electricity to the grid, helping it to balance the power grid but also to optimise cost for the consumer.

■ WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

Success for us is that consumers spend zero on their energy bills. Super success is when most of our members across Europe make money by generating virtual power from their homes.



# The tipping point of cybersecurity and broken circles of trust

The digitisation of businesses has led to increased complexity in their IT infrastructure, from public and private cloud to databases, VMs, containers and serverless functions. This can enhance business productivity, but it also comes with risk as these layers represent a new vulnerability. Enterprise network perimeters have also blurred with remote work, and endpoints inside and outside network boundaries have increased exponentially. Enter Zero Trust: a concept in cybersecurity whereby each interaction or "trust decision" should be re-verified, from the endpoint to the network and every stage in between. With an ever-increasing supply of solutions, we look for consolidation in the year ahead as large players aim for full end-to-end solutions as well as smaller players to expand their offerings organically.

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## COMPANIES TO WATCH



### AN ARCHITECTURE, NOT A STANDALONE PRODUCT

Zero Trust prescribes strict access permissions and constant activity monitoring for all users and endpoints to mitigate inherent threats. Standalone instances of Zero Trust have always been in place, but the trend towards true end-to-end ensures that there is Zero Trust capability from each vendor across every piece of the cyber security stack. This philosophy is a departure from legacy security architectures which are susceptible to bad actors or legitimate credentials falling into the wrong hands. It has already reshaped cybersecurity in theory and practice, and vendors have scrambled to integrate it into their offerings. Zero Trust is not a product from any single company and is not patented. Instead, it is an architecture that any company can adopt and implement. This unfettered reproduction allowed it to proliferate rapidly within the cybersecurity community after its efficacy in mitigating breaches became clear. The most important Zero Trust principal is "never trust, always verify".

97% of companies reported working on Zero Trust initiatives in 2022 versus 16% in 2019<sup>(1)</sup>

### MACHINE LEARNING CAN BOLSTER THE DEFENCE EFFORTS

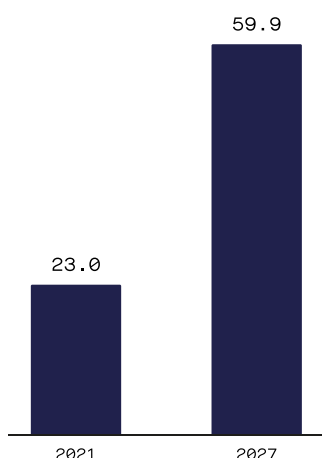
Machine learning models can be trained with large datasets to identify behavioural patterns indicative of a security breach. They can then immediately respond and mitigate the risk via quarantining or policy and permission adjustments. All of this can be completed within a fraction of the time it would take a human, and monitoring can be done 24/7 in real-time, expanding the role of ML in cybersecurity in the future.

Global Zero Trust market projected to grow from c.\$23bn in 2021 to c.\$60bn in 2027, representing a 17.3% CAGR<sup>(2)</sup>

### AN INVESTMENT PERSPECTIVE ON ZERO TRUST

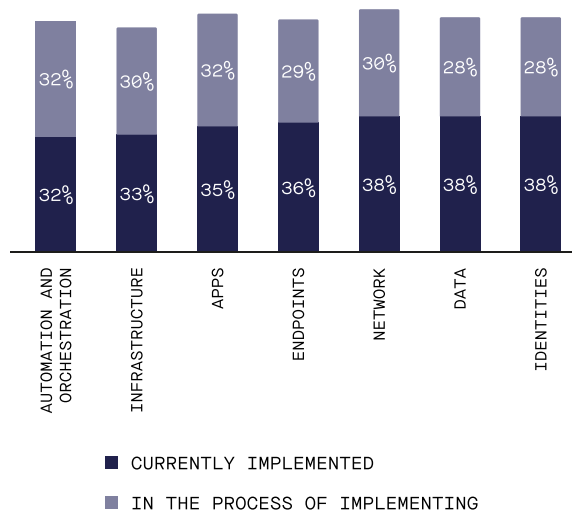
From an investment perspective, we view cybersecurity spending as a key secular growth area. However, after years of the increasing complexity of cyber solutions, multiple vendors addressing a single solution, and many organisations using solutions from multiple providers, we expect a stronger push towards consolidation in the cyber-security space in 2023, such that the large providers are able to provide full end-to-end solutions to their customers. Cisco, Palo Alto Networks, Proofpoint, and Zscaler actively invest in and develop Zero Trust offerings. We also look for smaller providers to expand their offerings organically to meet increasing demand, but a key consideration will be the extent to which they navigate a path to profitability as many still rely on very high salesforce expenses. Startups are raising major rounds or being acquired outright by strategic and financial buyers – in October, Vista Equity Partners agreed to a \$4.6bn all-cash deal to acquire KnowBe4, a publicly traded cybersecurity company helping enterprise workers avoid phishing attacks.

GLOBAL ZERO TRUST SECURITY MARKET, 2021-2027 (\$BN)



Sources: GP Bullhound Global Insights and Statista

GLOBAL ZERO TRUST IMPLEMENTATION  
By security risk and deployment state



Sources: GP Bullhound Global Insights and Statista

Sources: GP Bullhound Global Insights and publicly available information  
Note: 1) Okta "The State of Zero Trust Security 2022" report; 2) Statista (June 2022)

# Expert view



CEO - HACKERONE

**Marten Mickos**

**hackerone** | #1 Trusted Security Platform  
and Hacker Programme

## ■ HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR

Cybersecurity is a giant industry that keeps growing in depth and breadth. There's a high number of cybersecurity vendors, both established and new ones, so success for a vendor is by no means guaranteed in this space. To be successful, you need a product offering that works very well and can produce demonstrable results. Too many cybersecurity vendors sell on fear, without showing a return on investment. They know the problem, but they may not be providing a solution. Customers would like to see consolidation in this space so that they could have fewer vendors to buy from. But new areas of cybersecurity are constantly emerging. Typically, it's only new vendors that can properly solve new problems. Although consolidation is happening, there are new startups created at a faster pace.

## ■ WHAT ARE SOME OF THE INTERESTING THINGS THAT HACKERONE IS DOING IN THIS SPACE RIGHT NOW?

HackerOne made its name with bug bounties, which is by far the best way to keep testing production software for security vulnerabilities. There is nobody and nothing that can outperform a community of external security researchers. In addition to bug bounties, we now have three other groups that allow us to serve customers at all stages in the software development lifecycle (SDLC). For a company that's undergoing business transformation, such as cloud migration, our platform can be the end-to-end solution for making software less prone to breach. HackerOne Assets creates a list of all your digital assets, including those you weren't aware of, adding hacker sentiments and assessments, and allowing you to decide what kind of testing and hardening to apply to the various digital assets you operate. HackerOne Code Review provides an immediate security review of code you have in development, provided by human experts. HackerOne Assessments is for our various pen-testing services, suitable for various compliance needs and before going live with a new product or piece of software.

■ CAN YOU COMMENT ON ZERO TRUST AND HOW IT HAS IMPACTED HACKERONE'S APPROACH?

Zero Trust isn't so much a technology or an exactly defined practice as it is a way of thinking that should underlie all actions in cybersecurity. It's a reminder that we live in a nearly borderless digital world where trust needs to be re-created and verified at every step. A digital identity may need to be re-authenticated over again. Zero Trust reminds us that every piece of software is exposed to the risk of compromise. All software needs to be tested for security vulnerabilities and Zero Trust points to the importance of normal cyber hygiene because there are no safe zones or areas. HackerOne's approach is to provide the ultimate security testing of software. Whatever security-enhancing actions have been taken earlier, there's always a vulnerability remaining that HackerOne's ethical hackers will find. This way, our offering completes the thinking of Zero Trust by adding the last stop of testing. You don't want to go beyond that testing because that's where cybercriminals rule. With HackerOne Assets, we help customers find out all their digital assets so that they can direct the appropriate type of security testing on each one of them. In line with Zero Trust thinking, we leave no stone unturned.

■ HOW DOES HACKERONE ASSESS VULNERABILITIES FOR ZERO TRUST?

Firstly, we ensure that as many vulnerabilities as possible are found. We know that small holes can lead to bigger ones. Secondly, we apply human intelligence to rank the vulnerabilities by severity because we also know that no organisation can fix all vulnerabilities in one go. You must start with the critical ones and work your way down the list. This way, we provide the strongest support for Zero Trust principles.

■ WHAT ARE THE NEW AND NOTEWORTHY THREATS THAT ORGANISATIONS SHOULD BE AWARE OF?

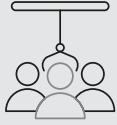
Organisations need to be prepared for all kinds of threats. The threat landscape is reasonably well understood but having the resources and bandwidth to build resilience against those various threats is the issue. Phishing and social hacking attacks will always be common. Software supply chain threat is another common category. The threat landscape will also change when organisations migrate to the cloud. On a public cloud, your software will be safer than in a traditional on-prem environment, but there will be new forms of threats as well.

■ WHAT ARE SOME OF THE NEW INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

What I find most interesting is not the various techniques and technologies but the ways of producing security. There is an increasing agreement in the industry that transparency is useful. We need to share our findings with all other defenders. Companies also realise that pooled defence is the best defence – by working together we become stronger. Cybersecurity is not just a matter of an organisation's small security team, but of everyone else working there. We talk about "cyber hygiene" and "cybersecurity posture" to make it clear that it's something that every employee needs to be aware of and engaged in. That's how we make it work.

■ WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

We're on a simple mission to empower the world to build a safer internet. To get there, we keep building and nurturing the strongest ethical hacker army the world has seen. With hackers, we can help any organisation that develops and deploys software improve its resistance to attack. Our goal in the coming years is to bring our solution to more customers and broaden our solution to serve every single step of the software development lifecycle. Just as we are convinced that external experts are vital to any security programme, we believe it's the software developers on the inside that will be able to impact security the most. That's why we talk about Developer Security. Our full vision is called Attack Resistance Management. It's about solving the problems of software security across the entire SDLC.

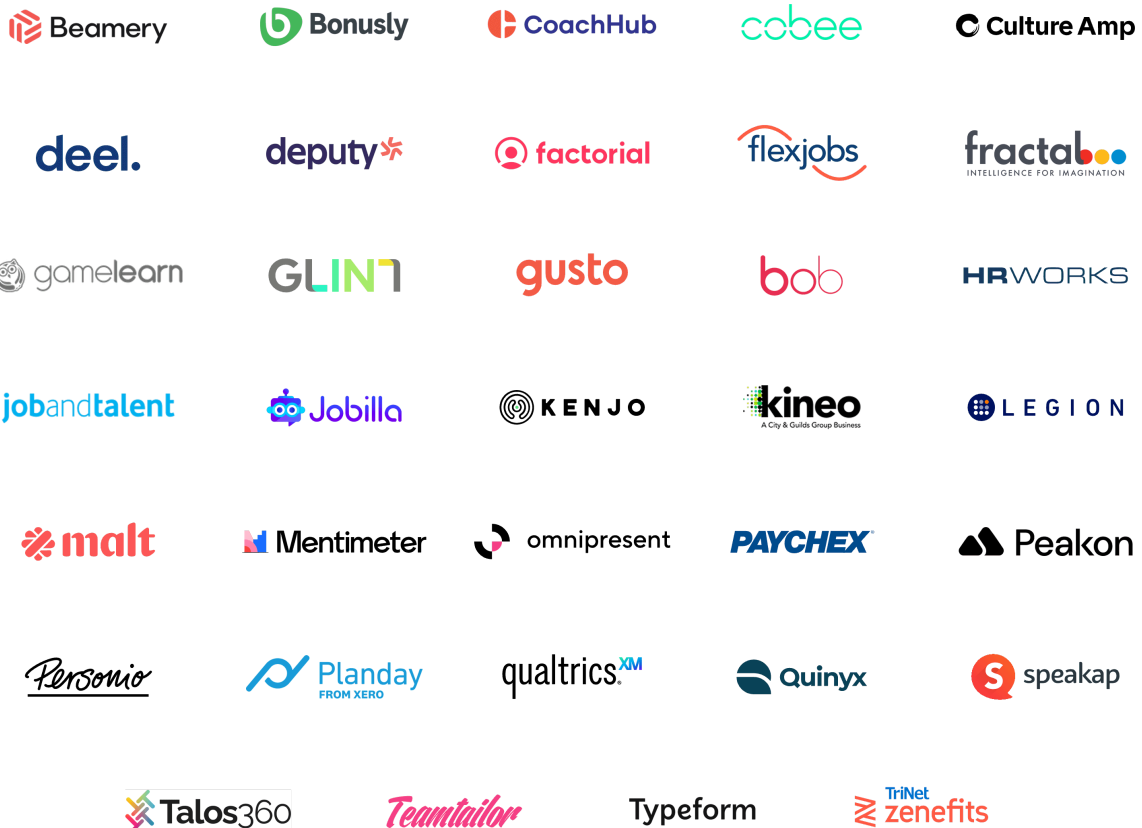


# The future of the workplace

In recent years, improving employee happiness and retention has been at the forefront of business initiatives. A recent Microsoft study showed that 43% of the global workforce is thinking about leaving their job<sup>(1)</sup>. To recruit and retain talent, companies must provide more competitive offers, including high-paying salaries, improved work-life balance, better professional training, hybrid work environments, extended PTO, and increased retirement contributions. The need for modern tools to streamline talent attraction, training, engagement, and retention will grow, and we foresee further market consolidation and creation of powerful integrated platforms in 2023.

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## COMPANIES TO WATCH



## FOUNDATIONS OF TALENT RETENTION

One of the challenges faced by employers post-pandemic is being able to engage and retain frontline and non-desk workers, which represent 80% of the global workforce – almost three billion employees. Companies that are more engaged with their talent and prioritise inclusive workplaces will see an increase in talent retention. Speakap, a communications platform that enables employees to have structured interaction with their frontline and non-desk staff, has recognised the demand for employer-employee engagement to support businesses in retaining talent.

**DEFINITION**  
Frontline & non-desk workers:  
  
Employees in retail, factories, restaurants, or providing an essential public service, typically difficult to interact with via email / intranet and corporate communications

## EMPLOYEE FEEDBACK FUELS IN-HOUSE CULTURAL INITIATIVES

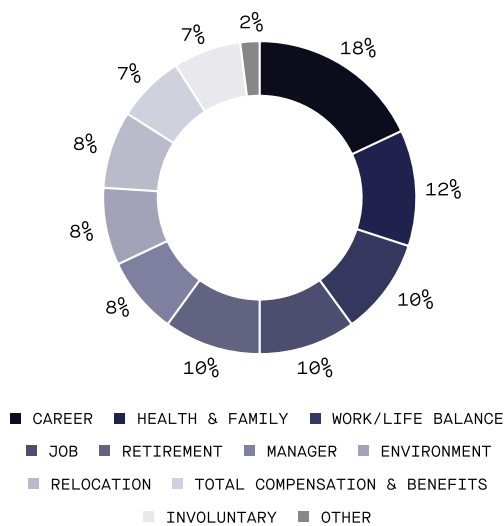
Key to talent engagement is an environment that encourages employee commitment. To gauge employee experiences, companies like Medallia have developed platforms that capture employee attitudes through tools that relay feedback and provide predictive insight throughout their journey. This allows employers to adopt realistic business initiatives, reducing talent churn and improving overall employee experiences. In 2021, Medallia was acquired by Thoma Bravo for \$7bn, allowing it to strengthen its operating capabilities through capital support and sector expertise. Given the larger platform, Medallia will have a broader market reach with the ability to improve employee retention at a greater scale.

The global mobile learning market is set to reach over \$155bn in 2026<sup>(2)</sup>, demonstrating the importance of employee training

## PROPER TRAINING IMPROVES EMPLOYEE RETENTION

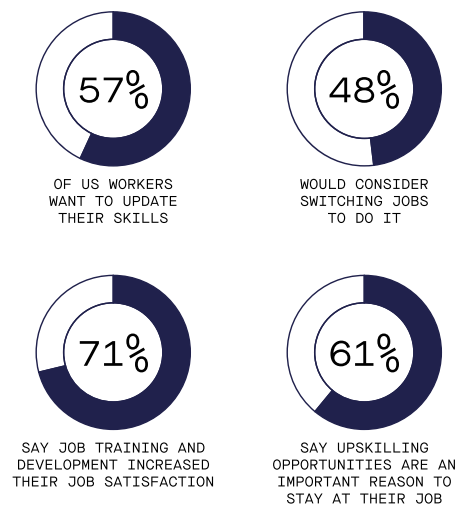
The need to retain talent in addition to pandemic-fuelled resignations empowers firms to run continuous specialised training for their employees. Organisations are implementing more in-depth training sessions to decrease employee turnover and increase work productivity through newly developed skills. Kineo, a workplace training company, develops and publishes corporate learning and technology solutions for businesses. Companies utilising programmes like Kineo find that employee efficiency and retention improve.

WORKERS WANT LEARNING OPPORTUNITIES



Source: The American Upskilling Study, Gallup 2021

WHY EMPLOYEES LEAVE



Source: Work Institute 2022 Retention Report

Sources: GP Bullhound Global Insights, Gallup, Work Institute, and publicly available information  
Note: 1) Microsoft Work Trend Index Annual Report, March 2022; 2) GlobeNewswire Mobile Learning Global Market Report 2022

## Expert view



FOUNDER AND CEO - SPEAKAP

Patrick van der Mijl



The Employee App for Your  
Frontline Workforce

### ■ HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR TALENT MANAGEMENT SOFTWARE?

The Covid pandemic created a whirlwind of changes for businesses; managing people has never been more critical, and the difficulties companies face in the talent shortage are compounding. In today's highly competitive marketplace, recruiting and retaining top talent has undoubtedly become a key challenge for HR departments in most businesses. The quick advent of hybrid and flexible working, and the lessons learned from trends like the Great Resignation, are resulting in a flooded market filled with new tools and software. The upside is that innovation is coming fast and furious. The downside is that many HR teams and employees feel they have too many tools and a technology ecosystem that doesn't fit their needs. The trick going forward is to build software that helps consolidate the entire employee experience, either complimenting the existing tech stack or, ideally, providing one single tool to rule them all.

### ■ WHAT TACTICS IS SPEAKAP IMPLEMENTING TO HELP CLIENTS INCREASE EMPLOYEE RETENTION?

The most effective way of increasing employee retention is knowing what your employees need and meeting those needs. After more than a decade, Speakap's biggest tactic remains unchanged: Help clients understand what their employees need by meeting employees where they are. That means providing a platform to be seen and heard, and making it available wherever employees are. Mostly they can be found on their phones. It means sharing information that's relevant to them, in their own language. And it means providing workforce analytics on top of this, enabling clients to infuse their people strategies with data, paving the way for increased retention.

■ ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

Eighty percent of the global workforce is deskless. That translates to a staggering 2.7 billion employees. Yet only a fraction of employee technology is focused on this group. By overlooking deskless or frontline employees, organisations are creating an even greater divide between HQ and everyone else. Recent studies show that the global economy loses trillions to low engagement, so there's a big opportunity here. But if it's not addressed, the gap will continue to grow, resulting in a workforce that feels misunderstood and undervalued.

■ WHAT ARE SOME OF THE NEW INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

There is an increasing focus on data within HR teams. I see it across every industry we serve. When done right, true workforce analytics can change an HR or (Internal) Communications team from being seen as a cost centre by the C-suite, to a problem solver. I have helped HR clients build business cases for investments by drawing a direct line from employee communications to end-customer satisfaction, or from employee engagement to revenue. Speakap is investing big in data because that is where I see the biggest opportunity for true innovation.

■ HOW ARE YOU CONVINCING BUSINESSES THAT TALENT ENGAGEMENT/EMPLOYEE ENGAGEMENT SOLUTIONS ARE NECESSARY? HOW ARE THEY ABLE TO RECOGNISE THE IMPORTANCE?

Luckily for me, research is coming out every day about the negative effects of low employee engagement on a company's bottom line. From a broader viewpoint, HR technology is fundamental to remaining competitive. The landscape is constantly changing; therefore, companies need to adopt software to stay in step with trends in digital and human spheres. It can still be difficult to convince a board of directors to spend a significant amount of money on employees when you can't guarantee that money back within a few months. Our biggest selling point, in that case, is sharing the success stories of our clients, and often connecting clients with potential buyers so they can share honest conversations. The fact is that businesses that make the effort to put their employees first, end up reaping the benefits in terms of increased employee satisfaction, productivity, and retention.

■ WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

Companies are dealing with the growing challenge of managing talent amid changes in work. We have seen an explosion of new HR tech solutions in the past few years; a flood of new vendors is vying to help companies manage their workforce. Because of this, companies struggle to keep up with various new disconnected HR solutions. The coming five years will be an exciting window for us to stake out our position in this highly active market. With over 600 customers, we understand the market's needs and design more intelligent solutions on top of our powerful platform to meet those needs. As we advance, we are building software that helps consolidate the entire employee experience, either complementing the existing tech stack or, ideally, providing one single tool to rule them all.



# Software driving sustainability

Businesses have long recognised the value of taking responsibility for their environmental impact but it remains extremely difficult for organisations to analyse and measure what that implies in practice. This is where the power of software comes into play. Some of today's most innovative software platforms and tools offer businesses actionable steps to amplify the transition to a more sustainable future, and we are only seeing a fraction of what is possible. From 2023, we look for increased funding in a variety of technologies that employ environmentally-friendly practices to improve sustainability, as well as companies with resource-efficient supply chain processes.

07

## COMPANIES TO WATCH

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AFFIVAL



bulb



## SUSTAINABILITY SOFTWARE AND HARDWARE

While the benefits of investing in software might be obvious, truly transformative technologies rely on both hardware and software. Software helps to accelerate shifts and enables companies to expedite their transitions to sustainability, but manufacturing tools and devices promote research, development, and production in the space. Sustainability tech, both software and hardware, is a major focus area for venture capital. And while some startups have suffered setbacks due to cheaper alternatives, like shale gas, in the past, today sustainability tech offers more long-lasting growth for the sector, with investors, entrepreneurs, and governments armed with better knowledge and experience. Software will help establish a more voluntarily-functioning carbon market, and accelerate the potential of capturing, removing and offsetting current GHG emissions. This requires better use of data to ensure better quality, monitoring and scalability in the space. In addition, software that efficiently manages and optimises energy flow, load and usage for renewable producers and conscious consumers will continue to increase its foothold, helping ease the current energy crisis in the coming years.

## THE VC PERSPECTIVE

It is understandable that VCs see many challenges when it comes to sustainable investing. Difficulties surrounding the benchmarking of non-financial terms, ambiguity in defining and measure impact outcomes, and a lack of consistent understanding of sustainable investing among peers are all contributing factors to the often-apprehensive sentiment that VCs feel. At the same time, climate tech funding represented more than a quarter of every venture dollar invested in 2022<sup>(1)</sup>, showcasing a resilient climate tech market in an otherwise challenging macroenvironment. However, funding in earlier stages remains comparatively underfunded and it will be important to hold the funding momentum going forward, especially to further strengthen the commitment to earlier-stage ventures and in technologies that have a significant impact, so they can progress to later-stage funding and reach the full potential deployment of capital in this sector.

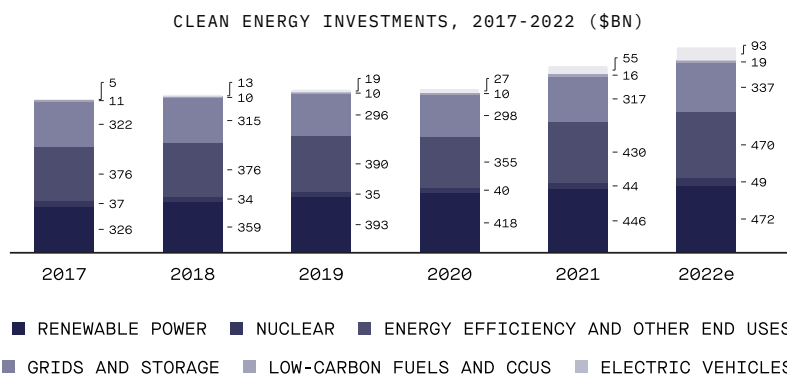
● Climate tech funding represented more than a quarter of every venture dollar invested in 2022

## WHAT'S AHEAD

Overall, the cleantech industry is set for growth in 2023. While geopolitics and trade barriers will affect supply chains, potential support from government policies committed to fighting climate change will set the industry down new avenues of growth.

<p><b>49 COUNTRIES AND 93 FORTUNE 500 COMPANIES</b></p> <p>49 countries and 93 Fortune 500 companies have committed to net-zero targets, expanding the market opportunities in climate tech<sup>(2)</sup></p>	<p><b>8 IN 10 INVESTORS</b></p> <p>8 in 10 investors plan to increase their investments in ESG products over the next two years<sup>(3)</sup></p>	<p><b>EU CORPORATE SUSTAINABILITY REPORTING DIRECTIVE</b></p> <p>The EU's Corporate Sustainability Reporting Directive (CSRD), which applies to companies with &gt;\$40m turnover and 250+ employees, calls for all ESG initiatives and claims to be backed up by data<sup>(4)</sup></p>
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CSRD will be an extremely important regulatory trend that will further accelerate the demand for new, improved, and user-friendly tools in almost every part of a business's current operations. In a space that's now exposed to grey areas, greenwashing, and difficulties of measurement, we believe that increased standardisation, sources of quality data, and software capabilities will be needed to comply with the new modus operandi.



Source: International Energy Agency, World Energy Investment 2022

Sources: GP Bullhound Global Insights, International Energy Agency, and publicly available information  
 Note: 1) PwC State of Climate Tech 2022 report; 2) SVB, The Future of Climate Tech 2021 report; 3) PwC State of Climate Tech 2022 report; and 4) European Parliament News (November 2022)



# No longer sci-fi

With robots commonly used at the consumer and commercial levels, the robotics industry is set for continued growth across all sectors, from industrial applications to professional services and private use cases, creating new opportunities globally. In 2023, we expect increased M&A activity in a well-funded industry, separating successfully scaling robotic companies from innovator-only players.

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## COMPANIES TO WATCH


### THE CURRENT STATE OF ROBOTICS

Today, most robots are used in the commercial sector for manufacturing automation. Companies leading the industrial robot industry include ABB, Fanuc, KUKA, and Yaskawa. However, newcomers have entered the scene with collaborative robots, or cobots, which are robots that are smaller, less expensive, and easier to programme. Historically, the penetration of cobots was hampered by a lack of sufficient accuracy, configurability, and safety to operate in industrial and service environments collaboratively with humans. Today's cobots are not yet replacing jobs but enabling workers to do their jobs more efficiently, and they are generating significant interest in robotics startups. Many VCs are specifically targeting this innovation vehicle for investment, which has birthed several robotics Unicorns. Companies like Agile Robots, Argo AI, CMR Surgical, flexiv, Horizon Robotics, Nuro, and many others have reached Unicorn and even Decacorn status.

The robotics industry is set to grow to \$260bn by 2030<sup>(1)</sup>

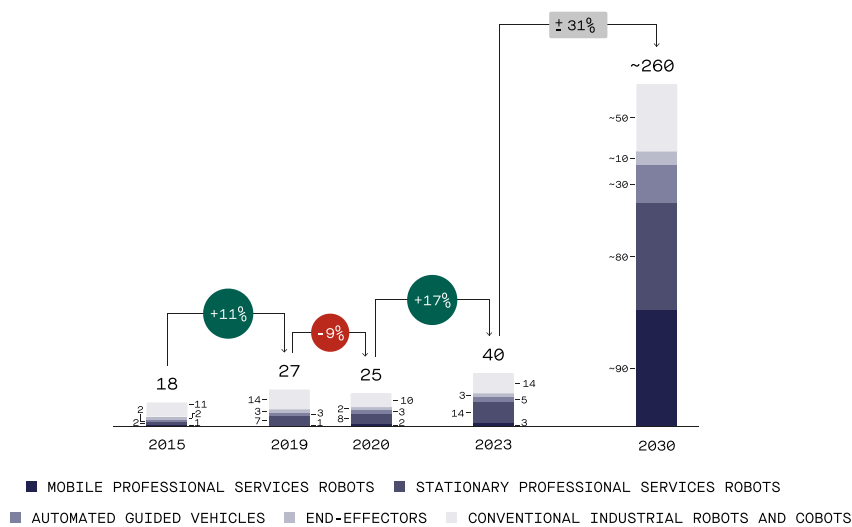
### REVOLUTION OF COGNITIVE ROBOTICS THROUGH MAJOR IMPROVEMENTS IN HARDWARE AND SOFTWARE

The rapid development in hardware and software used in the new generation of robots, together with fast, edge-based computing power, is enabling robots to combine a multitude of sensory data into a comprehensive perception of their surroundings. This in effect makes robots capable of truly and safely interacting with humans in a work environment. With ever-faster operating systems and AI-driven continuous learning, robots can already see, feel, hear, and act on their human-centred environment. Combined with lower hardware costs through modular robot design and decreasing implementation costs due to AI capabilities, the addressable market for robot-based automation is set to multiply several-fold.

### THE FUTURE OF ROBOTICS

The technological advances will drive significant growth and proliferation of robots in our everyday lives. While the industrial robotics industry is set to grow to \$80bn by 2030<sup>(1)</sup>, professional services robots are set for market volume of up to \$170bn by 2030<sup>(1)</sup> and will likely outpace conventional robots. Use cases include elderly care (driven by demographic trends), applications in retail and public services, and robots acting as multi-purpose personal assistants in households. Eventually, we see a robotic revolution occurring, with the most cutting-edge robots freeing humans from laborious activities, but also replacing jobs across various sectors.

GLOBAL ROBOTICS MARKET, 2015-2030 (\$BN)



Sources: GP Bullhound Global Insights and BCG Robotics Outlook 2030. Percentages are CAGR.

Sources: GP Bullhound Global Insights, BCG, and publicly available information  
 Note: 1) BCG Robotics Outlook 2030: How Intelligence and Mobility Will Shape the Future, June 2021
















# E-commerce, but make it social

Social commerce has disrupted the way consumers shop online by offering a more efficient ad-to-purchase funnel as well as drastically increasing customer engagement. Through models like livestream shopping and group buying, social commerce has proven itself to be a game-changer in the east, and now, it is taking over the US and Europe. In 2023, we look for livestream shopping to enter the mainstream, adopted by major global brands in the west, thanks to its high measurable ROI in a period of tightening advertising budgets.

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## COMPANIES TO WATCH

- aifora**
-  **amaze**
-  **Amplitude**
- bambuser**
- branch**
-  **Constructor.io**
-  **Firework**
-  **Gelato**
- GROUPON**
- GUMROAD**
- Klarna.**
- LIVE shopper**
-  **LTK**
- MAGICLINKS**
- Moteefe**
- N A M O G O O**
-  **NTWRK**
- PATREON**
-  **the POP company**
-  **shopify**
-  **spreadshirt**
-  **SPRING**
-  **TikTok**
-  **whatnot**

## SOCIAL ENABLEMENT FOR BRAND FAMILIARITY AND INCREASED SALES

The commerce ecosystem is at a crossroads as the consumers' preferred point of sale is shifting from e-commerce platforms to social media. With an average attention span of only eight seconds<sup>(1)</sup>, the modern consumer has difficulty completing the ad-to-purchase funnel when shifting from a social media platform to a digital marketplace. Social commerce connects the point of discovery to the point of sale by allowing the customer to complete their purchase within their social media experience, resulting in an efficient funnel and a higher conversion rate. By increasing brand familiarity, social commerce ensures a more efficient ad-to-purchase funnel and higher conversions.

● **Social commerce market to hit \$3.8tn by 2030, at a 30% CAGR<sup>(1)</sup>**

87% of consumers take action after seeing a product on Instagram<sup>(2)</sup>: Following a brand, visiting its website, or purchasing online

## TWO BIRDS, ONE STONE: CREATOR MONETISATION

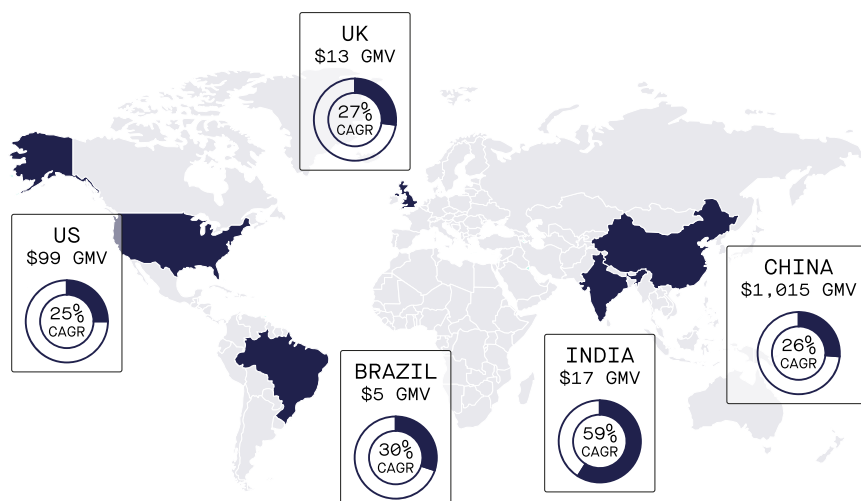
Social commerce has enabled creators to take an essential role by promoting brands on social media – the new marketplace. With 49% of consumers depending on influencer recommendations to purchase products and services<sup>(3)</sup>, social commerce has become a gold mine for creator monetisation and a significantly effective go-to-market strategy for brands. Companies like Spring, LTK, and Gelato are transforming this ecosystem by providing creators with digital tools to sell their products on all major social platforms – creating a unified commerce cycle with loyal customers.

## ECONOMIES OF SCALE THROUGH GROUP BUYING AND THE LIVE SHOPPING MOVEMENT

Two other significant trends within social commerce are group buying, where consumers can start or join a group to purchase an item in bulk at a cheaper price, and the live shopping movement, where a streamable session showcases various products or services, usually presented by a person of influence. Both models started in China via platforms like Pinduoduo, Meituan Youxuan, and Jingxi PinPin, and only just started moving toward the west. Through these models, commerce enablers offer a more stimulating buying experience for the consumer, usually at lower prices, while minimising stock risks for themselves by making sales in bulk quantities.

The move toward the west is imminent, with TikTok and Shopify creating their live shopping features and companies like Pop and Groupon advocating the advantages of group buying. In the coming year, the social commerce movement is likely to take up much bigger space within the merchandising ecosystem, especially in Europe and the US. With social commerce likely to grow three times as fast as traditional e-commerce in the next four years<sup>(4)</sup>, we expect the sector to be a hot spot for investors and acquirers. Livestream shopping platform Whatnot's \$260m Series D round that valued the company at \$3.7bn is an early example of this shift from east to west.

SOCIAL COMMERCE 2025 MARKET  
GROSS MERCHANDISE VALUE (\$BN) AND 2021-2025 CAGR



Sources: Accenture Social Commerce Econometric Model, based on data from Accenture survey and third party input

Sources: GP Bullhound Global Insights, Accenture, and publicly available information  
 Note: 1) Grand View Research Social Commerce Market Report 2022; 2) Facebook IQ, February 2019; 3) Digital Marketing Institute October 2021; and 4) Accenture, January 2022

## Expert view



CO-FOUNDER AND CEO - LIVESHOPPER

Tim Frank Andersen



Your very own Live  
Shopping experience

### ■ HOW WOULD YOU DESCRIBE THE OVERALL MARKET FOR SOCIAL COMMERCE AND MORE SPECIFICALLY THE LIVE SHOPPING MOVEMENT?

While social shopping mostly happens on external platforms like Facebook and Instagram, live shopping takes place on the company's own website. It's the perfect hybrid between the physical store experience and the convenience of e-commerce. It's a direct and engaging digital sales channel, where customers can shop and interact with the brand in real-time. And, at the same time, it allows companies to put a face to their brand and add an emotional connection to the buying experience. Research shows that live video shopping increases the online shopping experience by up to 60%. Customers get a personal interaction when shopping online, they can ask questions in real-time about the products while at home. At the same time, brands can assist throughout the buying journey and, as a result, the path to purchase becomes more fluid, from inspiration to validation to buying. Conversion rates for live video shopping can be 10x greater than for conventional e-commerce.

### ■ WHAT ARE SOME OF THE INTERESTING THINGS THAT LIVESHOPPER IS DOING IN THIS SPACE?

Liveshopper allows e-commerce companies to host live shopping events on their own websites, fully integrated with their e-commerce solution and wrapped in their brand identity. Products can easily be explored and added to the basket directly in the live video, while inventory status will be updated in real-time, and customers can chat and engage with the brand as they go along. Most importantly, our solution allows businesses to drive traffic to their website to win back ownership of their data and customer relations from social media, keeping full control over their content. This provides great opportunities for re-engagement and retargeting – even after the event has been broadcasted since it will still be available on the website as on-demand shoppable content. And this is highly relevant because customers are as happy to watch the programmes later if the content is inspirational and entertaining. And that sales from on-demand watching can be up to five times the amount sold during the live broadcast.

■ HOW WILL THE SOCIAL COMMERCE MOVEMENT IN CHINA AND SOUTHEAST ASIA CARRY OVER TO THE US AND EUROPE? WILL CULTURAL DIFFERENCES DETERMINE HOW THIS MOVEMENT IS PERCEIVED BY THE CONSUMER?

I believe there are huge cultural and behavioural differences between China and the rest of the world. One of the main differences is the Chinese e-commerce super Apps like Taobao, Pinduoduo, and WeChat, which simply don't exist in Europe or the US. That said, customers in both the US and Europe have strongly adopted the live shopping concept. Research shows that over 50% of Gen Z and Millennials would purchase from a live stream event when brands launch new products. McKinsey predicts live video shopping will account for 10-20% of all e-commerce by 2026. I think that we will develop a model that fits our cultures closer, with less hard-selling and more engaging and inspirational content, where companies themselves will be hosting the events, instead of influencers, and where live shopping events will be hosted at companies' own websites instead of external platforms.

■ ARE THERE ANY KEY RISK FACTORS TO CONSIDER IN THIS MARKET THAT MIGHT IMPACT FUTURE GROWTH?

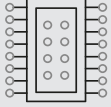
The competition for customers' attention is one. A crucial success factor for any live shopping event is a significant number of viewers, which requires a well-executed marketing plan. Why should people watch your live stream instead of a competitor's or instead of binging their next TV series? In the future, there might be thousands of live events happening on Tuesday nights at 8pm. How will brands differentiate their content and stay top of mind? So far, we've seen little innovation when it comes to concept and format development, but that is about to change. Live shopping is a new sales channel, which means that brands need to be persistent and not give up after their first few live streams. Not only does it take time for brands to be familiar and comfortable with the format, but the same goes for the customers. Going live with too low a frequency is a risk that should be avoided. Rather go for a "campaign-like" approach with 6-10 events weekly or biweekly for a period.

■ WHAT ARE SOME OF THE INNOVATIONS AND INTERESTING WORK BEING DONE ACROSS THE INDUSTRY TODAY?

Since it's still early days, there is a lot for companies to get their hands around with the current model. So, the need for further innovation right now isn't so urgent. What we are beginning to see is companies trying to develop portals for live shopping by aggregating all the shows in a specific area or language. I also think we will see huge e-commerce players like Boozt, opening their own platform for brands to do their live shopping there, instead of on their own sites. We have developed this solution, so the 1,800 brands on Boozt get a super simple possibility to get started while leveraging the enormous traffic on Boozt and their first-party permissions and customer data to drive traffic to their shows. Even though we recommend companies use their own employees to host the shows, I think we will see an interesting business opportunity for influencers to go into live shopping themselves on a permission-based model. Finally, we are following the development of the future metaverse very closely since this might be the next destination for live shopping. A part of this development might be that future hosts could be virtual influencers instead of real humans.

■ WHERE DO YOU WANT TO TAKE THE BUSINESS? WHAT DOES SUCCESS LOOK LIKE OVER THE NEXT FIVE YEARS?

I think that live shopping will become an integrated part of every e-commerce company's strategy. Right now, live shopping follows the same growth path as social media did in 2010-2011. This means that the next step for companies will be to hire a full-time live stream manager and to develop a live shopping playbook. Our ambition is to be the preferred partner for e-commerce companies wanting to master live shopping. By having the easiest-to-use and most flexible platform, by providing the best real-time data overview and customer insights, and by providing the best onboarding, training, and support setup in the industry.



# Semis rule the world

Semiconductors are critical to our everyday lives. Our cars, smartphones, even our fridges and washing machines use semiconductors. And we'll need more, and more complex, semiconductors over time: in electric and autonomous cars, renewable power, datacentres to keep up with our increased internet use, and to enable more factory automation. Covid and supply chain disruption exposed our reliance on semiconductors and their importance in the world, but semiconductors have been moving up political agendas for several decades. 2022 marked a significant step up in semis politicisation, which will have a significant impact for many years to come. The market expects a major downturn in semicap equipment spend, but we expect the battle for tech leadership, tech sovereignty and structural demand shortage in trailing edge nodes to result in spend above market expectations in 2023.

10

## COMPANIES TO WATCH



**DOMESTIC SEMIS PRODUCTION STRENGTHENS; THE US CHIPS ACT WAS THE OPENING MOVE**

2022 firmly set the scene for the battle for tech sovereignty. The US Chips Act passed in the summer represented \$52bn in grants and incentives (subsidies and tax credits) for US semiconductor manufacturing. US companies have dutifully followed with domestic manufacturing plans and announcements, such as Micron spending \$100bn on a fab in New York. In a sense, this is a reversal of several decades of US semiconductor businesses outsourcing their manufacturing and moving to very high-returning fabless business models.

**GROWTH DRIVERS**

- Booming data volumes
- Integration of ever-increasing computational power
- AI and connectivity into everything

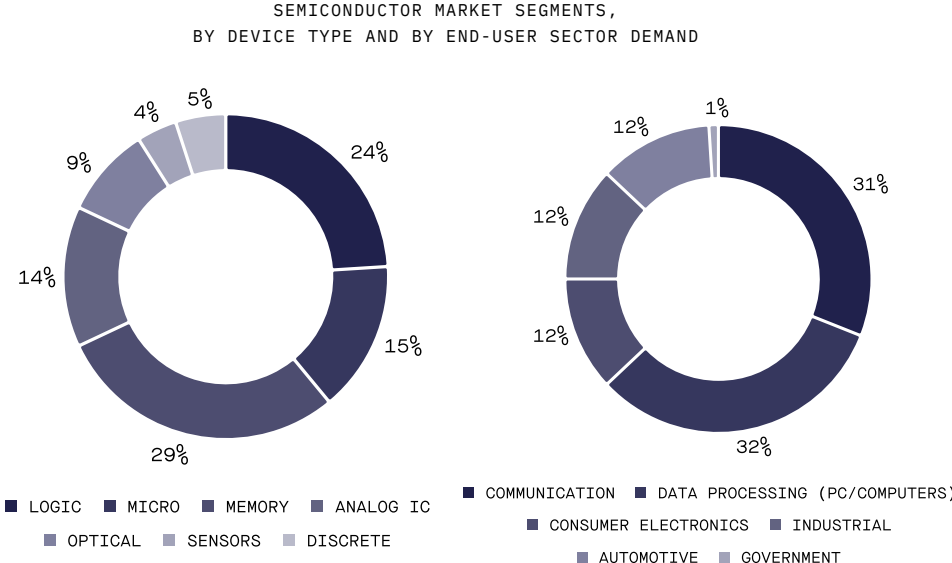
**CHINA RESTRICTIONS CAME NEXT**

Later in the year, the US shocked the world by announcing sweeping restrictions around the export of semis and semi-related IP into China, effectively stopping China from manufacturing high-end chips and debilitating any technological advancement. While former US President Donald Trump had gone some way in restricting China, the effect, in reality, wasn't far-reaching. We believe this move from the current US administration is extremely influential and likely much more permanent than any made before.

**WHAT THIS MEANS FOR BUSINESSES**

Handicapping China and reversing the globalisation trend has significant ramifications for semis, tech, and the wider world. Building more fabs (with likely more inefficient utilisation) will mean more semiconductor manufacturing equipment (Intel's US fab builds are beginning to show up in order books for the companies that make semiconductor manufacturing equipment). TSMC – the world's largest and most technologically advanced manufacturer of semiconductors – finds itself somewhat between the US and China, selling semiconductors to both and problematically close to China, geographically speaking. But it remains the technology leader. For US businesses, it remains to be seen if they can reclaim their tech manufacturing prowess – they remain very far behind. Globalisation itself aided tech deflation and advancement for the world, allowing us all to carry a supercomputer in our pocket at a fairly low cost. It's fair to say that a reversal of globalisation would have far-reaching implications for businesses and society as a whole.

GLOBAL CHIPS MARKET TO GROW FROM \$550BN IN 2021 TO OVER \$1TN BY 2030<sup>(1)</sup>



Source: European Commission, A Chips Act for Europe (August 2022)

Sources: GP Bullhound Global Insights and publicly available information  
 Note: 1) European Commission, A Chips Act for Europe (August 2022)

# The past, present and future

## 2011

GOOGLE'S ANDROID  
DISTANCING APPLE'S IOS ✓

Android to distance itself from Apple's iOS platform in terms of market share

SOCIAL SHOPPING, DATING  
AND GAMBLING WILL THRIVE ON MOBILE ✗

Services that revolutionised everyday life of millions of users to massively hit the mobile space

MOBILE AND SMART GRID APPLICATIONS OPEN  
THE DIGITAL HOME ✓

Home control system suppliers leveraging next-gen devices to help control and manage home equipment

THIN FILM MAKES A COMEBACK  
AND VCS TO EXIT TO STRATEGICS ✗

Massive consolidation driven by the entry of industrial players with their capital and manufacturing might

GAMING MOVES INTO THE CLOUD ✓

The interactive entertainment industry to continue to move into the cloud

MOBILE PAYMENTS SET TO SURGE ✓

New payments providers emerging along with established players increasingly diversifying offerings

AR APPLICATIONS TAKEOFF ON LOCATION-BASED SERVICES FOOTPRINT ✗

LBS devices to reach critical mass, driving widespread popularity of AR applications

PRIVACY BECOMES A TOP PRIORITY FOR SOCIAL NETWORK USERS ✗

Need for privacy to drive users to separate social networks into core life functions

SHORT MESSAGING FORMAT TO GAIN SUPPORT AND MOMENTUM ✓

More use of short messaging format on the Internet, at the expense of blogs and long format emails

NEW GENERATION OF BUSINESS INTELLIGENCE & DATA ANALYTICS APPS ✓

Companies attacking the big data problem to see success in both the fund raising and M&A markets

## 2012

RECOMMENDATION ENGINES GET PERSONAL  
THROUGH SOCIAL MAPPING ✓

Set to integrate user-specific preferences and social mapping; recommendations curated just for you

RUSSIAN INTERNET TO EXPORT NEW SOCIAL MODELS ✓

Russian Internet to export new social models; expect activity in this respect

VOICE RECOGNITION BOUND  
TO DISAPPOINT - AGAIN ✗

Broad market utility and adoption will again fail to materialise due to remaining technical constraints

SMART WALLET BREAKS THROUGH ✗

After so many false starts, we expect the smart wallet to finally take hold

LIGHT-EMITTING DIODE (LED)  
PRICES WILL COLLAPSE ✓

Prices for LEDs to plummet as competition intensifies to satisfy demand for energy-efficient lights

HARDWARE AND CONTENT  
CONVERGENCE WILL ACCELERATE ✓

Hardware manufacturers to partner with software and content providers to create better user experiences

WINDOWS PLATFORMS PICK UP NEW MOMENTUM ✓

Microsoft Windows platform to see new momentum in 2012, materialising after Windows 8 release

SOCIAL RECRUITING HITS THE MAINSTREAM ✓

Social recruiting to gain significance as companies turn to social networks and media to discover talent

A RE-BIRTH OF THE  
SECOND SCREEN - THE TV ✓

New feature sets to transform the TV into a fully interactive device; a new era of differentiated TVs

2011-2021



Our trends don't just look at the year ahead, they endure – more than a decade ago we were one of the first to predict a surge in mobile payments and digital blockchain technology – both of which have transformed and continue to integrate into our lives with a real impact.

2013

COLLABORATIVE CONSUMPTION BECOMES THE NEW ECONOMY ✓

Economic system built from network technologies for creation of exchange platform for different assets

✓ DISRUPTION OF EDUCATION TO ACCELERATE

Disruption of education system by technology and free online resources to continue to build momentum

THE RISE OF CURATED AND PERSONALISED CONTENT ✗

Content is king holds true, but getting right message to the right person at the right time is a major trend

✓ GESTURE AND TOUCH CONTROLS EMERGE AS STANDARDS

The way we interact with computers has moved beyond the computer mouse

CONSOLIDATION TO CONTINUE, LED BY "BIG FOUR" ✓

Major buyers to pursue tech M&A for diversification and revenue growth

✗ VIDEO CALLING GOES CORPORATE

Although still a novelty today, video calling to grow strongly within the corporate world

MICROSOFT TO DOMINATE NEXT GAME CONSOLE CYCLE ✗

Microsoft to win fight between Xbox 720 and PS4

✓ GAMIFICATION – AN EXPLOSION OF INNOVATION

Gamification marketing efforts engage users in game-thinking and game mechanics to raise brand loyalty

IP ARMS RACE INTENSIFIES IN 2013 ✓

After the 1990s web-browser war and the 2000s Internet search war, IP arms race to intensify in 2013

✗ WEARABLE TECH – THE HEALTH APP BREAKS THROUGH

Wearable technology applied to health and fitness to make its way into the mainstream

2014

EYE TRACKING REACHES CONSUMER MASSES ✗

Mass consumer applications of eye-tracking technology to hit the market in 2014

✓ BREAKTHROUGH IN INDOOR LOCATION, COMMUNICATION AND MARKETING

Large retailers leading the way for beacon technology implementation.

SMART MACHINES MARKET TAKING-OFF ✗

SmartThings and IoT to penetrate market; innovations, investments and acquisitions to continue

✓ SHOPPING GOES 'CLICK & MORTAR'

E-commerce retailers such as Birchbox, Bonobos and Amazon opened retail stores

SOCIAL MESSAGING MARKETS TO CONSOLIDATE ✓

High number of users make these apps attractive to strategic partners searching for growth

✗ THE BATTLE OF 'WHERE' TO UNFOLD

Map applications to proliferate and develop features like lane navigation, restaurant reservation, ETA, etc

MARKETPLACES TO GO VERTICAL ✓

Vertical marketplaces to be more prominent than horizontal marketplaces on increased investment

✓ ADVANCED DATA ANALYTICS CLIMBS TO TOP OF CORPORATE AGENDA

Big data and data analytics applications to become attractive to businesses

CURVED SMARTPHONES TO FLOP IN 2014 ✓

Big players tackle consumer pain of high price points and lack of perceived value of the curved design

✓ CLOUD STORAGE PLATFORMS GO MAINSTREAM

Cloud storage to increase due to time and money saved in IT management and fewer internal resources

2015

INTERNET OF THINGS TO MOVE FROM SMART TO INTELLIGENT ✓

IoT to turn intelligent by harnessing insights from actionable data uploaded to the cloud

MAJOR LANDSCAPE CHANGES IN THE WORLD OF PAYMENTS ✓

Cleaner cryptocurrencies and digital blockchain technology for industries to increase transparency

END-TO-END SERVICE DISRUPTION GOES BEYOND UBER AND AIRBNB ✓

End-to-end consumer experiences using a fusion of software and labour to penetrate consumption spend

CONTINUED EMERGENCE OF ONE-STOP SHOPS IN AD-TECH ✓

Consolidation as larger players diversify into digital advertising segments and acquire pure-play ad-tech

STRONG WAVE OF TECHNOLOGY & PRODUCT EXITS ✓

M&A led by large players targeting consumer experience, electronics, one-stop-shop digital tools

✓ NEW MEDIA OUTLETS TAKING-OFF

New media brands producing engaging content in various delivery formats to attract mass audiences

✗ SAAS ADOPTION PERMEATES THROUGHOUT THE ENTERPRISE

Increased adoption of cloud SaaS enterprise applications to increase productivity and efficiency

✗ 3D PRINTING MOVES FROM PROTOTYPING TO END-PRODUCTS

To enter larger, less price-sensitive industries where products are lighter, versatile and durable

✓ RETURNED FOCUS ON CUSTOMER LONG-TERM VALUE IN MOBILE GAMING

Gaming companies target user retention with realistic graphics, culturalisation and community management

✓ COMPREHENSIVE CYBERSECURITY PROTECTION TO BECOME THE NORM

Big data security options, and multi-factor and biometric authentication to permeate consumer apps

2016

VIRTUAL REALITY BECOMES REALITY ✓

Virtual reality to revolutionise media, sports, gaming, entertainment, and education

AUTOMOTIVE INDUSTRY RIPE FOR INNOVATION ✓

New car operating systems to spur growth, dominated by third-party software and technology players

ALTERNATIVE LENDING CONTINUES TO SHINE IN FINANCIAL TECH SECTOR ✗

From early innovation in Fintech for mobile payments and cryptocurrencies, to alternative lending

DIGITAL VIDEO BECOMES MORE MEASURED TO KEEP GROWING UP ✓

To be the largest video format; tech/media-focused platforms to adjust to capture video audience

DRONES TO FLY INTO HEADWINDS OF UNCERTAINTY ✓

Promise of drones undeniable, but drones functioning responsibly at mass scale to remain unproven

✓ 'QUANTIFIED SELF' TRANSITIONS FROM NICHE TO MAINSTREAM

Hardware and software startups to create products and services to track vital health information

✓ GAMING GIANTS FORTIFY POSITIONS, GOBBLING UP CHALLENGERS

Consolidation to continue and smaller independent developers to build their user base until acquired

✓ DESKLESS WORKERS AT FOREFRONT IN ENTERPRISE MOBILITY SHIFT

Seismic technology paradigm shifts in recent years, leading to growth in enterprise mobile app companies

✗ CYBERSECURITY CONTINUES SOUL SEARCHING

Advanced cybersecurity solutions for the enterprise to become ubiquitous and a 'must have'

✓ TECH UNICORN HUNTING NOW IN SEASON

Some to lose 'mythical' status as growth slows, fundamentals weaken & unrealistic expectations rise

## 2017

## THE NEXT GENERATION OF AI ✓

AI has made waves since Alpha Go toppled Lee Sedol, 18x world Go Champion; high investment, it's staying

## ✓ CORDLESS CONTENT ANYWHERE AND EVERYWHERE

Millennials leading change in how media is consumed; cable networks fight the rise of over-the-top services

## E-SPORTS TAKES CENTRE STAGE ✓

Rapid growth of e-sports to continue, becoming a billion-dollar industry driven by huge fan base

## ✗ FINTECH SHIFTING TECTONIC PLATES

Traditional financial institutions to disrupt themselves to stem the impact of 'banks 2.0'

## THE DAWN OF VR/AR CONTENT ✗

With VR/AR at hype cycle peak and hardware ahead of content, software to drive next platform

## ✓ DRIVERLESS CARS STILL REQUIRE HUMAN DIRECTION

As cars are more connected, large tech players to enter market

## SOCIAL MEDIA TRANSFORMATION ✓

In a flat world of consumer technologies, Western and Asian social media giants to offer similar features

## ✓ SAAS SOFTWARE REIGNING SUPREME

Mobile workforce has led to mass adoption of SaaS. Fragmented market to see some consolidation

## TECH IPOs SET FOR TAKE OFF ✗

Global uncertainties have hampered performance for IPO markets, but these to rebound in the coming year

## ✓ YEAR OF THE EUROPEAN DECACORN

European unicorns to continue demonstrating resilience versus Asian and US counterparts

## 2018

## AN UNSEASY FUTURE FOR POLITICS AND TECH ✓

Tech firms to come under scrutiny for content allowed on their platforms with specific regard for politics

## ✓ INTERNATIONAL LABOUR ARBITRAGE FLOURISHES

Companies to abandon traditional tech hubs in favour of smaller and up-and-coming places

## TRANSLATION TECHNOLOGY TAKES HOLD ✗

Translation technology to enjoy widespread consumer adoption due to advances in machine learning

## ✓ THE UNLIKELY COMBACK OF THE SOFTWARE SUITE

Companies to spend large amounts on IT platforms to aid their digital transformation efforts

## MOBILE TRUMPS TV IN CHINA ✓

Mobile phone usage to overtake TV consumption

## ✓ CYBER SECURITY EXPOSURE AND ADOPTION

There will be widespread consumer adoption of digital security in light of hackings in 2017

## OVER AND OUT EMAIL ✗

Information workplace communication tools to overtake email, YoY growth in corp email to cease

## ✗ INDUSTRY 4.0

Factories to embrace artificial intelligence and robotics, spurring the fourth industrial revolution

## REGULATORS RULE ON BOOM AND BUST OF ICOs ✓

Regulators to look at booming ICO market and create definitive guidelines and regulations for the space

## ✓ AUGMENTED REALITY ADAPTS FOR EARLY ADOPTION

AR to enjoy a rapid increase in consumer adoption due to improvements in technology

2019

DIGITAL BANKING CONTINUES TO RISE ✓

Consumer adoption of digital banking tools as digital transactions continue to increase YoY

✓ APP DISTRIBUTION MOVING AWAY FROM APPLE AND GOOGLE

Apple and Google to see widespread backlash from developers fed up with their commission fees

EMPLOYEE ENGAGEMENT GOES HIGH TECH ✓

HR to embrace AI and data analytics to make capital management more efficient

✓ RETAIL TECHNOLOGY GETS SMARTER

Traditional retail to embrace innovative technologies to usher in the new age of retail

ARTIFICIAL INTELLIGENCE IS THE END OF REPETITION, NOT LIFE ✓

AI to improve working conditions and create more flexible ways of working

✓ CONSUMER SUBSCRIPTION SET TO ECLIPSE ADVERTISING

Subscription models win versus traditional advertising as concerns of data misuse continue to mount

LAST MILE DELIVERY GOING THE DISTANCE ✓

More retailers to focus on improving last mile delivery solutions to keep pace with vendors like Amazon

✓ A BREAK-UP OF AN ADVERTISING DUOPOLY

Brands to break up large advertising hold of Google and Facebook with own end-to-end services

END OF THE BOYS CLUB ✗

Corporate initiatives for gender balance through improvements in accessibility to female entrants

✗ CRYPTOCURRENCY WILL GROW UP

Institutional capital to flow to cryptocurrencies as blockchain activity continues to increase

2020

THE WAR IN STREAMING FILM AND VIDEO ESCALATING TO A FRENZY ✓

Consumers using multi-platform for premium content; large incumbents offering bundled premium services

✗ RELATIONAL DATABASES MAKE WAY FOR DATA LAKES

Data lakes clearly demonstrating supremacy over relational databases and other legacy products

VERTICALISED AI SOLUTIONS TO SOLVE REAL BUSINESS CHALLENGES ✓

Until AI models can integrate into existing systems / architecture, purpose-built AI tools to solve needs

✓ AI/ML SHOWING QUANTIFIABLE RESULTS IN MARKETING

Adoption of AI technology to more accurately target consumers and improve ROI is set to continue

APPLE A13 BIONIC SETS THE PRECEDENT FOR ON-DEVICE AI / ML ✓

Apple rules computing power and graphical capabilities, but the competitive gap has narrowed

✓ GAMING EMBRACES THE ERA OF SUBSCRIPTION AND STREAMING

Streaming and subscriptions to become the default way games are consumed and purchased

CORPORATE SOCIAL RESPONSIBILITY TAKES CENTRE STAGE ✓

Fast growth for CSR software, boosted by increasing awareness and greater adoption of CSR initiatives

✓ 5G LANDGRAB: THE RACE FOR COMMERCIAL DEPLOYMENT OF 5G

5G touches all of the communication ecosystem, and devices and networks are racing to lead

THE EDGE OF TOMORROW ✓

Importance of running data-intensive processes on devices, with significant business outcomes

✓ EVERYTHING AS A SERVICE

The benefits of an as-a-service model are clear and becoming widely adopted

## 2021

## EDUCATION IN THE 21ST CENTURY ✓

digital learning should continue to surge given the format's clear benefits

## ✓ NEW PATIENT DOCTOR RELATIONSHIP

Many are benefitting from tech-enabled healthcare worldwide and we expect continued collaborations

## 'I WANT IT NOW' E-COMMERCE ✓

Consumer sentiment proves that the 'I want it now' mindset is going to be a permanent commerce fixture

## ✓ THE NEXT SOCIAL NETWORK

The world is connected through a growing number of platforms and devices; more interactions are virtual

## CONSUMERS TAKING CONTROL OF PRIVACY ✗

Products offering privacy controls are a differentiator for tech companies and the new consumer standard

## ✓ SURVIVAL OF THE FITTEST

Digital fitness, a new star in the CSS ecosystem, is here to stay as consumers embrace at-home fitness

## CASH IS NO LONGER KING ✓

No longer just for techies, digital wallets and payments are now mainstream

## ✗ THE FUTURE OF WORK

Employers are rethinking the future of the office with the ever-increasing reliance on collaboration tools

## MARTECH ALL-IN ON CUSTOMER EXPERIENCE ✓

the convergence of marketing, customer experience and cloud communications is full speed ahead

## ✓ EPIC'S ULTIMATE BATTLE ROYALE... WITH APPLE

Apple to continue adapting its app developer approach as more challenge its ecosystem leverage



# Methodology

This report is based on the expert insights of GP Bullhound’s worldwide team alongside detailed analysis of investment trends across the global technology landscape. It is intended to provide our predictions for the digital economy in 2023.

Each year, we present a transparent assessment of our predictions from the previous report to maintain a high level of scrutiny on our own research. Conceptually predicting tech of the distant future is in many ways simpler than predicting near-term advancements, but our challenge is identifying which technologies will see the greatest progress and market adoption in the coming 12 months.

Historically, we have highlighted significant trends standing the test of time; e.g. our predictions for IOT, wearables and collaboration tech, as well as critical trends in cybersecurity, cloud and edge computing. Many will continue to evolve, eventually forming the foundation for future tech in years to come.

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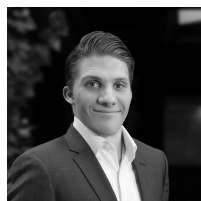
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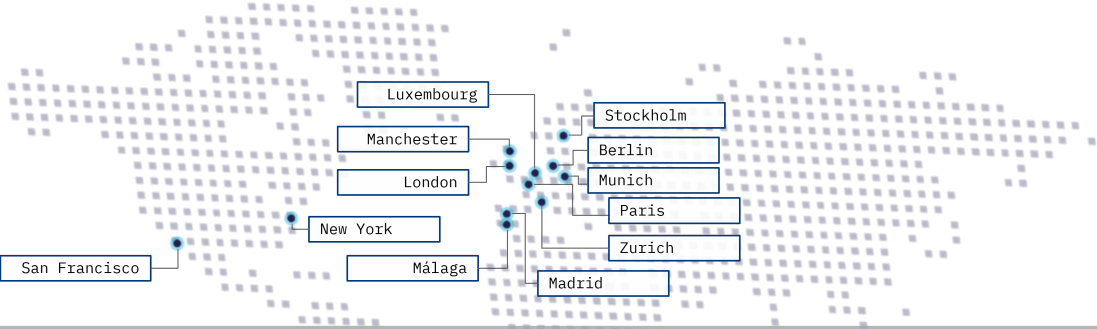


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# About GP Bullhound

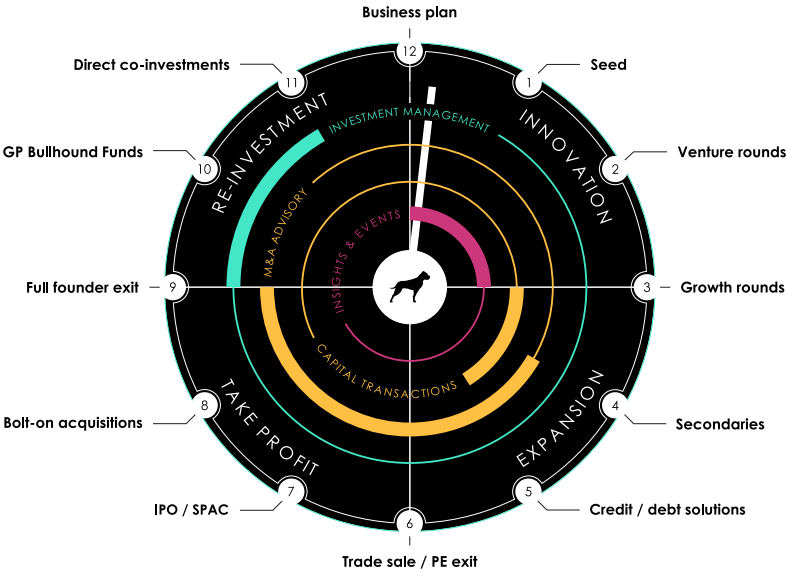
GP Bullhound is a leading technology advisory and investment firm, providing transaction advice and capital to the world's best entrepreneurs and founders. Founded in 1999 in London and Menlo Park, the firm has 12 offices spanning the globe. For more information, please visit [www.gpbullhound.com](http://www.gpbullhound.com).



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1999	180+	12
SUCCESSFUL TRANSACTIONS	TRANSACTION VALUE ADVISED ON	AUM ACROSS GP BULLHOUND MANAGED FUNDS
640+	\$39bn+	\$1bn+

## GP BULLHOUND'S ENTREPRENEUR CLOCK

GP Bullhound partners with entrepreneurs throughout their founding journey, supporting them with advisory, capital, insights and access to our global network.



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