Leveraging ICT for a World-Class Education System

Momentous ICT-Enabled Opportunities Lie Ahead for the Education System

It is widely accepted that education is paramount in a knowledge-based society. Young Shim Dho, South Korea's ambassador to UNWTO, once said, "Education is what transformed our country from poverty to the 14th-largest economy in the world." Yet, education itself is today on the brink of the most significant transformation ever experienced. The underlying vehicle of this change is information and communication technology (ICT), which has already transformed other industries and is now introducing myriad opportunities for students to improve their learning, as well as their results.

From a broader perspective, ICT is enabling a higher degree of personalization by offering a wide range of learning tools and materials that are more adaptable to individual needs and competences than before. Examples of such opportunities are movies and games, flipped classroom, podcasts and tools for students with special needs, and web-based presentations.

Pedagogical games are available for a wide range of educational areas and make it easier and more fun for students to learn. Flipped classroom is a concept that makes it possible for students to learn new content outside the class-room by watching video lectures. The time in the classroom with the guidance of the teacher can then be used for tasks such as problem solving, which before would have been given as homework.

Another area with large potential benefits for learning is online education, in which users can access world-class education independent of location. This is an area that is rapidly expanding in both the public and private sectors. Students and teachers alike benefit from such technologies. For teachers, online education is a source of inspiration on how to use new ways of teaching. Online education solutions such as the Khan Academy, where users can learn different topics ranging from mathematics to humanities for free, are invaluable resources for millions of students and an inspirational basis for teachers worldwide. What's more, ICT is also enabling better communication and collaboration between students and

teachers within and across schools all over the world through new communication channels. Internet-based projects and online multi-player games allow global communication and cooperation in a playful and interactive manner.

Despite noticeable efforts and investments worldwide, most opportunities are still not fully explored, and their benefits are untapped. Arthur D. Little's experience confirms what has already been proven by various studies – it is further seamless integration of pedagogy with ICT and digitalized content that will unleash these benefits.
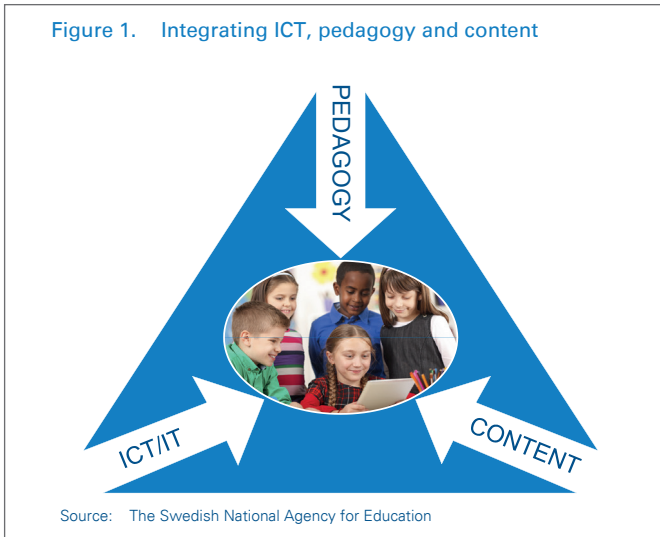
Why do schools fail to grasp ICT opportunities?

Educational institutions have made substantial investments in ICT the recent years. A European survey shows that in 2011 there were twice as many computers per 100 students in secondary schools as there were in 2006. However, the ICT investments differ substantially between countries. About 80% of the students in grade 8 in Sweden, Finland, Denmark and Norway attend highly digitally equipped schools while less than 10% do so in many other countries, such as Bulgaria, Croatia, Greece and Italy[1].

Interestingly, the same survey did not find any overall relation-ship between highly developed ICT infrastructure and students'

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1   European Journal of Education, Part I; http://onlinelibrary.wiley.com/ doi/10.1111/ejed.12020/pdf

Figure 1. Integrating ICT, pedagogy and content

PEDAGOGY

ICT/IT

CONTENT

Source: The Swedish National Agency for Education

and teachers' confidence in and usage of ICT. Such evidence reinforces the conviction that addressing ICT alone is not likely to deliver the desired outcome. On the contrary, many ICT investment programs have resulted in frustration rather than excitement, as clearly shown by this statement, made earlier this year by a teacher in natural sciences in one of Sweden's largest newspapers:

"One has really just thrown computers to the students, but not told us how to use them."

The essence of using technology in its right context is clearly emphasized by the National Council of Teachers of Mathematics (NCTM):

"It is essential that teachers and students have regular access to technologies that support and advance mathematical sense making, reasoning, problem solving, and communication. Effective teachers optimize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. When teachers use technology strategically, they can provide greater access to mathematics for all students."

Investments in ICT should be combined with efforts to develop and adapt pedagogy and content for seamless embracing and usage of new ways of learning. Another obvious example could be observed in students with intellectual disabilities, who could communicate significantly better with their teachers through the use of iPads, which are both easier to handle than pen and paper and offer more variability than any communication tool that these students had previously used.

The development should, however, not be limited to learning

to use existing technology. A pedagogic development needs to take place in the schools, and future ICT development needs to be driven by this pedagogical development.

"The priority is to create a pedagogical set-up which makes learning interesting and stimulating to students. There we have enormous possibilities to develop new IT-enabled pedagogic tools in collaboration with the industry." Per Wadman, Principal at IT-oriented school Ärvingeskolan in Stockholm
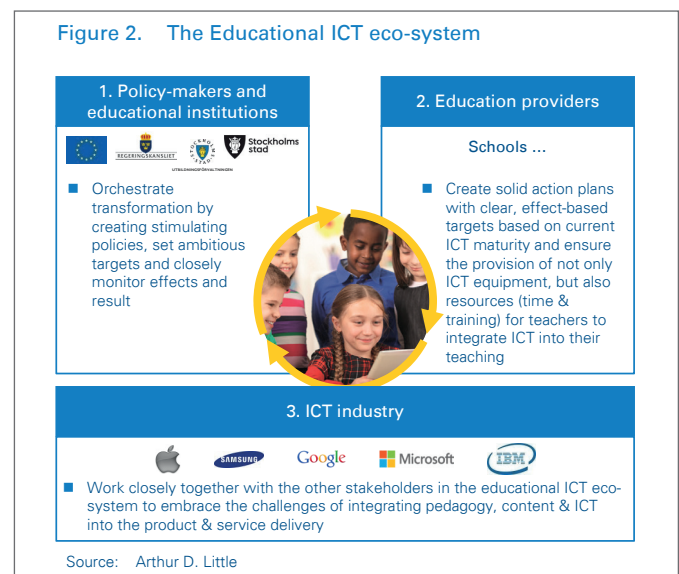
To reap the benefits of ICT across the education system, a clear and integrated vision and strategy for ICT, pedagogy and content are needed. Education providers need to ensure that the desired skill set is carried by their teachers and practiced in their tutoring. Most importantly, teachers should play an influential part in this integration and adaptation process. The teachers that work with ICT in the classroom must be backed up by engaged and visionary head teachers and principals.

"A successful collaboration with students rests on four pillars: pedagogical competence, technical competence, subject matter competence and leadership competence." Sveriges Kommuner och Landsting (SKL)

Policy-makers and educational institutions, education providers and the ICT industry need to take action

In order to fully utilize the opportunities that this transformation brings, several actors need to rethink the way education is delivered. A series of enabling actions from 1) policy-makers and educational institutions, 2) education providers and 3) the ICT industry is necessary to gain and sustain a world-class education system (Figure 2).

Figure 2. The Educational ICT eco-system

1. Policy-makers and educational institutions

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■ Orchestrate transformation by creating stimulating policies, set ambitious targets and closely monitor effects and result

2. Education providers

Schools …

■ Create solid action plans with clear, effect-based targets based on current ICT maturity and ensure the provision of not only ICT equipment, but also resources (time & training) for teachers to integrate ICT into their teaching

3. ICT industry

■ Work closely together with the other stakeholders in the educational ICT eco-system to embrace the challenges of integrating pedagogy, content & ICT into the product & service delivery

Source: Arthur D. Little

First, policy-makers and educational institutions who are the ultimate orchestrators of this transformation need to get a clear, holistic view of the opportunities ahead and create levers for all parties to realize them. A lucid example of the effect of stimulating policies is found in Norway, where "digital skills" have been integrated as one of five basic skills for all pupils and citizens, along with talking, reading, writing and calculating. This increases the emphasis on continuous development and on the follow-up of digital skill sets in education.

Secondly, education providers need to set distinct targets for what they want to realize with the integration of ICT in teaching, as well as clear action plans to meet those targets. Moreover, progress should be continuously followed up and evaluated.

Schools would benefit from annual or biannual examination of their current state in terms of ICT maturity set against the desired state, and outlining of clear action plans to close the gaps. Principals should provide the prerequisites required for teachers to integrate ICT into their teaching by, e.g., allocating time and funds for training – a common problem today. Teachers would benefit from taking individual responsibility to understand how ICT can be used to improve results and share best practices to learn with colleagues. Support should also be available to share digital content and teaching practices across schools. Finland and Estonia are taking interesting and creative measures in this sense. On January 29, 2014 they together announced a cross-country ICT initiative using cloud services.

"This joint effort aims to enable creation of cloud services in education and learning and the use of digital materials and find new ways of learning and teaching in the learning environments." Minister of Education in Finland, Krista Kiuru

The ICT needs of education providers differ significantly from those in dominated administrative environments.

Thirdly, the ICT industry would benefit from greater under-standing of these specific needs, which would help them provide solutions that support creativity and nourish students' desire to learn. It would also benefit from supporting education providers in embracing these technologies better as they improve performance in the education system.

Key insights

This article argues that there is an opportunity to achieve a world-class education system that leads to better study results and lifelong learning, should 1) policy-makers and educational institutions, 2) education providers and 3) the ICT industry do their part to stimulate the integration of ICT, pedagogy and digital content. Arthur D. Little engages with policy-makers and

educational institutions, education providers and the ICT industry around the globe to build world-class education systems in nations, step by step.

Case study: Digitalization of schools in the City of Stockholm, Sweden
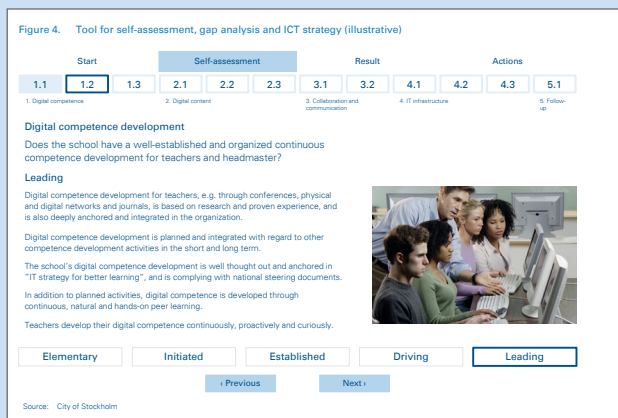
A recent report released by the commission of digitalization in Sweden clearly illustrates the need to focus on improving all three elements – ICT, pedagogy and digital content – to achieve a world-class education. According to the report, Sweden is number-one in Europe when it comes to the number of computers per student in eighth grade, averaging around three students per computer. Meanwhile, Sweden is ranked number seven, with 40 percent of teachers using ICT in education, and number 14, with 33 percent of teachers having participated in training sessions on ICT use in education.

The ICT unit at the department of education in the city of Stockholm is taking a series of actions to improve integration of ICT, pedagogy and digital content to support the vision of a world-class school. Stockholm started by developing a strategy covering ICT, pedagogy and digital content to improve the learning situation in schools. To implement the strategy, Stockholm created a "target picture" based on the developed IT strategy, with detailed descriptions and illustrations of what it means to fully utilize the combination of ICT, pedagogy and digital content. The "target picture" and its detailed objectives are fully compliant with the steering documents for the Swedish school, as well as with appurtenant common principles, goals and guidelines for a school at world-class level (Figure 3).

Figure 3.   Target picture for use of ICT in schools

Source: City of Stockholm
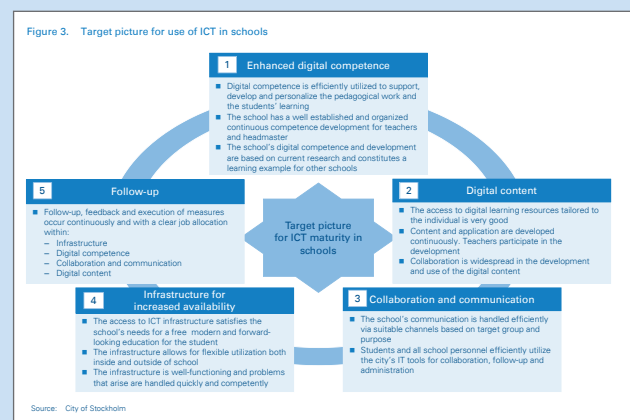
A web tool is being developed to support both headmasters and individual teachers to assess their "ICT maturity" in comparison with the target picture (Figure 4).

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Based on the result of the self-assessment, the tool provides detailed actions for both the headmaster and teachers, as well for the city's central organization, on how to improve ICT maturity and usage of ICT. The actions include ICT, pedagogy and content and the integration of these, and are concluded in the continuous quality management work in each school.

Figure 4. Tool for self-assessment, gap analysis and ICT strategy (illustrative)

Source: City of Stockholm

An action plan for how to use ICT in education is a requirement to take part in Stockholm policy-makers' decision to provide each student with their own computer – "1:1" in the upper secondary schools. Discussions on how to integrate the new computers with pedagogy and digital content in each school are preceding the action plans.

As a next step, Stockholm city has started a project to procure ICT infrastructure, with the objective of making ICT suppliers provide solutions that are better adapted to educational needs. Examples are for ICT to facilitate usage of educational digital content, and for suppliers to support teachers in using ICT in their pedagogy. Hence, the procured ICT equipment should not only improve the level of infrastructure, but also support the integration of both digital content and pedagogy.

"The self-assessments, proactive discussions among teachers and broad creation and implementation of action plans on how to increase the ICT maturity in each school will be critical to realize the potential brought by the 1:1 investments. In conjunction with the coming new ICT infrastructure procurement, Stockholm has a bright outlook to increase use of ICT for better learning for each student." Ann Hellenius – ICT Director, Educational Department, City of Stockholm

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Arthur D. Little

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