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ICT in Education: "The Context-Specific Characteristics and Challenges for developing Countries based on the Example of Georgia"

Master's Thesis

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Author's declaration of originality

Hereby I declare that I am the sole author of this master's thesis and that thesis has not been presented to any other University for Evaluation.

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Abstract

Over the past few years, information and communication technologies have become the powerful tool in different fields. Education is one of the areas experiencing paradigm shifts in teaching and learning processes by integrating ICT in the system. It creates the new learning environment which leads to change in roles of both educators and learners. Considering the fact that Georgia is still in the process of implementing ICT tools in education, it is crucially important to address the issue of perceptions of different counterparts of the system and identify the barriers and challenges that Georgia is facing when integrating an innovative tool into primary and secondary education. Georgia as a developing country has a huge potential to use ICT to improve the overall educational performance.

The study uses the SCOT theory for identifying the challenges and different social actors responsible for shaping the educational system in Georgia. According to the findings, ICT integration in primary and secondary education is perceived to be highly effective by educators and policymakers. However, some of the teachers are unable to make an effective use of the tools either due to lack of adequate resources, proper infrastructure or lack of required competencies. The study has attempted to make the substantial contribution to existing literature to answer research questions and highlight research areas needing further exploration.

Keywords

ICT, Innovation, Primary and secondary education, Georgia

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Introduction

In the world, moving strongly towards the advancement of data and media, ICT's involvement in the field of learning and education is getting a more significant topic to be discussed. There are already studies, arguing that ICT has a noteworthy part to play in the educational facilities (Obiadazie, 2014; Raturi, Hogan and Thaman, 2011). From 1960s, when computers appeared into education many researchers recognized the huge potential of ICT in primary and secondary education (Voogt. J and Knezek. G. 2008). The expectations towards the ICT usage in education are particularly high in developing countries, where the main objectives in relation to ICT usage in education are stated to be related to improving the level of knowledge of a population, providing better access to education (Sahlfeld, 2007). However, the analyses studying ICT and its benefits keeping in mind a specific country or region are scarce (Richardson, Sales and Sentočnik, 2015).

The specific interest of this thesis concerns the case of Georgia that is a developing country in the process of adjusting to the developments of information society. In this light, "*e-Georgia Strategy 2014-2018*" and its action plan have been adopted to increase the usage of e-services by citizens and public sector, by providing high quality, efficient and trustworthy service delivery, creating transparent environment and encouraging private and public sector in developing e-services[1] (Republic of Georgia, 2011).

Further, according to action plan and e-Georgia strategy 2014-2018 there are training courses provided for teachers to improve e-skills. In other words, how to meet the expectations of education of the new generation, so called "*Digital Natives*" who grew up in close connection with new technologies. Compare to them educations who did not born in digital world and did not have chance to experience new technologies, referred to *"Digital Immigrants"*. As educators

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[1] A digital Georgia- e-Georgia strategy and action plan 2014-2018.
http://www.dea.gov.ge/uploads/eGeorgia%20Strategy.pdf

of "*Digital Natives*", they face the challenge to rethink the methodology used in the teaching process, accepting new ways of teaching and interacting with students (Prensky, 2001). ICTs can possibly enhance, quicken, advance, and develop aptitudes, to engage and motivate the learners, to relate school experience to work activities, enhancing teaching skills and helping the educational institutes to prosper (Harris, 2002; Richardson, Sales and Sentočnik, 2015).

So, while relying on previous, by implementation of ICT in education, one can say that radical changes are expected to be realized in the educational system in Georgia. At the same time, while the recent policy actions in Georgia focus mainly on the role of new technologies as tools to improve the learning environment and its positive impacts, **there are still missing actions for implementation into practice.** Further, it is important to mention that policy rhetoric presents and focuses on the huge potential of new technologies in the education system, but lacks more critical perspectives and challenges prevalent in reality.

While reviewing the academic literature, one has to acknowledge that some high tech computer labs are not used because of the poor infrastructure, limited teacher training, lack of ICT skills, lack of motivation of teachers to learn new skills (Richardson, Sales and Sentočnik, 2015). Also, integrating technology into the design and changing the pedagogical approaches and focusing on more student-centered learning is found to affect positively student's academic performance (Richardson, Sales and Sentočnik, 2015).

 The main research questions that the thesis addresses are:

- What are the perceptions on usage of ICT tools in primary and secondary education in Georgia by different counterparts of the system?
- What are context-specific characteristics of developing countries while implementing ICT in education?

Hence, implementing e-learning is still on-going process and the topic is not yet broadly covered in Georgian academic literature, using qualitative research methods can reveal a more systemic understanding of e-learning tools and it's benefits in learning and teaching processes.

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1. Theoretical background

1.1. Defining ICT role and factors relevant for its adoption in education

ICTs have been used in learning since the day these technologies were introduced, however they have not been enormously present in general to the masses (Barab, Barnett and Squire, 2002). Under the term "ICT in education" is perceived as implementing new ways of teaching and learning in educational system. The integration process is truly complex and multilayered which involves not only the technology itself but also the various factors such as: Institutional readiness, teacher skills and competences, educational program, socio-institutional acceptability and infrastructure (Tinio, 2000-2002).

In spite of the fact that around then PCs have not been completely incorporated in the learning of customary nature, the usually acknowledged thought is that the educational frameworks would have to make the individuals ready for the deep rooted learning of how to better utilize ICTs (Alexiou-Ray, Wilson, Wright and Peirano, 2003; Mooij, 2007). Speaking about developing countries, it is important to mention that ICT provides opportunities to improve and enhance the quality of education, for example online learning expands the access to remote learning materials, provides flexibility and more convenience for learners. However, there are also key factors to be considered, while implementing ICT in developing countries there is a gap between people who can access the technology and who cannot. So, in order to have an effective integration of ICTs in education, knowledge gap and existing economic and social inequalities should be definitely considered (Tinio,2000-2002). Below one finds the key elements and influencing factors of learning processes that affect the introduction of ICT in education.

Figure1: The learning process: key elements and influencing factors
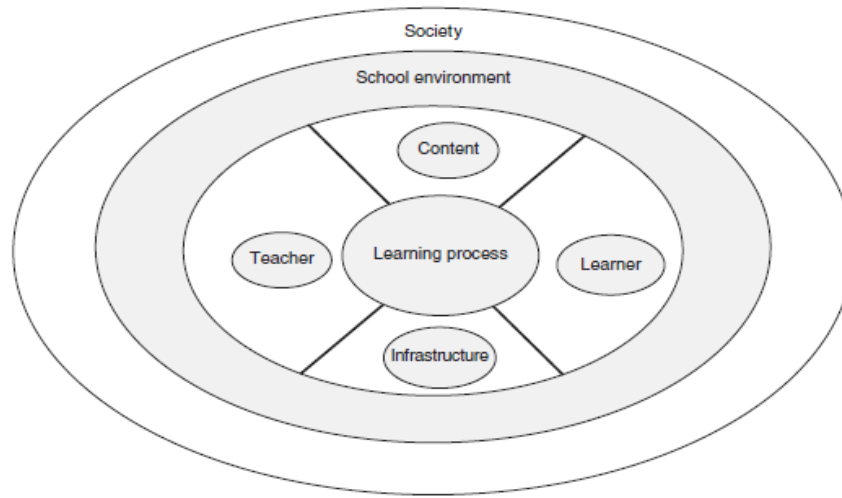
Source: *International Handbook of Information Technology in Primary and Secondary Education (Voogt. J and Knezek. G. 2008) (adapted from Plomp, Ten, Brummelhuis and Rapmund, 1996; Voogt and Odenthal, 1997)*

1.1.1. Technical preconditions – infrastructure and basic ICT skills

One of the important key factors affecting the utilization of ICT in education is proper infrastructure and other needed resources like internet access, to enable the technologies implementation in the classroom. At first PCs were only utilized to teach the student **courses related to computer sciences** but with the passage of time, the use of computers expanded and were used to other learning purposes as well (Duffy and Cunningham, 1996). The computer aided learning turned out to be more pervasive in the public eye which prompted a worry about the requirement for obtaining the skills that are required for using a computer or any other technology (Ching, Basham and Fang, 2005; Mooij, 2007). Poor digital infrastructure definitely demotivates educators to integrate ICT tools into teaching process. Another essential factor is the role of the teachers, which has to adapt and change in new digital environment; they are required to learn not only basic ICT skills but also the new methodologies and approaches to be able to integrate digital tools into educational practice (Voogt and Knezek 2008).

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ICT can expand the educational accessibility with the objective of students getting access to information from anyplace and at any time of the day (Loveless, 2003; Richardson, Sales and Sentočnik, 2015). This easy access and availability of education greatly influences the way in which learners learn and how they are being taught by their teachers (Williams, et al. 2000). This is due to the fact that the present techniques are learner driven rather than lecturer driven. Working together with geographical adaptability, programs of learning that are enhanced by innovation and technology likewise evacuate a number of the worldly limitations that face learners with extraordinary needs (Yuen, Law and Wong, 2003; Ching, Basham and Fang, 2005).

The learners of today are beginning to welcome the ability to embrace training anyplace, whenever and wherever (Richardson, Sales and Sentočnik, 2015). A standout amongst the most crucial commitments of ICT in this field is the easier accessibility of the education. Because of ICT, learners now can peruse through past year papers, test examination papers, e-books and so on and they can also have easy accessibility to peers, professionals, researchers, experts, mentors and teachers everywhere throughout the world (Richardson, Sales and Sentočnik, 2015).

1.1.2. Content –availability of applications and materials

In previous eras, the customary techniques for teaching have made the instructors lead and prepare learners with the help of traditional tools to accomplish learning results (Duffy and Cunningham, 1996; Mooij, 2007). The primary focus here is attributed to **self-guided learning** (Barab, Barnett and Squire, 2002). Marble Mountain community college was the first adopter of Web-based online courses. The college offered first **e-learning** English course in the mid 1990s when World Wide Web and internet started emerging and developing (Smith, 2008).

Typologies in relation to e-learning can refer three different learning environments: **distance learning, e-Learning, and online learning**. Distance learning is defined as the tool to provide the access to learning for students who are geographically distant. Internet and computers are the main players in delivering the education and instructors are located in the different area (Moore, Galyen and Deane 2010). Online learning is defined as a technology mean for accessing learning opportunities. It is mentioned as a recent version of the distance learning

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with more flexible functions (Moore, Galyen and Deane 2010). Moreover, we can differentiate two essential types of learning **online and blended learning**. As online learning is considered part of distance education. The new approach of mixing traditional lecture with Web-based learning is referred to blended learning which enables boosting learning process. The blended learning is the integration of face to face with online learning, improving student's engagement and making the environment more interactive (Randy and Vaughan 2008). E-learning we are facing today is highly interactive and equipped with huge potential as it is shaped by educators and students as well. (Harrison and Steve 2010)

Further, typologies in relation to e-learning can refer to taking feedback from a 'learning environment' or any medium via which knowledge may be translated to content that would change into a sequence of learning and teaching for those viewing the content (Tao, 2008). There are two types of e-learning by their style and delivery characteristics.

1.   **Supportive E-learning:** It is an environment where technologies are used by teachers and students to boost and support the teaching process. This type of e-learning involves electronic resources during traditional classroom activities and it is used to store and distribute knowledge. The type of **"adjunct"** e-Learning is considered as the aid for traditional classroom environment, where learners can express themselves and feel the independence (Arkorful and Abaidoo, 2014)

2.   **Pure E-learning:** In this type of environment the assignments are submitted electronically, without real life interaction within teacher and student. In most cases also there is a chance that there is no real human involved and the information or the feedback comes from the system. It is also known as **wholly online** learning which consists of **individualized** and **collaborative** learning. Collaborative learning contains synchronous and asynchronous learning environments (Arkorful, Abaidoo, 2014, Cunningham, Hebblewhite, Grout and Oram 2004). **Synchronous** is fully online based where educators and students communicate in real time via chats or video conferencing, wearers **asynchronous** learning is based on course work via websites, emails, and it can happen when learners are offline (Arkorful, Abaidoo, 2014)

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Figure 2: A Model for Using E-learning in Education
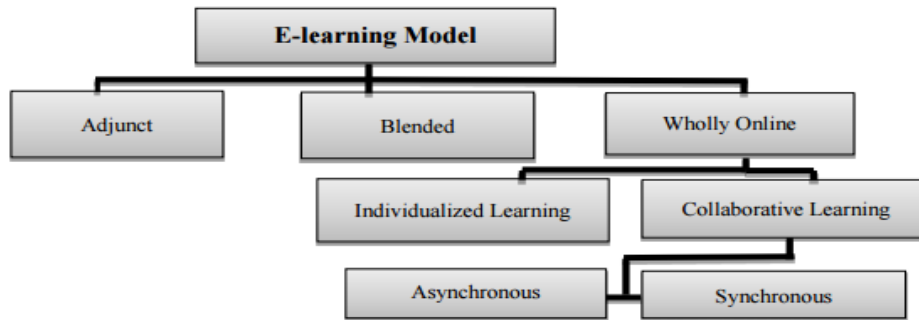
Source*: (Arkorful and Abaidoo, 2014) the role of e-learning, advantages and disadvantages of its adoption in higher education. Adapted from Algahtani (2011)*

In learning environment all the key factors are interrelated and they also influence each other depending on their characters. The content is shaped by the educational program while the infrastructure determines the physical learning environment, which contains the learning applications and materials. Infrastructure has a power in terms of providing opportunities or restricting usage of digital tools in the learning process. The learning content should be adjusted to the needs of the specific society (Voogt and Knezek 2008). For effective content it should be original, relevant and in the local language, it should convert the print-based content to digital. Also teaching and learning materials should match the national curriculum requirements (Tinio, 2000-2002). ICTs such as: videos, multimedia learning programs that provide sounds, colorful moving images can be used in benefit to create the original content and increase the student's engagement (Ul-Amin, 2013).

1.1.3. Teaching and learning processes – developed based on the use of ICT

ICT provides an altogether new learning environment for the learners of today, in this manner requiring diverse set of skills for becoming successful (Alexiou-Ray, Wilson, Wright and Peirano, 2003; Harris, 2002). Research, assessment abilities and critical thinking are developing in significance as learners now have access to data with greater volumes from many online

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resources to sort through (Duffy and Cunningham, 1996; Loveless, 2003). ICTs are changing procedures for learning and educating by adding components of essentialness for educational situations including the introduction of virtual environment (Yuen, Law and Wong, 2003; Girasoli and Hannafin, 2008). ICT is a powerful tool for offering opportunities within the field of education. By considering the current dissemination and utilization of ICT in successful societies, especially new generation, it is evident that ICT will greatly impact the whole process of learning today and even in the years to come (Richardson, Sales and Sentočnik, 2015; Higgins, 2003). According to Gebremeskel, Kebede and Chai (2016) few researchers have surveyed the writing on the topic of ICT with respect to learning. So it can possibly upgrade the teacher learning and achievement of the students. Innovation can have impact on supporting up close and personal instructing and learning in the classroom. While ICT can help instructors improve pedagogical practice, they can help learners with the learning processes by assuming a part in understudy abilities, inspiration, and information, also ICT makes the process of learning a faster and far more fun process for the child. Use of ICT encourages the exchange amongst users by keeping the learners up to date and improving educators limit and capacity by creating a live contact between the learner and his/her instructor through TV video-audio tape, intranet, online learning, e-learning, chalk sessions and emails (Stanley, 2011).

1.1.3.1 *Students' perspective: stronger learning motivation and better scholastic performance*

ICT can upgrade the nature of instruction in many ways, such as by expanding the levels of motivation of a learner, increasing engagement, encouraging the obtaining of essential abilities, and by improving the training of the teachers (Ballard, 2001; Harris, 2002; Loveless, 2003). According to Al Sharhan (2002) ICTs are additionally transformational instruments which, when utilized best, can elevate the move to a learner focused environment. ICTs, particularly Internet innovations and computers, empower new methods for learning and adapting instead of only allowing learners and teachers to do what they have done before more properly and improved (Williams, et al. 2000). ICTs have great effect on the realization and motivational levels of the learners, as well as it additionally play a noteworthy part on the ways

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in which these learners must study. With the move of educational program to "capability based" from "content-focused", the delivery methods of these programs have now moved from "instructor focused" types to "learner focused" (Jimoyiannis and Komis, 2007; Ching, Basham and Fang, 2005; Anderson, 2005).

Instructing ought to energize learners into building up an enthusiasm for learning and is something that is a piece of the life of a student since youthful kids are encompassed by innovation at home, in their group, and progressively, in early adolescence instruction programs. Practices of learning and education ought to adjust to the social requests of those included: the society, the teachers and the learners (Kompf, 2005). This should be accomplished by fusing practices and tools of ICT, for example, tablets and computers to build the motivation levels of students in the classrooms (Yuen, Law and Wong, 2003; Girasoli and Hannafin, 2008).

If looked at more broadly, the usage of ICT in education, it seems that there is a need to unwind the concept which encompasses ICT's usage as guidance towards learning and educating, and its effects on the performance (Alexiou-Ray, Wilson, Wright and Peirano, 2003). According to Girasoli and Hannafin (2008) these technologies extend educational access, emphasize the learning significance to the inexorably computerized work surroundings, furthermore, these technologies also raise the quality of education. The implementation of distinctive learning based technologies within the settings of a class everywhere around the globe proposes full appreciation for the potential advantages of ICT (Ching, Basham and Fang, 2005; Amutabi and Oketch, 2003; Loveless, 2003). According to Al Sharhan (2002) the immediate connection between the impact of ICT and scholastic performance of the learners has been the center of attention for many scholars amid the most recent two decades. These technologies help the learners to enhance the correspondence between their teachers and them, resulting in a better result in exams (Jimoyiannis and Komis, 2007; Higgins, 2003).

According to Gebremeskel, Kebede and Chai (2016) ICT likewise take into consideration the production of computerized assets like advanced libraries where the experts, teachers and the students are able to get their hands on research material and course material whenever they want to and whatever material that they require. Platforms like these permit the

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systems administration of scholastics and subsequently sharing of insightful material. This maintains a strategic distance from duplication of work. Utilization of ICT for learning purposes creates aptitudes and skills of higher levels, for example, teaming up crosswise over place and time and taking care of complex certifiable issues (Stanley, 2011).

1.1.3.2 Teachers' perspective: teacher training for ICT skills

It is important to mention that integrating ICT tools in education does not mean that the teaching process should be without a leader, the responsibility still remains for teachers to lead the process (Infodev, 2015 in Toit 2015). In order to improve the quality of learning it is essential to develop the teacher's capacity and different skills, particularly related to ICT. Having the digital literacy is one of the key elements that all teachers need in order to use new technologies efficiently in teaching process to encourage outcomes of scholastic performance.

It is worth noting that nowadays, most of the teachers are having information about ICT but they are not motivated enough to use it in the classroom. In traditional classes there is still the tendency that approach is teacher-centered rather than student-centered. Classrooms are lacking the digital hardware which is important to have while integrating ICTs into teaching process (Toit 2015).

International ICT in education argues that it is essential to take measurements for teacher trainings for using ICT in educational purposes at classrooms. But on the other hand from policymaking aspect it is obvious that different countries have different level of implementation ICTs in educational systems. For instance if the country have strong integration of ICT in education then there is more need for teacher trainings on a high quality level. But in countries where ICT implementation is less, it means just few schools have the infrastructure and the demand will be relatively less. Penetration is less whereby fewer schools have ICT in place, training demands will also be significantly less (UNESCO-UIS, 2009 in Toit 2015). But it also must be noted that ICT training for teachers should not be limited just providing the information about the usage of the technology itself, however also the training should focus on developing the methodologies and practices for using technology in teaching process at the classroom

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(Infodev, 2015 in Toit).

It is also important to capture that in Europe just 25% of students in secondary and 30% in primary school, are getting education from teachers that are trained because ICT training is obligatory for them (European Commission, 2013 in Toit 2015). Moreover, most of the teachers are getting ICT competences outside of the formal teaching trainings, so there is a need to make ICT trainings compulsory rather than optional part of the educational program. Furthermore there is evidence that teachers in Europe mostly are getting ICT skills during their free time, sometimes they are participating in the trainings provided by school administration or using online groups and communities (European Commission, 2013 in Toit 2015). However, there are also facts that teachers often refuse to take trainings. There are surveys carried out about ICT distance education trainings and evidence shows that teachers often perceive online courses as of poor quality (Toit 2015).

There is an interesting example from Uruguay schools, where teachers are not willing to accept ICT enabled distance training and the reason might be the lack of motivation, and lack of experience related to technologies. When ICT trainings were optional for secondary school teachers they had less participation rate, 10%, although primary teachers, for whom the training for compulsory they showed participation up to 87% (UNESCO, 2011a in Toit 2015).

1.1.4. Socio-institutional level – educational system and knowledge and innovation policies (innovation and educational challenges in developing countries)

While implementing ICT tools in primary and secondary educational practice, it is important to see the issue from broader perspective, particularly look into socio-institutional context. At first policymakers in developing countries should identify the framework for effective use of digital tools in their educational systems and see possible challenges. Key factors that might affect the integration process negatively, particularly: Infrastructure, capacity building, skills and competences of key players, content and language, policies and planning, financing and supporting the innovation. Policymakers have responsibility to define the context and see the specificities of the particular country; take into account the human and financial

resource capacity while implementing innovative tools (Tinio 2000-2002).

Liu & Pange (2015) conducted a study in Chinese context to identify the factors that hinder the integration of ICT in education. Data was collected from 46 early childhood teachers and data revealed that constrained financial resources, poor infrastructure, inadequate competencies and lack of awareness were most influential factors that hindered the ICT integration in education. Research suggested that government must address these issues before taking any major integration initiative (such as collaboration with third-parties to facilitate the integration) (Liu & Pange, 2015).

Also the fear that teachers have about technology replacing them in the classroom creates an additional barrier for technology integration, when teachers are the ones directly responsible for (Majumdar 2002-2006). The only way that teachers can see ICT differently is to provide them with proper knowledge of using new tools, understanding the fact that technology cannot function in learning process without educator leading it (European Commission, 2013 in Toit 2015). It is worth to note that financing ICT related cost in education is a huge challenge for developing countries. They have to balance the educational needs and goals with current economic realities. Decision makers tend to use private funds and donations but in fact ICT based programs does not last in a long run (Tinio 2000-2002). Good example is the case of Bangladesh, one of the developing countries that lack the recourses and proper infrastructure. Barriers include: poor organizational management, teacher's lack of ICT skills and competences, lack of technical support, proper infrastructure and maintenance, social readiness, internet access and lack of financial support (Shahadat, Mahbub and Kum 2012).

1.1.5 Summary

Paradigm shift in educational system changes teaching, learning and curricula by using ICT tools and creating the new learning environment which also requires a change in roles of the educators and learners. ICT is the essential tool for supporting the shift from teacher centered to student centered learning environment. New technologies have power to transform the educational system, integration of ICT does not mean the replacement of teachers by technologies, and moreover, it always puts pedagogy over technology.

In terms of **Technical preconditions** the most important factors are: having proper infrastructure and other needed resources like internet access,computers, computer labs, projectors.Computers should be placed in the classroom to maximaze the results of the curicculum activities (Ul-Amin, 2013).Content should be adjusted to specific society, having content in national, local language. Proper materials: interactive multimedia learning tools, audio and video programs. Providing chance to practice and learn basic ICT skills (Tinio, 2000-2002).

Change in teaching and learning processes: from face-to-face classroom training to virtual classroom training; simultations and virtual laboratories, real time tests and evaluations; changed role for the teacher – from controlling function to facilitating dialogue and collaboration; from teacher centred to learner centred paradigm, from reproductive model of teaching and learning to an independent learning that supports sense of initiation, creativity and critical thinking (Ul-Amin, 2013, Majumdar 2002-2006). Assesment and feedback are available easiely. Using ICT tools, spreedsheets for creating students lists for monitoring and keeping their academic performance, using multimedia applications, power point presentation for visibility. ICT provides flexibility in time, place and content selection. Flexible acces to resources, using learning management systems and software will benefit teachers (Majumdar 2002-2006)

Support for change in the educational system: financial support for appropriate human resourses, hirig technical support stuff, providing proper hardware and software. Software disigners should work with teachers to produce relevant programs (Shahadat, Mahbub and Kum 2012). ICT training for teachers, teachers need to have proper preperation before facing the

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challange of using digital tools in teaching process, being prepared will increase their motivation to integrate technologies in class, trainings will help them develop positive attitudes towards ICT applications (Toit 2015). Considering the developing contries ICT should be able to meet the needs of learners characterized by different socio-cultural conditions (Majumdar 2002-2006)

Performance: Better access, stronger learning motivation, better scholastic performance. Profound changes in the learning outcomes, (using multimedia tools during delivering lessons with face to face instructions). Developing problem solving skills, developing better anderstanding of systems, become socially aware and more confident, flexibility in time place and space (Majumdar 2002-2006)

Figure 3: Different actors of the system and key issues relevant for each in relation to e-Learning. *Source: Compiled by the author*

Key actors	Technical preconditions Proper infrastructure, internet, computer labs Content adjusted to specific society, in national language. Proper materials: multimedia learning tools (Tinio, 2000-2002; Ul-Amin, 2013).	Change in teaching-learning processes From face-to-face classroom to virtual, Teacher – from controlling function to facilitating dialogue; From teacher centred to learner centred paradigm, interactive &active collaboration, flexibility in content selection, flexible software to acces resources (Majumdar 2002-2006, Ul-Amin, 2013)	Support for change Financial support for human resourses, technical support, ICT training for teachers (Shahadat, Mahbub, Kum 2012; Toit 2015)	Performance: Better access, stronger motivation,better scholastic performance&learning outcomes Flexibility in time place and space (Majumdar 2002-2006)
Policy-makers	X		X	
School managers	X	X	X	
Teachers	X	X		X
Students		X		X

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Using ICT in education results the changes in teaching-learning enviroment. Traditional classroom enviroment has been replaced with virtual learning. The changes create more interactive inviroment between teachers and leraners and as a result there is a need to change educators and students roles as well (Majumdar 2002-2006). Below there is an illustration of paradigm shifts in learning and teaching (Majumdar 2002-2006)

Source: (Majumdar 2002-2006) Emerging Trends in ICT for Education & Training

Figure 4: Changes learners' Roles

Changes in Learners' Roles	
From	**To**
Passive Learner	Active Learner
Reproducer of Knowledge	Producer of Knowledge
Dependent Learner	Autonomous Learner
Solitary Learner	Collaborative Learner
Solely Learning Content	Learning to Learn/Think/Create & Communicate

Figure 5: Changes Teachers' Roles

Changes in Teachers' Roles	
From	**To**
Transmitter of Knowledge	Guide & Facilitator of Knowledge
Controller of Learning	Creator of Learning Environment
Always Expert	Collaborator & Co-learner
Learning to use ICT	Using ICT to Enhance Learning
Didactive/ Expository	Interactive/Experiential/Exploratory

When it comes to the effective use of technologies at primary and secondary education the important factor is teacher's attitudes and beliefs. For successful integration of ICT there is a need for educators to change the attitudes toward the nature of learning and teaching, the role of the teachers and the students in new envirroment (Shahadat, Mahbub and Kum 2012).

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1.2. The main criteria for assessing utilization of ICT tools and Its Benefits in Learning and Teaching Processes as derived from SCOT theory.

The theory of Social Construction of Technology was defined by Wiebe Bijker and Trevor Pinch (1987, 1995) which presents the idea that technology and society have influential effect on each other and might benefit from each other as well. Bijker (1995) argues how social structures can influence the development of technology and states that technology is constructed by society, influencing with its social features and shaped by human actions. In order to understand the reasons for rejecting and accepting the technology, it is important to take a look in social world and context. SCOT is not only a theory but also a methodology, which formulates the steps and principles to follow, while analyzing the technological development.

According to SCOT theory there are different phases where technology is shaped. The first stage of the theory is to reconstruct the alternative interpretations of the technology, analyze the problems these interpretations cause and connect them, the relations between groups and the artifacts. "*Each members of a specific social group share the same set of meanings, attached to a specific artifact*" (Pinch and Bijker 1987, 30).

According to Gebremeskel, Kebede and Chai (2016) social constructivist ways to deal with innovation developed as a lucid exploration program 20 years back contrary to determinism of technology. Bijker, Pinch and Clayton (2002) stated that in light of this perspective, social constructivist ways to deal with innovation showed how any given innovation a) has no natural, essential importance, yet has **interpretive adaptability**, and b) unexpectedly creates inside the talks and **clashes** of different social gatherings. In this manner, a specific innovation is nobody's static thing, but instead a 'heap of implications' that are challenged by various gatherings.

The achievement and "impacts" of an innovation is dependent upon the implications given to it by contending social gatherings as indicated by Bijker, Pinch and Clayton (2002). These gatherings can challenge the significance of the innovation since there is adaptability in how individuals consider or translate relics and additionally pose challenge to the configuration of the innovation as there is not only one conceivable way or one most ideal method for outlining

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an antiquity (Stanley, 2011). Considering this idea, and the SCOT theory that challenges the **fundamental metaphysics of dispersion studies,** one may conclude that innovation is not merely one thing alone, and that its dissemination could be evaluated (Bijker, Pinch and Clayton, 2002). The disseminations themselves could be of various sorts, working first and foremost with the idea that innovation, and usage of ICT as an educational tool also leads to the idea that **there is no fixed age for learning,** that it is in fact a lifelong process. In this scenario, it must naturally be inferred that e-learning has, for nearly a decade now, been an **integral part of the educational systems** in most developed countries. Children, as young as primary school goers, are allowed to play with apps, computer games and through videos and presentations that contain elements of both fun and education.

In the present day society of Information and technology, there is a rise of deep rooted learners as the time-frame of realistic usability of learning and data diminishes. Individuals need to get to learning with the help of ICT to stay parallel with the most recent advancements. In such a situation, learning, which dependably assumes a basic part in any social and economic development of a nation, turns out to be considerably more essential (Duffy and Cunningham, 1996; Mooij, 2007). According to Gebremeskel, Kebede and Chai (2016) instruction not just builds the profitable abilities of the individual, but it additionally increasing his/her power of acquiring. The different sorts of the product of ICT that are accessible and have importance for learning purposes include, CDS, audio cassettes, intuitive voice reaction framework, intelligent radio advising, radio communicates, TV lessons, sound conferencing, video chatting, email, and so forth have been utilized as a part of instruction for various purposes (Williams, et al. 2000; Ching, Basham and Fang, 2005; Mooij, 2007).

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1.2.1 Applying the SCOT theory: the key expectations in implementing ICT in education from the standpoint of key stakeholders

As discussed above, implementing ICT in Education is complex and multilayered. For successful results the integration process should be analyzed from different perspectives in order to identify the exciting barriers. The SCOT theory will be incorporated into theoretical framework as it is a great opportunity to rethink and understand how different problems are defined, interpreted and it also shows new ways of solving those problems. It is important to define different key players, or social groups, how they influence the meaning of the artifact, how they communicate with each other, how they identify the problems and find solutions. (Pinch and Bijker 1987).

The expectations are vary from different perspectives. Important factor to be considered is **teachers and students** approach to new innovation. Each school has different structure which affects the process of implementing innovation tools. That leads to the expectation that integration process requires realizing the changes in relationship between policymakers principals, teachers, students, parents and other key players of the society (Yuen, Law and Wong, 2003). **Students** are directly affected by the ICT tools used in classroom, with the expectations to develop their skills in problem-solving, analytical thinking, communication and collaboration skills which were not achieved by the traditional curriculum (Yuen, Law and Wong, 2003). **Teacher's** role is crucial as well, but on the other hand institution itself and leaders should create a platform for teachers to experience new pedagogical approaches with ICTs (Toit 2015). **School managers** are the key players while providing proper facilities and different possibilities for teachers to acquire new skills (Voogt, Knezek 2008). Lack of ICT skills among teachers is one of the main barriers in developing countries. From **policymakers** perspective successful integration of ICT tools in education is not only a matter of vision. Moreover, there is need to have appropriate plan, proper policies, following checkups which is the main challenge for developing countries (Shahadat, Mahbub and Kum 2012).

While analyzing the integration of ICT in education, context-specific characteristics should be taken into account. According to Shahadat, Mahbub and Kum (2012) one of the

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specificities of developing countries is that when implementing ICT in the system they face barriers such as: providing proper infrastructure, ICT training for educators, financing the resources. By using SCOT theory it will be possible to identify the challenges and problems that Georgian educational system is facing when it comes to ICT integration (Bijker, Hughes, Pinch and Douglas 2012). SCOT theory will be incorporated into theoretical framework to support the arguments and understand different interpretations. All things considered the SCOT theory is applied to examine the Georgian educational policy, in terms of integrating e-learning tools in teaching process and the provided literature adds argumentative support to the thesis.

Theoretical framework presented below was constructed based on SCOT theory and its concepts. Different social actors were identified responsible shaping the educational system in Georgia. In this study perceptions of policymakers and teachers will be analyzed. Framework will demonstrate that the theory can be applied to analyze different key players when it comes to giving directions to new technologies in developing countries. By applying the theory new approaches can appear to see how different, relevant social groups or institutions interact in society, depending how they define the product and what benefits they see. The concepts of the SCOT theory was beneficial to identify the prevalent problems while implementing ICT tools in Georgian education, that helped to draw conclusions from problem identification to the stabilization and closure.
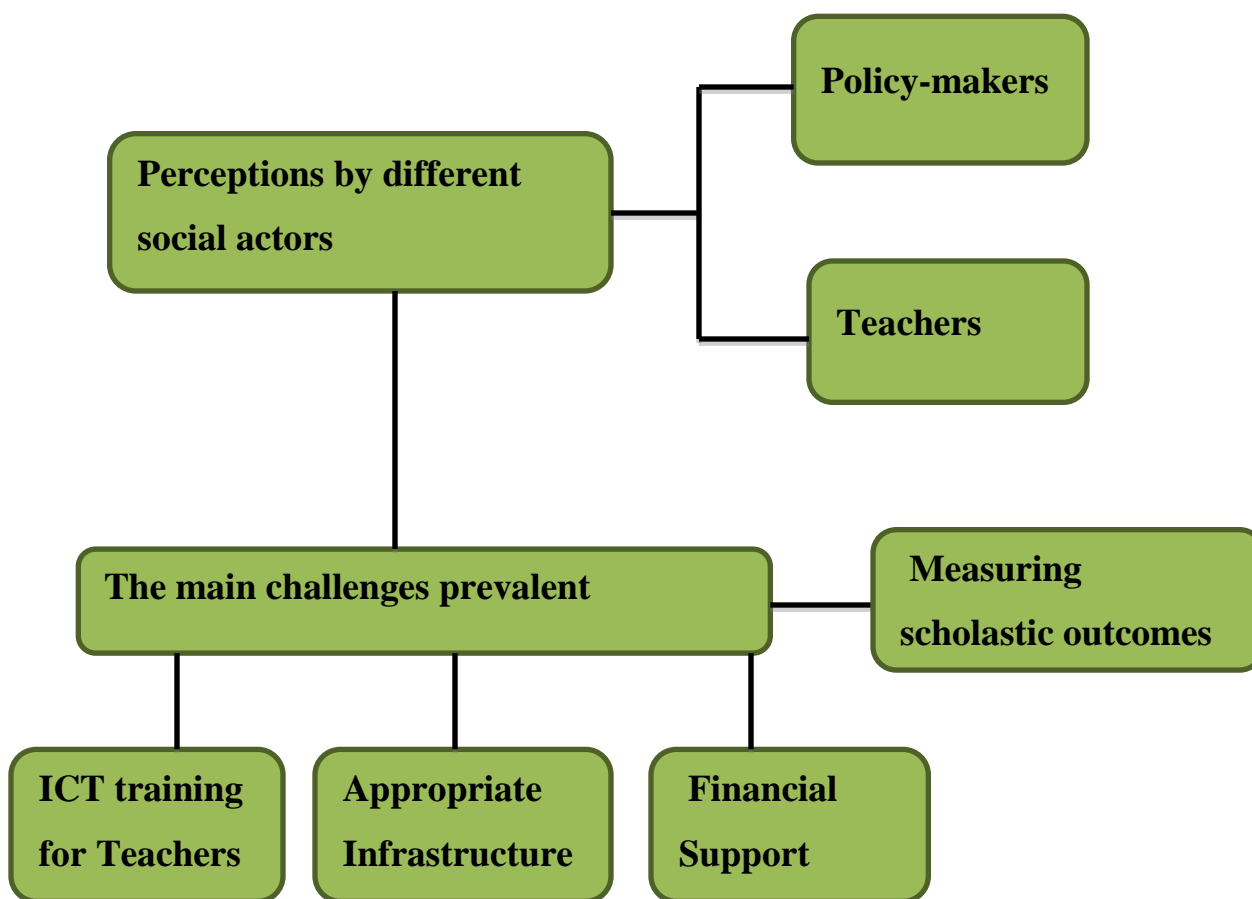
Theoretical Framework

Figure 6: The development of constructivist grounded theory.

  The above chart of theoretical framework elucidates the factors that are playing crucial role in shaping ICT development in Georgian education.

2. Empirical part

2.1. Stylized facts about E-learning in Georgia

Acknowledged with ICT, the task upheld by the government of Georgia as a new educational policy "Net-books for **Primary education**" was effectively actualized in the elementary schools all around the country (World Economic Forum, 2014). Inside the scope of the task all learners in the elementary schools have been furnished with the Net-books, intended to improve the learning procedure which is face to face and give them singular working space to ace new material clarified by an educator at class. For the schools of **secondary level**, the policy of "Virtual research facility" was executed (World Economic Forum, 2014). The point of this undertaking was conquering the absence of physical research facilities in characteristic sciences. For this, virtual research facilities were obtained for various schools, particularly for the schools in country districts. These research facilities are being utilized as a part of class, as a piece of conventional learning which is face to face. Numerous schools are utilizing e-assignments, e-grade books, e-journals with a specific end goal to make fruitful learning process by moving a few exercises into the environment of online based learning (World Economic Forum, 2014).

Through Georgia's Millennium challenge account, the government started a five year venture: Improving General Education Quality. The specialized exercises that were offered through the task were planned to supplement and upgrade the endeavors of the Ministry of education and science of Georgia. The program included: nonstop expert advancement of 7-12 grade instructors of all the important course including English, ICT, science, geology, arithmetic, and school pioneers and also other pertinent training work force; and classroom-based understudy appraisal. A five year teacher proficient improvement arrangement, initiated in 2014, incorporated a solid spotlight on ICT (World Economic Forum, 2014). The arrangement was co-built in a joint effort with different individuals from the government and Ministry of Education and Science of Georgia also different partners by a Germany-based counseling company named Gesellschaft für Organization, Planung und Ausbildung mbH (GOPA) (Republic of Georgia, 2011). The company was entrusted with planning exercises for the expert advancement of

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instructors, including teachers, principals, school-based proficient improvement facilitators (SPDFs), and mentors from different organizations from Ministry of Education and Science of Georgia (World Economic Forum, 2014).

Starting with a test case program, started in 2010, that gave away netbooks of around 2500 to students of 1st grade and their instructors, the legislature appropriated more than sixty thousand 'bukis', a confined adaptation of the Intel Classmate portable workstation which is manufactured by a technology firm based in Georgia (Bijker et al, 2012). A national instruction entry with the national language of Georgia is additionally accessible and computerized reading material and other instructive items are likewise pre-stacked on the gadgets themselves.

A national e-learning network was established by higher research and educational institutes across Georgia in 2012. The primary focus of this network was the advancement of e-learning at the national level and the backing of associations who are occupied with actualizing innovation improved learning in their instructive frameworks. A late action of the system was a progression of educational training for the delegates of institutions of Vocational Training keeping in mind the end goal to broaden the scope of online based learning (World Economic Forum, 2014). The National E-Learning Network is a part of Regional e-Learning Network (Georgia, Armenia, Azerbaijan), which was set up inside GIZ venture "Human Resource Development and capacity building in Caucasus (World Economic Forum, 2014).

2.2. Research methods employed and the sample of the case.

The aim of this research is to identify the perceptions of different social actors on usage of ICT tools in education, also to analyze the elements of educational systems affected by ICT and reveal the context-specific characteristics of developing countries. As the new knowledge materializes out of nowhere, it builds upon the findings of previous research and experiments. Both the primary and the secondary research are used for collecting data. Secondary data is collected from the different literature from the libraries, online educational journals, articles, magazines, newspapers and from webpage of the Ministry of Education and Science of Georgia.

In order to gather the data, **exploratory research** method is utilized. Exploratory research is mainly used for an examination of the subject for further insight. The main aim is to explore the boundaries of the new environment where the challenges or opportunities appear, also finding out variables relevant for the study. It seeks the explanations of problems and behaviors. The results from this research cannot be generalized and there will be opportunities for further study (Stebbins (2001). Relatively, the method is suitable for this study as the paper is interested exploring perceptions of different counterparts of the system. Since the study is focusing on only the case of Georgia, generalization is not possible, although there will be space for further research and analysis. The study only focuses the **primary and the secondary** level **public** schools, so it is unlikely that results can be used for private schools.

Qualitative method is used, as the main approach of the paper. According to Mahoney and Goertz (2006) a main goal of qualitative research is focusing on the individual cases and exploring the outcomes of the cases. Qualitative methods are used for deep understanding of the specific issue. Since the study focuses only the case of Georgia, qualitative method is appropriate for deep understanding of that particular selected issue.

Since the study is interested in expectations and perceptions of different social members of the system, qualitative survey is used to collect data. One of the main reasons using **qualitative survey** particularly, for this study is the advantage of using open-ended questions, which creates an opportunity for respondents to answer their opinion in their own words and provide rich information. (Jansen 2010). The study is exploring the two of the main key actors of the system: perceptions of **educators** and **policymakers**. When it comes to the integration of ICT, policymakers are the ones responsible for directing policies in a right direction, meaning allocating funds for infrastructure, providing ICT trainings and other needed resources to schools. On the other hand teachers play major role in integrating technology in teaching process to encourage outcomes of students' scholastic performance. Hence, the viewpoint of educators and policymakers are essential to explore. The questionnaires with open ended questions were sent to the teachers of **primary** and **secondary** education level and the representatives of the Ministry of Education and Science of Georgia. Since, the study is not focusing on the whole

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population of Georgia rather the small group of people **non-random sampling** is used. One of the advantages of the non-random sampling is the selection of small groups from the population. Mostly this approach is meaningful in qualitative research, despite its limitation that the results from non-random sampling cannot be generalized and will apply just the certain group of people (Johnson 2002). **Convenience sampling technique** is used. The reason for using this sampling is that samples are easily accessible and available. This technique is considered less time consuming and cheaper. This type of sampling is usually meaningful while focusing on measuring the validation rather than generalization of the research findings (Bhattacherjee, 2012). Teachers were selected from the different schools from the capital city of Georgia: school that the researcher graduated, teachers that were known by researcher and co-workers of those selected educators, mostly by using social media. As the situation is different in different regions in Georgia, the results are mainly focusing Tbilisi, the capital city. Out of 40 teachers 28 answered the questions. From Ministry of Education and Science of Georgia 2 representatives answered the questions, provided the supporting materials and other sources to find the related information. E-mail communication was used with representatives of the ministry.

It is important to mention the limitations of the selected methodology. Since this particular study chooses the single case of Georgia, research covers specific factors of the issue. The results of the study cannot be generalized to other countries. However this study allows for **further research** and the conclusions of this paper can lead to the hypothesis for future analysis for developing countries like Georgia.

3. Results

3.1. The perceptions for the usage of ICT in education by the side of different relevant counterparts

3.1.1. What kind of ICT tools and how are used for educational purposes

This was one of three broad themes emerged during the analysis of secondary and primary data. Analyzing secondary data showed that, in 2017 education and science committee is going to implement the legislative changes adopted in 2016 December, which imply implementing distance learning tools for educational purposes. Introducing distance learning is very important innovation especially for diaspora representatives, ethnic minorities and for people living in rural areas of Georgia. For that purpose the appropriate legal framework has been already created (InterPressNews, 2016). Ministry of Education and Science of Georgia introduced the competition to ICT teachers. The competition **"Digital and Media Literacy in School"** aims improving the quality of education and professional development of teachers by integrating innovative digital tools in teaching and learning processes. Ministry of Education and Science of Georgia is focusing on providing schools with, appropriate infrastructure and internet to enable the smooth implementation of ICT tools in the learning process (Ministry of Education and science of Georgia, 2013).

Primary date indicated that Georgian teachers have **positive attitudes** towards using ICT tools and they use internet and computers in the classroom. But not all of them are able to use them in the teaching process, because of lack of resources and e-skills. So above mentioned competition "Digital and Media Literacy in School" is definitely a useful step for educators. The survey results suggested that most of the Georgian schools were teaching ICT as a separate subject to develop the technical competencies. However, most of the Georgian schools haven't integrated ICT as basic curriculum requirement. Georgian teachers mainly use ICT tools for different purposes. For example: for printing exam materials and searching online resources to broaden their knowledge and prepare lessons.

"I am, using internet for gathering more information about my subject and also for preparing exam materials and tests"

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Some Georgian schools have resources to equip the students as well as teachers with **computer** and the **internet**. However, some of the schools can only provide their teachers with a computer and the internet. The response has clearly highlighted that there is further need to work in this dimension and assist the schools in providing access to their students and teachers simultaneously.

The secondary date also showed the results prove the effectiveness of the initiatives taken by Ministry of Education and Science of Georgia to facilitate the ICT integration process within the education. An example of these initiatives is the agreement between Microsoft and Ministry of Education and Science of Georgia to equip all the educational institutions with Wi-Fi. The plan for 2016-2017 academic years is to provide 32 schools in small and big cities of Georgia with **Wi-Fi technologies**, **office 365 Cloud Service** and other needed infrastructure (Ministry of Education and science of Georgia, 2016). Since the internet is available in all schools in Georgia it will encourage: information availability, enabling feedback among different educational institutions, improving students skills in searching, assessment and collaboration, accessing new teaching methodologies, E-labs for students and teachers and also sharing experience among schools in Georgia and also outside of Georgia (Ministry of Education and science of Georgia, 2013).

The empirical results are further supported by a previous study conducted by Richardson, Sales & Sentočnik (2015), that student and teachers have moderately **positive perceptions** towards educational use of technology. The research was conducted to assess the response of Georgian educationists towards emerging concept of usage ICT in classroom. The researchers stressed over need to conduct further research in this regard.

3.1.2 Required resources and presumptions for integration of ICT

3.1.2.1. Existence of proper ICT infrastructure

Sources report that Georgia has started integrating computer-assisted instruction in educational institutions and has learner to computer ratio of 7:1 at **primary and secondary level**. Integration of ICT in education requires the development of basic computer competencies. It has also been reported that approximately 31 percent to 33 percent of Georgian **primary and secondary schools** have fixed broadband (UNESCO, 2014).

According to secondary data, Ministry of Education and Science of Georgia took initiatives for ICT integration in educational system. One of them was national project "*The Deer Leap Programme*" intended to create an appropriate infrastructure and building capacity to support the modernization of the educational system in Georgia. Several accomplishments that the project resulted in 2008 were:

Provided infrastructure for ICT: around 26 520 computers were sent to schools with Linux operating system and open-source software. 60% of all primary and secondary schools were provided with internet access

Provided ICT support: School managers have hired support stuff for administrating and controlling ICT infrastructure (Deer Leap Programme 2005-2008).

One of the activites of ''*Millennium Challenge Corporation*'' project includes the support for schools to improve the learning environment, by providing the proper equipment and infrastructure to about 130 schools (Richardson, Sales & Sentočnik, 2015).

In primary data, some major policy initiatives were mentioned to assist the integration process, including: **"One netbook per child program"** for primary education, creation of some electronic educational resources, integration of ICT in all subjects at elementary level, teaching ICT as separate subject to grade 5 and 6 students and training **primary school teachers** to handle the advanced ICT tools (Ministry of Education, 2015).

Policymakers commented:

"Computer labs are controlled by the school administration and are often not freely available. Some high tech computer labs (called Future Labs) may be underutilized due to poor infrastructure and limited teacher training"

"There are several ways in which change in ICT education is envisioned to occur. For example: change in school infrastructure, educational equipment and teaching materials"

3.1.2.2. Development of skills required for ICT integration

Secondary data showed that, effectiveness of participation in professional development activities has been proved by previous researchers in context of ICT integration. Lean, Moizer & Newbery (2014) proposed that active participation in these activities resulted into **enhanced confidence, increased motivation and willingness** to use latest technology within the classroom. However, effectiveness depends on the quality of training and development offered to educationists. Recently, Ministry of Education and Science of Georgia has launched various training and development programs to build the readiness of teachers. **"*The Deer Leap Programme"*** is one major initiative taken by government with the participation of Estonian as well as local experts, in this regard in 2005 (Deer Leap Programme 2005-2008). The project resulted:

Provided ICT training for teachers: Nationwide, 21 540 teachers have completed computer literacy courses.

Developed Digital learning resources: For different subjects 310 web-based resources were created. Students from social science project developed 70 web-sites. Schools have been published 70 web based journals.

According to action plan and e-Georgia strategy 2014-2018, in order to improve digital competences of teachers, special ICT trainings are provided. For encouragement teachers are getting credits for participation in the trainings. Approximately, 50% of the 65.000 teachers took the basic ICT skill training and 30% the advanced ICT training which includes the learning methodologies of using ICT in the classroom (e-Georgia strategy 2014-2018).

The primary date showed that majority of Georgian schools made the participation in **ICT training** mandatory for educators. Whereas, some of the educators said that there was nothing like that in their educational institution. However, the majority of respondents

confirmed, the adequacy of ICT training initiatives. The results proposed that some of the teachers received subject specific training on learning applications that included planning projects and classes, also training on pedagogical usage of ICT. Some of them just had basic training on internet usage and operating general applications. A noticeable minority contended that they didn't receive any training. Results definitely indicate potential area for Ministry of education to improve. The respondents contended that participation in ICT trainings was **highly effective** and it enabled them to effectively develop high-quality lessons for class. One respondent commented:

"After having training, teachers are more comfortable with using computers and the internet in the teaching process. They can plan and conduct the lessons more effectively"

Another respondent said:

"Teacher can easily access the information, sort them and it is easy for visualization"

Educators acknowledged the programs designed to train young teachers and offer them the opportunity to develop their technical competencies. Some commented that impact could be measured by **observing the in-class behavior**, participation and academic output of students. There is need to conduct observational research studies within the schools. Educators also highlighted that ICT integration is dependent on the location of the school. In case the school is in a high mountainous area, then it would be difficult to use the ICT tools within the classroom due to **unavailability of required infrastructure.** Educators highlighted the barriers: insufficient number of computers and lack of adequate skills of teachers was the main issue. Also, **low internet speed**, **lack of content in Georgian**, **insufficient pedagogical support** and the **aged and incompetent teachers** were the main hindrance in ICT integration:

"We have a lot of older teachers, who do not have any education in this regard, and for them to arrange classroom with computers will be just decoration and nothing more."

Special focus is given to skills development of math and science teachers due to their subjects' importance. Moreover, the Ministry of Education and Science of Georgia has started offering subsidized training for teachers, also offering international projects like: Millennium Challenge Corporation, G-PriED and teacher development initiatives to meet the ICT

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requirements of Georgian educational sector. In new national curriculum, ICT will be taught separately from grade 7-9 students. Future actions include: developing distance education platforms, piloting "**Computer/Robotics/Technology Clubs**", promoting partnership between universities and schools to share innovative ideas and creating open education resources (Ministry of Education, 2015).

3.1.2.3. Proper financial mechanisms in place to support ICT integration

The effectiveness of the ICT integration process depends on proper financial support from the state government. Without having funds it is impossible to provide all the schools with proper infrastructure or offer teachers professional ICT trainings. Analyzing the secondary data showed that according to, the agreement between The Ministry of Education and Science of Georgia, and Microsoft, Wi-Fi and the required infrastructure will be implemented in Georgian schools. In order to smoothly integrate technologies and internet in the educational practices Microsoft will ensure to provide materials, content and share experience with school managers and teachers. Seven years corporation between Ministry of Education and Science of Georgia and Microsoft has resulted trainings, conferences and professional seminars for successful integration of technologies.

Also the initiative came from the agreement to **allocate funds** to provide all the first grade students with computers, implementing latest office software to support the learning and teaching process (Ministry of Education and science of Georgia, 2016). Georgia is considered as an exemplary country that has substantially decreased its learner to computer ratio at the national stage. The government launched ambitious **Deer leap program** with an objective of providing computers, educational software, complimentary services and necessary technical support to all schools and ensure full ICT incorporation across the curriculum. In Georgia, ICT integration was supported by multiple parties, including teachers, professors, private partners, civil society, elected officials and government members. **Sizeable budget** and systematic planning have assisted the country in modernizing outdated computer systems the project was **financed** from the **state government** and also from the **private sponsors** (UNESCO, 2014, Deer Leap

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Programme 2005-2008)

According to action plan and e-Georgia strategy 2014-2018 there is a potential for ICT to foster, as many promising initiatives and projects are introduced. Government plays a huge role in the development process as Ministry of Education and Science of Georgia can provide finances to support the integration process. By **allocating funds**, the government highlights the importance of the selected fields and makes the implementation process easier. It enables having qualified trainings and needed infrastructure in educational institutions (e-Georgia strategy 2014-2018).

According to primary data, there were mentioned system level barriers that hinders the ICT integration in teaching and learning practices. One of the respondent commented:

"There are barriers that may arise when integration ICT in teaching-learning such as: lack of finances in the budget for education and also diverse visions for ICT use in education among different stakeholders including Ministry officials, school leaders, teachers, parents, and students that need to converge"

3.1.3 Perceptions towards effectiveness of ICT integration on teaching and learning processes and its measurement

Another major theme emerged from the analysis was perceptions of respondents towards the effectiveness of ICT integration in education. To measure the response in this dimension, the educators stated that teachers are **ready and willing** to adapt their teaching process according to changed scenario. Based on empirical data, Georgian teachers are willing to integrate the ICT; however, some of them are unable to make an effective use either due to lack of adequate resources or competences. ICT integration has a **significantly positive effect** on the academic performance of students. The efficient use of ICT within the classroom makes the whole learning process more effective. One respondent commented:

"The teaching and learning process becomes more informative and interesting; also, the teaching material is diverse and easy to learn. Students work independently and are more motivated."

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Educators also mentioned active usage of ICT is highly effective during an **examination or test taking**. The advanced technological system has improved the monitoring and visibility, strengthening the control of invigilator on the students present in the examination hall. Hence, students remained active and focused in the class. Respondents commented:

"Gathering, sorting and using information is way easier and faster by using ICT tools."

"Nowadays it is impossible to imagine teaching/learning without any ICT tools."

The respondents specifically highlighted the effectiveness of ICT tools in enhancing the teaching process and consequently enhanced self-confidence of students. Also vast experience and exposure to ICT integration positively effects the future development and academic performance of students. ICT is highly effective while teaching a **foreign language**. One respondent commented:

"It is impossible to teach foreign languages without using video and audio materials, so yes the usage of ICT is very effective."

"It effects positively, as the new generation is very good at computers, they like to learn through advanced technology."

The respondents further commented that Georgian national education goals aim to enable each Georgian student to use latest ICT tools wisely right from the young age. Moreover, there is a need to develop a system that could facilitate such usage from early school age. Old monotonous teaching style has become outdated in area of ICT and teachers are left with no choice other than adapting their teaching styles according to the requirements of modern world. One respondent commented:

"The modern era is impossible without a computer; we have to adapt to the needs of learners. Student-oriented teaching helps their future development."

Some respondents also highlighted the weaknesses of the system by contending that currently, schools lack adequate resources to provide the latest ICT tools to all classes at the same time. It rarely happens that most of the classes get benefit from technological integration simultaneously. However, most of them had high hopes for future.

From policymakers' perspective, results contended that ICT cannot compensate the

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inefficient teaching practice. The biggest challenge in the integration of ICT is to change the **attitude and teaching style of teachers**. Major transformations in teaching methodologies are required to integrate the ICT into education effectively. However, transformations will require substantial time and wouldn't occur in the short run. A few training sessions, workshops and seminars cannot entirely change the attitude towards educational technology. It requires the development of professional networks for teachers to share the experiences and an on-going support from institution and government.

"Promoting student participation, development of competencies such as scientific thinking and problem solving skills with ICT in all students require a substantial transformation from teachers. These changes are neither simple nor quick, and do not happen from attending a few-day seminar, workshop or training sessions"

Some important steps taken by the Ministry of Education and Science of Georgia were also discussed, including enabling all stakeholders to access ICT for educational purposes, allocating adequate funds to support the ICT integration for education innovations and empowering the school leaders for disseminating ICT usage within their educational institution.

3.1.4 Measuring the scholastic outcomes: Impact of ICT on learning achievement

According to primary data, educators stated that it is possible to measure the effect of ICT as technological integration results into enhanced students' self-confidence that consequently results in improved scholastic outcome. However, others negated the notion and said that impact of ICT is abstract in nature and cannot be directly measured. Some respondents said that currently, schools lack an adequate monitory mechanism to measure the effect of ICT on learning outcomes. Overall, it was evident that majority of respondents regarded the effect as **tangible and measurement process possible**. Experimental compare suggested as one potential measurement tool to assess the tangibility of impact. One respondent commented:

"Yes, it is possible to measure, as we can always compare two classes, one with using

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ICT tools and the other with the traditional style. During the class, there should be an observation on students how they are involved in activates, if they are motivated and active if they have space for the initiative to express their ides. It definitely affects their performance positively".

Some respondents commented that impact of ICT on students' scholastic outcomes could be measured by **developed small monitory groups** that would be responsible to keenly observe the effect of technological integration on the overall performance of that class. Such monitory groups should comprise school IT manager, a teacher and representatives from subject departments. Comparison of both subjects (one using ICT tools and other using traditional teaching methodologies) could produce tangible results proving the effectiveness of ICT in an educational context. Some respondents stressed the need to conduct internal research to accurately measure the outcome. One respondent commented:

"From the fact that, ICT tools are not integrated fully it is not easy to talk about it; however, you might have a good outcome."

Overall, the respondents regarded the impact of ICT on learning outcomes of students as **highly effective**. Integration of ICT tools motivates the students to take active participation in various learning activities and get actively engaged in an overall learning process that also reflects in the academic performance. Educators suggested to conduct an internal research, to compare the classes (one using ICT tools and other employing traditional methodologies), and to formulate the monitory groups to measure the influence. There were some respondents that regarded the impact nature as abstract and difficult to measure due to inadequate resources.

Al-Qahtani & Higgins (2013) propose that there is a significant difference between blended-learning, e-learning and traditional class-room learning. The learning effectiveness is higher when teacher effectively blends the modern technology into traditional instructional approaches. The findings confirmed that effective technological integration assists the teachers and students to accomplish their teaching and learning objectives.

From government representatives mixed response was received. The findings support the existing literature as researchers are also debating about the effectiveness of ICT in this regard

(Richardson et al 2015, p.20). Respondents said that ICT has an indirect impact and it's hard to develop and measure a direct causal relationship between both variables.

"Integration of ICT is a nature's choice, and with the passage of time, its integration is becoming unavoidable."

Empirical data showed that impact of ICT is more visible in some areas (like mathematics, language learning and science) than others. Integration of advanced technology in science or math curriculum shifts the teachers and students' focus from some basic skills (like mental visualization, memorization etc.) which are still essential in the modern era, to modern competencies (such as simulation, modeling, synthesis, etc.).

"Thus ICT integration should be viewed as a requirement rather than an option"

Assessing the impact is also difficult since learning paths of students are different, where some students possess strong innate visual uptake while some are weak in this regard (World Bank, 2015). Moreover, teaching styles also differ, resulting in a highly varying impact on outcomes. It is recommended to conduct **observational experiments** to determine such influence. One respondent commented:

"Using smaller scale studies, with classroom observations and teacher interviews along with the formative (or classroom) assessments would be the better way to explore such influence."

3.1.5. Impact of political, socio-economic situation on ICT integration in a developing country

In terms of the impact of the political and socio-economic situation, on the integration of ICT, the empirical data showed that, unstable political and economic environment hinders the integration process. One educator commented:

"Of course, the country's economic situation directly affects the educational system. Because of the limited financial recourses, the government cannot pay attention to education and especially the implementing innovation at schools, which requires huge amount of finances."

The **poor economic situation** results into material shortage that has a chain effect. Socio-economic status determines the salaries of teachers. Lower salaries cannot attract the competent

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workforce in the educational sector. Lack of **competency** will be reflected in the overall teaching process. The teacher hired on low salary is usually media and digital illiterate. Though these competencies are considered mandatory in documents, nevertheless, execution in real world context is highly challenging. One respondent said that digital illiteracy coupled with media illiteracy leads towards political aspects. It was also mentioned that information dissemination is not an issue, rather inadequate critical thinking skills is a big problem.

"This is a solid ground for the development of information and communications networks, as a propaganda weapon to use and achieve results. So, I think, that these components are closely connected."

Georgia is seeking to develop a **democratic environment, effective ICT policy and high digital literacy.** Educators gave recommendations to Ministry of Education and Science of Georgia: increase teachers training programs, providing at least one computer in each class, increasing funding for infrastructure, raising teachers' salaries, improvement in school labs, internet connection in each classroom, providing IT support for timely maintenance of IT infrastructure and development of monitory groups to ensure that school labs are being used. One respondent commented:

"First step should be the ICT training for teachers and then the equipment for the schools. The government should allocate funds for training teachers and upgrade the infrastructure at schools".

Policymakers highlighted the fact that Georgia has been developing and having democratic transition processes, economic reforms for last 26 years and of course the changes is happening in education as well. In educational policy making process there are several groups shaping the policies: **Democracy, Economic Globalization and National state and Personal, Development** as the influential factors for defining the reality in modern educational system. One of the main priorities for Ministry of Education and Science of Georgia is integrating ICT for improving learning outcomes and results in education (Ministry of Education and Science of Georgia, 2015). There were mentioned few aspects that influence the policy for ICT in education, that needs to be taken into account:

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- Ministry of Education and Science of Georgia is implementing reform which initiatives on bi-lingual education to support ethnic minorities in Georgia. For better integration of ethnic minorities into the society they should have right to get education in their native language.

- Barriers that occurred after disintegration of the Soviet Union: Ethnic conflicts, democratic and economic transition which limits the possibilities and creating threats for country's stability.

There was mentioned post-conflict reconciliation process which is affected by education policies and practices including ICT. Educational policies are aiming to support the integration and reconciliation. Teachers have a crucial role in education reconstruction; especially in post-conflict settings (World Bank, 2005; p. 49) Overall effectiveness relies on certain contextual characteristics and ability of government to address the challenges associated with integration. Gebremeskel, Kebede and Chai (2016) proposed that ICT integration requires active collaboration among key stakeholders, including government, teachers, students and parents.

Respondent stated:

''Cultural values and "various manifestations of 'identity' and 'memory' are produced and reproduced within and through historical narratives in schools, and experienced by students, teachers and communities" (Bekerman & Zembylas, 2012, p. 5).''

According to empirical data, infrastructure, lack of financial resources and lack of teachers' professional ICT trainings were mentioned as the main challenges for ICT integration in educational system in Georgia

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4.   Discussion

This study analyzed the perceptions of different actors of the system in terms of using ICT in primary and secondary school education. Also, revealed the challenges that Georgian educational system is facing when integrating technologies into education. In this thesis school **teachers** and **policymakers** are explored. Based on the responses it can be said that Georgia is still in the process of integrating ICT and government is taking an interest in its development. There are **three main results** derived from this study. **First**: most teachers are willing to integrate the ICT, however, some of them are unable to make an effective use of technologies either due to lack of adequate resources or lack of required competencies to use advanced technological tools for the educational purpose. **Second**: There were identified the context-specific characteristics of Georgia, in terms of challenges that Georgian educational system is facing such as: resistance from teachers to change attitudes toward technologies and adapt their teaching style, insufficient internet connected computers lack of finances for proper infrastructure, lack of adequate competencies of teachers to make an effective use of available resources. **Third:** as mentioned above, the most hindering factor for teachers and for policymakers is teachers' incompetence to use technologies, so for successful integration of ICT in education there is need to provide teachers with processional ICT trainings. Which will increase their motivation and self-confident to change attitudes towards ICTs and use them regularly in the classroom. The government has taken several initiatives including subsidized teacher training programs, development of online teaching resources, allocating funds to educational institutions for arranging training sessions and collaboration with international projects to assist the integration process.

The results of this study offer important practical implications. The underlying study has attempted to assess perceptions of educators and policymakers towards ICT effectiveness and highlight research areas needing further exploration. **Qualitative methodology** has resulted into in-depth insights pertaining to overall assessment of ICT integration in Georgia's educational environment. The results suggest that there is need to conduct further studies to prove the effect of ICT on educational outcomes and develop a direct causal association. Study allows for further

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research and for future analysis for developing countries like Georgia. Other developing countries will be able to use results of this research in terms of realizing the challenges that might occur while ICT integration in education. Example of Georgian case showed the main barriers that country is facing: providing **proper infrastructure** to all schools, **lack of financial support** and **ICT trainings** for teachers are the main hindering factors.

Results can bring important changes in existing policies pertaining to **resource allocation** and development of **monitory groups** to measure the effect of ICT on learning outcomes. Using smaller scale studies, with **classroom observations** and teacher interviews along with the formative (or classroom) assessments would be the better way to explore ICT influence on academic performance.

5. Conclusion

The objective of this research was to investigate the perceptions on using ICT tools in **primary** and **secondary** education by different counterparts of the system, also to identify the **context-specific characteristics** of developing countries when integrating ICT in education. The research also focuses on finding the **challenges and the barriers** that Georgian educational system is facing. The study was interested in identifying the social groups influencing the technology development and capturing teachers' views and attitudes toward the technology, computer use and its benefits in learning and teaching processes.

The analysis was done by incorporating and applying the **SCOT** theory and its concepts. **Different key players were identified responsible for influencing the educational system in Georgia. In this study perceptions of policymakers and teachers were analyzed.** As all the social actors are affected by ICT they perceive the innovation depending on what positive or negative sides they see which creates different perceptions and expectations. **SCOT conception** proposes that technical design of a product doesn't determine its educational effectiveness; it is the ability of the person to make an effective use of that device. So teachers should integrate ICT in their pedagogical practice, as an additional useful tool to improve the teaching quality, which

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means that the educators have power over technology. The SCOT theory was suitable and beneficial for the analysis. However, the framework can be developed further by adding the section for better exploring the ICT influence on academic performance.

It should be noted that if the methodology had been different, the study would show different results. The qualitative method used in this study was intended to analyze certain areas in depth, which cannot reflect to overall situation. Moreover, the samples were chosen only from Tbilisi, meaning it cannot represent the situation of other schools in different cities.

The study concludes appropriate infrastructure, financial support, ICT trainings and teachers positive attitudes are important factors for successful integration of ICT tools in education. Educators expressed willingness and positive attitude towards using ICT in the classroom. However it remains unclear whether they are ready or not for technology use in teaching process. Yet some findings contradict this factor. One of the main challenges highlighted by policymakers was lack of cooperation from school teachers and resistance to change due to negative attitudes. Results can also help policymakers as well as teachers to understand perspectives of each other. The active interaction among various social groups may result in the construction of unified meaning and purpose of using advanced technological tools in education.

Overall, ICT integration in the educational sector, particularly in primary and secondary education is perceived to be highly effective and efficient by academicians as well as policymakers. To summarize, however implementation of ICT in education is a complex process, the collaboration of key players can lead the successful results.

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ICT & EDUCATION

Annex

Questionnaire for policymakers:

ICT- (information and communication technologies)

Name: **Family name:**   **Position:**

1. In context of Georgian education, what are the major planning and policy issues in ICT *(information and communication technologies)* integration? What are the short and long term visions?

 2. In context of education, what are the major policy execution and implementation issues in ICT integration? (e.g. infrastructure, financial issues, lack of training staff etc.)

 3. What are the required resources and presumptions for integration of ICT in education? Are they of good quality? If not, what challenges you face?

4. Do you face equity issues while integrating ICT in education? (e.g. students with social problems, disadvantaged, low-income families or people living in rural areas). If so, what remedial actions are taken?

5. What challenges do you face in integrating ICT in educational institutions? Do challenges differ according to educational level?

6. What is the readiness level of educators and learners? Do you face resistance during the integration process? If yes, what remedial actions are taken to overcome the resistance?

7. How does exposure to and use of ICTs in education affect student's academic performance and future development?

8. Is it possible to measure the scholastic outcomes of the students while using ICT in learning processes? What are the impacts of ICT on learning achievements?

9. Is there any way to measure outcomes of ICT use by teachers resulting from participation in professional development activities?

10. What is the impact of country political and socio-economic situation on ICT policy making and implementation as Georgia is developing country?

Questionnaire for teachers:

Name: **Family name:**   **Name of school:**

1.How long have you been teaching (at any school)?

Less than 1 year

1-3 years

4-10 years

11-20 years

More than 20 years

2. How often do you use computers and/or the internet in your classes?

Never

Rarely

Sometimes

Often

All the time

3.How is ICT taught to classes in your school?

ICT is taught as a separate subject

ICT is integrated in my subject because I choose to do so

ICT is integrated in my subject because of curriculum requirements

ICT is integrated in several subjects

4.Do you use computers and/or the internet for the following activities?

Preparing lessons

Class teaching in front of/with the students

For printing exam materials

Looking for information and other recourses in internet

For improving the school materials

Other

5. When you use computers and/or Internet during class teaching in front of the

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students, which equipments are available?

Students are equipped with computers and/or Internet

Only the teacher uses a computer and/or Internet

Both, teacher and students, use computers and/or Internet

6. **Is participation in ICT training compulsory for teachers in your school?**

Yes

No

I have never had ICT training

7. Have you ever undertaken professional development in the following areas?

Introductory courses on internet use and general applications (basic word-processing, presentations,)

Courses on the pedagogical use of ICT in teaching and learning

Subject-specific training on learning applications (planning classes ad projects)

Teaching ICT as a subject

Other

None

8. Do you think that the teachers are willing to learn the new skills about ICT and integrate   in teaching process in classroom?

Absolutely agree

Partially agree

Disagree

9. Do you think that using ICT in teaching process positively affects the student's academic performance? If yes how?

10. What are the barriers for using ICT in teaching/ learning process?

11. How does exposure to and use of ICTs in education affect student's academic performance and future development?

12. Is it possible to measure the scholastic outcomes of the students while using ICT in learning processes? What are the impacts of ICT on learning achievements?

13. Is there any way to measure outcomes of ICT use by teachers resulting from participation in professional development activities?

14. What would you suggest to ministry of education and science of Georgia in terms of developing policies for integrating ICT in schools and supporting teachers to acquire appropriate skills?

15. How do you think, what is the impact of country political and socio-economic situation on ICT policy making and implementation as Georgia is developing country?