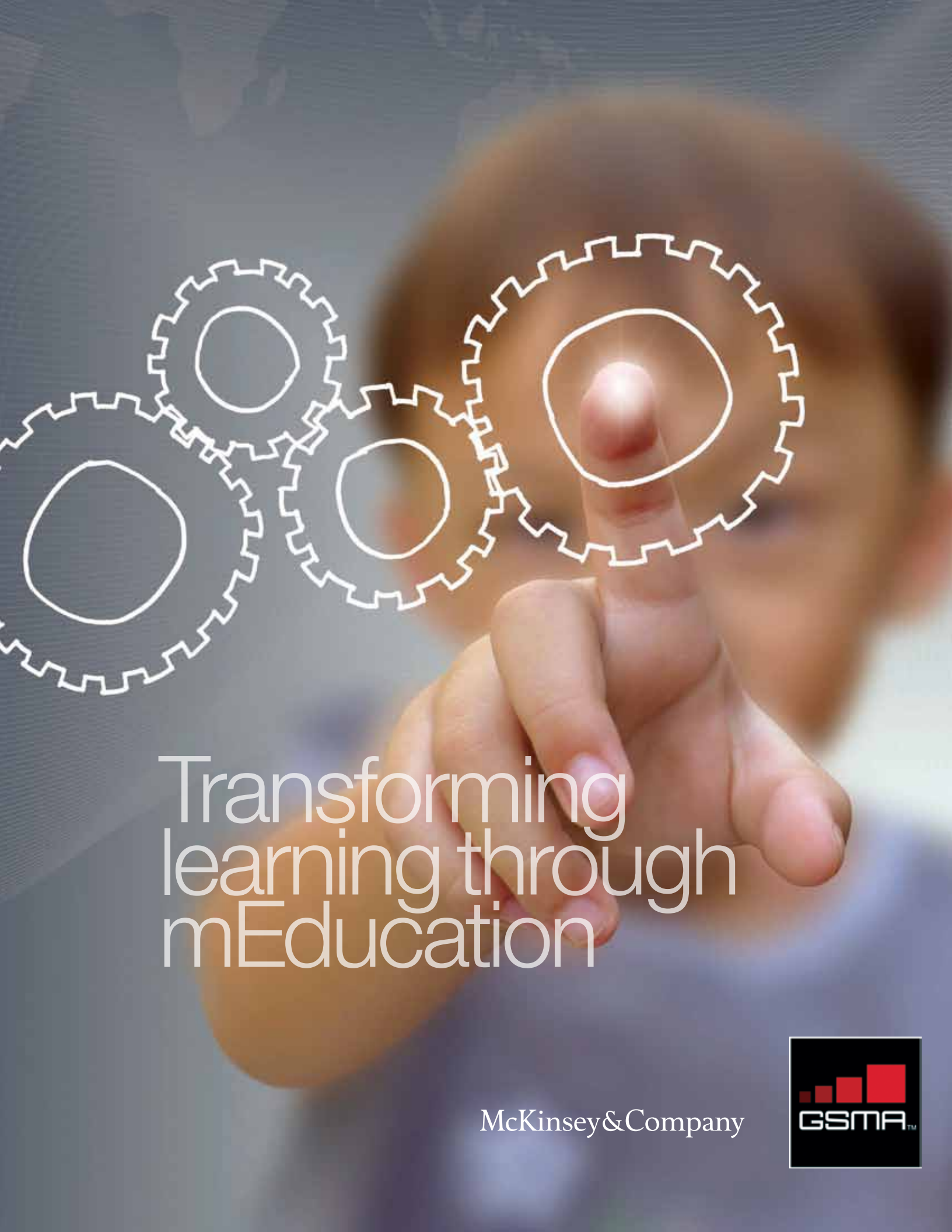

Transforming learning through mEducation

McKinsey&Company

GSMA

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Vivek Pandit
Director, McKinsey & Company, Mumbai

Executive Summary

Technology is changing our world in ways unimaginable even a decade ago. Mobile technology in particular has begun to permeate our daily lives, providing unparalleled access to information. It is also raising the quality of education and improving access to it. Early initiatives in mobile education, or "mEducation," are already enhancing learning outcomes worldwide. With growing availability and demand, mEducation is poised to become a USD 70 billion market by 2020.

Mobile operators can seize this exciting opportunity and shape the market if they understand how new technologies and initiatives will impact education around the world—and if they can develop smart strategies and implement them quickly.

THE POWER OF MOBILE IN CHANGING EDUCATION

We rely on mobile technology for many simple tasks, but we have yet to tap its potential to enable and even transform education.

The emerging promise of mEducation

We define mEducation as technology-enabled learning solutions available to learners anytime, anywhere. Any portable device, such as a tablet, laptop or mobile phone, that provides access to educational content through mobile connectivity (2G, 3G, or 4G complemented by mobile-based Wi-Fi) can be a tool for mEducation. Mobile technology's power to transform education is difficult to overstate, given the importance and impact of learning that takes place outside a traditional classroom environment.

To view mEducation as "distance learning using mobile technology" misses the deeper point. mEducation represents a profound shift in the way education is delivered and received. The change is underway now; mEducation has already achieved some success. In the United States, for instance, the oral fluency of kindergartners in New Mexico tripled just 3 years after educators began using mobile-based computing devices to assess the progress of individual students and tailor lessons to their needs. This is just one example of mEducation's tremendous potential.

Enhancing educational outcomes using mobile technology

Our research shows that mEducation offers three advantages with the potential to improve education delivery and thereby enhance learning outcomes:

- It simplifies access to content and experts, overcoming traditional constraints of time, location and collaboration
- It personalizes education solutions for individual learners, helping educators customize the teaching process, using software and interactive media that adapt levels of difficulty to individual students' understanding and pace
- It addresses specific challenges that lower the efficiency of educational systems worldwide. Case in point: MIT's Education Collaboration Services gives teachers access to best practices.

THE REVOLUTION IS COMING

The market for mEducation products and services today is worth approximately USD 3.4 billion—a sliver of the USD 4 trillion spent on education globally. But students, educators and e-learning players are warming up to the potential of mEducation. Five trends create a fertile environment to support mEducation growth:

- Portable device form factors are rapidly evolving. Increased availability and penetration of smart portable devices with advanced functionalities, such as accelerometers that sense motion, will lower costs and open a world of new possibilities for mEducation solutions

- A digital native and technology-literate generation is fast emerging. We are adopting mobile solutions and devices in our lives at a faster pace. Children will adapt especially well to learning through mobile devices

- Governments are turning to the potential of mEducation. Many countries are promoting the use of information and communications technology in schools and investing in portable devices that enable new ways of learning – all in a bid to improve learning outcomes

- Mobile applications are increasingly popular for educational content. More recently, mobile device users are downloading educational apps at higher prices than entertainment or gaming apps

- Pilots are leading to viable products with commercial potential, such as mobile-based learning management systems, game-based applications, and voice and text-based solutions. This is in turn attracting more investment into mEducation providers.

THE M-EDUCATION PRODUCT LANDSCAPE

Although mEducation is a nascent market, publishing houses, mobile network operators and device manufacturers have been focusing on it for years. We have classified more than hundred commercial mEducation offerings into seven product and solution archetypes: (i) educational e-books and courses accessed through portable devices; (ii) learning management systems (LMS) and authoring tools; (iii) game or simulation-based learning tools; (iv) collaboration tools; (v) adaptive assessment services; (vi) test preparation support; and (vii) distance tutoring and homework support.

SIZING THE M-EDUCATION OPPORTUNITY

The world is spending more on education than ever before. By 2020, we expect global spend to double to USD 8 trillion. mEducation may address up to USD 70 billion of this market through specialized product offerings and a growing market for devices.

mEducation products can represent a USD 38 billion market opportunity by 2020
The seven product and solution archetypes of mEducation could be a USD 38 billion revenue opportunity by 2020. Looking at the mEducation market along three conventional dimensions—geographic, end-user segments and value chain components—we foresee the following trends:

- Education spend will grow the fastest in developing Asia-Pacific at a CAGR of 54% between 2011-20, while North America will remain the biggest market in absolute terms with a total annual spend of USD 15 billion for mEducation products and solutions by 2020

- 75-80% of spending will be in higher education and K-12, while corporate learning will account for 10-20%, varying by market

- In parallel with online education spend, almost 90% of mEducation services will rely on content, enabling platforms and software.

The device opportunity alone will be worth USD 32 billion by 2020

With the anticipated growth in mEducation, manufacturers are likely to see rapid growth in demand for dedicated devices for use in education. While most of the growth, around USD 30 billion, will be for B2B (educational institutions) solutions, we estimate the B2C (individual learners) category will grow to around USD 2 billion over the same period.

HOW MOBILE OPERATORS CAN TAP THE MARKET

Depending on their aspirations and capabilities, mobile operators can tap the potential of mEducation in three ways:

- **Ride the connectivity wave:** This is the immediate opportunity for mobile operators and where they have the most natural right to play. It will be worth approximately USD 4 billion in annual revenue by 2020

- **Enable the mEducation ecosystem:** mEducation providers will require a broad range of technical support and enablers such as IT, network, content, hosting and data management services. Mobile operators can develop their capabilities to offer this support, tapping into a revenue pool of approximately USD 20 billion

- **Lead as an end-to-end mEducation provider:** MNOs can invest upfront and enter the market on their own, providing the entire range of services that include in-house content and/or devices. This throws open the entire mEducation opportunity, worth approximately USD 70 billion.

mEducation, now at a tipping point, offers significant opportunities for mobile operators, while enhancing educational access and outcomes for learners and educators around the world.

1. The power of mobile in changing education

Technology is transforming the way we live. In just the past few years, for example, most of us have come to depend on mobile devices in our pockets. But even though hundreds of millions of people around the world now rely on mobile technology for many simple tasks, we have yet to tap its full potential to transform learning. Mobile technology will dramatically change the way education is delivered—and improve educational outcomes.

THE EMERGING PROMISE OF MOBILE EDUCATION

We define mEducation as technology-enabled learning solutions available to users anytime, anywhere. Any portable device, such as a laptop, tablet or mobile phone that provides access to educational content through a mobile connection (2G, 3G, or 4G complemented by mobile-based Wi-Fi) can be a tool for mEducation. The ability to learn regardless of time or location can help make education easier to access and use. Early implementations across geographies and education segments have already used mobile technology to substantially improve learning outcomes.

In a school in New Mexico, for example, teachers are using mobile computing devices to regularly assess kindergarteners' reading progress and tailor instruction to help them develop oral fluency. Within the first 3 years of use, the share of students reading at benchmark levels rose from 29% to 93%.

In India, primary schools used mobile-phone games to help students from rural, low-income households learn English. Aided by local teachers, researchers devised a simple game to develop listening comprehension, word recognition, sentence construction and spelling. Test scores of students using the mobile-phone games improved by nearly 60%.

These projects, despite their small scale, indicate some of the potential for mEducation. The increasing affordability of mobile devices, with entry-level feature phones costing as little as USD 20, can help mEducation solutions transform education for 1.2 billion K–12 students[1], 160 million higher and vocational education students and many more lifelong learners around the world.

ENHANCING EDUCATION OUTCOMES USING MOBILE TECHNOLOGY

Mobile technology is increasingly helping resolve limitations of education in two areas: access and personalization. Emerging mEducation solutions also illustrate the power of mobile technology in addressing some of the specific challenges affecting the quality and effectiveness of education for learners.

mEducation simplifies access to education

Emerging mEducation solutions are improving access to education in two ways:

- **Wider geographic reach:** Mobile networks cover almost 90% of the global population today, creating an unprecedented platform to increase the availability of education. mEducation can enable learners worldwide to access locally and globally relevant content–and teachers anywhere. For example, mEducation solutions already allow thousands of people in China, Bangladesh, South Korea and Indonesia to learn English through SMS and audio lessons, despite limited local availability of qualified teachers.

- **Real-time access and independence:** mEducation makes it convenient to access educational solutions exactly when required – overcoming time and space constraints of traditional classroom environments. For example, in Canada, University of Waterloo teachers deliver lessons through podcasts that students can access at any time, anywhere—and interact with students via text messages, allowing them to learn at an independent pace. Meanwhile, an online education company known as Megastudy offers distance tutoring services in South Korea, connecting one master teacher with thousands of students at a time through on-demand video tuition.

Teachers can use mobile technologies to personalize education for individual learners

One-to-many education delivery approaches cater to the group mean, reducing the relevance of education for several learners. Mobile technology can change that by:

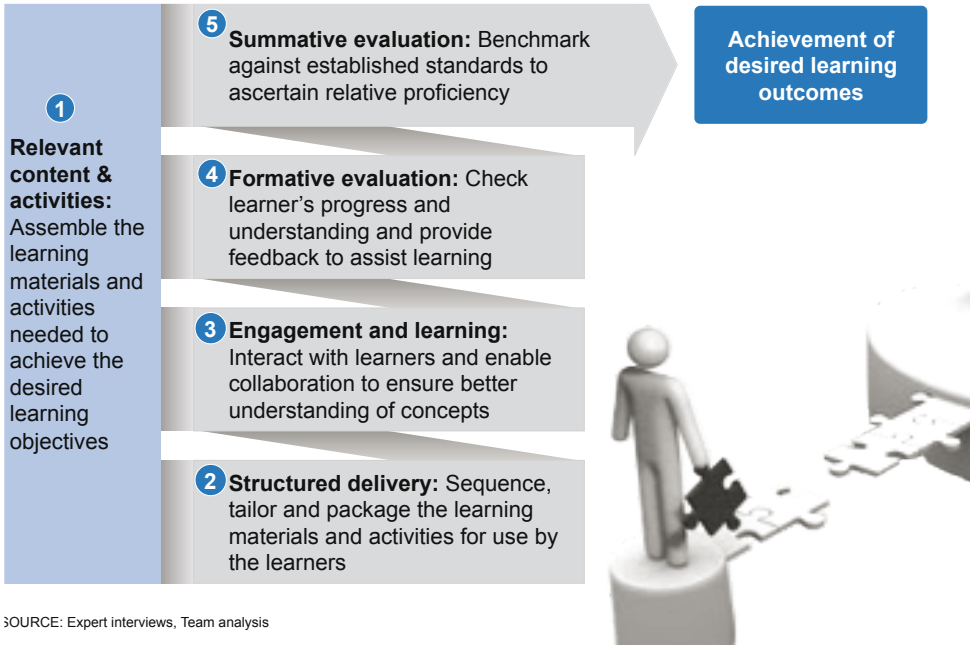
- **Customization:** Students have their own learning styles and triggers, learning at their own pace. Teachers are often unable to constantly track and respond to these differences in learning styles and pace. Mobile technology can enable real-time data collection through simple wireless-based formative assessments. This helps teachers customize instruction inside and outside the class for each student. For example, interactive learning solutions offered by DreamBox Learning allow differentiated instruction by adjusting difficulty levels, the number and type of hints, etc., for students based on tracking responses to several different questions.

- **Collaboration:** Students often better understand and apply concepts in discussion with peer classmates. Traditional classroom environments often do not allow this, especially with large class sizes or when students live far from one another. With mobile technology, students can source or create their own content, share it with peers, share different learning paths and evolve better answers through collaboration. An example of this is an mEducation project at the Centre for Teaching and Learning Innovation, Auckland, New Zealand, where students use mobile technology to blog their assignment posts from any location. When students shared the test results of their snow-kite harness designs live from the snowfields of Queenstown, they received live comments from professors and classmates in Auckland.

mEducation can address several challenges with the existing educational system

As players across the education landscape explore ways to improve education outcomes through mobile technology, they can help overcome challenges affecting education systems in both developing and developed countries. Exhibit 1 shows a five-step model of the education delivery process.

EXHIBIT 1: DELIVERY OF EDUCATION FOLLOWS A FIVE-STEP PROCESS



SOURCE: Expert interviews, Team analysis

Greater use of mEducation can help educators and learners overcome challenges in each of the five steps. These issues apply to varying degrees across the developed and developing world. While most developing regions are focusing on ensuring access to basic education and improving teacher quality, developed regions strive to improve student engagement and customize education to each learner. mEducation could provide tangible solutions to these issues.

- **Lack of access to high-quality and relevant content:** Enabling and facilitating access to education is a key challenge in education today. For example, almost 70 million children ages 6 to 12 are not enrolled in schools, 60 million of them in developing countries. Access to education remains a critical problem for reasons ranging from insufficient school coverage and low household incomes to limitations in the quality of locally available materials. The widespread penetration of mobile networks offers a powerful platform to improve access to relevant content

- **Undertrained teachers:** Preparing effective teaching strategies and lesson plans is a core responsibility of educators. Undertrained educators—a common challenge in developing regions—often cannot meaningfully contribute. Mobile technology is already providing to access many dedicated online resources to help educators share best practices. MIT's Educational Collaboration Space (ECS) and National College for School Leadership in the UK are just two examples.

- **Lack of tailored approaches:** Even the most developed school systems can do more to engage learners. Teachers would have far greater impact if they could adapt their teaching styles to the needs and preferences of each learner, but this is impractical in many classroom environments. Richer, more interactive formats and content tailored to individual learning styles increase engagement levels to help students understand better. Aula 365, a web-based solution offered by Telefonica in Spain, allows students to choose from a range of instructional media such as video and graphics to learn a given lesson—improving understanding and engagement and therefore retention.

- **Infrequent evaluation and feedback:** Regular assessments during the learning process help educators to evaluate student understanding, and determine where specifically they require support and how to provide it. Since more traditional assessments tend to be time-consuming, teachers often find it difficult to cope with the dual pressures of teaching and assessment for large classes. For example, a 2008 study of Chinese teachers2 reported that the pressure of completing basic teaching tasks and large class sizes prevented them from conducting formative assessments. mEducation solutions can offer a powerful solution to this. For example, teachers in New Mexico use Wireless Generation's mCLASS® handheld computer-based solutions to conduct frequent formative assessments.

- **Lack of data and analytics to benchmark student performance:** Most education systems compare student performance against local or national standards and benchmarks. mEducation could give educators the ability to confidentially track and benchmark student performance across multiple parameters, such as subject or student history, to provide a far richer assessment of student performance. Recently, New Jersey's Hunterdon County Educational Services Commission selected LinkIt to implement a strategic data-driven system to benchmark student performance on a district-wide basis. Over time, benchmarks can be provided at an individual, classroom, school, district, national or global level.

mEducation makes it easier for individuals to access educational solutions tailored to their unique requirements. Tapping this potential can transform the way people learn and how they perform in the educational system.

1 For the purpose of this report, we divide education spend into 5 segments: (1) pre-primary: children under age 6; (2) K-12: kindergarten to grade 12 equivalent, from age 6 and 18; (3) higher education: students ages 18 to 25 enrolled in formal education with a degree qualification; (4) vocational: students 18 to 25 enrolled in skill-based education; and (5) corporate learning: training for employees.

2 Teachers' views on conducting formative assessment in the Chinese context, Xuefeng Wang, 2008

2. The revolution is coming

eEducation products have been on the market for almost two decades now. mEducation products and services form a relatively small portion of this market, offering similar and new solutions using portable devices and a mobile network. Today, this market is worth around USD 3.37 billion—a mere 10% of the overall eEducation market, which in turn forms just 1% of the total USD 4 trillion spent worldwide on education.

As learners, educators and the market warm up to its potential, we are rapidly approaching a tipping point for mEducation. In this chapter, we lay out five megatrends that will lead to an explosion in the role of mEducation in the learning landscape over the next decade.

PORTABLE DEVICE FORM FACTORS ARE RAPIDLY EVOLVING

In the near future, we can expect two thirds of the global population to have enormous computing power at their fingertips. Smart portable devices like tablets and smartphones and ever-increasing wireless bandwidth provide access to applications once possible only on a computer. While smartphones have been on the market for years, the emergence of media tablets is accelerating the penetration of powerful portable devices. IDC reported global smartphone sales in 2011 at 491 million units, 60% higher than 2010 sales. Similarly, 62 million tablets were sold in 2011, a 252% increase from the 17.6 million units sold in 2010[3].

These devices are transforming the world in two ways: functionality and availability. They increasingly offer the memory, computing power and bandwidth of a computer with the added advantage of mobility. Smartphones and tablets also have far greater processing power than traditional feature-phones. Meanwhile, as prices fall, the devices become available to more low-income users. Entry-level smartphones cost as little as USD 80.

This opens up a world of possibilities for mEducation products and services—and it means the boundaries between eEducation and mEducation will increasingly dissolve as players deploy conventional eEducation solutions across multiple screens, devices and access technologies.

EMERGENCE OF THE TECHNOLOGY GENERATION

Accessing educational content using technology used to mean learning how to use the device or interface itself. Today, however, many children enjoy a level of comfort with the technology beyond anything seen in previous generations. A study by NTT DOCOMO and GSMA involving 3,528 children ages 8 to 18 and their parents in Paraguay, Japan, India and Egypt found 70% of children use mobile phones. Around 25% of children send six or more text messages per day by age 10 , and about 40% access the internet through their mobile phones. As many as 80% Indian children make at least six phone calls every day. In Japan, four in five 18-year-olds use the mobile internet.

Such children are likely to easily adopt mEducation products. They are already familiar with internet forums that promote collaboration between classmates. Many are as comfortable accessing educational material through tablets and smartphones as they are with paper books.

Children in developing countries may not have handled as much of the sophisticated digital technology as their counterparts in developed countries. But their increasing comfort and familiarity with digital

and mobile technology is inevitable as countries grow wealthier, technology becomes affordable and devices proliferate. With this fertile market, mEducation products and services are likely to grow exponentially in the next decade.

GOVERNMENTS WARMING UP TO THE POTENTIAL OF mEDUCATION

As governments recognize the advantages of mEducation for their people, many countries are promoting the use of information and communications technology in education and investing in devices that enable new ways of learning.

The Turkish government, for example, announced the Movement to Increase Opportunities and Technology (FATİH) Project in 2010, committing to bring 15 million Wi-Fi tablets to students in 600,000 classes across 40,000 schools. The government hopes teachers will have instant access to any document around the world and project it on the interactive smart-board while teaching. This demand for mobile devices suggests that students will one day take these devices home and to out-of-classroom learning environments, extending their learning experience.

Another example is the South Korea government's USD 2.4 billion effort to enable education through technology at lower costs. The government aims to digitize all educational materials by 2015, making them accessible through computers, tablets and smartphones. Besides content from ordinary textbooks, the digital textbooks will include supporting material such as multimedia and related FAQs. Each school will have its own cloud computing system that stores the digital curriculum for students seeking study material.

Though the initiatives vary in scale, they indicate the growing willingness of governments around the world to invest in mobile technology in education.

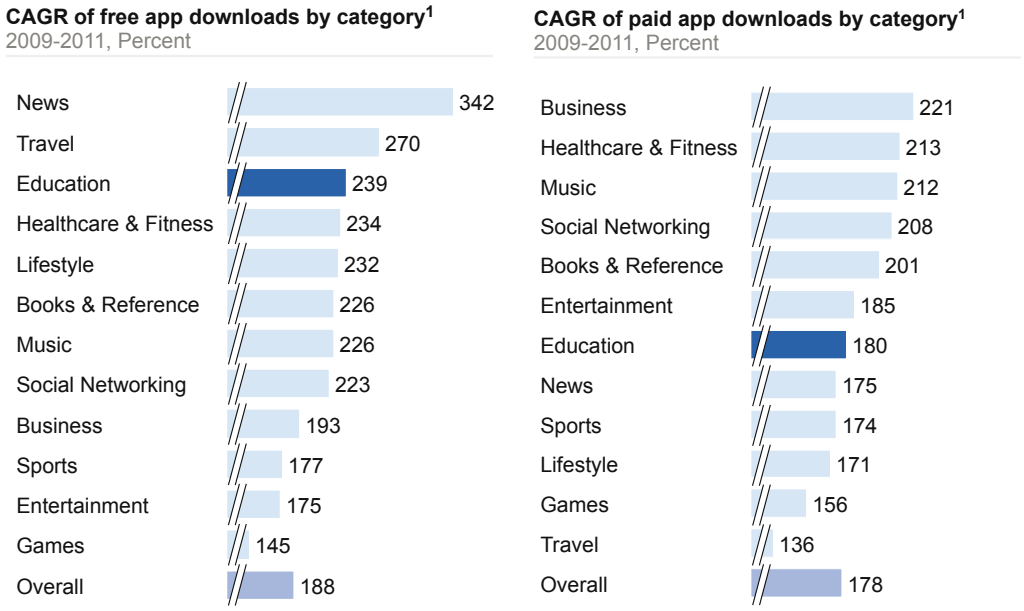
GROWING SUCCESS OF MOBILE APPS AS A MEDIUM FOR EDUCATIONAL CONTENT

Mobile applications or "apps" are packaged pieces of software designed to run on devices such as computers and smartphones. Apple, Android, BlackBerry and Windows together offer approximately 80,000 educational apps, compared to around 170,000 apps in the most popular categories such as games and entertainment[4].

A 2011 Strategy Analytics study found that 25 million education-linked apps were downloaded in 2009 and 270 million in 2011—a more than tenfold increase. The growth in free education apps has been significantly higher than the overall market growth (Exhibit 2). Paid education apps have also grown to 36 million downloads in 2011, representing a total revenue of USD 120 million—a sharp rise over the 4.5 million paid downloads in 2009 worth USD 15 million.

3 Source: IDC Worldwide Quarterly Media Tablet and E Reader 2011 Q3
4 Source: http://www.mobilewalla.com/Desktop/AppIntel_AppCountByCatg.htm?filterDevicePlatform=101

EXHIBIT 2: EDUCATION APP DOWNLOADS – BOTH FREE AND PAID – HAVE GROWN FASTER THAN THE OVERALL MARKET IN THE LAST 3 YEARS



1 List of categories not exhaustive
Source: Strategy analytics 2011 download forecast across Apple, RIM, Android and Windows app stores

Consumers are also willing to spend on relatively more expensive educational apps compared to entertainment apps. At an average price of USD 3.30 per app, educational apps generally cost more than popular entertainment apps, which range from USD 1.70 to 2.60.

PILOTS LEADING TO VIABLE COMMERCIAL BUSINESS MODELS

In the last few years, the mEducation market worldwide has moved beyond research and pilot projects to introduce more than a hundred commercial offerings. These include courses delivered on mobile phones, game-based applications, authoring and collaboration tools, wireless formative assessments and online tuition services.

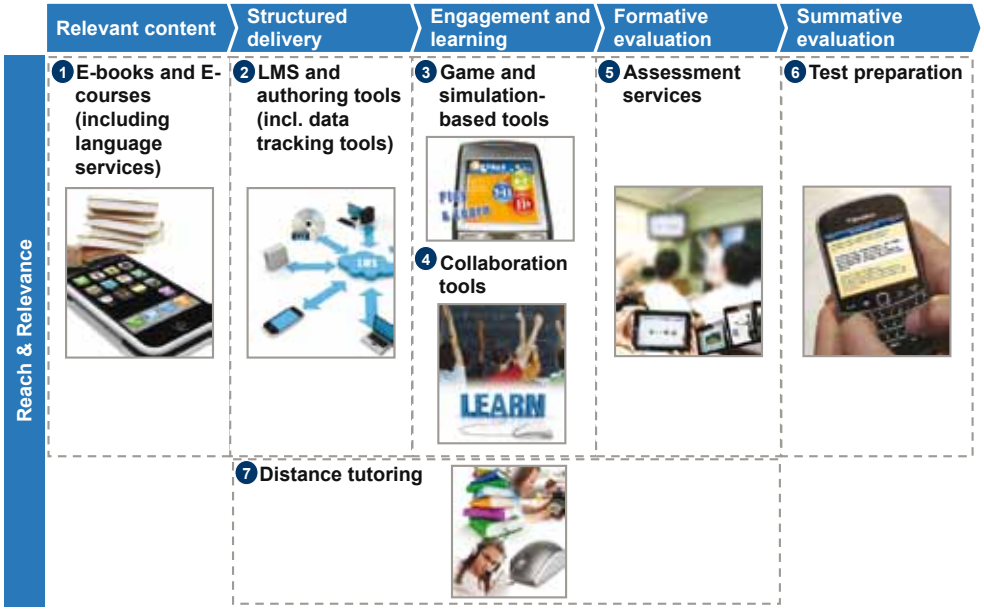
Some of these offerings have demonstrated potential as viable business models and attracted investors. Many new players have entered the education market with notable acquisitions. Examples include Providence Equity Partners acquiring BlackBoard Inc. in 2011 for around USD 1.64 billion; the sale of a 90% stake in Wireless Generation to News Corporation in 2010 for approximately USD 360 million; and Research in Motion's acquisition of Chalk Media in 2008 in an all-cash deal of USD 18.7 million. Continued innovation in technology will likely create more success stories in the near future.

Given these trends, mEducation has the potential to carve out it's own utility in the education market. The growing ease in providing and accepting these solutions should help deepen and entrench advances in mobile learning solutions.

3. The mEducation product landscape

As publishing houses, mobile operators and device manufacturers turn their attention to the market potential of mEducation, we can classify products into seven archetypes, each helping to resolve challenges along one step in the educational process (Exhibit 3).

EXHIBIT 3: SEVEN ARCHETYPES OF mEDUCATION SERVICES HELP STUDENTS THROUGH THE FIVE STEPS OF EDUCATION



SOURCE: Press search; expert interviews; team analysis

- **Educational E-books and E-courses accessed through portable devices:** Aptara's 2011 research revealed that of the 1,350 publishers surveyed worldwide, 84% either already produce e-books or plan to do so in the near future. As educational content is digitized, consumers are simultaneously learning more through their mobile phones. For example, Urban Planet Mobile, a leading provider of English-learning services over mobile phones, has over 100,000 subscribers in Indonesia.

- **Learning Management Systems (LMS) and authoring tools:** Educators are using LMS to manage content and lesson plans and customize them using built-in authoring tools. There is also a demand for standalone authoring tools free of any particular LMS provider, and tools such as Apple's iBooks author are already generating significant interest. Platforms such as BlackBoard Mobile Learn allow students to download course material, time-table updates, assignment deadlines, and their grades.

- **Game-or simulation-based learning tools:** These applications integrate curriculum with augmented or virtual reality-based environments, helping students understand and learn in exciting ways. For example, DreamBox Learning's games for adaptive learning increased test scores of grade 2 students by 19% in just 2 weeks. Over 170,000 students have used this service to date. Students in vocational courses also rely on simulation-based applications to learn processes and concepts. For example, plumbers can learn to fix taps through simulations.

- **Collaboration tools:** Networking platforms allow users to generate content and share and discuss it with a larger group. Mobile phones make this possible in real time, allowing users to get immediate feedback. Collaboration tools, often embedded within the LMS, represent a rapidly growing product category and help educators and learners to keep in touch with colleagues. Ultranet, a student-centeed learning environment, allows students, teachers and parents to connect and collaborate to improve learning outcomes.

- **Adaptive assessment services:** Educators can now assess students' understanding using wireless assessments on handheld devices. These provide real-time updates on individual student progress, allowing educators to track class progress and tailor instruction for students requiring remedial support. In addition to Wireless Generation, Prometric provides wireless assessment services.

- **Test preparation support:** Students worldwide take standard tests such as the SAT, GRE and GMAT. Instead of traditional study groups and practice tests, they now often use mobile-based mock tests with built-in guidebooks and applications. Candidates can compare their performance with thousands of others. A growing number of test preparation products are targeting developing regions, where inadequate higher education capacity drives much higher competition and hence demand for these services.

- **Distance tutoring and homework support:** Many developed Asian countries such as Japan and South Korea demand extensive supplementary education support outside the classroom—driving almost 10% of the total spend on education. MegaStudy and TutorVista are just two of the online services bringing together tutors from around the world to help students around the clock understand their curriculum and complete their homework. Many apps like Tutor PRO, 2x2 Tutor, which are compatible with portable devices, are already targeting the supplementary spend.

Each type of mEducation product addresses the challenges in the current educational system. While this market is still nascent, growing demand for these services will ensure a large market for mEducation in the future.

4. Sizing the mEducation opportunity

The world is spending more on education than ever before. Seeing it as the key to a brighter future, many nations spend 5 to 6% of their GDP on education. Better educational outcomes can indeed have significant economic impact for nations. A recent study[5] on the long-term impact of education establishes that even slight improvements in the quality of education, such as a 25-point increase in PISA[6] scores, would result in an aggregate GDP upside of USD 115 trillion over the entire lifetime of the generation born in 2010 for OECD countries.

By 2020, we expect the global expenditure on education to double to approximately USD 8 trillion. We believe mEducation can address around USD 70 billion of this market.

UNDERSTANDING THE SUPPLEMENTARY EDUCATION OPPORTUNITY

Supplemental education is defined as any learning that aims to provide remedial support to students outside formal learning institutions such as schools and colleges. It supplements classroom learning and reinforces concepts for better understanding. This kind of learning, typically funded directly by households, is common in developing countries and attracting billion-dollar companies like MegaStudy in South Korea. Given that most of this spend is private, it could be an immediately addressable opportunity segment for mEducation providers.

However, the drivers of supplementary education differ from those of core education. Our detailed study of the Indian supplemental education market reveals three distinct drivers:

- Recognition of "stuck" educational outcomes in the classroom:
  Highly performance-oriented students remain dissatisfied with the inadequate classroom learning, largely since the dominant learning style dictates the teaching approach. They opt for supplemental education, and this represents a total spend of approximately USD 9 billion in India today.

- Increasing competition:
  In a developing country such as India, where the demand for job opportunities far outstrips supply, most parents view education as the best investment for their child's future. Almost 2 million Indian students are taking to supplemental education to help them prepare for competitive exams

- Growing per capita incomes leading to demand for niche education:
  About 90% of the spend on supplementary education in India across grades 6 to 12 comes from students already enrolled in the most elite and expensive schools. Most of these students come from economically privileged households and opt for supplemental education to broaden their horizons.

Supplementary education already represents about USD 150 billion of annual spend. Unless core education systems are transformed, supplemental spend is likely to grow rapidly in developing regions, driven by parents' increasing affluence and ambition for their children.

THE mEDUCATION OPPORTUNITY CAN BE USD 70 BILLION BY 2020

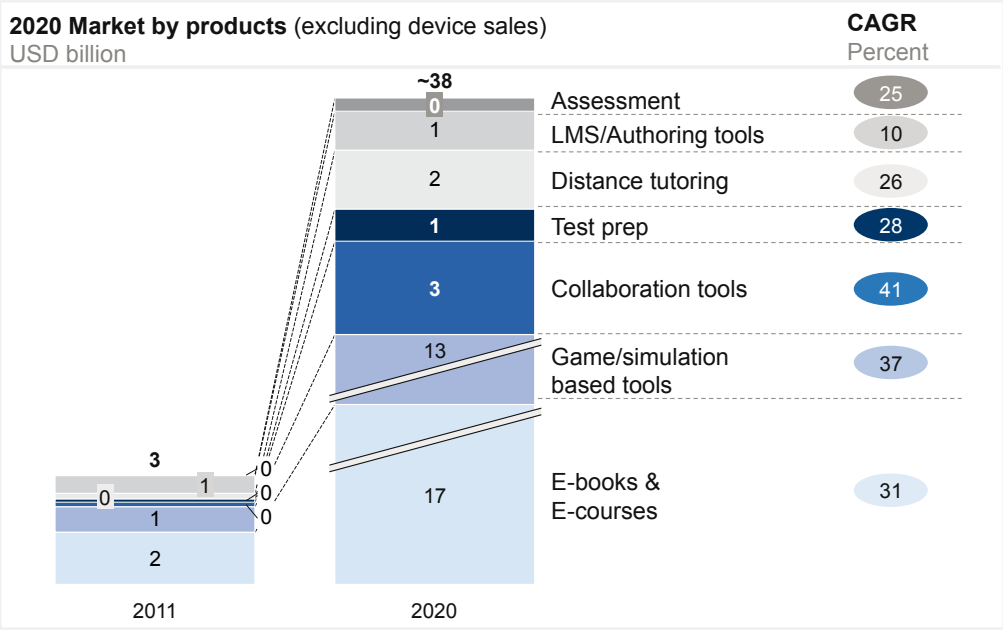
Growing consistently at about 7% per annum over the last decade[7], education spend has doubled from about USD 2 trillion in 2000 to USD 4 trillion in 2011 and is expected to grow at 8% per annum to reach USD 8 trillion by 2020. The opportunity for mEducation will also grow rapidly over this decade. We expect the total annual market opportunity for mEducation to reach USD 70 billion by 2020. mEducation products represent USD 38 billion of this figure, while the remaining USD 32 billion will come from the sale of devices.

mEDUCATION PRODUCTS WILL REPRESENT A USD 38 BILLION MARKET OPPORTUNITY BY 2020

Together, the seven archetypes of mEducation products will represent a USD 38 billion annual revenue opportunity in 2020 (Exhibit 4). E-books and e-courses delivered over mobile networks and accessed on portable devices will continue to represent the biggest product segment on the back of strong growth in developing regions. This will be followed by game- and simulation-based tools, which will emerge as the second significant category, on the back of strong growth in developed regions. Together, these two will account for almost 80% of the market.

Distance tutoring will emerge as a substantial category, particularly in Asian countries such as South Korea, Japan and India, which have a strong culture of supplementary education. Three trends will drive market growth for mEducation products:

EXHIBIT 4: GAME-BASED AND COLLABORATION TOOLS WILL GROW FASTEST, CORE-CONTENT-BASED SERVICES WILL CONTINUE TO REPRESENT THE LARGEST CATEGORY



SOURCE: Press search; expert interviews; team analysis

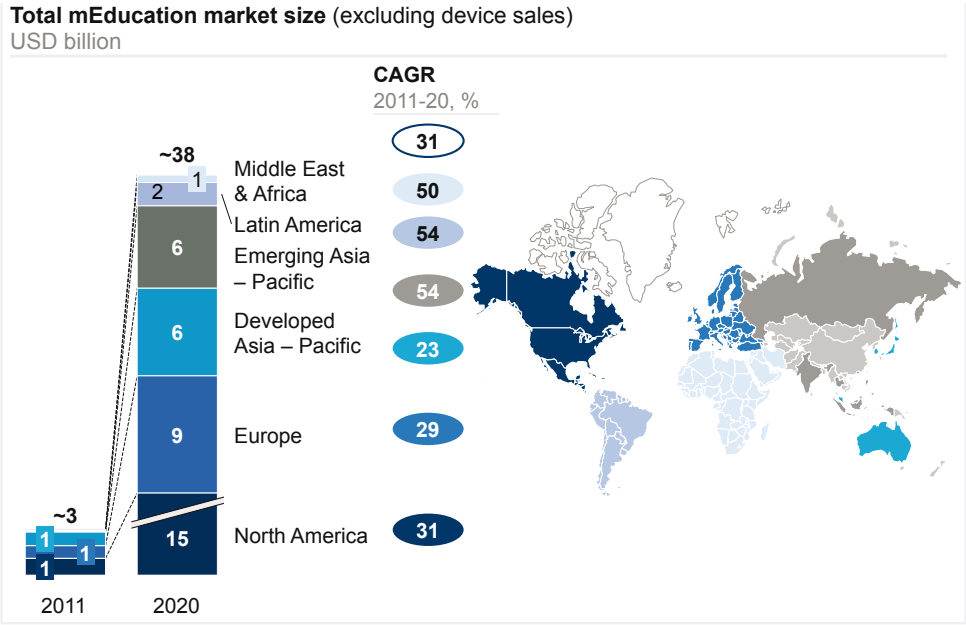
- **Developing Asia Pacific will grow the fastest, while North America will remain the biggest market for mEducation products:** Developing regions will drive most of the growth in mEducation because of rapid economic development and a push to spend an increasing share of GDP on education. Challenges in education vary significantly across developed and developing regions, both in terms of access to education and its quality.

  This seems likely to change, however, as per capita incomes grow in developing regions, narrowing the gap in education spend per student. While countries like US and Japan spend an average of USD 10,000 to 15,000 per student per year from kindergarten through college, countries like Mexico, Chile and Hungary spend only USD 2,000 to 5,000.

  Developing regions will also catch up in feature and smart portable device penetration, propelling those markets to grow even faster as the population gains access to and benefit from a broader variety of mEducation solutions beyond those available on basic phones.

  We therefore estimate the mEducation market in developing regions to grow at 50 to 55% CAGR between 2011 and 2020, compared to 25 to 30% for developed regions (Exhibit 5). At an aggregate level, developed regions will still account for the bulk of the opportunity, with North America accounting for around 40%, followed by Europe at 23% and developed Asia-Pacific at 17%.

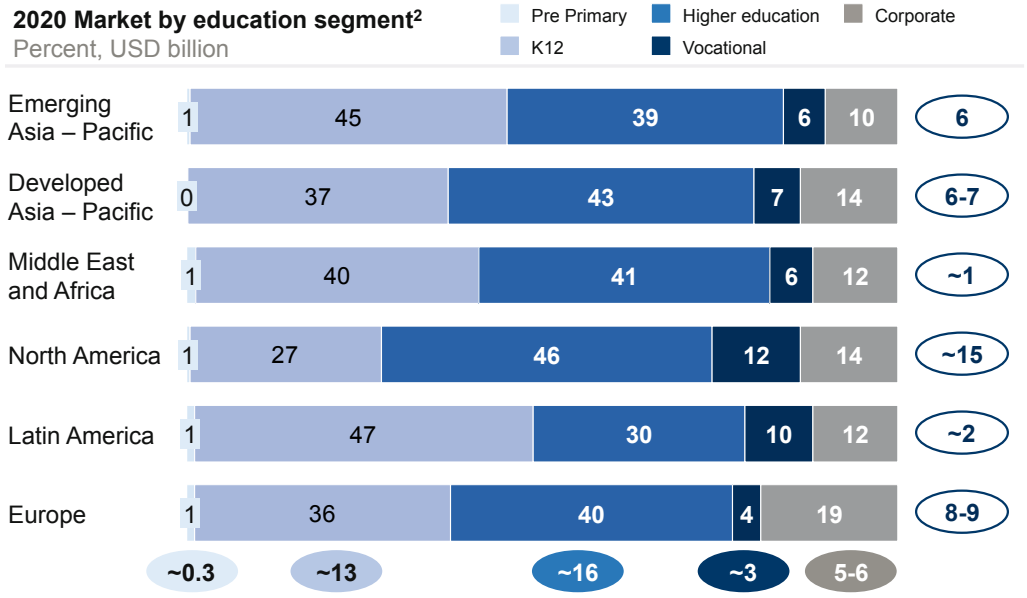
EXHIBIT 5: THE mEDUCATION MARKET WILL BE WORTH ABOUT $38 BILLION BY 2020



SOURCE: Team analysis

- **Higher education and K–12 will represent the biggest mEducation product opportunities across regions:** Global expenditure on education can be grouped into five categories: pre-primary, K-12, higher education, vocational, and corporate learning. Across all regions, 55% of total expenditure goes into the K-12 segment, 30% into higher education, and 15% into pre-school, vocational and corporate learning.

EXHIBIT 6: IN LINE WITH THEIR SHARE OF OVERALL SPEND, K-12 AND HIGHER EDUCATION[1] WILL BE THE BIGGEST OPPORTUNITY SEGMENTS ACROSS THE WORLD



1 Higher education refers to tertiary education
2 Excluding device sales

SOURCE: Team analysis

To estimate the mEducation product opportunity by education segment, we looked at the proportion of spend that can be addressed through technology. We included components such as content and instructional support, such as printed assignments. We estimate that higher education and K-12 will represent the biggest opportunities for mEducation products across regions (Exhibit 6).

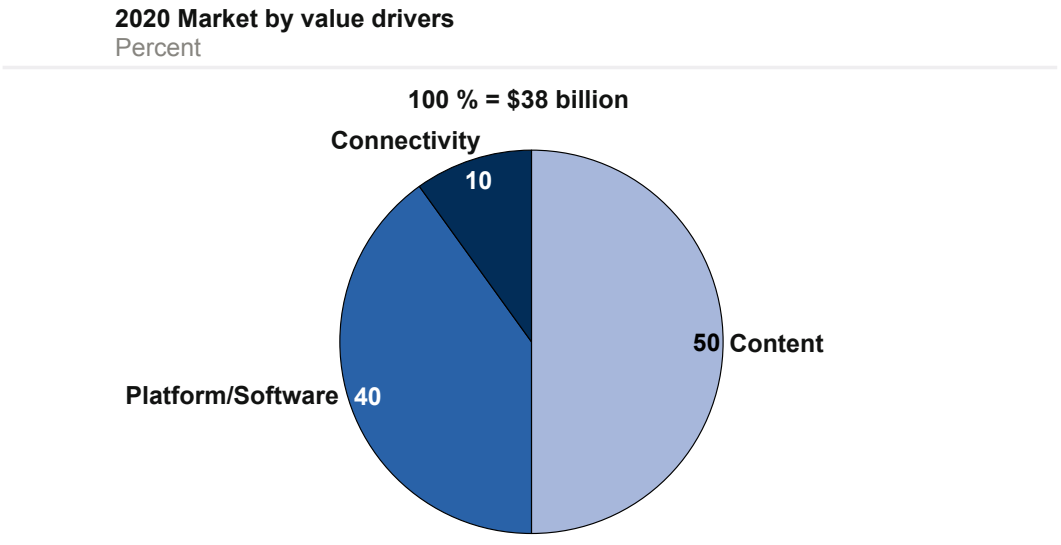
Higher education will be more important, as the spend addressable by technology represents approximately 15% of total spend in higher education compared to 10% in K-12. In segments such as pre-school, teacher salaries represent 85 to 90% of the total spend, leaving less room for technology investments.

On the other hand, in corporate learning, content alone represents 15-20% of the total spend, creating a larger opportunity for technology. As a result, corporate and vocational training will represent about 25% of the mEducation opportunity.

- **Almost 90% of the product opportunity will be in content, platform and software:** The mEducation product opportunity lies in three main components of the value chain: content, platform and software, and connectivity. We define content as all forms of lessons, concepts, tests and assessments. Platform and software include software and adaptive algorithms. We define connectivity as all data costs incurred in receiving or sending information over mobile networks while using the mEducation products.

  We estimate that connectivity will represent about 10% of the USD 38 billion value in 2020 (Exhibit 7). The bulk of the value lies in either the content or the platform/software. Services such as e-books and e-courses, test preparation, distance tutoring, games and simulation-based applications are predominantly content-heavy services, whereas services like adaptive assessment, learning management systems and authoring and collaboration tools are predominantly platform- and software-heavy.

EXHIBIT 7: ALMOST 90% OF THE mEDUCATION PRODUCT OPPORTUNITY LIES OUTSIDE CONNECTIVITY



SOURCE: Expert interviews, press search, team analysis

The device opportunity alone will be worth USD 32 billion by 2020

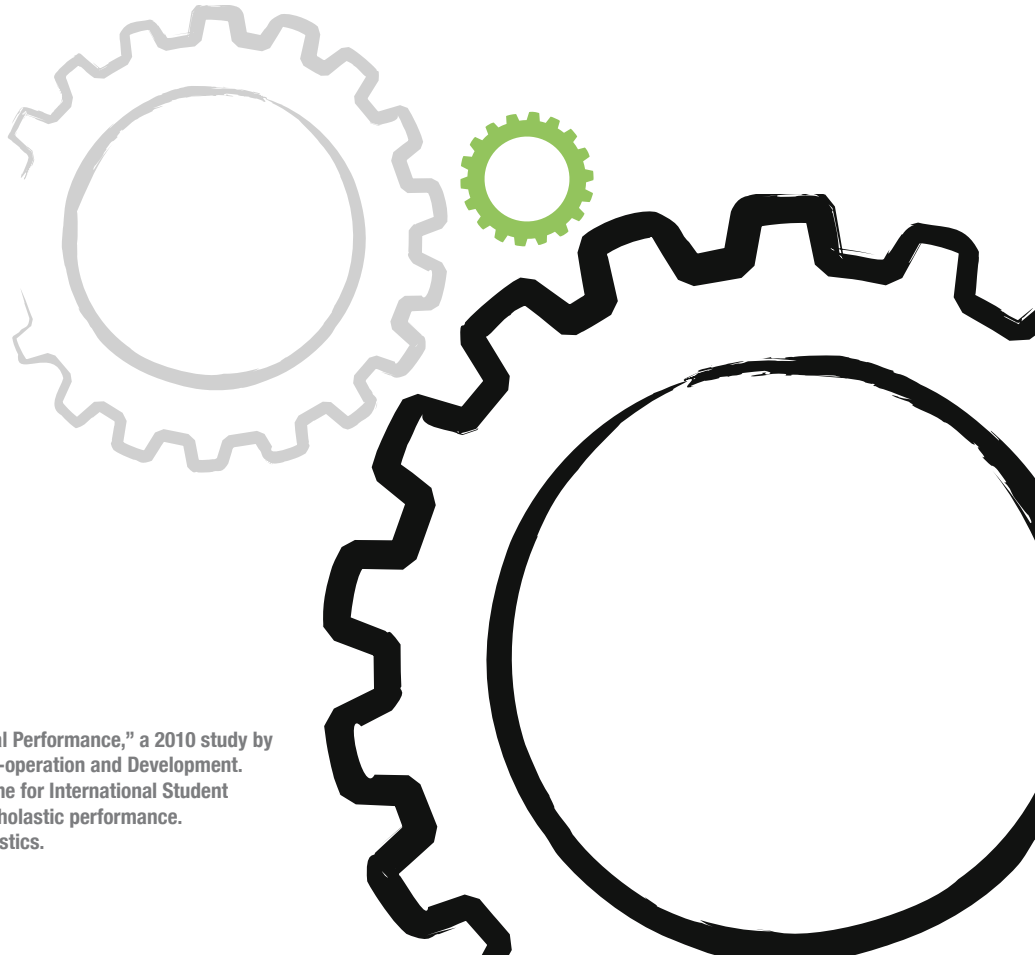
Education already represents a vibrant market opportunity for device manufacturers. For example, educational institutes represent 10 to 15% of the total B2B sales for laptops, according to IDC. Many governments, such as Turkey, have committed to buying tablets for the classrooms. Dedicated devices, such as LeapFrog's LeapPad, are already generating millions of dollars through mEducation.

We estimate the B2B device market in education to be worth USD 8 billion today, with laptops representing approximately 90%. Tablets are the remaining market–and the fastest-growing category.

With growth in mEducation, device manufacturers will also see rapid growth in the demand for their devices. We expect the annual B2B sales of laptops, tablets, smartphones and e-book readers to educational institutes to go up to a total of 80 to 100 million units by 2020. Despite the decreasing unit prices across all these devices, this represents a revenue opportunity of approximately USD 30 billion by 2020.

The B2C space is seeing significant activity in dedicated learning devices with players like LeapFrog and Kibot, both built for young children. This space could enjoy robust growth akin to the emergence of dedicated consoles for gaming. The previously quoted Strategy Analytics survey found that the share of education apps is increasing and accounted for 1.2% of total app downloads from major app stores like Apple, Amazon, Android and Blackberry App World in 2011. We expect that share to rise significantly, driving the education-specific B2C device opportunity to approximately USD 2 billion by 2020.

With potential to deliver USD 70 billion by 2020, this market offers multiple opportunities for mobile operators who can identify customers, develop education value added services and implement them quickly.



5 "The High Cost of Low Educational Performance," a 2010 study by the Organisation for Economic Co-operation and Development.
6 OECD countries use the Programme for International Student Assessment (PISA) to evaluate scholastic performance.
7 Source: UNESCO Institute for Statistics.

5. How MNOs can tap the market

The broad range of mEducation services presents many opportunities for mobile operators. They can explore business models based on their aspirations and capabilities, ranging from continuing to provide connectivity to playing across the value chain with end-to-end services that include content and devices. We propose that MNOs consider three strategic options for capturing share in the mEducation market.

RIDE THE CONNECTIVITY WAVE

As a first and most natural strategy, MNOs can focus on their core skills and offerings to support mEducation. Under this strategic posture, MNOs target the education segment with their range of connectivity products and services. The MNOs would provide learners, teachers and other education professionals with the scale and coverage to access educational content and solutions provided by other players in the education ecosystem. This would provide access to a global connectivity-linked revenue pool of USD 4 billion out of the total mEducation product opportunity of USD 38 billion in 2020.

Many MNOs are already targeting opportunities linked to mEducation. In doing so, several operators are partnering with other players in the education ecosystem to provide joint offerings and highlighting discounted data plans bundled with it. This business model relies on connectivity services and may therefore be the most logical extension of their core business for MNOs. But they could benefit from investing in key capabilities as they try to tap this opportunity:

- Dedicated sales and marketing capabilities focused on the network requirements of educational institutes. This may require combining existing consumer activities that target learners with packages and offerings, and B2B activities targeting the education market. Telefonica deploys a dedicated sales team for mEducation products in Spain, for example.

- Combining different access technologies, such as 3G and Wi-Fi, to provide seamless connectivity to learners at school, at homes and on the go.

- Partnering with players in the education ecosystems to provide connectivity-backed solutions to the education space, including schools.

- Robust safety features that monitor and filter harmful content—critical to winning the confidence of customers wary of children's exposure to the internet.

Connectivity represents the immediate opportunity for MNOs in an area where they have the most natural right to play.

ENABLE THE mEDUCATION ECOSYSTEM

Beyond pure connectivity, mEducation providers require a broad range of technical enablers that MNOs could potentially provide. mEducation providers will need IT, network, content and data management services to support their solutions. Additional features, such as security, privacy and digital payments, will encourage the users of mEducation.

Enabling this mEducation ecosystem would expand the addressable global opportunity for MNOs to USD 20 billion, previously identified as the platform related mEducation revenue streams.

While this strategy would unlock a larger revenue pool, it would also require MNOs to build capabilities in areas adjacent to connectivity. Examples of capabilities include:

- **Building IT-managed services capabilities to enable mEducation platforms:** Services that MNOs could build include secure cloud-based storage and hosting, data management and analytics, content management and delivery, and IT application hosting. Integrated operators with existing IT services capabilities are well-positioned to capitalize on the opportunity. Operators with ICT arms[8], such as Deutsche Telekom, are targeting the education market with a range of IT solutions. Bharti Airtel in India is partnering with leading content providers, such as Britannica and LearnNext, to offer its broadband subscribers comprehensive supplemental learning solutions for the K-12 segment, encyclopaedias, and educational games such as chess and jigsaw puzzles.

- **Developing the digital interfaces required to facilitate adoption by mEducation users:** MNOs could develop systems and interfaces to allow for secure user identification and billing of digital services provided by third parties. This would provide MNOs with a privileged position to support mEducation solutions such as e-books and games. For example, SingTel recently launched a platform called Skoob that allows customers to pay for e- books through their phone bills.

Operators may choose to provide only some of these services to play a bigger part in the mEducation ecosystem. Entering any of these areas might require new investments, but it might offer opportunities to participate more broadly in the mEducation opportunity.

TAKE THE LEAD AS AN END-TO-END mEDUCATION PROVIDER

The third strategic option is to provide end-to-end services that include in-house content and/or devices. Some MNOs are trying this model, which can throw open the entire mEducation opportunity of USD 70 billion. Telefonica, for example, has created a separate and dedicated learning company called Telefonica Learning Services. A cross-functional team of educators and programmers is creating a range of mEducation products from corporate learning courses to virtual-environment-based learning solutions for K-12 students.

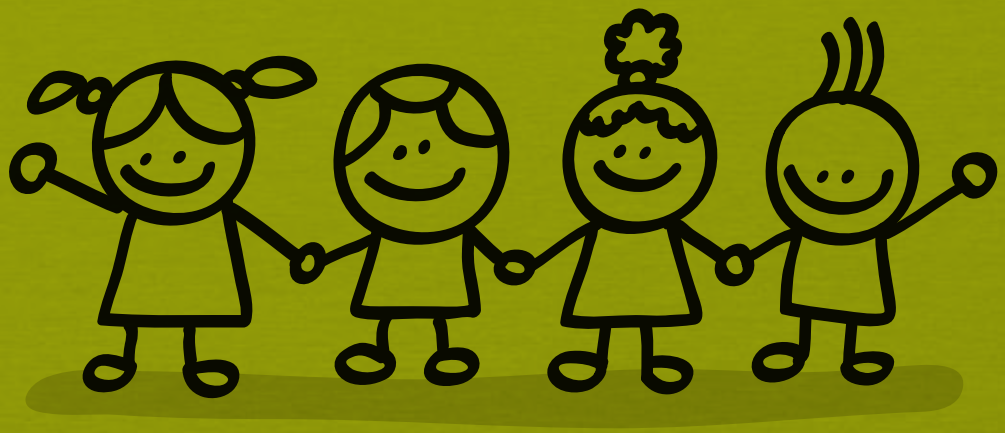
Korea Telecom (KT) has launched its own dedicated learning device, Kibot, an interactive learning toy that can sing, read, allow young learners to play online educational games and even download content developed by KT.

This strategy requires a very different set of skills and the willingness to risk entering a highly competitive and relatively nascent industry. To effectively execute this model, MNOs will need to do the following:

- Work closely with educators to integrate curriculum, pedagogy and technology to provide engaging learning solutions. For example, SK Telecom has partnered with 12 educational companies on its learning platform
- Acquire the skill sets to develop compelling educational content and solutions. Telefonica has hired a dedicated team of educational experts to help create mEducation solutions
- Establish partnerships with third-party players to provide those components of the solution that MNOs may not wish to provide, such as white-label device manufacturers.

Partnerships or even mergers and acquisitions may be required to build some of these capabilities. MNOs will need to invest to create proprietary assets, managing this almost as a new business segment, similar to SME, Enterprise, etc.

mEducation is at a tipping point that may lead to a transformation of the education landscape, enabling better educational outcomes at scale. As MNOs recognize the potential of the opportunity and consider which path to take, they must carefully weigh their capabilities, aspirations and risk tolerance. This strategy decision will go a long way in determining where MNOs stand in the future of the mEducation market.



Appendix A: Estimation methodology and key tables

We used a combination of top-down and bottom-up approaches to estimate the mEducation market opportunity. We overlaid our analysis of geography, education segments and products to refine and clarify the estimates. In this appendix, we describe our approaches.

Geographic and economic classification

For this analysis, we considered the top 45 countries by GDP that account for more than 90% of global GDP, classifying them as developed or developing using the IMF classification. We grouped them in six categories based mainly on geography, dividing Asia Pacific into Developed Asia Pacific and Emerging Asia Pacific to account for vast differences in incomes and evolution of education systems.

Top-down market forecasts by regions and education segments

We chose GDP as a driving factor for estimating the total spend on education. We categorized education by segment—pre-primary, K-12, tertiary, vocational and corporate—and by source of funding (public or private) and by type of spend: core or supplementary, where core represented formal education institutions and supplementary spend represented private tuitions, corporate learning, etc.

TABLE 1: SEGMENT SPEND IN EDUCATION 2011 (USD BILLION)

S. No	Region	Pre Primary	K12	Tertiary	Vocational	Subtotal	Corporate	Total
1	Emerging Asia-Pacific	41.46	409.74	187.71	28.88	667.79	14.05	681.84
2	Developed Asia-Pacific	21.28	327.17	182.70	27.05	558.20	40.09	598.29
3	Middle East & Africa	12.24	81.99	27.48	4.06	125.78	2.48	128.26
4	North America	73.89	725.62	366.29	100.25	1,266.08	73.65	1,339.71
5	Latin America	28.11	226.86	48.07	15.49	318.53	5.97	324.49
6	Europe	94.98	636.16	214.10	20.89	966.14	70.83	1,036.97
	Total	**271.97**	**2,407.54**	**1,026.36**	**196.62**	**3,902.49**	**207.07**	**4,109.56**

TABLE 2: GLOBAL EDUCATION SPEND BY SOURCE AND TYPE IN 2011 EXCLUDING CORPORATE (USD BILLION)

S. No	Region	Public	Private	Core	Supplementary	Total
1	Emerging Asia-Pacific	512.54	155.25	644.50	23.29	667.79
2	Developed Asia-Pacific	339.44	218.76	500.26	57.94	558.20
3	Middle East & Africa	99.49	26.29	123.39	2.39	125.78
4	North America	855.97	410.09	1,197.71	68.35	1,266.06
5	Latin America	258.65	59.88	310.72	7.81	318.53
6	Europe	852.37	113.76	955.79	10.34	966.14
	Total	**2,918.46**	**984.03**	**3,732.37**	**170.12**	**3,902.49**

We also considered the "technology-addressable spend," the components that can be replaced by technology in the near future, such as instructional material, IT infrastructure and private tutoring. The share of these components in total education spend varies significantly by geography and education segment. Another limiting factor for mEducation market is portable device penetration, which varies across regions. To factor in the different starting points of each region, we downsized the technology-addressable spend using the current mobile feature phone penetration across geographies as a proxy for technology readiness.

We used the estimate of global addressable market and bottom-up mEducation revenues to estimate adoption rates across regions. To forecast future adoption rates, we looked at the historical adoption curves of similar technologies, such as digital music, PCs and mobile phones. We provide detailed projections for the mEducation market in Table 3.

TABLE 3: mEDUCATION MARKET BY REGION (USD BILLION)

S. No	Region	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	CAGR
1	Middle East & Africa	0.01	0.02	0.03	0.05	0.07	0.11	0.16	0.24	0.36	0.54	50%
2	Latin America	0.03	0.05	0.08	0.12	0.19	0.29	0.45	0.69	1.07	1.65	54%
3	Emerging Asia-Pacific	0.12	0.19	0.29	0.45	0.69	1.06	1.63	2.52	3.88	6.00	54%
4	Developed Asia-Pacific	0.98	1.21	1.48	1.83	2.25	2.76	3.40	4.18	5.15	6.34	23%
5	Europe	0.88	1.13	1.45	1.87	2.40	3.09	3.98	5.13	6.61	8.52	29%
6	North America	1.34	1.75	2.28	2.97	3.88	5.07	6.61	8.63	11.27	14.71	31%
	Total	**3.37**	**5.14**	**7.25**	**9.75**	**12.71**	**16.20**	**20.33**	**25.20**	**30.95**	**37.75**	**31%**

Bottom-up market estimates by key mEducation products

We categorized the mEducation market into seven core product and service archetypes. For future estimates across the seven product and service archetypes, we reclassified the 45 countries into five clusters to factor in education challenges, cultural factors, present stage of mEducation market and likely growth drivers:

- Cluster 1 (US and UK): Grouped separately as they are first movers in mEducation adoption
- Cluster 2 (Japan and South Korea): While they are also first movers, they are have a higher share of supplementary spend
- Cluster 3 (India, China and Brazil): Nascent mEducation markets that are likely to enjoy significantly higher economic growth than other developing regions
- Cluster 4 (Other developed countries): Nascent mEducation markets with high per capita incomes and technology readiness in terms of devices and high-speed network penetration

- Cluster 5 (Other developing countries): Very low penetration for mEducation coupled with medium to high economic growth and struggling with core issues of access to education.

We provide estimates for mEducation products by cluster in Table 4.

mEDUCATION OPPORTUNITY BY PRODUCT AND BY CLUSTER (2020, USD BILLION)

S No	mEducation product	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
1	E-books & E-courses	3.59	2.39	5.04	4.05	2.33	**17.40**
2	Game/simulation based tools	7.20	2.03	0.21	3.80	0.06	**13.30**
3	Collaboration tools	2.29	0.08	0.07	0.37	0.00	**2.81**
4	Test prep	0.41	0.17	0.18	0.16	0.06	**0.97**
5	Distance tutoring	0.68	0.34	0.54	0.20	0.02	**1.78**
6	LMS/authoring tools	0.78	0.25	0.01	0.13	0.00	**1.16**
7	Assessment	0.33	0.03	0.05	0.01	0.00	**0.42**
	Total	**15.28**	**5.29**	**6.06**	**8.75**	**2.47**	**37.84**

mEducation opportunity split across the value chain

We broke the mEducation products and services across the value chain—content, platform/software and connectivity—through conversations with experts, including leading telecom operators in the mEducation space. We also estimated the education-specific device opportunity, dividing revenues into four main segments:

- Content-linked mEducation revenues: Share accruing to publishing houses and other content providers for making content available
- Platform- and software-linked mEducation revenues: From providing technical enablers such as IT, network, content and data management services, security, privacy and digital payments
- Connectivity linked mEducation revenues: Share accruing to mobile network providers for providing connectivity services, including voice and data services
- Device linked mEducation revenues: From the sales of all general-purpose portable devices, including laptops, tablets and e-book readers, to educational institutions, and sales of education-specific devices, such as LeapPad and Kibot, to institutions and individuals.

Appendix B: Key definitions

Adaptive learning: An educational method which uses computers as interactive teaching devices to adapt the presentation of educational material according to students' needs, as indicated by their responses to questions

Authoring tools: A program that helps write hypertext or multimedia applications

Cloud computing: Delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility

Corporate learning: Organizational activity aimed at bettering the performance of individuals and groups in organizational settings

Data management services: Administrative process by which the required data is acquired, validated, stored, protected, and processed, and by which its accessibility, reliability, and timeliness is ensured to satisfy the needs of the data users.

Digital textbooks / E-books: An eBook is an electronic version of a traditional print book that can be read by using an electronic device such as personal computer, tablet, mobile phone or an E-book reader. Many eBooks include additional functionality not possible in printed versions, including hyperlinks to explanations and websites and embedded multimedia, such as videos and interactive diagrams

Digital payments: Any transaction in which monetary value is transferred electronically or digitally between two entities as compensation for the receipt of goods and services

Distance tutoring: Process of tutoring in an online, virtual environment or networked environment in which teachers and learners are separated by space

E-Course: An electronically supported educational course, where content may be delivered via the Internet, intranet/extranet, audio or video tape, cable or satellite TV, CD-ROM, or other electronically based methods

eEducation: E-learning comprises all forms of electronically supported learning and teaching, where the information and communication systems, whether networked or not, serve as specific media to implement the learning process

Feature phones: A mobile phone which is not a smartphone but has additional features to a basic phone e.g. a camera. Features phones have a small screen and numeric keypad

Higher education: Formal degree based education delivered to students primarily between the age group of 18 to 25 years

K-12 education: School education delivered to students primarily between the age group of 6 to 18 years

Learning Management Systems (LMS): A learning management system is a software application for the administration, documentation, tracking, and reporting of training programs, classroom and online events, e-learning programs, and training content

Lesson plan: A teacher's detailed description of the course of instruction for one class. A daily lesson plan is developed by a teacher to guide class instruction

Managed services: Offerings by service providers which combines the supplying of telecommunication services and facilities with complementary management services, thereby eliminating the need for hiring / developing in-house skills to support the systems

mEducation: All forms of eEducation that use mobile networks for connectivity and are accessed through portable devices

Mobile apps: Mobile applications, also called mobile apps, are software applications, usually designed to run on smartphones and tablet computers. They are available through application distribution platforms, which are typically operated by the owner of the mobile operating system, such as the Apple App Store, Android Market, and BlackBerry App World

Mobile hotspot services: A small personal device that creates a small area of Wi-Fi coverage allowing nearby Wi-Fi devices to connect to the Internet. The device serves as a link between nearby Wi-Fi devices and a cellular data network

Mobile Network Operators (MNOs): A mobile network operator (MNO), also known as wireless service provider, wireless carrier, cellular company, or mobile network carrier is a mobile phone operator that provides network, voice, and data services to mobile phone subscribers

Mock test: A preparatory/practice test that does not carry actual marks but helps students in preparing for the actual exam

Podcasts: A type of digital media consisting of an episodic series of files (either audio or video) subscribed to and downloaded through web syndication

Portable device: A mobile device (also known as a handheld device, handheld computer or simply handheld) is a small, hand-held computing device, typically having a display screen with touch input and/or a miniature keyboard and weighting less than 2 pounds

Pre-primary education: Education delivered to students primarily aged below 6 years with the objective of introducing them to a school-type environment

Smart board: An interactive projection display used in classrooms to enable teachers to combine websites, images and videos into an engaging presentation

Smart phones: Mobile phones that typically combine a mid-sized screen, A to Z keypad and higher computing power compared to a feature phone

Supplementary education: Education provided outside of school hours either to reinforce and support the regular school program or to compensate for educational disadvantages

Tablet: A tablet computer, or a tablet, is a mobile computer, larger than a mobile phone or personal digital assistant, integrated into a flat touch screen and primarily operated by touching the screen rather than using a physical keyboard

Vocational education: Education or training that prepares trainees for jobs at various levels from a craft or trade to a professional position in engineering, accounting, nursing, medicine and other heath practice, architecture, pharmacy, law, etc.

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ABOUT THE GSMA

The GSMA represents nearly 800 mobile operators and over 6 billion connections worldwide.

Our work in mEducation, part of the Connected Living programme, is focussed on bringing the operator and education industries together to address market barriers, foster collaboration and speed up the adoption of mobile education services. We encourage you to reach out and get involved, whichever part of the ecosystem you belong to. To learn of our work, the latest information on our programme please visit www.gsma.com or contact meducation@gsm.org .

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