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Intelligence Will Transform Student Information Systems

Institutions must factor AI capabilities into their SIS investment strategies

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Summary

Catalyst

Driven by the need to cultivate capacity for institutional innovation, improve student services, and garner efficiencies with IT solution administration, higher education's next decade will be marked by a significant investment in student information systems (SISs). Consequently, a meaningful discussion has emerged about how institutions can realize the most return from these investments, including how to select and implement solutions. "Modern" and "next generation" are terms being used liberally in this debate, but concrete evidence of how they are defined is limited, making discerning between SIS solution options difficult. If the advancement of artificial intelligence (AI) and related technologies and their accelerating uptake in consumer-facing industries such as retail and media are any indication, Ovum anticipates that AI will become a critical element of the SIS landscape, transforming how colleges and universities deliver education services. Unfortunately, there is considerable hype around AI, which makes understanding the nuanced differences between related technologies and identifying potential use cases challenging. In this paper, Ovum seeks to address this knowledge gap to help institutions better understand the role AI should play in their SIS strategies and make progress on their path to service-delivery transformation.

Ovum view

The higher education industry is experiencing a period of historic disruption, driving colleges and universities to consider new operating models and seek out innovative ways to engage students and deliver education services. The SIS has a pivotal role to play in whether institutions are successful in these endeavors, but established approaches and many existing solutions may prove insufficient to meet the rising expectations of students for more personalized, frictionless, and proactive services. The consumer market is shaping these student expectations – a market in which AI is recalibrating how individuals prefer to engage with retailers, media, and service providers, among others.

Taking a cue from these trends, Ovum believes that the next generation of best-in-class SIS solutions will integrate AI technologies in deep, meaningful ways, ultimately transforming the delivery of key institutional processes such as course registration, advisement, and financial aid. Adoption will not occur overnight, and therefore discerning between AI technologies and predicting when and for what institutional use cases they will be applied is critical to making the right and well-timed investment decisions. Not all SIS providers will have the wherewithal to launch and evolve solutions with these capabilities, and institutions must therefore carefully assess areas such as records with product, industry, and technical expertise, and overall perspectives on the role of AI.

Key messages

- A myriad of forces is transforming higher education.
- Differentiating AI technologies supports smarter investments.
- Consumer experiences with AI are shaping student expectations.
- AI will be a core element of next-generation SIS.

Recommendations

Recommendations for colleges and universities

- **See beyond established practice for the role of the SIS:** The next decade will witness significant investment in student information systems, and in many cases this will translate into the selection of new solutions or changes to existing deployment approaches. Adopting a new solution or migrating to the cloud, on its own, does not constitute institutional transformation, particularly if the solution supports the same processes, transactions, and interactions in the same way. Colleges and universities must expand their field of vision to reconceptualize how they leverage the SIS to support business operations and deliver education services. The integration of AI into the SIS landscape enables personalized, frictionless, and proactive to be the prevailing characteristics of how to achieve these goals and, ultimately, to meet student expectations for services and outcomes.
- **Take an incremental approach to AI adoption, but have an overarching vision:** While the pace of technological innovation is accelerating and AI use cases are emerging rapidly in the consumer market, colleges and universities should nevertheless take a more incremental approach. Marked by a consensus-driven model for decision-making, change comes slowly in higher education. Ovum therefore recommends that institutions start with applications for AI within the SIS that will deliver "quick wins," building the confidence of key stakeholders and the subject-matter expertise of end users. Processes with vocal advocates, clear parallels with the consumer market, and consensus around best practice represent appealing targets. The institution's strategic vision for transformation should influence the sequencing of these targets to ensure that the sum of the incremental, small steps delivers longer-term value.
- **Seek out a vendor partner with robust AI capabilities and commitment:** The effective delivery of AI solutions rests on a robust stack of technologies, developed and maintained by highly skilled subject-matter experts. While the end user may have a seamless experience, delivering that experience is an exceptionally resource-intensive endeavor. Ovum advises colleges and universities to carefully assess potential vendor partners on their ability to deliver AI not only today but also in the future. A strong history of and commitment to product development, with sufficient resources and established methodologies, is critical. Yet, horizontal firepower should be balanced with deep experience in the higher education industry so that vendors can provide potential AI use cases that are practical and deliver value.

AI is a defining feature of next-generation SIS

A myriad of forces is transforming higher education

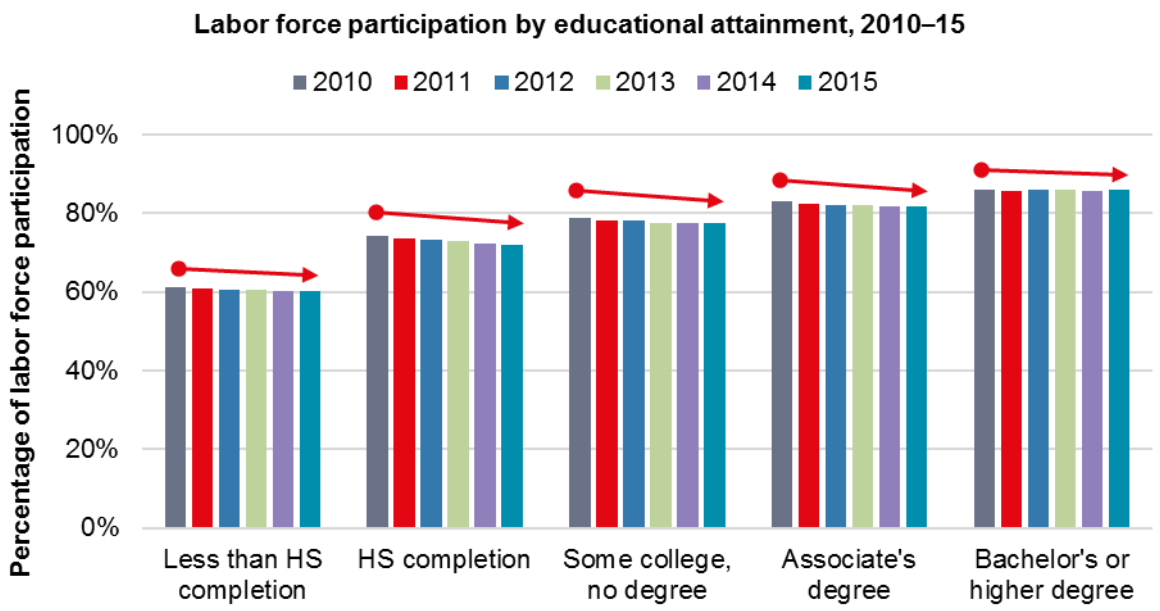
Higher education faces a pivotal juncture in its history, whereby choices made today will shape its position and role in society over the coming decades. A myriad of macro forces is putting unprecedented pressure on colleges and universities, ultimately driving stakeholders from across the institutional landscape to reconsider long-held beliefs about the purpose of higher education and what constitutes the most effective delivery of education services. Accelerating technological innovation serves as both a driver of these changes and the key to their successful realization. Institutions that navigate the tumult of these increasingly strident demands by identifying and then investing in the right technological innovations will transform their operations and education services, thereby positioning themselves for long-term success.

The delivery of education services is undergoing a metamorphosis

A profound shift is underway in the higher education industry that will shape institutional operations and the delivery of education services for many years to come. At the most basic level, student characteristics are shifting. In some geographies, such as North America, the traditional student market is in decline. Classroom seats are still being filled, but increasingly by older adults, who are often returning to higher education. To some degree, this is part of a larger demographic trend, but economic displacement and upheaval is also fueling this change. The need for job training has moved from sporadic and passive, often aligned with career changes, to more continuous and dynamic, following technological and business model innovation.

Economic displacement, however, is not evenly distributed, highlighting the importance of higher education. During the global economic crisis, US adults with a four-year degree remained at consistent levels in the workforce, whereas those with fewer qualifications experienced higher rates of unemployment. However, taking the same approach to students who were unable to complete a degree – for whatever reason – under the historic model is unlikely to be effective as they will require education and support services that factor in different pedagogical styles, academic preparedness, financial needs, and academic and professional goals, among others. New business models will need to emerge, supported by more flexible and innovative technology.

Figure 1: Labor force participation by educational attainment, 2010–15

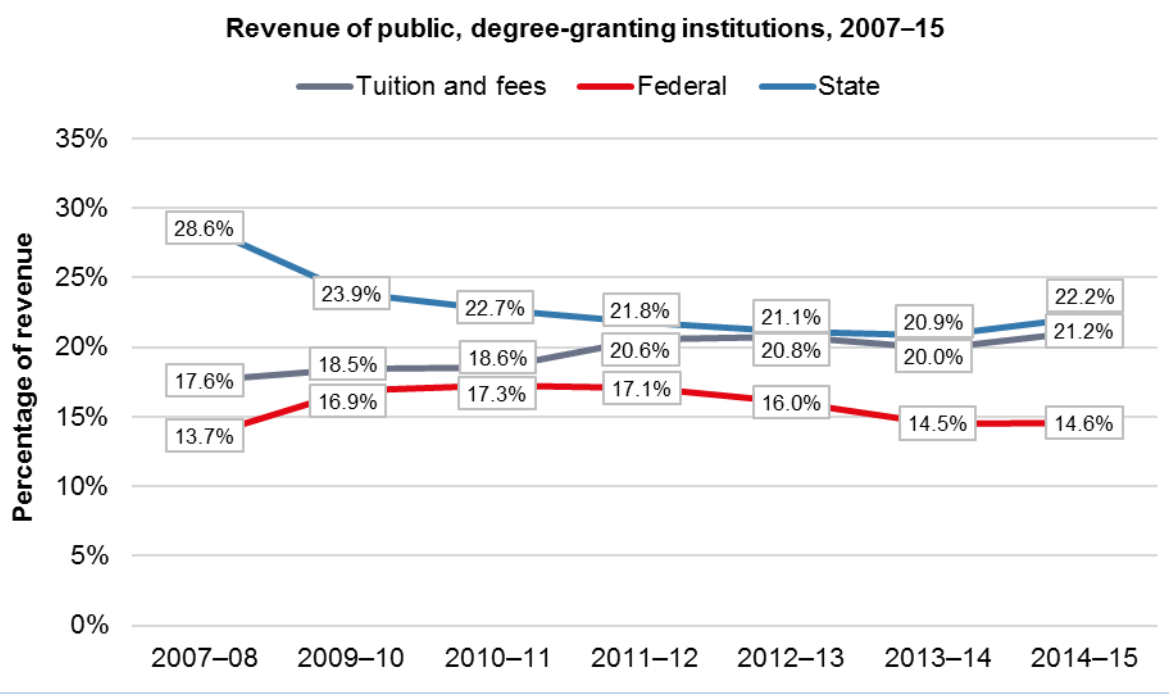


Source: NCES, Digest of Education Statistics, 2016 and 2013

Another key factor disrupting higher education is education's move from being a public good to a private good and the subsequent change in service expectations by students and their families. Over the last few decades, tuition costs have risen. Many factors are driving this, not least of which is declining state subsidies for public institutions, resulting in students bearing a larger percentage of the total cost. Consequently, for many students and families, higher education has become one of their largest financial investments. And with any personal investment, service expectations rise in terms of both the delivered student experience – from registration, to course availability, to career services and beyond – and the return on that investment (ROI), often measured in more concrete terms, such as graduation and employment.

Without question, experiences with personalization and efficiency in the consumer market are shaping these expectations. It is not so much the creation of exclusive, concierge-type services – with which some institutions have experimented – but more the delivery of personalized, frictionless, and proactive ones. In other words, my institution knows me and my goals, makes it easy for me to conduct routine transactions, and alerts me when I might benefit from different services or options. These expectations can only be met through the strategic application of technology, particularly those solutions with strong intelligence, automation, and mobile communication capabilities.

Figure 2: Revenue of public, degree-granting institutions, 2007–15



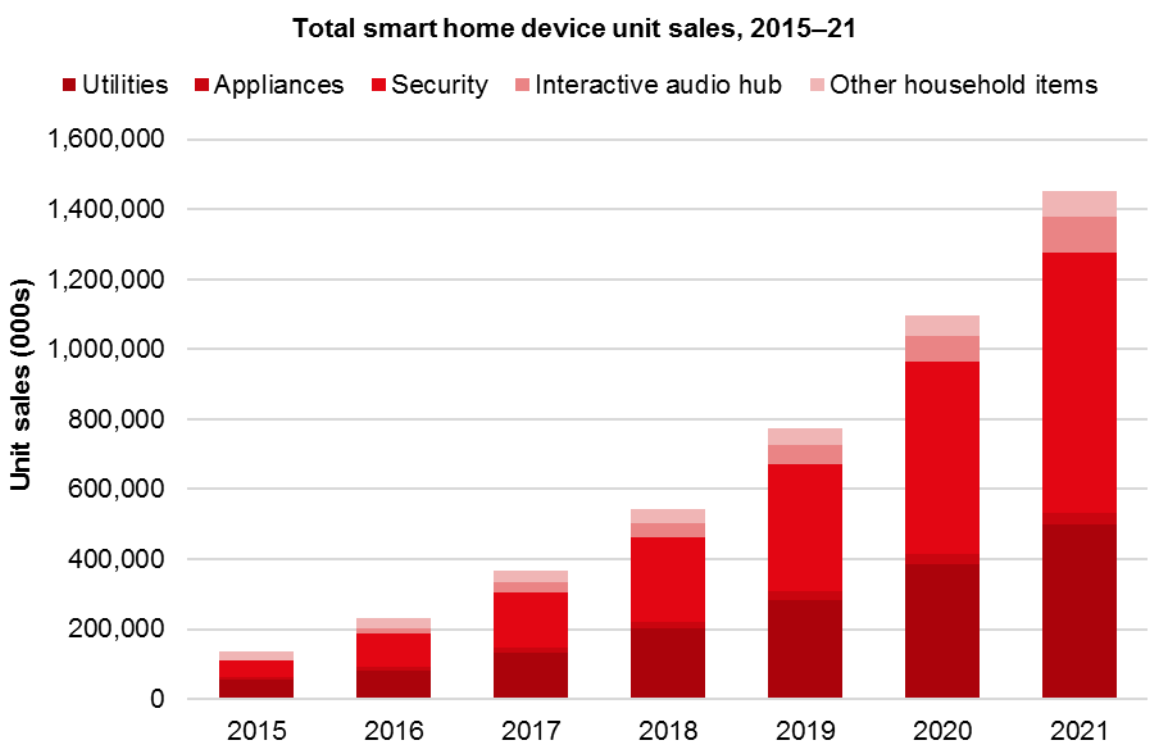
Source: NCES, 2016 Digest of Education Statistics, Table 333.10

Technological innovation is the spark

Few would argue against the proposition that technology has changed the way people live and work. Mobile devices are ubiquitous, to the point where the "end of life" for landline telephones is in sight. Online commerce has proliferated, embedding itself in how individuals buy goods and services and ultimately changing the purpose and place of the "bricks and mortar" retail experience. Enabled by connectivity, communication, and collaboration solutions, many employees have become untethered to a physical office or location, transforming the definition of what constitutes a workspace and 24x7 availability. This level of adoption and subsequent business disruption is sparking another wave of technological innovation, moving faster and with more far-reaching impact than previous ones. In this environment, the availability of data and computing power has grown at a staggering pace, and continues to do so, while costs decline, creating a fertile environment for the application of AI technologies.

The uptake of AI technologies is already underway in the highly volatile consumer electronics market. For example, shipments of smart home technologies, including utilities management systems such as Nest, home security systems, interactive audio speakers such as Amazon's Echo or Google Home, and other connected devices, including appliances, are increasing at an unprecedented pace. Ovum forecasts that total shipments, globally, will grow from 367.8 million in 2017 to 1.5 billion in 2021. As consumers engage with Alexa at home to manage an ever more sophisticated set of tasks, they will expect to do similar things as students once they pass through the campus gates. At the most basic level, if a student can buy toothpaste through voice commands with Alexa, then he or she will similarly expect a college-branded virtual assistant to purchase course materials for them at the beginning of the semester.

Figure 3: Smart technology adoption in the consumer market: smart home unit sales, 2015–21



Source: Ovum, Smart Home Devices Forecast: 2016–21

Differentiating AI technologies supports smarter investments

AI is impacting many areas of activity, commerce, and industry. For example, intelligence is being infused into robots, drones, and autonomous vehicles, as well as into consumers' everyday lives as they interact with mobile apps where AI makes speech recognition, digital assistants/chatbots, biometric identification, face recognition, predictive text, sentiment understanding, and more, possible. AI is still emergent in higher education, but as SIS solutions are data-rich systems, Ovum believes they are the perfect application for AI, ultimately benefiting students and institutions with more personalized, frictionless, and proactive services. Now is the time to assess the potential impact of this technology and invest accordingly.

Considerable hype clouds the landscape for AI

Given the level of hype around AI, it is important to do one's research, differentiate solutions, and discern when and where the most value can be realized in the institutional context from the application of these technologies. Hype, on many levels, is inevitable when any new technology gains rapid attention. The popular media often conflates the more science-fiction aspects of AI with its practical reality. But there is also misunderstanding about the nature of AI available today, in terms of its value and limitations.

The first step to discerning between AI technologies is to recognize that machine intelligence (MI) – meaning technologies based on machine learning algorithms – is the primary type of AI used today. This type of AI requires considerable data to train the MI models, so data availability and management (sourcing the right data and cleaning it) is necessary. Such systems work best augmenting or

assisting human work; they require setting of goals and monitoring, and they do specific tasks very well but are not capable of those outside their original scope. Some AI systems can continually learn and update themselves in real time in production, but this means they improve within the scope of their original design and move beyond MI to artificial intelligence. For the sake of this paper, we will use the term AI to refer to the broad set of technologies and approaches that it encompasses. However, in the next section, we will consider the MI stack required to support AI applications.

A solution taxonomy and technology stack provides powerful insight for investment decisions

Questions that people have about the different technologies that make up the MI landscape tend to focus on the more long-term goals of AI research, especially in the popular media. These long-term goals are referred to as artificial narrow intelligence and general artificial intelligence. In terms of aspired capabilities, the former goes beyond MI – for example, the AI system is able to learn from a few examples instead of requiring hundreds of thousands of training examples. Many decades of research are still required before AI can reach this level.

There is also uncertainty about what constitutes the MI stack, and we see different definitions of machine learning being used, for example. Understanding the technology stack and taxonomy will help decision-makers navigate the different aspects of AI and disambiguate the many terms that appear in AI that mean the same thing but appear to be different.

To help make sense of the field of MI, we provide a high-level overview in Figure 4.

Hardware

It is essential for MI algorithms to run on AI accelerator hardware, whether the MI system is being trained or run in production (this is called inference mode). The original research on deep learning, for example, involved many layers of neurons, and top-end systems today can contain millions of neurons. Training such systems on standard CPU architecture takes many months and prohibits any progress in the field. The porting of machine learning algorithms to hardware accelerators such as GPUs reduces the training time of large AI systems to a day or less. Accelerators are also essential in inference mode, when a trained system is used in production, but the degree of speed improvement does not need to be as great as in training. Apart from GPUs, novel accelerator microprocessors are due to hit the market in 2018. If they deliver on their promise, there will be an impact on algorithm development, as faster processing allows more ambitious machine learning designs.

Software

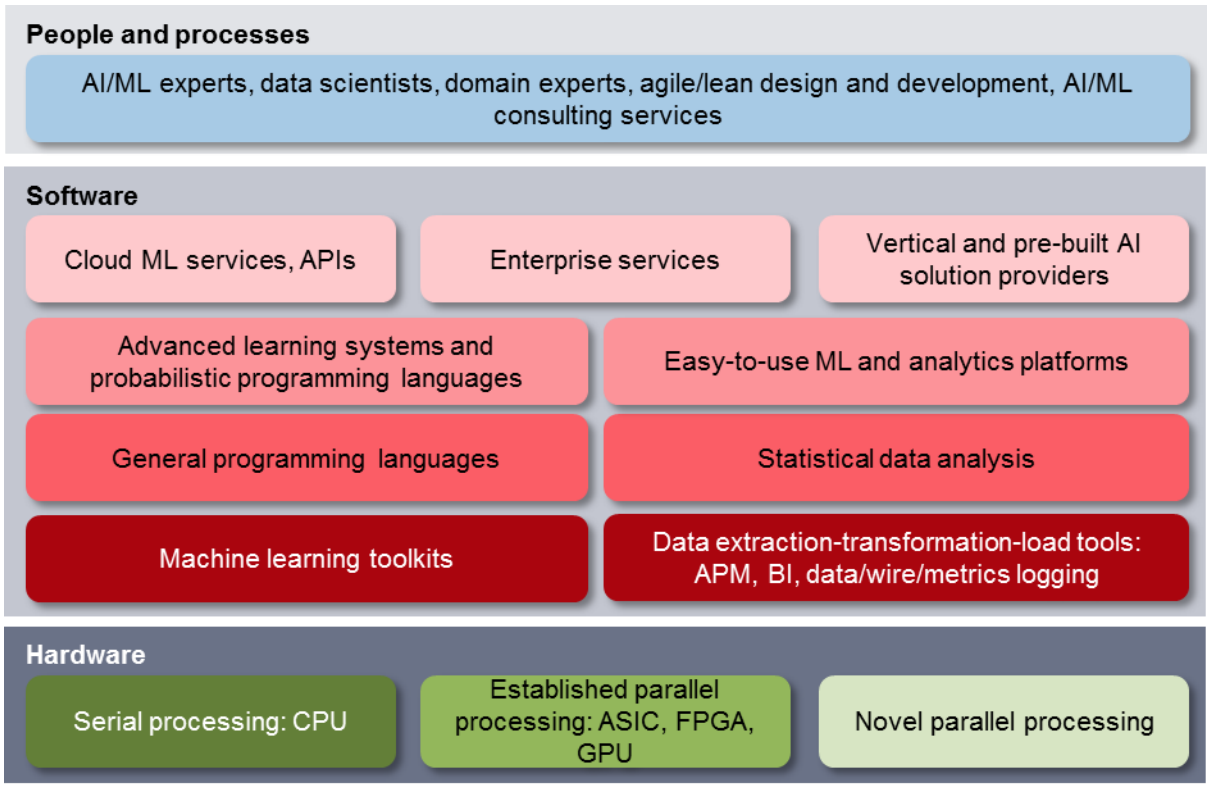
At the bottom end of the software category, users can build their own AI solutions using just standard programming languages, while at the top end, there are many service options: the major public cloud providers all use AI to entice users to their platform; there are enterprise service vendors, from start-ups to major outsourcing players; and then there are niche vertical partners for enterprises that understand the specific business or industry domain.

The tool market is wide and rich in products spanning from data gathering and analytics to machine learning design and development. The different tools on the market address different levels of skills required by the user. Some require graduate-level skills in machine learning, whereas others are easy-to-use tools that business-domain experts can use. Skills in statistical modeling such as data science are essential to accompany the MI solution development. The statistical data tools market is

well established, and quite mature, though tools that cross over to support the needs of feeding AI systems are a newer area.

For many business domains that can benefit from MI, it is often preferable to make use of solutions pre-built by experts and available out-of-the-box. This lets the user focus on the application and leverages the AI expertise of the provider to select the right technology for the job and build the solution.

Figure 4: Machine intelligence technology stack, 2017



Source: Ovum

People and processes

The use of MI in real-world applications leads to providing better services and improving how people work. The MI solutions assist and augment humans, and it is rare for an MI system to outright replace humans; more likely to occur is displacement of humans to higher-level work, which is often more enjoyable, as machines take over chores.

Skills in machine learning and data science are at a premium today, and sourcing the right mix of skill sets in MI will be challenging for many organizations. With high demand and scarce availability, organizations must decide whether to re-skill existing staff, buy solutions, or partner. Ovum recommends that institutions take a pragmatic approach, whereby appointed individuals manage the introduction of AI into the organization and external partners provide readymade solutions that can be finetuned and enhanced once in place.

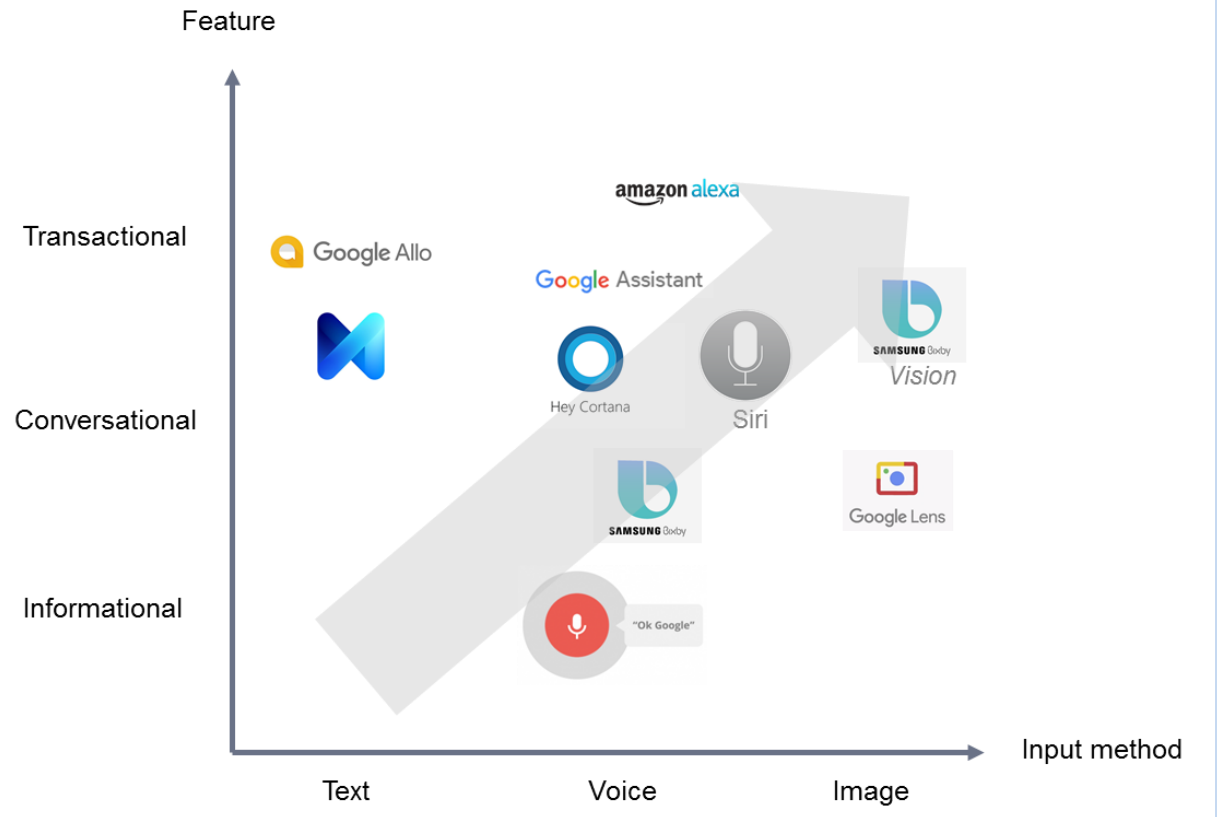
The processes used in design and development are also critical. Ovum advises agile and lean methodologies. Furthermore, the development of MI solutions requires deep knowledge of statistical modeling and the scientific method.

A brief taxonomy of consumer-facing AI applications

Consumer-facing AI applications are segmented based on the input/output interface that they use. Chatbots are text-based, virtual digital assistants are mostly voice-based, and vision systems are image-based. The complexity of the underlying AI engine grows as we move from text to voice to image recognition as inputs. Natural language processing (NLP) is at the core of those applications. NLP is almost entirely reliant on machine learning technology and has therefore seen tremendous progress in the past couple of years. Real-time translation is a good example of the use of advanced NLP technology. Google's Pixel Buds – in-ear headphones that come with Pixel 2 smartphones – can translate up to 40 languages in real time.

Another dimension is then added based on the nature of the exchange between human and machine. It can be purely informational, essentially executing a standard web search, or more conversational, where context (e.g., user preferences, location info, previous questions) affects the response. More advanced bots and assistants also have a transactional layer where data can be exchanged with third parties, such as Uber, Grubhub, Spotify, and Netflix. A representation of where popular chatbots and virtual digital assistants are positioned is given in Figure 5.

Figure 5: Consumer-facing AI services



Source: Ovum

Voice-based conversational interfaces have become ubiquitous across most device segments in the US and parts of Western Europe and Asia. The focus of the industry has now moved onto visual-based AI and expanding transactional ecosystems. However, consumers are not ready to follow suit and have yet to be convinced by voice-based and text-based AI services. A survey conducted by Ovum in June 2017 revealed that more than 50% of consumers in the UK and US do not use digital

assistants because they do not find them useful. In the same survey, a quarter of users of digital assistants rated their experience average or poor, mostly due to the assistant not understanding them or performing the wrong command.

Consumer sentiment toward AI so far has tilted more toward the suspicious than the excited end of the spectrum. The prospect of these AI services being carried over to adjacent markets should be considered carefully. As colleges and universities seek to leverage AI technologies to transform the delivery of education services, it is critical to address these concerns. Leveraging a chatbot or a virtual assistant simply for the sake of using one, or "ticking a box," would be ill advised. Instead, the technology must address a true, unmet student need, and integrating AI within the transactions, processes, and interactions supported by the SIS is a path to achieving this goal.

Consumer experiences with AI are shaping student expectations

Following how employees' consumer market experiences with technology have shaped its adoption in the workplace, students are influencing – through their service expectations and demands also shaped in the consumer market – how technology is applied in the institutional context. The adoption of student experience management strategies and related technologies has progressed considerably over the last decade. The creation of "one-stop shop" service centers and online self-service, both mimicking tactics from other industries, are examples of how higher education has moved from intractable department-based service delivery and paper-based processes, available only during regular business hours, to more student-centric, always-on approaches. However, the current wave of technological innovation, particularly AI, is once again on the verge of creating a gap between institutional services and student expectations. Ovum advises colleges and universities to seek insights and potential use cases from early innovators, often outside higher education, as best practice is emerging rapidly.

The experiences of early innovators are relevant to higher education

Although the context and language is different, the experiences of bleeding-edge industries are relevant to higher education. AI systems can mine large amounts of data and discover patterns that are otherwise difficult to detect. These patterns can be used to detect issues early or provide better support or recommendations.

Customer engagement use case

In the mobile telecommunications industry, customers typically subscribe to a mobile package from a fixed range. Often these packages are unsatisfactory to users; for example, many subscribers buy too much data usage in the fear that they may hit their limit. For users who spend a lot of time on social networks, this can be distressing, but they also overspend. Communications service providers (CSPs) can compete by providing a more tailored offering, but such individual service is costly. However, with AI, a CSP can customize a mobile package to best suit the user, and this can be fully automated so that the service can be scaled to millions of users. AI is used to analyze the customer's mobile usage and create an optimal package. This level of tailored service achieves higher customer satisfaction and retention, and is a win-win for the customer and the CSP.

First-line support use case

Many calls to call centers manning technical support or general enquiries are quite routine and can be easily handled by a machine. Organizations often use automated menus to filter out the most common issues, but people hate using such systems, and there are only so many menu options a person will tolerate before hanging up. Dissatisfied customers will not renew a service. AI systems with voice recognition can converse with a caller and deal with most simple enquiries, passing on more complex calls to people. They converse with users in natural language, leading to a frictionless experience when dialing a call center. The adoption of chatbots/digital assistants in the home and in smartphones is increasing, with millions of daily users. Natural language applications of AI represent a huge and evolving market. Voice-controlled human-machine interfaces will become common and a preferred way for people to interact with all kinds of devices, from radios and washing machines to TVs and cars.

A methodical approach to the application of AI improves the potential ROI

It is difficult to predict when and how AI will achieve pervasive adoption in higher education, because many of the use cases have only emerged in other industries. However, there is no question that the application of machine intelligence, chatbots, virtual assistants, and NLP, among others, across the SIS will impact institutional operations and the delivery of education services, and will likely do so over a far shorter time horizon than previous innovations.

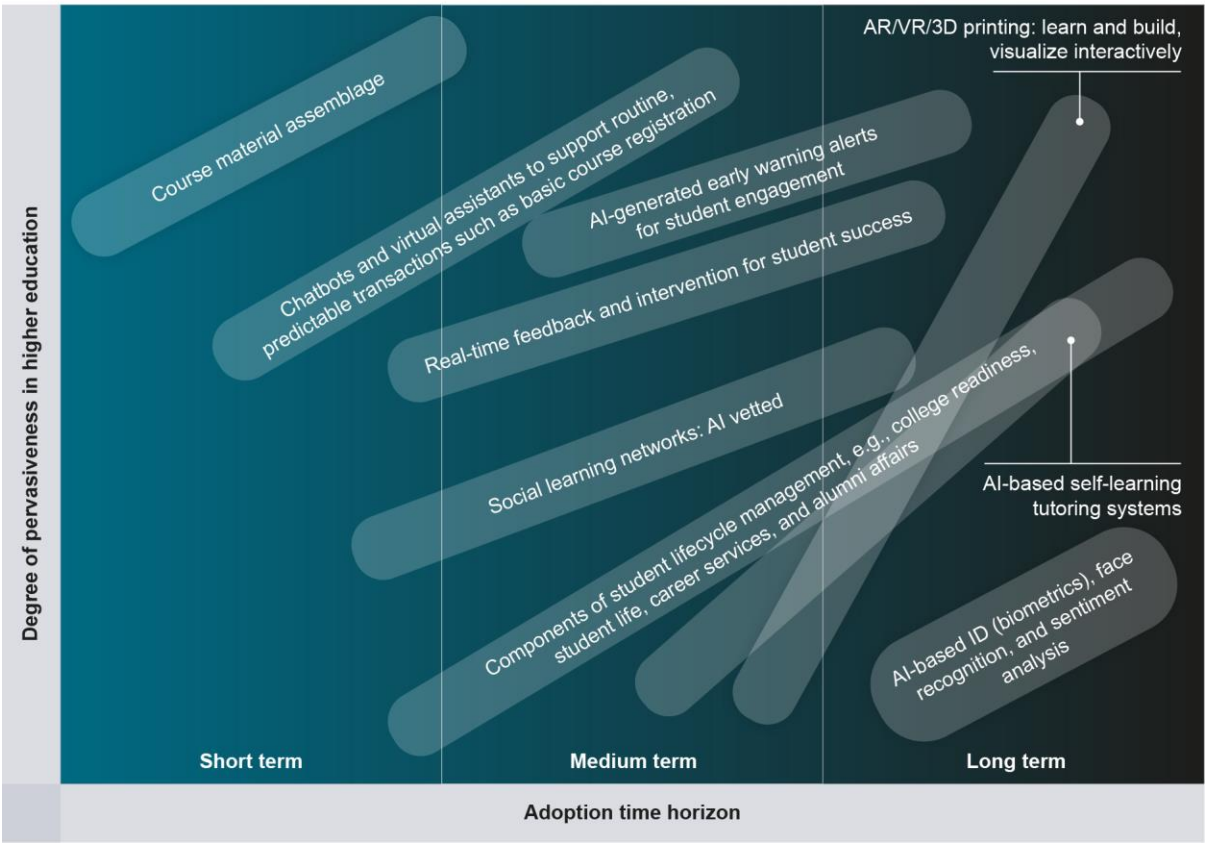
This transformation will touch different institutional processes, transactions, and interactions in stages. Consequently, for planning purposes, it is important to understand likely time frames. Ovum believes the following questions will help colleges and universities navigate the introduction of AI and ultimately structure investment and rollout strategies more effectively:

- **Does AI already support similar functions in the consumer market?** The greater the extent to which students and employees are already acculturated to using AI in other contexts for similar processes, transactions, or interactions – such as retail or media recommendations – the more likely it will transfer rapidly to the institutional environment. Course registration is a prime target, but other areas, such as library searches and student activities, are also likely. Institutions should move quickly in these areas, as they offer valuable ways to meet student expectations and realize important efficiency gains.
- **To what degree is the process, transaction, or interaction routine and predictable?** When there is established best practice around a function, or it is a linear or even binary event – for example, has a financial aid form been submitted – applying AI technologies will be more straightforward from a technical and political perspective. Course registration for academic programs that have more lockstep course requirements, as opposed to those that are more open, interdisciplinary, or rapidly evolving, will be a better place to start.
- **How close is the function to the delivery of teaching and learning?** The ability to micro-personalize courses and programs in the form of content and/or pedagogy is, to some degree, the holy grail of applying AI. The required technology is nearly there, but there are philosophical and political questions that must be answered. Now is the time to embark on this journey, as the closer a function is to the core purpose of

higher education – namely, teaching, learning, and research – the more important stakeholder buy-in becomes. Nevertheless, Ovum anticipates that routine aspects of academic advisement will be supported by chatbots and then virtual assistants with NLP far more quickly.

- **How visible is the application of AI to the institutional community?** Visibility is a double-edged sword. Intelligence-led automation that is more opaque to the end user will raise fewer questions, but this approach is anathema to the culture of higher education. For example, leveraging MI to automatically narrow course options, housing options, financial aid programs, or development campaign targets, while efficient, may undermine faculty buy-in and slow adoption. Transparency is the best long-term approach. However, if the function is routine and targets institutional operations rather than teaching and learning, adoption time horizons are more near-term. Examples might include expense or timesheet approvals, verifications, or some types of report submissions.

Figure 6: AI solutions heatmap – application of technology to institutional processes



Source: Ovum

The following list outlines potential short-, medium-, and long-term applications for AI in the higher education industry:

- **Short term**
  - Chatbots to support to support routine, predictable transactions, such as basic course registration

    - AI-powered course material assemblage
- **Medium term**
    - Social learning networks: vetted and monitored by AI to remove spam, spot abuse, and so on
    - Mobile apps – connect to education clouds, have courses recommended, make use of free open content (MOOCs)
    - AI-generated early warning alerts for student engagement
    - Real-time feedback and intervention for student success
    - Components of student lifecycle management, e.g., college readiness, student life, career services, and alumni affairs
- **Long term**
    - AI-based self-learning tutoring systems
    - Learning with AR, VR, IoT: interactive visualization. 3D printing: build and learn in real time
    - AI-based computer learning app with facial recognition, eye tracking, and emotion recognition to track student engagement and understanding

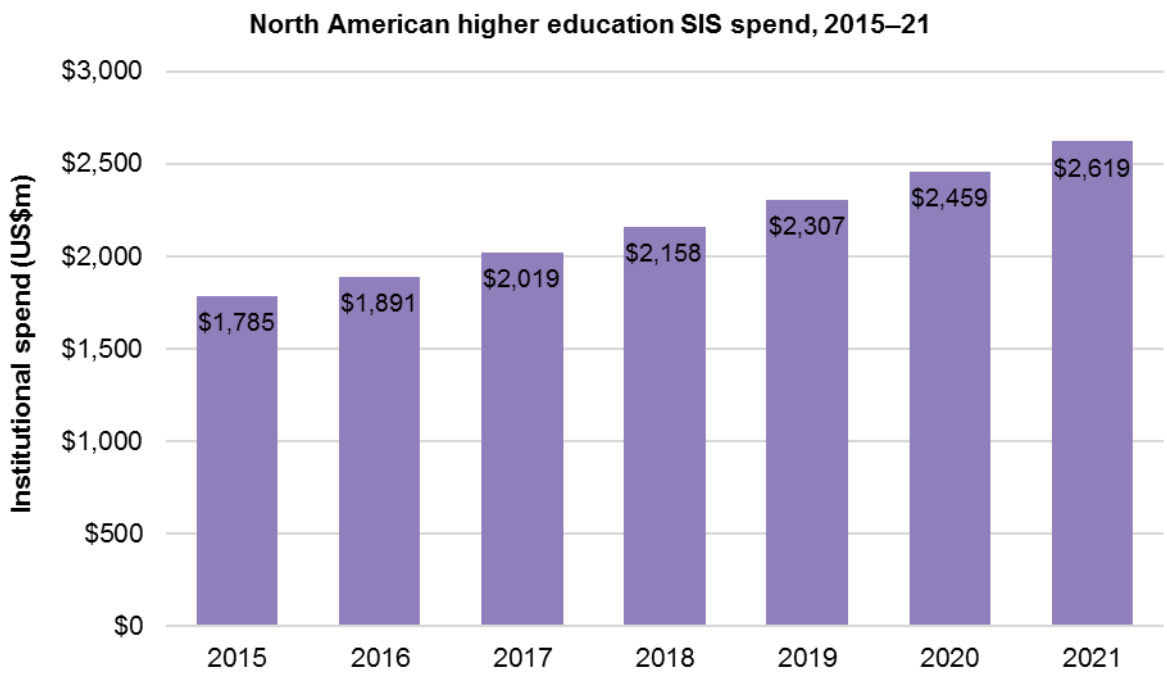
AI will be a core element of next-generation SIS

Driven by changing student expectations, as well as the need to realize key operational efficiencies, Ovum believes that the next generation of SIS will leverage AI in meaningful ways so that institutions can deliver more personalized, efficient, and proactive services. Higher education SIS investments are forecast to increase dramatically over the next decade, and it will be critical for colleges and universities to seek out the solution and vendor partners best positioned to deliver these capabilities.

Higher education will transform its student information systems

As discussed throughout this paper, higher education faces a period of unprecedented business disruption, which will precipitate a focus on institutional transformation. The SIS has the potential to be a critical component of achieving this goal. However, the combination of the limited flexibility of many current solutions, suboptimal approaches to implementation, and the unsustainable burden of administering the SIS has at many institutions undermined its potential to drive innovation. Consequently, over the next three to five years there will be a surge of institutions considering new approaches to their SIS. It is not necessarily a case of "rip and replace" but of modernization and supporting key functions, such as student success, in new, more innovative and effective ways. Ovum forecasts that these new approaches will result in SIS spend in North America growing from $2,019m in 2017 to $2,619m in 2021.

Figure 7: North American higher education SIS spend, 2015–21



Source: Ovum, Global Higher Education Technology Spending Through 2021

When institutions are working through the selection process, they must take a new approach, looking beyond the "as is" to the "what could be" to deliver the best ROI for these new SIS investments. It will be difficult to build a business case for a new SIS that, while having a more attractive user interface and some incremental improvements to performance, inherently supports the same institutional processes and transactions in the same way as the current solution. Instead, institutions must seek out solutions able to support new and unanticipated models for delivering programs, engaging students, and supporting business operations. Embedding AI capabilities within the architecture of the solution – delivering process and transaction automation and offering end users predictive intelligence and personalization – fundamentally changes how the SIS supports the delivery of education services and institutional operations.

Institutions must seek out specific characteristics in an SIS provider

While the surging accessibility of AI in the consumer market might suggest there are relatively few barriers to entry, these technologies are incredibly sophisticated, with development and maintenance hinging on considerable subject-matter expertise (SME) and resources. Similarly, an SIS must support numerous mission-critical transactions and processes, often spanning the entirety of the student lifecycle and subject to detailed regulatory and compliance requirements. Developing and maintaining an SIS depends on a product development team with deep industry expertise and an army of highly skilled developers. Combine these two scenarios and it is easy to see that not all SISs will leverage AI in the same way or deliver the same level of value to institutions. Consequently, as institutions craft their SIS investment strategies, Ovum recommends that they pursue the following vendor and solution characteristics in relation to AI:

- A track record of product innovation is a critical insurance policy.
- There must be a balance between horizontal firepower and industry specificity.

- AI must be embedded rather than relegated to a separate function.

A track record of product innovation is a critical insurance policy

The development and maintenance of AI solutions requires considerable subject-matter expertise and resources. While an end user might experience a simple application or a charming virtual assistant, making it work effectively requires sophisticated data science, a robust stack of technologies, and integration with a larger ecosystem of data sources. Keeping ahead of, or even just at pace with, innovation in this space further expands the development requirements. Ovum therefore strongly advises institutions to factor in the product development track record and capabilities of any SIS vendor. Higher R&D spend to overall revenue ratios, strong and stable product teams, the ability to consistently meet the milestones of product roadmaps, and industry awards are all characteristics to be considered in the selection process. There is no doubt that technological innovation will continue to accelerate for the foreseeable future, particularly for AI, and thus the ability to future-proof SIS investments rests, at least in part, on the right vendor partner.

There must be a balance between horizontal firepower and industry specificity

Many of the use cases for AI have developed in the consumer market, and there are important lessons to be learned from bleeding-edge industries, such as retail, media, or telecoms. However, without understanding the cultural nuances of the higher education industry and its unique processes, transactions, and interactions, it can become at best a tool looking for a problem and at worst an investment that fails to deliver as expected. For example, at some institutions, intellectual exploration – taking courses outside of one's major – is an important element of the educational experience. At such schools, the underlying algorithms driving course selection must incorporate this pedagogical tenet rather than support only the most expedient path to graduation. Taking a singularly consumer market approach may fail to recognize this requirement, which will undermine faculty buy-in and student satisfaction. Solution providers that have both the horizontal and the higher education expertise will understand how to support these types of nuances in a way that neither compromises robust performance nor curtails future flexibility.

AI must be embedded rather than relegated to a separate function

Realizing the full transformational value of AI technologies depends on embedding them in core business functions. AI is not a separate activity, but a key component of how institutional processes and engagements are supported and delivered. There are important lessons to be learned from the failure of many institutions to embed analytics, and even business intelligence, into the day-to-day work of line-of-business end users, as this has been a major impediment to the more pervasive adoption of these technologies and their ability to deliver institutional value. The best SIS solutions will embed AI capabilities deeply into the solution architecture and workflows, enabling valuable automation and intelligence to be developed. In some circumstances, AI will be transparent to the end user, be it student or employee, but in others, it will be entirely opaque, capturing process efficiencies and personalization in profound ways. It is not about AI as new feature or functionality but a radical shift in how the SIS supports institutional transactions and interactions.

Appendix

Methodology

This report was produced through a combination of primary and secondary research. Primary research included discussions with colleges and universities, as well as ongoing briefings from software, hardware, networking, and services vendors serving the higher education industry. The author also drew on the findings of Ovum's annual ICT Enterprise Insights survey.

Secondary sources of information included company reports and websites, international organization statistics, national and international industry associations, SEC filings, broker and analyst reports, and business information libraries and databases.

Further reading

2018 Trends to Watch: Higher Education, IT0008-000321 (October 2017)

2018 Trends to Watch: Consumer Technology, TE0004-001201 (September 2017)

Digital Consumer Insights 2017: Smart Living Technology Analysis, TE0004-001185 (August 2017)

Global Higher Education Technology Spending Through 2021, IT0008-000310 (April 2017)

2017 ICT Enterprise Insights in the Higher Education Industry, IT0008-000286 (November 2016)

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We hope that this analysis will help you make informed and imaginative business decisions. If you have further requirements, Ovum's consulting team may be able to help you. For more information about Ovum's consulting capabilities, please contact us directly at consulting@ovum.com.

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