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2018 STATE OF
IN EDUCATION
REPORT



2018 STATE OF AI IN EDUCATION REPORT

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CITATION

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EDIA

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Important Definitions to keep

in mind throughout this report

- **Artificial Intelligence (AI)**

Is the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.¹

- **Personalized Learning**

Is a method of learning that uses learning analytics to track student progress and provide supporting content if they need help. Personalized learning platforms change as students meet different benchmarks and can help those who are grasping a concept quickly move forward while supporting those who are struggling with a concept.

- **Smart Content**

Unlocks adaptive or personalized learning experiences to increase potential reuse of existing content for multiple channels. Smart content needs to be granular, context free, and enriched with high quality metadata. Using metadata, content items can be linked to a learning graph which describes the relationships between learners, content and learning objectives. Therefore, smart content enables opportunities to analyze these relationships and make predictions.

¹ Copeland, B.J., "Artificial intelligence - Encyclopedia ..." 3 May 2018, www.britannica.com/technology/artificial-intelligence. Accessed 13 June, 2018.



Letter from the Founders

In the last five years, we've seen an explosion of artificial intelligence (AI) across different industries. The sentiment behind AI has shifted from being scary to being exciting as it is becoming an integral part of our everyday lives. We all make use of some sort of AI algorithm powered device or application every single day—from robot vacuum cleaners that clean your kitchen floor to even recommended content you watch on Netflix.

AI is becoming somewhat mainstream in industries like finance, human resources, transportation, healthcare, call centers, and even retail. The stigma behind AI is slowly changing from “unattainable” or “expensive” technology that’s difficult to implement to rather positive messages like it’s “possible” and it’s “inexpensive” or relatively “easy to implement.”

In many ways, AI will enable the education industry to grow for the 21st century needs. AI will, undoubtedly, shape the path that education takes. However, we’ve witnessed firsthand that education is still adopting new technology in general at slower rate than the industries aforementioned.

This report is meant to serve as a reflection of the current state of AI in education. Our goal is not only to evaluate current trends and new insights in the world of AI, but to also emphasize the excitement and expectations surrounding AI. Over **75%** of our survey respondents are optimistic about AI and **90%** think that business will be affected by AI in the next five years.

AI has transformative power. We want the education industry to benefit from the technology the same way that other industries have. We hope that this report will encourage you to look more seriously at your technology investments as well as shed light on how AI can be beneficial for your business needs.

We understand that the world of AI can feel overwhelming right now and we want to help you navigate through it. We hope that this report provides you insight into how to better prepare for the future of AI.

If you are looking for reasons to use AI for your long-term organizational goals, please feel free to reference this report as a credential to build a case for AI in your organization.

Best of luck,
Jaeques Koeman & Roland Groen



About EDIA

EDIA education technology was founded in 2004 and based in Amsterdam, the Netherlands. In 2006 EDIA launched its first AI in education product, which used machine learning and natural language processing to curate online text sources for vocabulary training. The product won several (international) awards and is still widely used today.

The founders of EDIA envisioned that smart automation would play a significant role in the content creation and publishing industry. As modern web technologies rapidly enabled personalized learning at scale, this also revealed an urgent need for truly adaptive content. EDIA then developed 360AI, an artificial intelligence engine created specifically for education publishers. 360AI offers a set of AI capabilities which automate metadata-tagging so that content managers can search, curate, reuse and create smart content. By implementing 360AI, data-entry and administrative tasks are relieved during the publication process. Ultimately, 360AI is able to shorten time-to-market for adaptive content at lower costs.

Currently, the company is owned and led by the original founders, Jaques Koeman, CEO Co-founder and Roland Groen, CTIO and Co-founder. EDIA has a team of more than 30 talented professionals who dedicate their time to work on 360AI. For nearly 15 years, provided a wealth of experience with AI in education, EDIA now finds itself in a unique position to share those experience, the lessons learned and our insights about AI with a broader audience.

EDTECH
Est. 2004

360°
AI

Research Methods

EDIA produced this report using a variety of primary and secondary resources. To conduct primary research, we distributed a survey to c-level executives, content managers, curriculum designers, professors and other educational players across different sectors such as higher education, publishing and edtech.

We also conducted secondary research for this report. By analyzing government documents, consultancy reports, academic studies, and news reports, we were able to create a robust and holistic view on the state of AI in education. You can find those sources at the bottom of this report in our references chapter.

Executive Summary

The purpose of this report is to shed light on the state of artificial intelligence (AI) in education. Artificial intelligence has already impacted different education sectors such as publishing, higher education, K-12 and education technology. The report shows how informed the education market is about AI, how much money is currently invested in AI and if education leaders think that there are benefits to implementing AI within their industry. Further, the report highlights different set of challenges pertaining to why companies are not adopting AI right now or in the near future. The report also reveals different trends about AI that directly impact the education industry such as new global data privacy laws, blockchain and the decentralization changes in higher education. Lastly, the report will reveal what the next phase of AI will be in regards to education.


A few findings of the report include:

- ▶ The overall sentiment towards AI is very positive. **75%** of our participants indicating that they're "**optimistic or excited**" about AI.
- ▶ **90%** of our participants have stated that they think **within the next 5 years their industry will be affected by AI.**
- ▶ However, one of the largest challenges to AI in education is cost. **46% of our respondents believe that cost is a challenge for implementing AI.**
- ▶ **50%** of our participants **consider implementing AI in the near future**, but **64%** of them **don't have a clear budget for AI development.**
- ▶ While traditional stalwarts in education are slow to adopt AI, smaller startups are proving they're more agile. New companies are emerging in the education pipeline to solve traditional problems using AI and other future technologies like blockchain. **University recruiting, online education, and even accreditation** will all change because of these technologies.
- ▶ Questions about **big data** and **privacy** will continue to affect all aspects of the AI industry. Additionally, changing privacy laws around the world will impact innovations such as learner analytics and blended learning.

From our survey research, we've found that

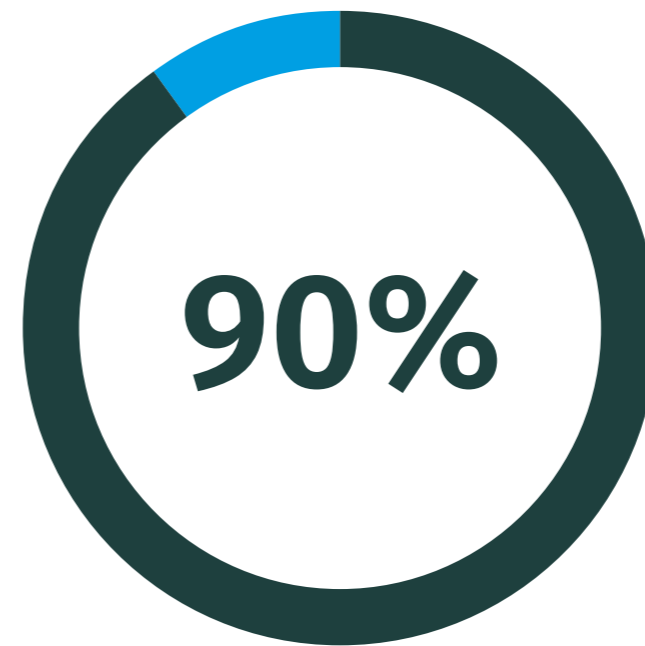
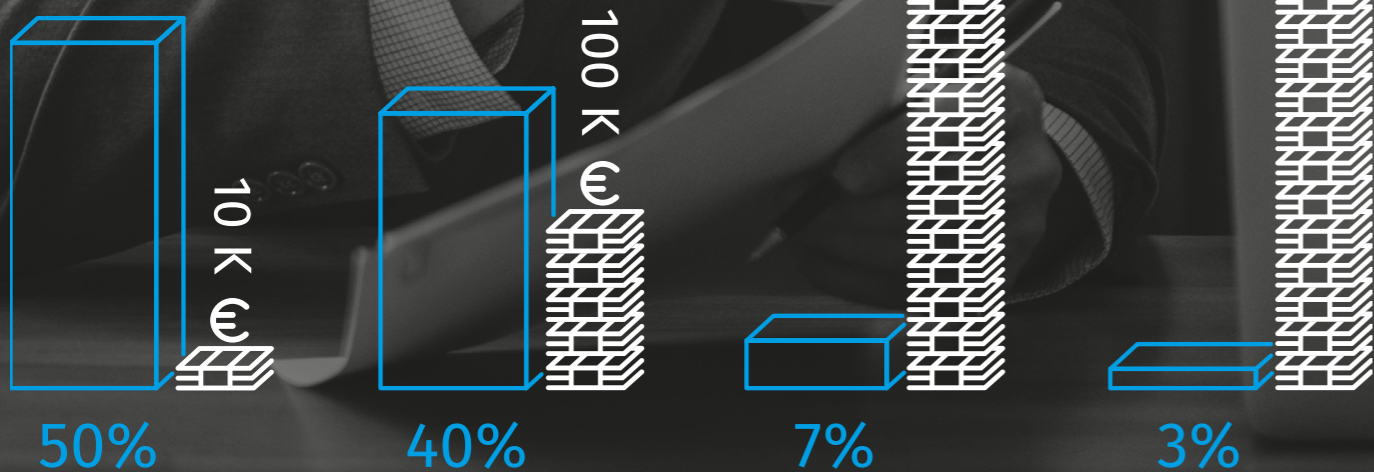
64%

of participants don't know about or don't have a clear understanding of their budget for AI.



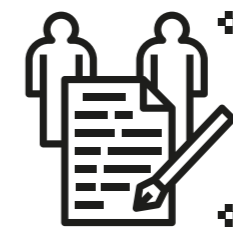
However, out of the 35% that do know their budget, 50% have only up to a meagre €10,000 to spend on AI;

40% only have up to €100,000; 7% have up to €900K, and 3% have over €1 million to spend.



Of participants think within the next 5 years their industry will be affected by AI

40%

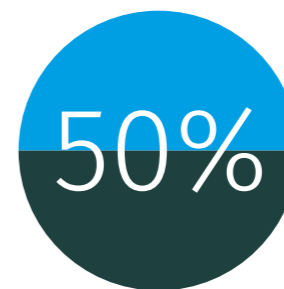


Of Publishers state that defining corporate standards and procedures for metadata is a huge issue right now.

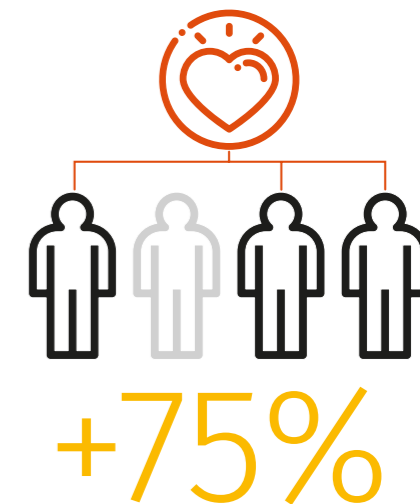


40%

Of Publishers state that content quality assurance is a pressing issue they face.



Want meta-tagging for smart content.



Are excited about AI, therefore, the majority of them don't fear the technology despite the fact that (68%) work for complex, traditional or legacy-driven industries (publishing, higher education, K-12, corporate training)



75%

Indicated that they want some sort of API for AI development that will help their business.



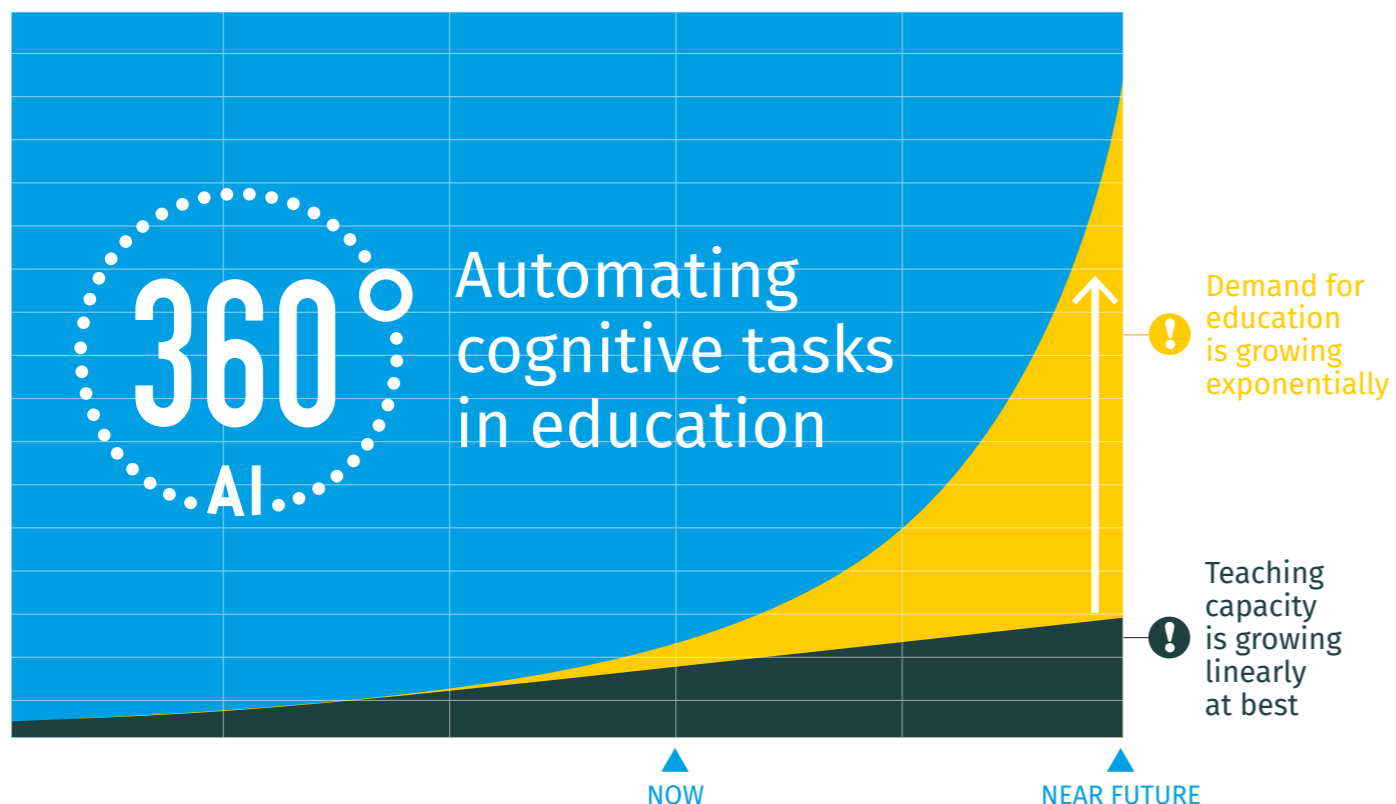
WHY IS AI
ESSENTIAL
FOR EDUCATION
NOW?

In this section, we'll provide some insights on how AI can help mitigate current bottlenecks in education. We will also provide an example of how education publishers can make use of AI to enable personalized learning at scale.

The demand for knowledge coincides with the shortage of teachers

The global demand for knowledge could stem from the theory of knowledge doubling. Knowledge doubling was developed by Buckminster Fuller who claims that human knowledge and information grow at an exponential rate. As humans gather more information and understanding about the world, the knowledge about that information compounds on itself.

How can compounding knowledge be transferred then? With teachers, naturally, who play an imperative role in the transfer of knowledge. Unfortunately, there is an outstanding shortage of teachers to fulfill knowledge doubling demands. UNESCO estimates that by 2030, the world will need 68.8 million instructors. A good amount of those teachers (48.6 million) are required to replace existing educators.



On a high level, AI can automate certain tasks that teachers struggle to fulfill. AI can automate administrative processes such as grading or assist with instruction. In turn, AI saves valuable time. AI can also play an important part in the supply of educational content, as we will point out below.

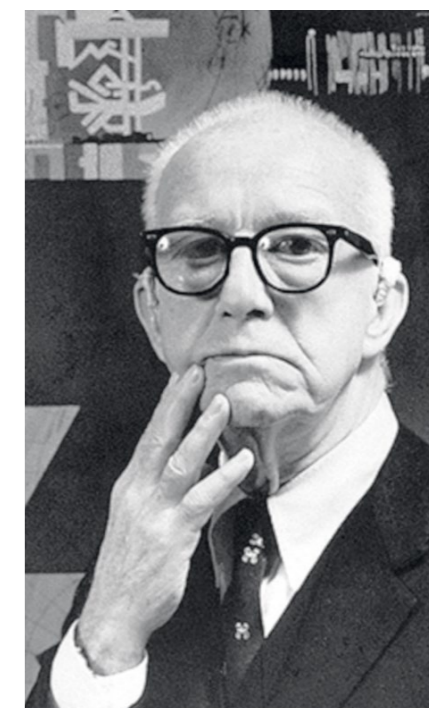
Example: AI can help educational publishers get value from content

Although publishers are eager to support personalized learning, content that adapts to the user is needed first. However, the supply of adaptive content is quite limited because the process of adding knowledge about content (also called metadata-tagging) has always been the exclusive domain of humans. Humans are prone to error in data-entry, mislabeling information and not filling out texts or labels entirely, nor accurately. Also human capacity simply can't keep up with the volumes of adaptive content that are required to support personalized learning at scale, and if they could, it would not be economically viable.

To find adaptive content (also known as smart content), publishers need to dig very deep. Publishers can now turn to AI to find adaptive content by executing smart automation. Smart automation should automate the process of metadata-tagging educational content.

For example, an author would like to find out if an English language test is at the level of A2 or B1. By metadata-tagging the text, content is matched to the right [reading level](#). [Malmberg](#), a Dutch publisher, achieved a 95% accuracy readability rate through 360AI's metadata-tagger.

UNESCO estimates that by 2030, the world will need 68.8 million instructors



Buckminster Fuller

The Knowledge Doubling Curve

[Source, The Natural Edge Project]



²United Nations Educational, Scientific and Cultural Organization. UNESCO Institute for Statistics. The World Needs Almost 69 Million Teachers To Reach the 2030 Education Goals. Accessed July 14, 2018. <http://uis.unesco.org/en/blog/closing-teacher-gap-almost-69-million-teachers-needed>

Moreover, AI can sometimes perform tasks better, more accurately and faster than a content manager or author could. For example, AI can detect [similarity](#) among keywords, [classify topics](#) and [extract entities](#) from a text.

Some key factors that make content smart:

- Smart content extracts educational value and purpose from content.
- Smart content is optimized ready for reuse and context free.
- Smart content is properly tagged and accurately classified to the taxonomy or curriculum needs.
- Smart content is scalable and quickly reproduced for print or digital use.
- Smart content has a clear understanding of all IP and its ownership status.
- Smart content items can be linked to a learning graph which describes the relationships between learners, content and learning objectives.
- Lastly, smart content can analyze these relationships and make predictions for adaptive learning.

Overall, applying AI in publishing workflows is scalable, and provides an economically viable approach to meet the growing demand for adaptive content, which relieves teacher's workload and improves learning outcomes

CHALLENGES OF AI IN EDUCATION

Many challenges affect the market adoption of AI. Although new technologies give the opportunity to transform an industry, there will also always be resistance or some setbacks that inhibit the implementation (or adoption) of AI.

We've identified three primary reasons why educational organizations, in general, are resistant to implementing AI

1 Misunderstanding AI

AI has the power to transform industries, job markets, and even economies, but the education industry might misunderstand the true power of AI.

Our research³ shows that 50% of our participants consider implementing AI, but only 23% are actually implementing it right now. We've discovered that there are various reasons why our participants don't implement AI. 50% of our participants say that they lack a business case to propose artificial intelligence as a viable solution to a problem. Additionally, 21% of respondents claim that AI is not necessary now. Therefore, our data suggest that 1 in every 5 participants believe that AI is not something that they plan on executing immediately.

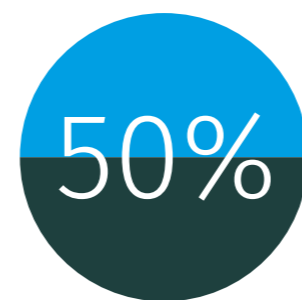
Another reason why educators might misunderstand AI is that they underestimate the resources available like talent and brainpower dedicated to innovation projects. 50% of our respondents claim that they outsource "some or all" of their AI innovation to third parties. Only 28% of our participants have some internal talent dedicated to AI development.

2 Cost of AI

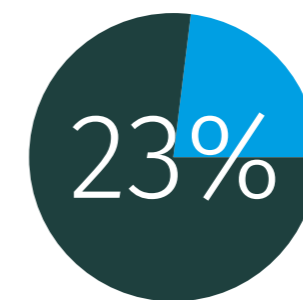
Cost is another challenge when it comes to the widespread adoption of artificial intelligence. A 2017 McKinsey report⁴ notes that 41% of 33,000 business owners are uncertain about the return on investment with AI.

³ Frangos, Katherine. EDIA Market Research. June 30, 2018.
⁴ McKinsey Global Institute. 2017. Artificial Intelligence: The Next Digital Frontier.

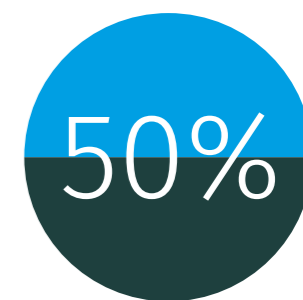
Survey responses



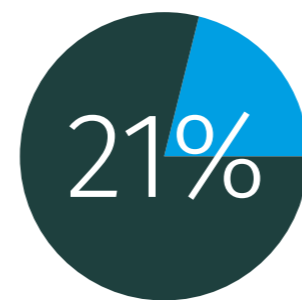
Consider implementing AI



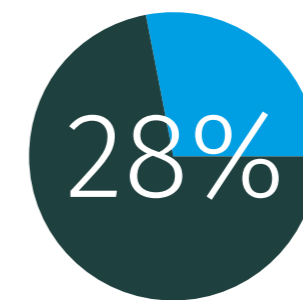
Only 23% are actually implementing it right now



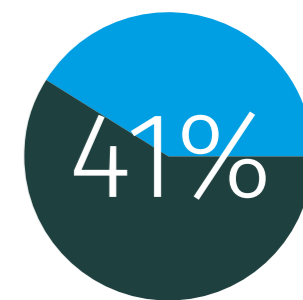
Lack a viable AI business case



Claim that AI is not necessary now



Have some internal talent dedicated to AI development



Are uncertain about the ROI with AI



On average spend on IT by universities



top 60 global publishers revenue spend on innovation technology



1 in every 5 participants believe that AI is not something that they plan on executing immediately

Looking to universities, they are generally reluctant to adopt new technology. According to a 2015 EDUCAUSE Core Data Services Report⁵, universities spend, on average, a measly 4.2% of their budgets on IT. While this is too small of an amount to invest properly in an AI solution, it makes innovation seem unimportant—making it more difficult to convince the institution at large to adopt AI.

Regarding education publishers, Publishing Perspectives⁶ states that the top 60 global publishers with annual revenues of approximately \$70 billion spend 4.5% of their revenues on innovation technology. Instead of allocating more budget towards innovation, the majority of IT spending is actually allocated to legacy solutions which represent between 60% and 75%. Unfortunately, the lack of innovation spending impairs publishers from taking the necessary steps to develop AI in order to catch up with other industries which are already implementing AI.

From our survey research, we've found that 64% of participants don't know about or don't have a clear understanding about their budget for AI development. However, out of the 35% that do know their AI budget, 50% have only up to €10,000 to spend on AI, and 40% have up to €100,000. Only 10% have a budget of above €100,000 to spend. Thus, 46% of our respondents believe that cost is a challenge for implementing AI.

McKinsey highlighted Netflix as a successful company that has adopted AI. Netflix created a personalized [content recommendation](#) feature which groups similar types of shows (content) together using a powerful algorithm. Netflix estimates that their AI efforts have saved roughly \$1 billion (USD) every year in lost subscription fees. Thus, with AI they can retain their customers and decrease cancelation rates.

The Netflix case proves that AI has a massive impact on the bottom line, but there's one caveat to consider. To reap benefits like Netflix, AI investments have to be big enough to make a significant impact on an organization, and they also should be close to the organization's core business operations.

Sectors leading in AI adoption today also intend to grow their investment the most

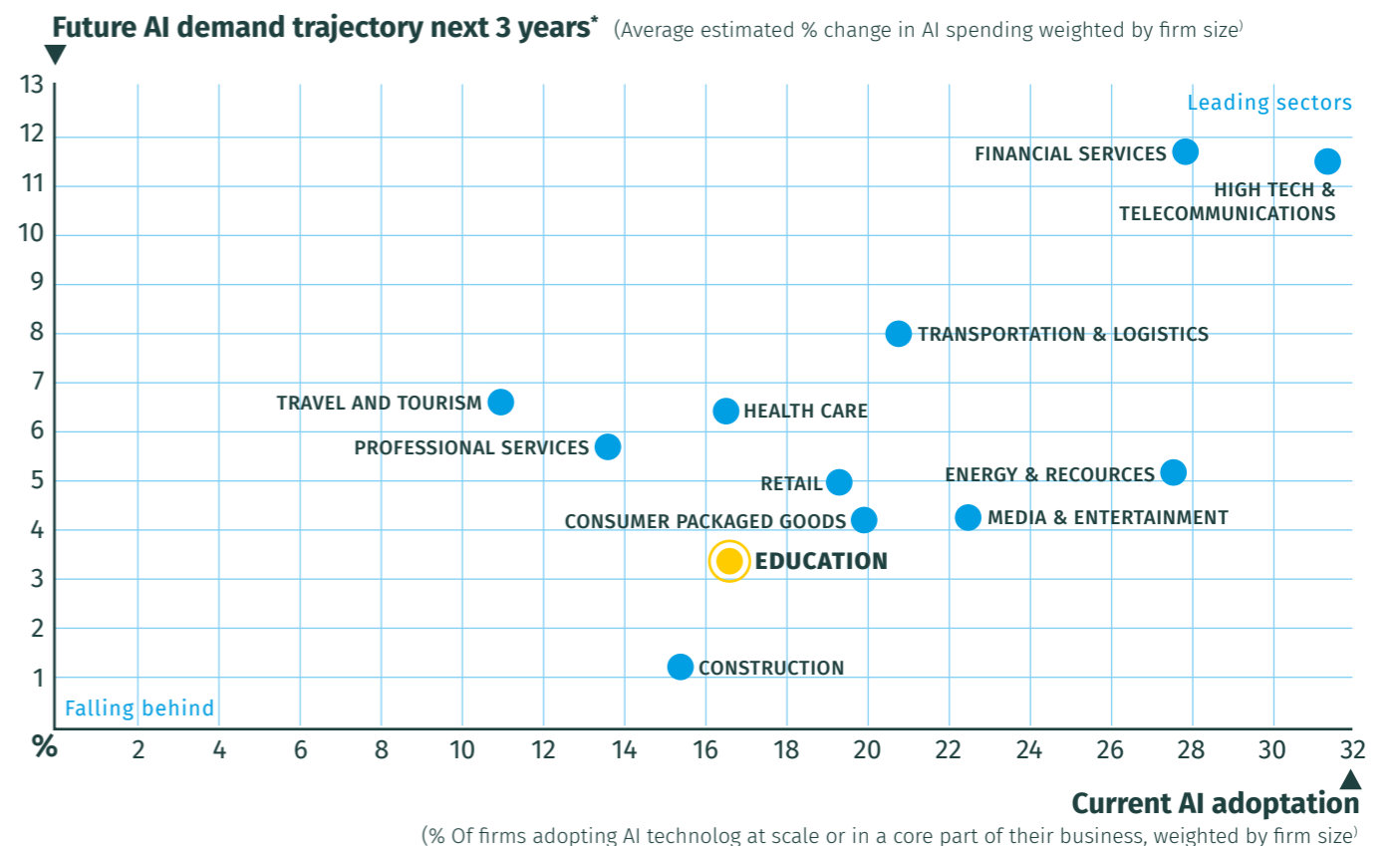
⁵ Lang, Leah. EDUCAUSE 2015 CDS Benchmarking Report. March 11, 2016.

⁶ Anderson, Porter. "A New Report for 2018 on a Fragmented Publishing Software Market." Publishing Perspectives. January 15, 2018. Accessed July 13, 2018. <https://publishingperspectives.com/2018/01/publishing-software-technology-report-2018/>.

3 Slow adoption of AI

Another challenge to the education industry is its slow adoption of AI technology. Most organizations fall under the impression that AI takes a long time to implement and that it requires a high level of technical knowledge to execute. Within our survey data, we've found that 35% of our participants claim that they lack a technical understanding of AI.

Regarding the top 50 global educational publishers, there are reasons why they're slow to adopt AI. First of all, they have millions of pieces of metadata to sort through (or meta tag) each month. Currently, content editors or authors are sorting through this metadata by tagging content manually to the right curriculum or the right taxonomy. However, human labor cannot keep up with the demands of big metadata to tag nor keep up with perfect accuracy all the time. Hence, educational publishers are slow in adopting faster and more agile ways to sort their content.



* Based on the midpoint of the range selected by the survey respondent.

SOURCE: McKinsey Global institute adoption and use survey; McKinsey Global institute analysis.

Addressing AI challenges with solutions

Overall, the three main challenges why companies don't implement AI (misunderstanding, cost, and slow adoption) are all resolvable.

The misunderstanding of AI is most likely due to that companies lack a strategic business case to implement it. Educational organizations may not fully understand the possibilities that AI has to offer such as creating smart content for publishers, personalized learning or long-term savings and reduction of production costs that meet the bottom line. It's also suggested that companies underestimate the necessity to implement AI right now.

Organizations need to realize that AI has the potential to relieve some of the administrative, laborious, time-consuming and fallible activities that teachers, content managers, and authors do every day. Once organizations recognize that they need AI, they can then build up a solid business case to implement it and set aside the right resources to develop it. Hiring a dedicated team for developing AI or outsourcing AI development projects to third parties will better position the education industry. The expectations of AI's high return on investment will also improve once organizations properly estimate the correct planning and execution timelines with the right external or internal resources at hand.

The challenge of cost plays an essential stake in the adoption of AI. In order to address the cost challenge, one option is that organizations could go "all-in" and invest big to reap long-term benefits like Netflix. However, if organizations don't have a large budget like Netflix they can allocate a modest budget into smaller-scaled AI development. Organizations can look into a proof-of-concept (PoC) project with an initial investment of €10,000. A PoC will set the expectation of AI and help ensure the company to move forward instead of delaying AI further. Whether a company has a big budget or small, the long-term payoff is huge as AI can decrease production costs and increase revenue gains.

Lastly, the challenge of slow adoption can be resolved by looking into the right AI solution. To keep up with big data, publishers and educational institutions need to adopt a smart content management engine that tags metadata in a faster and more accurate way. It ensures that content is ultimately tagged to the right curriculum or taxonomy. Another option is to look into solutions that resolve one problem at a time. Instead of looking at all problems as a whole, like smart

content, personalized learning, learning analytics, automated grading, and so forth, organizations should adopt a more agile perspective and seek one solution at a time.

Adopting one solution, for example, metadata-tagging content to make it more accurate, is a relatively fast process. The results can be seen in as little as 3-4 weeks depending on the type of content and metadata needed. By taking the first step and beginning AI adoption, organizations are setting themselves up to be prepared for the AI future.

The majority of IT spending is actually allocated to legacy solutions which represent between 60% and 75%.

Unfortunately, the lack of innovation spending impairs publishers from taking the necessary steps to develop AI in order to catch up with other industries which are already implementing AI.



THE FUTURE OF AI IN EDUCATION — TRENDS TO WATCH

Keeping track of the trends in AI helps organizations stay ahead of the curve.

This section details what are some of the biggest trends regarding AI.

Big data and privacy laws

Around the world, countries are adopting AI into their unique marketplaces⁷, but they're also changing their privacy laws on a governmental level. As AI continues to disrupt the marketplace, consumers will continue to question the security of their user data. Big data has become a huge topic for debate among countries who are already seeing the effects of AI.

SOME SPECIAL LAWS PERTAINING TO PRIVACY AND BIG DATA YOU SHOULD BE AWARE OF INCLUDE:

- ▶ **EUROPE** May's General Data Protection Regulation (GDPR) could impact overall innovation on the continent.
- ▶ **CHINA** The new Social Credit System will use AI to monitor citizen activities. These 'social credit scores' will impact everything from a citizen's ability to board a plane to where they can send their children to school.
- ▶ **USA** Changing data protection laws state-by-state aim at giving consumers more protections for their data, as well as the data of their children in classrooms.
- ▶ **RUSSIA** A major data retention law recently enacted requires telecommunications companies to hold all data available indefinitely.

While privacy laws might not impact education directly, they will have a broader implication for AI at large. It will ultimately trickle into education innovation and data privacy laws affecting minors will change how AI can be applied in classrooms around the planet. However, AI can still be deployed in other areas of the education, from accreditation management to book publishing and in some cases, it might help organizations stay compliant with privacy laws.

Decentralization of universities & increase in MOOCs

Technology, not just AI, is changing education at its core. As the internet connected the world, it also decentralized the traditional centers of knowledge power. Just like the way online shopping changed the brick-and-mortar retail landscape, online courses are changing the role that universities play in society.

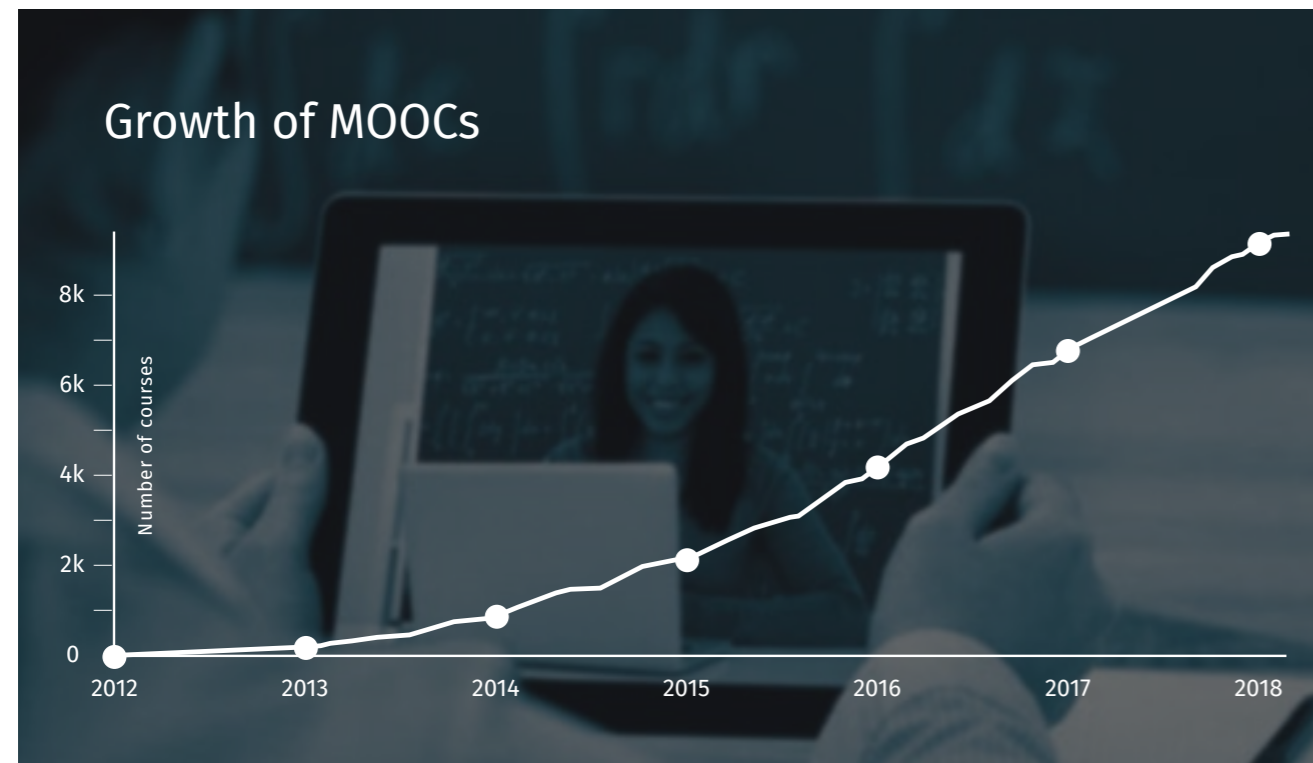
As learners want more targeted and personalized educational options, online courses are on the rise in popularity. The question if learners need to acquire a traditional university degree

⁷ Dutton, Tim. "An Overview of National AI Strategies – Politics AI – Medium." Medium. June 28, 2018. Accessed June 29, 2018. <https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd>.

As learners want more targeted and personalized educational options, online courses are on the rise in popularity. The question if learners need to acquire a traditional university degree is becoming an increasingly important debate.

is becoming an increasingly important debate. The validity of a higher education degree has been especially challenged in the United States after the economic crash in 2008. Students are questioning if college degrees really suffice the skills that they need for a dedicated career.

Thus, the number of shorter, self-learning courses in response to the demand for education is growing. Instead of pursuing traditional degree programs, students and professionals are focusing on taking shorter online courses that hone their skill sets.

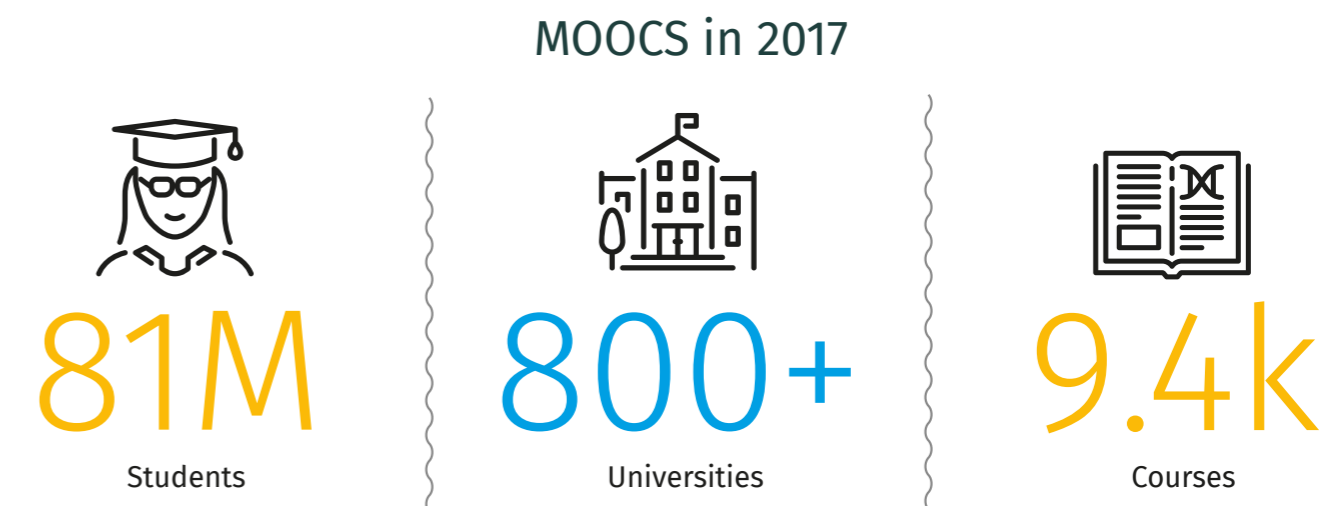


AI can serve as a tutor for students who are pursuing self-study courses. Massive open online courses (MOOCs) such as Coursera, edX, Futurelearn, Lynda.com, Udemy, Udacity are examples of companies that are filling in the knowledge gap that universities struggle to fulfill.

As a result, there's been a shift from traditional learning to alternative, digitalized ways of learning. Students are turning to online courses in their spare time while continuing to work their day job and support their families. Some courses are free and easily accessible online. With MOOCs, learners can access lectures from the top universities of the world. Some courses charge a marginal fee for a certificate of completion.

University degrees are under threat as these online courses gain traction. What we now see is that former MOOC platforms are now entering the arena of micro-credentials and degree programs. In other words, the future might be filled with “budget bachelors” comprised of several different credentialed courses from many online providers.

For now, accreditation sets universities apart from certifications given by smaller edtech learning businesses, but the rise of MOOC certifications might lower the value of accreditation overall. This trend is something to keep an eye on, and it will be interesting to see how accreditation plays a role in the future of learning.



Blockchain and accreditation applied in AI

Blockchain's most common association is with cryptocurrencies, but its applications in the crypto market are precisely what makes it useful for accreditation. In essence, blockchain is a ledger that holds the truth of a users' activity online. It's the perfect place to store grades, courses, and certificates. Forgery is impossible, and it is unique to every user out there. The use of blockchain for managing online courses and certifications would make the entire process transparent, eliminating the fear of forged accreditation.

There are both the risks and rewards of this blockchain system. The ability to provide a clear history of academic records in the world of digital learning is fantastic, but blockchain might also undermine traditional forms of accreditation. In any case, blockchain is likely to grow as a trend in education.



CONCLUSIONS

Overall, we've discovered why artificial intelligence is essential for educational publishers, but we've also revealed the challenges of applying AI in the education industry

We've discovered different research both primary and secondary that shed light on the solutions available for addressing these challenges. Lastly, we've revealed insights and trends about the state of AI in education right now.

AI is essential for modernizing the classroom

First, AI is essential for modernizing the classroom. It can reduce workload for teachers and helps students learn at a personalized pace. However, there is still a considerable amount of confusion surrounding the importance of AI. Such uncertainty means that many organizations in the education industry delay the adoption of AI. Schools, publishers, and other education organizations need to start preparing their infrastructures to support AI in the classroom.

Costs play a significant role

Cost also plays a significant role in the adoption of AI. McKinsey reported that 41% are uncertain about the return on investment in AI. We've found that 64% of our participants don't know about

their AI budget. However, reports do indicate that AI has a high return on investment only if companies are willing to go 'all-in' like Netflix, Amazon, Tesla, etc. If organizations don't possess large budgets for AI development, they can allocate money into smaller-scaled AI development projects.

University degrees might become less relevant

We've also learned that blockchain applied in AI is decentralizing the classroom and that university degrees might become less relevant in specific industries. The rise of online schools creates uncertainty about the accreditation and legitimacy of a degree.

The main takeaway is that artificial intelligence will continue to disrupt the marketplace as a whole. As a result, AI will inevitably impact the education industry. However, if educational organizations don't act now by adopting AI, they will inevitably fall behind other industries. The chance to evolve and improve education is very evident with an availability of artificial intelligence solutions.

If you like to consider using AI for your writing tasks or administrative processes, check out the [live demo of 360AI](#). Or book an appointment on our consultation page to learn more about how smart content, adaptive and personalized learning can prepare your company for 21st-century learning.

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