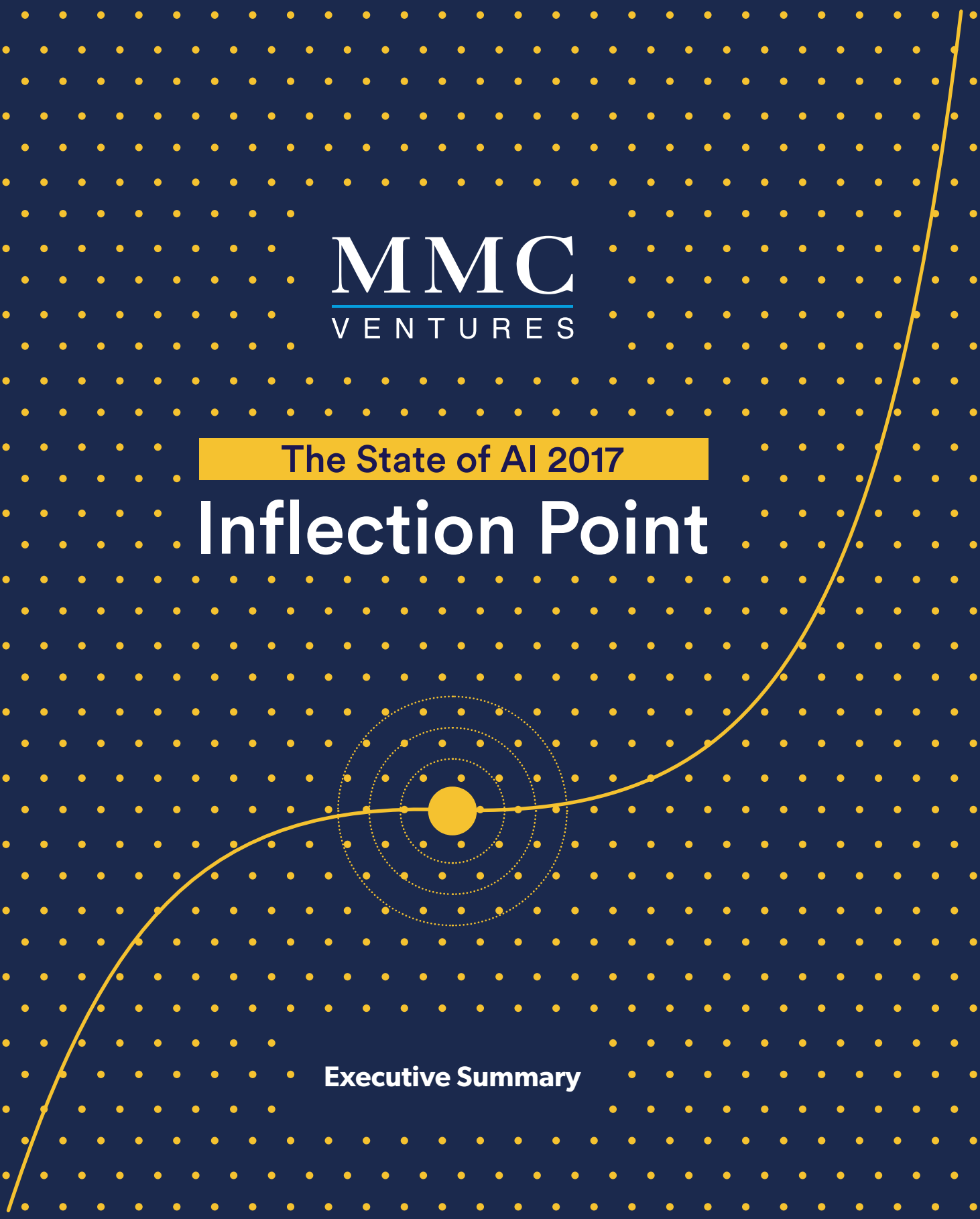
MMC VENTURES

The State of AI 2017

Inflection Point



Executive Summary

in association with

Numis

MMC Ventures

Founded in 2000, MMC Ventures is a research-driven venture capital firm investing in high-growth technology businesses. MMC has backed more than 50 enterprise software and consumer internet companies that have the potential to change the future of financial services, the workplace and retail.

MMC invests on behalf of private and institutional investors. MMC has over £200 million under management and is investing approximately £25 million annually.

MMC's portfolio includes: Appear Here, Bloom & Wild, CloudSense, Elder, Gousto, Interactive Investor, Masabi, NewVoiceMedia, Signal Media, SafeGuard, Sky-Futures, Small World FS and Tyres on the Drive.

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Numis

Numis is the UK's leading mid market investment bank with a focus on high growth companies both in the listed and unlisted equity markets. Numis has the no. 1 rated equity research team, the leading market share in UK equity issuance and the most UK listed corporate clients, at 200, of any investment bank. In 2015, Numis formalised its efforts in the unlisted market with the formation of its Venture Broking team and its investment in Crowdcube, the largest UK investor in seed and stage A companies.

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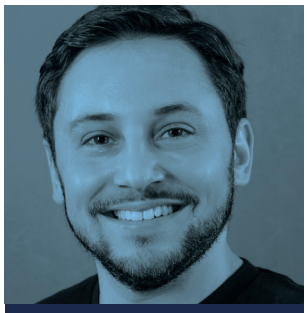
Executive Summary

The State of AI 2017: Inflection Point



David Kelnar
Report author

Investment Director & Head of Research

MMC Ventures

Artificial Intelligence (AI) has been described as "the ultimate breakthrough technology" (Satya Nadella, Microsoft). Five of the world's ten most valuable companies – Alphabet (Google), Amazon, Apple, Facebook and Microsoft – are repositioning to become AI-first organisations. While the last ten years have been about building a world that is mobile-first, "in the next ten years, we will shift to a world that is AI-first." (Sundar Pichai, Google).

While hype around AI is at a peak, and some expectations may exceed results in the short term, we believe AI represents a paradigm shift in technology that warrants the attention it is receiving. In 2017 AI reached an inflection point, driven by milestones in investment, capability, entrepreneurship and adoption. The implications for consumers, companies and society will be profound.

Our inaugural State of AI report for 2017 is intended to inform and empower corporate executives, entrepreneurs and investors. While accessible and jargon-free, it draws on new data and over 400 discussions with ecosystem participants to go beyond the hype and explain the reality of AI today, what is to come and how to take advantage. Every chapter includes actionable recommendations for executives, entrepreneurs and investors.

In 2017 AI reached an inflection point, driven by milestones in investment, capability, entrepreneurship and adoption.

In Part 1, we provide an accessible introduction to AI for the non-specialist.

- We explain how AI is a way for software to perform difficult tasks more effectively, by learning through practice instead of following rules.
- We describe why AI is important. For the first time, traditionally human capabilities can be undertaken in software efficiently, inexpensively and at scale.
- AI capability has reached an inflection point. We explain why, after seven false dawns since the 1950s, AI technology is coming of age.

In Part 2, we explain the applications, implications and adoption of AI.

- AI has numerous, tangible use cases. We highlight 31 across eight sectors and highlight why some sectors, such as financial services, will be affected more than others.
- We explain the profound implications of AI. AI will cause shifts in sector value chains, require new competencies from companies, change companies' competitive positioning, disrupt business models and accelerate cycles of innovation. We also explore AI's potential benefits and harms to society, from improved health to risks of job displacement and increased conflict.
- The adoption of AI has reached an inflection point, moving from innovators and early adopters to the early mainstream. We describe buyers' awareness, understanding and spending intentions regarding AI, highlight sectors leading AI adoption and identify which will be next. We also explain the dynamics of corporate AI adoption. How are companies deploying AI, who is making the decisions and what are the key inhibitors?

We draw on new data and 400 discussions with ecosystem participants to go beyond the hype and explain the reality of AI today, what is to come and how to take advantage.

In Part 3, we explore the ecosystem of early stage AI companies in the UK.

- We map 400 innovative, early stage AI software companies in the UK and highlight key dynamics. AI entrepreneurship is thriving – a new AI company is founded every five days – but focus is uneven, with areas of competition and opportunity. Nearly two thirds of companies are at the earliest stages of their journeys, and their path to monetisation can be longer. We also highlight 11 of the UK's leading early stage AI companies.
- We explore UK AI in a global context. UK AI startups comprise nearly half of the European total, and UK companies are less embryonic than their European counterparts. UK entrepreneurs are embracing AI; a higher proportion of startups in the UK focus on AI than in Europe or even the US.
- Capital dynamics for AI startups are unusual. We discover that investments into early stage AI firms are 20%-50% larger than average and explain why.
- We hear from 11 of the UK's leading AI entrepreneurs. They explain how AI will impact the future, how buyers can maximise value when engaging with startups, the biggest challenges they face when developing AI, and the key success factors for AI entrepreneurship.

In Part 4, we explain how investors can identify promising early stage AI companies.

- The AI paradigm shift presents opportunities to invest in disruptive early stage software companies as well as public companies developing competitive advantage. We are entering a second wave of AI investment, with capital being allocated to developers of vertical applications.
- We provide an investment framework that describes success factors for early stage applied AI companies. Spanning value potential, value realisation and defensibility, the 16 factors provide a guide for investing in AI and a framework for early stage companies to assess their strengths and challenges.

In the next ten years, we will shift to a world that is AI-first.

Sundar Pichai, Google

At MMC Ventures, AI is a core area of research, conviction and investment. In the last 12 months we've made eight investments, comprising 54% of the capital we've invested in that time, into some of the UK's most promising AI companies. If you're an early stage AI company, get in touch to see if we can accelerate your journey.

Previous industrial revolutions stemmed from the ability to create or move power, goods or information. Today, as we enter the fourth industrial revolution, value creation lies in the processing of information. AI's ability to process information more intelligently will create benefits both humble and historic. Welcome to the end of the beginning.

"At Numis, we recognise the potential of AI and other transformative technologies. In 2015 we formed our Venture Broking team to engage with high growth private UK companies and help the next generation of leading companies leverage our Number 1-rated public market research and 200 corporate broking relationships." **Nick James** Technology and Venture Research, Numis

Summary and recommendations

Part 1: An introduction to AI

1. What is AI?

- Artificial Intelligence ('AI') is a general term that refers to hardware or software that exhibit behaviour which appears intelligent.
- Basic AI has existed since the 1950s, via rules-based programs that display rudimentary intelligence in limited contexts.
- Rules-based systems are limited. Many real-world challenges, from making medical diagnoses to recognising objects in images, are too complex or subtle to be solved by programs that follow sets of rules written by people.
- Excitement regarding modern AI relates to a set of techniques called machine learning, where advances have been rapid and significant. Machine learning is a sub-set of AI.
- Machine learning enables programs to learn through training, instead of being programmed with rules. By processing training data, machine learning systems provide results that improve with experience.
- Machine learning can be applied to a wide variety of prediction and optimisation challenges, from determining the probability of a credit card transaction being fraudulent to predicting when an industrial asset is likely to fail.
- Deep learning is a subset of machine learning that is delivering breakthrough results in fields including computer vision and language.
- Deep learning emulates the way animals' brains learn subtle tasks – it models the brain, not the world. Networks of artificial neurons process input data to extract features and optimise variables relevant to a problem, with results improving through training.

Recommendations

Executives

» Familiarise yourself with the concepts of rules-based software, machine learning and deep learning.
» Recognise that machine learning represents a paradigm shift in software development that offers new possibilities and will impact your organisation.

Entrepreneurs

» Explore the concepts of machine learning and deep learning, the benefits they offer, and how they are being applied to solve problems in a range of sectors (Chapter 4).

Investors

» Ensure leaders at existing portfolio companies are familiar with the concepts of machine learning and deep learning, given their importance.
» Familiarise yourself with different approaches to machine learning, including random forests, Bayesian networks, support vector machines and deep learning, to differentiate between companies deploying meaningful machine learning and others.

Machine learning enables programs to learn by training, instead of being programmed with rules.

2. Why is AI important?

- Increasingly, AI enables traditionally human capabilities – understanding, reasoning, planning, communication and perception – to be undertaken by software effectively, efficiently and at low cost.
- General analytical tasks, including finding patterns in data, that have been performed by software for many years can also be performed more effectively using AI.
- New possibilities enabled by AI include: autonomous vehicles; automated medical diagnosis; voice input; intelligent agents; automated data synthesis; and enhanced decision-making.

Recommendations

Executives

» Explore the new possibilities enabled by AI to appreciate the importance AI will have in the decade ahead.
» Familiarise yourself with the five fields of AI research we describe. Identify core aspects of your company's value proposition – for example, planning or communication – to which AI could be relevant.
» The new possibilities enabled by AI will have secondary consequences. Read Chapter 5 to understand the implications of AI.

Entrepreneurs

» Explore opportunities, within your own organisation and for customers, to apply progress in the five fields of AI research we describe to solve intractable problems and ease difficult ones.
» Given the importance AI will have in the decade ahead, explore best practices for developing an AI capability (Chapter 9).

Investors

» Recognise that although AI is hyped, the possibilities it enables are significant.
» Seek companies that are using AI to fulfil new possibilities. The paradigm shift to AI will create large new winners.

3. Why is AI coming of age?

- After seven false dawns since its inception in 1956, AI technology has come of age.
- The capabilities of AI systems have reached a tipping point due to the confluence of seven factors: new algorithms; the availability of training data; specialised hardware; cloud AI services; open source software resources; greater investment; and increased interest.
- Together, these developments have transformed results while slashing the difficulty, time and cost of developing and deploying AI.

Recommendations

Executives

» Be aware that AI technology has come of age and will be a key enabler, and potential threat, in the coming decade.
» Familiarise yourself with the seven enablers of AI, the applications of AI (Chapter 4), and the implications of AI (Chapter 5) to lead and contribute to AI initiatives in your organisation.

After seven false dawns since its inception in 1956, AI technology has come of age.

Entrepreneurs

» AI technology can deliver tangible benefits today. Look for opportunities to incorporate AI in your software, where appropriate, whether or not you are an 'AI company'.

» Explore AI infrastructure and services available from Google, Amazon, IBM and Microsoft, as well as open source machine learning libraries. They enable experimentation with AI at speed and low cost.

Investors

» AI will be a powerful tool for existing portfolio companies – and a threat. Evaluate whether portfolio companies are embracing AI as a means of competitive advantage.

» With AI technology at a tipping point, seek opportunities to invest directly or indirectly in companies taking advantage of AI.

Part 2: The applications, implications and adoption of AI

4. The applications of AI

- AI has numerous, tangible use cases today that are enabling corporate revenue growth and cost savings.
- The capabilities of AI – its power to incorporate broader data sets into analyses, identify concepts and patterns in data more effectively, and enable human-to-machine conversation – will have application in all sectors and numerous business processes.
- Applications will be most numerous in sectors in which a large proportion of time is spent collecting and synthesising data: financial services; retail and trade; professional services; manufacturing; and healthcare. Applications of AI-powered computer vision will be particularly significant in the transport sector.
- Use cases are proliferating as AI's potential is understood. We describe 31 core use cases across eight sectors: asset management; healthcare; insurance; law & compliance; manufacturing; retail; transport; and utilities.
- We illustrate how AI can be applied to multiple processes within a business function (human resources).

Recommendations

Executives

» Examine AI use cases in a range of sectors to familiarise yourself with the technical capabilities of AI – from incorporating additional data sets into analyses to identifying patterns in data more effectively and understanding written and spoken language.

» Assess the extent to which time is spent collating and processing data in your industry. AI's impact will be greatest in sectors where data synthesis and processing are core.

» Identify business processes in your sector that could be improved, automated or reinvented using AI.

Entrepreneurs

» AI offers new opportunities for disruption in sectors ranging from manufacturing to healthcare. Identify business processes ripe for improvement or reinvention through AI, particularly in sectors in which data synthesis or processing are extensive.

» AI has numerous capabilities, from multi-variate analysis to natural language processing. Identify opportunities to use multiple aspects of AI, both within your company and for buyers.

Investors

» Evaluate opportunities and threats to portfolio companies from the many applications of AI.

» With AI poised to impact multiple sectors, develop a framework to identify preferred sectors for investment. Considerations are likely to include fundamentals (scope for structural change in a sector) and pragmatic factors (sector expertise).

AI's value can be abstracted to four benefits: innovation, efficacy, velocity and scalability.

5. The implications of AI

- AI's value can be abstracted to four benefits: innovation (new products and services); efficacy (the performance of tasks more effectively); velocity (the completion of tasks more quickly); and scalability (the extension of capabilities to new market participants).
- By automating capabilities previously delivered by human professionals, AI will reduce the cost and increase the scalability of services, significantly broadening participation in select markets.
- In multiple sectors AI will change where, and the extent to which, profits are made within a value chain.
- New commercial success factors will determine a company's ability to be successful in the age of AI.
- New leaders, followers, laggards and disruptors will emerge as the paradigm shift to AI causes significant shifts in companies' competitive positioning.
- AI, growth of 'x-as-a-service' consumption, and subscription payment models will obviate select business models and offer new possibilities in sectors including transport, insurance and healthcare.
- As AI gains adoption, the skills that companies seek, and companies' organisational structure, will change.
- By reducing the time required for process-driven work, AI will accelerate the pace of business and innovation. This may compress cycles of creative destruction, reducing the period of time for which all but a select number of super-competitors maintain value.
- AI will provide benefits to society including improved health, broader access to services and more personalised experiences. It will also present risks and dilemmas, including issues of job displacement, bias, conflict and privacy.

Recommendations

Executives

» Evaluate how the benefits unleashed by AI – innovation, efficacy, velocity and scalability – will impact your industry.
» Assess the shifts in your industry value chain that will occur as AI adoption grows.
» Evaluate the business model a disruptor might adopt in the age of AI, if freed from the "innovator's dilemma". What would the Netflix to your Blockbuster look like?
» Assess the extent to which your company is developing the commercial success factors, skills and organisational design required for the age of AI.
» Recognise the need for responsible stewardship. AI presents risks to society – including issues of job displacement, bias, and privacy – as well as benefits.

Entrepreneurs

» Identify opportunities to take advantage of probable shifts in sector value chains that will be caused by AI.
» Develop initiatives that will take advantage of the new market participants and business models that AI will present.
» Identify weaknesses in incumbents' competitive positioning that are likely to persist, or worsen, given their structure or strategy.

Investors

» Assess how the innovation, efficacy and scalability enabled by AI will impact your existing portfolio companies.
» Identify investment opportunities in sectors that will be transformed as a result of AI altering value chains and enabling new market participants.
» Evaluate opportunities to invest in companies structured around business models that will come of age as AI disrupts existing markets.

6. The adoption of AI

- Awareness of AI has reached an inflection point. Given media attention and vendor marketing, executives' awareness of AI is high.
- Understanding of AI among buyers is low. Technology principles, use cases and deployment methodologies are poorly understood.
- While nascent, AI adoption is 'crossing the chasm' from innovators and early adopters to the early majority. 20% of AI-aware executives say they have adopted one or more AI-related technology at scale, or in a core part of their business (McKinsey Global Institute).
- Adoption of AI will increase significantly as buyers seek to unlock value from data and avoid losing competitive advantage. 75% of executives say AI will be "actively implemented" to some degree in their organisations within three years (Economist Intelligence Unit).
- High tech, automotive and assembly, and financial service firms lead AI adoption. Spending on AI will increase most in sectors that currently lead adoption.
- Poorly articulated business cases weigh on adoption. Better articulation of ROI by AI vendors can catalyse adoption.
- While numerous pilot projects relate to chatbots, more than two thirds of buyers are deploying AI to improve decision-making and enable process automation.
- For mid-size and large companies, the C-suite is key for initiating, selecting and funding AI initiatives. In two thirds of organisations, the CTO or CIO make AI technology decisions given its cross-functional implications.
- AI deployment strategies are varied, with a mix of 'build' and buy' strategies, and in a state of flux. 'Hybrid' approaches are typical. A quarter of companies deploying AI today prefer to purchase a standalone solution.
- Lack of skills is the primary challenge for companies deploying AI. Defining an AI strategy, identifying use cases for AI, and securing funding for AI initiatives are additional difficulties.

Recommendations

Executives

» Adoption of AI is nascent but has passed a tipping point. Develop an AI strategy to avoid losing competitive advantage.
» Understanding of AI within your organisation is likely to be low. Develop initiatives to improve senior executives' understanding of AI by engaging with third-party experts.
» Engage with AI software companies that articulate tangible use cases and ROI opportunities. Seek vendors offering solutions to business problems, not slogans.
» While chatbots receive extensive attention, recognise that your peers are more likely to be deploying AI to enhance business decision-making and process automation.
» Proactively address the likely challenges to your organisation's adoption of AI: lack of skills, the absence of an AI strategy, lack of clarity regarding AI use cases, and prioritisation of funding.

Entrepreneurs

» To address buyers' caution regarding AI technology, articulate solutions to business problems and ROI opportunities, not AI technology as an end in itself.
» Recognise that buyers' understanding of AI is low, and they are likely to lack AI skills and personnel within their organisations. Become a strategic partner for customers by offering education and support.
» Offer buyers improved decision-making and process automation to align with their priorities.
» Given the importance of the C-suite in initiating and funding AI initiatives at large companies, prioritise securing senior sponsorship for your initiatives.

AI adoption is 'crossing the chasm' from innovators and early adopters to the early majority.

Investors

» AI adoption is nascent, but crossing a tipping point from early adopters to the early mainstream. Identify opportunities to invest in AI-first companies that can capitalise on increasing demand for AI.
» Understanding of AI among buyers is limited, and C-level sponsorship may be required for deployments in large companies. Given these go-to-market dynamics, evaluate management teams' ability to articulate to buyers tangible solutions to business problems, and their C-level account management skills.
» Prospects that provide solutions aligned with buyers' priorities – improved decision-making and process automation – may be most attractive.

7. The growth of AI services

- For every £1 spent on enterprise software, £3 is spent on IT services – consulting, system integration and outsourcing.
- IT service companies involved in AI – 'AI service' companies – assist buyers with AI initiatives ranging from reviews of AI strategy to chatbot implementations.
- A focal point for AI service activity is supporting buyers' rollout of analytics software that incorporates AI.
- As mid-size companies and enterprises experiment with AI, most plan to involve a third-party AI service provider, fuelling growth in the AI services market.
- While early and modestly-sized today, the AI services market is poised for rapid growth. As buyers use AI to gain value from historic investments in data collection, we expect AI services to offer a multi-billion-dollar market opportunity by 2020.
- 'Convergence' and consolidation are reshaping the market. Software companies are developing service capabilities to support solution-selling, while service companies are developing and acquiring software assets to access client opportunities and reduce cost to serve.
- The delivery model for AI services is changing. Led by mid-market buyers, we expect a mix shift from traditional projects of fixed scope, to managed services delivered via the cloud, paid for on an ongoing basis.
- Competition for AI services work above the mid-market will be fierce. For large deals, global service firms will leverage their data and data science personnel. Mid-size deals will represent a second battleground, with mid-tier vendors competing with each other and vendors from above and below. For smaller deals, select boutiques offer buyers the right success factors – accessibility, flexibility and low cost – to achieve scale and mature into mid-size vendors.
- Specialisation is becoming a key success factor for competitive differentiation and defensibility. Increasingly, individual AI service providers are focusing their competencies on specific verticals, business functions or business sub-functions.

Recommendations

Executives

» Evaluate opportunities to catalyse time to value in AI by engaging with AI service providers.
» Effective service providers focus on solving business problems, not AI technology for its own sake. Engage with companies that describe clearly how they can improve your key performance indicators, using technology as an enabler.
» Managed service deployments are coming of age. For AI-powered analytics, evaluate whether a third-party solution delivered via the cloud could be suitable.
» Competition for large contracts is fierce. Negotiate robustly with multiple suppliers to maximise value.

Entrepreneurs

» Consider offering a managed service capability to take advantage of evolving buyer behaviour.
» Evaluate a specialisation strategy to develop data network effects and competitive differentiation in a competitive market.
» Proactively explore M&A to avoid being left sub-scale in a consolidating market.

Investors

» Evaluate opportunities for investment in AI services, given potential for strong growth in the market.
» Be cognisant of competitive dynamics and the risk of commoditisation in the market.
» Evaluate whether encouraging portfolio companies to specialise in certain sectors or business functions could support their defensibility.
» Given extensive market consolidation, create and identify opportunities to achieve scale through mergers and realise value through trade sales.

Part 3: Early stage companies in the UK

8. The dynamics of UK AI

- There are nearly 400 independent, early stage software companies in the UK with AI at the heart of their value proposition.
- AI entrepreneurship is thriving. The number of AI companies founded annually in the UK has doubled since 2014. A new UK AI company has been founded every five days, on average, since 2014.
- Over 80% of UK AI startups are vertically-focused business-to-business (B2B) suppliers. Few companies sell direct-to-consumer given the difficulty of acquiring training data from a 'cold start' and the deployment of AI by global consumer technology companies.
- Entrepreneurial activity in AI is unevenly spread. More UK AI companies (one in seven) address the marketing & advertising function than any other. For companies with a sector focus, finance dominates. In select sectors (manufacturing) and business functions (finance), activity appears modest relative to market opportunities.
- Few (one in ten) UK AI startups develop core AI technologies applicable to a wide variety of markets. Among these companies, most focus on research into autonomous systems.
- UK AI companies comprise nearly half the European total. AI is well represented in the UK, with a slightly higher proportion of startups focused on AI than in Europe (excluding the UK) or the US.
- UK AI companies are nascent. Two thirds of companies are in the earliest stages of their journey, with Seed or Angel funding. The sector, however, is maturing rapidly. UK companies are less embryonic than their European counterparts.
- Over 40% of companies we meet have yet to receive recurring revenue. The journey to monetisation for AI companies can be longer given technical challenges, long sales cycles in a B2B-driven market, and client integration requirements.
- Globally, investments into early stage AI firms are typically 20%-50% larger than capital infusions into general software companies of comparable stages.
- Staging of capital into UK AI companies can be atypical. One in three growth stage companies raised a significantly larger post-Angel rounds than is typical.
- We feature 11 leading B2B and B2C AI companies across a range of sectors to illustrate how early stage companies are using AI to address opportunities.

Recommendations

Executives

» Explore the rich ecosystem of early stage AI companies in the UK. Most will be B2B vendors and some will offer market-leading solutions to challenges in your organisation.
» Identify potential suppliers and partners in your sector, and in key business functions.
» Anticipate that many AI companies will be nascent, which may limit their ability to provide customer references and extensive resources.

Entrepreneurs

» Identify potential competitors and partners using our market map.
» AI entrepreneurship has accelerated, increasing the number of market entrants and competition. Prioritise customer acquisition in an increasingly crowded market.
» Implement technologies that can reduce the cost and time required to ingest data, process data and deploy your product at client sites, to overcome challenging go-to-market dynamics that are common for early stage AI companies.
» Recognise that capital raises for early stage AI companies are typically larger than for non-AI software companies. Capitalise your business adequately to create and maintain competitive advantage.

Investors

» With some segments over-supplied by startups and others under-served, identify attractive pockets of opportunity aligned with themes on which you focus.
» With investments into AI companies larger than average, valuations can be elevated. Consider whether or not you are willing to 'overpay' to access opportunities.
» A significant proportion of AI companies have yet to achieve recurring revenue. Further, a sizeable minority of Angel stage companies are raising larger second rounds than is typical. Evaluate whether you are willing to invest in pre- or low revenue companies to secure access.

9. AI entrepreneurs' perspectives

- Entrepreneurs anticipate a new, AI-driven future. AI will improve decision-making and increase automation in every sector and most businesses functions, with profound effects.
- Early stage companies offer buyers innovation and flexibility. Startups enable established companies to harness new technologies, and buyers can shape evolving propositions from early stage companies to their bespoke needs.
- When engaging with early stage companies, buyers can maximise value by adopting a collaborative mindset and simplifying procurement processes.
- Successful AI entrepreneurs deliver solutions, not technology. AI companies should focus on solving a business problem, not on technology as an end in itself. Identifying repetitive, data-intensive problems well suited to AI enables companies to attract clients and address inefficiencies in their own organisations.
- Access to data, scarce talent and difficult productisation processes are key challenges for early stage AI companies. Companies can mitigate these challenges, respectively, by implementing data acquisition strategies early in their journey, building relationships with academic institutions and research communities, and developing feedback loops between development teams and customer success functions.
- Key success factors for AI entrepreneurship are: customer focus; continuous technological evolution; development of data access strategies; long-term planning; and perseverance in this demanding field.

Recommendations

Executives

» Entrepreneurs have a valuable understanding of the AI-enabled future. Engage with them to improve your organisation's understanding of AI, and how its potential could unlock strategic value for your organisation in the long term.
» Early stage companies can be powerful enablers of innovation. Explore opportunities to collaborate with early stage companies by creating horizontal innovation departments and engaging in proof-of-concept projects.
» To maximise value from early stage companies, consider a simplified procurement process, adopt a collaborative mindset, provide continual feedback and expect capabilities to evolve over time.

Entrepreneurs

» AI has the potential to create value in most business processes and can be a powerful tool for all early stage companies – not just 'AI companies'. Identify opportunities to apply AI to business problems and develop an AI strategy to avoid losing competitive advantage.
» To attract customers and investors, articulate solutions to business problems rather than AI technology as an end in itself.
» Given their importance and difficulty, from the inception of your company develop strategies for data access, AI talent recruitment and productising AI. Plan for the long term.
» View AI as a capability, not a feature. Anticipate ongoing development and resource the initiative accordingly.
» AI can improve your own company's processes as well as customers'. Look within your company for opportunities to automate manual processes and free personnel to focus on client activity.

Investors

» Identify founders who combine a profound vision of AI's ability to unlock value with the ability to articulate to buyers down-to-earth solutions that address business challenges.
» Prioritise evaluating AI companies' access to data and ability to attract AI talent, given the importance of these factors to AI companies' success.
» Evaluate the extent to which leadership teams have the necessary domain expertise and account management capabilities to engage with large buyers, given demanding go-to-market dynamics.

Part 4: Investing in AI

10. An investment framework for AI

- The AI paradigm shift presents opportunities to invest in disruptive early stage software companies as well as public companies developing competitive advantage.
- AI acquisitions have increased significantly, averaging ten per month in 2017 (CB Insights).
- A first wave of acquisitions focused on core AI technologies – 'deep-tech' AI research or AI-powered computer vision and language capabilities with cross-sector utility.
- We are entering a second wave of AI investment and exits. Capital is being allocated to developers of vertical applications.
- We provide our AI Investment Framework, which identifies 16 success factors for early stage, applied AI companies. We divide the 16 factors into three categories: value potential, value realisation and defensibility. Applying the success factors helps highlight attractive investment opportunities.
- Keys to value potential are: scope for value release and disruption; unattractive alternatives; suitability of AI to a business problem; a path to acceptable technical performance; and suitability of available data.
- Keys to value realisation are: management commerciality; quantifiability of ROI; buyer readiness; benign regulation; and deployment scalability.
- Keys to defensibility are: distance from AI monoliths' offerings; domain complexity; data network effects; proprietary algorithms; attractive AI talent dynamics; and strong capitalisation.

AI acquisitions have increased significantly, averaging ten per month in 2017.

CB Insights

Recommendations

Executives

- Apply the 16 factors to assess your own organisation's AI capabilities.
- Use the 16 factors to identify strengths and weaknesses, and support due diligence, of AI partners and potential acquisition opportunities.

Entrepreneurs

- Evaluate your company's strengths and weaknesses against the 16 factors.
- Highlight to buyers and investors, as appropriate, your company's strengths in key criteria including value release, management commerciality, quantifiability of ROI, data network effects, AI talent, vertical focus and domain expertise.
- Address headwinds to value realisation by automating deployment requirements, particularly customer data processing, and focusing early on building a capable sales organisation.
- Investors decline to invest in startups due to doubts about management commerciality and tangibility of ROI more than for any other reasons. Focus remediation and messaging on these critical issues.

Investors

- Consider developing a basket of AI-driven investments.
- Apply the 16 factors, in addition to your usual considerations, to evaluate early stage applied AI companies.
- Remain open-minded to select investment opportunities in horizontal AI providers. While rarer, and with differing dynamics to application providers, companies with world-class technology valuable to an AI platform provider can be an attractive technology or talent acquisition.
- Get in touch with us to discuss your perspective. Where do you agree, or disagree, with our thinking?

We provide our AI Investment Framework, which identifies 16 success factors for early stage, applied AI companies.

UK AI Landscape (Early stage companies)

Core Technologies

AI INFRASTRUCTURE

EARLY STAGE / GROWTH
Grakn Labs · Graphcore ★ · Hadean

ANGEL / SEED
Brytlyt · Memgraph ★ · Seldon

AUTONOMOUS SYSTEMS

EARLY STAGE / GROWTH
FiveAI · Oxbotica · Sky-Futures

ANGEL / SEED
Academy of Robotics · Accelerated Dynamics · Baro Vehicles · Drone Space AI ★ · Evolve Dynamics
Intelligent Robots ★ · Machines With Vision · Predina ★ · React AI · Robik.ai ★

COMPUTER VISION/PERCEPTION

EARLY STAGE / GROWTH
Neurence · Spectral Edge · Tractable

ANGEL / SEED
Blue Vision Labs ★ · Emteq · Visio Ingenii
Xihelm ★

OTHER

EARLY STAGE / GROWTH
Audio analytic · Cambridge Quantum Computing · Prowler.io ★
Mind Foundry

ANGEL / SEED
Bloom.ai · Bloomsbury AI · Mindi ★ · VividQ · Weave.ai

KEY

- B2B
- B2C
- ★ New company (since 2016)

Funding category
Angel/Seed: <$500k–$2m
Early stage/Growth: >$2m–c.$200m

Sectors

AGRICULTURE

EARLY STAGE / GROWTH

ANGEL / SEED
Dogtooth Technologies
Global Surface Intelligence · KisanHub
Hummingbird Technologies ★
Observe ★ · Optimal Labs

EDUCATION

EARLY STAGE / GROWTH
BridgeU · Century

ANGEL / SEED
Kwiziq · Oxademy ★
Synap

FINANCE

EARLY STAGE / GROWTH
Aire · Arkera · BMLL Technologies · Cleo AI · Cytora · Digital Contact · Vortexa ★

ANGEL / SEED
Abaka ★ · Acuity Trading · AlgoDynamix · Almax Analytics · Alpha I ★ · Brolly ★ · Chip ★ · DealX · EnAlgo · Financial Network Analytics · ForecastThis ★
ForwardLane · FriendlyScore · Hello Soda · Knowsis · Metafused · Multiply ★ · Oseven Telematics · Plum ★ · PriceHubble ★ · Procensus · Proportunity ★
ProvidensAI · RightIndem ★ · Silicon Investing · Spixii ★ · Torafugu Tech ★ · TradeRiser · TradeTeq ★ · TypeScore · Wluper ★ · Yedup ★ · Zenith One ★ · Zoral

FOOD & BEVERAGE

EARLY STAGE / GROWTH
Gousto · Nuritas
VITL

ANGEL / SEED
Captain ★
VideraBio ★

HEALTHCARE

EARLY STAGE / GROWTH
Babylon Health · BenevolentAI · BioBeats · BrainWaveBank
Cambridge Medical Robotics · Deontics · Desktop Genetics · Drayson Technologies
Healx · Ieso Digital Health · Kheiron ★ · Snap40 · Synthace · Your.MD

ANGEL / SEED
Aequa Science ★ · Exscientia · InnersightLabs · InsideDNA · Kaido
Kraydel ★ · LabGenius · Optellum · PetaGene ★ · Resurgo Genetics ★
Sime Diagnostics · ThinkSono ★ · Transformative ★ · Visulytix · Viz ★

INFRASTRUCTURE

EARLY STAGE / GROWTH
Li Clinithink

ANGEL / SEED
Alchera Technologies · Archangel Imaging ★
Biscuit · Calipsa ★ · Crowd Connected
Disperse.io · Green Running · Grid Edge ★
NumberEight · OpenCapacity · TravelAI

LAW

EARLY STAGE / GROWTH
Luminance

ANGEL / SEED
Cognitiv+
Eigen Technologies
ThoughtRiver

MANUFACTURING

EARLY STAGE / GROWTH
CloudNC
Senseye

ANGEL / SEED
Flexciton ★
Materialize.X ★
Thingtrax

MEDIA & ENTERTAINMENT

EARLY STAGE / GROWTH
Artomatix · Jukedeck

ANGEL / SEED
AI Music ★ · Aiva Technologies ★ · ANDi ★
Antix · DeepAR · eBlur ★ · Factmata ★
Grumgo ★ · Kompas · Pimloc ★ · Popsa ★
Skim.it · Spirit AI · Sure · Thingthing

RETAIL

EARLY STAGE / GROWTH
Cocoon · Cortexica · DigitalBridge
Emotech Ltd · Hero · Metail · Thread

ANGEL / SEED
Boldmind · Hoxton Analytics · JCC Bowers
Orpiva · Pasabi · Presence Orb · Proximus
See Fashion ★ · Third Space Auto ★
ThirdEye ★

Functions

BI & ANALYTICS

EARLY STAGE / GROWTH
Black Swan Data · Brandwatch · Import.io · Logical Glue · Massive Analytic · Peak
Rezatec · Ripjar · Satalia · Semantic Evolution · Signal Media

ANGEL / SEED
10x ★ · Airfinity · Algo Digital Solutions · Amplyfi ★ · Analytics Intelligence · Bird.i
Chorus Intelligence · Data quarks · Flumes · Gyana · Hertzian · illumr · Kite Edge ★
Krzana · LiveMetrics.io ★ · Oxford Semantic Technologies ★ · Policy Radar ★ · Reportbrain
SeeQuestor · Shouter · Simudyne · Singular Intelligence · Terrabotics

COMPLIANCE

EARLY STAGE / GROWTH
AimBrain · Callsign · Checkrecipient
Exonar · iProov · Onfido

ANGEL / SEED
Anon AI ★ · CoVi Analytics · Eyn ★
VChain Technology ★ · WaymarkTech ★

CUSTOMER SERVICE

EARLY STAGE / GROWTH
DigitalGenius · Gluru · Sentiment

ANGEL / SEED
Action.AI ★ · Enterprise Bot ★
Humley · Hutoma · rasa
Sentient Machines ★ · True AI · Velmai

CYBERSECURITY

EARLY STAGE / GROWTH
Corax · Darktrace · Encode
RepKnight

ANGEL / SEED
Alchemy Data · Barac ★
Cyberlytic · CyberSparta
Honeycomb Technologies · Trudera

FINANCE

EARLY STAGE / GROWTH
Rimilia

ANGEL / SEED
Fractal Labs

FRAUD DETECTION

EARLY STAGE / GROWTH
Featurespace
Fraugster · Ravelin
Salviol

ANGEL / SEED
Cybertonica
SixthCents

HUMAN RESOURCES

EARLY STAGE / GROWTH
Beamery · Behavox · PredictiveHire
Qlearsite · Rotageek · Saberr
ThisWay Global

ANGEL / SEED
Cyra ★ · Grad DNA · Headstart App
Human · MeVitae · Occupassion
Potentially · StatusToday · Unmind ★

IT

EARLY STAGE / GROWTH
4th Office · Aria Networks · Aurora AI · Automated Intelligence · Celaton · Diffblue ★ · Focal Point Positioning
Mettrr ★ · Rainbird Technologies · Recordsure · Redsift · Speechmatics · Sumerian · Trint

ANGEL / SEED
Ampliphae · Automorph ★ · Autto ★ · BigHand · Capito Systems · Cardinality · Context Scout · Cyanapse ★
Digital Taxonomy ★ · Fantoo · Fedr8 · Firedrop · Fraim · Intelligent Voice · jClarity · Linguamatics · Mentat Innovations
MicroBlink · Retechnica · Rossum ★ · Skipjaq · TextRazor · Thingful · Unity {Cloud}Ware ★

PROCUREMENT

EARLY STAGE / GROWTH
Matchdeck · Previse

ANGEL / SEED
keelvar · Quotable ★
VendorMach

R&D

EARLY STAGE / GROWTH
GlassAI · Patsnap · Sparrho

ANGEL / SEED
FeedStock · Iris.AI · Klydo
Wizdom ★

SALES

EARLY STAGE / GROWTH
Conversity · DueDil
GrowthIntel

ANGEL / SEED
Cognism · Drafter ★
Kluster Intelligence ★ · Netz
SalesSift · Synoptic Technologies

Function – Marketing & Advertising

ANALYTICS/OPTIMISATION

EARLY STAGE / GROWTH
Admedo · Decibel Insight · Fresh Relevance · Insider · Intent HQ · Jampp · LoopMe · Perfect Channel
Realeyes · Storystream · Twizoo

ANGEL / SEED
Advizzo · Aiden ★ · Bibblio · Carsift · Chattermill · Concured · Creative AI ★ · Crowdemotion
Crystal Apps ★ · CustomSell · FindTheRipple · Incisively · Media IQ · Mercanto ★ · Metageni · Mobile Acuity
Nudgr ★ · Phrasee · Platform360 · rais · re:infer · Sweet Pricing ★ · Swogo · TUMRA · Vaix ★ · Viewsy

AUGMENTED CONTENT

EARLY STAGE / GROWTH
Blippar

ANGEL / SEED
BoomApp · Gamar
Selerio ★ · Vyking

PURCHASE DISCOVERY/ RECOMMENDATION

EARLY STAGE / GROWTH
Visii

ANGEL / SEED

SENTIMENT ANALYSIS

EARLY STAGE / GROWTH
Echobox · TheySay

ANGEL / SEED
Adoreboard · Colourtext
DigitalMR · SentiSum

TARGETING

EARLY STAGE / GROWTH
Adbrain · Big Data for Humans · Codec · Idio
iotec · Pixoneye

ANGEL / SEED
DataSine · Deep Index ★ · Otus Labs
Permutive · Personalyze ★ · Popcorn Metrics

Sources: MMC Ventures, Beauhurst, Crunchbase, Tracxn.
Additions or corrections? Email us at insights@mmcventures.com

MMC Ventures
2 Kensington Square
London W8 5EP

mmcventures.com

Numis Securities
The London Stock Exchange Building
10 Paternoster Square
London EC4M 7LT

numis.com

Report design by
Aviary Creative
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The State of AI 2017

Inflection Point