Helping the Education Industry Learn and Ascend the Digital Technology Curve

All players in the learning ecosystem – educational publishers, institutions of learning and educational technology providers – need an efficient and quick way to evaluate new technologies. By rapidly identifying high-impact technology trends that drive learner-centricity, companies can pilot innovations that show value quickly or move on to other opportunities.
EXECUTIVE SUMMARY

New technology trends appear with breathtaking rapidity in a world hungry for innovation. In the education industry, publishers, institutions and technology providers are struggling to find ways to adopt the learner-centric new tools and techniques that will help them improve student experience and outcomes. But most of these organizations lack evaluation methods that take into account technology’s various facets, including maturity level and the dimensions of learning: space, schedule, style and supplement.

Our 4Si Framework provides a pathway from the constant barrage of new technologies. The 4Si Framework helps education companies answer these key questions:

- How does an emerging digital technology trend affect learning effectiveness?
- How do we transform our current product or service offering into a next-generation product using emerging digital technologies?
- How can we select digital learning products that most effectively leverage the emerging technology trends?
- How can we become more learner-centric?

For education companies, structuring the analysis of which technologies to deploy is a major advantage, enabling them to make the right call at the right time.

The 4Si Framework helps education organizations minimize risk, which is more important than ever in today’s volatile environment. Using the 4Si Framework to identify the most fruitful technology trends for learning allows organizations to think big (while starting small) and fail fast, scaling projects that work.
Players in all segments of the education industry are now making critical decisions as to which technologies to leverage to meet their objectives. But it can be difficult to evaluate individual technologies. Education providers know they cannot afford to experiment with and invest in every new technology that comes along.
AN INDUSTRY IN FLUX

Digital disruption has hit the education industry with a vengeance. Today's students demand more flexible, personalized models of learning. As a result, educational providers are scrambling to leverage digital technology that enables innovation. (See our white paper, “Managing Innovations and Student Expectations: Going Beyond the Roadmap.”) Institutions are under pressure to provide a much more comprehensive user experience.

New digital technologies applied to education such as virtual reality (VR), cognitive computing and artificial intelligence (AI) are changing how learning is delivered, paving the way for next-generation digital-learning products. The significance of these digital technology trends is potentially enormous.

Numerous players within the learning ecosystem are working together to improve the efficacy and efficiency of learning and maximize value to the learner:

- **Educational publishers** offer content for the educational market, including schools, institutions of higher education and providers of professional training. Educational publishers offer products and services to promote learning, including traditional course materials, digital content and online tools.

- **Educational institutions** range from K-12 public and private schools to universities and providers of professional education.

- **Learning technology providers**: These organizations are advancing the innovative technologies that are changing the way learning is being delivered today, including massive open online courses (MOOCs), virtual learning environments (VLEs), computer-based tests, adaptive learning and immersive learning.

The lines of distinction among these entities are blurring and all the types of players in the education ecosystem are drawing closer together (see Figure 1, next page). Textbook publishers are now adding digital learning products to their portfolios. Traditional universities, formerly solely embodied in bricks and mortar, now all have significant online learning components, with some even lending their faculty to MOOCs.

Players in all segments of the education industry are now making critical decisions as to which technologies to leverage to meet their objectives. But it can be difficult to evaluate individual technologies. Education providers know they cannot afford to experiment with and invest in every new technology (whether or not specifically geared to learning) that comes along. They need a methodology they can use to evaluate each new technology's level of learner-centricity, relative maturity, degree of potential impact and level of innovation.
Our 4Si Framework aims to help educational players do just that, serving as a pathway out from the chaos of a constant barrage of new technologies. The 4Si Framework helps education companies answer these key questions:

- How does an emerging technology trend affect learning effectiveness (i.e., if we deployed it, to what degree would it increase learning effectiveness)?
- How do we transform our current product or service offering into a next-generation product using emerging digital technologies?
- How can we select digital learning products that most effectively leverage the emerging technology trends?
- How do educational providers become more learner-centric?
To remain relevant, institutions must discard their traditional three- to five-year technology roadmaps and adopt a robust technology infrastructure and planning strategy that will accommodate ongoing innovation.

THE INNOVATION IMPERATIVE

Organizations in the educational ecosystem need to innovate especially quickly as digital devices and experiences rapidly upend learner expectations. Yet many institutions of higher learning have not kept pace with student demands for more convenient, customized experiences delivered on their device of choice. To remain relevant, institutions must discard their traditional three- to five-year technology roadmaps and adopt a robust technology infrastructure and planning strategy that will accommodate ongoing innovation.

By contrast with traditional software development practices, innovation in the learning ecosystem moves from free-range ideation, to identifying discrete opportunities, to quickly abandoning ideas that don’t work and rapidly scaling up initiatives that succeed. This pathway is more flexible and enduring than a roadmap to launch engaging student experiences delivered through digital innovation.

THE ‘FOUR ESSES’: DIMENSIONS OF LEARNING

Traditionally, the learning environment – where it takes place, when, how and with whom – has been constrained by time and physical space. That is no longer true. The four pillars of the classic learning environment have changed:

• **Space**: Up until recently, the classroom has been virtually the only place to acquire knowledge. This is how education has been transmitted since the beginning of pedagogy. The educational institution – for example, the school, university, teachers, administrators – would establish a physical space – a classroom, amphitheater or laboratory – where the teaching and learning would take place. This became the locus of ideas and thoughts, where questions were considered and learning occurred. Now, by contrast, learning can occur almost anywhere in the world, at any time. Thanks to the widespread use of modern communications technologies, the boundaries of space have been broken.

• **Schedule**: As with the classrooms, the boundaries of time were also set by the educational providers concerning when learning would occur – the timetable for learning. In a limited space, usually within a narrow one- or two-hour schedule, the learner was expected to acquire the desired skills. Digital-enabled learning modalities expand those boundaries. Learners can pick up materials when they have time and are so inclined. Self-paced learning transcends the boundaries of time. Any-time learning offers the flexibility to learn and practice as many times as needed to master the skills when needed.

• **Style**: Traditionally, teachers enabled learning for their students in the class. Assignments, quizzes, assessments have been the common tools teachers use to ensure learning happens at the designated time and place. One person, the teacher, stands in the center of the space; students are seated...
and they take in the material being presented by the teacher. Now, there can be multiple teachers - or no specific teachers, in the case of peer learning - and interactive technologies to support a variety of learning styles. And with open education resources, it is not always clear who the teachers are - if any - and where the educational materials come from.

- **Supplement**: Teachers typically use resources and tools such as textbooks, reference materials, projects, quizzes, tests and activities to supplement the learning process. These supplemental activities have traditionally occurred in a limited space and on a predefined schedule, bolstered by supplemental materials that help ignite learning. Learning supplements such as textbooks required long lead times to create, which affects how learning can happen. A newly renamed country might not appear with its fresh moniker on a classroom globe for years after the change occurred. Digital technology, of course, changes all that. A wide range of open educational resources (OER) are available without charge, changing the game for learners who struggle to pay for learning materials.

**Now, there can be multiple teachers – or no specific teachers, in the case of peer learning – and interactive technologies to support a variety of learning styles.**

**INTRODUCING THE 4Si FRAMEWORK**

Working along the four dimensions of learning delivery, we have created a framework that helps to assess the technology trends that form a foundation for digital transformation.

The 4Si Framework helps educational organizations achieve the following objectives:

- Assessment of technology trends.
- Identification of the maturity of each technology trend.
- Evaluation of the innovation maturity of the technology trend (as correlated to commercial maturity).
- Establishment of a 4Si technology trend baseline map for each trend.

Educational publishers, institutions and technology providers can use the 4Si technology trend baseline map to evaluate the impact of technological trends on their current offerings, as well as to help them plan for the future.

The key issue that all publishers, educational institutions and educational technology providers are trying to address is, simply, how to make their offerings more learner-centric.

The principle of learner-centricity positions the learner at the center of the holistic learning process. The where, when, what and how of learning become personalized toward the learner with the goal of achieving the desired learning outcomes. Learner-centricity is achieved when the technology or trend
Learner-centricity is achieved when the technology or trend addresses the needs of the learners across the four dimensions—space, schedule, style and supplement—while also being innovative.

The 4Si Maturity Index

![Diagram of the 4Si Maturity Index]

As Figure 2 reveals, the learner is at the center, with concentric circles representing the degree of innovative maturity (blue for low, yellow for medium and green for high), as well as the four learning dimensions helping to determine the learner-centricity of each technology trend. The closer the score is to 0, the closer it is to learner-centricity.

Educational publishers and institutions need to understand the impact of the technology trend on the four dimensions of learning. The dimension maturity framework (see Figure 3, next page) helps to answer the key question: “Which dimension(s) of learning are impacted by the technology trend (space, schedule, style, supplement)?” This analysis will reveal how the technology trend is impacting the learning process— the where, when, what and how.
Figure 3 also defines dimension maturity values (low, medium and high) for the four dimensions. These maturity values are indicative of the degree of learner-centricity exhibited by the technology trend. The dimension maturity values have associated colors (blue for low, yellow for medium and green for high) as well as numeric values.

The innovation maturity framework depicted in Figure 4, next page, helps to answer the key question: “How innovative is the technology trend?” It defines innovation maturity values (low, medium and high) based on three stages (adoption, availability and application). The innovation maturity values have associated colors (blue for low, yellow for medium and green for high) as well as numeric values.
The 4Si framework utilizes a three-step process, evaluating each technology in terms of stage of adoption, availability and application quotient and giving it a numerical score on a scale of 1 to 3 (see Figure 5, next page). For example, with adoption, a score of 1 indicates it is so innovative there are likely few service providers (SPs) so debuting a product based on that technology might place you in a cost disadvantage. As discussed, innovation is another dimension of analysis that transcends the 4Sis.

As Figure 5 relates, the maturity index is classified from low to high with respect to learner-centricity and depicted by colors - the same ones as in Figures 3 and 4: blue for low, yellow for medium and green for high.

Figure 6, next page, illustrates the 4Si assessment of a sampling of technology trends conducted by our education research team. (This assessment reflects one point in time. The analysis might well change over time, depending on market drivers.)
The 4Si Framework at a Glance

**DIMENSION MATURITY**
This helps in defining the maturity scales for each dimension. Goal is to achieve learner-centricity.

**INNOVATION MATURITY (MARKET LINKED)**
This helps in defining the innovation maturity based on adoption level, availability to service providers and application.

Figure 5

**4Si’s Baseline Analysis of Technology Trends 2017**

<table>
<thead>
<tr>
<th>February 2017</th>
<th>Dimension Maturity</th>
<th>Innovation Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Trend</td>
<td>Space</td>
<td>Style</td>
</tr>
<tr>
<td>Virtual Reality</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cognitive Computing</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Gamification</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Learning Analytics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>OER</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>E-textbooks</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

The baseline is achieved by analyzing the technology trends by dimension and innovation maturity.

Figure 6
4Si Framework Assessment of Virtual Reality

To get a better idea of the 4Si Framework in action, we’ll evaluate the virtual reality (VR) segment (see Figure 7).

For innovation maturity, VR has a limited number of service providers, with an increasing level of business process standardization. With greater adoption, more standardization and service players would be available. At this stage, we place it at the middle of the innovation matrix.

- **Space**: VR as a technology is dependent on the space for the offerings related to learning objects – for example, getting VR content related to stars, nature and planets for a science class. We currently are in a state where offerings of VR for learning are in a hybrid space. Real learner-centricity will be achieved when we have the technology enabling the anywhere learning beyond the boundaries of limited space. Hence, we gave VR a value of 2 for this dimension.

- **Style**: Current VR technology is limited to sharing information only. It is based on a predefined method of learning, more like a piece of curated information with a specific objective. Real learner-centricity would require a thoroughly collaborative way of imparting learning, where educators and learners can cooperate and enhance learning through scenarios and critical thinking concepts. Thus, we gave it a score of 3 for this dimension.

- **Supplement**: VR for learning is digital content. But the next level of interactive and adaptive content needs to be generated to improve learner-centricity. Considering its current state, we gave VR a value of 2 for this dimension.

- **Schedule**: Using VR as a learning technology is based on a predefined pace. As more adaptive and collaborative content comes into play, the degree of learner-centricity will evolve. This level would enable the learner to have immersive learning at his own personalized pace and time zone. Another score of 2.

### 4Si Baseline Analysis of Virtual Reality

![4Si Baseline Diagram](image-url)
**Gamification**

Our 4Si evaluation of gamification technology is shown in Figure 8. As for innovation maturity, gamification is highly standardized, with enough service providers to cater to market needs. It is on downward curve on innovation, however. Hence, we placed it on the lowest level of innovation maturity.

- **Space**: Being digital in nature, gamification enables anywhere learning. Hence from the space aspect, the use of gamification in learning is at the level of anywhere learning, as it is embedded into a learning method and is independent of the space.

- **Style**: Gamification for learning at this stage is with a predefined objective and follows the “Sage on Stage” approach. To move more toward learner-centricity, the supporting technology must balance engagement and effectiveness.

- **Supplement**: The current state is digital, hence we place the current value as central. Once the adaptive nature of content is provided, gamification nears learner-centricity.

- **Schedule**: Gamification as a technology enables anytime learning. Hence, from the schedule aspect, it is embedded into a digital learning method and is at the level of self-paced from a learner-centricity perspective.

**4Si Baseline Analysis of Gamification**

![Figure 8](image-url)
When it comes to innovation maturity, cognitive computing as a technology is a niche, with limited service providers. The processes of implementation are becoming standardized.

**Cognitive Computing**

When it comes to innovation maturity, cognitive computing as a technology is a niche, with limited service providers (see Figure 9). The processes of implementation are becoming standardized. Since cognitive computing appears to be the future of learning, we placed it on the central value in our chart.

- **Space**: Currently, cognitive computing is inching toward learner-centricity, with few dependencies of environment or space (e.g., research labs are used along with unconventional learning environments such as space and nature). Once the external environment can be better controlled and scenario-based cognitive-computing-enabled learning is gained, learner-centricity is achievable.

- **Style**: The current state of cognitive computing is limited to interaction. It is much beyond the “Sage on Stage” model and has already set the initial level of interaction where machine learning (ML) and natural language processing (NLP) have started giving shape to learning methodologies. Adaptive learning is an example. Thanks to algorithms, content is tailored to the learner’s inputs and behavior. Once the data stores are enriched, organizations can deliver more collaborative learning content that is personalized and adaptive. This moves them closer to learner-centricity.

- **Supplement**: Cognitive computing is a key enabler of adaptive content delivery, which helps the learner with content based on the scenarios and the needs of the learner. This trend leads to learner-centricity.

- **Schedule**: Cognitive computing fits the needs of the self-paced learner. With the dimensions being very close to learner-centricity, cognitive computing will positively impact learning outcomes.

**4Si Baseline Analysis of Cognitive Computing**

![Figure 9](image-url)
How to Use the 4Si Framework

Figure 10 shows how to use the 4Si Framework to assess a technology trend or digital learning product.

Our 4Si Framework also helps educational providers benchmark specific technology trends. The assessment takes the maturity of the innovation and the dimensions of space, style, supplement and schedule into consideration. Once this step is completed, the provider can compare results against 4Si baseline values for 2017. This comparison will help the organization to create a transformational roadmap using technologies that will be the most significant for its learners.

Once the roadmap is established, your organization should aim to adopt the “fail fast” model, in which we suggest a pilot implementation for one or two offering areas allowing you to see the benefits or shut it down. Once the pilot phase is successful, the next step is to execute the complete transformation plan.

The 4Si Framework also helps the educational provider identify which technology trend to focus on, based on innovation and learner-centricity.

For example, if a university wants to automate the full lifecycle of its operations, from enrollments to courses to student services to alumni and lifelong learning, it will need to identify how such an initiative impacts the different dimensions of learning and which specific technologies will be needed to achieve its goals.

The framework can also be used to identify important learning outcomes as defined through 4Si. And if a learning provider has already implemented a technology, there is still value in assessing it based on 4Si, discovering key gaps, how learning is (or is not) enhanced, how content is being delivered, how learning is being managed and any other activities.

For instance, universities may have discrete systems for digitizing records. But these systems may not be connected seamlessly to enable automated processes. The 4Si Framework can be used to determine the specific technologies needed for the university to bring the seamless automation of these processes, as well as any effects on learning.
A TOOL FOR TREND EVALUATION

The 4Si Trend Evaluator (4Site) is a tool for educational publishers, institutions and learning technology providers and for anyone who needs to evaluate the learner-centricity and innovation of a digital product.

The 4Site tool helps educational ecosystem players:

- Identify the gaps within their digital learning products with respect to learner-centricity.
- Identify areas that should be piloted.
- Plan the transformation journey based on desired learning outcomes and 4Si technology trend analysis.

The 4Site tool utilizes the baseline values for the various technology trends that we have derived (see Figure 5, page 11).

Our 4Site tool works as follows:

- Identify the key technology trend to assess.
- Select the key technology trend in the 4Site Baseline section. On selecting the trend, the baseline values get populated. Also, the 4Si Maturity Chart is populated as per the baseline values. (We provide baseline values.)
- Assess the technology trend for your digital product based on the four dimensions of space, schedule, style and supplement, along with the technology trend’s innovation maturity.
  » The assessment can be performed using the dimension maturity rating (Figure 2) and the innovation maturity rating (Figure 3).
- Enter the assessment values into the 4Site tool. The 4Si maturity chart will then show the following:
  » Gaps in results from the assessment and the baseline for the four dimensions and innovation.
  » How far or close you are from learner-centricity and in which dimension(s).
- Define and prioritize your organization’s digital learning product journey using the results from your 4Site assessment.

[Click here](#) to access the 4Site tool.
A Deeper Look: 4Si Evaluation Scenarios

**Scenario One:** An Education Publisher Assesses Digital Readers

Working with a publishing company, we used the 4Si Framework to guide its decision about what to do with multiple e-reader platforms that the organization had gained through acquisition.

The 4Si Framework analysis yielded interesting insights, including answers to these questions:

- How similar are the different digital reader platforms?
- What potential enhancements should be made?
- How can learner-centricity be achieved?

Using the 4Si Framework, we helped the publisher derive a next-generation digital reader matrix against which all the existing digital readers platforms could be compared and unified. We created a roadmap and implementation plan for a next-generation digital reader platform. This utilized the matrix generated during the pilot stage.

Potential benefits, once implemented, include:

- Ease of development and maintainability.
- A unified experience to global learners.
- Cost savings on development and maintenance efforts.

**Scenario Two:** An Education Technology Vendor Assesses Digital Learning Delivery

Educational technology providers have an administrative tool to manage their business processes along with digital learning delivery. For specific business needs, the buy-vs.-build decision is critical. We performed an assessment for an education technology provider using the 4Si Framework.

The 4Si Framework analysis yielded interesting insights about the following:

- Identification of specific aspects of the four dimensions that would enhance learner-centricity.
- Prioritization of development offerings with learner-centricity as the focus.
- Convergence of digital and human interactions to enable holistic learning.

Using the 4Si Framework, we helped the digital product development team prioritize the product features with a go-to-market roadmap. This helped them make a build-vs.-buy decision. We also created a new-feature roadmap and incremental product development plan. Potential benefits of this plan, once implemented, include:

- Prioritization of offerings as per go-to-market plan.
- Achievement of learner-centricity.
- Digital and human convergence points with focus on teachers, parents and students.
LOOKING AHEAD

The world of education will be very different for the next generation of learners than it was for most everyone reading this white paper. When these young people move to university in 2030, education will look very different, unbound by the constraints of time and space and including a wide array of learning modalities, materials and teachers.

No one can say exactly how education will take shape in the next few decades. But the ability to bring structure to the process of determining which technologies to deploy is a major advantage. Making
the right call at the right time is key. If you wait too long, your organization is late to the game. If it’s too early, your organization might be an early adopter of something that later fails.

The first steps on your technology trend assessment journey:

• Start by identifying three to five technology trends creating buzz in your industry.
• Create a list of your organization’s products or services that need to be enhanced for future use.
• Build a timeline to assess the designated technology trends using your organization’s favorite framework or tool of choice, such as the 4Si Framework and the 4Site tool.

The 4Si Framework gives organizations in the educational ecosystem a way to minimize the risk surrounding new technologies and make informed judgments using a structured method. This approach makes the necessary space for innovation, the ability to think big but start small and fail fast, scaling projects that work. The 4Si Framework is your compass, clearing your pathway through the forest of new technology introductions.

ABOUT THE AUTHORS

Venkat Srinivasan leads Cognizant’s Education Practice. He is a trusted advisor to higher education industry leaders with over 25 years of experience helping clients with business strategy, innovation and technology enablement.Venkat has a consistent track record of delivering value to clients and building the practice. His areas of interest and research include higher education, online learning, student retention analytics and digital technology disruptions for schools and universities. Venkat can be reached at Venkatraman.Srinivasan2@cognizant.com.

Manoj Chawla is a Senior Manager within Cognizant’s Education Practice. He has served global customers in the higher-ed, K-12 and continuing education spaces. In these different roles Manoj has helped customers define and develop learner-centric digital solutions. His areas of expertise include digital strategy, solution envisioning and process consulting. A Certified Scrum Product Owner (CSPO), Manoj also holds an M.B.A. from Great Lakes Institute of Management and an engineering degree in electronics. Manoj can be reached at Manoj.Chawla@cognizant.com.
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