The 2018-2023 Global Game-based Learning Market

Worldwide Serious Game Industry in a Boom Phase

Analysis by: Sam S. Adkins

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# Metaari's 2018-2023 Global Game-based Learning Market

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About Metaari

Metaari (formerly Ambient Insight) is an ethics-based quantitative market research firm that identifies revenue opportunities for advanced learning technology suppliers. Metaari publishes quantitative syndicated reports that break out revenues by customer segment (demand-side analysis) and by product category (supply-side analysis). Our forecasts are based on our industry-leading learning technology taxonomy and our educational game framework.

We track the learning technology markets in 122 countries. **We have the most complete view of the international learning technology market in the industry.** Metaari focusses solely on advanced learning technology research on products that utilize psychometrics, neuroscience, game mechanics, robotics, cognitive computing, artificial intelligence, virtual reality, and augmented reality.

About the Analyst

Sam S. Adkins is the CEO and Chief Researcher at Metaari. Sam has been providing market research on the learning technology industries for over twenty years and has been involved with digital training technology for over thirty-five years. Sam is an expert at identifying revenue opportunities for global learning technology suppliers.
Sam was a business development manager for Microsoft’s Training and Certification group. During his eight years at Microsoft, he managed the Advanced Knowledge Engineering team that built the world’s first commercial online learning business (The Microsoft Online Learning Institute). Prior to that, he was a Senior Instructional Designer at United Airlines.

Before United Airlines, Sam was the manager of the Instructional Animation and Graphics Lab at AT&T’s central computer-based training (CBT) facility for four years.

Sam Adkins and Tyson Greer founded Ambient Insight in 2004. Ambient Insight ceased operations in late 2016 and rebranded as a new company named Metaari that launched in January 2017.

"Ambient Insight has been in operation for twelve years and we have a well-respected brand and a very successful company," comments Adkins. "The global learning technology market has changed dramatically in the last few years and the new advanced learning products coming on the market essentially represent a 'brave new world' in education. We want to be an active part of this new world and launched our new company to focus on these incredible innovations."

**Metaari's Definition of Serious Games**

The definition of Game-based Learning in our taxonomy is based on the research published by Alessi and Trollip in their seminal work entitled, "Computer Based Instruction: Methods and Development."

Game-based Learning is defined as a knowledge transfer method that utilizes "game play" comprised of some form of competition (against oneself or others) and a reward/penalty system that essentially functions as an assessment method to quantify mastery.

All educational games are designed for behavior modification (a synonym for learning), pedagogical intervention, and/or cognitive remediation. The first two are well known but the third is relatively new.

Game-based Learning is quite different from gamification. In gamification, game-like features (like badges and points) are tacked onto traditional
education content. Gamified courses are not games, but legacy products with gaming artifacts.

We developed the first iteration of our industry-leading Pedagogical Framework for Game-based Learning Products in 2005. At that time there were only six distinct types of educational games on the market. Cognitive learning and brain training games were added to the framework in 2007. AR, VR, and AI-based educational games are very new to the market and are now part of the framework. A very new type of education game has just come on the market and is used for pre-employment assessment in the organizational segments. **The 2018 iteration of the Metaari's framework identifies eleven unique types of educational games, each with distinct revenue streams in specific buying segments.**

**Executive Overview: The Global Game-based Learning Market is in a Boom Phase**

The worldwide five-year compound annual growth rate (CAGR) for Game-based Learning products and services is a robust 37.1% and revenues will more than quadruple to reach well over $17 billion by 2023. Global, regional, and country market conditions are now extremely favorable for serious game suppliers. The worldwide educational game market is now in a boom phase.

*Metaari has revised our revenue forecasts for the global Game-based Learning market significantly upward from previous forecasts.* This is due to the impact of major global market catalysts that are creating very favorable market conditions for suppliers. Of the seven advanced learning technology products tracked by Metaari, Game-based Learning has the highest growth rate.

The five-year compound annual growth rates (CAGRs) for the global Game-based Learning market have been increasing for the last six forecast periods. This is somewhat unusual for a mature product type. Mature products tend to reach a peak in the product lifecycle characterized by a lack of innovation and then begin to decline as buyers migrate to newer products (known as product substitution). This is happening now for legacy products like Self-paced eLearning with buyers moving to new product types; global eLearning revenues are in steep decline.

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The steady increases in five-year CAGRs for educational games is directly correlated to the ongoing innovations that are being integrated into next-generation educational games like psychometrics, neuroscience, augmented reality (AR), virtual reality (VR), and artificial intelligence (AI). Essentially, Game-based Learning has transformed (evolved) into a new type of advance learning technology and has effectively rebooted its lifecycle. As a product type, it has effectively leveled up.

**Figure 1 - Longitudinal Data over Last Six Forecast Periods: Five-year Compound Annual Growth Rates (CAGRS) for the Global Game-based Learning Market**

This is an evidence-based quantitative report. This report identifies over 900 educational game developers competing in the 122 countries tracked by Metaari. Some have global distribution reach and are licensing third-party games from developers across the planet. Dozens of global distribution agreements are identified in the report. This report identifies the companies making the licensing deals and the types of games the global distributors are licensing. Some developers are regional competitors, but most compete at the country level in specific buying segments.

- This report identifies the Game-based Learning companies and distributors that operate in specific countries and regions; it identifies

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the types of products and services they sell, their business and pricing models, and their primary buying segments.

- The report provides verbatim marketing messages from most of the companies in this report to show suppliers how their competitors articulate their value proposition. It identifies the investment funding totals for many of the suppliers cited in this report. Developers that have garnered private investment have obviously been successful at quantifying their value proposition.

- This report identifies specific buyers by company or organization name and location providing suppliers with potential sales leads. This provides invaluable insight on the top buyers across the globe, the types of Game-based Learning products they buy, and the suppliers that are meeting the demand from these buyers.

There are three sections in this report: a detailed analysis of the catalysts driving the market, a demand-side analysis, and a supply-side analysis. The demand-side analysis provides revenue forecasts for seven regions, thirty-nine countries, and eight buying segments.

The supply-side analysis provides five-year revenue breakouts for custom educational game development services, authoring tools and platforms, and eleven educational game categories as defined by Metaari's Pedagogical Framework for Game-based Learning Products. The framework identifies eleven unique types of educational games. The educational game framework (and the forecasts for each game type) provides suppliers with a precise method of tapping specific revenue streams and a concise instructional design specification for the development of effective and profitable educational games.

This report includes the combined revenues for both mobile and non-mobile educational games. It also includes a description of Metaari's Mixed Reality Spectrum defined as immersion along a spectrum and also a description of our Artificial Intelligence Array that ranges from so-called "humans in the loop” to autonomous machine learning and deep learning methods. A great deal of innovation is now occurring in AI-based learning games and they are discussed in the section analyzing the catalysts.

The education and training industry is on the verge of extraordinary innovations in knowledge transfer due to advances in cognitive computing and artificial intelligence platforms. One of the best-known cognitive computing platforms is IBM's Watson and developers are building out
advanced learning technology products on top of the cloud-based platform. Pearson, Apple, Blackboard, Sesame Street, and Houghton Mifflin Harcourt are building new educational products on Watson.

This report also includes a description of Carroll’s Three-Stratum Theory of Intelligence, one of the most widely accepted models for categorizing cognitive abilities and intellectual processes in cognitive research. It is a schemata for developing eight types of cognitive learning and brain training games.

Due to the high demand in the US, a detailed demand-side analysis by eight buying segments and a supply-side analysis by eleven serious game types, custom educational game development services, and authoring tools and platforms is provided for the United States in this report. The US analysis identifies very distinct revenue opportunities for developers; **the US is the most lucrative market for educational games on the planet.**

### Primary Catalysts Driving the Global Educational Games Market

There are eight primary convergent catalysts driving the global educational game market. They are convergent in the sense that they are all having an impact on the other catalysts. The catalysts include:

- Exponential innovation and transformation in the worldwide serious games industry
- Historic levels of private investment flowing to Game-based Learning companies across the planet
- Large scale global distribution agreements between serious game developers and global distributors
- The booming global consumer demand for mobile serious games
- The rapid uptake of Game-based Learning in the corporate segments across the planet
- Native Mixed Reality (virtual reality and augmented reality) and AI support in operating systems, game engines, and on billions of devices: the new Apple ARKit and the Google ARCore SDKs are game changers
- The availability of inexpensive easy-to-use rapid development tools
- The proliferation of online marketplaces selling premade digital 3D models, VR environments, and pre-trained AI models.

Combined, these catalysts have created highly favorable market conditions that are contributing to the boom phase in the Game-based Learning market across all seven regions analyzed in this report. This report provides

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quantifiable and significant revenue opportunities for suppliers in specific buying segments and in particular regions and countries.

There are also secondary catalysts such as the global rollouts of very fast 5G networks and the impending implementation of the so-called Internet of Things (IoT). National commercial networks won't be operational in most countries until 2020-2021. It is too soon to analyze the tangible impact of 5G on the serious games industry.

Figure 2 - Primary Catalysts Driving the 2018-2023 Global Game-based Learning Market

The serious games industry is in a period of profound innovation (if not outright disruption) that is at the root of the booming market. These innovations are exponential in the sense that they are not small incremental linear innovations common to traditional products; they are fundamentally new types of learning products.

These innovations coincide with the extraordinary advances in augmented reality (AR), virtual reality (VR), location-based Mixed Reality, and artificial intelligence (AI). The innovations are also rooted in the advances being made in child development, psychometrics, neuroscience, behavioral science, cognitive learning, and educational psychology.

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These technology and science advances are having a dramatic impact on the Game-based Learning industry. Developers are releasing stunningly beautiful (and profitable) immersive learning experiences. There is a growing body of empirical clinical evidence on the effectiveness of these new educational games. The value propositions are compelling and empirical data on effectiveness gives developers a major competitive advantage over legacy learning technologies like eLearning.

AI is a game changer for Game-based Learning. AI-based educational products have just come on the market and they will have a major impact on the learning technology industry since they enable true personalized and adaptive learning. There are several AI-based educational games on the market, but it is too soon to generate forecasts for this type of serious game.

In September 2017, Unity released their machine learning (ML) Agents features "The new Imitation Learning tech means games can learn from real player habits and adjust based on their behavior." In February 2018, IBM and Unity released the IBM Watson Unity SDK, which will greatly reduce the complexity of developing AI-based games. "The SDK makes it easy for developers to take advantage of modern AI techniques through a set of cloud-based services." This is a major catalyst that will accelerate the development of AI-based serious games.

Private investments made to serious game suppliers reached historic highs in 2016 and 2017. Over $1.7 billion in funding flowed to educational game companies across the planet in 2016 and 2017. What is interesting about the investment patterns is that most of the funding is going to companies that develop specific types of educational games designed for particular demographics. Those investment patterns are listed in the analysis of the catalysts section that also identifies several funding sources including governmental agencies that find game development.

Large-scale distribution agreements between Game-based Learning companies and global distribution partners are a major catalyst accelerating the adoption of serious games by billions of new users across the planet and a major variable contributing to the spike in global revenues for serious games in the booming global market.

Dozens of large-scale global distribution agreements are cited in the section analyzing the global catalysts. This provides suppliers with blueprints on distribution partnership agreements and isolates potential partners in specific countries and regions; it also identifies very large revenue opportunities for serious game developers. The recent slew of major

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distribution agreements is one of the variables contributing to the boom phase of the market.

A very clear indicator of the vibrant global Game-based Learning is the IPO launched by Ireland's VR Education Holdings (the holding company of the subsidiary Immersive VR Education) in March 2018. They are known for selling some of the world's most popular VR-based educational games including the Apollo 11 game. They sold over 120,000 copies of the game generating over $1.2 million for the game since 2016. The game was included on the new Oculus Go stand-alone headset that launched in May 2018.

Publicly-traded Game-based Learning companies were common in the 1990's in the so-called edutainment industry. All of those companies were acquired and/or taken private. The edutainment industry imploded by the end of that decade and there were very few IPOs for best-of-breed serious game companies until Immersive VR Education's IPO in 2018.

Australia's KNeoMedia is another exception and trades on the Australian Stock Exchange (ASX). They sell a game-based platform for special needs students and in their latest financial statements reported large licensing agreements with the New York City Department of Education.

In 2016 and 2017, the consumer demand for early childhood learning games spiked and spread to almost every country on the planet, even in developing economies. Many developing economies are mobile-only countries where web access is overwhelmingly a mobile experience.

This is sometimes called the post-PC era characterized by the majority of people in a country leapfrogging PCs altogether. There are five types of educational games for children that are in very high demand in almost every country on the planet. They are described in the section in this report on the catalysts.

The top twenty best-selling educational games (for both the Apple app store and the Google Play Store) are identified for 39 countries in this report. This provides quantifiable evidence on the specific consumer demand in each of these countries and identifies the developers that consistently have games in the top rankings.

Corporations were once resistant to the use of games for training and education. The perception (mostly true as recently as five years ago) was that training games were expensive, complicated, and time-consuming to
develop. This is no longer true; the growth rate for Game-based Learning in the corporate segments across the globe is very high at a breathtaking five-year compound annual growth rate of 53.4%, the highest growth rate of all the buying segments.

Corporations are buying very specific types of learning games. They buy packaged games from developers and pay the developers to create custom versions. Many developers also license their authoring tools to clients. An analysis of the specific game types that are now in high demand in the corporate segments across the planet are included in the demand-side section that includes a detailed analysis of the corporate demand in the US.

Startups that develop these new corporate-facing games continue to come on the market and are attracting the attention of private investment firms. Over 30 of these companies are cited in this report and investment totals for each company are also cited.

Native support for Mixed Reality in operating systems, in gaming engines, and on devices is a major catalyst for Game-based Learning. It essentially creates a massive delivery channel for suppliers and offers developers standard tools and platforms to create the products. Native Mixed Reality support is accelerating the demand in all the buyer segments and it discussed in detail in the analysis of the catalysts.

- Google launched their Daydream VR platform in 2016. It is native on all Android builds starting with Nougat and beyond. Google also has a dedicated portal for Daydream apps providing developers with a centralized distribution method.

- Microsoft's latest releases of Windows now have native Mixed Reality features. Windows Mixed Reality was included in the Windows 10 Fall Creators Update that launched in late 2017.

- In 2017, Apple released their ARKit SDK and Google launched their ARCore SDK. By 2020, billions of smartphones will have native support for AR. Going forward, every new iOS and Android model of smartphone will include native support.

- Both Unity and Epic's Unreal Engine gaming platforms have integrated support for ARKit and ARCore.
Vuforia is one of the most widely used augmented reality authoring tools. Of the 88 AR games in their catalog, 42 were educational games and they were all designed for young children.

Vuforia now supports both the ARKit and ARCore specifications but also allows developers to build AR apps and games for devices that are not yet compatible with Google's or Apple's specifications. Vuforia's platform is unique in that it is not only aware of objects in the environment, it also "knows" what they are via object recognition.

In March 2018, Google opened their Google Maps API to game developers with an add-on for Unity. "Developers will now have access to an accurate, living model of the world to serve as the foundation for their game. Google Maps API provides access to over 100 million 3D buildings and landmarks from over 200 countries, allowing developers to craft games around the globe."

At the GDC conference in March 2018, a company called uSens launched the beta of their AR engine uSenseAR. "Developers and content creators can now build experiences for two billion Android devices. uSenseAR is a single camera AR engine that is optimized for low-end cameras, sensors and IMUs, it make it possible for almost all Android devices to experience the thrill of AR."

Until recently, educational game development required very expensive and complex proprietary development platforms. It is no longer true in the educational games industry. In 2016 and 2017, a range of new rapid educational game development tools came on the market and continue to come on the market. They are relatively inexpensive and designed for non-technical people.

These new tools include gameplay templates, "blocks" of interactivity, knowledge transfer models, so-called behavior packs based on AI, and Mixed Reality content libraries that support rapid development. Forty-three new Game-based Learning authoring tool companies are identified in this report.

A major catalyst enabling the development of cost-effective serious games in very short time frames is the proliferation of online marketplaces selling premade digital 3D models, virtual environments, and pre-trained AI models designed to be customized by developers. Over forty of these companies are discussed in this report. A description of their inventories and pricing models is also provided.

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What You Will Find in This Report

There are three sections in this report: an analysis of the major catalysts driving the market, a demand side-analysis, and a supply-side analysis. The analysis of the catalysts provides a detailed discussion of the major catalysts driving the global serious game market.

The demand-side analysis breaks out five-year revenues forecasts for seven international regions and by eight buying segments. Five-year forecasts are provided for seven regions: Africa, Asia Pacific, Eastern Europe, the Middle East, Latin America, North America, and Western Europe.

The demand-side analysis includes five-year forecasts for eight buying segments: consumers, three academic sub-segments (preschools, primary schools, and secondary schools), tertiary & higher education institutions, local/state/provincial/prefecture government agencies, federal government agencies, and corporations & businesses. A global analysis for all regions combined and a detailed analysis of the US supply-side is included in this section.

The supply-side analysis provides revenue forecasts for eleven Game-based Learning types. Each has very clear revenue opportunities. They are categorized in Metaari’s Pedagogical Game-based Learning Framework. The supply-side analysis also include five-year forecasts for custom educational game development services, and authoring tools and platforms. A global analysis for all regions combined and a detailed analysis of the US demand-side is included in this section.

Until recently, most educational games on the market were built with commercial gaming engines, mostly Unity and Unreal Engine. Those are general-purpose engines and their revenues are not included in this report. However, revenues for packaged retail educational games built with those tools are included. Dozens of new authoring tools designed exclusively to create game-based learning have come on the market since 2015 and those revenues are forecast in the supply-side section.

Metaari uses standard exchange rate and inflation/deflation variables in our predictive analysis and the impact of these fluctuations are baked into the forecasts. Metaari temporarily suspends tracking the learning technology market in countries undergoing severe socioeconomic challenges and restarts the monitoring once the conditions stabilize. We have done this in the past for countries like Egypt and the Côte d'Ivoire (The Ivory Coast),

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but restarted the tracking when the conditions normalized in those countries. We have currently suspended tracking in Venezuela.

**Where are the Buyers?**

Metaari tracks the learning technology markets in 122 countries across seven regions. While there can be similarities in buying behavior across countries, they are usually confined to a particular buying segment. In general however, the buying behavior is quite different in each country.

**Table 1 - The 122 Countries across the Seven Regions Tracked by Metaari**

<table>
<thead>
<tr>
<th>Number of Countries Analyzed in Each Region</th>
<th>Countries Analyzed in this Report by Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Countries in Africa</td>
<td>Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Chad, Côte d'Ivoire (The Ivory Coast), the Democratic Republic of Congo (DRC), Ethiopia, Ghana, Kenya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Tanzania, Tunisia, Uganda, Zambia, and Zimbabwe</td>
</tr>
<tr>
<td>21 Countries in Asia Pacific</td>
<td>Australia, Bangladesh, Cambodia, China (including Hong Kong and Macao), India, Indonesia, Japan, Laos, Malaysia, Mongolia, Myanmar (Burma), Nepal, New Zealand, Pakistan, the Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, and Vietnam</td>
</tr>
<tr>
<td>15 Countries in Eastern Europe</td>
<td>Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Serbia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.</td>
</tr>
<tr>
<td>18 Countries in Latin America</td>
<td>Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Perú, Uruguay, and Venezuela (Metaari has suspended analyzing Venezuela during the current financial crisis in that country.)</td>
</tr>
<tr>
<td>12 Countries in the Middle East</td>
<td>Bahrain, Egypt, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Turkey, the United Arab Emirates (UAE), and Yemen</td>
</tr>
<tr>
<td>2 Countries in North America</td>
<td>Canada and the United States</td>
</tr>
<tr>
<td>24 Countries in Western Europe</td>
<td>Austria, Belgium, Bulgaria, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom</td>
</tr>
</tbody>
</table>
This report provides five-year forecasts for Game-based Learning products for seven regions: Africa, Asia Pacific, Eastern Europe, Latin America, the Middle East, North America, and Western Europe. The regional forecasts for each region are for all countries in that region combined and there are 39 stand-alone country forecasts for the top buying countries in each region.

**Figure 3 – 2018-2023 Game-based Learning Growth Rates by Seven Regions**

Africa has the highest growth rate for Game-based Learning at a breathtaking 60.1%. The revenues in the 2018 market in the region are still relatively low compared to Asia Pacific, North America, and Western Europe but higher than the revenues in Eastern Europe and the Middle East. Revenues for serious games in Africa will surge over ten times by 2023; serious game startups are coming on the market at a rapid pace across the African continent.

Ten countries in Africa can be categorized as mobile-only countries: Benin, Botswana, Burkina Faso, Ghana, Mali, Mozambique, Namibia, Rwanda, Senegal, and Tanzania. All of these countries have mobile penetration rates above 120%. Fast 4G networks are rolling out rapidly across the region.

In mobile-only countries, access to the Web is overwhelmingly through mobile devices. PC penetration rates are relatively low on the continent.
except for pockets in large urban areas. Mobile educational games dominate the market in Africa.

The revenues for Game-based Learning are heavily concentrated in the Asia Pacific region and North America over the forecast period. In the 2018 market, Asia Pacific and North America combined accounted for 80% of all global revenues. The two regions will still account for 71% of all global revenues by 2023.

North America now has the second-highest growth rate after Africa at 46.1%. Revenues for educational games will grow over seven times in North America by 2023. The growth rate in the Asia Pacific region is 27.0% and revenues will more than triple in the region by 2023.

Eastern Europe has a healthy growth rate of 42.8% and while the revenues in the 2018 market are relatively low, by 2023 the revenues for serious games in the region will surge over six times.

The Middle East has a robust growth rate of 32.3%. The revenues in the 2018 market are relatively low in the region compared to the other regions but the revenues will spike over four times by 2023.

**Top Buying Countries in Each Region**

Five-year forecasts are provided in this report for the top buying countries in each region. Additionally, a five-year forecast is provided for the five countries in the Nordic Cluster combined. Five year forecasts are included for thirty-nine countries:

- Nigeria, South Africa, Kenya, and Uganda in Africa
- China, India, Japan, South Korea, Indonesia in Asia Pacific (forecasts are also included for the fastest growing markets in Asia Pacific including Bangladesh, Myanmar, Cambodia, Vietnam, Nepal, and Thailand)
- The Russian Federation, Ukraine, Georgia, Kazakhstan, Belarus, and Azerbaijan in Eastern Europe
- Brazil, Mexico, Colombia, Argentina, Perú, and Chile in Latin America
- Turkey, Egypt, Saudi Arabia, and the United Arab Emirates (UAE) in the Middle East
- Canada and the United States in North America
- The United Kingdom (UK), Spain, France, Germany, the Netherlands, and for five countries combined in the Nordic Cluster

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The three countries with the highest revenues for serious games in 2018 are China, the US, and India, respectively. In the 2018 market, China was still the largest buyer of serious games having overtaken the US in 2014. Yet, market conditions in China are shifting rapidly due to increased pricing pressures, consolidation, and pronounced commoditization, particularly in the consumer segment. Demand is very high and unit sales are high in China, but suppliers are increasingly competing on price (against very large competitors with deep pockets that can afford to drop prices as they consolidate the market) effectively keeping the revenues flat.

The growth rate for educational games is now slightly positive-to-flat at 2.2% in China in stark contrast to the robust growth rate of 47.6% in the US. By 2023, the US will be the top buying country again. China will drop to second. India will retain the third position throughout the forecast period.

In the 2018 market, Japan and South Korea had the fourth and fifth highest revenues, respectively. By 2023, Indonesia will jump to fourth place, followed by Japan and South Korea.

**Top Fifteen Countries with the Highest Growth Rates**

Azerbaijan has the highest Game-based Learning growth rate at a breathtaking 61.2% despite having relatively low revenues. Seven of the top fifteen countries with the highest growth rates for Game-based Learning are in Africa including Uganda, Senegal, Nigeria, Rwanda, Kenya, Tanzania, and Angola. All seven have growth rates well above 50%.

Of the 122 countries that were analyzed for this report, twelve countries have growth rates over 50% and fifty-three countries have growth rates above 40%.

Revenues in countries with over 50% growth rates will spike over eight times during the forecast period. Countries with growth rates over 40% will surge over five times over the forecast period.

The US is in the top fifteen with a growth rate at 47.6%. The Netherlands has a very high growth rate of 54.3%. Both the Netherlands and the US are

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very mature Game-based Learning, but they are both hubs for extraordinary innovations; *both countries are experiencing a resurgence in demand for educational games.*

**Figure 4 – Top Fifteen Countries with the Highest Growth Rates for Game-based Learning in the 2018-2023 Market**

Three countries in Eastern Europe were in the top fifteen: Azerbaijan, Belarus, and Kazakhstan. Two countries in the Asia Pacific made it in the top fifteen: Bangladesh at 48.8% and Myanmar (Burma) at 47.4%.

**Who are the Buyers?**

There are eight Game-based Learning buying segments analyzed in this report: consumers, three academic sub-segments (preschools, primary schools, and secondary schools), tertiary & higher education institutions, federal government agencies, provincial/state/prefecture & local government agencies, and corporations & businesses. This report breaks out the global revenues for each of these segments and provides a detailed breakout by these segments for the US.
Revenues will more than triple in all eight global buying segments over the forecast period and will surge more than five times in four of them. Yet the market drivers are unique to each segment. For example, the corporate demand is being driven by the booming demand for pre-employment assessment and evaluation games; the corporate segment has the highest growth rate out of all eight segments.

By 2023, the consumer Game-based Learning market will essentially be a commodity market; volume sales and revenues will be very high but unit prices will decline. In a commodity market, suppliers tend to compete on price.

Commodity markets create ideal conditions for merger and acquisition (M&A) activity as suppliers consolidate to maintain revenue streams. This is already occurring for early childhood learning games and mobile cognitive fitness games.

**Figure 5 – 2018-2023 Global Game-based Learning Market by Eight Buyer Segments**

The PreK-12 segments are broken out by the three sub-segments because the buying behavior and the user demographics are quite different in each cohort. The preschool sub-segment has the second-highest growth rate after corporations. There is a strong emphasis on "play-based learning" in...
preschools across the planet. The demand is being driven by data showing that games in preschool can accelerate the transfer of basic academic skills. Games have been proven to be quite effective at teaching young children social and emotion learning (SEL) skills. The large for-profit preschool chains (particularly in the US and China) are the top buyers of educational games for preschoolers. They license games from commercial Game-based Learning companies.

The types of games used in the primary and secondary sub-segments are very different as they map to scaffolding curricula. For example, STEM games are more common in middle school and high school programs.

Several recent trends could greatly accelerate the adoption (and the revenues) of serious games in the academic segments. Perhaps the most significant catalyst is Microsoft’s entry in the serious games industry when they launched their Minecraft: Education Edition in November 2016. In just one year, they had over two million licensed users across the planet. Microsoft continues to add resource packs (coding and chemistry are the latest) making the platform more attractive to the academic segments.

There are other major trends impacting the uptake of Game-based Learning in the global PreK-12 sub-segment:

- One of the most successful Game-based Learning suppliers in the PreK-12 segments across the planet is Kahoot! based in Norway. In January 2018, they reported that they had surpassed 70 million users. They claim their game is being played by more than half of all US-based PreK-12 students (30 million students). Kahoot! claims to be the fastest growing learning brand in the world with a 75% year-over-year growth rate.

- In June 2018, Roblox launched their Roblox Education program, which is essentially a Game-based Learning platform. The bundle is free for educational institutions and includes lesson plans. “The curriculum is available now and includes everything educators need to teach kids, ages 10 and up, technical and entrepreneurial skills on Roblox, such as step-by-step tutorials, handouts, lesson guides, and more. Roblox’s roots have always been steeped in STEM education.” Roblox had over 64 million active users by the end of 2017.

- Ubisoft’s Assassin’s Creed is one of the most popular games in the gaming industry. Their Assassin's Creed Origins game was released in late 2017 and sold over 1.5 million copies in the first week. In
February 2018, Ubisoft launched their new (non-violent) Discovery Tour by Assassin’s Creed: Ancient Egypt game that is "a new educational and entertaining tool which lets anyone explore the entire interactive 3D recreation of Ancient Egypt." The game "is a unique experience at the intersection of entertainment and learning. Interactivity, specific to the world of video games, is at the heart of the experience, creating strong engagement with the content. As both a game and a learning tool, it is quite a unique asset for teachers to integrate as part of their history classes." According to Ubisoft "Discovery Tour by Assassin’s Creed: Ancient Egypt a completely new type of edutainment tool."

- A major trend driving the adoption of VR-based games in the PreK-12 segment is the availability of so-called VR classroom kits that include headsets, chargers, routers, carts and most importantly, packaged educational content. This has created a growing distribution channel for development companies that partner with the kit companies.

Revenues for educational games in the tertiary and higher education segments are still relatively low compared to the other segments but the growth rate is quite healthy at 32.8%. Education games that incorporate role playing are now common in sales, finance, business, and marketing programs in higher education institutions across the planet. The demand for business simulation games is quite high in all the developed countries.

The buying behavior in the two government segments analyzed in this report is similar in that games are used for civilian employees, military personnel, public safety employees, and first responders. Agencies hire developers to create custom games for various civic initiatives.

The growth rate for Game-based Learning in the federal government agencies across the planet is 41.7% and 43.4% in the local and state government agencies. The growth rates are essentially on par for the two segments. Yet, there are unique buying patterns in both segments and they are discussed in great detail in the demand-side analysis.

**What are They Buying?**

This report tracks educational games designed for mobile devices, dedicated handheld gaming devices, personal learning devices (PLDs), PCs, the web, consoles, and hybrid devices like the Nintendo Switch.

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Packaged retail games distributed on tangible media (DVDs) are declining rapidly in developed countries and console suppliers are moving to streamed products. Once 5G networks become ubiquitous across the planet by 2020-2021, streaming will be the dominant delivery method. Game executives are already predicting the end of the console.

This report forecasts revenues for three types of Game-based Learning products and services: packaged retail games sold by unit or by subscription, custom educational game development services, and tools and platforms designed to create and deliver serious games.

**Figure 6 - 2018-2023 Global Game-based Learning Growth Rates by Three Products and Services**

The five-year compound annual growth rate for packaged retail games is 36.5%. Revenues for packaged retail educational games (for all eleven types combined) will more than quadruple over the forecast period. The vast majority of revenues for Game-based Learning will be derived from packaged games throughout the forecast period.

Free-to-play educational games are found in the market but in-app advertising is rare compared to the non-educational game types. Parents are particularly hostile to advertising in early childhood learning games. Almost
all of the free-to-play educational games are basic mods and derive revenues from in-app sales of premium versions and add-ons.

This report identifies eleven distinct types of serious games as categorized in Metaari's Pedagogical Framework for Game-based Learning. Five-year revenue forecasts for each game type are provided for the global market combined and for the US market. The educational game framework provides suppliers with a precise method of tapping specific revenue streams and a concise instructional design specification for the development of pedagogically-sound and profitable educational games.

One of the eleven game types is AI-based serious games. It is too soon to generate baseline revenues for AI-based serious games and those forecasts are not available yet. It usually takes 2-3 years of a product lifecycle to calibrate forecasts and commercial AI-based educational games have only been on the market since 2016.

The growth rate for custom content development services is quite high at 42.2% and revenues will spike over five times over the forecast period. There is a vibrant (and growing) cottage industry of custom Game-based Learning developers across the planet.

The major buyers of custom services are corporations and government agencies although tertiary institutions (particularly business schools) also hire developers to create custom learning games. Corporate-facing custom developers tend to specialize in specific industry verticals. Government-facing developers tend to be very specialized.

The growth rate for Game-based Learning authoring tools and platforms is 45.2%, the highest of the three product types. Revenues will surge over six times over the forecast period. Dedicated Game-based Learning tools are relatively new on the market but new specialized rapid authoring tools continue to come on the market at a rapid pace. This report identifies over 40 new Game-based Learning tool companies.

Usually, this would indicate that the market will become crowded, M&A activity will increase, and startups will decline. Yet, suppliers are bringing authoring tools to the market designed for specific demographics, buying segments, and verticals.

For example, tools designed to create educational games for museums and tourist venues are specialized for those verticals. Specialized tools are also available now for pre-employment assessment and evaluation games used
in the organizational segments. There are highly-specialized authoring tools designed to create games for children. And of course, the tools used to author AR, VR, and AI-based learning games are quite unique and very new on the market.

It should be noted that legacy eLearning authoring tools do include gaming features, but they are of gamification-based features that tack on game-like content onto legacy courseware. They are designed to develop courseware, not Game-based Learning. The two learning technologies are very different.

**Dramatic Differences in Global and United States Buying Behavior**

While the growth rates for packaged retail content for all eleven educational game types combined are similar for the global market and the US, the growth rates for custom development services and tools/platforms are dramatically different.

**Figure 7 - Comparison Between the 2018-2023 Global and the US Growth Rates by Three Game-based Learning Products and Services**

The growth rate for packaged retail education games across the globe is 36.5% and the US growth rate is slightly higher at 40.4%. In stark contrast, the growth rate for custom Game-based Learning development services in 42.2% in the global market, but significantly higher in the US at 77.0%.
The global growth rate for educational game authoring tools and delivery platforms is 45.2%, yet the growth rate in the US is nearly double the global rate.

This report includes a detailed demand-side analysis for the US and a detailed supply-side analysis for the US. Both analyses provide extensive data on the catalysts and market drivers in the US.

The US demand for custom serious game development services and Game-based authoring tools and delivery platforms are heavily concentrated in particular buying segments and they are identified in this report. The types of custom services and the types of tools in demand are also identified at length.

It should be noted that growth rates over 50% are almost always due to new demand with relatively low baseline revenues in the 2018 market. As the demand matures, the growth rates will normalize.

Sources of Data on the Global Game-based Learning Market

Metaari principals are competitive intelligence experts that have been tracking the global learning technology industry since 1998 and the global Game-based Learning market since 2005; we have published an updated serious game market report every year since 2007. We have the most detailed and comprehensive data on the global serious game competitive landscape in the industry.

Our primary data sources include our predictive analysis data repository (mapped to our learning technology taxonomy developed in 2005 and updated annually), our serious game pedagogical framework, and a vast amount of longitudinal data collected since 1998 on over 3,000 suppliers (including over 900 Game-based Learning companies) across 122 countries. We have tracked the investments made to learning technology companies since 1998 and publish a whitepaper on global investment patterns every year.

Secondary data sources include: trade agencies, trade associations, financial reports, press releases, news articles, investment disclosures, merger & acquisition (M&A) disclosures, game and Mixed Reality news portals, and academic budget statements.
These data are then cross correlated with country-specific variables that include: population, socio-economic factors, technology distribution, broadband penetration, device sales, and education policies. Metaari generates actionable competitive intelligence by mapping the competitive landscape, performing supply-side and demand-side analyses, and by compiling data from a wide spectrum of information broadly classified as leading and lagging indicators.

**Figure 8 - Metaari's Actionable Competitive Intelligence Methodology**

There are several analytics firms that track the top selling mobile apps in the major app stores in countries across the planet. All of them have an education category and it is easy to identify the top selling educational apps (which varies from country to country).

One of the best global sources of information on mobile educational games is the App Annie portal, which includes rankings for the top 100 best-selling and top grossing education apps for over 100 countries and has separate breakouts for iOS, Android, and Windows. The rankings provide invaluable insight on what consumers are buying in each of the 100 countries.

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The online game marketplaces are excellent sources of information on the best-selling educational games. They all have a category for education and related categories like travel, space, and family games. The commercial stores rank the best-selling educational games providing developers with real-world insight on the games that are successful.

- WEARVR operates a VR experience marketplace. They have several categories related to learning including educational, architecture, travel, exploration, marine life, and space. They rank the top best-selling educational apps. One of the most popular VR apps according to WEARVR is DinoTrek developed by Geomedia and HIVE VR.

- The largest online game store is Valve's Steam. One of their category tags is education and they rank the top selling educational games. They also have a list of "new and trending" educational games. They have a category tag for exploration and one for "family-friendly" and the majority of those games are educational.

- Microsoft's Windows Store has a games section that includes education as a category. They rank the top paid educational games. They also have a category for family and kids that is mostly comprised of educational games for children. The rankings include both PC and console games.

Telecoms and mobile network operators (MNOs) operate app stores and Mobile Learning value-added services (VAS) in almost every country in the world and identify their revenues in their financial reports. They also identify the best-selling content. The mobile network operators (MNOs) and the third-party publishers that provide the Mobile Learning VAS learning content usually report the number of subscribers and the MNOs always identify the price of the subscriptions. Revenues are relatively easy to calibrate, yet, due to subscriber churn, the calibrations have to be done on an on-going basis.

It is important to note that sales ranking are dynamic and continually change. At best, they are snapshots of the current market. The rankings can change quickly. Portals like App Annie keep track of previous rankings to show how fast an educational game is climbing (or falling) in the charts. That said, certain types of serious games tend to rank high in the top best-selling educational game rankings: *early childhood learning games are bestsellers in every country in the world.*
There are information portals dedicated to digital games that include coverage of educational games. Gamasutra, Gamesindustry.biz ("The resource for people who make and sell games"), and PocketGamer.biz are good examples.

The annual Ed Games Expo event in the US is an exhibition venue for educational companies that have been awarded Small Business Innovation Research (SBIR) grants from the government. The event highlights the educational game companies (and the games they submitted) that were awarded grants and in that sense, a good source of competitive intelligence. There were 38 serious game developers that exhibited at the fifth annual event in January 2018.

There are now dozens of portals across the planet that aggregate global news and information on VR and AR including the Virtual Reality Reporter, Next Reality, VRFocus, UploadVR, Haptical, Wearable, VR World, The Virtual Report.biz, Hypergrid Business Review, Digital Bodies, and Road to VR. They all cover and review educational products as part of their coverage.

There are two major global trade associations for the AR and VR industries: The VR/AR Association and the Augmented Reality for Enterprise Alliance (AREA).

The VR/AR Association (VRARA) is "an international organization designed to foster collaboration between innovative companies and people in the virtual reality and augmented reality ecosystem that helps develop industry standards, connects member organizations, and promotes the services of member companies."

There are VRARA chapters all over the world. As of February 2018, there were chapters in 58 cities across the globe including 24 in North America, 20 in Europe, 12 in Asia Pacific, and two in the Middle East. These chapters provide "hyperlocal" information on the AR/VR markets in their areas.

VRARA had 24 working committees that focus on specific verticals. The committees are comprised of member companies that compete in specific verticals. There are working committees for education, training, healthcare, tourism, aerospace, and architecture/engineering/construction (AEC).

Training and education companies make up the majority of these committees. Each committee has a web page with links to companies.
competing in those verticals. It is a good way to gather competitive intelligence on Mixed Reality Learning suppliers operating in specific verticals.

AREA had 65 company members in early 2018. They have published the world's first standard functional specifications for augmented industrial applications and their documentation places a great emphasis on the application of AR for training and real time performance and decision support. Their site includes information restricted to members but a wide range of market-related content available to the public.

Another good source of information is the Virtual Reality Venture Capital Alliance (VRVCA). "Formed in 2016, the VRVCA is a close-knit membership comprised of 47 of the top Virtual Reality Investors in the world. We believe that VR is a transformative technology that will revolutionize entire industries. We are working tirelessly to ensure that the VR startups today get the resources they need."

In December 2016, Google, HTC, Oculus, Samsung, Sony, and Acer launched the Global Virtual Reality Association (GVRA). "This group believes in VR’s immense global potential and the opportunities ahead – it will change the landscape of education, training, healthcare, and design, among many other areas." The group disseminates regional VR research reports.

An organization with a large amount of data on the European market is the European Games Developer Federation (EGDF). "The European Games Developer Federation represents games studios based in Austria, Belgium, Croatia, Denmark, Finland, France, Germany, Norway, Malta, Poland, Romania, Spain, Sweden, The Netherlands, Turkey and the United Kingdom, which together employ over 40,000 people." The association publishes detailed reports on the markets in each country including an analysis of the demand and markets for Game-based Learning in the region.

The International Game Developers Association (IGDA) is "the largest non-profit membership organization in the world serving all individuals who create games." One of their goals is "connecting worldwide game developers at all stages of their careers to peers with shared interests and goals through a global network of over 150 Chapters and Special Interest Groups (SIGs)." Three of their SIGs are related to Game-based Learning: Learning, Education, and Games (LEG), Game Education, and Serious Games.
Investment activity is a good source of competitive intelligence for the global learning technology industry. Companies and investors often report annual revenues at the time of funding. Investments made to Game-based Learning companies in the last few years have picked up momentum and the investment patterns are a good source of data on the types of companies attracting funding and the regions where they operate. For example, the Nordic Cluster is a vibrant hub of serious game development and companies are attracting significant investments.

Metaari considers investment activity as a leading indicator. An analysis of the investment activity surrounding Game-based Learning suppliers is included in the analysis of the global catalysts. An analysis of the Nordic Cluster is provided in the Western Europe section of the demand-side analysis.