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ICT, EDUCATION AND DEVELOPMENT: A REVIEW

Globalization and the changing world economy are driving a transition to knowledge-based economies. In particular, developing countries need knowledge-based economies not only to build more efficient domestic economies, but also to take advantage of economic opportunities outside their own borders. In the social sphere, the knowledge society brings greater access to information and new forms of social interaction and cultural expression. Individuals therefore have more opportunities to participate in and influence the development of their societies (UNESCO, 2004).

It is commonly thought that knowledge has replaced industrial organization and production as the major source of productivity.The term 'Knowledge Society' generally refers to a society where knowledge is the primary production resource instead of capital and labour. It may also refer to the use a certain society gives to information: a knowledge society 'creates, shares and uses knowledge for the prosperity and well-being of its people'(Evers, 2003). All researchers owe a debt of gratitude to those who have gone before for the knowledge that have contributed. This chapter examines a representative range of literature on Information and Communication Technologies (ICTs) in developing countries, ICT education, ICT in teaching and learning from Indian perspective. Different researchers have defined ICTs in a number of different ways. The combination of both terms i.e.,"information and communication" took place in the 1980s to emphasize the merging ofboth technologies (Ong, 1998). Thus ICT refers to a range of technologies for gathering,storing, retrieving, processing, analyzing, and transmitting information. ICT includes butis not limited to technologies such as the Internet, mobile telephony, satellitecommunications and digital television over cable or aerials. Additionally, use of the term"information communication technologies" (ICT) is preferred over the term"Information Technology" (IT) or "Information Systems" (IS) in the context of thisresearch. How information is communicated is just as important as how information iscollected, stored and shared (Yildiz, 2007). Therefore, for the purpose of this research,the term "ICT" is used as an umbrella term which includes any

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communication device orapplication encompassing: Internet, cellular phones, computers, radio, television,network hardware and software and satellite systems, in addition to the various servicesand applications associated with them, such as videoconferencing, e-learning, e-governmentand online databases. The following matters are considered:

- Information systems in developing countries.
- ICT education including history, current issues and debates.
- Indian education system.
- The hopes and expectations of practitioners, school systems, policy makers and other stakeholders.
- School and school system governance and how these impacts on policy implementation.
- Implications for professional learning to support the use of ICT in classrooms.
- Bridging digital divide with ICT.

The aim is to provide insights to support planning and implementing initiatives to design, develop and implement effective and efficient teaching and learning practices enhanced by the use of ICT's.

HISTORICAL AND CURRENT PERCEPTIONS OF INFORMATION TECHNOLOGY

To begin with historical outline of the role of education, it starts with examination of the philosophyof technology and the position it holds within society. This begins byoutlining the frequently dystopian portrayals regarding the impact oftechnology that were prevalent in the mid-20th century. The researcher contrast this with the naive optimism now espoused by certain commentators, somewhatreminiscent of early 20th century thought. Within this setting the researcher, argue that theincreasing influence of ICT within developing countries necessitates a stanceof critical engagement to ensure that the benefits of new technologies aremade available to those who need them most, rather than only those whohave the economic resources to access them.

Impact of Information Technology

The emerging digital age has been labelled as a 'new technological paradigm'with current advancements in ICT heralded as being of greater significancethan both the industrial and print revolutions (Castells 2000) andtechnology promoted as being potentially the most significant agent ofchange in the modern world (Chambers, 2005). As Floridi (2002) asserts,'no

previous generation has ever been exposed to such an extraordinary acceleration of technological power over reality with the corresponding socialchanges and ethical responsibilities'. He goes on to note how ICT has beenpromoted to become 'the characteristic technology of our time, factually,rhetorically and even iconographically' (Floridi 2002). This is further developed by Wagner (2009) in the specific context of poverty. Henotes: 'In an era of increasing globalisation, there is no social and economicdomain where one feels a greater pressure of rapid change than that oftechnology. And, there is no domain where it appears that the gap betweenrich and poor seems to be laid bare so starkly'. Such dramatic claims,although contestable, serve to demonstrate the magnitude of thetechnological shifts occurring. It is therefore necessary to acknowledge thecomplex and contrasting implications they embody for society, andspecifically developing contexts (Castells, 2000).

In order to build a foundation from which to determine the most appropriateapproach for monitoring and evaluating within the context of ICT ineducation, it is necessary to engage with the progression of philosophicalunderstanding regarding the relationship between technology and societaldevelopment. The conclusions of such a discussion form a vital foundationfor understanding why and how monitoring and evaluation are undertaken,rejecting technological determinism and advocating a stance of appliedcritical engagement. The practical job of assessing the use of ICT in education in the current area of study is founded upon, and driven by, the underlying, often subconsciousphilosophies of technology that stakeholders adhere to. It therefore followsthat undertaking rigorous and effective monitoring and evaluation isdependent upon a more conscious engagement with the implications of these foundations.

Philosophies of Technology

Technology and associated innovation was perceived in Greek philosophy asdistinctly inferior to the immutable arts. There was widespread suspicion oftechnological innovation throughout this period with 'the sphere of technicalaffairs … something that persons of the ruling classes sought to avoid' (Winner, 1995). Only within the modern capitalist structure of post-Enlightenment Europe has technological innovation attained a position ofcentral value within the ethos of society, primarily due to its significantpotential for wealth generation. Since this time, the increasing momentum oftechnological innovation and its potential consequences for both individualsand society has been the subject of sustained philosophical debate.

Conceptions of the role of technology within society in the early 20thcenturywere defined by a broadly uncritical, although not unregulated, perspective (Dewey, 1930). This optimism was in contrast to later theorists,exemplified in the Frankfurt School, disillusioned through witnessing thedestructive power of technology and crafting a dystopian critique

inopposition to an increasingly technological society. Significant and frequentlypolemicised theses regarding the place of technology within society weredeveloped by a succession of philosophers during this period. For Ellul (1964), the increase of technological domination had impact at a morefundamental level than any official ideology with which a society may alignitself such as liberalism or socialism, eclipsing all else and inculcating 'theabstract concept of the economic man'. This was reflected in McLuhan's (1964) conviction that technological progress was initiating 'the finalphase of the extensions of man', increasing negative autonomy and isolation and reducing humanity to the point where man simply constitutes 'the sexorgans of the machine world' (McLuhan, 1964). This is grounded inHeidegger's (1954) assessment of technological advancement as afundamental violation of humanity, constituting a central dimension of hiscritique on the Platonic ontological foundations of western society. Morerecently, related emphases have been sustained by Postman (1992) whosuggests that current social and cultural values have become subservient tomodern technologies, especially the computer, leading to the destruction ofhumanity through removing all ultimate meaning, direction and purpose.

The outworking of dystopian portrayals such as those illustrated necessitatesa rejection of technology due to what is perceived as its intrinsicallydominative and destructive nature.In partial contrast, Marcuse (1964, 1968, 1969) proposed a perspective somewhat less intrinsic in its rejection of technology, focusing attention onappropriate application in recognition of the potential for exploitation. Herejects the neutrality of the machine and emphasises the place of power,asserting that technology constitutes a historical-social project that asserts'what a society and its ruling interests intend to do with men and things' (Marcuse, 1964). He argues that this 'new technological work-world'binds technology to capitalism and domination, because 'the prevailing formsof social control are technological (Marcuse, 1964). The projectedoutworking of this is the enforcing of a socio-political system with totalitariantendencies, increasing the oppression of the working class and producing aone-dimensional thought system of technical rationality that delegitimizes critical opposition. In the light of this Marcuse emphasised the need for analternative liberated technology that can promote a non-dominative society,targeting his critique at the current prevailing expression of technology ratherthan the notion of technological advancement itself. (Hollow, 2010).

Practical Implications

A weakness with the Marcusian perspective is his presentation of technologyas a singular entity which is only capable of being utilised for one of twooptions: either maintaining the status quo or entirely restructuring societythrough 'a science and technology released from their service to

destructionand exploitation' (Marcuse 1969). Such dichotomizing serves as anabstract philosophy but is of limited practical assistance in the complex realmof applied engagement, especially when considering the specifics of ICT foreducation. The limitation is highlighted by Feenberg (2003), who notesthat 'the logic of dystopia is too totalising and does not correspond to therather chaotic realities of technical life'. Building a framework to facilitateactive involvement is therefore dependent upon acknowledging the potentialfor a third option that is based on critical engagement and embraces a visionof technology that encompasses a wide variety of tools which have potentialto be utilized simultaneously for a multiplicity of different purposes anddesired ends. Such conflicting opinions surrounding the multiple and variedpotential uses of technology within a development or, more specifically education context are usefully illustrated by the debate between Helmreich(1999) and Lansing (2000) centred on digital technology and water.

Advocates for critical engagement (Feenberg and Hannay, 1995; Vogel, 1995)dismiss the assumption that technology has autonomous and staticfunctional logic as deterministic, fatalistic, and offering 'only condemnationof the present and no guidance for the future' (Feenberg 1999).Arguments that position technology as the primary structure of society (Ellul, 1964) can be simply contested on the basis that technology, in itself, isambivalent. Put simply, technology can be used either to serve the interests ofthose in power or to transform the nature of power relationships (Castells, 2000). Emphasising the 'malleability of technology' challenges the Marcusiandichotomy and recognises the potential for incremental change, diversity andchoice as well as complete paradigm shift. Thus technology is positioned assubservient to people and as a potential element of both liberation and subjugation (Vogel, 1995).

Feenberg (1995) makes the important point that although a dominantexperience of recent history has been the use of technology in hinderingparticipatory democracy, it is foreseeable that 'technology can support morethan one type of technological civilisation, and may someday be incorporatedinto a more democratic society than ours'. Castells (2000) reinforcesthis stance within the specific context of current ICT, pointing to itsemancipatory and transformative potential, serving to enliven democracy,create networks and redefine power to the point where 'the power of flowstakes precedence over the flows of power'. Indeed, potential indications ofthis are found in participatory web-based technologies such as blogging and twitter.

Offering practical steps towards a view of technology that could help bringabout such a transformed society is dependent upon holding lightly to theseabstract reflections and engaging with the practical implications of rapidlyshifting, technology-induced, time-space interactions in both developed anddeveloping contexts. Once it is recognised that the application of

technologycan instigate both harm and good, it becomes necessary to form a frameworkfor promoting principles such as political transparency, social creativity andindividual freedom. It is such issues that constitute holistic definitions ofsocial and individual development (Sen, 1999) and thus should be centralelements within any ICT for development and education initiative.

Employing technology effectively within development therefore requires anormative agenda, harnessing the potential of technology to help form a'non-alienated society' where 'humans consciously and explicitly assert theirresponsibility for the world, transforming it on the basis of needs that arediscursively expressed and social decisions that are democratically made (Vogel, 1995). If achievable, this has the potential to break thedeterminist link between technology and domination, challenging the notionof technology as self-generating and detached from society, andsimultaneously shifting its position away from one of unquestionedacceptance.

HISTORY OF TECHNOLOGY CYCLE IN SCHOOL

The computer as an educational tool, arrived in schools with a lot of prior enthusiastic claims about how it could be used to reform education: 1) by making schools more efficient and productive, 2) by transforming teaching and learning into an engaging and active process connected to real life, and 3) by preparing the current generation of young people for the future work place (Cuban, 2001). The computer is butone of many technologies that have been introduced into education. Cuban (1986) describes some of the patterns that have emerged in the adoption of many innovations within educational systems.

Cuban (1986) studied the classroom use of technology since the 1920's including the use of radio, film, instructional television and the early use of computers in the classroom. He recognized a cycle of technological innovation, continuing to today's case of integrating ICT, that is similar to past innovations in instructional technology that have occurred within the past century such as radio, film, instructional television, and computer assisted instruction. He describes this cycle as starting out with the introduction of the new technology and of claims as to how it will revolutionize teaching practices and improve learning among students. The technology is typically supported by claims of increased learning, efficiency and productivity, and the prediction that the new technology will make extraordinary changes in teacher practice and student learning. The idea that the use of the technology will improve education is also sold to the public during this process. These claims are often promoted by the companies that create the particular technology. As an example, Cuban (1986) quotes Thomas Edison in 1922 claiming that film will replace the textbook and that textbooks are 2% efficient while film is 100% efficient. There is no study on how Edison decided what efficiency is, but his statements probably carried some weight in the media with his stature as inventor and businessman.

Role of ICT in Creating New Society

A debate is taking place in social science circles as to whether or not the world, or at least animportant portion, is moving into a new era, in which space and time are being shrunk by the new available technology. The researcher put this question into perspective to delineate the coverage of this study.

Bell (1973) coined the term "post-industrial" to refer to societies in which the service sectordominates the economy. Toffler first mentioned "super-industrialism" (1973) and later on advisedthat political, business and social institutions should be prepared to enter into the "third wave"society (1980), in which computers and electronics would play a dominant role. Naisbitt (1984)talked about the "time of the parenthesis" to describe the transit from the industrial to theinformation society, the latter being characterised by "an economy based on a key resource[information] that is not only renewable but self-generating". Appadurai (1990) putforward the "global cultural economy", in which technology in general and informationtechnology in particular permeates not only across geographical borders but also political andsocial boundaries. Ultimately, in his The Information Age trilogy, Castells (2000a, 2000c, 2004)grants information a predominant role in the present world and proposes that we are experiencingan epochal shift, leaving behind the industrial society and entering into the network society erathanks to the information technology revolution(Díaz Andrade and Urquhart, 2009).

Castells (2000c) claims that the world is experiencing a technological paradigm shift. He arguesthat under informationalism attributes we are witnessing a revolution and the emergence of the"network society" in which information technology is pervasive and networks became a powerfulstructure. He concludes that the new economy is informational, global and networked.Information and knowledge turn out to be critical components of economic growth and, inaddition, technology is recognised as the major productivity-inducing factor while the networks,recognised as old forms of social organisations, are now empowered by new ICT tools (Castells, 2000a, 2000b). Even though Webster (2002) regards Castells' masterpiece as the most comprehensive study ofthe contemporary world, he casts doubt on the declaration of the emergence of the new epoch andtakes a less far-reaching approach, favoring an evolutionary explanation based on historicalantecedents. Some other authors argue that using information is not a new phenomenon becauseits importance was recognised throughout history (Holvast et al., 2005). Webster (2002) rejectsthe presentism – "the conceit that one's own times are radically different from those that went before" and the implicit technological determinism – although strongly repudiated byCastells himself – of those emphasising the "network society". Surprisingly, Webster (2002) suggests the emergence of the "business civilisation", as a consequence of the "intensification of [market] competition on a global scale".

The critical point isthat ICT today is wide-ranging; from health care to military affairs through education andentertainment. The fact is that nowadays telecommunications technology allows the distributionof information to an expanded geographical area, speeds the flow of communication as well asincreases the amount and variety of information and communication services (Bates, *et al.*, 2002), and has brought hope and enthusiasm to international development agencies,national governments, non-governmental organisations and donors.

Visions of Education Through ICT

The literature advocating the use of ICT includes visions of computers as toolsin the hands of learners being guided and supported by well-informed teachers. Such teachers would have a good understanding of how the learner might use the available ICT to enhance their learning by accessing the tools, services and resources that are available to the learner. According to Papert and Caperton (1999), most writers adopt one of the three types of vision. Firstly, visions of ICT as headlight, in which ICT is used to solve problems, such as, limited access to education (Nunan, 1996). Secondly, visions of ICT as a drivingforce. In such visions, the use of technology results in enhanced teaching and learning. Thirdly, vision of ICT as possibility. This approach involves well thought-out education taking advantage of the potential of current and emerging technologies to make profound pedagogical progress as in Papert and Caperton (1999).

Advocating vision as possibility, Papert and Caperton place the central contemporary issue within education itself and not within technology. That is, they propose a Vision of Education in which the "primary commitment of education should be about vision." They propose that every citizen should enter the world with "A proud vision of self as a powerful life-long learner; a vibrant vision of a worth-while life ahead; an optimistic vision of a society to be proud of, and the skills and the ethic needed to follow these visions." (Papert and Caperton,1999). Theirsupport for ICT arises from its potential to be useful in achieving "a worth-while life". Thus, the greater part of the reviewed literature arranges itself around various visions of the future in which ICT will have profoundly changed the 'what and the how' of education. These visions include a future in which teachers and learners draw on ICT to achieve new capacities to acquire, share, organise, and communicate information and undertake tasks over both time and space (Becta, 2001; Yelland and Swaminathan, 2003). Just as ICT has impacted on products and processes in virtually all other areas of human endeavor, so too there is an increasing expectation that education will undergo a matching transformation and soon. (OECD, 2001). Such approaches are consistent with "the dominant view in the organizational world" (in which) "the future is split off (from the present) "and exclusively focused on in the form of vision, simple rules, values and

plans, so distracting attention from the present and reducing the future to simple aspects that can be manipulated to determine the present" (Griffin, 2002).

Griffin is highly critical of such approaches given the complexity of the phenomena involved in everyday activity within organisations. This dominant view ignores the reality that phenomena within organisations are largely emergent from the everydayactivity and interactions of those involved. This makes prediction highlyproblematic (Darling-hammond and Baratz-Snowden, 2005; Stacey, 2001), which has implications for the Reynolds question in that beliefs often incorporate predictions. Much of the literature is predictive in that it indicates the need for change but in doing so does little to make sense of the present: the starting point. Elaborating predictions and/or the need for change does have some possible merit in that the visions involved can become 'strange attractors' in a complexity sense, at least for some parties such as early adopters. Certainly, many of the schools and teachers participating in this study have been attracted to the possibilities associated with the use of ICT. (Webb, 2007)

ICT Education

The label of "ICT Education" contains many different ideas that are not always compatible. Thus it is important to make the following distinction between computer education and computer-assisted learning.

1 Computer education means teaching people about technology, teaching them how to use technology and what technology can be used for.

2 Computer assisted learning, or computer education refers to using ICTs as a pedagogical tool, to help teach students how to do mathematics or learn languages, etc.

This is not a pure dichotomy, when a student learns english using a computer, he will also learn something implicit about the technology. However, this distinction is useful when trying to make sense of the literature on the relationship between ICTs and education.

History of ICT Education

ICTs and their associated instructional programmes arose in a certain historical context, which is worthy of some discussion. The computer arose in a time and place that was decidedly modernistic. As Carmel (1997) wrote, it is unsurprising that ICTs developed in America given its high levels of military spending, entrepreneurial culture, capitalistic economy and individualistic society. In some sense, ICTs and modern society formed a mutually beneficial loop, fuelling the growth of ICT and further promoting modern ideals.

This paved the way ICT was taught. Literature on ICT education began to appear in the 1960s, and was primarily focused on technical details, programming and the mathematical applications of computing (Brauer, 1985; Ercoli, 1985). From a social standpoint, there were papers exhorting ICT education to "meet the needs of industry" (Department of Education and Science [England] 1967), but there was no discussion on designing courses to teach how ICTs could lead to competitive advantage, or how they change aspects of society, or other issues related to politics and the economy.

This is not to say that social issues did not exist; they did and educational planners were clearly aware of them. In 1967, in a booklet called "Computer Education" targeted to academics and policy makers, Diana Law (1967) wrote:

> Computers have always been surrounded by a certain amount of mystery. Some people think of them as witch doctors, others as electronic brains. Some see them as square, grey metal "Dr. Whos" who may dominate and rule people's lives - an aura of secrecy, black magic and mumbo jumbo very often surrounds them. It is fair to say that some of this thinking is due to the original computer experts who, wither by accident of intent (and the former implication is preferable) were treated (and expected to be treated) as conjurors, whose expertise means at the same time fascination and mystique. In fact, computers are not electronic brains, nor in any way magical; nor will they ever make decisions or dominate ourlives. Computers are electronic morons which (and one should say which rather that who) can do nothing except what they are told to do.

Some information system (IS) practitioners might find surprising parallels between the issues raised in 1967by Law and the current IS literature. What is revealing is the social issues related tocomputing were clearly apparent. However, when designing curricula, academicstended to focus on technical problems rather than social issues. This booklet (Law, 1967) goes on to stress the facilities needed in schools, in particular, the importance ofelementary card punching equipment.

In the 1960s, ICT education tended to be called "computer science". As this disciplinewent through its growing pains, it was always fighting for legitimacy and trying tofind its voice. Practitioners commented that it resided somewhere between the "purestmathematics and the dirtiest engineering" (Oettinger, 1968). Such was the place forICT education. Also, a typical 4-year undergraduate curriculum wasvery technocratic, devoid of any reference to the socialimplications of technology. Social issues started to play a role in the ICT education inBritain with the publication of an "Information Systems" curriculum. It is important tonote that for the most part, ICT education – including Information Systems – wasdesigned and delivered on the basis of a vocational rationality. The intention was toteach students the skills to get good jobs and to meet the needs of the economy (Galliers, 1987).

Current Issues and Debates

Today, at the tertiary level, most students are still taught about computers in verytechnical programmes such as Computer Science or Computer Engineering. However,there are disciplines that focus on the social aspects of technology, not just withinInformation Systems but also related disciplines such as Anthropology, Sociology, Media studies, Business IT, InformationManagement and Library Science (Adam and Yesha, 1996; Gorman and Corbitt, 2002; and the discussion in Avgerou 2000).

In regards to the technical programmes, there is a large body of research that discusseswhat is to be taught, how curricula should be set up, and which programmes best suit student needs (Barrett, 1985; Buckingham and McFarlane, 2001; Reichgelt *et al.*, 2002). However, there seems to be little research done on the curricula for more socialcomputer-related programmes. Most introspective work on Information Systems is focused on research (Avgerou *et al.*,1999; Robey, 1996), not teaching.Nevertheless, some papers have raised some interesting social issues with regards toICT education.

Little *et al.* (2000) have called for ICT education to be more sensitive to culturalissues and differences that are related to technology. Secondly, following a similarline of argument, Granger *et al.* (1997) highlighted the absence of modules addressingethics in ICT education. The authors have made several curriculum recommendationson how ethics can take on a more prominent role. Thirdly, Strong *et al.* (1987) have developed an Information Systems curriculum that is primarily technical, but theauthors stress that ICT is developed for people and so the focus of the curriculum ison usability, deployment and human-computer interaction.

A common theme that runs through the current literature on ICT education is that oftechnical literacy. As mentioned, this also plays a role in the debate on ICTs forDevelopment (Castells, 1996; Mansell; 2002) is part of a general concern thatnot enough people are getting the skills needed to operate in the 'information age'.Craver (1997) has written an interesting book on teaching media literacy, how to useelectronic search engines, electronic databases and how to evaluate electronicinformation. The issue of technical literacy does not just apply to students; lack ofliteracy in teachers also has effect on the delivery of ICT education (Williams *et al.*, 2000).

This lack of literacy on the part of teachers can create odd dynamics in the classroom.As children play on computers in their homes and during their free time, they aredeveloping digital literacies that in many ways surpass those of their teachers. AsBuckingham and McFarlane (2001) argued, this is a new phenomenon and creates aneed for new forms of pedagogy and curricula in order for ICT education to maintainits relevance. The problem will become exacerbated as younger and younger childrenstart using ICT, and as computers become prevalent in elementary schools and kindergartens (Chapman, 2000).

There are a few observations to make about the current state of the academic literatureon ICT education. Much of the literature is prescriptive; outlining what must be doneso that ICT education can maintain its usefulness. Often, this literature has a revolutionary zeal (Ezer, 2005; Webb, 2007). There is much less descriptive research that seeks to understandICT education or to analyse it within a particular theoretical framework. Social issuesare definitely gaining prominence as problems of access and relevance are becomingapparent. However, these issues are only appearing in theoretical and reflective academic papers. They are rarely manifested in model curricula.

Reffell and Whitworth (2002) have argued forcefully that most ICT education is ineffective because it is too technical and not at all concerned with local contexts andreal world problems. Other case study research seems to support this argument. InBrunei, ICT education was too rationalized and modernistic for the country's reentereconomy (Minnis, 2000). Likewise, in Papua New Guinea, the desire for a Westernstyle ICT education programme caused disruptive tensions between local and foreignacademics (Kelegai and Middleton, 2002). However, Neville (1998) argued thatMalaysia's ICT education programme was particularly successful because it wasnarrowly focused on a modernistic agenda. On a higher, more abstract level, someargue that computers are over-hyped, do not increase productivity, and so the need forthem is overstated (Garnham, 2000). Others argue the opposite – that IT is now afourth basic competence, equal in importance to reading, writing and arithmetic (Bohme, 2002).

At the heart of these debates is a fundamental disagreement about what it is that universities do. Some argue cogently that universities must first satisfy the needs of industry, and then other stakeholders will benefit (Eggleston,1994; Kohli and Health, 2001; Liu and Jiang, 2001; Roberts, 2000). Others who support this claim point out that the reason students go to university is primarily because they want good jobs (Dougherty 1988), and argue that education should focus on achieving full employment (Saunders and Machell 2000). But Williams (2000) writes that universities are already too focused on employment and industry, which is detrimental to their teaching and research. He is representative of a more idealistic school that argues that universities should help build pure knowledge, social capital and the capacity for critical thinking (Aronowitz and Giroux, 1991; Conceicao *et al.*, 2001; Freire, 1972; Giroux, 1983; Reffell and Whitworth, 2002).

Banks (1994) characterized this as "The Great Debate", between "liberal" and "instrumental" education. For him, liberal education rests on a desire to cultivate the intellect and to develop a highly analytical and critical way of thinking. A liberal education sees the pursuit of knowledge as active and interconnected, not simply a recollection of facts. Liberal education tends to create a hierarchy of cerebral subjects, such as Latin, Physics and Mathematics that have a higher status that art of craft. The risk of such a

system is that schools become divorced from the world of work and education loses any notion of immediate usefulness. On the other hand, instrumental education is based on the premise that education serves society. An emphasis is placed on the relevance and utility of education, where students are expected to apply their knowledge vocationally, contributing to the economy. The risk of such a system is that students are encouraged to simply meet some identified need, rather than think critically with the purpose of achieving some sort of personal or communal advancement. Conlon (2000) is highly critical of instrumental education and calls it a form of paternalism. He argues that instrumental education is underpinned by the following dubious beliefs:

1 The aim of schooling is to prepare for the nation's economic success. IT is at the heart of the knowledge economy. Therefore all children must learn the skill of IT.

2 Postmodernist forces are fragmenting society. Society should not be allowed to fall apart. Ensuring that all children follow the same curriculum can strengthen social cohesion. Therefore a standard curriculum will be imposed.

3 The necessary changes are too important to be left to chance. Therefore schools must be made accountable and teachers must be monitored. Considerations of efficiency, high standards and equity justify the use of computer networks and centrally devised IT-based teaching resources (Conlon 2000).

His first criticism of instrumental (or paternal) education is a direct attack on some of the writers mentioned above: For Conlon, "Paternalist" education is an acceptance of what Goodson and Mangan (1996) have called the "computer literacy ideology". This consists of a set of widely-held but somewhat vague beliefs about IT that can be summarised as follows: computers are everywhere; jobs increasingly require computer skills; therefore everyone should learn about computers at school. The first premise of the argument is correct but the second is dubious and the third is a non sequitur. Most employment forecasts indicate that only a tiny minority of future workers will require significant IT expertise and the needs of this group require graduate-level education. Other workers who use computers will either do no more than follow simple on-screen instructions of will receive special training for the required task. Of course, future technology may bear little resemblance to the computers that are around today (Conlon, 2000).

The need to increase computer literacy is treated as given by most writers on 'ICT education' and 'ICT and Development', that it almost appears banal. Conlon's criticisms stimulate an important debate. He strengthens his argument by proposing that paternalist education necessitates an unduly centralized education system where schools are rigidly controlled from above. This introduces a real risk of a slide towards authoritarianism.

Striking the right balance in ICT education is notoriously difficult (Dawson and Newman, 2002) and, as Conlon acknowledges, his proposed libertarian system too has weaknesses. It emphasizes a consumerist culture, encourages social disintegration, and undervalues the social function of schooling. Moreover, it can precipitate a slide "towards a dumbed-down, trivialised culture" (Conlon, 2000). However, in raising these issues, Conlon articulates the points of contention that are at the heart of a major debate surrounding ICT education. This debate takes on added significance in the context of developing countries and reflects a wider debate on the purpose of education.

Freidrich Ebert, former leader of the German Social Democrat party once wrote: "General education is the vocational education of the upper class. Vocational education is the general education of the working class." (quoted in Feingold et al. 1990). Education is not merely the benign and altruistic transfer of skills and knowledge. For many authors, the primary purpose of education is to establish certain attitudes, values and behaviours (Mitch, 1999), the process referred to as the sociology of education. The idea is not new, for the Roman Empire, conquering lands also meant civilising people and "saving the savages" (Spring 1998). Thus, education always had the side effect of spreading and entrenching a certain worldview. Today, education also serves that purpose as well; some go as far as to call it "brainwashing" (Angell, 2000). These debates take on added significance in the globalised era. As standards converge, the risk of homogenization and excessive profiteering becomes very real (Bird and Nicholson, 1999).

Early social theorists such as Durkheim (1956) stressed the instrumental role that education played in society. He argued that society flourishes when it is in a relatively stable state achieved through consensus. He argued that society provides a "moral education" to pass on central beliefs from generation to generation. Parsons (1959), went further and suggested that education is not only used for socialization, but also for selection into various societal roles. Both Durkheim and Parsons saw the functional role of education as a method of establishing a stable, integrated society of well-functioning interdependent parts (Parelius and Parelius, 1978).

However, many authors feel that the consensus theorists have blinded themselves to the obvious hostility, violence and conflicting goals that exist in society. These conflict theorists see the world in a constant state of change. For them, education is a coercive tool used by the powerful to indoctrinate the oppressed and justify their rule (Waller, 1961). Bowles (1972) wrote that capitalism weakens the family and reduces its ability to socialize the young. Further, inequalities of wealth and oppressive factories create a threat to the interests of the elite. And so the ultimate solution is a mass education that supplies workers with appropriate skills, and more importantly, legitimizes existing inequalities by suggesting they are based

on merit rather than on coercion (Bowles and Gintis, 1977). This argument is present in the literature on ICT education. Moll (1998) argued that technology is not neutral. Introducing ICT into schools and universities in such a dogmatic and enthusiastic way gives a distinct advantage to the private sector, which is by contrast, to the detriment of public and communal interest.

ICTs provide a unique challenge to education providers. Technology changes at a very fast rate, where education is notoriously slower. This is partly because it is costly to develop materials and curricula, and partly because of the difficulty for teachers to acquire new and necessary skills continuously (Avalos, 2000; Cochran-Smith, 2003). Once education has caught up, technology has moved on. Exacerbating the problem, industry places heavy demands on society for various skills and abilities that cause ripple-effects throughout the education system (Kohli and Health, 2001). These competing forces work in a fluid arena where the very purpose of education is constantly debated.

ICT in Teaching and Learning

Educators initially engaged with digital information and communication technology (ICT) for reasons of curriculum. For example, Webb's (2007) study stated, teaching computer programming using mainframe computers became common in senior secondary colleges in Tasmania in the early 1970s. With the emergence of personal computers in the 1980s, a wider range of educators engaged with ICT forreasons of pedagogy based on its envisioned capacity to transform both curriculum and pedagogy. Seymour Papert's *Mindstorms: children, computers and powerful ideas* (1980) was something of a milestone in response to the pedagogical possibilities arising from the emerging technologies. In recent times, many educators have become more circumspect in relation to the contribution of ICT to teaching and learning. For example, in *Oversold and underused - computers in the classroom* Cuban (2001) reports a number of case studies that demonstrate some of the challenges complexity and uncertainty for teachers and schools involved in incorporating the use of ICT into their programs. Interestingly, this study was undertaken in schools in Silicon Valley, a location synonymous with leading-edge information technology at the world level. Even Papert acknowledges the difficulties involved yet maintain a commitment to the potential of ICT to contribute to the transformation of teaching and learning (Papert and Caperton, 1999). In responding to a question about the present uncertain effectiveness of technology in schools, they write "...technology doesn't work. Technology doesn't do anything. People do". They identify the critical success factors as "vision and the courage to take advantage of the opportunity..." made available by the emerging technology (1999).

ICT and Primary Education

Enhancing learning outcomes and overcoming constraints are both highly desirable goals. Large-scale studies of the use of ICT in schools (Becta, 2001; Cox *et al.*, 2004a; Dwyer, *et al.*, 1991) and numerous smaller scale case studies demonstrate that these goals for using ICT are also possible. Other studies of how young people are using ICT to mediate their own learning in new and creative ways outside of school settings (Robertson and Williams, 2004) also confirm the possibilities for enhanced and less constrained learning arising from the use of ICT. Studies of the connections between effective teaching, learning and the use of ICT all indicate that a fundamental requirement is the need for teachers to change their pedagogies in order to make these desirable goals possible. Using ICT to do familiar tasks in traditional ways is unlikely to transform learning.

Schools, school systems and professional organisations have developed learning outcome frameworks to support teacher planning and classroom observations. For example, in Tasmania, Fluck (1998) developed the Key Information Technology Outcomes (KITOs) as a framework that outlines ICT-based tasks and activities appropriate to the respective grade levels in the following six areas of ICT use: operations (with computers); publishing; communicating; researching, problem solving and independent learning. Such guidance can be useful to schools and teachers in helping them to develop their class program and, in the process, achieve appropriate changes to their pedagogy and curricula.

However, as was reported by schools participating in this study, the rate of development in the technology itself can challenge the on-going usefulness of such frameworks. Upgrades of devices and applications generally make them more user- friendly so that younger children can then make greater use of them. Similarly, some participating schools and teachers reported that dramatic changes in the knowledge and skills of respective student year groups also made the school's current frameworks outdated. Ensuring that such frameworks match the current needs of the teachers and students was, reportedly, a significant challenge.

Information Systems in Developing Countries

The idea that IT can help developing countries is intriguing to many, because of the benefits that have apparently been realized in the West. As Avgerou (1990) wrote, the literature sometimes contains a naïve taken-for-granted assumption that the success of the West is attributable to ICT's, and therefore bridging the benefits of this development to poorer countries is simply a matter of delivering IT. The simple and technologically deterministic view might be unsurprising coming from world leaders, such as Annan (2002), but it is also found in the academic literature. Egglestone *et al.* (2002) argue that

ICT's make markets more efficient and lower transaction costs by making information more available, accurate and reliable. They optimistically refer to it as 'the gift that keeps on giving'. The view is apparently justified by the prevalence of league tables that show a correlation between GDP and ICT penetration. Correlation is not causation but this has not stopped several academics from focusing the debate on low-cost technologies, open source software, and the liberalization of the telecommunications sector (James, 2001a; Mbarika, 2002).

Central Debates

Clearly, this does not tell the whole story. Sometimes, an IT implementation does not meet its objectives because of social factors (Madon, 1993; Southern, 2002). Researchers who see Information Systems as "social" systems have looked at non-technological factors that influence an IT inititative (Bhatnagar, 2000). Mixed within the differing views on what makes IT projects successful is a lurking skepticism about the whole endeavour. Wade (2002) argued that telecommunication standards and patent regimes give the West a distinctive advantage. Therefore, promoting ICT's in developing countries strengthens a relationship where the South becomes increasingly dependant on the North.

Other authors are not just skeptical of the application of Information Technology but of Development itself. Escobar (1995) argued forcefully that the notion of Development is a construction of the Western industrialized countries whose new form of orientalism paints a picture of people in developing countries living in darkness. The underlying message that the rich world sends to the poor through the notion of Development is "you have a big problem, but don't worry, we can help." The perverse nature of this discourse was also recognized by Avgerou (1998) who argued that the West, with their own particular history and rationality, perceive problems in developing countries with their own particular bias. In this light, the Western idea that Western technology can be used to solve problems of developing countries appears disingenuous.

The problem with this approach is not so much the bias, which is unavoidable considering that everyone has their own unique perspective, but rather because it denies the undeniable differences in context. Ciborra (2002) pointed out that in Jordan, the application of Information Technology for the relatively simple purpose of managing drivers' licenses, became fraught with risk. The problem stemmed from the fact that there were conflicts between Jordanian culture and the culture of the Western management consultants who were hired to manage the project. Information Technology can easily threaten the interests of local citizens by altering power relationships. For example, Bada (2002) showed that in Nigeria, much effort is put into building highly valued personal networks. Citizens found the introduction of an

impersonal Information System threatening, because it reduced the value of these personal networks, built with much care over the long-term.

Differences in context are often a reason why ICT initiatives fail to meet their initial objectives (Avgerou, 2001; Davison *et al.*, 2000; Madon, 2000; Ziegler, 1995). However, contextual reasons can also help explain the rise ICT's. It is often argued that the fact that Information Technology first became prominent in America was not a result of random chance. America had the appropriate legal infrastructure, high levels of military investment and cultural traits that together formed an environment conducive to the development of Information Technology (Carmel, 1997). In contrast, governments of developing countries are sometimes paternalistic and not production oriented, thus hindering the development and integration of ICTs (Avgerou, 1990).

Humans have always tried to use new knowledge to improve their lives (Schumpter, 1975). To be sure, there are some communities that are steadfast, are keeping to traditional ways of living, and reject even the simplest modern conveniences, but in general, humans adopt technology when they can see some benefit. People in poor countries seem to want Information Technology (Leach 2003) and there is no reason to doubt their sincerity (Banuri, 1990). Even in the academic literature, nobody is seriously suggesting that developing countries reject Information Technology altogether. According to Castells (1996), the world today is more connected than it ever has been. In the new "information society", the success of developing countries depends on their information literacy and their ability to handle information, and that in turn depends on education. In our "network-society" countries have no choice but to learn to use ICTs in order to interact with other countries in this globalized age. Thus, this study proceeds with the ontological assumption that developing countries should indeed bother with ICTs, and it is the remit of researchers to examine the relationship between technology and society in order to see how they can benefit from each other.

The differences in theory and perspectives can be quiet stark. In examining a simple act, such as a rich country donating an old computer to a poor country, there are many perspectives and nuances. Some would say that this is a kind gesture of the rich country, which is generously bridging the digital divide (James 2001a, 2001b). Others suggest that it is coercion on the part of the rich country to force their old technology on the poor (Moss 2002). Some even take this a step further and suggest that suggest that such an act is an example of neo-colonialism (Sy, 2001; Ezer, 2005).

When seen in this light, some commentators have suggested that the recent interest in technology- and the term "the digital divide"- is just a latest buzzword to describe social stratification, or the income gap (Bernhardt 2000, Murdock 2002). Some authors have concluded that technology can only have a developmental impact when several factors are present (Servon, 2002;

Steinmueller, 2001; Vartanova, 2002) including education, which is given significant importance in the ICT for Development debate.

Education in ICT for Development Debate

The literature on ICT education is found scattered around journals from many subjects, including information systems, development studies, education and policy and social sciences. This reflects the fact that the subject is inherently multi-disciplinary. Because of this multidisciplinary nature, policy recommendations and views on ICT education are quite diverse. However, within these diverse views, there are two major ongoing debates about the nature of ICT education in developing countries.

One of the most interesting ongoing debates in the literature is about where ICT education policy should be focused. Peter Sy (2001) looked at IT communities in the Philippines' and concluded that ICT education had to be re-addressed in favour of a grass-root, bottom-up approach.

> Bottom-up approaches in mass education that promote meaningful engagement of technology must be given priority over those commercially sponsored, hype-driven programs (Sy 2001).

The language in this quotation suggests that according to (Sy, 2001) this point is obvious to anyone except those with commercial interests. However, Ziegler (1995) who suggests that the most important factor in harnessing technology to a country's advantage is "knowledge-bearing elites" contradicts this explicitly. He thus advocates a more top-down approach to education that is more focused on power relationships and the future leaders of society. The battle lines of this debate are repeated in a wider argument over who should receive government attention. Bohme (2002) called for more focus on primary education. However, Quibra *et al.* (2003) disagreed and argued that if a country is to exploit potential opportunities arising from ICTs they must develop secondary and tertiary institutions as well.

To complicate the debate further, other authors have tried to focus government attention on adult education. In an interesting paper, Hartviksen *et al.* (2002) suggest investing in municipal IT schools similar to music schools found in Northern Europe. The authors gathered their empirical data from lower income neighborhood's in Norway, and claimed that there findings suggest this type of schooling, primarily targeted to adults over thirty, can be used to bridge the digital divide. However, in examining the "Lessons from Asian Success Stories", Subhash Bhatnagar (2000) wrote about the importance of "sustained training to all levels". In this case, he meant "workers, managers and supervisors". Clearly, the debate about where governments should focus their policies is lively and ongoing.

A second debate in literature is focused on content. There is a significant body of literature on the subject of ICT curricula, not necessarily

in developing countries. This literature generally prescribes a curriculum independent of context, and recommends a technical education (Davis 1987, Roberts 2000). Even within this narrow area, there is a debate about what courses should be included in a good technical education, however more interestingly, there are some authors who suggest that the "social science" aspects of ICT should not be ignored, particularly in developing country context (Granger *et al.*, 1997).

Yahya (1993) stressed the need for education in management information systems (MIS), specifically, courses in data processing and peculiarities of managing various systems. He proposed that the lack of this type of knowledge is a major cause for problems in managing ICT in developing countries. Reffell and Whitworth (2002) also stressed socio-technical issues and recommended policies that focus on "IT fluency" such as teaching critical and evaluative skills, and the relevant contextual factors. Finally, there are authors who state that cultural issues such as gender, ethnicity and ethics ought to be included in various curricula, arguing that all technology is affected by social context (Granger *et al.*, 1997; Little *et al.*, 2000).

These two debates- first, on which constituencies governments should focus their attention, and second, what should be taught- are the essence of the literature on ICT education. In the wider context, it is these two questions upon which governments must focus. Differences in policy recommendations found in the literature often exist because of conflicting rationalities for delivering ICT education. Hawkridge *et al.* (1990) discussed four major rationalities for introducing computers into third-world schools: social, vocational, pedagogical and catalytic. Many of these rationalities exist in the literature on ICT education policy, reflecting differences on the underlying purpose of education.

Some authors suggest that curricula should be changing in order to educate students in "digital literacy" (Buckingham and McFarlane, 2001). As mentioned earlier, this opinion is shared by Bohme (2002), who writes that IT is now a fourth basic competence. This view of education stems from a social rationality, a view that the purpose of education is to make students more socialized into their environment. The vocational rationality is also prominent in the literature, with some authors recommending policy that focuses on increasing employability (Kelegai and Middleton, 2002).

Other policy recommendations stems from an economic or industrial rationality. In recommending policy for ICT in Fiji, Davison *et al.* (2000) clearly advocate tailoring ICT policy for the purpose of creating a knowledge economy. Campbell (2001) also makes similar policy recommendations with the intention of creating a technology industry and attracting foreign direct investment. Finally, some authors have proposed that governments tailor education policies with the intention of stimulating research and spurring innovation (Dill and Teixeira, 2002).

A Major Departure Point

There are many differing views in the ICT for development literature on the role of education, but its importance is frequently emphasized. The following statement put forth by Avgerou and Walsham (2000) is lucid, moderate and is characterstic of the recent literature on ICTs for development-so it is worth quoting at length:

- Information and communication technologies, and related systems, have significant potential to aid the economic growth and improvement of social conditions in the developing world;
- However, such potential is not released by simply transferring technologies and processes from advanced economies. The organizational logic, work practices and cultural conditions, which surround and enable such technologies in their original context, are often alien to the recipient context. As a result, many IT-enabled projects fail to deliver expected beneficial outcomes, frustrating rather than assisting the recipient country's development efforts;
- In order to better serve development needs, people involved with the design, implementation and management of IT-related projects and systems in the developing countries must improve their capacity to address the specific contextual characteristics of the organization, sector, country or region within which their work is located (Avgerou and Walsham, 2000).

Since, this is characteristic of much of the literature on ICT and development, it is instructive to note the way education is hinted at in this passage. In the third and final premise it reads, "developing countries must improve their capacity to address specific contextual characteristics". Avgerou and Walsham are unclear about what they mean by improved capacity and how this should be done. Nor do they or other authors in the rest of the volume explain it more fully. (Ezer, 2005)

Similarly, Mansell (2002) wrote:

> For citizens to make sense of the discrimination they receive, the need skills….New media…..creates a need for citizens to acquire new capabilities for assessing the value, veracity and reliability of information if they are to participate effectively with the fabric of a global society….If as Castells suggests, 'the Internet is the fabric of our lives' and if those living within this fabric are to have the freedom to achieve the lifestyles they desire, then they must be able to acquire new media literacies.

Mansell's argument about the importance of acquiring new media literacies is similar to Amartya Sen's writing on Development. Sen (1997) argued that "Development" should be seen as giving people the fundamental capabilities necessary to live a meaningful existence and make key decisions pertaining to their own lives. These arguments are prescriptive, suggesting what people

"ought to do". Mansell does not elaborate as to what issues may arise, the inherent difficulties in promoting literacies, or the power relationship involved. Likewise, she makes no comment on the current nature of information literacy in various societies. Mansell's work is very similar to that of Castells (1996, 2001) in the manner in which they place importance on developing literacies and technical capabilities; alluding to the importance of education, but not addressing it fully or explicitly.

Heeks (2002) looked at the cause of IT failures in developing countries. Using the theory of design-actuality gaps, he argued that there is a need to build the capacity for local improvisation in developing countries. His prescriptive argument is strong; he makes a convincing case for why this is important. However, the notion of 'capacity for local improvisation" is left somewhat vague, as to what exactly this is, how it can be increased, and what the issues are.

These texts are from prominent writers in the field of ICT for Developing as Avgerou, Castells, Heeks, Mansell, Sen and Walsham. They are also characteristic of the way education is treated in the ICT for Development debate. The importance of education is almost taken-for-granted, but the issues are never fully addressed. This is not a criticism of those authors who have made a significant contribution to the field of ICT for Development. Rather, it is an observation that in much of the literature, education is given great importance, but is treated superficially, almost "in passing". This is major departure point for this study.

Coming to Indian context, India is also known in world market for its success in ICT production and export of IT software and services (Joseph and Harilal, 2001; Singh, 2003). The study on technological competence of Indian ICT sector shows that the Indian ICT sector is technologically vibrant and there is upward mobility of ICT firms in terms of their technological competence (Joseph and Abraham, 2005). However, with a compound annual growth rate of above 25% over the previous five years, the Indian IT-ITES industry has shown a remarkable growth both in exports of IT software and services as well as surge in the domestic market (NASSCOM, 2007). Since, there is a substantial literature regarding the contribution of ICT (more specifically IT) sector and IT enabled services to economic growth, the study on diffusion of ICT is comparatively very less. In spite of this it is also well known fact that the process of ICT diffusion in India, as one of the important issues for economic development, is not straightforward. Being the major driver of economic growth of the country, these technologies need to be diffused in all sectors and segments of the society. Identifying the factors which hinder these technologies' diffusion across the different sectors and segments of the economy will be the first step in helping to access and use those technologies productively.

Indian Scenario and Researches in the Field of ICT, Rural Development and Education

Roy (2012), in his paper "ICT- enabled education in rural India", discussed the scope, Purpose and Methodology adopted for computer education in rural India. He emphasized on Information and Communication Technology (ICT) as oneof the rapid development technological fields in the globalsociety. But, the benefits of ICTs are not reached expected level inthe ruralareas still the rural population living with minimumlevel of ICTs facilities especially the poorest of the poor.The overall objective of this paper is to improve access tobasic information in the rural schools by improvingconnectivity in the field of education, governance, socialinclusion, and health, access to the Internet, and disastermitigation and control. The main stress is given ondevelopment of education level on the basis of ICT in RuralCommunity. The study proposed a model to develop Rural Knowledge Network to enhance theE learning capabilities among rural peoples.

Abhijit *et al.*, (2007), conducted a study in Vadodara, India, year2000, 100 primary schools wereeach provided with four computers. A controlledexperiment commenced in 2002–03 and ran for twoyears. Half the schools were randomly allocated withtraining and educational software. Students in thoseschools played educational computer games fortwo hours a week and scored significantly higher onmathematics tests than students in the control schools.The bottom group of students benefitted most, withgirls and boys benefitting equally.

Swamy, (2012), in an article, Towards Improving the Quality of Education by Integrating ICT in teacher education discussed the factors whichstimulate or limit the innovative use ofICT by teacher educators in Kerala. Surveyanalysis was used to study the prospective influencing factors. The study indicated alimited involvement of the teacher traininginstitutions towards the use of ICT withinthe curriculum. The conclusions were based on limited survey in selected five colleges ofThiruvananthapuram district in KeralaThe study found that teachereducation institutions are no longer strictlyutilizing ICT. Measures are to be taken toimprove the quality and support to students,opening up new avenues for professionaldevelopment of our future teachers.

Byker and Austin, (2014), in Sociotechnical Narratives in Rural, High-Poverty Elementary Schools: Comparative Findings from East Texas and South India, compared case studies of computer technology use at two ruralelementary schools across two international settings. The study used the Social Construction ofTechnology (SCOT) theory to guide this comparative investigation of how elementary schoolteachers and students in East Texas and South India construct meaning for computer technology.Building off of SCOT theory, the article also introduces the term, "sociotechnical

narratives"aspart of the analysis of the meaningful descriptions of ways that social groups use tools inrelationship to their wider social context. The article found that even though the two settings, EastTexas and Rural Karnataka, are about as far apart geographically as they are culturally, similarsociotechnical narrative emerged. The sociotechnical narrative includes: A shared hope in theopportunity and possibilities with computer technology, the development of literacy skills, andsimilarity in knowledge tasks for the future. The study's comparative research design providesgreater depth in analyzing the meaning and uses for computer technology among students andteachers in rural, high-poverty areas across international contexts.

Rao (2009), in the paper "Role of ICTs in India Rural Communities" discussed the need to focus on Indian rural communities to empower them to access information, knowledge and poverty alleviation among them by deploying the Information and Communication Technologies (ICTs). The paper analysed the factors preventing rural communities from reaping the benefits of ICTs, Indian initiatives to overcome the factors, ways and means of poverty alleviation and sustainable development; identifies the bottlenecks and solutions, and lessons learned.

Anthropological Context

Since the analysis of the ICT deployment consequences will be defined by a particular setting, the researcherjudges its imperative to present a concise review of institutional theory. Individuals do not interactin a social vacuum; as the Spanish philosopher José Ortega y Gasset (1914) said, "I am I plus mycircumstances". This simple phrase reflects the complex interconnection between individuals andtheir surroundings.

Relevance of Social Context

Through the examination of collective rules of adherence, Ludwig Wittgenstein concluded that rules are social conventions or, even better, social institutions; therefore, to follow the rules is toadopt a convention and participate in an institution (Bloor, 1997). Institutions define the wayindividuals behave, how organisations conduct business and how collective groups perform. It isessential to understand institutions because they "parameterise the environmental state variablesand constrain the menus of actions available to the agents" (Coriat and Dosi, 2001).

"Individuals live and operate in a world of institutions. Our opportunities and prospects dependcrucially on what institutions exist and how they function", declares Sen (1999). Institutions are the framework within which the human interaction is performed (North, 1990)which reduces ambiguity in daily existence by both regulating interaction among individuals andforming the way persons consider and conceive society (North, 1990; Wolfe

and Gertler, 2002).Institutions can be formally or informally shaped. On the one hand, formal or explicit institutionsare created with a specific purpose and operate within specific acts, rules and laws (Díaz Andrade and Urquhart, 2009). On the otherhand, informal or implicit institutions are those, which have evolved over time like traditions,ways of life and non-written behaviour codes (Bloor, 1997; North, 1990). Furthermore, the notionof institution not only includes black-and-white statutes and patterns of behaviours that arecollectively shared but "also shape[s] the 'visions of the world', the interaction networks, thebehavioural patterns, and, ultimately, the very identity of the agents" (Coriat and Dosi, 2001).From a broad perspective, it is widely accepted that any innovation involves new ideas, people,transactions and the institutional context (van de Ven, 1986). As regards information systems,previous works insist on the need not only to study ICT development, deployment and use butalso to grasp a good understanding of the surrounding social context and its influences where thetechnological tools are to be implemented (Allen, 2003; Avgerou and Madon, 2004; Avgerou andWalsham, 2000; Montealegre, 1997; Sahay and Walsham, 1997; Walsham, 2001; Walsham andSahay, 1999). The social background is a real and existing structure that must be considered in this kind of research (Miles and Huberman, 1994).

Analysing the consequences of ICT should include a portrayal of the particular context for thereason that "without an institutional lens, information technology research might focus morenarrowly on technological designs, economic imperatives, or psychological impacts, thus missingimportant social, cultural, and political aspects" (Orlikowski and Barley, 2001). Since theuse of ICT entails accessing and making sense of information, I point out that we should take intoaccount the social systems and localised contexts because it is here that the "backgroundknowledge" resides (Liyanage and Jones, 2002) – contrasted to the previously defined commonknowledge. Indeed, knowing and forms of knowledge take place in institutions (Nahapiet and Ghoshal, 1998; Orlikowski, 2002), where the surroundings influence human learning but at thesame time generate consequences for the milieu in which this process happens (Simon, 1991). If it is assumed that talented individuals are necessary but not sufficient to exploit the ICT-mediatedinformation from a communal perspective, the existing social institutions must be examined todetermine to what extent they facilitate the acceptance and absorption of the information provided (Porter, 2002).

Culture and Social Determinism

Culture is the underlying concept of any social structure since it is embedded in institutions andorganisations (Castells, 2000c). Cohen (1985) affirms that culture is acquired in the community,the "arena in which people acquire their most fundamental and most substantial experience ofsocial life outside the confines of home". The process of moulding communal

identitiesentails constructing and internalising meaning onto a set of cultural attributes – history,geography, biology, productive and reproductive institutions, collective memory, personal fantasies, power apparatuses and religious revelations (Castells, 2004, Díaz Andrade and Urquhart, 2009).

We cannot, however, point out accurately when this process finishes since culture is under anincessant shaping cycle. Cohen (1985) states that culture is "created and continually recreated bypeople through social interaction… has neither deterministic power nor objectively identifiablereferents… and is manifest, rather, in the capacity with which it endows people to perceivemeaning in, or to attach meaning to social behaviour". This view is concurrent with thestructuration theory that postulates that agents shape social structures and social structures limitagents' actions in a recurring process (Giddens, 1984). Therefore, when researching oninformation systems, culture should not be understood as either static or homogeneous. Rather, tothe contrary, culture is "locally situated, socially negotiated and contextually embedded"(Weisinger and Trauth, 2002) and should be understood as "contested, temporal and emergent" (Myers and Tan, 2002).

Institutional contexts act together with technological systems and societycannot be understood without its technological artefacts; however, "technology does notdetermine society", declares Castells (2000c). Similarly, Wolfe and Gertler (2002) claim, "a region's capacity for technological learning and adaptation is supported or weakened byits institutional structure". Rogers (2003) heavily leans on the surroundings to explain theprocess of diffusion of innovations; he affirms, "technology is a product of society, and isinfluenced by the norms and values of the social system". These contentions reveal asocial determinism position to which the researcher strongly subscribes.

The researcher support the view that neither technological artefacts in general, nor information technology in particular, decide the way humans use them. Technology is continuously shaped beyond itsoriginal design according to the conditions of the context where it is applied (Madon, 2003). Wehumans eventually decide what technology to create and how to use it; technology does notdecide by itself the path it will take (cf. Dosi's technological paradigm concept (2001)) and howhumans will use it. Computers, as any other technology, are instrumentals; their consequencesdepend on cultural factors (Holvast *et al.*, 2005). For instance, a study on a GeographicInformation System (GIS) project in India, where underlying traditions and ways of conductingbusiness became a barrier against successful implementation (Sahay and Walsham, 1997; Walshamand Sahay, 1999), demonstrates that social structures are not invariant across different contexts andmakes evident the need of understanding cultural context before deploying the technology.Indeed, culture becomes an essential variable that explains how societies interpret and use ICT (Leidner and Kayworth, 2006; Walsham, 2001).

CONCLUSION

So far, the researcher has presented a summary of understanding the established ideas that are consideredrelevant and constitute the building blocks for this review paper.The literature review includes theconcepts of information systems, human capital, social capital and institutions and how they interact towards making a knowledge society. ICT and education are critical for development and for securing employment in a knowledge society. However, the potential of ICT in education can only be realized when it is embedded in a social context that is open to innovation and supported by a favorable policy environment. Government policy has a real impact on strategic initiatives, and often determines the parameters of such initiatives through laws, regulations, and the allocation of funds.An effort has been made to cover as much as possible the literature and studies relating to ICT, education and development in digital age.

The present literature review outlines the role of education, the philosophyof technology and the position it holds within society. This begins byoutlining the frequently dystopian portrayals regarding the impact oftechnology that were prevalent in the mid-20th century. An attempt has been made to contrast this with the naive optimism now espoused by certain commentators, somewhatreminiscent of early 20th century thought.The literature on ICT education is found scattered around journals from many subjects, including information systems, development studies, education and policy and social sciences. This reflects the fact that the subject is inherently multi-disciplinary. Because of this multidisciplinary nature, policy recommendations and views on ICT education are quite diverse. The literature advocating the use of ICT includes visions of computers as toolsin the hands of learners being guided and supported by well-informed teachers.Analysing the consequences of ICT it is suggested, the study on ICT's should include a portrayal of the particular context for thereason that "without an institutional lens, information technology research might focus morenarrowly on technological designs, economic imperatives, or psychological impacts, thus missingimportant social, cultural, and political aspects" (Orlikowski and Barley, 2001).

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