ICT-based Innovation in Stockholm's Secondary Schools –
Advancing Towards "Collaborative-Personalization" in Education

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1   Introduction

> *"Education should be adapted to each pupil's circumstances and needs."[1]*

In most places around the world, policies and processes of ICT-based educational innovation[2] have to contend with issues of infrastructure, lack of equipment, lack of resources for teacher training, inadequate support for content development, etc. This is not the case in Stockholm, a city among the most advanced in terms of computer per capita, broadband connectivity and, indeed, available resources to facilitate ICT-based innovation in different walks of life, in this case, in the area of education.

Moreover, as shown by the quotation above, in Sweden not only education is a right for every person, regulations also state that *'Education should be adapted to each pupil's circumstances and needs."*   This paper is about a story of e-learning[3] innovation

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[1] Ministry of Education and Science in Sweden and National Agency for Education (2001). Also, "The Education Act stipulates that the education provided within each type of school should be of equivalent value, irrespective of where in the country it is provided (Chapter l, § 2). National goals specify the norms for equivalence. However, equivalent education does not mean that the education should be the same everywhere or that the resources of the school shall be allocated equally. Account should also be taken of the varying circumstances and needs of pupils as well as the fact that there are a variety of ways of attaining these goals. Furthermore the school has a special responsibility for those pupils who for different reasons experience difficulties in attaining the goals that have been set for the education." (p.6)

[2] ICT-based educational innovation (i.e., educational innovation based on information and communication technologies) is here used in the broad sense of the implementation of any form of ICTs to enhance learning processes in schools and in the educational system as a whole. The field has received a huge amount of attention in the last decades and today has a burgeoning literature published in books and journals and increasingly online. More recently, international organizations such as OECD and UNESCO have also sponsored large-scale studies involving many countries. For UNESCO see, for instance, Resta (2002), Haddad and Draxler (2002) and Institute for Information Technology in Education (2004). In turn, the OECD has produced the "Schooling for Tomorrow" series. See OECD (2000, 2001a, 2001b) and OECD/CERI (2003). In addition, OECD and the Centre for Educational Research and Education (CERI) have conducted a comprehensive study of *The Transformation of Schooling in a Networked World* with access to over 90 case studies of ICT-based innovation in over 20 countries across the world. See Venezky, and Davis (2002) and Toomey and Ekin-Smyth (2001). Finally, the Second Information Technology Study in Education (SITES) looked at 174 case studies of ICT-based innovative pedagogical practice from the 28 participating countries. The results are found in Kozma (2003).

[3] In this paper, the concept of e-learning will basically mean the same as ICT-based education (to the extent that education is essentially about learning), although some definitions of e-learning stress the central role played by the internet, particularly, because networking enables the emergence of qualitatively more powerful forms of learning activities and environments. For instance, the European Commission's eLearning Action Plan defined eLearning as "the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration." (CEC, 2001a, p.2) Also, the UK's eLearning Strategy raised and answered the question: "What is e-learning? If someone is learning in a way that uses information and communication technologies (ICTs), they are using e-learning. They could be a pre-school child playing an interactive game; they could be a group of pupils collaborating on a history project with pupils in another country via the Internet; they could be geography students watching an animated diagram of a volcanic eruption their lecturer has just downloaded; they could be a nurse taking her driving theory test online with a reading aid to help her dyslexia – it all counts as e-learning …. E-learning exploits interactive technologies and communication systems to improve the learning experience. It has the potential to transform the way we teach and learn across the board." (e-Learning Strategy Unit, 2003, p.6 and p.9) Also, e-Learning Strategy Unit, 2004). Other definitions put the emphasis on "learning" rather than on the "technology" although it is clearly the combination of the two that matters and not just the potential for change made possible by the

beginning to make true this aspiration - the story of the "Education Online" Project aiming towards "mass-customization" or, more precisely, "collaborative personalization" of education in Stockholm's schools.

Prior to the story, however, the paper discusses three themes that will help to structure and enrich the understanding and analysis of the ICT-based educational innovation of "Education Online." The first theme concerns both the ICT environment as well as the educational environment of the City of Stockholm. It helps place the analysis of "Education Online" in its broader City context. The second theme posits key referents of what has become known as "education for 21st century skills." This helps to contrast and highlight the achievements, as well as the pending challenges, of the Education Online's innovation. The third theme introduces the conceptual framework to be used for the analytical dissection of the Education Online experience. This is the framework of "sociotechnical constituencies" and associated "diamond of alignment." Having positioned these three themes, the paper then proceeds with the analysis of the Education Online educational innovation, its vision, drivers, achievements, difficulties and solutions. The analysis places special emphasis on identifying the transformation and/or emergence of new didactical instruments and practices. It also seeks to identify "constituency-building" tactics and strategies that have helped the advance of the project.

2   Broad Overview of Stockholm's ICT and Educational Environments

2.1   Broad ICT Environment in Stockholm

It is well known that Scandinavia and particularly Sweden are among the most advanced information-society regions in the world. For instance, the IDC/World Times' annual ranking of the world's most advanced information societies placed Sweden right at the top in 2002. Likewise, the Global Technology Report compiled by Harvard University in 2002 placed Sweden among the most developed IT nations and holding the greatest potential for exploiting the networked world. [4] The capital of Sweden, Stockholm is part and parcel of this leading-edge position in the ICT world. Indeed, Stockholm city and region are the leading IT centre in Scandinavia and a world's leading competence cluster in mobile Internet and wireless communications technology, as well as host many major research institutions and universities. In addition, Figure 1 shows that Stockholm tops the league of the European Innovation Scoreboard in 2002. [5]

One of the keys to Stockholm's leading place in broadband connectivity was the foresighted approach to cabling adopted by the Municipality back in the early 1990s, at the time of the liberalization of the telecommunications market in 1993. In practice the Municipality did not allow unbridled competition among network providers who would

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technology. Thus, Eletti (2004) writes, "e-Learning, literally "electronic learning", is proposed as a modality or, better, as a system of continuous education, where the value resides in the process within which the individual learning activity is integrated. This means that it is not enough to use the network, for the benefit of courses or for the communication between teachers and students, to talk about e-learning." (Eletti, 2004, p.64. Translated from Italian)

[4] http://www.bas.stockholm.se/text.asp?id=105

[5] "The European Innovation Scoreboard has seven indicators: tertiary education; participation in life-long learning; employment in medium/high-tech manufacturing; employment in high tech services; public R&D expenditure; business R&D expenditure; high-tech patent. These are combined to generate a Revealed Regional Summary Innovation Index, which compares each region against the EU mean." ODPM (2002).

have each sought to install their own cables across the city. Instead, the Municipality adopted the "Stokab" model based on the philosophy that telecommunications infrastructure should be provided as a 'public good' to facilitate access to advanced communications services for its businesses and citizens.[6] The city envisaged the provision of advanced infrastructure would generate an educated workforce, a prosperous economy, and an attractive lifestyle. Thus, in 1994, the city-chartered company Stokab begun to lay a public owned fibre optic network throughout the city to provide dark fibre to telecommunications operators and other users at cost-based rates. Since Stokab is a non-profit company run for the benefit of the citizens at large, it does not compete with private business. Instead, it rents out 'dark fibre', to anyone requesting it and then leaves it to the market to offer telecom services. Customers of the Stokab network include telecom operators, Internet service providers, cable television networks, mobile telephone operators, municipalities, county councils, major banks, insurance companies and the new media companies.[7]
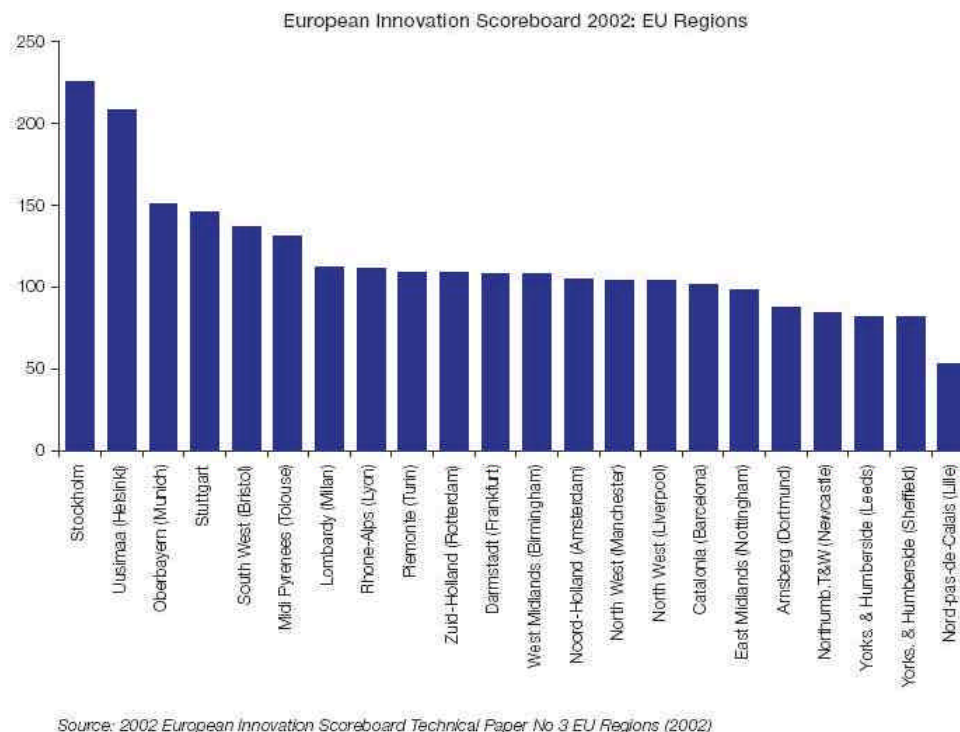
Figure 1. European Innovation Scoreboard

By 1999, Stokab fibre-optic network covered most of the central city, providing connectivity to public schools and institutions such as libraries, district administrations, industrial, office and business centres in the Stockholm area. Today, over 3,000 kilometres of fibre-optic cable with a total of 450,000 kilometres of fibre have been laid out and the model is spreading outside of the metro area, covering all the municipality centres in the 6,500 square kilometres county and even some of the larger islands in the rural archipelago. Most importantly, the Swedish Government is considering a funding

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[6] http://www.newconnections.gov.au/Printer_Friendly/0,,0_2-1_1-2_5-4_100919-LIVE_1,00.html
[7] Ibid.

program to assist municipalities to deploy open access fibre infrastructure to every home, school, library and business.[8]

2.2 *Broad Educational Environment in Stockholm*[9]

Figure 2 provides a simplified representation of a three-layered city's educational system comprising centralised educational facilities (level 1), various schools (level 2) and all specific school subjects (level 3). It serves to explain more in detail the different dimensions of the educational context within which the Education Online project has taken place.
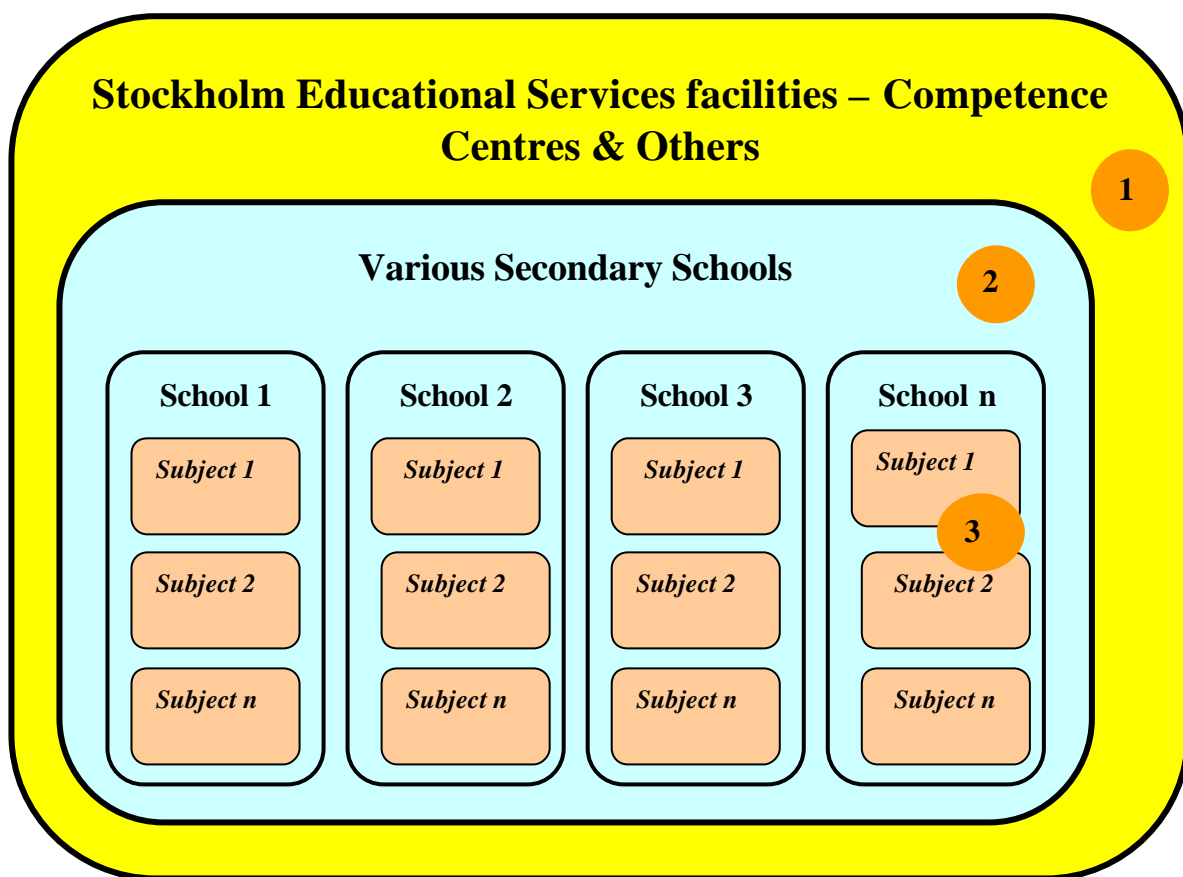
Figure 2. Simplified Representation of Three-layered Educational System Comprising City's Educational Centre Facilities, Schools and Specific Subjects

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[8] Ibid.

[9] Based on text found at
http://www.stockholm.se/templates/template_121.asp_Q_mainframe_E_template_120.asp_Q_number_E_2 1040_A_category_E_167

2.2.1 Level 1 - City's Centralised Educational Facilities

The highly advanced ICT environment of the City of Stockholm is reflected in the Stockholm educational system. The City of Stockholm has around 150 comprehensive schools with 47,800 students and 75 independent comprehensive schools with 9,600 students. At secondary level, there are 23 municipal Council upper secondary schools with 18,500 students and 26 independent upper secondary schools with 2,700 students. Around eleven percent of the city's students attend independent schools. In addition, there is also education for adults: municipal with 7,700 students and independent with 8,000 students. The Stockholm Education Administration[10] employs around 5,000 persons and has a budget of over SEK 4.5 billion.

The use of ICTs in the general operation of the educational system goes well beyond the back office. Thus, Stockholm was the first municipality in Sweden to offer an electronic application procedure, and just over 90% of pupils chose to apply via the Internet when the chance was offered for the first time. Today, Stockholm's students are able to choose their upper secondary school over the Internet, achieving a better service and more efficient use of counselling and vocational guidance resources. The Education Administration has also entered into a partnership with the network company Cisco to offer web-based network courses at upper secondary level. Some schools have their own Cisco-equipped rooms.

The Education Administration is concerned with the development of educational human resources in all areas of the educational system. Thus it seeks to offer teachers more career paths than the one leading to head-teacher through, for instance, a higher education programme for teachers at upper secondary schools, comprehensive schools and pre-schools as well as the opportunity to do postgraduate study in their field of work. On management, the Education Administration has a development programme for recruiting and develop the competency of its own managers and head-teachers. The aim is "to support managers in implementing the management of various activities by objectives and results, with particular emphasis on feedback and evaluation."[11]

As part of its extensive policy of human resource development, the Education Administration also runs ten development centres aimed at improving "the quality of tuition through teacher competency development, links with research, commissioned courses, and experimental educational activities. There are development centres in IT, environmental studies, science, language and communication, media, vocational training, social care, and economics."[12]

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[10] The Stockholm Education Administration *(Utbildningsförvaltningen)* is the executive body of the Stockholm Education Board *(Utbildningsnämnden)*, which is responsible for upper secondary schooling, local government administered adult education, Swedish tuition for immigrants, special schools and adult education for the mentally retarded. Its area of responsibility also includes private pre-schools and independent schools. The Board is further responsible for laying down guidelines and principles, for feedback and evaluation, and for the development and support of education and pre-schooling in the City of Stockholm. *What´s on in the schools in Stockholm?* www.stockholm.se/files/23900-23999/file_23957.pdf, p.1.

[11] Based on text found at http://www.stockholm.se/templates/template_121.asp_Q_mainframe_E_template_120.asp_Q_number_E_2 1040_A_category_E_167

[12] Ibid.

Of major significance for this paper is the IT Centre devoted to IT-supported educational development. At this centre, educators develop new teaching materials and methods and, today, there are some twenty basic upper-secondary courses created by IT Centre educators freely available on the Internet. Of even greater significance for this paper, however, is the Education Administration's work.

> to promote more flexible organisation of education based on student preferences. Students should be able to have a say in their timetable and choose the pace at which they want to study. A few schools are trying web-based tuition, with compulsory attendance alternating with computer-based work, either at home or in the school's computer room. [13]

As we shall see below, this effort to evolve towards "personalization" of education is precisely at the centre of this paper's story of Education Online innovation in Stockholm's schools.

Interestingly enough, the educational authority does not pursue a policy of compulsory training. To a large extent the educational services' entire resource amounts to an offer from the educational system to the schools and their personnel and it is up to them to take advantage of the opportunity. As Joke Palmkvist confirms, "The Municipality of Stockholm gives the teachers the opportunity to attend courses on how to use computers and how to implement them in didactics. But it is still an "opportunity", meaning that teachers are not obliged to do that."[14] This makes 'willingness' and 'motivation' key issues in the evolution of Stockholm's ICT-based educational system.

Of course, the City of Stockholm wants "motivated, well-trained personnel who feel secure and motivated in their professional roles"[15] and would like as many teachers and educational personnel to take the opportunities laid down by the central services. The prevailing governance of "personnel development," however, is very much based on positive incentives and free-choice by schools and individuals and this is probably a key factor shaping the type of evolution of ICT-based educational innovation taking place in Stockholm. Typical of this approach is a recent trial programme implemented by the City. This offers "employees the opportunity to save in a "skills account". Employees who use their skills account are allowed to save a maximum of 5% of their gross salary in the account, with the amount being matched by the employer. This method of skills development does not replace the employer's regular skills development activities."[16]
Another project -PRIS Project- "aims to develop educational management and management by objectives and results in school. The emphasis is on clear leadership, prioritisation of achievement goals, high expectations on students, order in the sense of universally observed social norms, and student-centred work practices. Another part of the PRIS Project is about developing better methods for measuring achievement."[17]

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[13] Ibid.

[14] Interview with Joke Palmkvist, City of Stockholm Educational Services, March 2003.

[15] http://www.stockholm.se/templates/template_121.asp_Q_mainframe_E_template_120.asp_Q_number_E_21040_A_category_E_167

[16] Ibid.

[17] *What´s on in the schools in Stockholm?* www.stockholm.se/files/23900-23999/file_23957.pdf, p.2.

2.2.2 *Level 2 – The Schools*

The high-level of educational infrastructure and services in Stockholm follows into the school environment (level 2 in Figure 2), where a great deal of discretion and freedom exists with respect to allocated budgets and use of the facilities made available by the central educational services. All schools however benefit from access to broadband Internet connections and the reservoir of multimedia educational material gathered as well as developed by central services' competence centres.

The Example of Thorildsplans Gymnasium[18]

Thorildsplans Gymnasium is a three-year high school with more or less 1,000 student aged between 13 and 16. Natural Sciences and Social sciences are the two major subject areas and, after the school, students can apply directly to the University. Thorildsplans Gymnasium is one of the most advanced in the use of computers in Stockholm. It has more or less 700 computers and they are placed all over inside the school building. The almost 1 to 1 computer/pupil ratio of Thorildsplans Gymnasium is however exceptional since, "generally speaking here in Stockholm schools have an average of one computer per five students."[19] Thorildsplans Gymnasium's "exceptionality" however is not the result of some unique privileged access to resources. It is:

> basically a matter of priority. If the school says that it needs that amount of computers that is the aim to be reached … The headmaster is strongly supportive of the innovation process. He considers the introduction and the use of ICT as a must for the school. He is very motivated.[20]

Indeed, Lars-Gustaf Jonsson, Headmaster of Thorildsplans Gymnasium, confirms that:

> my main duty is to facilitate this process and let that ICTs are used in the didactics. I think that ICTs are so important for the education that it is extremely important to let the teacher have the proper tools to manage this new way of learning. We have to give them the skills and competences.[21]

Concurrent with the emphasis on ICTs, Thorildsplans Gymnasium seeks to implement a didactical approach that places a great deal of value on students' inputs into the educational life of the school. This philosophy permeates the provision of services such the library as well as the allocation of school space for students' self-development and expression. The Thorildsplans Gymnasium's Librarian, for instance, passionately argues that: "it is not only the infrastructure of the school, what matters is the way of thinking from the director of the school towards the students. We think it is important to take care of the needs of everybody who is involved in the educational process and put all our efforts to succeed." Thus students are encouraged to be responsible for their own learning, very much free to decide how to organize their study following the classroom lessons.

The school's physical environment is thus designed to reflect the didactic approach of empowering students to take responsibility. For instance, the library was designed to

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[18] www.thn.edu.stockholm.se/

[19] Interview with Joke Palmkvist, City of Stockholm Educational Services, March 2003.

[20] Ibid.

[21] Interview with Lars-Gustaf Jonsson, Headmaster of Thorildsplans Gymnasium, March 2003.

make the place appealing and comfortable to students and it is also accessible online.[22] It should not be the place where students must go because they have no option. For the Librarian:

> The students when entering the library get into a different dimension of the school. The can feel free. The students should not feel constrained to go into the library, it's their own choice. They should go there because they like it. In the room there is a clock-wall that help them to organise their time. We help students to use criticism while searching for sources, books, websites, etc. We have an internal network where all the material inside has been previously checked and tested for reliability. This work is today important for the Internet sources.[23]

Other interesting didactical places/spaces for students to do their own activities in the school include the "Acting Room," that is, a room with a stage and seats where students and teachers can talk about and perform to other students the project they are working on. This didactic facility is aimed at improving students' confidence at communicating their work as well as at interacting with others.

Another special place at Thorildsplans Gymnasium is found in corridors where book shelves have been placed containing free books, novels, magazines, etc. that students themselves have decided to donate to the school and share with their school mates. The turnaround of books in the shelves seems to be high with students withdrawing as well as adding to their collective "library."

A third "students' space" is the study room. This room has been largely designed by students in order to meet a variety of studying methods. Among the facilities, there are a corner with five/six computers, high tables (like counters) for reading standing, normal tables with seats where students can work in groups or on their own and, also, a corner with well refined blue sofas put in a circle for students meetings and conversations. The students we found in the room during our visit were happy with this place. They told us that they like very much staying in there, they feel the study room like their own place, although in no sense restrictive to other school personnel to enter. Indeed, sometimes teachers come to meet students and spend time taking there. Another interesting aspect is that students were empowered to design most of the study room by themselves, for instance, the colours and the seats models. This stimulated a greater sense of belonging for students and hence they properly feel more comfortable and free.

Another place worth mentioning at Thorildsplans Gymnasium is the Cisco Lab, a special room fully-equipped with computers donated by the company Cisco Computers and aimed primarily at the training of teachers. Such Cisco labs are part of Cisco's policy of supporting Cisco Academies across the world with a view to help tackle the shortage of ICT skills affecting the development of the information society.

With such forward-looking perspective, it also comes as no surprise to learn that Thorildsplans Gymnasium is already having a head start in the exploration and implementation of Linux and free and open source software in school computers. Thus, the school has about 30 computers running Linux and different common applications.[24]

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[22] http://bib.thg.se/

[23] Interview with Monika Mechler, Librarian of Thorildsplans Gymnasium, March 2003.

[24] Personal communication with Lars-Gustaf Jonsson, Headmaster of Thorildsplans Gymnasium, May 2004.

Lars-Gustaf Jonsson sees the Linux facility as potentially crucial for the school's own development of customized educational material. Thus, looking at a few years ahead, He foresees that:

> we should have more computers and different ways of using them. More integration of the use of PCs in the different subjects being taught here. Another layer could be the development by ourselves of educational programmes and software for the school without only buying them. I think there are less expensive ways to improve the use of ICT, and in this sense our Linux facility in the school could be triggering such a process.[25]

In the meantime, computers at Thorildsplans Gymnasium tend to be found more in dedicated computer rooms, public spaces such as the School Library, the Student's Room, and corridors rather than integrated in the normal classrooms. In this sense, it is clear that ICTs are very much part of the school culture but are yet to reach high integration into the pedagogical activities conducted during the normal hours of class.

For instance, we talked to a student (student 1) working with a computer at the library on a scientific report.[26]. He told us that he did not have access to computers in the classroom. In fact, in his experience, "we use computers in the classroom while doing computer lessons." On the other hand, in relation to computer access for working the teachers' assignment, the situation is clear:

> We don't need to be continuously followed by the teacher. Once we are given the task it is up to us to organise the work. I can do it also at home. [In particular], the school has a server and there we can find a lot of educational resources that we can use for our research and essays. I can access this material from every computer placed in the school building. I've been given a certain time to stay here and do my task with the computer.[27]

In practice, the pedagogical use of computers by teachers varies depending on the teachers' preferred approaches to teaching and learning, as well as on the specifics of the subjects being taught in the classroom. For instance, a teacher can decide to use the material inside the school server, giving tasks to students, etc. There are no compulsory rules. It is very much left to teachers' discretion how, and if, they exploit the resource. On the whole, however, the student's judgement was that, today, "we don't do much with computers at the lessons. Teachers know how to use computers, but they prefer the traditional way of teaching that give them more control of the learning process." He also estimated that the number of his teachers who are actively introducing the use of computers into didactics amounts to "two or three, in a total of ten teachers. The majority of my teacher prefers working traditionally."

At the same time, it must be noted that the forward-looking ICT-based educational activity and environment of Thorildsplans Gymnasium is not representative of the average situation in Stockholm. In fact, this is a school rather at the vanguard of the use and implementation of new technologies in education and, as one would expect, in Stockholm there will be a mix of schools, showing a mix of attitudes towards the use of new technologies in their pedagogical practices. Indeed, Joke Palmkvist from

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[25] Interview with Lars-Gustaf Jonsson, Headmaster of Thorildsplans Gymnasium, March 2003.

[26] This student will referred to as Student 1 and the views following are based on his experience.

[27] Interview with Student 1, Thorildsplans Gymnasium, March 2003. This student is aware of the advantages conferred by computers in relation to the past, for instance, "I can see sometimes that it was very different, for instance, if you take some papers type-written that have a lot of errors. Today computers do no allow it!"

Educational Services, distinguish very broadly between popular schools, old-fashioned schools and gilded schools. The latter are the kind of prestigious schools that face little problems to attract good students and, for the same reason, tend to be more conservative of their traditional ways of educating. In a sense, the pressure to change is less strong since the success of these schools is to an important extent already ensured by the good quality of the students they are able to attract. At the same time, in other schools, as for instance Rågsved Secondary School that we shall find later on in this paper,

> there are lots of students who need extra help to pass the exams. But this problem collides with another problems, i.e., the decreasing number of teachers in Sweden so this is an important issue for the administration that has to find new ways to guarantee students to achieve high levels of education. Moreover we have a lot of teachers that are retiring, instead we want to stretch the working age till 65.[28]

We see therefore that in spite of all the available resources, ICT infrastructure and services, the Stockholm's educational system is not free of serious problems and challenges. Regarding ICT-based educational innovation, the key governance factor is that the schools' administrations are highly decentralised with different schools following different educational strategies. Senior educational authorities, however, are highly aware of the key role ICTs play in making a reality of the challenge of 21st century education. This is the case of Mr. Per Engbach, Head of the Upper Secondary Schools in Stockholm, the 23 of them. He is very supportive of ICT-based educational activity and he would very much like to see changes that improve the upper secondary school system and organisation.

2.2.3 Level 3 – Specific Subjects

In Figure 2, level 3 corresponds to school's specific subjects. Here the important consideration is that most subjects such as languages or mathematics run across several years in the curriculum of a secondary school. Besides in the Stockholm system there is a marked break between lower secondary and upper secondary schools, with students changing not just course but school as a result of this transition. In terms of course, for instance in English language, the transition from lower to upper secondary school implies a transition to the A-level course of 1st year upper secondary. In this arrangement, there is no continuity of teacher and, indeed, subject teachers may also change from one year to another inside the same school. Figure 3 illustrates the case of one subject's (English language) journey through secondary schools, particularly the transition from lower to upper secondary schools. The figure shows one lower secondary school and a choice of three upper secondary schools for students to continue their studies. It shows that, in the case of English language, the transition implies a change to the A-level course of 1st year upper secondary.

The key point raised by the diagram of Figure 3 is that every shift of year constitutes a potential change in the learning governance of the subject, since it may imply a change to course levels and teachers showing different didactic approaches, knowledge and attitudes towards ICTs. This is clearly the case in the transition from lower secondary school to upper secondary given the break in schools as well as in the level of courses.

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[28] Interview with Joke Palmkvist, City of Stockholm Educational Services, March 2003.

Below, as we discuss the experience of Education Online aimed at advancing towards ICT-based 'collaborative-personalization" of education, we shall see that the innovation and learning challenges faced by the project are indeed substantial as it is aiming to create a truly new educational reality. In particular, this new reality implies not only the normal shift in educational governance intrinsic to the transition from lower to upper secondary school. It implies new ICT-based ways of teaching, learning, relating to school and, above all, a challenge to the sequential progression of students through every subject at the traditional school, year after year regardless of their knowledge and abilities.
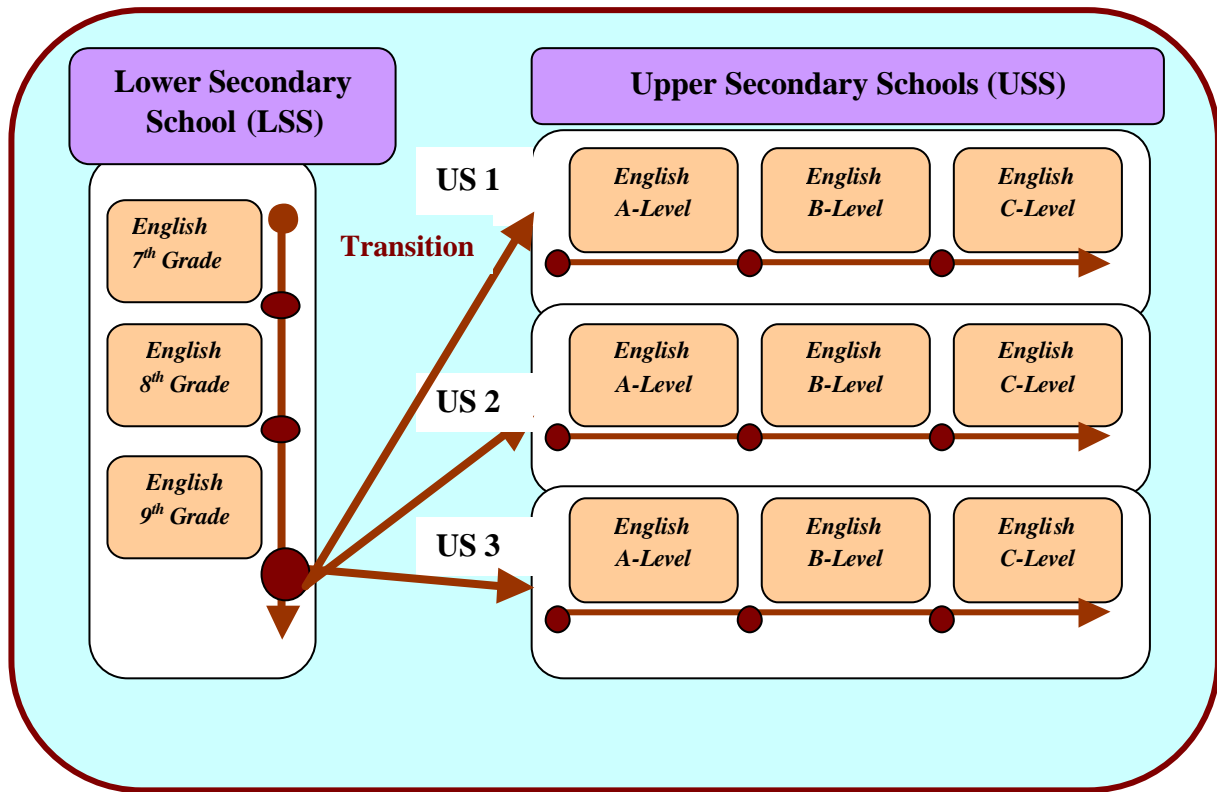
Figure 3. Transition of One Subject (e.g., English) from One Lower Secondary School to a Choice of Three Upper Secondary Schools

Before entering into the details of the Education Online project, however, the next section posits key referents of what has become known as "education for 21st century skills" and briefly uses them in relation to Stockholm's educational system.

3   Some Elements of "Education for the 21st Century" and the Role of ICT-based Innovation

3.1 Consensus in Educational Policy Circles

One of the important factors in the context of ICT-based experiences such as that of Sint Amandus is the great deal of consensus existing in educational policy circles regarding the needs and challenges facing education in the 21st century. Table 1 confirms this fact by showing the fundamental similarity in the type of educational skills that US and European educational policy-advisory bodies recommend as required for the 21st century. Clearly, in both places, information and communications technologies (ICTs) play a central part in the realization of the educational scenario for the 21st century. For our purposes, the confirmation of this consensus and the crucial role given to ICTs is enough, although it is clear that the realization of the educational vision expressed in the contents of Table 1 is not free of problems. For instance, there are issues of resources, details of practical implementation strategies and the rise of new governances, and even the interpretation and borders of some of the key concepts such as the importance of spirit of entrepreneurship and the relation to business in the real-world context. If this concept is not treated carefully, there might the risk of excessive "marketization" of schools and their student population. Indeed, even the centrality of ICTs is open to the risk of "technology push" by suppliers, thus making the technology a "driver" of expenditure rather than an "enabler" of change that enhances the schools' pedagogical processes. One specific issue in this connection is the emergence of free and open source software to challenge the traditional "proprietary governance" of the software market. In short, the visions of educational policy are not unproblematic, but this is concern beyond the scope of this paper.

Table 1. Type of Educational Skills Required for 21st Century	
US[29]	*Europe[30]*
Core subjects beyond basic competency, reaching understanding of core academic content at much higher levels. Core subjects include English, reading or language arts, mathematics, science, foreign languages, civics, government, economics, arts, history and geography.	Literature, philosophy and scientific knowledge and awareness help individuals to develop their powers of discernment and critical analysis and to participate in an informed way in debates and decisions concerning critical environmental, ethical and societal issues. Better foreign language teaching is also essential for Europe's multilingual society to achieve its economic, social and cultural potential.
Learning skills to keep learning continually throughout life and comprising three broad categories of skills: information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills.	Ability to learn – maintaining the curiosity and the interest in new issues and skills – without which lifelong learning cannot exist.
ICT literacy, i.e., "interest, attitude and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate and evaluate information, construct new knowledge, and communicate with others in order to participate effectively in society." [31]	Information technology across the board in curricula is a necessity.
Learning emerging content areas: global awareness; financial, economic and business literacy; and civic literacy. Educational and business leaders identify them as critical to success in communities and workplaces.	Learning European awareness, the feeling of belonging to Europe, and ultimately, European citizenship in a context of cultural diversity and broadening of experience and enhancement of skills, including foreign

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[29] Partnership for 21st Century Skills *(*2003).
[30] CEC (2001b, 1996).
[31] Programme for International Student Assessment (PISA)

	languages.
Teach and learn in context: need to learn academic content through real-world examples, applications and experiences both inside and outside of school.	Absorbing the intellectual and practical contributions of business, research and society as a whole, particularly spirit of enterprise and initiative by facilitating the understanding of the value of enterprise, risk-taking and innovation. Models of successful entrepreneurship should be promoted, particularly of socially responsible enterprises.[32]
Assessment measuring 21st century skills: A balance of assessments — i.e., high-quality standardized testing for accountability purposes and classroom assessments for improved teaching and learning in the classroom. To be effective, sustainable and affordable, sophisticated assessment at all levels must use new ICTs.	Quality assurance systems are essential to an effective education and training system. They enable schools and training institutions to look critically at the value delivered people, identifying strength, weaknesses and hence areas of improvement.

3.2 ICTs as an Enabler of Qualitative Change in Education

Writing of the role of ICTs and education has a long history preceding the forceful emergence of interactive multimedia and the Internet in the 1990s. Before, the emergence of computers gave rise to terms such *computer-aided education* or *computer-assisted learning* and analogue television became the technology of *distance learning*. The rise of the Internet and *cyberspace,* however, is certainly seen as enabling the emergence of qualitatively more powerful forms of electronic learning activities and environments (i.e., e-learning, see note 3 above). The overall expected result is a new educational dynamics, with new types of roles for teachers and students, new didactics, higher and richer levels of attainment, and ultimately life-long learners prepared to face the challenges of a world in constant change in the 21st century. Levy (2001) has described this transformation in the following words:

> The key point here is the qualitative change in the learning process. … The most promising direction, which reflects the outlook of collective intelligence in the educational field, is that of cooperative learning.
> On the new virtual campus, professors and students will share the available material and informational resources. Teachers will learn along with their students and continuously update their knowledge along with their teaching skills.
> The primary role of education will no longer be the distribution of knowledge that can now be obtained more efficiently by other means. It will help provoke learning and thinking. … It will focus on managing and monitoring learning: encouraging people to exchange knowledge, relational and symbolic mediation, personalized guidance for apprenticeship programs, and so forth.[33]

Such vision is reinforced by Haddad and Draxler (2002a) who highlight the teachers' transformation from "transmitter" to "mediator," or, as they prefer to call it from "provider" to "facilitator." They envisage an increase in the number of didactic activities and skills that takes place as the teacher's and the learner's roles evolve from "provider" to "facilitator" and from "passive" to "active" respectively. Figure 4 illustrates this change with the traditional teacher and learner didactic relationship found at the bottom-left side of the diagram in the form of a "provider-passive" relationship dominated by a didactics of 'presentation."

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[32] Schools should also build on the contacts they have with businesses in their local environment to provide role models of successful businesses as part of their civic education curricula. (CEC, 2001b, pp.11-12)

[33] Levy (2001, p.151). Also Levy (1997), Batini and Fontana (1997), Alberici (2002) and Alessandrini (2002).

Of course, the excitement of these visions should not veil the fact that key didactical concepts such as "active learning, "cooperative learning," "personalized learning" and many others have a long tradition in educational fields such as *didactics*, *psychology of learning*, *cognitive science*, *cybernetics* and *human-computer interaction* largely preceding the educational arrival of ICTs.[34] At the same time, it is plausible to say, that it has been the arrival of ICTs and particularly interactive multimedia computing and communications that has truly enabled the realization of these didactical concepts on a magnitude, richness, flexibility and "borderless geography" qualitatively different from anything we have seen before.
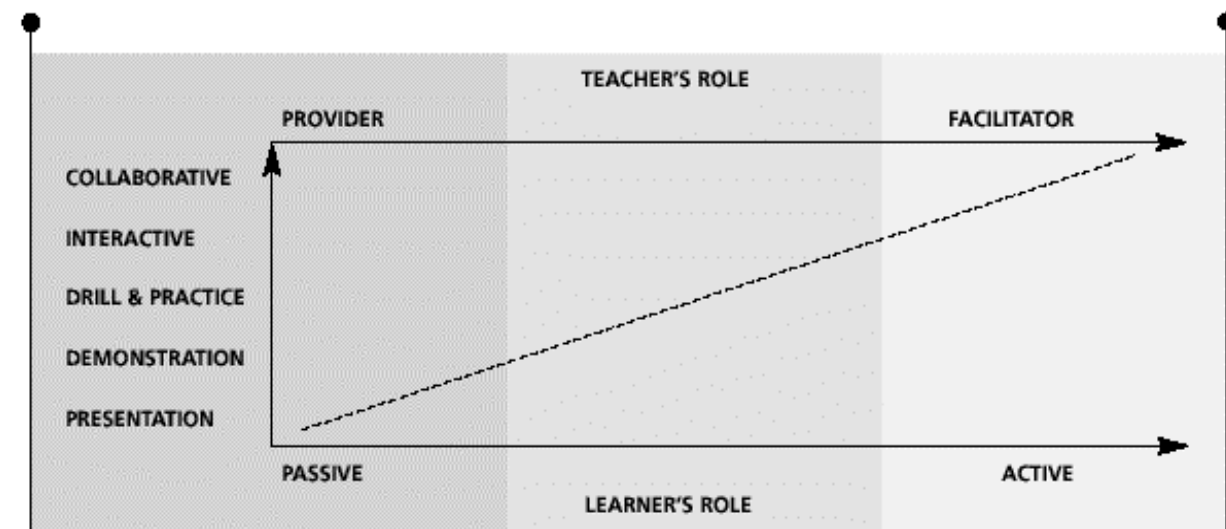
Figure 4. Use of ICTs for different Roles of Teachers and Learners
Source. Haddad and Draxler (2002b), p.13.

The end result for schools and educational systems across the world is the requirement for innovative change in the practices, technology, and governance characterizing today's learning processes. Such innovative processes will most likely benefit from a holistic approach that recognizes that the real challenge is in fact the emergence of completely new "physical and virtual learning communities and environments." In this environments, intra- and inter-schools "learning communities" will have the opportunity to operate at multiple levels and times, very much as combinations and re-combinations of "communities of practice" in the sense of Wenger.[35] Simultaneously, the opportunity for the systematic "personalization of students' learning processes" will also be enhanced

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[34]Greg Kearsley's Theory Into Practice (TIP) database (http://tip.psychology.org/backgd.html) contains descriptions of over 50 theories relevant to human learning and instruction. Among the influential concepts are "social development theory" and "zone of proximal development (L. Vygotsky), "situated learning" (J. Lave and E. Wenger), "social learning theory (A. Bandura), "constructivist theory" and "discovery learning" (J. Bruner), also constructivist "genetic epistemology of J Piaget and "Anchored Instruction" (Bransford and the Cognition & Technology Group at Vanderbilt (CTGV). Indeed, the list is long and span back many decades, reaching the early 20th century and even further back with the work of 19th century educational philosopher J. Dewey and his *Democratic Principles in Education*. (see full text in The Project Gutenberg Etext of *Democracy and Education* by John Dewey, March, 1997 [Etext #852] found at ftp://sunsite.unc.edu/pub/docs/books/gutenberg/etext97/dmedu10.txt . Finally, Conway (1977) offers a matrix with examples of specific educational software to support the practice of some of theoretical educational concepts.

[35] Wenger (1998, 2002).

to suit their individual combination of characteristics or personal profile as implied, for instance, in Gardner's concept of "multiple intelligences."[36] Ultimately, this combination system should facilitate the learning community to be a resource for the individual learner and, conversely, the individual learner to be a resource for the learning community.

3.3   Basic ICT-based Capacities to Realise the Educational Concept for the 21st Century

This section provides an illustrative idea of the basic technologies and associated skills required by a process of ICT-based educational innovation for 21st century education. The purpose is to highlight that for schools the development, integration and diffusion of a basic set of network infrastructure, hardware equipment, instrumental software, educational content and skills is simply unavoidable. Figure 2 illustrates the ingredients of this basic set that starts with the inner rectangle highlighting the requirement for availability or access to appropriate:

- network infrastructure (e.g., ADSL, broadband cable, wireless, etc. and their associated software)
- hardware equipment (e.g., computers, printers, scanners, etc. stand-alone or interconnected),
- instrumental software (e.g., databases, word processors, spreadsheet, email, browsers, etc.),
- educational content (e.g., software applications related to specific subjects such as math, physics, languages, etc.)

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[36] Gardner (1983, 1999).
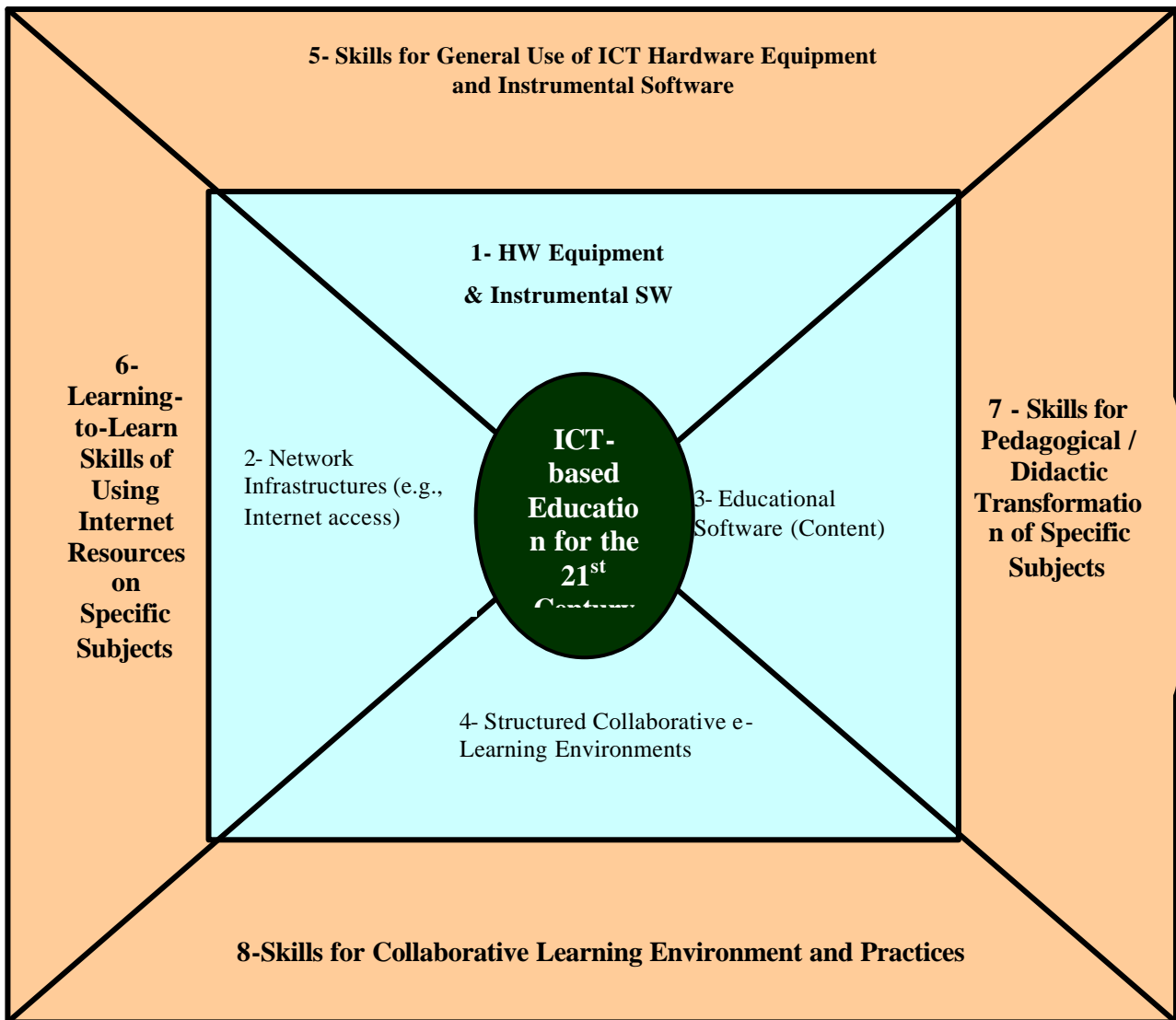
Figure 5. Basic Set of ICT-related Requirements for the Realization of 21st Century Education

And, in more advanced cases, the presence of structured collaborative e-learning environments, which integrate all the ingredients above, and more (e.g., virtual forums, chat rooms for real-time conferencing, groupware for group interaction and collaboration, etc.), into an ensemble of functionalities that reflect and understanding of learning processes and enabling the implementation of both courses in targeted areas and collaborative educational work between two or more individuals. Also included at this inner level is the requirement for servicing, maintenance, and development of these ICTs. In turn, the outer rectangle highlights the requirement for various skills necessary to realize the educational potential of the ICT-based ingredients into the educational concepts for the 21st century. Also included at this skills level is a research and training capacity to maintain the ICT-based educational/pedagogical skills at the leading edge. Structured collaborative e-learning environments will require skills not only to maintain the environment but also to moderate and manage the evolution of the learning processes, including the respect for the specific *netiquette* adopted for the virtual interactions.

For schools travelling the journey of ICT-based educational innovation, the set of ingredients of the double-rectangle of "ICT-based education for the 21st century" provides a reference to contrast the progress and state of development of their innovation processes. Where does the school stand in relation to each one of the dimensions? What has been achieved?

3.4 Holistic Synthesis of Ingredients of ICT-based 21st Century Learning Environment

This section goes beyond the technology and associated skills requirements just described. It makes an effort to synthesise into a more holistic instrument the main ingredients associated with 21st century education identified during the brief discussions of previous sections. They can be broadly grouped into a matrix with the headings of *multiple intelligences*, *didactic attitudes*, *subject-specific knowledge*, *life skills* and *ICT-based knowledge and skills*.

Table 2 illustrates the resulting matrix that, it should be noted, has no intention of being exhaustive. *ICT-based knowledge and skills* is placed horizontally precisely because of its transversal influence on the development of *didactic*, *knowledge* and *life-skills* flows. Looking at the entire matrix, it can be proposed that the key to the success of the educational challenge of the 21st century lies in the generation of learning environments with governances, processes, mechanisms, activities and assessment approaches that stimulate a harmonious integration of all four sets of learning flows with the demands emerging from learners' specific combinations of multiple intelligences. That is, ideally, the educational system should be able to match the learners' specific combination of multiple intelligences with specific combinations of knowledge, life-skills and ICT-based skills flows. If this is accepted, Table 2 should be also useful to think and construct instruments for the evaluation of progress of mass-customized education.

Table 2. Towards Mass Customization of Education - Multiple Intelligences and Learning Flows in 21st Century Education			
Multiple Intelligences[37] *(Students & Teachers)*	**Didactic Flows** *(can all be integrated)*	**Knowledge Flows** *(can all be assessed)*	**Life-Skills Flows** *(can all be assessed)*

-Verbal-
  Linguistic
-Mathematical-
  Logical
- Musical
-Visual-Spatial
-Bodily-
  Kinesthetic
-Interpersonal
-Naturalist
-Existential
	-curiosity and creativity
	-motivation to learn
	-fun to learn (ludic)
	-participation, responsibility
	  and discipline in tasks
	-team and shared learning
	-scientific honesty
	-fair competition
	-integration with community
	-focus and concentration
	-inclusion
	-etc.
		Variety of subjects
		-English
		-literature & philosophy
		-mathematics
		-science
		-other languages
		-civics
		-history & geography
		-arts
		-government
		-economics
		-etc.
			-initiative / leadership
			-communication
			-creativity
			-problem solving
			-mnemonics
			-team-building
			-communicating across
			  languages
			-research (including
			internet)
			-ICT-based collaborative
			work
			-ludic skills
			etc.

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[37] See Gardner (1983, 1999).

	ICT-based knowledge and skills flows for:
	?? general use of ICT equipment
	?? learning-to-learn using Internet and other research resources on specific subjects
	?? participating in collaborative learning environment and practices
	?? preparing, processing, presenting, and communicating knowledge and work on specific subjects

The preceding discussion leads us to introduce an understanding of the nature of innovation processes through the particular conceptual framework "sociotechnical constituencies" and associated "diamond of alignment." This conceptual instrument, along with the synthesis of Table 2, will facilitate the systematic analysis of the particular ICT-based educational innovation process of "Education Online.".

3.3 Ingredients of ICT-based 21st Century Learning Environment and Stockholm's Educational System.

This section briefly looks at the Stockholm's educational system against the framework of "21st century education" ingredients provided by Figure 5 and Table 2.

First, we have seen that Stockholm educational system makes available a first class infrastructure of connectivity to all schools as well as equipment budgets that have resulted in a high ratio of computer/students. In addition, the system provides a support structure rich in competence centres, training and educational content - within a governance of incentives rather than compulsion. Looking at Figure 5, this means that most of the dimensions of the inner diamond (i.e., ICT Equipment, Network Infrastructures, Educational Software Content, and Structured Collaborative e-Learning Environment) are largely in place in Stockholm. The development of the latter two dimensions however is still at early stages, with "cross-school collaborative e-learning environments" as probably the least developed part.

Logically, this situation has a close connection with the "skills' dimensions of the outer diamond of Figure 5. Thus, it seems clear that "Skills for General Use of ICT Equipment" and "Learning-to-Learn Skills Using Internet Resources on Specific Subjects" are more diffused than the other two: "Skills for Pedagogical/Didactic Transformation of Specific Subjects" and "Skills for Collaborative Learning Environment and Practices." Indeed, there seems not to be widespread instances of "collaborative learning environment and practices" in Stockholm, while most of the development in "pedagogical/didactic transformation of specific subjects" seems still centralised at the level of Educational Services rather than inside schools.

Looking at Table 2, the evidence that emerges from the brief informal account of the presence of ICTs and approach taken by Thorildsplans Gymnasium gives indications of a incipient evolution towards "collaborative-personalization" of education. Indeed, elements of the various flows: didactic, life-skills and ICT-based knowledge and skills are presents, along with the traditional knowledge flows. So far, however, no evidence is apparent of efforts to link any of the flows: didactic, knowledge, life-skills and ICT-based knowledge and skills, to the individual characteristics of students as expressed by the concept of "multiple intelligences," contained in the column on the right hand side of Table 2. Yet without reference to the elements of this column and, above all, without rethinking the learning governance and structure of schools towards encouraging ICT-based "collaborative-personalization of education," it seems clear that any progress

towards the hugely challenging direction of "mass-customization" of education is likely to remain an *ad hoc* activity.

The preceding discussion leads us to introduce an understanding of the nature of innovation processes through the particular conceptual framework "sociotechnical constituencies" and associated "diamond of alignment." This conceptual instrument, along with the synthesis of Table 2, will facilitate the systematic analysis of the particular ICT-based innovation process of Stockholm secondary school.

4 Conceptual Framework to Analyse ICT-based Innovation Processes in Schools - Sociotechnical Constituencies and Diamond of Alignment[38]

To facilitate understanding of processes of change, the set of Figures 6, 7, 8 and 9 give first (Figure 6) a simple representation of a school world in the context of other schools and technical, market, pedagogic, and educational policy trends. Figure 7 then illustrates the birth of an ICT-based educational innovation process inside a school, as represented by the small "ICT-based sociotechnical constituency (STC)" circle right in the middle of the figure. In this respect, the birth of an ICT-based innovation process is equivalent to the birth of an ICT-based sociotechnical constituency.
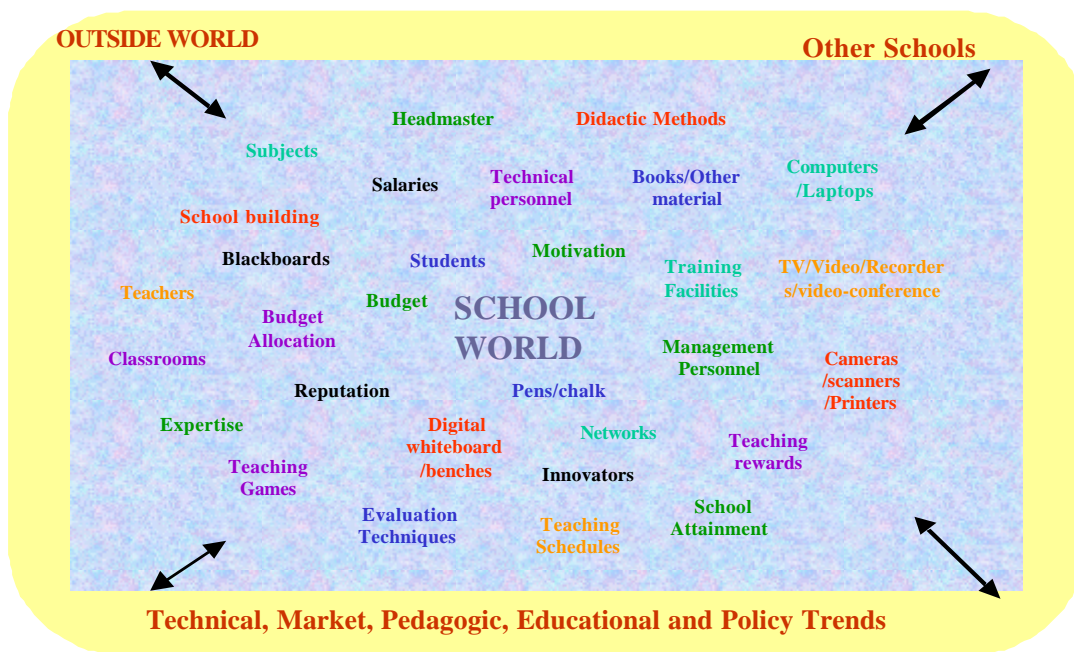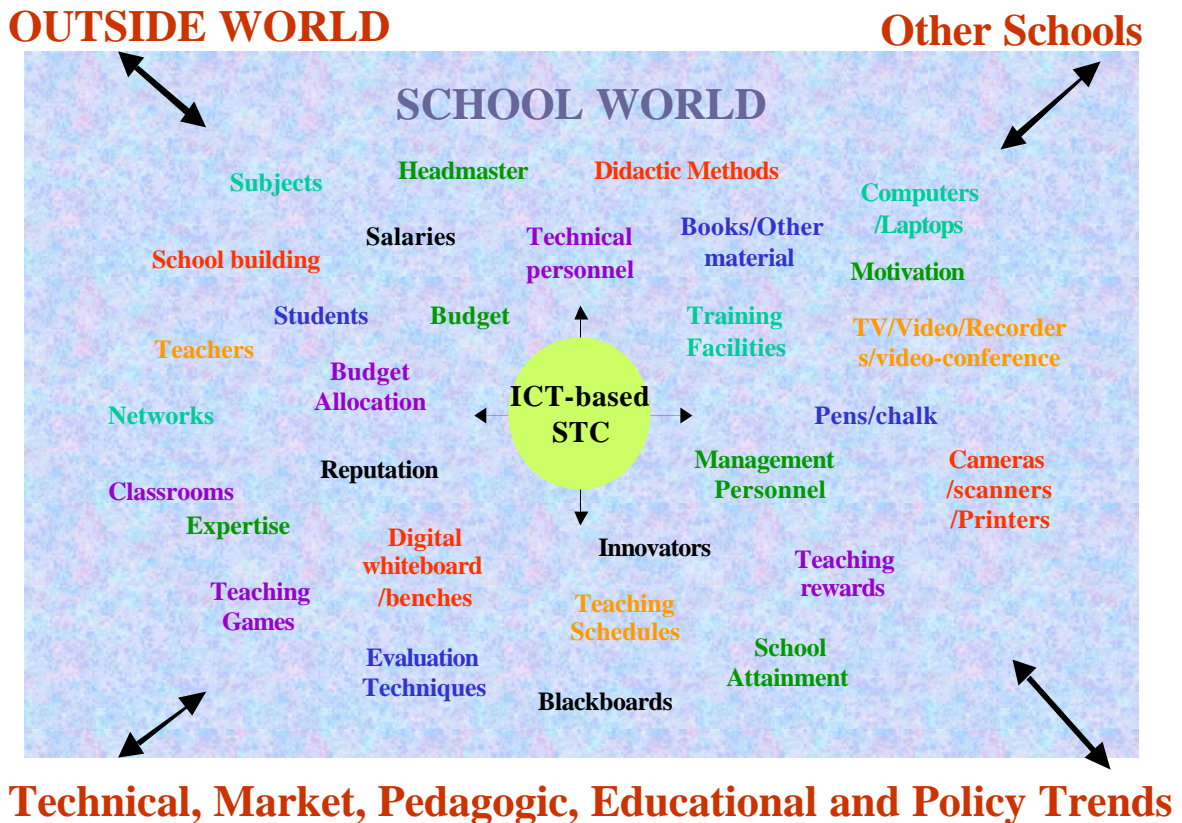

Figure 6. Simple Representation of a School World

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[38] The field of innovation and technology has a long tradition and many schools of thought going right back to the writing of Adam Smith, David Ricardo and Karl Marx. It includes work concerned with the determinants of success or failure of products in the market such as the classical SAPHO study of the 1970s, to the work of evolutionary economists and network approaches such as those from the sociology of technology, and also the work on communities of practice already mentioned in Section 3.2 of this paper. This paper does not seek to provide a review of the innovation literature to any extent. It takes the simple avenue of selecting and applying the process-oriented conceptual framework of "sociotechnical constituencies" to deal with the analysis of the evolution of Sint Amandus' experience. A selection of papers on this framework includes Molina (1990, 1997, 1999a, 1999b).

OUTSIDE WORLD   **Other Schools**

SCHOOL WORLD

Subjects   Headmaster   Didactic Methods   Computers /Laptops

Salaries   Technical personnel   Books/Other material   Motivation

School building

Students   Budget   Training Facilities   TV/Video/Recorders/video-conference

Teachers

Budget Allocation   **ICT-based STC**   Pens/chalk

Networks

Reputation   Management Personnel   Cameras /scanners /Printers

Classrooms

Expertise   Innovators

Digital whiteboard /benches   Teaching rewards

Teaching Games   Teaching Schedules

Evaluation Techniques   School Attainment

Blackboards

**Technical, Market, Pedagogic, Educational and Policy Trends**

Figure 7. Birth of an ICT-based Sociotechnical Constituency Inside a School

Indeed, this is fundamental postulate of the theoretical framework used in this paper, namely, all innovation and technological processes are in essence an integration of *social* and *technical* constituents. That is, they imply the construction of 'sociotechnical constituencies,' understood as dynamic ensembles of *technical constituents* (hardware, software, etc.) and *social constituents* (people, interest groups and their visions, values, etc.), which interact and shape each other in the course of the creation, production and diffusion of specific technologies.

Most importantly, the concept of "sociotechnical constituencies" emphasises the idea of interrelation and interaction in innovation and technological development. It makes it possible to think of technical constituents and social constituents but always stressing the point that in the technological process both kinds of constituents merge into each other. Sociotechnical constituencies are never static; they are always evolving and changing their mix in ways that are reflected in growth or decline. A manifestation of this change may be seen, for instance, in the spread adoption and implementation of ICTs in schools.

Within constituencies, players' interaction may be competitive, collaborative or a combination of both, and the extent to which any given technology such as ICT is diffused and successfully implemented is conditional upon the relative success or failure of the social constituents creating and promoting it. To an important extent the success or failure of the sociotechnical constituency will depend on the ability of the leading drivers

or constituency-builders to strike a balance between their individual interests and the development of the constituency as a whole. Figure 8 tries to illustrate the growth of an ICT-based constituency over time and Figure 9 illustrates a situation of success in which the ICT-based sociotechnical constituency (or ICT-based innovation process) has spread completely inside a school.
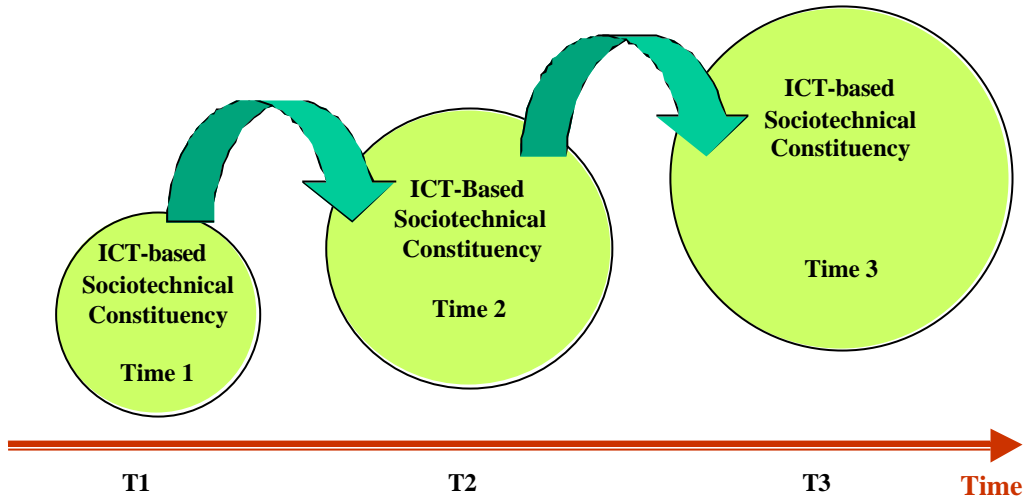
**Figure 8. Evolution of a Growing Constituency Over Time**
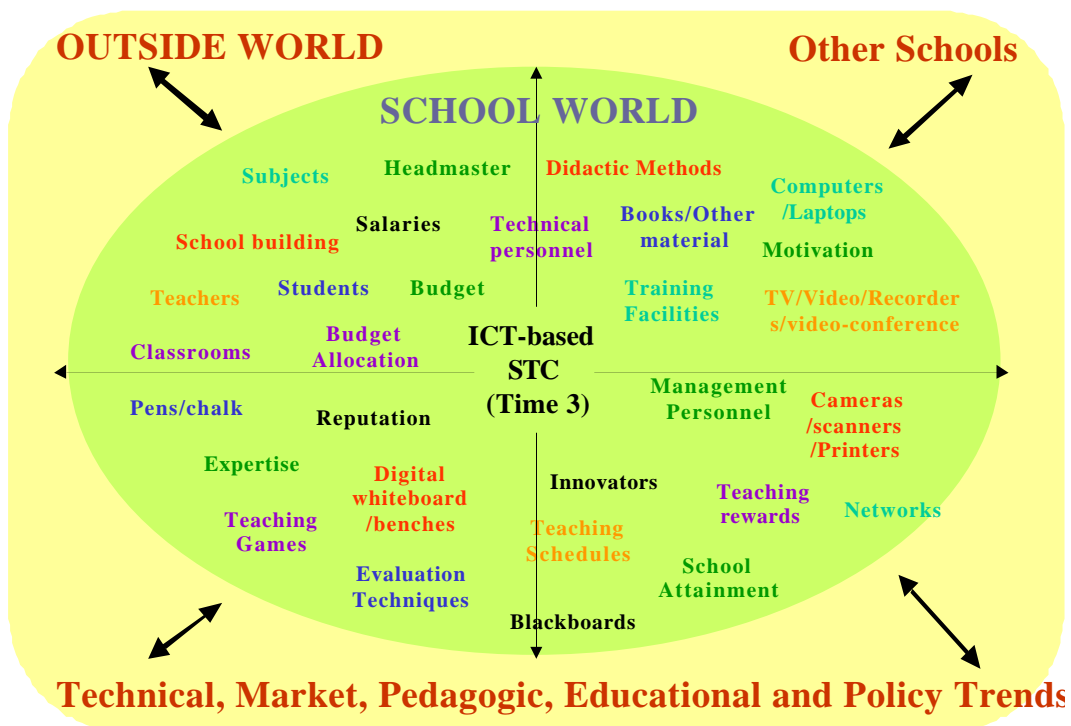
Figure 9. ICT-based Sociotechnical Constituency Spread to All School

Figure 10 provides a systematic (although static) picture of the richness and complexity of an ICT-based educational innovation process in a school. It overviews three levels of

intra-school elements the constituency must create and/or involve to be able to succeed in generating a harmonious and fruitful integration of flows of didactic attitudes, subject-specific knowledge, life skills and ICT-based knowledge and skills (see Table 2). These include the elements of the first inner circle " STC's Material, Financial, Space and Time Resources," the second middle circle "STC's People - Human Resources" and the third outer circle " Intra-school Environment, Organization and Governance." The coloured arrows radiating across the three circles represent the different flows of educational ingredients of 21st century education.

The entire process is highly challenging, and there is never a guarantee that these "intra-school elements" will be created and/or enrolled, or that they will be harmoniously integrated into an effective ICT-based innovation educational process or sociotechnical constituency. In practice, it is rare for a constituency to advance simultaneously unhindered across the whole front of aspects. For this reason, some constituencies will look patchy and partial at certain points in time, while others may never achieve full integration of elements, other will, and so on. The effort to achieve this integration is the essence of "sociotechnical alignment," the process whereby all sociotechnical constituencies are built - whether consciously or not.
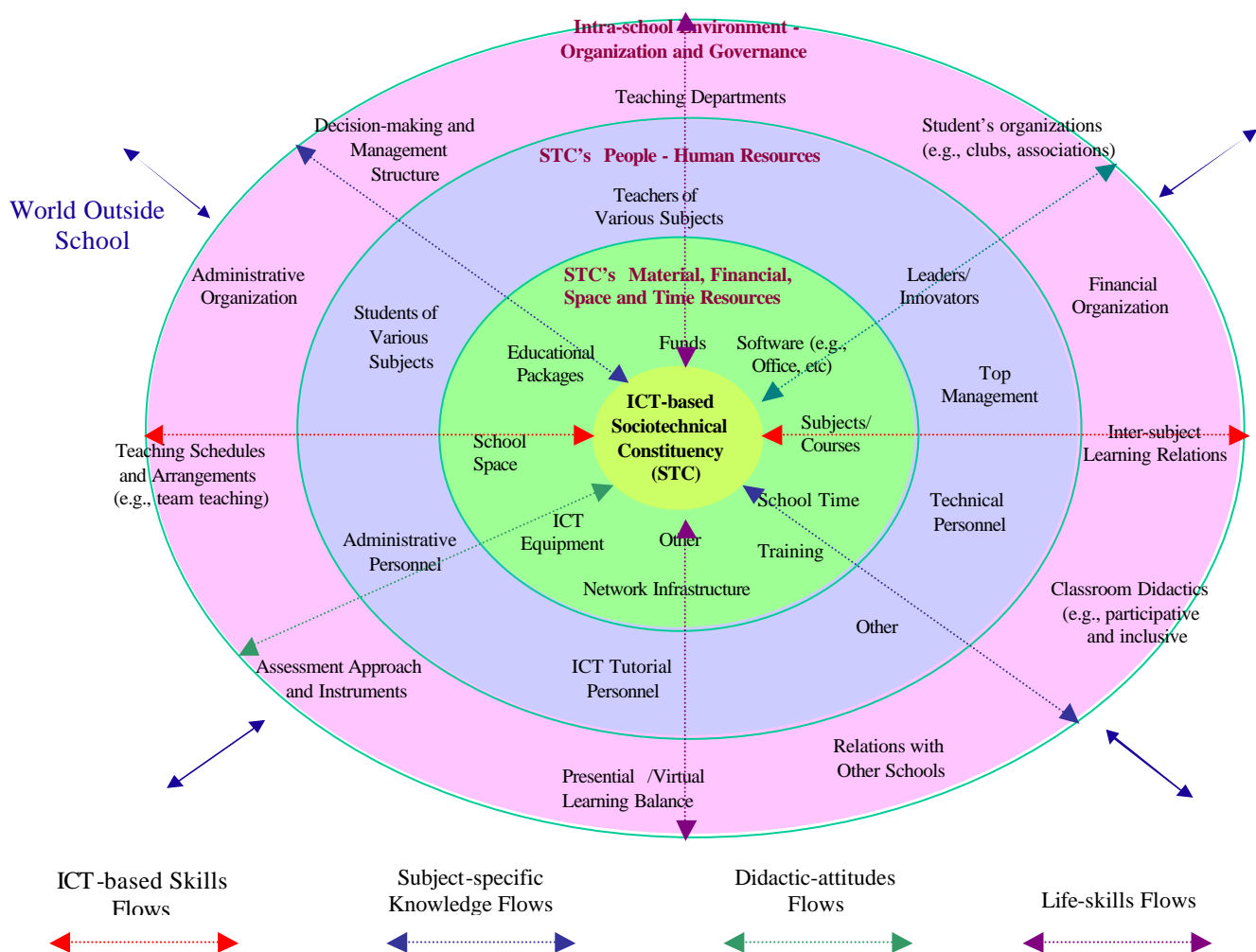
Figure 10. Full Overview of Intra-school Elements the Constituency Must Create and/or Involve, Including Educational Value Flows

4.1 Sociotechnical Alignment and the Diamond of Alignment

Having identified that innovation processes imply the build up of sociotechnical constituencies, the next question is: How are sociotechnical constituencies created? What processes are involved? How does a diverse range of interests, involving collaborating as well as competing organizations, evolve into a new capability such as an ICT-based education for 21st century skills? The answer to these deeper questions is found in the process of 'sociotechnical alignment' and its instrument the 'diamond of alignment.'

Sociotechnical alignment[39] is what social constituents <u>try to do</u> (however consciously, successfully, partially or imperfectly) when they are promoting the development of a specific innovation or technological capability (e.g., ICT-based education) either intra-organisationally, inter-organisationally, or even as a service standard.

'Sociotechnical alignment' may be seen as *the process of creation, adoption, accommodation (adaptation) and close or loose interaction (interrelation) of technical and social factors and actors which underlies the emergence and development of an identifiable constituency*. As such, alignment should neither be seen as a mere jigsaw-like accommodation of static available pieces nor as complete and permanent, once achieved. Instead, alignment accommodates the rich picture of competing influences and trends, across institutional settings and governance systems.
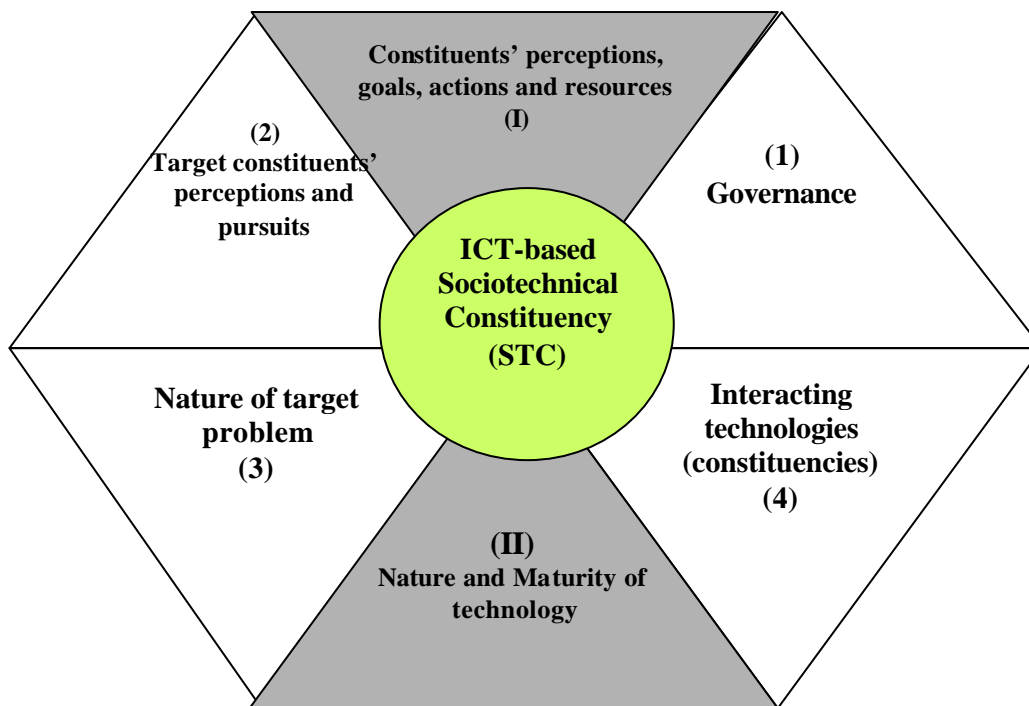
The 'diamond of alignment' is the conceptual tool enabling a structured analysis of processes of sociotechnical alignment in constituency-building. Above all, it enables a <u>dynamic analysis</u> of constituency-building processes, thus complementing and deepening the more static identification of a constituency's ingredients given in Figure 10. Figure 11 shows the basic diamond of alignment with its six fundamental dimensions, while Table 3 gives a description of the content of each of these dimensions. Dimensions I and II represent the constituency's state of development and nature/maturity of its technology. Whereas dimensions 1, 2, 3 and 4 contain key factors the constituency interacts with in its process of development. The nature of the interactions and alignments helps explain the dynamism, direction, achievements and potential for success of the constituency.

Each of the diamond's dimensions influence each other and, put simply, the entire set acts as an overall setting and guide to alignments between people-people, people-technology, technology-people and technology-technology. A successful constituency building process will be a virtuous cycle in which all types of alignment reinforce and strengthen each other. However, mis-(non)-alignments can reverse this process, creating a vicious cycle exacerbating internal and external conflicts and contradictions. Indeed, care must be taken that alignment in certain directions should not involve potential mis-alignments in others.

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[39] The term "alignment" is commonly found in the literature on implementation of information technology in the business organization. It usually refers to the process of 'matching' business and information systems strategies and, more generally, to deal with the mutual adaptation process involving incoming technologies and user organizations (Leonard-Barton, 1988). For strategic alignment, see Baets (1992) and Luftman *et al*. (1993).

Figure 11. Basic Diamond of Alignment

Table 3. The Content of the Dimensions of the Diamond of Alignment
(I) Constituents' Perceptions, Goals, Actions and Resources
This relates to the present state of the constituency's resources: the type of organisation, people, material and financial resources, knowledge, experience and reputation. It also includes other elements such as current perceptions, goals, visions and strategies.
(II) Nature and Maturity of the Technology
This dimension highlights the importance of the nature and maturity of a technology for its successful constituency-building process. Adopted strategies must align with the strategic opportunities and constraints implicit in the particular technologies. Thus emerging technologies such e-learning systems imply different requirements from other more mature educational technologies.
(1) Governance
This dimension highlights the importance of aligning the constituency-building process with the governance and strategic directions of the organisational and educational environments in which it is expected to flourish.
(2) Target Constituents' Perceptions and Pursuits
This dimension relates to the people and organisations the constituency is seeking to enrol. This includes the alignment of perceptions and goals between the innovating constituency itself and its target constituents in organisational and educational environments.
(3) Nature of Target Problem
This dimension highlights the importance of alignment between the capabilities of the emergent constituency and the requirements of successfully introducing new technologies and associated practices. This includes alignment between the technology and innovation and agreed technical and service trends and standards in the target area.
(4) Interacting Technologies/Constituencies
This dimension relates to the interaction a constituency has with other existing or emerging technologies. No constituency emerges in a vacuum. Other technologies, innovations, trends and standards may impact upon the constituency's innovation in both competitive and collaborative ways.

4.2   *Using the Diamond of Alignment*

The diamond of alignment can be used to capture the evolution on an innovation process, assessing the strengths and weaknesses (i.e., quality) of its alignments and, consequently, the effectiveness of the strategies pursued until then. It can also be used to research the history of the alignment processes since their origins, through questions related to Dimension I such as:

- ✍ Who is starting the constituency-building?
- ✍ What are the main reasons behind it? What perceptions have been most influential in prompting the constituency-building process?
- ✍ Is there an initial vision for the process? If so, what is it?
- ✍ Are there defined goals for the process? If so, what are they?
- ✍ Is there a defined strategy the constituency is pursuing? If so, what is it?
- ✍ Is the process following the steps or example of some other school or organizations?

At the same time, other questions will enable an assessment of progress of the constituency-building process, for instance:

- ✍ Is the original vision or objective on course or has it changed in time? If so, how?
- ✍ What are the present achievements? Do they match expectations?
- ✍ Are the technical aspects of the ICT-based innovation completed?
- ✍ Is the ICT-based innovation implemented across the organization?
- ✍ Has the process hit major problems, what are they?

In turn, each one of Dimensions 1, 2, 3 and 4 interacting with the constituency (Dimensions I and II) in the ICT-based innovation process enables the identification of a range of aspects with distinctive influence in the success of the alignment process. These aspects are listed in Table 4 and they can be used to focus the enquiry and assessment of the overall constituency-building process.

Table 4. Key 'Component' Sub-dimensions of Each One of Dimensions 1, 2, 3 and 4
Dimension 1 - Governance (School)
??   Flat decision-making structure
??   Rewards for ICT-based innovators
??   Encouragement to new didactics
??   Teachers' collaboration and teams
??   Assessment appropriate to new educational methods
??   Students' participation in learning
Dimension 2 - Target Constituents' Perceptions and Pursuits
??   Good prospects with target teachers
??   Good prospects with target students
??   Good prospects with Head of School
??   Good prospects with technical personnel
??   Good prospects with administrative personnel
??   Good prospects with senior management
Dimension 3 - Nature of Target Problem
??   Well inside expertise/ capabilities of constituency
??   Very important to school
??   Highly motivating to leaders/innovators
??   Very important to schools' teachers and students
??   Well inside space and time resources available
??   Well inside financial/material resources available

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┌─────────────────────────────────────────────────────────────────────────────┐
│ Dimension 4 - Interacting Technologies (Constituencies)                      │
│ ??  Easy technical integration between new and existing legacy system        │
│ ??  Easy with displacement of obsolete practices                            │
│ ??  High presence of required complementary technologies (e.g., electric network) │
│ ??  High presence of useful complementary technologies (e.g., content)      │
│ ??  Low opposition from competing ICT-based system                          │
│ ??  Effective mechanisms for socializing new mix of technologies            │
└─────────────────────────────────────────────────────────────────────────────┘
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Once an assessment is conducted, the format of Table 3 can be used to summarize the key aspects and issues characterizing the state of each one of the dimensions of the diamond of alignment. The overall result should generate a clear overview of the strengths and weaknesses of the different alignments implied in the process of constituency building. Such overview should be useful to assess or re-assess the quality of the strategies in operation in a given process of constituency building. Form instance, if all the dimensions of the diamond of alignment show a fundamentally harmonious relation to each other, then the conclusion is that the constituency-building strategy and its implementation are effective an sound at least up to that point in time.

On the other hand, if the dimensions of the diamond of alignment show a fundamentally dis-harmonious relation to each other, then the likelihood is that the constituency-building strategy being implemented is either wrong or, simply impossible in the circumstances. This should lead either to the revision of the strategy and its implementation in order to induce re-alignments or, in extreme circumstances, the whole revision and potential abandonment of the constituency-building process.

The paper now concentrates on the experience of the innovative Education Online project pioneering the path towards potential "collaborative personalization" of learning in Stockholm's secondary schools.

5   The Constituency-building Experience of Education Online's "Collaborative-Personalization" in Education

The Education Online project is the first of its kind in the Stockholm educational system. All the infrastructural, technical, content, training, etc, facilities put in place by the City of Stockholm over the past years have clearly given rise to a new environment with high "e-ducational capital"[40] to try new ideas to tackle old problems and/or exploit new opportunities - in short, an environment propitious for innovators to make their mark. One of the persons who emerged to do precisely this is Bo Lindström.

Bo Lindström is one of those educational innovators who works with schools from more socially deprived areas of the city, for instance, schools with high concentration of immigrants, many of them sons and daughters of refugees escaped from war atrocities and traumas that have mercilessly hit young innocent lives. Sweden has a tradition of haven against persecution, a tradition of opening the doors for a new life, including

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[40] The concept of "e-ducational capital" follows that of "social capital" commonly used to characterise the richness of facilities and opportunities of a particular place.

education,[41] to many who have found them closed in their own birthplaces. Many of the immigrant and refugee kids are at a disadvantage for the loss of leaving behind friends, families, languages, identities, etc. They have to face new worlds and find the ways and resources to integrate themselves and make a life in the new places. Stockholm offers a great deal of facilities for this to happen, but the task is daunting and kids must still contend with the fact that they are aliens trying to make it in a foreign country.[42]

Lindström saw early the new educational opportunities offered by new the technology and, indeed, has for long worked with computers. He has also seen with critical eyes the mismatch between the new possibilities and the prevailing ways in which education unfolds in most schools in Stockholm. He wants to do something to advance both: education and the wellbeing of kids who run a risk of finding themselves at the socio-economic borders of society, simply because they did not go through the "best" doors in the educational system. This mission, however, demands the development of an entire new reality – a new reality blending innovatively a wide range of issues, factors and actors. These include new technologies, new didactical approaches, new kid's life-styles, immigrants' kids who need to integrate successfully in an ever more demanding society, schools with social problems and stigmas, teachers who may not wish to adopt new ICT-based practices, the governance of Stockholm's educational system, and so on.

As we shall see, Lindström's initial steps identified the opportunity to use new technology to "personalize" the learning of English language and, ultimately, make true the aspiration that: *"Education should be adapted to each pupil's circumstances and needs."* This would help immigrants and, indeed, any advanced student motivated and capable to take greater responsibility for their own education and learning.[43] It would also help less advanced students requiring greater teacher's attention in the traditional classroom by releasing his/her time and preoccupation from students taking greater responsibility for their own learning. It was also clear to Lindström that the approach would be applicable to any subject where the appropriate conditions existed.

One of the schools to benefit was to be Rågsved lower secondary, Lindström's own school. It has 70% immigrant student population and, a few years ago it had attracted a great deal of bad press as a result of some (drug and violence) incidents. Rågsved badly needed to break a damaging 'vicious circle' of image and events that could lead to an entrenched culture of low achievement, and consequent stigmatization giving students an unfair handicap so early in life. As we shall see, schools like Rågsved have clearly benefited from the Education Online project and they are clearly thankful of Lindström

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[41] "The school has the important task of imparting, instilling and forming in pupils those fundamental values on which our society is based. The inviolability of human life, individual freedom and integrity, the equal value of all people, equality between women and men and solidarity with the weak and vulnerable are all values that the school should represent and impart. In accordance with the ethics borne by Christian tradition and Western humanism, this is achieved by fostering in the individual a sense of justice, generosity of spirit, tolerance and responsibility." (Ministry of Education and Science in Sweden and National Agency for Education, 2001, p.5)

[42] "They can't read Swedish if they are immigrants and they attend Chemistry. What's the point of that? They only learn how to fail." (Interview with Bo Lindstrom, leader of Education Online Project and teacher at Rågsved LS school, May 2004)

[43] "[The school] should also provide pupils with the opportunities for taking initiatives and responsibility as well as creating the preconditions for developing their ability to work independently and solve problems." (Ministry of Education and Science in Sweden and National Agency for Education, 2001, p.7).

for having persevered and succeeded in starting the project sometimes in the face of difficulties.

> Bo Lindström who started this project is a teacher with many new ideas, and he also has the courage to make them come true, which isn´t all that easy, because he has been in disfavour with some people. I´m grateful and so are my pupils that he never gave up this project.[44]

5.1 The Vision and Full Potential of Education Online Project

To understand the magnitude of both the potential educational transformation implied by the Education Online project and the complexity of the issues and challenges involved in making it happen, this section places the entire Education Online process and challenge in the perspective of its full vision. This also helps provide an idea of its progress and how much is yet to be achieved.

Figure 12 gives an idea of the new educational reality implied in the vision of Education Online. The example uses the case of English language and considers four lower secondary schools (LSS) and two upper secondary schools (USS). It shows that Education Online now opens the opportunity to do online the upper secondary English courses, while assuming normal sequential progression in all other subjects, that is, the relation of students joining the Education Online course to their own schools remain unaltered for all other educational purposes. In practice, they only replace their traditional English classes for an online programme more in accord with their levels, working on their own time, from a place of their choice. This could be from a computer at school, at home, or any other place of access. Apart from this, they have to take the same exams as their classmates and, if successful, progress to the next level in the subject.

By freeing potential students from the temporal and spatial attachment to their physical schools, however, the possibility of "collaborative personalization" of education becomes possible. For instance, highly advanced students of English, say at 9th grade, or 8th grade or even 7th grade of lower secondary need not wait before moving to A-level or B-level or even C-level of upper secondary, if this is their appropriate level.

In the example of Figure 12 advanced student/s from different lower secondary schools - 9th grade of LS1, 8th grade of LS2 and 9th grade of LS3 - have taken the online A-level course, while the advanced student/s from 9th grade of LS4 have taken the online B-level course. The result following the completion of the year is illustrated on the right hand side of Figure 12. The student/s from 9th grade LS1 and LS3 choose and move to US1 where they should connect with the B-level course of English as well as continuing to have the choice of doing this B-level course through Education Online. The student/s from LS2 follow a different track since the starting point was 8th grade. In fact on completion of the year, they progress to 9th grade in all other subjects while in English they can progress to the B-level course making use of Education Online. Only the year after, these students select and move to US2 where they should connect with the C-level English course as well as continuing to have the choice of doing it through Education Online.

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[44] Interview with Annette Malsmten, English teacher at Rågsved lower secondary school, March 2003.

Finally, the 9th grade student/s from LS4 started at the more advanced B-level course so as they complete the year, they select and move to US2 and should connect immediately with the C-level course both at US2 and Education Online. In this way, any student/s at any level of lower secondary should eventually be able to do any appropriate level of upper secondary. Indeed, a very advanced student, say from 7th grade lower secondary, may complete all A, B and C upper secondary levels before moving to the upper secondary school, thus never doing the subject at upper secondary at all.
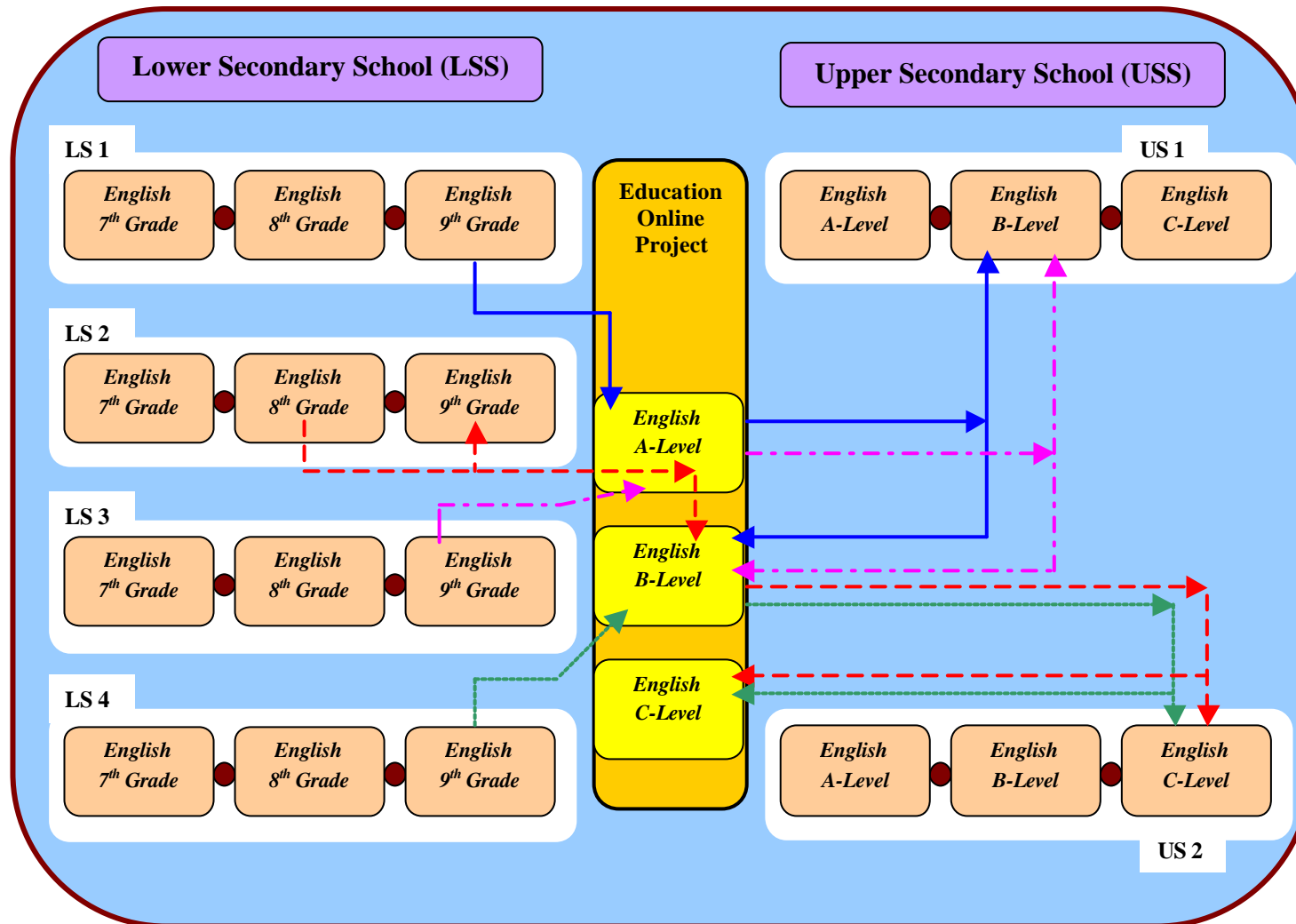
Figure 12. New Educational Reality Promoted by Education Online Project with Reference to the Case of English Language in Lower and Upper Secondary School

Two points are important to stress in the vision of Education Online educational innovation. First the Education Online Project is not intended to replace the traditional classroom. Second, Education Online is not intended to benefit advanced students only. Far from it, the Education Online course is in fact intended to improve the performance of the traditional class and less advanced students. It does so by releasing the teacher from the demands of students whose knowledge and abilities are such that they would perform much better in environments of self-responsibility and greater challenges. Such steps enable the teacher to concentrate on the students who need most tuition, thus increasing the "personalization' of learning in the traditional class as well. As we shall see, an added benefit reported for the traditional class is that the absence of the very advanced students -who before tended to dominate the class- allows the other students to grow in confidence and performance, with better results for everybody. In sum, the Education Online course and the traditional class are complementary aspects in a single process of general improvement of attainment of students.

Last but not least, the vision of Education Online has an economic dimension of sustainability in the sense that its realization does not demand major new investments on the part of the educational authorities. As we shall see, the investments have been modest, especially as contrasted with the huge investments in infrastructure and equipment and, also, as one takes into account that at early stages the development of content (e.g., English) and improvements of the online platform tend to demand use of larger resources. In time, as the content of the facility grows in richness, these costs are likely to be absorbed within the normal costs of teaching activities.

Regarding costs per student, Lindström has given careful thought to the economic argument in the knowledge that substantial additional costs would undermine the case for investment. The argument goes as follows. The online course receives 5,000 SEK per student per subject annually. This is about the same cost per student per subject at upper secondary school. This means that the cost of the online course to the educational system remain largely neutral, although an up-front investment of 5,000 SEK is required while Education Online students are still at lower secondary. As these students move to upper secondary, however, they carry with them a saving of 5,000 SEK since they need not repeat the course and can move to the next level. In other words, a student who takes the online course is apparently creating an additional cost of 5,000 SEK but, in practice, is also saving a cost of 5,000 to the traditional upper secondary class. To set the entire process in motion, therefore, the authorities must be prepared to make the up-front investment of 5,000 SEK per online student while at lower secondary school.

These are some of the potential gains opened by the Education Online experience. Ultimately, it is really opening an important avenue towards the realization of 21st century education in the specific context of Stockholm and Sweden.

5.2 The Start and First Two-year Development Phase of the Education Online Project

Bo Lindström remembers that the origins of the project go back to June 2000, to a student, Karin Söderstrom, from his own Rågsved lower secondary school. Karin had done the 8th grade of English and had achieved the highest level in the class.[45] Lindström asked the girl "why do you want to stay at this course?"[46] At first Karin thought she was not wanted but, then, she realized that what Lindström actually meant was that her English level was already beyond the 9th grade course. Lindström consulted with other teachers and they all concurred with this assessment, so he begun to look for a solution. Eventually, Karin skipped 9th grade and, in January 2001, she started upper secondary and did the entire first year's A-level English course in four months.

Following the experience, Lindström recalls: "Her former classmates asked me jealously, "Why only her. What about us?". I agreed with them. This was a waste of time and resources."[47] Furthermore, was it not the case that the regulations stated that *Education should be adapted to each pupil's circumstances and needs.* "Thus, I started to look for something that could give them what they wanted, and it was in investigating that, that I found the English course and started to build the organisation that was to become the Online Education project."[48] In practice, Lindström had started a process of constituency-building that would engage him for several years of his life, leading to the birth of an innovative ICT-based process of "collaborative-personalization" of education in Stockholm. Soon he would learn that he would need the alignment of various target constituents to succeed, amongst them:

?? students willing to step out of the traditional course approach to enjoy more the studies and achieve better results and,
?? teachers willing to join the new course out of stimulus to learn some new teaching way and in exchange for a small payment for the extra hours they would have to spend since they would still have to work on their traditional courses,
?? teachers from traditional courses willing to release their most advanced students in the classroom and see the implications,
?? headmasters willing to give a try to the new ICT -based approach
?? access to an online language platform, connectivity and computers for the students
?? educational authorities willing to support the start of the project, providing necessary financial resources and authority

As he took his very first constituency-building steps, Lindström found the online platform for English made available by Stockholm's central educational services. Lindström had experience with computers so he saw the path forward. However, the

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[45] "Karin Söderström was my pupil in social studies, history, religion, geography and Swedish. She had reached the highest or was close to the highest level in every subject! Not just in English. She left secondary school after one term in the 9th grade and began study in an upper secondary school. There she managed to do the first year in one term. So she was even with her classmates when beginning the second year. This was big news in the Swedish newspapers "Karin, to clever for school", was one head-line." (Personal communication with Bo Lindström, leader of leader of Education Online Project and teacher at Rågsved LS school, June 2004)

[46] Interview with Bo Lindstrom, leader of Education Online Project and teacher at Rågsved LS school, May 2004.

[47] Personal communication with Bo Lindström, leader of leader of Education Online Project and teacher at Rågsved LS school, June 2004.

[48] Ibid.

English content in the platform was not very good. Then he met Annelie Rydell from the adult upper secondary school, Åso Komvux. She had made an online course for English. Lindström contacted her and in March 2001 they began a pilot course with 5 pupils from different 9th grade classes from Rågsved lower secondary school. Eventually one student dropped out and four completed the course in June 2001 - a period of three months. To run the pilot, Lindström had managed to raise 20,000 SEK (Swedish Krones) - approximately Eur 2,200 - from the Stockholm's former Comprehensive School Department then headed by Monica A-son Gustavsson. This allowed him to pay for Rydell's time and that of one tutor from Rågsved school. Lindström also obtained a release and re-allocation of some of his own time to dedicate to the project. The low investment required to start the pilot is worth noting since it is the pay off for the high investment in educational ICT infrastructure made by Stockholm over the years. Such investment has positioned the City in a leading position to advance towards the realization of 21st century educational concepts, as will be shown below by the results of the Education Online experience.

The pilot was successful, so the next step was to seek to try the online approach with the A-level English course normally given at first-year upper secondary schools. In this way, advanced students from lower secondary school, such as Karin Söderstrom, could have the option of progressing through the secondary school system in accordance with their level and pace.

This implied finding an upper secondary with Headmaster and teachers willing to play. The teachers of upper secondary are the only ones allowed to teach A-level, B-level and C-level courses. In addition, Lindström had to find further financial resources for a more extensive project and, also, to release himself from teaching and be able to work on the development of the project. It was not easy:

> First I contacted Kersti Hjertkvist at IT Centre. I presented my ideas to her. She wanted me to work for her but in the end she thought I was too expensive. I asked for 1800 SEK above my teacher salary. Wiwi Ahlberg at another center SEC employed me instead. Now I had 50% with her and was able to work with co-operation and integration between comprehensive and upper secondary school, part time. The other half was provided by Per Engbach, Head of upper secondary department.[49]

The Education Department's IT Centre asked Lindström to write the specification and submit the application for funding at the ratio of 100,OOO SEK (approximately Eur 11,000) per every group of 20 students per course. In the end, the IT Centre did not support the project financially and the "support came from The Stockholm Education Administration, upper secondary school department - in other words, from Per Engbach."[50]

At the same time, Per Engbach, Head of Upper Secondary Schools at the Stockholm Education Administration, suggested Farsta upper secondary school as the possible place to set up the project. Indeed, Farsta's Headmaster Lennart Walles "was from the first moment very interested. He said: let's do it."[51] Most importantly, at Farsta upper

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[49] Personal communication with Bo Lindström, leader of Education Online Project and teacher at Rågsved LS school, June 2004.

[50] Ibid.

[51] Interview with Bo Lindström, leader of Education Online Project and teacher at Rågsved LS school, May 2004.

secondary, Lindström met two English teachers enthusiastic and willing to devote extra hours to be part of an innovative online course, Göran Södervall and Margareta Bergholtz. Thus, "we teachers were curious to learn some new teaching way."[52]

The Education Online project started in November 2001 as an online option for A-Level English and also Mathematics, with Lindström working half-time in the project and half-time in other projects. Eventually 27 students did the A-level English course and 10 of them also did Mathematics, although it is considered that the latter did not really use the online platform very much. The initial funding was for six months, then another six months, and then one year always depending on the positive evaluation of reports Lindström had to submit, often under a great deal of pressure. The overall budget raised by Lindström for the first year amounted to 500,000 SEK (around Eur 55,000). This budget covered the payments for Lindström's and other teachers' salaries, items such as books and the costs of developments of the ICT platform.

It is interesting to stop briefly in the experience of Mathematics because it is revealing of the fragility of ICT-based innovative efforts at these early stages implementation of new technologies to transform pedagogical practices. The main problem, according to Lindström was that "the ICT platform in Math was very low level, not designed for this kind of pupil … [and] …The teacher who have said he was very interested said: I don't give a damn about computers - but it was too late."[53] So, in Math, the students did not use the computers very much and the teachers preferred to meet the students following traditional practice. Lindström adds that: 'Now they have reached the level of using the computers but it took them three years. Before they were not using a platform at all."[54]

At the time of the first course, however, Lindström came under fire because the "authorities were saying Math was not online - and this put pressure." They asked Lindström to improve it but, in reality, Lindström could only improve the framework because it was the teachers themselves who had to develop the content in accordance with their pedagogical visions. In this respect, the material in the platform was "only a framework for you to develop. Each teacher was supposed to introduce his own material - that was the thinking from the beginning."[55]

Turning to the A-level English course given by Education Online, the students targeted for the option were the most advanced students from 9th grade lower secondary schools who were ready to shift to upper secondary level. These students were now invited to "come together" to participate in the new "supra" A-level course run online by pioneering Farsta upper secondary teachers. They would now have to work online to pass the exams of the A-Level English course and, ideally - if we consider the full vision depicted in Figure 12 - move forward into the B-Level English course of second year of upper secondary and so on. Formally, these students would be in no way integrated to Farsta upper secondary school. They remained students in their original schools, taking their exams together with all other students from their traditional classes.

In practice, a good number of 'volunteers' came forward from different lower secondary schools, who thought they would satisfy and be able to work under the new more

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[52] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.
[53] Ibid.
[54] Ibid.
[55] Ibid.

autonomous conditions involving physical and virtual activities with a great deal of self-responsibility for achieving results. Figure 13 (bottom) illustrates the intake of lower secondary students for the first ever Education Online course run in 2001-2002. As indicated, a total of 27 pupils joined and completed the course, although initially over 50 pupils had joined the list with the intention to run it but dropped out after fully understanding the nature and demands of the new didactics and work responsibilities. In the new approach they were much more empowered, given self-responsibility, obliged to make use of ICT-based collaborative work environment for peer-collaboration, and provided with systematic tutorial and teaching support when necessary. In short, the key to the success of the experience was to be the self-drive and self-discipline of the students themselves and, clearly, from the amount of students dropping out in the first Education Online's A-level course, not all students felt comfortable with the new approach.

Figure 13 shows that the first 27 students who eventually completed the A-level English course came from four lower secondary schools: Rågsvedsskolan, Hagsätraskolan, Kvickenstorpsskolan and Hökarängsskolan. It also shows that the Education Online Project suffered from an unequal alignment regarding, on the one side, lower secondary schools and, on the other, upper secondary schools.
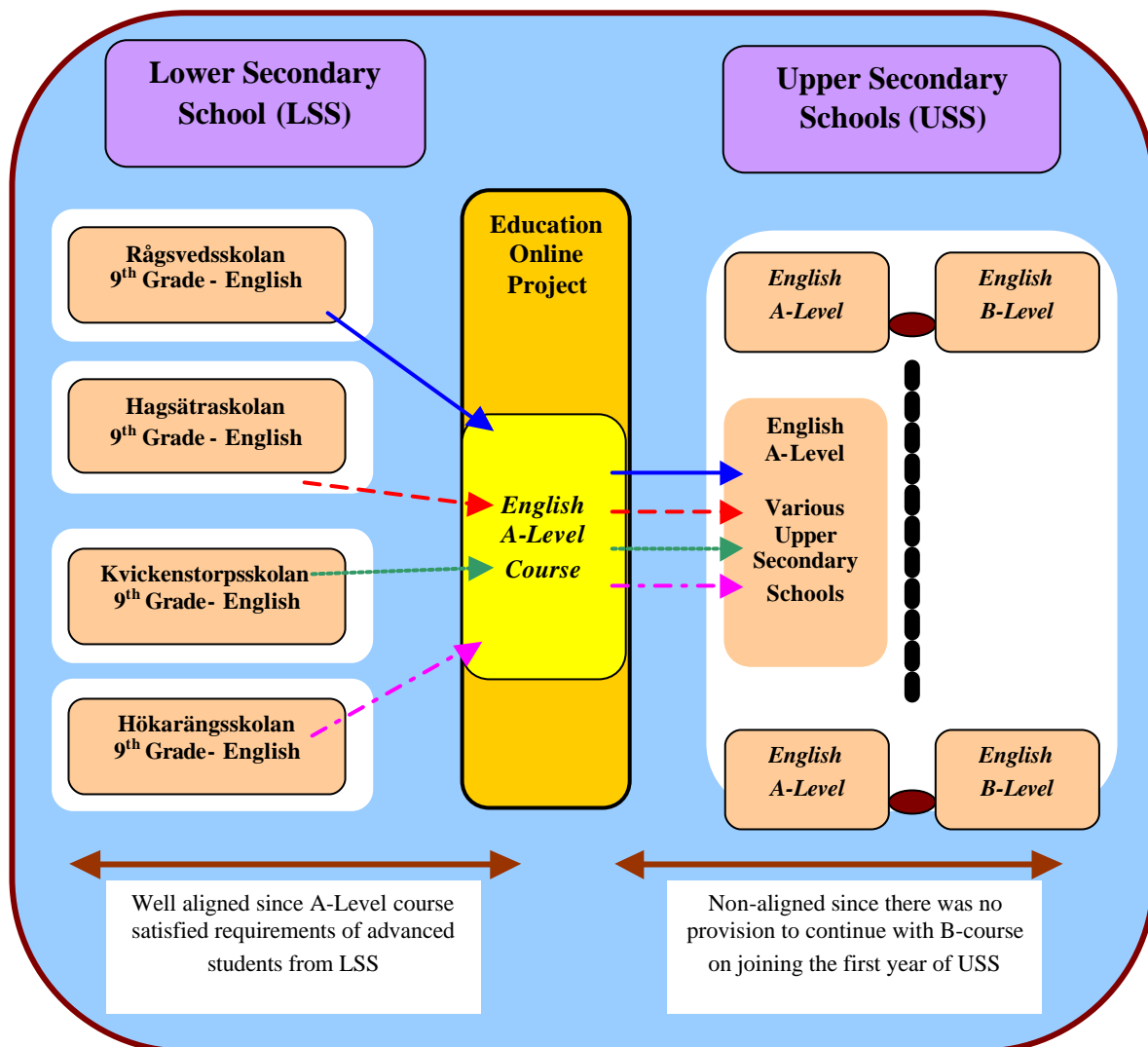
Figure 13. First Ever "Education Online" Course Attracted 27 Third-year Pupils from 4 Lower Secondary Schools

Indeed, the experience was well aligned with the LSS side since the online A-Level course satisfied the requirements of the advanced students at 9h grade LSS. At this early stage, however, it seems that little thought was given to the problem generated by the next step. That is, *if students successfully completed the Education Online A-level course and passed the exams, how would they continue their development as they moved to upper secondary school.* The upper part of Figure 13 illustrates what actually happened to the students of Education Online class 2002 as they moved to the upper secondary schools of their choice. They found themselves without a path to enrol at a B-level English course either at Education Online project or at the upper secondary school. In practice, these students faced a variety of situations, as illustrated by the comments of some of them contained in Table 5.

Table 5. Situation Faced by Students after Completing English Education Online Course
Students from Education Online Class 2002. Variety of situations encountered as they moved from the over to Upper Secondary level and different schools
"I hadn't the opportunity to continue with the course because we're now in a school in a different municipality not far from here. So I'm now repeating the course." *(Sebastian Tabrizzi, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary)*
"I talked to the teacher because I wanted to increase the speed of my personal learning but I had not the opportunity to do that, I wanted to do the next course as well at the same time and then I lost my motivation for the first course." *(Sebastian Tabrizzi, ibid.)*
"This year I'm not doing any English lesson. I'm supposed to do it next year. But now I'm losing all what I have learned last year when I was in secondary" *(Ulrika Isberg, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary school)*
"We are now in the international school, so every subject is *English for us." (Selma Dedic, Education Online Class 2002 when at 9th grade Rågsved lower secondary school)*
Students from Education Online Class 2003 from 8th and 9th Grade at Rågsved Upper Secondary School
"The school for which I have applied will give me the opportunity to follow the B course without repeating the A course." *(Anita Gasal, 9th grade Rågsved lower secondary school*)
"I have applied for a conservative school (old fashioned), and they are not so fond of the A course idea because they want to preserve their way of teaching, so I'm not sure they will give me the same opportunity." *(Mikael Jatta, 9th grade Rågsved lower secondary school)*
"I chose Kärrtorp [upper secondary] school…. [I would like to have the opportunity to continue]…"If you do not continue you will forget all what you have learned before." *(Nenne Jallow, 8th grade Rågsved lower secondary school)*

Source. Interviews with students from Education Online Course, English Class. March 2003

There might be various reasons why the students taking the Education Online course at the A-level did not find an open path to continue with the "collaborative personalized" approach. The immediate reasons are straightforward. On the one hand, the upper secondary schools the students moved to were not enrolled to play in the online scheme.

On the other hand, although "The B-level course did exist on the platform. We weren´t yet allowed to use it and provide the course within the project."[56]

It is true that, as Goran Södervall points out, he is only responsible for the Education Online activity, while at any upper secondary school, English teachers are the ultimate responsible for the student and, therefore, have the final word about a student taking the Education Online course. And it might well be that in some cases teachers do not wish to give students too much freedom because of the curriculum they need to follow. But, this was never tested since there was no online B-level course accessible and no real close contact between the Education Online innovators and teachers along the line from lower to upper secondary schools.

Ultimately, there is an issue of the constituency-building strategy selected and pursued by the Education Online educational innovators. How do you start and grow your sociotechnical constituency with the people and resources you have and you think you can align for development? In the case of Education Online, the strategic approach was first to make the online course work at one single level (A-level English), rather than taking a more holistic strategic approach that would have implied entering into a much more extensive range of negotiations with stakeholders in Stockholm educational system. In principle, the latter holistic strategy might look like the more appropriate. On the other hand, it would have required much more effort, time, initial funding and would have lacked a practical demonstration to point out in order to facilitate strategic conversations and alignments. It is difficult to say a priory what would have been the result of a broader strategic approach and whether it would have started the process at all. It is possible to say however that the more fragmentary approach implemented by the Education Online course did manage to start the experience with modest resources, although it did also result in an unsatisfactory dis-continuation for the first students when it came to the next level. In practice, the constituency-building process simply came across this problem once it made itself visible through the frustration of the students having completed the A-level course. Indeed, Lindström confirms that "the limit was the A course." And Södervall: "Of course you could do the B course but we were not prepared for it. When we started we were inexpert and unused to it."

Having consolidated the first step of the A-level course, however, the Education Online innovators did not intend to stay at this level. They were already preparing to advance further the content and constituency of Education Online. Thus,

> We have changed few things. In reality no one asked the same question to go on with the B course. But I think we have found a right way to work. … You have to organize a number of meetings as well to organize this activity. In reality last year we were not prepared for this further step. … Of course, we communicate with our students, and we know what the problems are and their needs…and we know that we need to change certain rules…and we are working to find solutions and better conditions for the activity to be done.[57]

The task will not be easy however. The constituency-building challenge to expand the Education Online course to the upper secondary school is quite considerable, given that there are deep governance issues involved. In Lindström's view:

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[56] Personal communication with Bo Lindström, leader of leader of Education Online Project and teacher at Rågsved LS school, June 2004. The B-course became accessible to the Education Online project in 2003, following Lindström's initiative and "then we received allowances both in English and maths." (ibid.)

[57] Interview with Göran Södervall, language teacher at Farsta upper secondary school, March 2003.

It demands a changing in the way of thinking of the upper secondary school for the organisation, because it sometimes happens that despite the willingness of students to go further and learn more, they have to face the opposition of the headmasters or teachers who have a conservative attitude.

Students in Stockholm are free to choose which secondary school to apply. If students want to apply for a popular upper secondary school they have to have a high score to enter, and these student have high scores. In this sense, their participation to the course gives them the opportunity to have high scores. But when they join the upper secondary there is not any diversification with the other students, so most of times they have to do again what they have already learnt during the course. And this is basically a problem related to the kind of organis ation that the upper secondary schools have.[58]

In this context, the precise communication of the objectives and benefits of the realization of the full vision of Education Online is crucial, particularly because of its deep implication for schools and eventually the entire educational system.

For instance, it might be argued that by selecting the most advanced students the "academic" success of the experiment was largely ensured. The "creaming off" of the best students from every class could also be seen as fomenting "elitism," it could also be hypothesised that the other students in the class would lose the benefit of the contributions by the most advanced students, etc. etc. All these are points to raise but the issue can only be settled on the basis of real evidence collected from real practice, and this evidence, as we shall see below, is firmly positive towards the educational benefits of Education Online. Of course, for educational innovators with strong social consciousness such a Bo Lindström, the separation of the most advanced students in a subject has nothing to do with "elitism." It is simply a means to the ultimate challenge. Namely, *how to make use of the opportunities of the new technology to find the best and most effective ways for all students to benefit from a "collaborative-personalization" that gives them a 21st century education (see Table 2 above) in accordance with their specific competencies (or "multiple intelligences").* The Education Online experience must be seen in this perspective, that is, setting in motion a pioneering effort to begin to understand and discover the best ways to progress towards the realization of 21st century education.

5.3   *Broad Assessment of the First Phase of Education Online Constituency-building Process*

At a certain level, the implications of Education Online's ICT-based innovation seem unproblematic and this may well be the case if the project remains small-scale. However, if the Education Online educational innovation is pursued in all its potential, the didactical opportunities, gains and challenges opened towards 21st century education are quite momentous. For instance, among the new relations required for the full operation of the virtual/physical "collaborative-personalization" would involve:

    ??   teachers with new ICT -based skills integrated to the courses
    ??   students with a preparation much closer to what is known as 21sy century education
    ??   new course governances with much greater collaborative-personalization and self-discipline
    ??   new relations between students with different abilities in specific subjects and between different
         subjects

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[58] Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school March 2003.

- ?? new uses of teachers' time devoted to students in the classroom
- ?? new governance for a consistent integration of virtual/physical courses in school's curricula so that schools may offer a coherent path to the flow of "personalized education" for all
- ?? new governances of assessment that make justice to the fuller educational development offered by the new ICT-based "collaborative-personalized" education involving a much richer combination of flows of didactic, knowledge, like-skills and ICT-based knowledge and skills.

Referring back at Figure 10, we see that elements of the three levels: (1) "STC's Material, Financial, Space and Time Resources," (2) "STC's People - Human Resources," and (3) "Intra-school Environment, Organization and Governance" are all clearly involved in the process.

Table 6 provides a brief assessment of the state of the different dimensions of the diamond of alignment of the Education Online of the constituency-building process at the time of the first A-level course delivered online.

Table 6. State of Alignment at the Start of Education Online's Constituency-building Process
(I) Constituents' Perceptions, Goals, Actions and Resources The process counted on an educational constituency-builder or innovator (Bo Lindström) with a commitment to see improvements in the educational system and particularly in the academic achievement of schools and students from less favourable backgrounds. It also counted with the support of authorities such as the Head of Upper Secondary Schools, Per Engbach, the Headmaster of Farsta upper secondary school, Lennart Walles, and a small number of teachers willing to try new ways of teaching and learning, particularly two teachers from Farsta secondary school, Göran Södervall and Margareta Bergholtz, and also Annelie Rydell from Åso Komvux. They were among the first to try the new online approach. The Stockholm Education Administration's upper secondary school department also supported with funding at the ratio of 100,000 SEK (approximately Eur 11,000) per every group of 20 students per course, subject (initially) to six-monthly review. Finally, the process also counted with a good number of students happy to change the traditional course for the new ICT-based "collaborative-personalized" approach.
(II) Nature and Maturity of the Technology Available network infrastructure and hardware were largely mature, of high capacity, and easily available through different access places: school, home, libraries, etc. The most experimental part of the entire system was the online learning platform applied to English language. Some educational software was available by the City's Educational Services but the content and structure of the Education Online English course had to be developed by teachers.
(1) Governance Initially, the Education Online process did not entail a major change in school governance since the traditional class continued very much the same, with the difference that teachers releasing the advanced students were now able to concentrate more time on a lower number of students in greater need of their attention. On the other hand, the new multi-school course certainly represents the emergence of a new governance of learning and, in this sense, a potentially massive change of educational governance in relation, for instance, to the progression from lower secondary school to upper secondary school. In this respect, the decentralised nature of school administration in the Stockholm educational system presents a significant challenge to the widespread adoption of the Education Online's "collaborative personalization" of learning. Yet, without an effective response to this challenge the potential benefits of the approach may not spread fully.
(2) Target Constituents' Perceptions and Pursuits Today, the target constituents of the Education Online project are all types of educational stakeholders, including teachers, school authorities, students, parents, City's educational authorities, etc. Since the Education Online project started has received funding for limited periods of six months or one year at the most one depending on positive evaluation, continuation will clearly demand the ability of least maintaining the flow of further financial resources for the constituency.
(3) Nature of Target Problem The immediate target has three aspects: (1) to demonstrate that e-learning can lead to improvements of educational performance of students who have the capacity and the motivation to learn faster and deeper, first, language and mathematics and, potentially, other subjects in the future. (2) To try a virtual/physical learning

environment that radically shifts the learning process from the traditional classroom approach to a "collaborative-personalization" of learning. (3) to demonstrate that this process leads to complementary improvements in the educational performance of less advanced students by increasing teachers' attention to their requirements. And (4) in the process, help students with less favourable social backgrounds to gain fully the advantages of 21st century education.

(4) Interacting Technologies/Constituencies

All the technologies necessary for the Education Online learning process are largely available in Stockholm's educational system: high connectivity, computers, educational content, learning platform, etc. However, their integration into an effective "collaborative-personalized" learning environment for A-level English, for instance, required further developments from teachers regarding both the structure and content of the online learning environment. On the other hand, an important proportion of the school environment in Stockholm is still dominated by the traditional approach to education: its skills, methods and technologies.

6 Detailed Characteristics, Governance and Evolution of the Education Online English Course

The definition and implementation of the pioneering Education Online course brought with it new organizational and didactic practices as well as new participation and performance requirements for students and teachers. This is reflected, among other aspects, in the type of students and teachers selected to carry the course forward and in the basic operation of the course.

6.1 Type of Students in the Education Online Course

The selection of students for the Education Online course applies strict criteria, as Lindström explains, the students "have to achieve excellence, they must be able to get responsible for their own learning. These are the criteria that the teacher should find."[59] They must also have parents' permission.

The strong students are identified through their own performance record and in conversation with their teachers. Overall, they must show motivation, high-level of performance in the traditional language course, familiarity with computers and independence (i.e., a good attitude to take responsibility for their own learning).

> They have to be able to shift from a situation (traditional school) where they are continuously followed by their teacher and they know that they can trust on her/him, to a situation (online course) where they are supposed to manage their learning on their own. This is very important too. They have to be independent. It is a growing process of the student.[60]

For instance, Fatima Guseinova and Nenne Jallow are two students from Rågsved lower secondary school, a school with a 70% concentration of students with immigrant background. At the time of our visit to Rågsved school, Fatima and Nenne were at 8th grade English and had been selected to do the Education Online course during 2003. They were clearly confident with the technology since "we have computers with internet connections. We use it for studying and rarely for playing." They were also very good at

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[59] Interview with Bo Lindstrom, leader of Education Online Project and teacher at Rågsved LS school, March 2003.

[60] Interview with Göran Södervall, English teacher at Farsta secondary school, March 2003. "On-Line English works very well but the students must be able to plan their own work. Responsibility is perhaps more important than actual intelligence in this case." (Interview with Annette Malsmten, English teacher at Rågsved LS school, March 2003).

language, something that had a lot to do with their immigrant background. Thus, Fatima's mother is Russian and they spoke Russian at home, and English at school. Whereas Nenne's mother is from Finland and father from Gambia, so "I speak Finnish with my mother, Swedish with my father and here at school I have the opportunity to learn and speak English."[61] Not surprisingly motivation to do the course was also very high. In the words of Fatima "I wish to speak English better. I want to reach a higher level … I think it [the course] is very good and I want to do it. I will learn much better and faster."[62] In turn, Nenne refers to the traditional course, saying

> sometimes it is too slow. The teachers keep explaining things that I already know and I feel like wasting time. Many weeks repeating the same things. If there is someone that does not understand she has to stop and explain better, but when she does that all the class have to stop. And then you get bored.[63]

Finally, Fatima's and Nenne's ability to work independently is emphatically confirmed by their English teacher. "She [Nenne] is responsible for what she is doing. I know that if she says that tomorrow "I will translate this and I will give it to you," I know that she will do it and I can trust her…and her grade will improve much more if she goes faster."[64]

Interestingly, thus far not all the students who have initially manifested the intention to follow the course have ended up by doing it. "I think that 50% of students found out that they were not qualified for the course and they dropped out. Normally students have one month to decide whether they want to stay or not. It is a trial period. After this month they stabilize. We normally don't have drops-out once the course has fully started."[65] Malsmten believes that the dropout students may have lacked a clear idea of the effort that the course required from them. Thus "to avoid drop-outs we will show the future students the platform and the kind of assignments that they will meet next year."[66]

6.2   Type of Teacher and Head of School in the Education Online Course

The two English teachers running the first Education Online course did not require any special course or development skills before starting it. They just plunged into using the online platform and content available from central services. Södervall recalls that he and Bergholtz "were very interested in trying this new concept. When we entered the platform we discovered a lot of things that could potentially improve our teaching." True, Södervall and Bergholtz had the key condition of a positive attitude towards computers and Internet. Thus,

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[61] Interview with Nenne Jallow, 8th grade English student at Rågsved lower secondary school, March 2003.

[62] Interview with Fatima Guseinova, 8th grade English student at Rågsved lower secondary school, March 2003.

[63] Interview with Nenne Jallow, 8th grade English student at Rågsved lower secondary school, March 2003. This is confirmed by their teacher who referring to Fatima explains: "for her, it [the traditional course] is boring because I have to explain things that she already knows. She is a good student. They learn English everywhere, not only in school. They learn easily." (Interview with Annette Malsmten, English teacher at Rågsved LS school, March 2003).

[64] Ibid.

[65] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

[66] Interview with Annette Malsmten, English teacher at Rågsved LS school, March 2003.

we were very interested and maybe more skilled in using computers than other of our colleagues who are more conservative and interested in the traditional way of teaching, where the teacher is the one who knows everything and he transfers his knowledge to the pupils. This is the reason why we started … At the moment not so many teachers are interested in the application of ICT to the didactics. In this work there has to be a little bit of courage.[67]

The positive attitude of the innovator teacher is only one side of the coin however. Also required is a positive attitude from the Head of School (schools authorities) and, indeed, from any other educator or party involved in one way or another in the success of the experience. In the case of the Education Online course, heads of schools have encouraged and backed the activities of the innovating teachers, thus amplifying the motivation to go ahead. In addition, this has helped both the spread of knowledge and a better attitude towards the project.

6.3   Basic Operation of the Education Online Course (English language)

The basic structure of the Education Online's English course was defined by the teachers taking into account the traditional course and, above all, the potential of the new online platform "for teaching online and see what happens when we are not having the students in the classrooms, how can we improve the ways of teaching and the students attainments."[68] These teachers could therefore compare the workings of the traditional and online environments and, indeed, combine elements of the two in the understanding that the students of the online course were among the best in the subject - English. The result was a course structure that combined activity in the online platform with physical lessons. Specifically, the course contains six face-to-face teacher-student meetings during which student are split into two groups of five six students each and a number of topics are discussed, with an assessment of the students' learning progress following after. In practice, there is no particular reason for the number of six physical meetings and teachers acknowledge that they could meet more frequently "but as teachers we are also interested in the development of the online concept as a teaching tool. We try to use online as much as possible."[69]

Apart from this the course has no other fixed parameters since there is awareness that the work involved must align with the work demands students have from all other subjects. Indeed, this alignment is essential to facilitate the acceptance of the course by students, since a perception of overload has been one of the causes of some students quitting the course. They say: "Yes, I'd like to do the course but I'm busy with the other subjects and I could not do both."[70]

6.4   Stockholm Online Platform and Didactic Innovations for English language

The online platform for English language made available by central services has evolved with the Education Online course. In particular, teachers found that the more personalized teacher-student interaction around the evolution of students' learning required them to improve the content and structure of the platform in order to respond to the evolving demands of students. Today, the Education Online students log in to enter

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[67] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.
[68] Ibid.
[69] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.
[70] Ibid.

the platform and find both the Education Online course and a more standard A-level course of English. The standard A-level course is not immediately useful to Education Online teachers precisely because of its standard, uniform philosophy, that fails to recognise the different requirements implied in the different level of each student. "What students find in the platform is sometimes too easy for them so we need to update constantly the materials inside. That is something we have to do if we want to improve the platform of the course and make the course itself more a challenge for the students."[71] One result has been that the available platform is used more for teacher-student communication rather than for the actual content of the available course. The content is rather provided by the Education Online teachers in their personalized approach to students' learning.

Technically speaking the platform is not difficult to use and complaints have been minimal. Indeed, students from the 2003 Education Online class (taking the online course at the time of visit to Stockholm) reported: "We don't have problems to use the platform."[72] And a similar comment came from students from the 2002 Education Online class, who had gone through the course and had now moved to upper secondary level: "We found it very easy to use and follow, also thanks to the instruction inside it."[73]

Of course, the key to user-friendly learning lies not only in the technical characteristics of the online platform. It also lies in the actual organization of the flows of knowledge, skills and didactics involved in the teaching-student methods of interaction and communication. In the latter respect, the Education Online teachers have clearly been involved in a learning process themselves; a process of "learning by doing or trying" which has improved ways of communicating and, consequently, exploiting more effectively the potential of the platform for "collaborative personalization" of learning.

In particular, the teachers found out that the best way to communicate with the students was to introduce a *tutor function* enabling individual students to ask for help and generally interact with their teachers. Besides, they also found out that the tutor function can also be used for work-group interaction with students asked to work in small groups. A second function that has proved very effective is the *platform's discussion forum,* which is used to stimulate *collective interactive learning* among all the students. Here teachers provide key topics for discussion and all students are requested to participate following specific instructions, such as having to follow a proper way to explain a certain thing, or to ask for something, or respect a certain number of words or lines in paragraphing, etc.

At the same time, students have started to interact among themselves, creating a third didactic innovation along with the learning interactions mediated by the teachers. As Lindström says, "when they haven't the teacher they trust each other to go on in their tasks."[74] Furthermore, this interaction has tended to expand beyond the immediate companions from the same physical class (something that one would also find in the

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[71] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

[72] Interview with Ulrika Isberg, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary school, March 2003.

[73] Interview with Sebastian Tabrizzi, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary, March 2003.

[74] Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school, March 2003.

traditional classroom) into the companionship of the virtual class created by the Education Online course. Thus, "we noticed that students started to face a different dimension of their learning process. First they were used to stay in a classroom and always interact with the same companions. Now they meet with other student from different schools and contexts."[75]

In practice, students from different schools are now becoming a learning resource for each other, something that Lindström sees as a normal development of the increasing learning and experience of both students and teachers. In particular, students increase their confidence with the platform and the concept of virtual class, while teachers are able to improve the e-learning environment in ways that facilitate even further the confidence and ultimately the attainment of the students.[76] Indeed, through the experience of the Education Online course, teachers have been able to improve the platform's interactive functionality in two ways that have underpinned significant didactic innovations with good results for the students' learning of the English language. Thus, "at the very beginning students hadn't got good writing skills, now they have improved enormously because they have learned to use all the tools inside the platform. They have a superior writing degree now."[77]

6.5 Students' Comparison of Education Online Course with Traditional English Course

By March 2003, the Education Online course had been running for two years, allowing students from the English classes 2002 and 2003 to form an opinion of its value in relation to the traditional English course. Overall, all the students were positive about the Education Online course. Table 7 shows some of the advantages identified by different students.

Table 7. Comments by Students on the Advantages of Education Online Course in English
Students from Education Online Class 2002
"The platform is probably best, it enables distance learning." *(Ulrika Isberg, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary school)*
"You have to think more and it is faster." *(Malin Attlin, Education Online Class 2002 when at 9th grade Rågsved lower secondary school)*
Students from Education Online Class 2003
"Doing lesson with computers is much more interesting. Computers help me to do more things than with books." *(Mikael Jatta, 9th Grade Rågsved lower secondary school)*
"I think it easier to learn with the computers and it is more interesting." *(Anita Gasal, 9th Grade, Rågsved lower secondary school)*
"I think it is an important opportunity for us to reach a higher level." *(Anita Gasal, ibid.)*
"It's good. We don't have English lessons now, it is a kind of free time. We can work at home, so when we are in school during English lessons we can do whatever we like. And I feel that I have done more with this course than what I would have done in the traditional course. I'm happy with the course, the normal course is too easy for me." Also, "We have more responsibility in our learning process. We don't

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[75] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

[76] "This is the result of a process when students get to know better and start to share opinions … They started to be more active thanks to the tools provided in the platform. Another point is we ourselves are learning in this process and we are creating conditions for bettering this learning environment." (Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school March 2003)

[77] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

have the teacher saying all the time "do this, do that"…they give you an assignment, if you want to do it you do it, if you do not do it is your responsibility. There are strict deadlines to be followed." *(Mikael Jatta, 9th grade Rågsved lower secondary school)*

"It is sometimes easier to use the computer, you can use it whenever you want." *(Mayram Mostajir, 9ᵗʰ grade Rågsved lower secondary school)*

Students preparing to do the Education Online Course in 2003

"We feel also more independent in our learning." (*Nenne Jallow, 8th grade Rågsved lower secondary school*)

"We have less pressure." (Nenne Jallow, ibid.)

As we can see the students highlight factors such as more interesting, greater self-responsibility, less pressure but at the same time they stress that they have worked harder and learnt more than it would have been the case with the traditional classroom. It is interesting to examine more closely the apparent contradiction between on the one side the ideas of "easier, "free time at school," "less pressure" and, on the other side, "strict deadlines to be followed" and "having to think more," etc.

The answer is in the combination of students' self-motivation and structure of the course (i.e., content and mechanisms). Indeed, we have seen that the course is not fully flexible distance learning, it is in fact driven and structured through the teachers' assignments, communication activities and continuous assessment. The resulting activity implies more work for the students as compared with the traditional course but, at the same time, the increased demands, learning instruments and time management with its emphasis on self-responsibility are more satisfying to their self-motivation to learn and be challenged. Thus,

> I think it was harder, more things that corresponded to your real level. And there were specific duties supposed to be done by the deadline without alternatives. It is something different from what happens in class where you can more easily jump the deadlines and postpone them…
> (*Sebastian Tabrizzi, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary school*)
>
> [and]…
>
> There is not the teacher pushing you to do things. It is yourself and your willingness to learn that push you to do it. And they select the ones that want really to learn something. And this is the reason why it was so good.
> (*Malin Attlin, Education Online Class 2002 when at 9th grade Rågsved lower secondary school*)

An additional benefit of the Education Online course pointed out by students concerned the teachers' assessment of their performance. They thought that the use of computers introduced an element of neutrality in the relationship between teacher and student, thus making the evaluation of students' work less open to subjective influences.

> Using the computer you are really evaluated for the work that you actually do. Sometimes students who are very good at school but having problems with the teachers are given less marks than they should deserve… With the online work, the teacher looks more at what you have done than at your personality.
> (*Selma Dedic, Education Online Class 2002 when at 9th grade Rågsved lower secondary school*)

6.6 Changes in Didactic Communication Flows of Students in the Education Online Course

The students taking the Education Online course have left the traditional class but have in reality increased the number of opportunities of didactic communication flows. In a traditional class, students mostly communicate with the teacher and amongst themselves in the learning process.[78] In contrast, the Education Online student is potentially able to communicate with (1) the online tutor, (2) online students from his own traditional class or school, (3) online students from other schools, and (4) their own teachers in the traditional class who still maintain a close interest in them.

Thus during our conversations with the Education Online students, all sorts of interactions were reported. For some students having a question, the initial step could be to ask first the teacher in their own school and then to the online tutor. Most however would go to the online tutor first, or, would open a discussion in the platform to see if other students in the course could help. Anita, Mikael and Mayram (Education Online class 2003) from 9th grade Rågsved LS School, agreed in that: "The first thing I would do is to send a message to my tutors in Farsta. Well, I could ask first also my mates, but if nobody knows that thing I'll have to write to my tutors."[79] Mikael stresses that: "I do the same. But it is very convenient to communicate with Farsta because there is a special function in the forum."[80]

At least initially, student-student learning interactions in the Education Online course tend to flow more easily among students coming from the same class and school. Thus students from the Education Online Class 2002 pointed out that:

> It is not so easy to start communicating with people that you don't know…we better liked to talk with other students who were from our school. Within the platform there are specific rooms that are addressed to the schools taking part to the activity and we interacted there. Another point is that not all the students have access to the Internet from home…so it is not easy at that point to keep constant relations.[81]

Although it is normal for people to tend to interact with those they know best from their own schools. It is also true that there is nothing in principle that prevents the Education Online class becoming more like a single virtual class in which students develop a sense of belonging and identity and, consequently, become more fully learning resources for each other, going beyond the mental borders reflecting the physical borders of their own schools. Of course, this requires the design and implementation of activities and mechanisms specifically targeted to this didactic purpose. At Education Online, steps in this direction seem to be taking place already. Thus, "I think that the technological system has improved this last year …this year [2003] we have implemented discussion forums where students are asked to follow a precise set of instructions and give good answers and arguments…it's not a simple chat room."[82]

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[78] I am excluding parents and other (unpaid) sources of knowledge support that often students are also able to muster in their learning processes. These sources may be accessible to students from any type of course.

[79] Interview with Mayram Mostajir, Education Online class 2003, 9th grade Rågsved LS school, March 2003.

[80] Interview with Mikael Jatta, Education Online class 2003, 9th grade at Rågsved LS school, March 2003.

[81] Interview with Sebastian Tabrizzi, Education Online Class 2002 when at 9th grade Kvickenstorpsskolan lower secondary school, March 2003.

[82] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

An interesting aspect worth mentioning in the new world of student-student relationships created by the Education Online course is the impact the course had in the relations of Education Online students with their mates in the traditional classroom. The impression is that nothing has changed very much since the Education Online students continue being part of the traditional class for all other subjects. Thus, "it doesn't affect me at all. We follow all the other courses together", or, "we have all the time to stay together."[83]

One danger could have been one of jealousy, but this would be more likely if students not taking the Education Online course would have been discriminated o disfavoured over others even if they have wanted to take course. In reality, the Education Online course is open to all those who satisfy the conditions to do it, for this reason, some students who have taken the course have then decided to drop out and go back to the traditional course. From this perspective, the Education Online course is an expansion of choice and personalization of education for all students rather than an option to favour a group selected on "elitist" basis – which would amount to discrimination.

6.7   *Student Assessment in the Education Online Course*

There are three types of learning assessment in the Education Online course. One is the final test from the normal school curriculum that the online course shares with the traditional English course. Without aligning with this requirement the Education Online course would simply not exist. In the experience of the online teachers, although the online course is different from an ordinary A-level course, the students that follow it have all the elements to succeed in the final test. The online course offers a different path to this success. Of course, it must be taken into account that the students in the online course are selected among the best and probably they would have succeeded in the traditional course as well. Nevertheless, this does not eliminate the fact that the online course does carry them to success and it does so in a way that the students themselves consider clearly preferable to the traditional course.

The second type of learning assessment is intrinsic to the dynamics and governance of the online course. From the beginning, the students know that they have to take responsibility for their learning within a didactic environment different from the traditional classroom. This is part of the "contract" and, indeed, it is one of the main reasons why the students enrol in the course in the first place. In this context, students know that they will work in new ways, with associated new ways of monitoring and assessment. In the Education Online course, the six face-to-face teacher-student meetings play a critical role in formal assessment.

The students have an obligation to prepare well before coming to the meetings. Prior to the meeting, they are given specific instructions for an assignment made up of two parts: an oral part and a written part. As indicated already, students are split into two groups of 5 or 6 students each and a fixed number of topics are discussed. Afterwards, teacher and students talk about what happened (about what went well or wrong, etc.) and decide which aspects to assess on the basis of evaluation categories created by the teachers, for instance, content, language, fluency, etc. Then teachers and students sit down all together

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[83] Interview with Mikael Jatta, Education Online class 2003, 9th grade Rågsved lower secondary school, March 2003.

and make a report for each student. In this way, the students are fully involved and aware of the evaluation process.

The third type of learning assessment is more informal and frequent and focuses on each of the students' participation and contribution to online group assignments through virtual forums. As Södervall explains:

> they are in a big discussion group and we challenge them to take an active part in the discussion and there we notice their level of involvement and improvement. We have a separate file for each student where we save all what the student wrote in the forum for that specific topic and we evaluate it. We usually close the topic every two weeks and add a new one.[84]

Teachers do not intervene to make corrections while the discussion is going on since this would disturb the flow of arguments. Afterwards however teachers give a good look at the overall discussion and advise the students on how they can improve weak aspects of their use of the English language. So this assessment is something that comes after the students have done their assignments.

The combination of diverse evaluation activities just described was not in place at the start of the online course. Like other aspects of the Education Online course, it has been the result of a learning process leading to improvements over time. In the early days, the evaluation tended to follow the traditional focus on individual student's activity with teachers' placing students at different levels and different skills. Now, the evaluation is a more dynamic and collaborative process, with the involvement of students enhancing its value and hence potential impact for improved learning.

6.8   Attainment of the Education Online Course

At its simplest, the evaluation of students' attainment as a result of the Education Online course can follow the same mechanisms of the traditional course, that is, tests, essays and final exam, with markings reflecting the success of the course. From this point of view, the Education Online course has certainly proved very successful since all students have passed the exams without problems, either at top or middle grades.

There are two issues however. First is that the advanced students of the Education Online course would have probably passed the traditional courses with high results anyway. Sure they would have not enjoyed the course as much as they reported they did with the online course but the success of these students in the English course may have never been in doubt.

The second issue concerns the concept of attainment and associated assessment instruments in the context of 21st century education. If we take Table 2, the didactic, skills, knowledge and ICT-skills flows associated with 21st century education, it is clear that attainment means multiple sets of elements well beyond the traditionally predominant knowledge assessed by mechanisms such as exams and tests. Thus, as expected, the students of the Education Online course did very well in their exams of English knowledge. But, considering the requirements and emphasis the Education Online course placed on other factors belonging to the process of "collaborative personalization" in education, we can produce Table 8. This is a qualified version of

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[84] Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003.

Table 2 and provides an indication of the broader range of elements where the Education Online course is making a contribution in the sense of 21st century education.

Broadly, all those elements marked in **bolded red** in Table 8 can be said to be present in one form or another in the pedagogical concept and dynamics of the Education Online course. Admittedly, at this stage no formal evaluation of these new elements has been conducted and, indeed, new instruments would be required to be able to do so formally and scientifically. The value of the Education Online course however is that is taking steps, opening avenues, for the integration of a much richer set of activities and dimensions in the education of the students than it has been the case so far – this is the world of "collaborative personalization."

Table 8. Towards Mass Customization of Education – Elements Found in the Education Online Course			
Multiple Intelligences *(Students & Teachers)*	**Didactic Flows** *(can all be integrated)*	**Knowledge Flows** *(can all be assessed)*	**Life-Skills Flows** *(can all be assessed)*
-Verbal-Linguistic -Mathematical-Logical - Musical -Visual-Spatial -Bodily-Kinesthetic -Interpersonal -Intrapersonal -Naturalist -Existential	-curiosity and creativity **-motivation to learn** **-fun to learn (ludic)** **-participation, responsibility and discipline in tasks** **-team and shared learning** -scientific honesty -fair competition -integration with community **-focus and concentration** -inclusion -etc.	*Variety of subjects* **-English** -literature & philosophy -mathematics -science -other languages -civics -history & geography -arts -government -economics -etc.	**-initiative** / leadership **-communication** -creativity -problem solving -mnemonics **-team-building** **-communicating across languages** **-research (including internet)** **-ICT-based collaborative work** -ludic skills etc.
ICT-based knowledge and skills flows for: ?? **general use of ICT equipment** ?? **learning-to-learn using Internet and other research resources on specific subjects** ?? **participating in collaborative learning environment and practices** ?? **preparing, processing, presenting, and communicating knowledge and work on specific subjects**			

7   Impact on Education Online Course on a School – The Case of the English Class of Rågsved Lower Secondary School

At Rågsved lower secondary school, the 2003 English class has 23 students, a rather good number of students for a single class compared to other places. The total number of students at Rågsved is about 300 and they share a pool of about 50 computers, with a good average of 1 computer per six students. All computers are connected to the Internet through broadband connection, since the area has 1gigabit backbone connection. The school also has two technicians who provide constant support to the teachers, and most teachers are indeed happy to use computers. Teachers themselves may not be entirely happy with their salaries, as in most places, but the use of new technology can have a

positive impact in making life and work easier. Thus, "I think that the salary is a problem for teachers everywhere. On the other hand, we have changed our way of working, for instance, I don't need the book anymore…new technologies…because of all this my work is less heavy today. If we change method and it become easier for us everything changes."[85]

Along with these very positive features, however, Rågsved LS school has had to contend with social problems that have given the school a bad image, as Lindström explains. "Well, ten years ago some papers wrote about this school for drugs, petty crime…all things that gave a bad picture of this school. And now we are fighting to overcome this perception."[86] And this is exactly where the innovative use of new technology can help change not just educational practice but, simultaneously, the standing and image of a "difficult" school. Thus, "the Rågsved headmaster is very interested in this, she wants her school to be a good school. We don't want the papers to diffuse bad news on this school in Stockholm. Especially in Math and in English we are not so good so we want to increase the level."[87] Such success is a real challenge and its impact would also be really momentous, especially given the fact that 70% of the student population in the school are of immigrant background. To a large extent, if innovation and new technology can make a real difference at Rågsved, it is a duty to make it happen. First for the sake of the children of the school and second, because it would be a gift of positive demonstration to other schools that may find themselves facing similar challenges of having to replace dynamics of vicious circles for those of virtuous circles of constructive development.

There are encouraging signs that the participation of Rågsved at the ICT-based innovation experience of the Education Online course may be beginning to have a positive effect. In particular two related aspects would be gradually improving, on the one hand, the grades of students of English and, on the other, the image of the school as pioneer in a successful innovative experience. Thus, "we have many articles where you find that this is the first positive thing that the school has done after long years."[88]

Let us examine more closely how the use of new technology is helping to improve the grades of students. It is worth quoting *in extenso* the following explanation from the Rågsved English teacher Annette Malsmten:

> Since we started this collaboration with the Senior high School in Farsta, we have obtained two goals: the kids who have achieved a pass for grade 9 have got new challenges, the teachers have got more time to help those who still haven´t passed.
> I worked with Sara Lehmann [another Rågsved English teacher]. We had a group each. She had the higher level. When twelve pupils started the online course, I could send the best ones in my group to her. In that way my group improved considerably. The shy pupils dared to speak much more often, and those who went to Sara wanted to show that they were as good as her pupils, so they were more active too. We really had a win-win situation.
> The tests in September, October and November gave us dramatically good results. In my group I had about ten pupils who needed to learn more in order to pass and they actually did!

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[85] Interview with Annette Malsmten, English teacher at Rågsved lower secondary school, March 2003.

[86] Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school, March 2003. Interestingly the school is also associated with an image of rock-and-roll since a famous band started here.

[87] Interview with Annette Malsmten, English teacher at Rågsved LS school, March 2003.

[88] Ibid.

> Immigrants who start in our school go to the Preparatory Classes first to learn Swedish for about a year. After that they start their English studies. I got four of them during that year. They worked hard and thanks to their great motivation they passed, too.[89]

It is important to underline that when the best students join the Education Online course, this does not mean that they lose contact with their class at their school. For instance, at Rågsved, students know that once a week "they can come to me and talk to me. They can ask whatever they want."[90] In addition, the teachers from all the lower secondary schools participating in the Education Online course also maintain contact among themselves, meeting three times a term. There are also different modalities in which the Education Online students make use of their time while the traditional English class takes place. At Rågsved, for instance, the more senior students of grade 9th are totally independent to leave, while the students of 8th grade actually do remain in the class. Most critically, however, at Rågsved, the Education Online students always have easy access to computers. Thus,

> They can ask for permission and get the possibility to work with the computers we have here in school. The school is open until 10 p.m. so they can stay here and do their task for Farsta. They have simply to make an appointment with someone and advise if they cannot come. We have lots of computers and they can come any time they want.[91]

Perhaps one of the most interesting results of the online Education Online course is its impact on the attainment of the students who do not take it and remain in the traditional English class. Contrary to the thought that the Education Online course would help create "elitism" in the subject by separating the best students and denying the benefit of their presence to other less-performant students, the reported impact of the separation has actually been positive to the English performance of all students. In a sense, it all comes down to the effective use of limited learning resources within a limited amount of time (i.e., the lesson hour). Thus,

> The best thing I think is that I have more time for those students that need me more. I can help those who have not passed the level yet. For instance …[an advanced and motivated student]… works very fast and she needs extra things to do and I have to put energy into that instead of helping those students who really need me. So if I get rid of …[the advanced and motivated student]… I think it's easier for me, because she knows enough now, she needs more challenges.[92]

Of course, one could raise the alternative possibility of blending the kids in such a way that the advanced and motivated students could help explain things to those students who are going slower, with the teacher operating more through the middle, as it were. The problem with this solution is that, "even if you blend the kids, the ones who are really bright will always feel that as too slow in comparison with what they would like to do and with what they can really do. You have always kids who need more."[93] At the same time, it is not clear that the others will want to be taught in more formal arrangements by fellow members of the class. It is much more likely that they will be afraid of the advanced students, feeling that they will not be able to compare to them. For this reason,

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[89] Ibid.
[90] Ibid.
[91] Ibid.
[92] Ibid.
[93] Ibid.

> "The Farsta online course was a great relief for me, because I can see that when the best students are not in the class the others are stimulated to be active and learn more. For instance, last year we had a girl that seemed she had lived in England for years and all the other kids suffered from inferiority towards her. When she left the class to attend the online course, the others became more active, as if they were afraid of speaking when she was there. There are students who really need my help and thank to this activity I will be able to give much more of my time."[94]

8   Advances, Set Backs and Governance Challenges in the Evolution of Education Online

When Lindström and Rydell started their original online English pilot with 5 Rågsved LS students in March 2001, they opened an avenue of ICT-based innovation that led to the start of Education Online and two years later had clearly proven its educational value. The potential benefits of the experience for the educational system of Stockholm are clearly very promising, particularly if understood that the Education Online course and the traditional classroom are indeed strongly complementary aspects in a single process of general improvement of students' attainment. Not surprisingly, Education Online has grown from its first A-level English course of 27 lower secondary students.

During 2003, the number of students taking the online course increased to 43 and the number of upper secondary schools increased to four, since 3 other upper secondary schools - Skarholmen US, Tensta US and Brännkyrka US - joined Farsta US in the process. In terms of content, although English remained the strongest didactic exploitation of the online environment, Mathematics is also becoming established. In addition, recalling the first research meeting he had with this author in March 2003, Lindström reports:

> Since we met I have held an A-course in social science with four pupils at my school. They all passed. I did that at half the normal cost. It was a problem-based concept and I wanted to make a web site and expand this opportunity. This year I don´t do this course. This year it is possible for students to read the B-course on-line at Farsta. I suggested that after listening to the pupils you spoke to (see Table 5 above). The method is spreading and the authorities have set a limit to the number of participants. It is too popular. I have also suggested a financial solution for the method so that the cost would be reduced in order to expand it.[95]

The limits referred to by Lindström translate into Education Online being offered only in the four schools already mentioned and to a maximum of three groups of 20 students per each of the two available subjects - English and Mathematics. This gives a maximum total of 24 groups and 480 students. At the same time, given that the two subjects are considered rather mature, the funding for coordination time has been reduced to 25% from the half time that Lindström had originally. At the upper secondary school, however, two teachers will have half their time funded -one for Math and one for English- mostly for administration, with little development work. These changes must be seen in the context of a reorganization taking place in Stockholm Education Administration, with various projects terminated due to funding cuts. Indeed, the IT Development Centre itself is under review with the possibility that the Education Online project will move to another department.

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[94] Ibid.

[95] Personal communication with Bo Lindström, leader of Education Online project and teacher at Rågsved LS school, 7 May 2004.

The limit to four upper secondary schools, however, has a different rationale. It is for a purpose of educational inclusion and has the backing of the political authorities of the City of Stockholm. All the four selected schools face serious social problems and there is a danger of segregation in the city's school system.

> There was a TV programme in Sweden addressing the fact that there was segregation going on. All the high achievers were attending schools in the centre of Stockholm that has a higher reputation, and the suburban upper secondary schools were left with the low achievers. So if the latter got the opportunity to have the online course then maybe they would attract high achievers. And that's a political issue really. If every upper secondary school says: "let's to do it," this would remove the advantage from the suburban schools and that was the purpose of politicians when they left only these four schools.[96]

As a result, the Stockholm's educational authorities have made it a condition for Education Online to expands only into the four schools. This purpose is indeed laudable given the positive impact that the online experience can have on a school facing social problems. At the same time, given that these social problems are likely to be rooted in a variety of deep factors, care should be taken that the restriction does not lead to a negative association between the Education Online project and social problems. The unintended result could be to neutralize any sense of educational advantage of the four schools while restricting the potential educational gains of the online opportunity to all others. In this respect, it might be advisable to incorporate into the group of schools joining Education Online at least one that comes from those that have a very positive social image.

Unfortunately, the situation just described has also led to a dramatic development for the Education Online constituency-building process. In a mis-alignment that may have a serious negative impact on the innovative leadership of the process, Lindström himself is no longer responsible for the direction of the project, in spite of his wishes. The Education Department IT Centre first asked him to apply for the coordination of the four US schools. He helped define the job, went to the interview and was informed that he would not get the job. The result is that: "I don´t have access to the decision makers. Therefore I can´t help developing this any more today, and consequently I have decided to leave this project. I have been told that I don´t have 'a sensitive ear'!"[97] The project is now administrated directly by Education Department IT Centre. Without entering into the details of this decision, it is however possible to say that the loss of the key constituency-builder at such early stage of development of the full vision of the Education Online constituency is something most likely to weaken its future development. Admittedly, if the project is to remain confined to its present limits in

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[96] Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school May 2004.

[97] Personal communication with Bo Lindström, 7 May 2004. Also, "I am leaving the project at the end of this term - the coordination. Since we are not suppose to develop anymore subjects or expanding it to other schools… But for me personally if there is not any development work to do, I am not interested anymore." (Interview, May 2004). In fact, there is more to Lindström's departure because he had actually proposed that the whole project be housed under the Stockholm Education Administration's Developing Department since the Upper Secondary School Department had come to the end of its funding for the project. At this point, Lindström was shocked to have to respond to questioning about the integrity of his role in the project: "I have to face twice the accusation for being an agent for the IT-company, Theducation, that provided the maths platform." (Personal communication with Bo Lindström, 29 June 2004). In a later development, Lindström has also resigned his post at his school Rågsvedsskolan.

terms of students, subjects and schools then the presence of the key constituency-builder may have run its course. If not, the loss of the constituency builder is a clear loss to the project.

9   Assessment of Present State of Alignment of Education Online's Constituency-building Process

As we have seen, the Education Online experience has succeeded in having a noticeable beneficial impact in the educational performance of English language as reported by students, teachers from both the online course and the traditional classroom. Indeed, the experience has highlighted the beneficial synergies created between the online and traditional English courses for the overall benefit of language education in Stockholm. It is clear that the positive ICT resource endowment of Stockholm's educational system has placed the City's schools in a leading position to concentrate on the more didactic and pedagogical aspects of the processes of ICT-based educational innovation leading to "collaborative personalization" of education. Such ICT resource has certainly facilitated the birth and further development of the Education Online experience.   The full realization of the educational potential demonstrated by the innovative Education Online experience, however, will require careful attention to problems of governance and leadership. In particular, it will require a change of perspective regarding the present limits set to its development.

This section makes an assessment of the present state of development of the process of alignment of the Education Online constituency-building process. It offers first a broad assessment using the categories of the diamond of alignment and, second, a more detailed quantitative assessment of key factors in each of Dimensions 1, 2, 3 and 4 of the diamond of alignment conducted by the leading constituency-builder of the experience - Bo Lindström.

9.1   Broad Assessment of Education Online' Latest State of Alignment

Table 9 updates the broad assessment of the state of alignment of Farsta's constituency-building process.

Table 9. State of Alignment Farsta's Constituency-building Process (May 2004)
(I) Constituents' Perceptions, Goals, Actions and Resources
The Education Online constituency-building process has grown from its original idea, available infrastructure, small number of teachers and limited financial resources into a larger constituency involving teachers from traditional classrooms, online tutors, a sizeable number of students who have successfully completed the online courses in English and Mathematics, and a much more developed interactive platform and content mostly developed by the online tutors. The number of upper secondary schools has also grown from one to four and the English course has also developed several layers of assessment including a set of physical sessions in which rigorous evaluation of progress is carried out. The students have expressed a high degree of satisfaction and would wish to see the same method applied to other subjects if this is appropriate. Teachers of traditional classes are also highly satisfied given the beneficial impact of the complementary online course which has an overall effect of increasing the degree of "personalization of education" that the system can give to every student. Major challenges have however emerged with the changing circumstances in Stockholm's educational system, which have resulted in the establishment of limits to the project's development and the involuntary withdrawal of the key constituency-builder. The latter is likely to weaken the innovative leadership of the process at an uncertain time, while the limits surely eliminate the potential for realization of the full vision of "collaborative personalization" of education demonstrated by Education Online. If this full potential is to be realized and Education Online expanded to

many schools as well as to other subjects inside the Stockholm educational system, then clear support, commitment and resources will be required.

(II) Nature and Maturity of the Technology

The constituency continues to benefit from Stockholm's highly developed network infrastructure and hardware. This is largely mature, of high capacity, and easily available through different access places: school, home, libraries, etc. The online content found by the Education Online constituency in both English and Mathematics, however, required considerable development since it did not respond to the requirements of the didactic activities designed and implemented by the Education Online teachers. As a result, the Education Online course now counts on a much more developed didactic platform, with greater and more flexible communication capabilities for individual and group activities and for real-time assessment of the progress in the English course. Mathematics has also evolved into a more mature online course and Lindström piloted a small first Social Science course in 2004.

(1) Governance

The Education Online process did not entail a major change in school governance since the traditional classroom continued very much the same, with the difference that teachers releasing the advanced students were now able to concentrate more time on a lower number of students in greater need of their attention. In this respect, a critical point to stress is that the ICT-based educational innovation of the Education Online Project is not intended to replace the physical traditional class. On the contrary, it is intended to improve its educational performance by changing a dynamics dominated by the most advanced students to another that allows other students to grow in confidence and performance, with better results for everybody. In combination, the Education Online course and the traditional class complements each other to generate the best results for students and the school.

At the level of the online course itself, the Education Online experience has created its own didactic governance (i.e., learning and assessment processes, mechanisms, rules and times). It has done this very much in a "learning-by-doing" fashion and to very good effect, as testified by the satisfaction and results of students. On the other hand, a critical constituency-building problem emerged most in the absence of transition path from A-Level to B-level English course for students moving from final year lower secondary school to first year upper secondary school in the context of Stockholm's decentralised school administration. The problem was twofold: (a) lack of access to B-level English course at the online platform; (b) lack of involvement of the upper secondary schools the students moved to in the online scheme. Education Online innovators, however, were taking steps to tackle this challenge and, indeed, a B-level English course is now accessible. However, the generation of alignments with a range of upper secondary schools to provide students with real choice and access to online courses is something likely to require a great deal of effort. It will first require that Stockholm's Education Administration do not limit the experience to two subjects and four schools with social problems only. It is highly laudable that the first opportunity be given to these schools for purposes of educational inclusion and equality. There is a risk however that too much hope may be invested on the capacity of Education Online to deliver social change at its present stage of development, especially as the course is largely virtual in nature. Without an effective response to this major governance challenge the potential benefits of the approach for the entire system may be lost.

(2) Target Constituents' Perceptions and Pursuits

Today, the target constituents of the Education Online project still remain all types of educational stakeholders, including teachers, school authorities, students, parents, City's educational authorities, etc. True, the number of active constituents of the experience has grown from its humble beginnings, but it is a small core when one considers the innovative potential to improve the full landscape of Stockholm's educational system. One thing is for sure. The initial funding has produced good results, but this does not avoid the fact that continuation and, above all, an expansion of the experience will demand further resources and other incentives for the constituency. An unusual problem in this constituency-building process is the involuntary loss of the key constituency-builder - Bo Lindström. If the project were to evolve beyond the present established limitations to pursue its full potential, this would seem to place him in the paradoxical situation of "target constituent" given that concrete efforts might be necessary to re-align him into his original position of "active constituent" and, indeed, key constituency-builder.

(3) Nature of Target Problem

The implementation of the Education Online course has demonstrated positive solutions to the target problems set out at the beginning of the project (See Table 8). First, it has demonstrated a virtual/physical learning environment that radically shifts the learning process from the traditional classroom approach to a "collaborative-personalization" of learning. In so doing, it has demonstrated (1) e-learning can lead to improvements of educational performance of students who have the capacity and the motivation to learn faster and deeper; (2) this process leads to complementary improvements in the educational performance of

less advanced students by increasing teachers' attention to their requirements; (3) this process can help students with less favourable social backgrounds to gain fully the advantages of 21st century education.

The demonstration however is only the beginning. It has merely laid the foundations of an ICT-based innovative experience with a huge potential for pedagogical transformation across Stockholm's educational system. At present however the limits established to the project have also limited the target problem to something that has largely been achieved from the point of view of both ICT-based innovation and educational coverage. Alternatively, the next target could be more ambitious, namely, the systematic and extensive adoption of ICT-based "collaborative personalization" in education across secondary schools in Stockholm. Unlike the present situation, this target would demand a qualitative and quantitative leap in constituency-building with the aim of creating a virtuous circle of simultaneous "bottom-up" and "top-down" processes. To an important extent the "bottom up" process is already very much under way through the experience and lessons created by the Education Online course. Required is a much stronger "top-down" process that helps release and expand the potential of the "bottom-up" effort already created.

(4) Interacting Technologies/Constituencies

The situation regarding this dimension remains very much the same as described at the start of the Education Online experience. Thus, all the technologies necessary for the Education Online learning process are largely available in Stockholm's educational system: high connectivity, computers, educational content, learning platform, etc. Their integration into the "collaborative-personalized" learning system targeted on, for instance, English language did not present serious problems, although an important effort of platform and content development was necessary and successfully achieved by the English online tutors. If the Education Online course expands from English and Math to other subjects, it is almost certain that similar improvements will have to be pursued. This time, however, the experience of the Education Online course may serve to illuminate the path of any new course.

Finally, it seems still the case that an important proportion of the school environment in Stockholm remains dominated by the traditional approach to education in terms of skills, methods, technologies, etc.

9.2   *Detailed Quantitative Evaluation of Key Factors in the Education Online's Alignment Process*

Figures 14a, 14b, 14c and 14d provide a more detailed quantitative evaluation of key factors in each of Dimensions 1, 2, 3 and 4 of the diamond of alignment. The factors are found in Table 4 and the marks enable the construction of "spider-webs" giving a visual representation of the areas of strength and weakness in the strategic development of the constituency. The result highlights those areas requiring greater attention to secure the success of the constituency. The evaluation is conducted by the leading constituency-builder of the experience - Bo Lindström.

Figure 14a refers to key factors in the alignment of the Education Online constituency with the organizational governance of Stockholm's educational environment. A cursory look at the pattern that emerges from Lindström's evaluation shows immediately the existence of three areas of strength and three areas of weakness in the alignment of the Education Online's constituency with the organizational governance of the Stockholm's educational environment. On the factors stimulating positively the development of the constituency are the "flat decision-making structure" and the "high level of students' participation," while the least stimulating factors include "rewards for ICT-based educational innovators" and "encouragement to new didactics." The latter factors are highly important to the successful realization of the full potential of the Education Online vision discussed in Section 5.1. This implies the strategic need for constituency-building progress on these areas since lack of significant improvements carries the risk that the full potential of the Education Online educational innovation may never be reached.

Figure 14b shows that the prospects of alignment of the Education Online constituency with "target teachers" and "target students" are the highest (9 out of 10), reflecting the fact that the constituency concentrates on teachers and students with well-defined characteristics that makes them highly receptive to join the constituency. The prospects with "headmasters" and "technical personnel" is cautiously positive reflecting the fact that they have a clear stake in the process but may not be necessarily as strongly and immediately motivated by it as the target teachers and students who play the central role. The prospects of alignment with schools' "senior management" and "administrative personnel" are the lowest with the latter presenting the most difficult prospects. They are probably the farthest away from an immediate and visible benefit from the project, hence their interest in the project is likely to reflect this situation. Yet "administrative personnel" are important for the integration of the project in the routine running of schools, thus the constituency-building process must give proper attention to them, most probably, through the authority of teachers and headmasters.
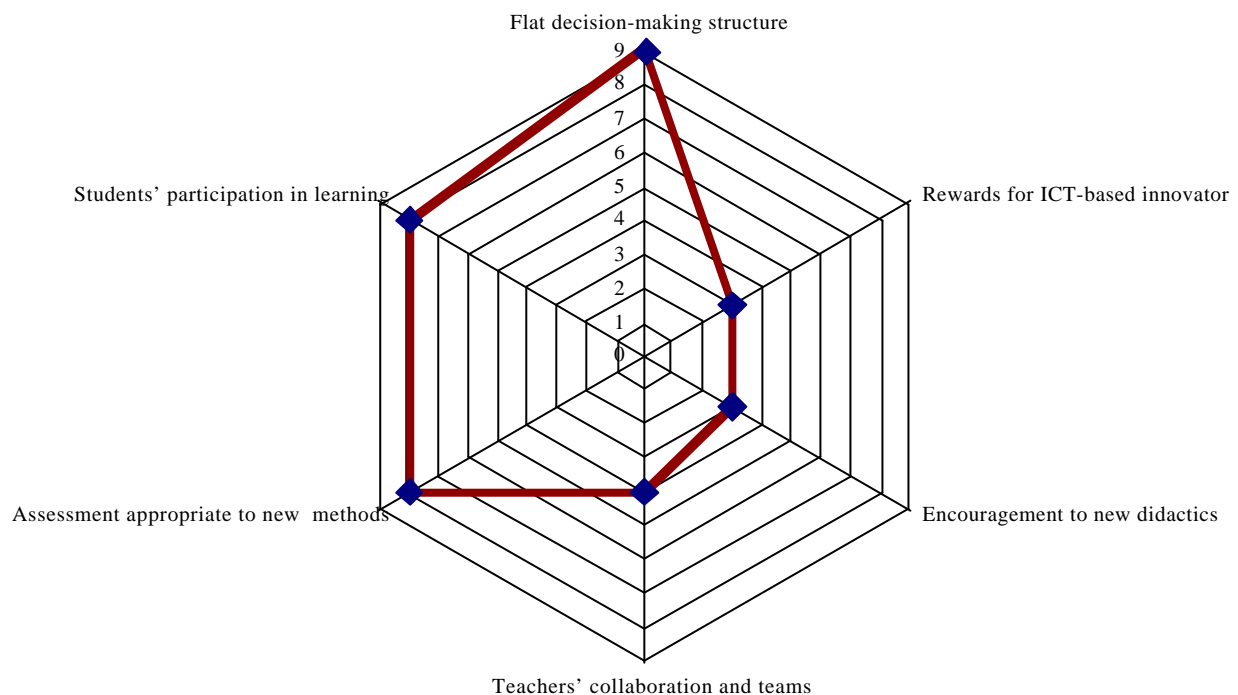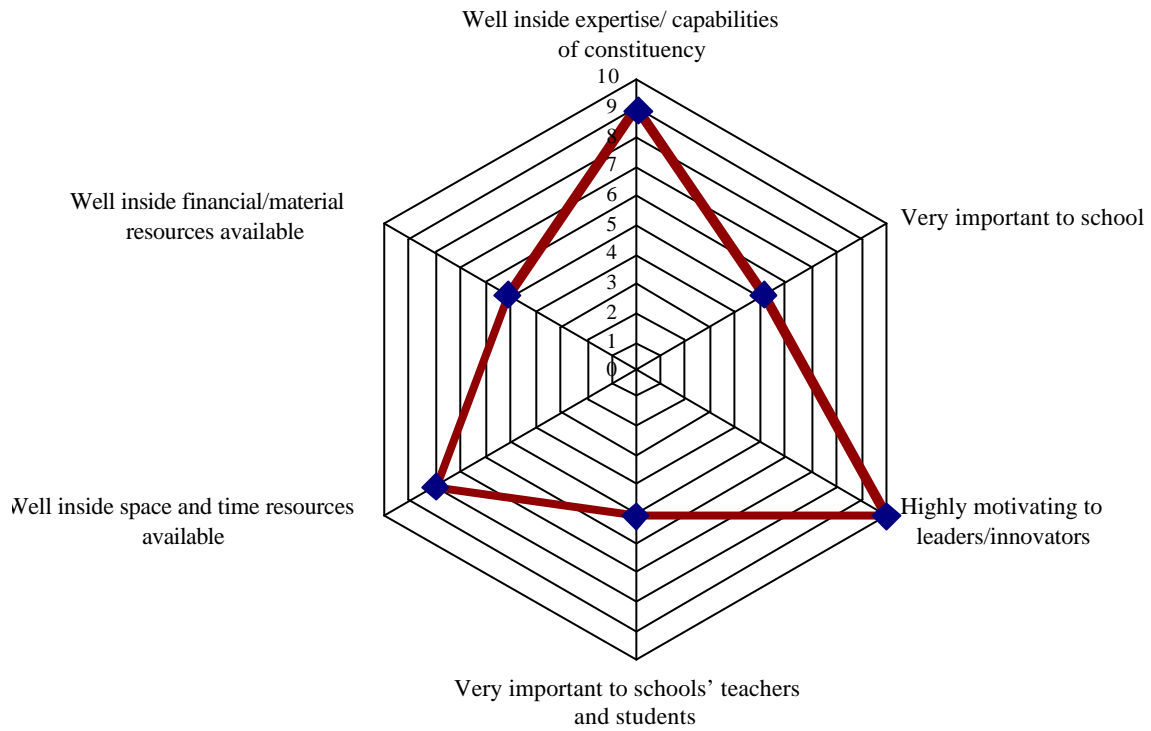

Figure 14a. Degree of Constituency's Alignment with Organizational Governance
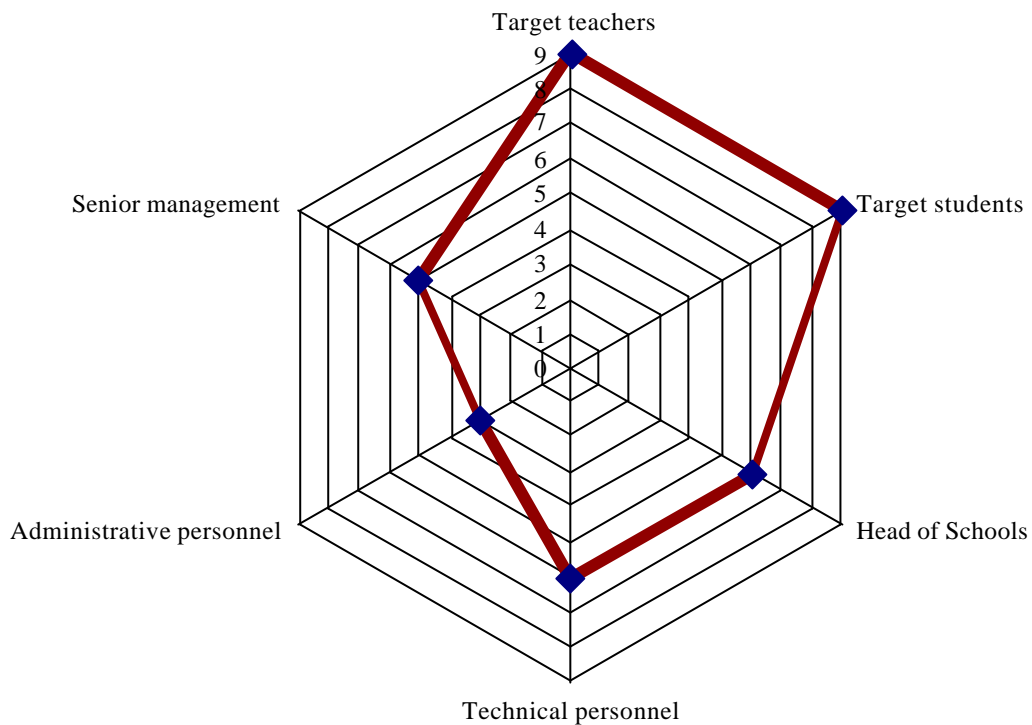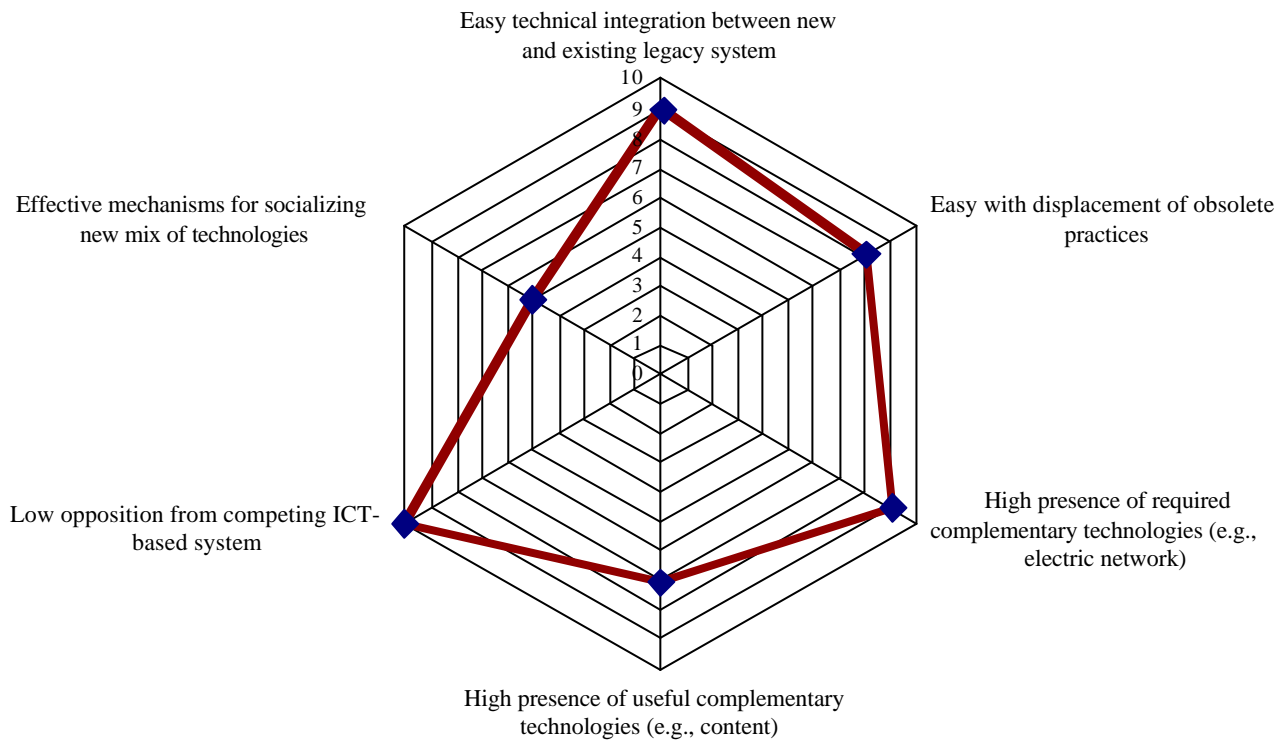
Figure 14b. Degree of Constituency's Alignment Prospects with Target Constituents

Figure 14c tell us that that the educational "target problem" pursued by Education Online is well inside both "the constituency's capabilities and expertise" and the "space and time resources available." Above all, the target problem is "highly motivating to the leaders/innovators of the constituency," something simply essential for its chances of success. On the other hand, if one considers schools, teachers and students in general (not just the target teachers and target students), Lindström markings reflect the existence of a moderate appreciation of the importance of the educational problem and solution raised by Education Online. Also, "financial/material resources available" are not considered in strong alignment with the magnitude of the demands imposed by the Education Online's target problem. The absence of strong alignment in the latter two areas may reflect the fact that Education Online is at early stages and has so far involved only two subjects and a few secondary schools. Finally, the assessment in Figure 14d shows a very positive alignment and lack of conflict with interacting technologies/constituencies.

Figure 14c. Degree of Constituency's Alignment with Nature of Target Problem Technologies/Constituencies

Figure 14d. Degree of Constituency's Alignment with Interacting

Finally, the assessment in Figure 14d shows a very positive alignment and lack of potential conflict with interacting technologies/constituencies. Integration with legacy systems and displacement of obsolete practices have not been a problem for the Education Online constituency and the rich ICT environment of Stockholm's education al system has provided a high presence of required and useful complementary technologies. The only factor to show a moderate alignment with the Education Online constituency-building process is the presence of "effective mechanisms for socializing the new mix of technologies," something likely to require further investments but have the pay off of helping to disseminate the benefits of the Education Online educational innovation.

In short, the quantitative evaluation of key alignment factors has generated a deeper mapping of the strengths and weaknesses of the Education Online constituency-building process at this stage of this evolution. Together with the broader assessment provided in Table 9, they provide a valuable strategic picture and guidance as to where the constituency-building efforts of all those interested in the success of the Education Online constituency should concentrate in the future.

10   Conclusions - Future Requirements and Constituency-building Lessons of the Education Online Experience

With the Education Online course, Stockholm has clearly pioneered a leading-edge experience of "collaborative-personalization" in the English language. Furthermore, this experience has gone beyond the normal learning of knowledge on a specific subject. It has indeed reached many elements today closely associated with 21st century education (see Table 8). The learning experience and its results have been plainly satisfactory to all those closely involved in it, particularly, the students, the teachers from the traditional English classes, the Headmasters, the tutors of the online course,[98] and from what students report, their parents have also been happy with the results. Even the disappointment of the first ever group of Education Online students for the initial absence of path from A-Level to B-level English shows a desire that reflects positively on the online course.

In short, a win-win avenue for all educational stakeholders and the simultaneous opening of an innovative experience with a huge potential for pedagogical innovation across Stockholm's educational system. The condition to exploit this potential to the full is simple to identify but not easy to implement. The authorities, schools and personnel should get together to tackle the governance and resources problems associated to a new larger-scale effort that would take the lessons of the pioneering Education Online experience to all levels of English language but, also, to other appropriate school subjects. The problem of innovative leadership caused by the involuntary withdrawal of the key innovator from the process should also be tackled for the long-term benefit of the Education Online constituency-building process. Leading innovators make a unique contribution to pioneering processes and their talent should be nurtured and supported particularly as the challenge of 21st century education is here to stay.

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[98] [Given the choice]…"I would do online more. With the online resources we have the possibility to concentrate more on the learning." (Interview with Göran Södervall, English teacher at Farsta upper secondary school, March 2003)

Overall, the critical constituency-building step will be to create a virtuous circle of "bottom-up" and "top-down" processes, with the "bottom up" already very much under way through the experience and lessons created by the pioneering Education Online course. The time seems ready for a stronger synergistic "top-down" process that helps release and expand the potential of the "bottom-up" effort already under way.

The key "bottom-up" innovators seems ready to take the challenge of explaining to other teachers and key target constituents the benefits and requirements of the "collaborative-personalised" approach and system of the Education Online course. The platform already exists, has been improved, and can be used also for other subjects, although with due attention to the specific nature and requirements of these other subjects. It cannot be expected that the workings of the platform for English language or Mathematics constitute a universal model. They do however offer valuable experience that can be used to illuminate the start of other subjects' experience.

The expansion of the systems to other subjects, however, is not only a problem of awareness and training and support of other teachers. It is also a matter of "top-down" support from the relevant educational and schools' authorities that must provide the resources to reward teachers for the extra time and work involved in the online course.

At the highest authority level of Upper Secondary Schools the situation seems to be favourable. Thus,

> Mr. Per Engbach is the head of the Upper Secondary Schools in Stockholm, the 23 of them. He is very supportive of this activity and one of his aims is to try to change the upper secondary school system and the organisation. He wants to be a very a successful project but he thinks also that it is up to the single headmasters to solve the specific problems that the school have. He wants to find solutions for the long run.[99]

Clearly a favourable Head of Stockholm's Upper Secondary Schools can play a positive role in creating awareness of the results and benefits of the "collaborative personalization" of the Education Online experience for the evolution of education in the 21st century. Of course, this first requires an acceptance by the system of the importance of pursuing the full potential of the vision of Education Online and, consequently, the elimination of the present restrictions that confine the project to a small niche inside the Stockholm educational system. In addition, within the decentralised structure of the Stockholm school system, it is clear that it will be the headmasters and teachers who will have the final decision regarding ICT-based innovations in their respective schools. But the Stockholm's Head can advocate the issue and certainly points to the benefits of the experience for Stockholm's world class position in the arena of ICT-based education for the 21st century.

Equally critical in strategic terms, the Stockholm Education Administration's IT Centre or any other department hosting Education Online should squarely support the encouragement of a more forceful experimentation, adoption, implementation and assessment of ICT-based "collaborative personalization" in all appropriate subjects of Stockholm's secondary school curriculum. Further resources may be the incentive that helps trigger a more-systematic and extensive adoption of ICT-based "collaborative personalization" across schools in Stockholm. In particular, it is important to reward

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[99] Interview with Joke Palmkvist, City of Stockholm Educational Services, Stockholm, March 2003

innovative teachers and to make the necessary R&D investments, otherwise with the process is likely to remain small scale.

Whatever the steps taken by the Stockholm and schools' authorities following the initial success of the project, it must be taken into account that ups and downs are a normal part in the life of innovative constituencies. Sometimes difficulties and uncertainties, sometimes smooth progress. Powerful ideas and concepts however seldom disappear, especially when users begin to make clear that their time is coming. In this respect, Lindström is surely right in believing that, ultimately, "I think that in this process a fundamental role is played by the students…They can become the real drivers of this process…They want to face the challenge."[100]

10.1 Constituency-building Lessons of Education Online Experience

The story of Farsta's ICT-based educational innovation has revealed important lessons of effective constituency-building "techniques" or responses implemented to tackle concrete constituency-building challenges. Below, the paper synthesizes some of the most important for the benefit of other constituency-builders engaged in similar processes of school innovation.

LESSONS OF CONSTITUENCY-BUILDING CHALLENGES AND EFFECTIVE RESPONSES IN THE CASE OF "EDUCATION ONL.INE' EXPERIENCE

Challenge 1. Creating the infrastructure and conditions for 21st century education
Response 1. Long-term investment by the City of Stockholm's authorities in ICT infrastructure for the educational network.
Response 2. Creation of a dedicated IT Centre for the development of new teaching materials and pedagogical methods

Challenge 2. Seeking to exploit the ICT infrastructure available in Stockholm for educational innovation benefiting all students, particularly those from schools with social problems at first
Response 1. Focus on educational problem-solving or opportunity-exploiting, not on the technology per se. Lindström's focus was on the Swedish educational aspiration that: *"Education should be adapted to each pupil's circumstances and needs."* This would help immigrants and, indeed, any advanced student motivated and capable to take greater responsibility for their own education and learning. It would also help less advanced students requiring greater teacher's attention in the traditional classroom by releasing his/her time and preoccupation from students taking greater responsibility for their own learning.

Challenge 3. Identify the ICT-based educational innovation most likely to help provide a solution to the educational problem and/or opportunity
Response 1. Lindström identified an online learning environment as the best approach to his problem. In so doing, he started a process that would radically shifts the learning process from the traditional classroom approach to a "collaborative-personalization" of learning.

Challenge 4. Starting the constituency-building process to fulfil the ICT-based educational objectives
Response 1. Lindström selected a "one-step-at-time" constituency-building strategy rather than working on an overall strategic plan for online education of English language across all years of upper secondary school. The immediate focus was the online provision of the A-level English course.
The constituency-building approach taken to achieve the A-level course contains multiple ingredients, amongst the most important:
?? Run a small pilot to demonstrate the value of the idea, without re-inventing the wheel. Lindström searched for an available A-level course to pilot his idea with a small number of students. The

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[100] Interview with Bo Lindstrom, leader of Education Online project and teacher at Rågsved LS school March 2003.

educational platform made available by Stockholm's education central services did not offer such course, so Lindström enrolled Annelie Rydell who had developed a course for adult upper secondary school. He also raised a small amount of funding (Eur 2200) from the Department of Education to cover the costs of the three-month pilot with 4 students. The pilot was successful.

?? _Building on the success of the demonstrator pilot_. Lindström used the success of the small pilot to raise further funding and, above all, to find a supportive Headmaster and teachers from an upper secondary school (Farsta), thus solving a major alignment problem since only teachers from upper secondary schools are officially entitled to teach the A-level English course.

?? _Be prepared to be flexible and accept consistent proposals from target constituents in order to reach alignment_. The Stockholm Education Administration was willing to support with funding Lindström's ICT-based innovation of the A-level English course, but they wished to introduce some elements of their own. First, funding would be initially for six months at a time and subject to positive evaluation of six-monthly report to be submitted by Lindström. Second, Mathematics should be included in the project. Lindström agreed to both requests, even if the funding would not cover all costs, since they were largely consistent with the "Education Online" constituency-building process, especially as he was able to get a re-assignment of his teaching time to devote himself half-time to the project. In addition, the inclusion of Mathematics meant an expansion of the constituency's reach to another subject. Eventually, progress in Mathematics proved more difficult than anticipated but the agreement did allow the Education Online project to make the critical breakthrough into the official programme of Stockholm's upper secondary schools.

?? _Secure incentives for educational innovator to encourage their participation and best efforts_. This is very much a supplement to the previous point, but worth underscoring given its critical importance for successful ICT-based educational innovation in schools. Innovators are commonly highly motivated and determined individuals. The success of a pioneering process such as Education Online, however, requires incentives from the educational system for the achievement of the best results. Proper funding, resources and time allocation must be made available to those working hard to advance the ICT-based transformation of education to respond to the needs of the 21st century.

Challenge 5. Selecting the appropriate teachers to make a success of a pioneering experience such as Education Online
Response 1. Given the lack of well-developed online content for the A-level English and Mathematics courses, the teachers initially required for the success of the online courses were innovator teachers. That is, teachers with interest, motivation, knowledge and creativity to work with computers and the Internet and, above all, to develop both the facilities and the English-course content in the available platform. The Education Online A-level English teachers ultimately created the course. They were ready to "learn-by-doing" and applied themselves to the task. In a different way, the initial experience of Mathematics also confirms the importance of the innovator teacher. In this case the Math teacher was not equally interested in using computers and this meant a slower development of the Math online course online as compared with the A-level English course.

Challenge 6. Selecting the appropriate students to make a success of the pioneering experience of Education Online
Response 1. The Education Online course seeks to tackle a particular educational problem and/or opportunity (see above _Challenge 2_), by inviting students from lower secondary schools to do the A-level English course normally given at first year upper secondary school. It is clearly a course for a certain type of student whose appropriate selection under well-defined criteria and procedures was fundamental to prove the educational value of the course. Ultimately, the students are identified through their own performance record and in conversation with their teachers. They must show motivation, high-level of performance in the traditional language course, familiarity with computers, independence (i.e., a good attitude to take responsibility for their own learning) and have parents' permission.

Challenge 7. Solving critical problems emerging during the constituency-building process such as the blockage that affected the online progression of the first group of students to do the Education Online A-level English course.
Response 1. Be alert and respond rapidly as soon as the critical problem in the constituency-building process is spotted. The research visit by this author (March 2003) alerted Lindström and Södervald of the students' unsatisfactory situation following completion of the online A-level English course since they would have wished the opportunity to continue to the online B-level English course. Two aspects

were missing: (i) access to the B-level course online and (ii) involvement of upper secondary schools. The Education Online innovators responded effectively. Lindström proceeded to enrol teachers of upper secondary schools, while Södervall and Bergholtz went forward to complete the offering of an online B-level English course.

Challenge 8. Helping to maintain the support of the school authorities and promoting the value of the Education Online educational innovation
Response 1. Having demonstrated the value-added of the ICT-based innovation, Lindström and other key constituents in the Education Online innovation have promoted the pioneering and innovative quality of this value and its particular importance for schools facing social problems in Stockholm. They have attracted and made good use of the press who have published articles giving a positive image to schools that in the past have been known for problems of violence, drugs, etc. Education Online has brought a breath of fresh air to the image of these schools, with a positive impact on the motivation of the teachers and students involved.

Challenge 9. Seeking to make a persuasive economic case to facilitate support from the educational authorities for the ICT-based educational innovation.
Response 1. Lindström has given thought to the economic argument in the knowledge that substantial additional costs would undermine the case for investment. Thus, regarding costs per student, he has worked out that a student who takes the online course is apparently creating an additional cost of 5,000 SEK but, in practice, is also saving a cost of 5,000 to the traditional upper secondary class. The result is that to set the entire process in motion, the authorities must be prepared to make the up-front investment of 5,000 SEK per online student while these students are still at lower secondary school.

Challenge 10. Recovering from involuntary loss of key constituency-builder in the pioneering Education Online experience.
Response 1. This is something unresolved at the time of completing this paper.

No doubt the Education Online constituency building process is already accumulating a rich set of lessons that can illuminate the experience of others. Of course, the process continues and other challenges exist and others will certainly emerge in the future. Some of the challenges will be easier to tackle, others harder. In the process, the accumulated constituency-building experience will help, but constituency-builders will always have to be ready to find creative and innovative responses, since in the struggle to invent the future there are no real recipes, only wisdom, ingenuity and the determination to move forward to new frontiers. Indeed, the latter may already have to be called upon because, as I write these final words, the Education Online constituency is faced with critical limitations to its future development and the loss of its key constituency-builder. These are both developments that can have significant consequences for the future evolution of the experience. One can only augur for a satisfactory evolution for the benefit of all those participating and the many more potentially to come.

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