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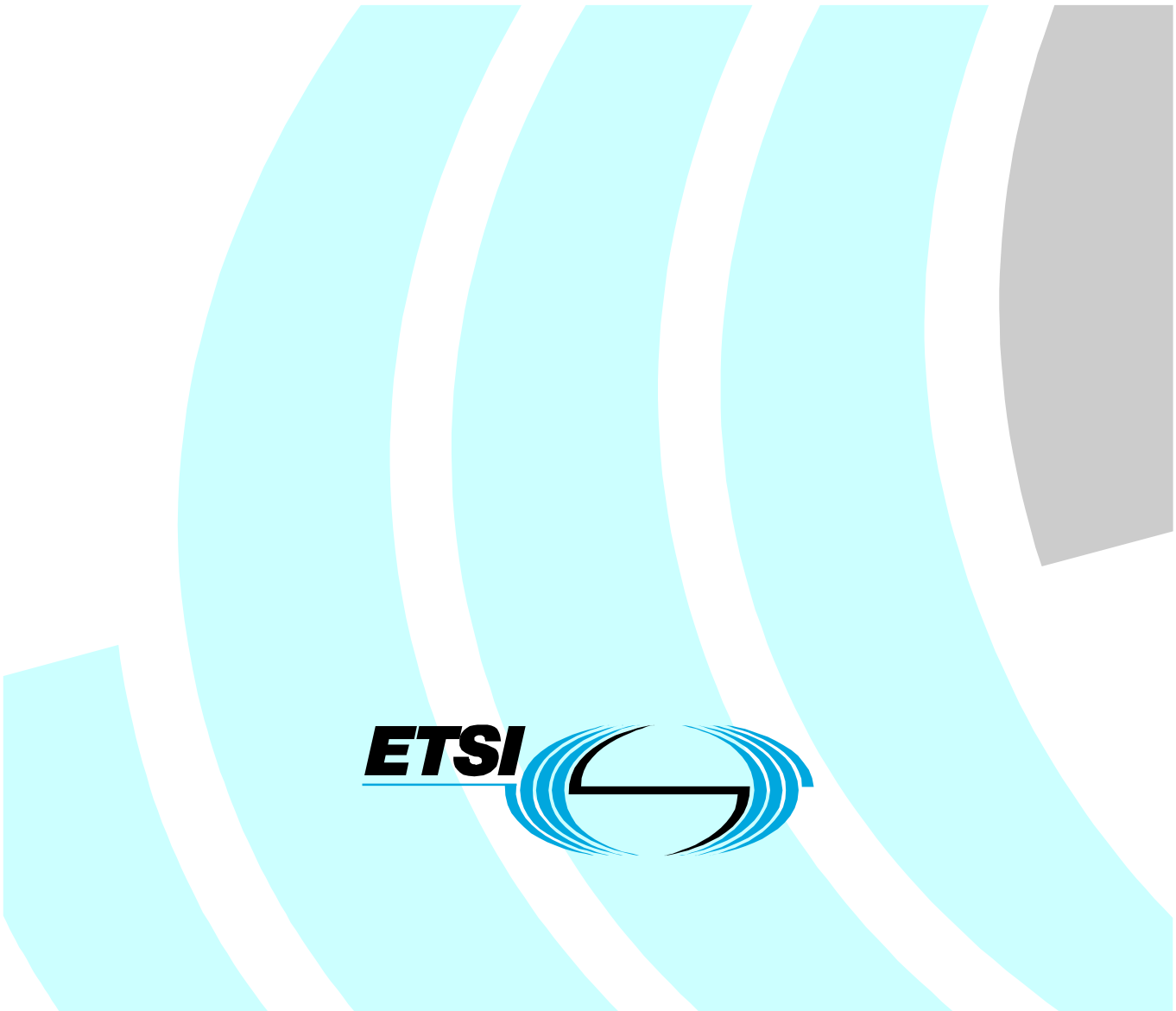
Technical Report

Human Factors (HF);
Access to ICT by young people:
issues and guidelines



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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Human Factors (HF).

Introduction

An estimated 65 million children between 2 and 17 have access to the Internet at home in Europe and the US, and 25 % to 30 % of nine to twelve year olds in the Nordic countries have personal mobile telephones, yet children are generally overlooked when considering ICT accessibility requirements. It is assumed that childhood is a *temporary* impairment that will vanish as the body and mind mature, and that special attention to the requirements of children is wasted effort. *Accessibility for All* thereby becomes *Accessibility for Adults*. Alternatively, it is assumed that children are "Masters of Technology" who are far superior to adults and have an inexplicable, innate ability to understand the inner workings of ICT and put it to constructive use. The present document confronts both of these assumptions, uncovering various myths associated with children and ICT use, replacing them with empirical findings and specific concerns recently expressed in public debate.

Children (12 years and younger) are becoming an increasingly significant consumer group for advanced computing and communications services. In some cases, children as young as four or five are using ICT products. These products are often imbedded in or "disguised" as toys, but far too often they are designed for the generic user, i.e. adults. Children are expected to use equipment designed for adults that has inappropriate physical and cognitive ergonomics for their needs. The accessibility requirements for participation in ICT of this group are not currently clearly identified or catered for, partly because no developmental account of physical, cognitive and social maturation that can be readily applied to product design exists. If not adequately taken into account this may result in problems such as inability to access services, service abuse, on-line vulnerability to exploitation, failures in growth of relevant cognitive skills and physical damage from prolonged use of systems with inappropriate or inadequate physical terminal design.

Public anxiety and awareness of issues related to exclusion is high. We are almost daily confronted with examples of how poorly designed products and services - especially automated services - exclude and disenfranchise significant proportions of the general population, particularly, but not limited to, the elderly and people with physical and cognitive impairments. What is often overlooked, however, is that children's daily encounters with technology encompass much more than GameBoy®, PlayStation®, TV's and vending machines. The home and school are rapidly being transformed - for better or worse - into sites of a globally connected multimedia culture, integrating a wide variety of audiovisual, information and telecommunications products and services that children are expected to use. Children are increasingly dependent on the PC, Internet and mobile telephones in order to achieve their educational goals, be entertained and interact with friends and family. As Sonia Livingstone [13] has pointed out, electronic media are extending their influence throughout children's lives to the extent that children's leisure can no longer be clearly separated from their education, their employment prospects, their participation in the civic or the private family arena. Accessibility thus becomes not merely a design objective, but an issue of central importance within the field of children's rights. The right to protection from harmful influences, abuse and exploitation, and the right to participate fully in family, cultural and social life as specified in the *UN Convention on the Rights of the Child* [7] are all directly linked to the ICT accessibility issues described in the present document. The link will become increasingly more important as society and our children become more and more reliant on ICT to fulfil their basic needs.

The present document reviews the human interaction issues for access to ICT (Information and Communications Technology) by children and provides guidance on how these should be dealt with by ETSI. This will include the ethical issues of security for vulnerable children accessing public communications spaces.

1 Scope

The present document reviews the human interaction issues for access to ICT (Information and Communications Technology) by children and provides guidance on how these should be dealt with by ETSI. This will also include the ethical and legal issues of security for vulnerable children accessing public communications spaces.

The present document identifies key issues, potential solutions, and makes recommendations to ETSI for the specific actions that need to be taken in this area. Where possible this is supported by examples. Relevant issues have been identified and selected on the basis of consultations with stakeholders and industry representatives, review of existing empirical studies and anecdotal accounts of ICT use by children as presented in popular media.

The present document emphasizes opportunities for simple generic solutions that are commercially attractive to network operators and equipment providers for delivery as a sustainable revenue generating activity, which open information and communications technologies to consumers who might otherwise be excluded.

The present document explores key issues in relation to child development (physical, social and cognitive). Although the scope of this technical report is limited to "normal" child development, the approach described in clause 5 can also be used to uncover and describe the requirements of user groups with special needs, e.g. developmentally impaired or delayed children. Contextual issues (ethical, legal, sociocultural) of children are highlighted.

The present document reviews current initiatives within and outside Europe promoting ICT usage by children.

The present document presents the various interactions involved in children's use of ICT within a structured framework consisting of five aspects or parameters of technology use, allowing each aspect to be exposed in a systematic manner. An example of how this framework can be applied is presented.

Resources have not been available to initiate laboratory studies or surveys of user groups.

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

apprenticeship: model of learning, in which knowledge is acquired in the process of performing

banner: coloured, horizontal bar with a title and optional graphic elements displayed on a portal page

browsing: moving from place to place on the Internet searching for topics of interest

chat room: virtual room on the Internet where real-time communication between two or more users takes place via computer

child development: process that turns infants into adults, including changes in size and shape, in knowledge and reasoning ability, in physical and social skills, etc.

clickstream: sequence of navigational data or usage information

comprehension: according to the communication theory, process that involves not only decoding messages, but also making additional inferences about meaning

cookies: files that log every site visited by the user

edutainment: computerized entertainment comprising both education and entertainment

icon: small picture displayed on the screen that depicts a task that can be invoked by clicking with the mouse

informercialization: integration of advertisements and programmes

internet: global network of computers

microtargeting: designing personalized advertising aimed at individual users

multimedia: combination of media types including text, graphics, animation, audio and video

multi-user domain: cyberspace where users can interact with one another

one-to-one marketing: interactive relationships between seller and purchaser

portal: set of information-content areas, pages, applications, even data from outside sources-brought together in one central location and accessed through a common interface, called a *page*

scaffolding: support platform allowing novices to enter a situation sufficiently to learn not only how to reproduce the activity but also the content that is embedded in the activity

software: series of computer instructions or data that can be stored electronically

spokescharacters: fictional cartoons animated characters

surfing: see browsing

(World Wide) Web (WWW): hyperlinked text- and graphic-based part of the Internet

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BECTA	British Educational Communications and Technology Agency
CD-ROM	Compact Disk - Read-Only Memory
CIPA	Children's Internet Protection Act
COPPA	Children's Online Privacy Protection Act
E-mail	Electronic mail (messages exchanged via computer)
ICRA	Internet Content Rating Association
ICT	Information & Communication Technology
SMS	Short Message System

4 The evolution of children and their ICT user requirements

Children, as ICT users, are by most aspects differently abled than their adult counterparts. Only if their abilities, needs and requirements are studied, understood and differentiated, can well working, understandable and accessible ICT solutions be offered.

Our challenge in providing guidance on designing for children is complex, because depending on how we define "children", our interfaces may or may not be supportive of their relevant cognitive, social, or physical skills and capabilities at a certain stage.

Any "Design for all"-approach from now on must include the youngest users, if and where they are part of the targeted user group, differentiating abilities and requirements.

4.1 Key theories of child development

An overview of the key theories and characteristics of child development is provided in this clause. Three main areas:

- Physical growth;
- Cognitive maturation; and
- Social development is discussed in a chronological order.

The focus is on typical development of the normal child.

Our selection criteria for the approaches and sources considered in the selection process was guided by balance, trying to include several major ideas bearing on important topics and agreement, conveying important facts and ideas on which researchers seem to have agreed, forming a sort of generic, common knowledge base.

Human development is the process that turns babies into children, children into adolescents, adolescents into young adults and young adults into old people. Nature is in no hurry at all- human infants are more dependent on other's care than are the young of any other species. Also, childhood spans far longer, allowing for a step-by-step physical and mental development. For the purpose of the present work, we focus on child development from birth to adolescence.

Once a child is born, the environment expands tremendously. The most important basic aspect, the family, is only the beginning. The environment includes many other factors, affecting a child's development, such as cultural differences, the socio-economic level and heredity. The interaction between heredity and environment and their importance shaping a child's intelligence, personality and sociability has been studied intensely. Scientists agree that children are shaped by their heredity *and* environment, but it is not agreed or clear how much is inherited and how much results from environmental influences.

Child development can be studied in different ways:

- *Descriptive studies* based on representative samples, allowing for conclusions about the mean and variability;
- *Correlational studies,* designed to investigate existing relationships between two or more sets of related data;
- *Experimental methods*, concluding upon significance of differences from data collected in experiments.

As there are a large number of theories and approaches describing child development, we have applied the selection criteria of *balance* and *agreement*, trying to include most major ideas on important topics, conveying important facts and ideas on which researchers have agreed.

Research of child development began in the late 1880s, when G. Stanley Hall tried to understand how children's beliefs changed and their knowledge increased, as they grew older [16]. Some 20 years later, Alfred Binet tested schoolchildren in Paris, in order to identify those who required more assistance. At about the same time, Sigmund Freud began to develop his theories on the human mind and personality [17].

Until the last century, childhood was not viewed as a special time of life: children were seen simply as miniature adults, assuming babies were born with their minds already "pre-programmed" with certain content. This was later denied by John Locke believing in an empty baby mind, a "tabula rasa" [18], until filled and shaped by thought knowledge and the environment.

Jean-Jacques Rousseau's theory [16] was based on that children are capable individuals to be left alone in order to develop naturally. Charles Darwin, assuming even humans are animals [19], subject to the same "laws of nature" that control animal's responses, believed in instincts- inherited patterns of behaviour.

Maria Montessori, in the early 1900s, stressed in her pedagogical methodology the need for training of the senses with unrestricted liberty [20], also introducing a new methodology of teaching children to write.

Sigmund Freud, the founder of psychoanalysis, argued that problems of sexual origin acquired during childhood experiences account for most adult psychological problems. Dividing the human mind into the id, the ego and the superego, he offered the first real stage theory of development. Stage theories are characterized by stages coming in a certain order but at various speeds. Also, what goes on in the stages is discrete and qualitatively different from what goes on in other stages. Freud's five development stages [17] are the oral, anal, phallic, latency and genital stages.

Erik Eriksson developed a more complex psychosocial stage theory [21], covering all phases in a human's life. The emphasis is on social interaction, less on sexual matters. The stages relevant for child development are trust versus mistrust, autonomy versus shame and doubt, initiative versus guilt, ego growth, industry versus inferiority followed by the identity crisis in adolescence. The last three stages, occurring in adulthood, are not relevant for this work.

Jean Piaget was interested in cognitive development [22], [26], the growth of knowledge and understanding. In his view, children actively seek information, achieving knowledge through their own efforts, as a result of the highest possible level of biological adaptation. Their built-in driver is one of the main characteristics of a human being.

Lawrence Kohlberg, focusing on the development of moral reasoning [23], defined three stages: on the pre-conventional level, moral reasoning is only about the possibility of success and failure, defined as "getting caught". Conventional reasoning is based upon society's rules, while post-conventional reasoning considers personal principles to be more important than upholding society's conventions and rules, a level most people never reach.

Behaviourists like J.B. Watson [24] and B.F. Skinner [25], focusing on the child's practical response and not thoughts or feelings, believed in conditional fear, classical and operand conditioning shaping our behaviour.

All these theories of child development, briefly outlined through their main characteristics, are not necessarily incompatible - they are pictures of a developing human, looked at from different angles, all providing a view - if not the whole and ultimate.

4.2 Key aspects of physical growth, cognitive maturation, perceptual and social development

The embryological development is a progressive process of anatomical differentiation, which also applies to the development of behaviour. Some aspects of the orderly progression of development are determined by maturation, genetically pre-programmed, independent of specific environmental conditions (e.g. walking).

Children's physical size and development is one of the basic obstacles to convenient use of ICT devices and services. Typically, children will have their first user experience with computer and telephone hardware designed and sized for adult users.

4.2.1 0-2 years

Noteworthy characteristics of newborn children are their small size, different body proportions and need to associate with other people in order to survive. The rate of growth will initially be high to later slow considerably. Sex differences can be observed, girls achieving more than half of their adult height by the age of two.

The brain of a newborn is only a quarter of the size of an adult brain. During the first six months of life, myelination to the parietal cortex introduces new spatial awareness abilities, although the ability to reason about spatial relationships is not functional. Development in the cortex provides abilities to handle specific senses and motor functions.

The newborn baby is not a remarkably sociable person, being in a receptive state for only very short periods, when not sleeping, crying or being fed. Basic behaviours are looking, vocalizing/talking and facial expressions with strong bands developed with the parents. This relationship develops to attachment, a remarkably universal aspect of development.

Many functional parts of the brain are formed in the womb, but are not functional at birth. Many clauses, including the cerebral cortex, have billions of neurons as internal connections. These neurons do not have the myelin sheath required for them to carry signals, and are therefore not functional. Many new neuron connections are made as the brain grows. Unless these are subsequently exercised they cease to function and die off. Baby brains also have an ability lost later in life - unusual sensory linkages, essential attributes of the infant brain that enables them to be "extra" aware of external stimuli.

During the second half year of life, the frontal lobe begins to become active giving the initial cognition and reasoning abilities. These are, however very primitive, and function at the level of choosing to take one of two objects rather than grabbing both. This coincides with the development of motor control skills leading to walking. Memory begins to influence a child's behaviour.

Between 12 and 18 months of age, toddlerhood begins with the child beginning to walk. In the mean time, the Wernicke language area begins to function, giving the child the ability to hear language as language, and to begin to understand it. Toddlerhood is also the time when socialization begins, the child beginning to learn attitudes, behaviours, knowledge and skills necessary to get along in society.

Between 18 and 24 months, the Broca language area [16] begins to function, providing the child with the ability to produce language. Also, children get a sense of themselves and the ability to recognize themselves in a mirror develops.

Piaget's first stage of cognitive development takes place, the sensory-motor period, allowing object performance to develop. Children during this period do not have object permanence - "Out of sight, out of mind" is a well-known, related phrase.

4.2.2 2-5 years

The pre-school period begins. Breathing becomes slower and deeper and physical health improves. Motor patterns and skills -sequences of precise movements -and manipulation develop. The various motor and sensor control areas of the brain start to correlate and work together. Visual constancies, pro-social behaviour but also aggression develop. The average vocabulary grows to 200 to 300 words by the age of 2, increasing to about 2 500 words in the productive and 15 000 in the receptive vocabulary at the age of 6. Grammatical morphemes develop, together with the first questions, negatives and tag questions.

During Piaget's preoperational period, between 2 and 7 years of age, thought is egocentric and single aspects of a problem, the "centre", are focused.

The child develops the ability to conceptualize abstract thought as an extension of the "reality" that they are experiencing.

4.2.3 5-11 years

Between 5 to 12, middle childhood, children extend their abstract thinking ability to include concepts such as the past and future, and begin to be able to have the ability to see things from the perspective of another person.

Growth is relatively slow but strength develops considerably. The ability to integrate fine motor skills with perceptual skills, such as the coordination of the eyes and hands, begin to operate at this age as a small but vital part of the parietal lobe begins to operate.

The smooth transition to the period of concrete operations (seven to eleven years) takes place. The child's understanding is tied to real, concrete, "touchable" objects. They cannot think in abstract, logical terms before they enter the period of formal operations (eleven and on).

There is a steady and considerable increase in meta-cognitive knowledge and understanding and use of strategies involved in learning, memory and information processing. Selective attention, the ability to focus attention on specific things, grows during the school years.

The child learns to read, an important pre-requisite to later acquisition of knowledge. Learning disabilities, e.g. dyslexia and hyperactivity, can seriously impact children's achievement at school.

The socialization process develops further, including development of self-control, morality and friendships. Antisocial behaviour, including dishonesty and aggressiveness, begins and is easier to form at this stage than later, in adolescence.

Apparent abilities displayed by children at an early age may suggest that they are exercising parts of the brain intended for basic processing, and developing instinctive linkages rather than reasoned linkages. Forced linkages of this type may make reasoned behaviour later in life harder as the instinctive linkages may operate faster than the reasoning functions of the brain.

Information received by the children beyond their experience will be interpreted within the framework of their experience, sometimes causing great anxiety and distress. Overexposure to themes such as war and sex may cause great difficulty later on as children have to reinterpret knowledge.

5 Children's use of Information and Communication Technology (ICT)

In the following clause the *parameters* of the use of technology that have implications for use by children will be systematically examined. In addition to developing a conceptual framework for future research, some specific issues of current interest will be emphasized. This is not a comprehensive list of issues, but, rather, selected concerns brought to our attention by stakeholders and frequently referred to in professional literature as well as by popular media.

5.1 Developmental mapping

The following three dimensions reflect individual traits and skills that develop as a result of genetically determined maturation and interaction with the environment. Each of these three dimensions is a composite of several developmental themes (some of them listed below), specifically selected in this context because they contribute to our understanding of the nature and prerequisites of ICT use by children.

Social development:

- from dependence to autonomy;
- from family to peer-group as primary reference; and
- balancing individual needs and social commitments.

Cognitive development:

- development of communication skills;
- discrimination between reality and fantasy;
- ability to take the viewpoint of others;
- refinement of classification skills (from single to multiple features);
- logical thinking and abstraction, understanding causal relationships; and
- moral reasoning.

Physical maturation:

- development of sensory capabilities (vision, hearing, touch);
- skeletal strength;
- muscle strength;
- coordination, manual dexterity; and
- stamina.

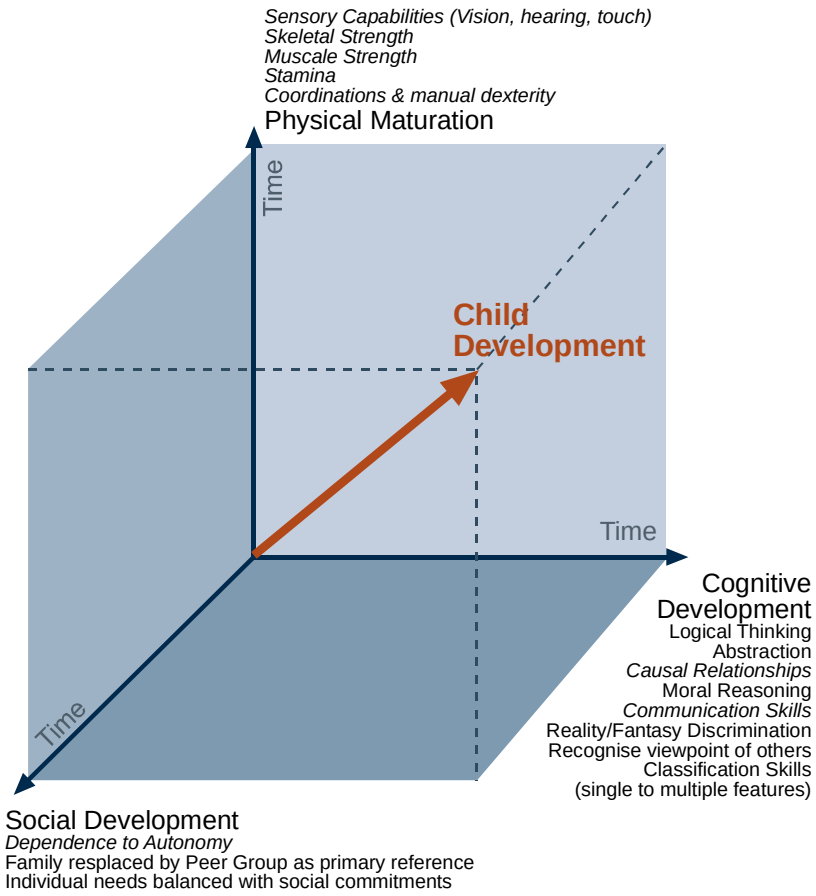


Figure 1: 3D conceptualization of three main developmental dimensions

The three developmental dimensions may be conceptualized as a three-dimensional space with time as main parameter along all three axes (see figure 1). At any given point in time any individual may be characterized by his/her development along the three composite dimensions, perhaps by means of a standardized set of test instruments. This will generate a *single* point within the 3D space for a single individual at a given point in time. This point need not coincide with the "standard" developmental trajectory (the vector labelled "Child Development"). A child could, for example, have a "normal" (statistically) cognitive development profile, lack some social skills assumed to be normal for its chronological age as a result of a physical impairment that will also result in a lower physical development rating. Taking all three dimensions into consideration, every child will be characterized by a single point in the 3D developmental space.

The next step is to move from the level of the individual to the group - the Target Group referred to in table 1. Collecting data on selected *groups* of individuals (e.g. seven year olds or visually impaired five year olds) will result in a cluster or scatter of points. Descriptive statistics may then be used to identify central features of this cluster. The defining features of the "seven-year-old-cluster", for example, will be the point of departure for analyses using the "Aspects of Technology" matrix illustrated in table 1. Individual variation in development is thereby taken into account, but since designers require *general* principles, the defining developmental features of specific target groups need to be identified. We maximize the probability of a good fit between product/service on the one hand and user needs/capabilities on the other by generalizing findings for a specific target group.

Given this general structure, the different developmental parameters can be explored within a given context or situation of use. For example, the issues associated with the use of ICT in emergency situations can be illustrated in the following way. A very young child or baby may not be aware that they are in an emergency situation, and may not have the communication skills to express their concerns should they realize the danger. They are totally dependent on others recognizing that they are in danger, and rescuing them. At such a young age they do not have the necessary physical maturity to escape from danger. This situation is illustrated in figure 2.

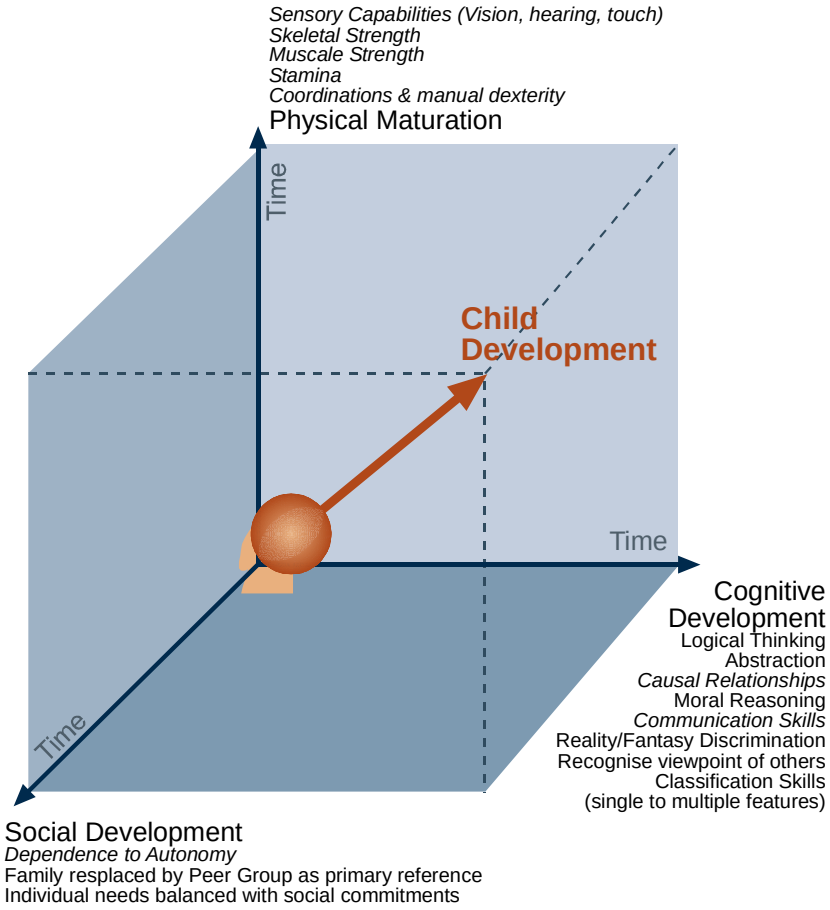


Figure 2: Developmental mapping of a cluster of young children

The role of ICT in this situation could be in the location of the child in order to rescue them from danger, or in the automatic detection of certain danger symptoms such as heat, sound or motion.

Once the child is mobile and has some initial communication skills, they may be more able to escape from danger. They may still be heavily dependent on others however, to alert them to the situation and to direct them to escape. This is illustrated in figure 3.

In this case the child could be provided with a communication and location device through which they could be instructed to move away from danger. This type of system raises issues of confidentiality and verification of who has the right to give these instructions and how the child can verify them before safely obeying them.

The volume enclosed by areas on the axis does not represent the size of the market of children covered by a specific context of use, but rather it represents the proportion of children from within the whole market of children.

Having located a developmental "stage" within this three-dimensional space, i.e. having fully described a target group in terms of its social, cognitive and physical characteristics, one moves on to a systematic description of the child's interaction with technology. As children use technology, they will interact with different aspects of the overall system. By considering these different aspects in turn, the implications for the use by children can be systematically explored, and the relevant issues exposed.

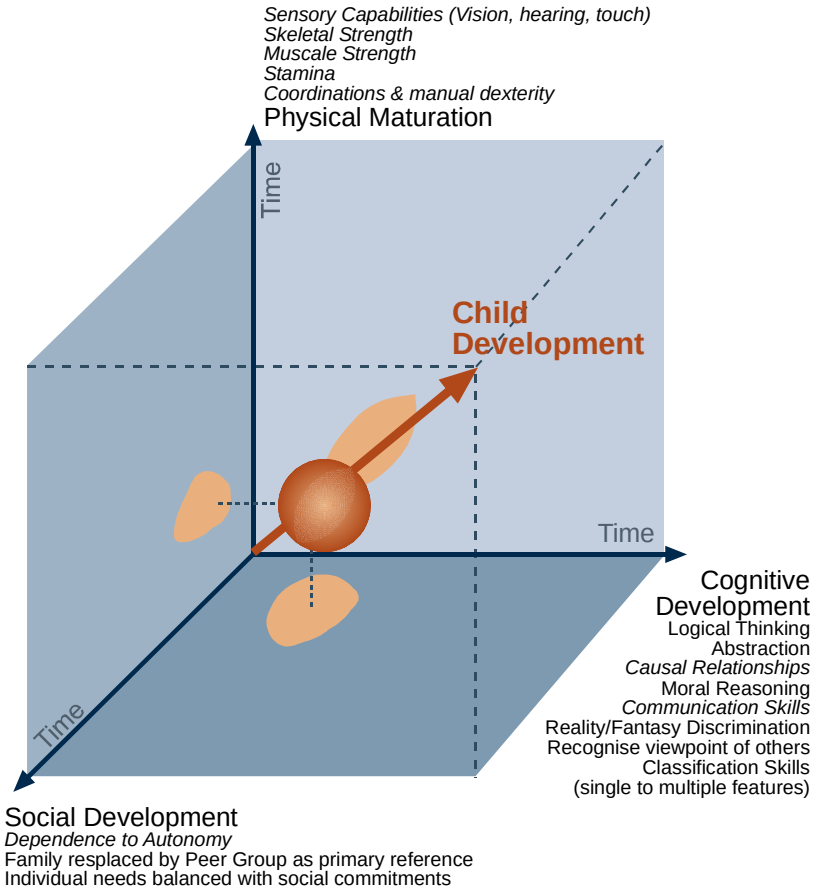


Figure 3: Developmental mapping of a cluster of older children

The various interactions involved in the use of ICT can be represented within a structured framework. This allows each aspect to be exposed and explored in a systematic manner. This framework is represented in table 1. As a child develops, the nature of the interactions with an ICT system and the issues arising from their interaction changes. The developmental profile generated by the approach described above will, for any given target group, bring to light qualities *typically* associated with that group that need to be taken into consideration by designers. The developmental profile may also suggest areas where products and services are lacking. Target groups may be selected on the basis of chronological age, educational level as well as by other defining characteristics such as specific physical and cognitive impairments. See clause 5.7 for an illustration of how this analytical approach can be applied to a specific target group.

Table 1: Matrix describing relevant issues related to five aspects/parameters of technology for selected target groups

	Aspects (parameters) of technology				
	Location and Context	**Physical Characteristics**	**Operating Characteristics**	**Services**	**Content**
Target Group 1	Issue "a" Issue "b"		Issue "c"		
Target Group 2		Issue "d"			
Target Group 3			Issue "e" Issue "f"		Issue "g"
Target Group n		Issue "h" Issue "i"			

Further elaboration and empirical investigation is required to uncover the *manner* in which the three developmental dimensions interact and contribute to the observed development of ICT proficiency and use by children. This STF is of the opinion that this is an essential first step, however, in the process of identifying issues, formulating guidelines and checklists for ICT designers.

Each of the five aspects or parameters of technology will be elaborated below and key issues related to ICT use by children identified. Some of these issues have been investigated and cited by experts as examples of issues that need to be resolved, while others have at the present stage been insufficiently explored.

5.2 Location/context

Children use technology in many different locations and for many different activities. This raises a wide variety of issues specific to the fact that children are the users. This clause will consider where the child will be using the technology, including the context of use.

Examples of location and contexts that highlight these child specific issues include:

- unsupervised use of a mobile phone in a public place;
- supervised use of an educational technology system in a school;
- restricted surfing of the Internet at home; and
- games playing on a portable device whilst travelling to school.

Issues that arise from use in these situations include:

- safety of use in a given context. Examples include, a child answering a mobile phone whilst riding a bicycle, or attempting to make an emergency phone call during a power cut;
- the right to use the system in a given context, including the payment for the use;
- the rules of appropriate use, including aspects such as the child being aware of them and the child acknowledging the authority of the person or body prescribing the acceptable use and consequently conforming to them. If the child does not obey the acceptable use policy, an issue is raised concerning the responsibility for enforcing this policy and for determining which party to sanction;
- in order to ensure that the use of the ICT system is appropriate the provider of the system or service may consider the need to ask for details about the user and the location and context of use. This may raise issues of confidentially of information and its secure storage and use; and
- depending on the location and context of use, it may be inappropriate for the child to be interrupted by additional unsolicited information being presented to them.

5.3 Physical characteristics

Children do not have the same characteristics as adults. Their skeletal and nervous systems are not mature; they do not have the strength or stamina that an adult would be expected to have. As they are maturing physically, they are vulnerable to damage from excessive use of or exposure to equipment that is not designed for their developmental level. This raises numerous issues about the physical characteristics of the equipment and its suitability for the child's purposes. Notably, media have recently called attention to microwave radiation exposure from mobile handsets and repetitive strain injury in children who are heavy users of SMS or gaming input devices, appropriately termed GameBoy™- or SMS-thumb.

The potential dangers to children of exposure to high levels of radio frequency microwaves emitted by mobile telephones has generated public debate. While no conclusive evidence of adverse effects of radiation exists, concern among parents and health officials is increasing as mobile phone penetration increases (Twenty-one % of eight to twelve year olds in the US [11] own cell phones.) Taking a proactive stance, the Bangladesh government has decided that mobile phones could potentially be harmful. Bangladesh plans to ban mobile phones for children under 16 to protect them from what it says is exposure to radiation that could damage their brains. In May 2000, a special committee in the U.K., the *Independent Expert Group on Mobile Phones* (also known as the Stewart Commission) issued a report [14] on mobile phone safety issues. With reference to children, the Stewart Commission concludes: "...the widespread use of mobile phones by children for non-essential calls should be discouraged and... the mobile phone industry should refrain from promoting the use of mobile phones by children." ([14], section 1.53).

The U.S. Department of Health and Human Services, Food and Drug Administration summarize research findings and make the following recommendation on their official web-site [15]:

- The scientific evidence does not show a danger to users of wireless phones, including children and teenagers. If you want to take steps to lower exposure to radio frequency energy (RF), the measures described above (see note) would apply to children and teenagers using wireless phones. Reducing the time of wireless phone use and increasing the distance between the user and the RF source will reduce RF exposure.

NOTE: If you must conduct extended conversations by wireless phone every day, you could place more distance between your body and the source of the RF, since the exposure level drops off dramatically with distance. For example, you could use a headset and carry the wireless phone away from your body or use a wireless phone connected to a remote antenna [15].

In addition to these general aspects, more detailed points may include:

- ergonomics of the relationship between system unit, input devices and output display;
- ergonomics of the input devices relative to the strength and co-ordination skills of the child;
- weight and portability of the device;
- brightness and legibility of the display;
- the operating behaviour related to the safety tolerances of children as opposed to those acceptable for adults;
- the physical design of the system, and whether it is suitable for the environment that it is likely to be used in. For example a device may be left outside in the rain;
- the degree to which the design is styled to reflect its use by children, and the degree to which this styling is suitable for children. This includes attributes such as being customizable;
- the portability of the devices, including the facility for it to be considered as wearable;
- the power supply, including batteries and feedback about their status being in a form that can be comprehended by a child; and
- the use of text and other representational metaphors to assist the child to operate the system, particularly as abstract metaphors may not be comprehensible to a child.

5.4 Operating characteristics

Not only should a child be able to physically operate an appropriate ICT system, they should also be able to negotiate the basic operation of the system at the software level. Various parameters may influence the successful comprehension of the operation of the system, and the ability to execute the procedures necessary to operate and configure the system, to ensure that it is ready to do the required tasks. Gilutz and Nielsen [9] point out that children's difficulties in using Web-sites are caused by factors such as lack of navigational confirmation of the user's location, inconsistent navigating options and non-standard interaction techniques. This might be thought of as the software issues related to the "enabling tasks" of getting the system to a state where it is ready to be used for the intended task. The issues involved may include, for example:

- navigation through options;
- invoking and closing communications or information exchange processes;
- comprehending instructions;
- general media storage and retrieval;
- identification as the legitimate user of the system and security validation at a level that is appropriate for children;
- configuration, representation and operation of short-cuts; and

- configuration and operation of restrictions on facilities appropriate to children, including access by children to configurable aspects of the system.

Usability findings for adults cannot necessarily be generalized to children. To illustrate this extremely important point Gilutz and Nielsen [9] list some of the more striking differences:

- Animation and sound effects were positive design elements for kids, while often a nuisance or obstacle for adult users.
- Children display a greater willingness to "mine-sweep" in order to find clickable elements on web pages.
- Geographic navigation metaphors (pictures of rooms or 3-D maps) work for children.
- Children rarely scroll pages and interact mainly with information that is visible without scrolling up or down.
- Surprisingly, half of the children in the Gilutz and Nielsen study were willing to read instructions, commonly a last resort for adult users.

5.5 Services

Having ensured that the basic system is usable, it will be necessary to consider issues arising from the use of the system to access communication and information exchange services. A wide variety of issues may be involved, including:

- opening and closing communication channels with the correct and appropriate communication partners.
- the possibility of being contacted by legitimate and inappropriate communicating parties;
- determining who the communication partners are;
- bringing communicating parties into a multiparty session;
- navigating through information stores;
- capturing information or communicated media; and
- configuring the operating characteristics of the service, and comprehending the process, the instructions and the representation of the options and the state of the service.

5.6 Content

The following clause will focus on content on the Internet and mobile services. In order to identify issues requiring action, these areas will be considered jointly, as convergence of technologies and the increasing prevalence of hybrid services are rapidly making the distinction between Internet and mobile telephony less relevant. Issues that are unique to either domain will, however, be pointed out.

The child is born into and develops within a sociocultural setting. The child's first encounters with telephony and the Internet are usually regulated and mediated by prevailing attitudes that reflect what society considers comprehensible, appropriate and "normal". Threats - imagined and documented - to the child's physical and emotional well-being have resulted in a wide range of guidelines as well as legislative action to protect children in the face of such dangers, in addition to impassioned public debate. The purported benefits of ICT use, both substantiated and unsubstantiated, in specific areas such as education have given rise to an industry. As the mobile phones and Internet find their way into primary schools and the public arena in general, it becomes increasingly important to secure access for *all* children - cultural/linguistic minority groups as well as groups with non-standard user interface requirements and children needing modifications in the way services are offered. The following clause examines the impacts and implications of such cultural variables on ICT use by children as they relate to the comprehension and control of content.

5.6.1 Comprehension

Comprehension is a process that involves not only decoding messages, but also making additional inferences about meaning and, at more advanced levels, the explicit and covert intentions of the message source.

Young children, e.g. pre-schoolers, are beginning readers that can encounter difficulties in mastering media literacy events such as understanding bedtime stories, labels and signs, interpreting instructions for games and toys, understanding messages and situations. They also have limited ability for abstract thinking. Gilutz and Nielsen [9] in their recent study of how 55 children (grades one to five) actually used the Web, found that young children and beginning readers had problems dealing with large amounts of text. Problems arose when they navigated into sections of text that were written at a different level than their current reading skills could cope with. The researchers also found that fancy wording rather than straightforward language easily confuses young readers, preventing them from understanding the options available to them. To this we would add that ethnic migration also exposes children of all ages to cultures and languages different than their native ones, with subsequent comprehension difficulties. Indigenous minority language communities exist in many parts of Europe as well. Although older children and adults are generally capable of speaking and understanding the majority language that surrounds their communities, younger children often lack the language skills needed to interact with their more inclusive environment.

Furthermore, children's ability to comprehend persuasive intent on the part of content providers is clearly related to age. In television children typically begin to distinguish between advertisements and programmes and understand that the purpose of commercials is to persuade them to buy around the age of 7 or 8 [2], [3]. In the Internet it seems that even children of 9 o 11 years may not be aware of the commercial intentions of many web-sites.

It has been noted that comprehension of the privacy concept differs from children to adults: 10 to17 year olds are much more likely than their parents to give sensitive personal and family information to commercial web-sites in exchange for rewards of various sorts [4].

The blurring of boundaries between reality and fiction, between the actual and the virtual, may be an important issue for young children interacting with toys in the future. Futurologists at BT predict that dolls and action figures can soon be shaped by downloading different "personalities" from the Internet. Children and their toys will also enter on-line virtual communities by means of large screens or head mounted displays while being tracked by geo-positioning systems. Physical toys will be able to communicate with each other, with the user, with the Internet and, more significantly, with the manufacturer, according to Mitch Resnick of the M.I.T. Media Lab research group Toys of Tomorrow [8]. Resnick's prediction suggests a much needed *research* focus not only on social and cognitive developmental implications associated with interacting with deceptively life-like virtual friends, but also a *regulatory* focus on marketing and data collection (see clause 5.5.3) when manufacturers can use toys to infiltrate the home.

5.6.2 Legal and ethical concerns

The characteristic Internet use patterns of children are difficult to measure. Entertainment is the primary attraction for children, but attempting to describe and document activity is like trying to hit a moving target [9]. Children mature, preferences change, technology advances and new knowledge bases emerge and spread among this networked generation. An estimated 65 million children between 2 and 17 have access to the Internet at home in Europe and the US. The estimated number of American children online has grown from 8 million in 1997 to 19 million in 1999 to 30 million in 2002 [9]. A survey of US children published in 2000 [12] indicates that children ages 2 to 17 spent about 34 minutes per day, on the average, using computers at home. Preschoolers (2 to 5) average 27 minutes and the 6 to 11 age group average 49 minutes per day. A recent research study [5] on the perceptions of the media reports that between 38 % and 82 % of parents of children aged 2 to 17 expressed at least some concern about the medium used. The media that concern parents most are television and Internet, accounting for 46 % and 32 %, respectively. The %age increases from pre-school to school age and decreases afterwards, with the exception of Internet (the concerns raised by Internet increase with age steadily). Findings [12] suggest that younger children are not at the present time heavy computer users in the school setting, averaging less than 10 minutes per day in grades K
(pre-school) through three.

The social and economic aspects of mobile phone use are two sets of concerns that have been voiced by parents and educators. Cell phone use in classrooms is disruptive, and a variety of measures are being employed to prevent undesirable consequences of use in schools. In addition to potential safety hazards, parents are expressing a variety of other concerns: increased susceptibility to theft and physical harm in connection with robbery, footing the bill for what may be hours of use, the initial cost of the terminal and peer pressure (reinforced by targeted marketing campaigns) to upgrade to the latest model, harassment and unsolicited calls and messages.

What concerns most parents with regard to these media is the content (64 %) rather than the amount of time spent with the medium (21 %). With TV, four problematic content themes have been identified, namely violence, sex, crude language and adult dialogue. The interactive nature of the Internet widens the area of concern about content and extends beyond it.

Value-Sensitive design attempts to connect the people who design systems and interfaces with the people who think about and understand the values of the stakeholders who are affected by the systems. This approach to design of ICT artefacts centres on human well-being, human dignity, justice, welfare, and human rights and serves as a tacit foundation for much of the public debate we have encountered. With reference to children and ICT use, this debate has focused on the following four sets of issues:

- exposure to inappropriate material;
- Internet (and to a lesser extent mobile phone) harassment of minors;
- legal and financial concerns (e.g. piracy, hacking, financial accountability, marketing, etc.).
  As children have access to ICT earlier and earlier in their lives, experts in piracy, hacking and other forms of Internet mischief emphasize that any effort to tackle the illicit trade in digital goods (video games, software, music and movies) should be targeting younger children as a preventative measure. Since norms of conduct are established within peer groups, critical periods and contexts for norm formation should be identified and targeted for the purposes of prevention. In addition, marketers are beginning to recognize the marketing potential of the Internet, and, more recently, the mobile telephone;
- physical molestation.
  Reports of physical molestation of minors following initial contact made using Internet chat or SMS exchanges are becoming disturbingly common. Preventative measures are required.

Attempts on the part of government authorities, service providers and special interest groups to influence content delivery and utilization by means of the Internet to homes and schools may be divided into four basic approaches:

- education and awareness;
- rules and guidelines;
- regulations; and
- legislation.

The US and Europe seem to have taken different approaches to content regulation, the US favouring legislation, while the EU has recently voted in favour of a less restrictive approach, placing responsibility for content monitoring on content providers and ISPs.

CIPA (Children's Internet Protection Act of 2000) is an example of legislation (US) that limits federal funds made available to local educational agencies for elementary and secondary school that do not have in place a policy of Internet safety for minors that includes a technology protection measure that protects against access to visual depictions that are obscene, child pornography or harmful to minors.

5.6.3 Marketing and privacy

Children have growing personal spending power and influence over their parents' purchasing decisions [6]. Therefore, it is not surprising that from 1993 to 1996 advertising in child-oriented media increased more than 50 % and that in 1996 the market sales of licensed products for infants increased 32 %. This influence is not limited to children's products, but encompasses everything in the household.

A European working group on commercial practices aimed at children set up by the Consumers Committee at its meeting of 6 December 1999 has recently concluded that children are particularly vulnerable to commercial pressures on the Internet. It is an appealing and personally engaging medium, which experts claim, puts children into a "flow state", making them very receptive to advertising. It allows for more sophisticated ways of marketing, which are interactive and one-to-one targeted. Web-sites specifically dedicated to children, with the aim to sell directly to children are already very common on the Internet.

The principle of spatial separation of advertising from the decision to purchase should be adhered to when communicating with children by means of the Internet. Because they are more impulsive and less concerned about the consequences of their actions, an advertisement accompanied by a box to click and buy is a special temptation for children. Logos and signals (popular melodies) are also being marketed directly to children via SMS, and payment collected for providers of these services by network operators.

On the Internet advertising and content are commonly merged, and it is even more difficult for children to make a distinction between advertising and content in this new media. For example, children's web-sites enable young people to interact with the main character, learn what products he purchases and click onto advertisers' sites or online purchasing forms. On-line game sites, increasingly popular with children, incorporate logos and develop game scenarios closely linked to products targeting young consumers.

Integrating advertising and web-site content enables companies to create brand loyalty at an early age when children are anxious to belong and be accepted by their peer groups. For example, banner ads appear at the top of many web-sites, even children's own web-sites, and hot link to the sponsor's site. Many children's web-sites have been pressured to put the word "advertisement" next to the hot link as well as to insert bridge pages, clearly a step in the right direction. One of the most notable findings in the Gilutz and Nielsen study [9] was that children tend to click on advertisements on web-sites - often by mistake, however, thinking they are just one more element of the site. Tagging advertisements with PAID or AD markers had little or no effect. Very few adults have been observed clicking on advertisements, and many are rapidly developing a form of immunity, blocking out commercial content.

There are sites that seem to promote smoking and also teen friendly alcohol advertising sites. In a survey by EKATO, the Greek consumer organization, all the children who participated in the study, admitted visiting either pornographic or gambling sites.

Parental consent for sales transactions must be given. Mechanisms are beginning to be provided for children's on-line accounts, but the norm is for children to make purchases using their parents' credit card. There is no systematic check on the age of purchasers on the Internet despite the fact that the anonymity of the net obscures this. This makes it too easy for children to "borrow" their parent's card and cause family friction. Prepaid mobile phone cards guaranteeing the anonymity also makes it impossible to verify the age of the end user.

Commercial web-sites have developed a number of strategies for developing personalized one-to-one relationships with children to learn more about them in order to market their products in a better way. For example, many commercial sites entice children to supply their names, addresses and names of their friends by making it necessary in order for them to participate in various activities on the site. Children's and family's right to privacy can be invaded by using profiling tactics [6] that consist of either tracking online browsing behaviour ("clickstreams") by using "cookies", or asking children directly to provide detailed personal data, such as name, age, gender, e-mail and street address, telephone number, favourite TV shows, interest in music groups, purchasing preferences, parents' credit card number, information about family social status and members. This disclosure of personal data, usually sought without parents' permission, can be encouraged through free gifts (T-shirts, mouse pads, screen savers, club memberships, opportunity to role-play in a game) or online prizes (Sign-up and win points), or can be presented as mandatory (filling a registration form or answering a questionnaire as a condition to play a higher level game or enter a context), or disguised as a loyalty test. The information about online visitors, their habits and interests is then used through Customer Relationship Management techniques to establish individual relationships (one-to-one marketing), craft personalized ad messages (micro-targeting), and develop long lasting brand loyalty.

The 1995 EU data protection directive gives consumers legal rights to limit the collection and uses of their personal information and to opt out from receiving unwanted sales pitches or direct marketing. It also requires information about a supplier's privacy policy and use of personal information to be provided. However, so far the directive has proven to be very difficult to enforce in the Internet environment and no special provision is made in the directive for children.

The working group set up by the Consumers Committee has concluded as follows.

The issue of on-line marketing targeted at children urgently needs to be addressed by the Commission. Limitations for on-line marketing practices are urgently needed because marketing using the new media is developing very quickly.

- Specific safeguards in relation to the collection of personal data on-line from children, such as the requirement of parental consent before any data are collected have to be put in place.
- Initiatives to ensure that parental consent is given for sales transactions are necessary.
- The Commission should undertake further study with this issue and present appropriate proposal for regulation as soon as possible.

To the list this STF would add a further concern: advertising that targets children specifically may in the future find its way to mobile phones. The combined effects of 3G multimedia terminals, increasing bandwidth and the market penetration mobile communication devices on young people will certainly spawn new marketing strategies and techniques. It remains to be seen how the interests and welfare of children will be protected. The European Parliament has indeed voted to ban the sending of unsolicited commercial email. The new European directive should be in place some time next year (2003) and would mean that people will have to "opt in" or specifically request commercial email, but it is unclear at the present time if this also would apply to SMS or MMS messaging.

An example of legislation designed to protect the rights of children with respect to data collection is COPPA (Children's Online Privacy Protection Act of 1998 (US)). This act makes it unlawful for an operator of a web-site or online service directed to children, or any operator that has actual knowledge that it is collecting personal information from a child, to collect personal information form a child in a manner that violates specific regulations specified in this law.

5.6.4 Approaches to controlling content

Content control may be divided into three basic categories:

- tagging, blocking and filtering;
- monitoring use; and
- separate "kids" domains.

The Internet Content Rating Association is an international, independent organization that empowers the public, especially parents, to make informed decisions about electronic media by means of the open and objective labelling of content. ICRA's dual aims are to:

1) protect children from potentially harmful material; and
2) to protect free speech on the Internet.

There are two elements to the system:

- The content provider fills in an online questionnaire describing the content of their site, in terms of what is and is not present. ICRA then generates a Content Label (a short piece of computer code) that the content provider adds to his/her site.
- Users, especially parents of young children, can then set their Internet browser to allow or disallow access to web-sites based on the objective information declared in the label and the subjective preferences of the user. The ICRA system can be used with Microsoft's Internet Explorer immediately, with wider applications under development. The existing RSACi labels can continue to be used in both Internet Explorer and Netscape Navigator but will be phased out over time.

A key point is that the Internet Content Rating Association does not rate Internet content - the content providers do that, using the ICRA system. ICRA makes no value judgement about sites. ICRA's labelling system is designed to be as objective as possible, and to cover a wide range of content types. The system gives users a great deal of flexibility in their choices of what should and should not be seen in their home or workplace. The browser's filtering system can of course be disabled and enabled easily, if you have access to the password.

The broad topics covered are:

- chat;
- the language used on the site;
- the nudity and sexual content of a site;
- the violence depicted on the site; and
- others (e.g. gambling, drugs and alcohol).

Within each category the web author is asked questions about whether a specific item or feature is present or absent on the site. This is in contrast to the earlier RSACi system where "levels" of nudity, sex violence and language were set.

Content Labels generated by ICRA conform to an Internet industry standard known as PICS - the Platform for Internet Content Selection. ICRA's forerunner, the Recreational Software Advisory Council (RSAC) was involved in the development of the standard, created by the World Wide Web Consortium. The RSACi system (RSAC on the internet) has been incorporated into Netscape Navigator and Microsoft's Internet Explorer, the latter since the release of version 3.0 in February 1996.

A new breed of ISP is emerging to serve the needs of parents and others who want access to an Internet free of pornography, bomb-making information, hate advocacy and other perceived ills. They are called "filtered ISPs", and they exist to make it easy for families and others to keep arguably objectionable material off their computer screens. Those who run the services say they are a safer bet than blocking software (see clause 7.5.2) installed on home computers, because they are not as easy for clever youngsters to circumvent. Many of the (US) services were started by people from religious, and particularly evangelical Christian, backgrounds. Like all Internet filtering efforts, however, the services run into criticism from those who say the technology is not foolproof, that it can fail to capture all the arguably bad sites while blocking those that are arguably good. Moreover, they say, the services are really a high-tech form of censorship.

The most pressing concern regarding Internet filters is the potential to block important sources of information. Internet Filters may also, it has been argued, provide a false sense of security, compelling users to rely on software as a surrogate for personal judgment or parental supervision. Questions as to who defines the labels and who labels the sites are important considerations. A study conducted by the Electronic Privacy Information Centre found that one family-friendly filter blocked 90 % of materials containing the relevant search term. 99,8 % of documents on the American Red Cross were blocked, 99,7 % of documents concerning Disneyland were blocked, and 99,9 % for the Bill of Rights, and only eight of 2 638 references relating to Dr. Seuss (Theodor Seuss Geisel is a popular US author of literature for young children) made it through the filter.

Opponents argue as follows:

- It prevents citizens from communicating and accessing constitutionally protected speech (US), imposes a prior restraint on speech, is not narrowly tailored to limit speech in the least restrictive way possible, and violates the well-established right to communicate anonymously because it requires adults to prove a "bona fide research purpose" before they may access protected speech at public libraries.

- The programs routinely and inexplicably block sites that clearly do not fall under the categories proscribed by the law (see examples above).

- Libraries preserve democratic society by making available the widest possible range of viewpoints, opinions, and ideas. CIPA prevents them from carrying out this mission.

Mandatory library blocking would widen the "digital divide" that already exists between the "haves" - those who can afford Internet access in the home - and the "have-nots"- low-income people, minorities, and those who live in rural areas where reliable Internet access is not always available.

Separate Internet domains for children have also been proposed. The Subcommittee on Telecommunications and the Internet (US) has approved the Dot Kids Implementation and Efficiency Act of 2002 without amendment. This bill if signed into law would facilitate the creation of a new, second-level Internet domain within the United States country code domain that would be a haven for material that promotes positive experiences for children and families using the Internet, provides a safe online environment for children, and helps to prevent children from being exposed to harmful material on the Internet. The bill tasks the Department of Commerce, through the National Telecommunications and Information Administration, with the responsibility of overseeing the establishment of "kids.us." This measure ensures that only material that is suitable for children twelve and younger will be allowed to use or advertise on the "kids.us" Internet address. The new subdomain name provides a gatekeeper or monitor to protect children from pornography and predators. The present document will be enforced through constant content monitoring and swift takedown of inappropriate materials as required under the bill. Further, the legislation requires that the operator of the "kids.us" work with the Department of Justice and other government agencies to prevent the targeting of children.

5.7 Applying the approach to a specific target group

It is beyond the scope of the present document to provide an exhaustive evaluation of every ICT service that children can be expected to encounter in their daily lives. Our intention has been, rather, to suggest an analytical framework within which such endeavours can be carried out at some future time. To conclude this clause we would, however, like to illustrate how the analytical approach described above can be put to practical use. We have chosen a target group consisting of children between the ages of seven and ten using mobile phones in a public place. Table 2 provides an overview of a set of issues related to a *single* target group of users in a *specific* context. It also highlights the fact that much research is needed to explore the spectrum of issues in any given usage context.

Table 2: Matrix describing relevant issues related to mobile telephone use by young children in and unsupervised, public setting

	Aspects (parameters) of technology				
	Location and Context	**Physical Characteristics**	**Operating Characteristics**	**Services**	**Content**
7-10 year old children	*Location:* *Phone used unsupervised in a public place.* 1) Issues Fashionable phones may be stolen by older children **Recommendation:** Make phones that are attractive to the age group but too "childish" for the older children. 2) Issue Phones may be lost while children are playing. **Recommendation:** Build telephone functionality into clothes so that they cannot easily be lost.	1) Issue The buttons on the phone may be too delicate for the robust handling of the children. **Recommendation:** Provide buttons that have been tested to stand the handling of children when used unsupervised and whilst in a play situation. 2) Issue Phones may be damaged while children are playing. **Recommendation:** Build telephone functionality into well-padded clothes so that they are well protected.	1) Issue Young children may need to ensure that the phone is locked to all but legitimate users. Unlocking needs to be appropriate to the abilities of the children. **Recommendation:** Voice recognition identification needs to be usable when the child is stressed, and needs to take the different vocal qualities of children into account.	1) Issue Children may not take the issue of nuisance calls seriously, and may make inappropriate calls. **Recommendation:** Provide a restricted set of numbers that can be dialled by a specific user when using a specific phone.	1) Issue Children may not take the issue of nuisance calls seriously, and may be the victim of abusive and offensive calls. **Recommendation:** Provide a restricted set of numbers that can be received by a specific user when using a specific phone.

It should be emphasized that the approach proposed is primarily an analytical tool that "bounds" thinking and generates a set of issues based on in-depth knowledge of the child's physical, cognitive and social development (cf. the ICT in emergency situations example presented above). This approach is *not* proposed as a substitute for detailed observation and analysis of children interacting with technology in laboratory and naturalistic settings. Issues of concern to telecom service providers and ICT designers catering to the needs of children will ideally, we believe, be identified by applying the type of methodology described in this clause in combination with detailed observational studies of technology in use.

6 Market characteristics

This clause provides information about the current status of the market for ICT products and services for children.

The market for ICT products and services for children is very complex. The users - children - are not one homogeneous group (see clause 4). They have different needs dependent upon their age, sex, culture and developmental characteristics. These needs also rapidly change over time. Products for children need to be "throw away", with a short life.

Cost is a major factor in product design. If products are too expensive, the majority of children will not want to or be able to purchase the products. Manufacturers are therefore reluctant to invest in products specifically designed for children, which will not sell. This leads to the current situation of children using products that have been specifically designed for adults and which may not be appropriate for their physical or cognitive use.

Currently children are not consulted in the design process when products are being produced. This leads to their full requirements not being taken into consideration. Current design guidelines do not cover specific issues for children and children are not involved in the evaluation of products.

An analysis of stakeholders has shown the following groups and individuals having an interest in the design of products and services specifically for children:

Technical Bodies

ETSI groups such as 3GPP/T2; Other standards groups such as CEN ISSS, CEN TC 224/WG6, ITU T; Telephone companies e.g. Alcatel, Mobile phone companies e.g. Nokia and PC Manufacturers e.g. Apple; Toy/Games Manufacturers e.g. Lego.

User Groups

Human Factors and Telecommunications community; Academics e.g. CHI for kids; Consumer groups e.g. ANEC, WHICH; Education groups e.g. European School Net, *e*learning projects in the IST EU programme, eEurope, Democracy of Primary schools in Europe; National Ministries of Education e.g. UK dept of Education and the UK National Grid for learning; Children's disabilities groups; Children's charities e.g. Oxfam, NSPCC, Action aid, Child line; Children's rights groups e.g. UNICEF, UN Human rights.

7 Conclusions and recommendations

Conclusions are based on reviews of relevant literature, surveys of media coverage of issues, organized stakeholder consultations and informal consultations with representatives from industry and academia. Specific recommendations have been highlighted in bold text below. We have not had the resources at its disposal to initiate laboratory studies or surveys of user groups.

7.1 Design issues

- Children, as ICT users, are in most respects differently abled than their adult counterparts. Only if their abilities, needs and requirements are studied, understood and differentiated, can well working, understandable and accessible ICT solutions be offered.
  It is recommended that:
  - The analytical approach described in clause 5 of the present document is recommended as a conceptual and procedural framework for the development of distinct sets of guidelines for (a) product designers, (b) service developers and (c) standardization organizations.
  - Representative *descriptive* studies of ICT use among children should be encouraged and promoted.
- Gender and cultural differences (including language) are not thoroughly understood as they relate to product and service design for children.
- Guidelines for product evaluation for children need to be tailored to children.

- Children instinctively share their experiences. A better understanding of this process is needed in order to design better products and services.

7.2 Market issues

- A better understanding of the market for ICT products for children and its characteristics is needed.
  The market's transient nature makes it difficult to market relatively high-priced products to children and their parents.
  It is recommended that:

  - Studies of the market for ICT products for children need to be undertaken.

  - Technology that grows with the child is needed. Developers as well as parents are unwilling to invest in expensive techno-toys and ICT devices that are discarded after a short period.

7.3 Health and safety concerns

- There is still a great deal of confusion and misinformation about radiation dangers from GSM terminals.
  It is therefore recommended that:

  - Radiation from mobile terminals and its effect on children needs to be addressed and monitored by independent bodies. In addition to traditional laboratory studies, effects on physical development need to be monitored specifically.

- Little is known about the social, physical and cognitive *impacts* of ICT use on child development.

  - Descriptive studies grounded in theoretical models as well as research focusing on specific benefits and vulnerabilities must be encouraged.

- Children's susceptibility to repetitive strain injuries (RSI) is poorly understood.

  - Research on RSI in relation to specific user interfaces and services is needed, e.g. the use of SMS on mobile terminals.

- The impacts of prolonged use of visual displays and the development of vision are poorly understood. Survey data gathered in 2000 [12] indicate that children between 2 and 17 with access to computers, video games and television spend about five hours a day in front of some form of visual display (screen).

  - Research on the impact of prolonged use of various types of visual displays on the development of vision must be encouraged.

- Typically, the child's ICT workplace is not tailored to match the physical dimensions and ergonomic requirements of children.

  - Proper workplace design in schools, libraries and homes needs to be addressed as a preventative measure as well as to secure access for all. Guidelines that can be applied by non-professionals should be produced.

- Poorly designed and outdated ICT products are more likely to find their way into the hands of children.

  - Schools should be provided with guidelines that can be applied to the evaluation of new as well as second-hand equipment that is donated to them by companies and government agencies.

7.4 Security and privacy concerns

- Age verification mechanisms independent of identity are needed.

  - European standardization bodies and activities investigating and/or proposing identity verification schemes should be made aware of the need for reliable age verification mechanisms that do not compromise the on-line anonymity of children.

- Parents, libraries and schools request improved content control mechanisms. Such mechanisms should not filter out useful content.
- Online marketing targeting children and increasing use of personal profiles is expected to increase.
  - Regulatory measures are needed, and need to be effectively enforced.
  - There needs to be a critical focus on and monitoring of ICT products, applications and technologies that can be used for the purposes of:
    - 1) eliciting personal information in order to compile individual profiles on children,
    - 2) tracking children's online activities,
    - 3) designing personalized advertising aimed at individual children (microtargeting),
    - 4) luring children with branded environments, and
    - 5) seamlessly integrating advertising and content.
  - Mechanisms for parental consent in connection with sales transactions initiated by are needed.
  - ETSI task forces and activities working in the area of online commerce need to take onboard issues related to sales transactions carried out by children with reference to the security and consent issues outlined above.

7.5 User interface design issues

- Help facilities, guidelines, manuals and documentation for children need to be better understood and produced.
- The *specific* benefits for children of common interactive elements in mobile user interfaces should be investigated and explored empirically.
  The availability of common, basic interactive elements increases the transfer of learning between devices and services and improves the overall usability of the entire interactive mobile environment. Such a transfer becomes even more important in a world of ubiquitous devices and services. Simplifying the learning procedure for end-users will allow for reuse of basic knowledge between different terminal devices and services and lead to a faster and easier adoption of new technologies, fully benefiting the end user without restricting the manufacturer's wish to use user interfaces based on a corporate look-and-feel and the overall user experience as a competitive edge.

NOTE: Examples [1] of such basic elements, *some* of which may be relevant for children, are: International access code, emergency functionality and services, symbols, icons and pictograms, acoustic signals, access to basic voice services, basic terminology, text entry and retrieval, assistive device interfaces, UIs of services and applications, configuration procedures, service and application access, service and application terminology, structure and vocabulary of spoken commands, address book data format and portability, terminology of network services, universal addressing in converging networks, positioning services, service and content presence, connectivity and adaptability and user privacy and security.

7.6 General accessibility issues

- Any "Design for all"-approach must include the youngest users, if and where they are part of the targeted user group, differentiating abilities and requirements.
- Accessibility requirements cannot always be satisfied for all users. Therefore, it is important to support assistive devices in order to be able to display larger font sizes or provide higher volumes of speech output to those who require it. Similar user requirements are to be found when accessing devices and services with multimodal user interface capabilities that need to be adapted to the user's needs, e.g. a blind person retrieving a written short message or a non-literate child wanting to call their parents by speaking their name instead of entering the digits of their telephone numbers.
  - Guidelines for connection of various assistive devices to mobile terminals need to be developed.

- When acquiring new hardware and software, schools should consider options that incorporate Design for All features to facilitate access to computers for all students, including those with special needs.

- Efforts by libraries and other community and public access centres to include components within their technology programs focused specifically on children should be encouraged.

7.7 Proactive issues

- The implications of anticipated future products and services need to be understood. Examples of such systems are communicating, networked, smart toys, image sharing (MMS and Internet), mobile edutainment and awareness systems.

  - Technology and service development activities need to be monitored in order to try to anticipate and evaluate their impact on children.

  - Specifically, implications of 3G (multimedia mobile terminals) need to be explored from the perspective of usability, content control and marketing.

  - Speech interfaces are very appropriate for pre-literate children and children who lack the strength and co-ordination skills needed to use other types of input devices, but these are not designed for young children. Research on speech interfaces that take into account the vocal qualities of children needs to be undertaken.

Annex A: Methodology

A.0 Introduction

STF 201 has reviewed the literature in relation to a number of issues of relevance to children and ICT use. In particular it has looked at the literature on child development (both physical, cognitive and social) and has tried to draw out issues of relevance to design of ICT products and services. In has looked at research in relation to the child in context of using ICT. This has focussed on the ethical and legal aspects of ICT use.

The STF has also looked at those parameters of use of ICT that will have an implication on their use by children. These parameters are the location/context of use, the physical characteristics, the operating characteristics, the type of services and the content being presented over the medium.

A range of other initiatives and projects working in this area has been identified. The main source of these was IST eLearning projects. See annex 3. Information has been exchanged with some of these projects and the draft will be sent to members of the projects for feedback.

Stakeholders who would be interested in this work have been identified. See annex 2, as many representatives from these organizations as possible were invited to the STFs workshop.

STF 201 consulted with a range of Stakeholders by running a one day workshop in Brussels on 29th May 2002. See below for details. The delegates from the workshop will be sent the draft document for feedback.

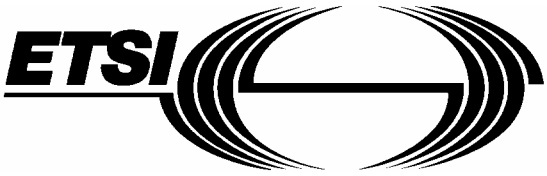
Contact and discussions were also held researchers at MIT in the United States. See below for key points raised.

This work has also been publicized, on the ETSI web-site and by presenting a poster at the International Workshop "Interaction Design and Children" August 28-29, 2002. Key outcomes from the workshop are given below in a brief report. The delegates from the workshop will be sent the draft document for feedback.

A.1 Description of STF 201 Stakeholder Workshop

The workshop was a great success, with much debate taking place during the sessions and the breaks. Many of the delegates said that they welcomed this type of forum to be able to meet with people who had similar interests. They all wanted to keep in touch with the developments of the STF work and would provide comments and input in the future as appropriate. They have been added to our shared server to facilitate this future exchange of information.

The following is the one page flyer that was distributed at CeBIT in March 2002. A similar email was sent to all identified organizations.



Workshop announcement:

Human Factors; Access to information and communications technology (ICT) by young people; Issues and guidelines.

Children (12 years and younger) are becoming an increasingly significant consumer group for advanced computing and communications services. In some cases children as young as 2 or 3 years old are using ICT (Information and Communications Technology) equipment.

Children are often expected to use equipment and services designed for adults that have inappropriate physical and cognitive ergonomics for their needs. Extended use by children of this equipment may have a detrimental effect on their health and long-term development.

As a result of this, ETSI (the European Telecommunications Standards Institute) has set up a specialist task force (STF201) to look into these issues. The aim of the work is to produce recommendations on where further work for standardization is required. Among other things, the group will review hardware and software issues of ICT along with the ethical issues of security for vulnerable children accessing public communications spaces.

There is a need for early European standardization involvement, from a human factors perspective, to contribute to the emerging ICT applications in this arena so that a common approach can be adopted. This will have the benefit of common agreed technical solutions based on best practice that can be used across Europe by network providers and equipment manufacturers. This work is funded under the European Commission's *e*Europe initiative.

In order to explore the issues, ***a workshop is being organized in Brussels on Wednesday 29th May.***

The aims of the workshop are to:

- Present the project team's current findings on specific critical issues;
- Invite workshop attendees to identify possible overlooked areas and to explore further service-related examples. It is anticipated that 20-40 people will attend the workshop.

If you (or a colleague) are interested in attending the workshop, can you please send an email of interest to the co-ordinator so that a formal invitation can be sent out.

At CeBIT, on March 14-15th, Mr. Bruno von Niman, STF201 expert will be available at the ETSI stand and can be consulted for further details.

Anne Clarke

Workshop co-ordinator

Tel: + 44 7801 532 579

Email: clarkeam@compuserve.com

The following people attended the workshop in Brussels:

Name	Organization	Brief Interests
Per Helmersen	Telenor	STF 201
Roberto Marion	TILab	STF 201
Nick Hine	University of Dundee	STF 201
Anne Clarke	European Management Services	STF 201
Bruno von Niman	Ericsson	STF 201
Karl Steffens	Dept of Education, University of Cologne	Use of new technologies for primary school children
Panos Markopoulos	Technische Universiteit Eindhoven	Methodologies for interaction design and usability testing techniques for kids.
Lydia Plowman	Inst of Education, University of Sterling	Use of ICT in schools, clubs and at home. For young and pre-school kids
Mathilde Bekker	Technische Universiteit Eindhoven	How to evaluate interactive products for children
Dick Lunenborg	Bartimeus Onderwijsinstelling	Ergonomic aspects of long term use for in particular partially sighted kids
Ray Arnold	Faculty of Education, University of Cambridge	Developmentally appropriate technology for early childhood
Steve Creed	British Education Communications and Technology Agency	Protection of children. Filtering of email and web content
Nick Morgan	Learning and Teaching Scotland	Kids use of ICT as a means of enhancing their education

A.1.1 Workshop agenda

9.30 - 10.00	Registration/Coffee;
10.00 - 10.30	Welcome, participants presentation, presentation of the agenda;
	What is ETSI, TC HF;
	What is STF201;
	Video;
10.30 - 11.15	Presentation of the project framework of critical issues;
11.15 - 11.30	Coffee;
11.30 - 12.30	Initial Brainstorming to identify gaps in the coverage. Plenary feedback of highlighted tasks and services;
12.30 - 13.30	Lunch;
13.30 - 15.15	Small work groups discussing critical topics for the highlighted services and tasks;
15.15 - 15.30	Coffee break;
15.30 - 16.30	Presentations from small groups;
16.30 - 17.00	Workshop summary and action plan.

A.1.2 Workshop summary

What follows are brief notes taken during the meeting. Many of the issues will be taken by the STF and considered in their report.

Following on from the project's presentation of its framework participants were asked to look at important issues of one or two service/application with which they were personally familiar. The topics that they looked at were as follows:

A.1.2.1 Systems that the delegates looked at initially

- Awareness systems - kids staying in touch with grand parents (PM);
- Input technologies for multiparty activities (PM);
- Evaluation methods (for educational games etc) (PM);
- Smart toys - multimodal interfaces (LP);
- Digital cameras (LP);
- Digital cameras - pictures and movies (MB);
- Mobile educational game (in a zoo) (MB);
- Internet use in primary schools (information and communication) (NM);
- ICT in instruction in schools, web based material distribution (KS);
- Educational software/Internet use by vulnerable children (DL);
- E-mail, unsolicited mail, acceptable use (SC);
- Developmental Appropriate Technology, Health and safety (RA);
- Hardware and software (RA).

Following lunch, the delegates were split into two groups to discuss common interests in relation to two topics:

1) fitting technology to younger children and developmental implications of ICT; and

2) learning in schools and acceptable use.

A.1.2.2 Summary of issues highlighted by the small group work

Group 1 Addressing fitting Technology to younger children and developmental implications of ICT

Issues in relation to younger children:

- Gender issues (not just genetic may be social) are important in relation to ICT use;
- Socio economic issues - access and effect, lifestyle different;
- Cultural differences cross language communication. ICT needs to take account of cultural and language differences. ICT can be used to understand cultures and must be sensitive to language and culture;
- Need to have techniques for eliciting kids user requirements, feeding those into design and then developing evaluation methodologies.

Developmental issues for young children:

- Children cannot structure information and categorize information;
- Web-sites therefore need to be provided on one screen;
- It is unknown at what age kids can use menus. Younger children probably need icons instead;
- Keyboards can be specifically designed for young children, should these be qwerty or alphabetic?
- Speech recognition systems currently difficult for children to use as they cannot read well enough to train the systems;
- Hand writing recognition needs exploring;
- Ergonomics important in terms of workstation and workspace design. What guidelines are given to schools? How can this be controlled at home?

Child protection:

- Health and safety issues are important, there is not enough research on;
- Radiation from mobile phones;
- RSI for example the "sms thumb", over mouse use leading to problems with the index finger;
- vision, what effect does long term viewing of screens have on children's eye development? - particularly close viewing of laptop displays.

Social interaction:

- Teachers' role;
- Collaborative learning (education still thinks of the individual learning). Systems need to suggest collaboration to the students;
- Computer not an electronic child minder.

Group 2 Addressing learning in schools and acceptable use

Blocking and filtering:

- In the past parents could approve material because new material was produced relatively infrequently, material is now dynamic, particularly on the Web. Monitoring and control is consequently more difficult. Parents have to get involved;
- There are practical problems for blocking/filtering;
- Who is responsible? ISP, parent, children, government;
- Problems with current techniques;
- Should be a classification of content, e.g. educational/age related;
- Will providers classify their material?
- Should users have an Internet id?

Accessibility:

- Special service may be required to enable children to gain access to information and to communicate. For example there may be a need to provide relay services for disabled children or e.g. on-line signing;
- There are many accessibility guidelines, but these are not taken up.

Education:

- Need mechanisms for optimizing motivation, is collaboration preferred?
- Location based services will be useful, e.g. content on pda using IR or blue tooth relevant to situation;
- Classifying requirements for children needed, and a need for methods for eliciting children specific user requirements.(concepts partially repeated in the 6th bullet point of next list);
- Evaluation of the usability of systems should evaluate task and non-task aspects;
- Should be fun as well as educational;
- Education in the classroom questioned in the future. Maybe a blend of home based and school based education;
- Tools for sharing information with children essential;
- Need education for users on safe use.

General points that came out of the meeting that we may have overlooked were as follows:

Issues raised that maybe we had overlooked

- Self regulation in learning;
- There is a need for systems that enable children and parents to share daily experiences;
- New generation of problem solving. Generally kids do not read the manuals. Naturally kids learn through exploration;
- Kids want to explore individually but want to share the results;
- ICT for children includes many aspects, such as play, communication and emotional support. This can effect emotional well being and social integration/skills;
- Need guidelines on eliciting user requirements for children and evaluating products for children (concepts partially exposed in the 3rd bullet point of previous list);

- Children's skills change so rapidly;
- Privacy issues of videoconferencing;
- Video on mobile phone - Asynchrony may be better as child can compile something and send to the granny - A videogram would be useful;
- Is providing basic functions better to counteract the digital divide?

A.1.3 Suggested actions

Need further research on:

- What is a child;
- Guidelines for designing equipment for different children's ages;
- How do we elicit children's requirements;
- Guidelines for evaluating products for children;
- Major user interface issues for children: Menus; Touch screens; Text input, speech etc.;
- How to support children:
  - Providing simpler instructions and simpler operating systems;
  - Making systems/equipment that are obvious to use;
  - How to best provide teachers and parents with training in order for them to be able to support the children.

Design for disabled children, must follow what is known for disabled adults. However, it must be noted that Web-sites for children are very visual. There needs to be research as to whether this is really appropriate for children, maybe web-sites should just be kept more simple. There also needs to be more research on how very visual web-sites can be best presented to visually disabled kids.

A.2 Report from Discussions with MIT and Microsoft

A.2.1 MIT Media Lab, Boston MA, USA

Catherine Vaucelle (http://web.media.mit.edu/~cati/) - Gesture and Narrative Language Research Group, (http://www.media.mit.edu/groups/gn/)

Conducts research on the value of toys that involve technology. The "DollTalk" story-telling puppets were demonstrated, together with some film clips demonstrating the puppets being used by children. The puppets retold a story that had been enacted by the child, with the recorded speech altered to provide audible differences between the characters in the story. It is claimed that this type of technology can:

- Assist in learning aspects of social interaction, including turn taking in conversations;
- Assist in story-telling as a step in the acquisition of literacy skills.

Observations noted in this research include:

- Young children reproduce what they observe and experience with very little discrimination. They therefore can be "fed" with information that they will readily absorb irrespective of the appropriateness of the content;
- Children's literacy and language skills develop when they converse with others who use language that is a little more complex than their own. If the language used is excessively advanced, the learning and development ceases;
- Children remember details very well. They can spot very small differences in stories, particularly those that they have heard a number of times.

Kimiko Ryokai (http://web.media.mit.edu/~kimiko/) - Gesture and Narrative Language Research Group (http://www.media.mit.edu/groups/gn/)

Also involved in a variety of projects intended to promote the learning of language skills through development of narrative skills in story-telling. On aspect of the work is to encourage the development of literacy skills, particularly in communities that have a high or growing illiteracy rate.

Timothy W. Bickmore - Gesture and Narrative Language Research Group (http://www.media.mit.edu/groups/gn/)

Discussed the Sam project. This project developed a 3D life-size projected character that can engage in story listening and telling, including the "ability" to manipulate physical objects. The purpose of this toy is to promote the development of children's narrative and story telling skills.

Bakhtiar Mikhak - Learning Webs Research Group (http://www.media.mit.edu/research/group.php?type=researchGroup&id=62)

The group focuses on the role of technology in learning and community building. There are a number of interesting projects exploring aspects assisting the exploration and learning process for children. These encourage the children to ask questions and provide tools that are suitable for the children to explore the answers for themselves. An example is the "Beyond Black Boxes: Rethinking Science Learning" project where children are encouraged to make their own scientific instruments as a key step in learning science. There is also a strong emphasis on making the technology and the power of the exploration that the technology can enable as usable as possible by children, including fitting the culture within which the children live.

A.2.2 Microsoft, Redmond WA, USA

Kirsten Risden; Mary Czerwinski; Libby Hanna

This group of people have extensive experience developing technology (toys, devices and software) for children within the Microsoft portfolio of products. Two messages came out strongly from this meeting.

- There is a general lack of guidelines for the design of technology-based systems for children. More importantly, there is no reference work available to designers detailing or even outlining the essential relevant characteristics of children. Designers have little concrete information about the user and their requirements and characteristics upon which to base their design work.
- The market for technology specific to children is poorly understood. The problem centres on the difficulty of ensuring that children specific technology grows with the child, without becoming too juvenile and being discarded. This problem is compounded that children specific technology may be expensive, so purchasers are reluctant to invest in systems (education or recreational) that will be discarded by the child after a short time (3 months typically). The purchase price threshold is considered to be around $30.

A.3 Report from International Workshop "Interaction Design and Children"

A.3.1 Background and executive summary

STF201 was invited to attend the workshop by the organizer Chair, Ms. Tilde Bekker, one of the participants at the workshop held by STF201 in Brussels, in May 2002. The program was considered highly intresting and relevant to the work of the STF. Also, STF201 was offered the opportunity to market our work and ask for active contributions through a poster, presented in several sessions during the conference, in the Poster area.

A.3.2 Event details

The International Workshop was held in Eindhoven on two full-program days on August 28-29, hosted by the Eindhoven University of Technology.

Approximately 100 attendees participated, including such gurus as Alison Druin and J. Kassel. The email addresses of the participants are available and STF201 will be able to announce its web-site and progress of the draft TR to a larger community.

A.3.3 Key messages

The event was successful, attended by a lot of researchers and industry people as well. It was a wide variation in the perceived quality of the presented material- some papers being state-of-the-art, some just restating common knowledge, etc.

Below is a summary of the key issues:

- Most papers addressed PC-and data oriented approaches. Somewhat more had an ICT focus and very few (basically one), telecommunications.
- Usability testing and user centred design must be adapted to children's needs, as it is very different with children. New techniques should also be developed.
- Evaluating for usability is not good enough, fun aspects must be included.
- Co-discovery does not work with kids as they do not have all those collaborative skills in place, yet. Also, the verbalizing thought is more difficult.
- Over the past few years, age-appropriate interfaces for young children to access digital content have been created.
- Children should take an active role in technology R&D.
- A good way to satisfactory kid's ICT design is to begin designing a product with defining the user experience.
- Tangible interfaces are suitable to young kids, moving away computers from the desktop, integrating it into everyday life.
- Some good examples on ICT UI design for kids were presented, e.g. the Video Composer (p. 25 in the Proceedings), using the children's own graphical language and notations.
- Educational software is much focused when developing ICT products and services targeting kids.
- Kids software development should include even children stamped "difficult", e.g. disruptive children (even more easily thinking "outside the box")- a very empowering experience, according to the authors, Gibson et al.
- No significant improvement resulted from involving kids in designing a school web-site in the UK.

- A method for designing future socio-technical systems, the Future Technology Workshop, was presented by Vavoula et al.ng prepaid subscriptions.
- Another method for gathering user requirements from children was presented by Bekker et al.
- The %age of young people owning a mobile phone has exceeded the average. Teenagers spend about 6 % of their available cash monthly, 90 % having prepaid subscriptions.
- Speech recognition technologies for children would be a very valuable UI complement- e.g., learning colours, shapes, phonics, creative writing, call handling. However, in its default form; accuracy and error rates are too poor. After training, these figures increase to the normal levels and use is fully possible.
- A paper on methods to attract kids to a mobile network cited the STF leader Mr. Helmersen's paper from 2000.
- Kamm presented a developmental toy system for the home environment that motivates children with motor learning disorders to confront their disabilities through playing games. Also, the author recommends the Funometer scale (p. 191), for children's opinions

Annex B:
Overview of stakeholders

An analysis of stakeholders has shown the following groups and individuals having an interest in this work.

B.1 Technical bodies

Groups of technical experts already identified include; ETSI groups such as 3GPP/T2; Other standards groups such as CEN ISSS, CEN TC 224/WG6, ITU T; Telephone companies e.g. Alcatel, Mobile phone companies e.g. Nokia and PC Manufacturers e.g. Apple; Toy/Games Manufacturers e.g. Lego.

B.1.1 ETSI groups

There has been no previous work by ETSI in this area. Some of the existing ETSI groups should have an interest in the work such as 3GPP who are investigating 3rd Generation Mobile Systems based on the evolved GSM core networks and the radio access technologies. http://www.3gpp.org

One of the ETSI Board members, Wolfgang Heidrich has highlighted an interest in education and therefore should be interested in the outcome of this STF.

The ETSI user group has the aim to establish reports on users' requirements pertaining to relevant topics and therefore should be interested in the outcome of the work as the young children of today and the mainstream users of the future.

B.1.2 Other standards groups

Different parts of the standards bodies such as CEN, IEEE, ISO/IEC etc have an interest in standardization issues in relation to children in particular to encourage European Youth into the Digital Age.

With the aim of standardization of "educational IT" - learning technologies. CEN/ISSS started a workshop on Learning technologies.

ISO/IEC JTC1 established its SC36 on Learning technologies in the autumn of 1999.

CEN/ISSS has a number of activities related to localization i.e. the application of local linguistic and cultural requirements to Information Society issues. These are undertaken by CEN/TC304. Of particular importance is the work on matching requirements, which enables browsing and surfing in the individual languages of the different nations in Europe. This is essential to allow school children to get maximum benefit from the Internet.

A number of CEN and ITU groups may have an interest in this area for example; CEN TC 224/WG6 has been investigating machine readable cards and ITU T have general interests in human factors.

IEEE

B.1.3 Operators

For example, British Telecom, France Telecom, Telenor, Telecom Italia etc are all producing telecommunication services. The younger generation of today are the mass users of tomorrow. All operators should have an interest in promoting new/novel services to the young. It was never anticipated that the Short Message Service (SMS) would be used so much by children. What is the equivalent service for the future? However, there has to be safeguards in the service to ensure that the children do not run up bills on somebody else's account.

Telecom operators have an interest in new services for the young (e.g. SMS, etc.).

B.1.4 Telecommunications manufacturers

Telecommunications manufactures in particular mobile telecommunications manufacturers such as Nokia, Sony-Ericsson, Motorola, Siemens etc see children as a potentially large market for their products. However, current equipment is not designed for the very young to use, both in terms of the physical design and the cognitive issues in use. Many manufacturers should be interested in the work of this STF.

Nokia, Sony-Ericsson, Motorola, Siemens. Telital, Urmet

B.1.5 PC manufacturers

Children spend a large %age of their waking time in front of a pc accessing the Internet or playing games. These devices were designed for use by the standard adult person. There has been problems with poor posture and eyestrain with adults using pc's. Little attention has been given to children using them who do not have the same physically developed bodies or minds. Microsoft, IBM, Apple etc should have an interest in the design and use of pc's for children.

Microsoft, IBM, Apple

B.1.6 Toy/Games manufacturers

As electronic games become communications devices the boundaries between traditional pc's, telecommunications devices and games start to merge.

Associations of Toy Retailers such as the British one (BATR) have a group dealing with electronic games and should be interested in this work.

Toys such as Lego Mindstorms are an example of where these boundaries are merging.

Lego, Duplo, Chicco, Fisher Price

B.2 User groups

Groups of interested user bodies include; HFT community; Academics e.g. CHI for kids; Consumer groups e.g. ANEC, Which; Education groups e.g. European School Net, *e*learning projects in the IST EU programme, eEurope, Democracy of Primary schools in Europe; National Ministries of Education e.g. UK dept of Education and the UK National Grid for learning; Children's disabilities groups; Children's charities e.g. Oxfam, NSPCC, Action aid, Child line; Children's rights groups e.g. UNICEF, UN Human rights.

B.2.1 Human Factors in Telecommunications research community

There are many active groups in this area both within companies and Universities. ETSI has its own Human Factors group. There is also a Human Factors in Telecommunications Conference that takes place every 2-3 years where researchers in this area present their current findings.

Conferences:

- HFT;
- CHI for kids;
- Cuccioli e multimedialita' (Puppies and multimedia): the organizers of this conference are preparing a charter of children's rights in telematic networks. http://www.onde.net/progetto/cuccio.htm.

B.2.2 Academics

The British Computer Society has a separate group for Human Computer Interaction issues. BCS-HCI. Some members of this group have an interest in issues related to children.

There is also a separate group for children at CHI. CHI for kids, part of the conference each year is devoted to issues related to children.

Many University groups have an interest in the physical and cognitive issues of children and ICT e.g. the University of Northumbria at Newcastle is interested in the impact of high levels of Internet use on mental health and also its impact on cognitive and communicative style.

The Eindhoven University of Technology in The Netherlands are active in investigating the methodological issues in relation to involving children in design and usability evaluation of children. This department organized the recent workshop "Interaction Design and Children" August 28-29 2002.

B.2.3 Consumer groups

ANEC - European Association for the Co-ordination of Consumer Representation in Standardization. ANEC has working groups on child safety and on the information society.

WHICH is the UK consumer products organization and there are many similar ones in other European countries which have an interest in products being safe for children to use.

B.2.4 Government education groups

Every National Government has an education Department.

In the UK it is the Department of Education and Skills (Rt Hon Estelle Morris MP Secretary of State for Education and Skills). This department has set up the following bodies:

UK National Grid for learning which is the gateway to educational resources on the Internet. It provides a network of selected links to web-sites that offer high quality content and information. http://www.ngfl.gov.uk/index.jsp

The NGfL portal is funded by the Department for Education and Skills and managed by the British Educational Communications Technology Agency (BECTA) http://www.becta.org.uk/index.cfm

In the UK, the Scottish Executive funds and controls its own implementation of National Grid for Learning, with a separate web portal at http://www.ngflscotland.gov.uk. This is managed for it by Learning and Teaching Scotland, a Scottish variant of BECTA. http://www.ltscotland.com.

The ICAA Education Centre. Dr April Jones has considerable experience in the use of ICT within the primary curriculum. In 1991 she founded Computer Kids, which offers children from 12 months to 12 years the opportunity to experience and enjoy computers and their educational benefits.

The British Association for Early Childhood Education is a voluntary organization with charitable status. It is concerned will all aspects of children's learning from birth through the early stages of primary education.

Association of I&I in Holland. I&I is an association of teachers, directors, ICT-co-ordinators, and all those who are involved in implementing ICT in schools.

B.2.5 Children's groups

Children's disabilities groups should be interested in the work. There is a lot of emphasis on taking account of the elderly and disabled in design of products. The needs of disabled children should also be considered.

Children's charities: e.g. Oxfam, NSPCC, Action aid, Child line.

Children's rights groups:

- UNICEF, UN Human rights, OECD;

- Riksförbundet BRIS (Barnens Rätt I Samhället) Swedish Association for Children with problems;
- Barnombudsmannen The Children's Ombudsman in Sweden.

In Italy there is an incredible number of private and institutional associations for the cultural, religious, social and political guardianship of children's rights and for the support to their health and education. To name a few:

- Save the Children Italia (rights promotion);
- CIFA (International Centre of Families for Adoption);
- religious schools (oratories) for recreation and education;
- FSE (European Scout Federation) for exploration;
- SOSchild.org (social solidarity against any abuse of the under 18);
- Aquilone Blu (Blue Kite) for infancy defense;
- Associazione Anni Verdi (Green Years Association to provide services especially in the socio-educational domain to handicapped children);
- ABIO (Association for Children in the Hospital) a voluntary association to set up a child-like environment for in-patient- FDA per i Bambini (Food and Drug Administration for children);
- Ministry for Education, University and Research;
- Arciragazzi (association for children education and play);
- Giacomino (Jimmy: http://www.giacomino.it/): an electronic magazine dedicated to children. It hosts the Children Television News (http://www2.rai.it/gtragazzi/storia.htm) targeted at the 10-16 age range, and an Internet site with a lot of attractions (http://www.rai.it/RAInet/Kids/raiKidsPortaMappa/1,3565,,00.html).

German Digital Opportunities Foundation. One main field of the foundation's activities is bridging the digital divide among youth. The reason for this is the frequent misconception that Internet access and use is no problem for kids and teens. But in fact there is a wide educational gap within the younger population.

Organization for children's safety (C.E.N.S.I. http://www.forzabambini.it/censi.asp): provides, among others, protection against web-sites with inappropriate content.

There are many web-sites offering Internet filtering software for children protection:

- SafeSurf (http://www.safesurf.com/main.htm) providing ratings and filtering solutions of Internet pages;
- Missingkids (http://www.missingkids.com/) an organization for prevention of children's abuse and Internet safety;
- Davide (http://iscrizionidavide.cometacom.it/);
- Cybersitter (http://www.cybersitter.com/);
- Cyberpatrol (http://www.cyberpatrol.com/);
- Net Nanny (http://www.netnanny.com/home/home.asp);
- Safekids (http://www.safekids.com/);
- Surfwatch (http://www1.surfwatch.com/);
- Winshare (http://www.winshare.com/kbindex.htm);
- Virgilio (http://club.virgilio.it): Italian search engine that offers an option to exclude from searching and accessing web-sites suitable for adults only.

Annex C:
Other projects and initiatives

C.0 Introduction

This annex provides a brief resume of those projects which are undertaking work that is of relevance to this STF.

There are many *e*Learning and on-line government initiatives being established within the member states of Europe and in other regions of the world. There are many initiatives looking at the various key issues relating to children and ICT. These initiatives have been investigated in order to identify key issues and to share information. Individuals from these other initiatives were invited to attend the stakeholder workshop.

The *e*Europe initiative was launched by the European Commission in December 1999 with the objective to accelerate the uptake of digital technologies across Europe and ensuring that all Europeans have the necessary skills to use them.

- The aim of the *e*Europe Action Plan is to ensure that the targets set by the Lisbon European Council (March 2000) are reached by defining the necessary measures.
- One of the main objectives of this action plan, entitled "Investing in people and skills" has as one of its action lines "European youth into the digital age".
- The aims of this are that every European citizen should be equipped with the skills needed to live and work in the new information society. eEurope proposes to connect all schools to the Internet, to adapt school curricula and to train teachers to use digital technologies.

C.1 Educational Use of ICT

A number of *e*Learning IST projects have been set up by the European Commission**,** DG Education and Culture, Unit C4 Multimedia; email: elearning@cec.eu.int

http://www.ecotec.com/mes/projects.html

These include:

- FABULA - Bilingual Multimedia Material for Children;
- MEDIAKIDS - Multimedia for Kids;
- MYTHE - Multimedia Young Children Thesaurus for Educational Purposes;
- VALASPI - Developing and Evaluating Culture and Language-learning Multimedia Telematics for Primary School Pupils;
- VIRLAN - Virtual Reality Language Learning Network;
- EUN - European Schoolnet.

The focus of most of these projects is on the educational use of ICT by children. The largest of which is the European Schoolnet which is a "network of networks" in the educational sector. It is the major platform for the co-operation between the European Ministries of Education on Information and Communication Technology in Education: a European network of national and other computer networks. On September 8, 1998 the European Schoolnet officially took off during a conference in the IBM-centre in Brussels. The Schoolnet is supported by the 19 Ministers of Education (from the EU countries, Norway, Switzerland, Slovenia and Iceland) and by the European Commission.

It is a key resource on the internet for any kind of information about education systems, for digital teaching materials and links to organizations all over Europe. Its office is located in Brussels and is made up of people from all over Europe, and beyond. At present there are 22 people focused on five areas of activity:

- Running the EUN web-site and schools collaboration activities;

- Planning open architecture and technical developments for schools networks;
- Promoting innovation and change in the EUN networks;
- Marketing and communication; and
- Overall administration and management.

European Schoolnet is an international partnership of more than 20 European Ministries of Education developing learning for schools, teachers and pupils across Europe. Teachers find resources, news, practice examples and collaboration opportunities at eSchoolnet, the educational portal for schools in Europe.

As well as just educational aspects of ICT the project addresses important issues such as safe use of the internet.

C.1.1 FABULA Bilingual Multimedia Material for Children

The overall aim of the FABULA project is to stimulate the production and use of bilingual multimedia educational materials in schools.

Bilingual multimedia material for children can be a powerful force for learning, raising the perceived status of minority languages and awakening interest in language learning. The most important potential producers of materials of this kind are teachers. At the moment, very few teachers have the necessary experience and confidence to attempt to produce multimedia educational materials. However, the availability of a user-friendly tool would act as a powerful stimulus for development in this area, contributing both to the amount and quality of material available for classroom use.

The specific practical objectives of the FABULA project are to develop an innovative and practical design concept for bilingual multimedia materials for children, and to design, prototype and create the technology for presenting bilingual multimedia storybooks and associated language teaching resources through a browser.

The project is also developing a simple-to-use authoring environment for such storybooks, to enable teachers and other multimedia authors, including possibly children themselves, to create their own teaching and learning resources.

FABULA is also designing and producing support materials that help teachers to create and make effective use of the multimedia storybooks which this technology will make possible. All the different options will be evaluated in real-life situations by teachers and children.

Target Audience: Teachers of 5 to 10 year old children in the project countries; parents and other potential producers of bilingual multimedia materials; children as ultimate end users of the multimedia storybooks produced
http://www.fabula.eu.org/en/about.htm

C.1.2 MEDIAKIDS Multimedia for Kids

Research on educational multimedia shows that there are a number of key pedagogic issues in the context of telematics and multimedia for learning that, in general, have received little attention. The MEDIAKIDS project pays particular interest to a number of areas in the context of the integration of learning through technologies.

Examples of such issues include the integration of technology products into the curriculum, the fitting and designing of programmes to specific curricula, the assessment of individual differences between teachers and the consequences in new media learning environments of cultural differences between educators and between learners.

On the other hand, the level of participation of end-users in the development process, the consideration of metacognitive and non-cognitive dimensions in learning and more general issues to do with the integration of multimedia material and Internet-based material into instructional processes, all lead towards a bigger picture of the role of technologies in learning.

The MEDIAKIDS project is studying and incorporating two means of designing and integrating multimedia materials into teaching. The first, "Geometry for Kids", is a CD-ROM multimedia program, which utilizes Internet-based communication elements in an open-module, flexible and interchangeable design. Software companies are developing the process of CD-building using input from both students and teachers, the ultimate end-users of the course of production. The national and individual differences between countries, schools and teachers, as well as the cognitive aspects of learning are all being taken into consideration.

The second such catalyst, "As we were", is an Internet-based multimedia environment with some CD-ROM based resources. It covers the history of childhood in Europe. This environment implies a high level of communication between schools involved either at national or European level. The environment is composed of elements and tools as well as methodological suggestions that teachers and students could integrate freely into their own curriculum. The CD-ROM offers multimedia elements - such as tools, samples as designs, video sequences, and sounds - compiled by schools that participate in the project.

The project has problems in realizing the trials due to technical problems.

Users: 8-10 year old children.

C.1.3 MYTHE Multimedia Young Children Thesaurus for Educational Purposes

The purpose of the MYTHE project is to design and develop a multi-lingual interactive, environment for language teaching to young children. The scientific and technological objectives of the endeavour focus on the following: developing an environment to be used for the teaching and learning of both the mother tongue and foreign languages; providing additional value to Computer Assisted Language Learning (CALL) with the incorporation of advanced Linguistic and Imaging tools (LIM); eliciting a deeper engagement of the child, by showing realistic 3D models and animations; enhancing multilinguality in Europe; developing a unified methodological approach for the teaching of three different European Languages; offering learners of different educational and cultural backgrounds a common, well-tested and effective platform for language learning; constructing a platform that can easily be localized for the teaching of other European languages.

This project will design and develop a multilingual interactive, computer-based learning environment capable of creating an enjoyable, stimulating and engaging learning platform for young children around the transition-to-literacy age (typically in the age range of 6 to 8 years) by designing and developing an interactive computer-based tool capable of supporting an environment which incorporates advanced language, speech, 3D modelling and animation tools.

It will support the promotion and development of key skills such as creativity, self-expression and learning by providing the conditions that will inspire children to think creatively, take risks and implement good ideas.

It will facilitate the linguistic development of young children by encouraging them to better learn their language and other European languages. Moreover, it will encourage both learning through collaborative effort and personal achievement by designing and developing an interdisciplinary learning system, adaptable to the needs and abilities of the learner and the learning situation.

It will also empower the active participation of teachers, parents and other members of the community by incorporating meaningful roles in the learning process.

3D models and animations will be used to elicit a deeper engagement of the child and offer the child tools for viewpoint manipulation, and the teacher tools to add new content.

Finally, a robust speech recognition system for children capable of coping with noisy environments and multiple pronunciations of the words will be incorporated.

Target Audience: 6-8 year-old children.

http://www.eyetronics.com/company/company.php

C.1.4 VALASPI Developing and Evaluating Culture and Language-learning Multimedia Telematics for Primary School Pupils

The VALASPI project is measuring the progress made by 50 French primary school pupils and 50 Italian pupils using multimedia telematics for one academic year. The scope of the study targets knowledge of a foreign language and culture about which they know nothing at the outset.

During this school year the French and Italian classes will communicate by teleconference and Internet and will teach each other about their language and cultures, choosing the multimedia tools which seem best adapted to this form of teaching.

The study will evaluate the contribution of multimedia tools, a teleconferencing facility, computers linked to the Internet, digital cameras and photographic equipment, scanners and video. VALASPI aims to define the cost-benefit relationship of this method of introductory teaching and to establish a model which would facilitate the widespread use of experience to other age groups, the general public and other areas of the training and education sector.

The project provides for pupils to learn essential elements of their language and culture and then teach what they have discovered in turn to other fellow pupils. In order to do this the pupils can choose the most appropriate medium and tools available to them.

Each time that the pupils are taught something by their teacher, they have to think about the best way to teach it in turn to their French or Italian counterparts. Each week they have at their disposal the recording of the last teleconference at which they participated and are therefore able to self-evaluate the quality of their teaching approach. This "mutual teaching" method is not in itself an innovation, because it is tried and tested. However, through multimedia telematics, this strategy exploits a new application area.

VALASPI's target audience is school pupils aged between 10-11.

http://www.ecotec.com/sharedtetriss/news/concertagenda1198/valaspi981119/

C.1.5 VIRLAN Virtual Reality Language Learning Network

VIRLAN is setting up a language learning network for primary school children in Europe.

Current language learning techniques involve either class-orientated or self-motivating approaches using traditional books, audio tapes, video tapes and now CD-ROMs. Each medium has its advantages and disadvantages but none have been proven to be superior for language learning.

It has been shown, however, that the best way to learn a foreign language is at an early age and in a real world context. The VIRLAN project proposes to create a virtual world in which children can learn by interacting with foreign children without leaving their school or home environment. The underlying technologies are now available to achieve this goal: wide availability of Internet access, VRML tools and tools for 3D multi-user environments.

The VIRLAN language learning network will be composed of the central node, and in the first stage of demonstration, of four pilot sites in the U.K., Finland, Germany and Greece.

Virtual environments for language learning

This environment will allow young children to come together and communicate as if they were physically present in the same place. Using virtual reality and avatar technology, the children will be able to enter the central meeting place and from there travel, via the Internet, to different virtual countries in order to meet and communicate with other children.

VIRLAN will be used in primary schools as a complementary tool for language learning, but it will also have the potential to be used for child-to-child communication on a private basis at home.

The VIRLAN language learning network will be composed of the central node, and of the four VR pilot sites in the U.K., Finland, Germany and Greece. The underlying technologies will be the Internet, VRML tools, and tools for 3D real-time multi-user environments.

Users include three linguistic experts, two educational institutions and end users from primary schools in the U.K., Germany, Greece and Finland.

VIRLAN is especially useful for children with special needs and children in remote regions. It will support equal opportunities in language learning and communication for children, without them leaving their home.

http://www.mikkelinmlk.fi/rantakyla/ENGvirlan.htm

C.1.6 EUN European Schoolnet

The EUN project is a virtual teachers' college for the professional development of teachers, with extensive learning resources for pupils in European schools. The network consists of 500 forward-thinking schools working for the development and validation of multimedia tools and services and offering access to high quality information and services of European interest.

Pupils and teachers, at a rapidly-increasing pace, are being introduced to new multimedia telematics tools. School leaders and teachers, regardless of what subjects they teach, find that they are expected to learn how to make use of new information and communication technologies in a pedagogically-valuable way. As more and more schools connect to the Internet, teachers and pupils are introduced to a range of new possibilities complementing more traditional ways of working.

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To meet the needs arising from these expectations, national educational networks are being created on an ongoing basis. From this starting point, the European Schoolnet (EUN) is a political initiative led by the education ministers of the EU Member States aiming to facilitate collaboration between schools in Europe, the building of educational Internet services, better co-operation at a European level to develop multimedia telematics resources in schools and, as a matter of urgency, the extended professional development of teachers. The EUN is a network of networks in the EU Member States, including in this instance, Iceland, Norway and Switzerland.

A unique online European school network platform has been under development by the partners from the outset of the project, building on and unifying resources already in existence in the participating countries. Through the EUN multimedia project, this EUN online resource will be further developed into a model platform, offering pupils and teachers access to high-quality information and services of European interest. The online resources cover the full range of teaching subject areas, news from innovative projects, extensive contacts and communication options, even comprehensive European media contacts.

One of the main objectives of the platform is to facilitate contacts between schools, teachers, headmasters and pupils in different countries. Be it through "penpals", finding partners in other countries for collaborative projects, or through discussion rooms for teachers to share and compare views and experiences or exchange teaching materials.

http://www.eun.org/eun.org2/eun/en/index_eun.html

Safer use of the Internet project (A project linked to the European Schoolnet)

The dotSAFE project is a pilot project across the 23 member countries of the European SchoolNet.

There are four principal areas of work:

- Auditing what is available, concerns, and effective practices to raise awareness of Internet safety in schools;
- Developing new and adapted pilot materials and technical solutions;
- Testing and evaluating the material produced;
- Developing detailed scalable plans.

Safer Internet http://www.saferinternet.org/

Dot Safe http://dotsafe.eun.org

C.2 Cultural use of ICT

Cultural use of ICT use by children is well addressed by the Netd@ys projects.

The "Netd@ys" are an initiative of the European Commission, DG Education and Culture, to raise awareness for the importance of new technologies for education. Netd@ys Europe was launched in 1997 within the framework of the Action Plan Learning in the Information Society (1996-1998). The Netd@ys concept and idea was "imported" from the United States: Developed in the Silicon Valley at the beginning of 1996, the original "NetD@y" concept aimed at encouraging schools to get connected to the Internet by using groups of volunteers from the local community to carry out the wiring. Netd@ys Europe has followed a different path. Here, the main objective is to raise awareness in the educational and culture community on the potential value of new online technology as a teaching, learning and discovery resource. This is done by promoting numerous projects throughout Europe during the Netd@ys week.

The first European Netd@ys took place in autumn 1997. Netd@ys 2001 was the fifth edition, taking place from 19 to 25 November 2001. Netd@ys 2001 concentrates on "youth" issues, especially in the areas of European cultural diversity and citizenship. It will continue to promote the educational and cultural benefits of the new media for equipping European citizens with the skills which are necessary for full participation in the Information Society. A sample of the projects are:

- Flying with five (DK) - Teaching primary kids to use the Internet and applications
- CAMPS - Intercultural language learning online (DE)
- Space from Kids (FR) - Kids describing space on the net
- :) EuropeanKids 2001 - Lets meet on the net (IT) - To show culture to other countries
- KID - Kid Intercultural Dictionary (IT)- Created by kids

C.2.1 Netd@ys

Netd@ys is a major awareness raising event in Europe.

2001 was the fifth year of Netd@ys Europe, an initiative of the European Commission's Directorate-General for Education and Culture. Its aim is to promote the pedagogical use of new media in the areas of youth and culture and to provide the participants with the opportunity to develop the skills to acquire and to exchange information on a range of subjects.
It also provides an important platform for the participants to create educational and cultural projects and to exchange their ideas using the new media. Since it was first launched in 1997, Netd@ys has grown in stature and it is now well known in Europe and beyond.

Originally focussed on schools, Netd@ys participants now come from all of the educational and cultural sectors - universities, youth centres, museums, film institutes and schools, for example. Participants can create their own projects, sharing them with others around the world, forging partnerships, exchanging information and showing off their ideas and expertise.

Netd@ys Europe is supported by the European Union programmes, Socrates, Leonardo da Vinci, Media Plus, Youth and Culture 2000 of the Directorate General for Education and Culture of the European Commission.

http://www.netdays2002.org/

A number of projects are of interest to this STF, a brief resume of each now follows:

C.2.2 Flying with five (Denmark)

The aim of the project was to teach primary school children how to use the Internet and applications for writing texts, such as "Wordart", to produce CDs, write e-mails and create art with their PCs.

http://www.hattingskolen.horsens.dk

C.2.3 CAMPS - Intercultural language learning online (Germany)

The aim of the project is to demonstrate to children and youths in Europe and beyond that language learning online with fellow-students from different cultures can be fun, creative, and efficient at the same time. During the networked week a conference will be opened, accessible via www.camps.de and www.ed-lab.net inviting kids and youths to intercultural communication on culture, traditions, what's in and out. The conference will be moderated by an international team of teachers.

C.2.4 SPACE FROM KIDS/L'ESPACE PAR LES ENFANTS (France)

Propose to children of Europe (target age 6-18) to explain what is space for them, what it brings to everyday life, by means of texts, poems, drawings, etc. These contributions will be put on the Web-site and comments and analysis will be given by ESA specialists during the Netd@ys week. First elements of the new ESA Education Web-site will be included to help children thinking.

http://www.esa.int/netdays

C.2.5 :) EuropeanKids 2001 - Let's meet on the net

The project involves European schools which contribute to a web-site showing the cultural identity and variety in Europe using student's works in their mother tongue and in English. Eventually everyone in the EC will find documents produced by students of their own Country in the 2 languages. A virtual meeting space is planned for teachers, students and schools, parents and others in the scholastic community working towards in real moments of mutual exchange.

It enables children and teachers to use the Internet in learning and teaching while pupils can express local culture and tradition through digital technology to reach and understand of cultural differences as told by children from other countries.

http://scuole.provincia.ps.it/europeankids

C.2.6 KID Kid Intercultural Dictionary (Italian)

Main goal of Media Project K.I.D. was to realize an offline and online tool in order to diffuse peculiarities of different cultures shown in tales and novels using a multimedia dictionary created by pupils themselves.

http://www.lynxlab.com/scuola/kid/index.php

C.3 Other initiatives and projects

There are a number of other projects and programmes addressing such issues as democracy for children, use of ICT by disabled children, computers for very young children. Each of which are of interest to this STF.

The following projects and programmes are covered here:

- DATEC - The Developmentally Appropriate Technology for Early Childhood. Appropriate applications of ICT for under 8's.
- DIPSIE - Democracy of Primary Schools in Europe. To promote European citizenship in primary schools.
- KIDSMART - Specifically designed terminals for the very young.
- De@fchild - A project promoting ICT and literacy for deaf children.
- ThinkQuest - A global network of students, teachers, parents and technologists dedicated to exploring youth-centred learning on the Net.
- MAYPOLE - Has developed a musical communicator for children.

- CHAT - Children's Awareness of Technology. Looking at curriculum integration for very young children.
- Swedish IT IS (IT @ School) program. Exploring usage, possibilities and applications of ICT

There do not appear to be any projects or programmes specifically addressing the physical and cognitive ergonomics of children and ICT use.

C.3.1 DATEC - The Developmentally Appropriate Technology for Early Childhood

DATEC is a two year research and development project funded by the Connect programme in association with the Children's Awareness of Technology (CHAT) working group within the European Network of Excellence for Intelligent Information Interfaces (i3).DATEC aims to identify the most appropriate applications of information and communications technology (ICT) to support the development of children under 8 years of age, and will be publishing exemplars and guidance material for parents and early childhood educators at the end of 2001. Work is currently taking place in UK, Sweden and Portugal.

http://www.ioe.ac.uk/cdl/CHAT/DATEC.htm

C.3.2 DIPSIE - Democracy of Primary schools in Europe

The DIPSIE project aims to promote European citizenship in the in-service training of primary and pre primary school teachers. In the first year the DIPSIE project will study how some selected kindergartens and primary schools in five EU countries work with and teach democracy and also how these schools function as democratic institutions. In the second year the project will focus on children's democracy in the local communities. In the third year the focus will be on establishing European citizenship and arranging a European Children's Parliament in Bergen.

http://home.hib.no/mediesenter/dipsie/

C.3.3 KIDSMART

Computers have become an essential tool in modern life and their use in education is increasing rapidly at all levels. It is only recently, however, that they have been introduced more widely to children of pre-school age.

IBM is a pioneer in this field with its KidSmart Early Learning programme, which extend its major Reinventing Education project for primary and secondary schools to the 3-6 year old age group. The company began the programme in the US four years ago and has now extended it to Europe, Asia, Australia, South Africa and the Middle East.

6 300 computers have so far been donated to early learning settings by IBM, which has invested $7,5m in KidSmart over the past three years. A further 15 000 units will be donated in the next three years worldwide. In Europe, KidSmart has been introduced into 11 countries, with particular significant programmes in the UK, Germany and France.

There are now 125 KidSmart installations in the UK. They are known as "Young Explorer computer learning centres" and consist of IBM computer hardware, educational software from Edmark and furniture from Little Tikes.

"We have had a very positive response," says Carol Berry, responsible for co-ordinating the IBM KidSmart programme in Europe, the Middle East and Africa. "It has been quite overwhelming."

The KidSmart settings are mainly in disadvantaged areas, in line with IBM's policy of helping to address need and reducing the "digital divide" between children from low-income families and those with greater opportunities. The settings include playgroups, nurseries, early excellence centres, family centres and nursery classrooms.

IBM also applied a number of other key criteria when deciding on the allocation of Young Explorer computer centres:

- The settings should have at least one staff member with IT skills;
- Staff must be prepared to undergo training and to evaluate and co-operate in the research programme;
- They must be willing to share their expertise with other early learning settings;
- The settings should strive to become centres of excellence;

- Parents should be involved systematically in their children's education.

C.3.4 De@fchild

The Deaf@x trust wants to create a world in which deaf children and adults are able to communicate effectively with hearing people on an equal basis through human interaction and by using Information and Communications Technology (ICT).

NOTE: The terms "deaf" and "deafness" refer throughout to all types and degrees of hearing loss.

Deaf@x trust aims to:

- use ICT to provide solutions for the acquisition of literacy, numeracy and communication for deaf children and adults;
- promote integration, deaf/hearing partnerships, networking and positive role models;
- facilitate lifelong distance learning through technology;
- conduct research on issues concerned with deafness and ICT;
- improve the quality of life for children and adults affected by deafness.

De@fchild UK is a project promoting ICT and literacy for deaf children under the Deaf@x trust.

http://www.deafchild.org/

C.3.5 ThinkQuest

ThinkQuest is a global network of students, teachers, parents and technologists dedicated to exploring youth-centred learning on the Net. ThinkQuest is an online community where young people learn, teach, mentor, discover, research and grow through ThinkQuest programs. The ThinkQuest World encompasses young people, educators and technologists in more than 100 nations who come together as digital learners, web creators, and Net entrepreneurs.

Through ThinkQuest, young people work together in teams, use the Internet to research a topic in science, mathematics, literature, the social sciences or the arts, and publish their research as an educational web-site for peers and classrooms around the world. ThinkQuest participants learn the 21st century skills of online collaboration, Internet research asynchronous project management and web communications. They think critically about their selected subject and organize their research into a format that educates and engages their audiences.

Teachers, parents and other interested adults support the participating young people as coaches, technology mentors, and subject-matter guides. They leave the hard work of defining the project, organizing the work, conducting the research and mastering the web technologies to the participating ThinkQuest team members.

http://www.thinkquest.org/

C.3.6 Maypole

The Maypole project is an i3 project. The project has learnt a lot about children and the way they communicate. The project uses user-focussed techniques with multidisciplinary teams.

One of the products recently developed is atOOn a musical companion and communicator for children. atOOn responds to the environment in which the wearer moves, and to atOOn devices being worn by other children. It creates new kinds of social interaction between children and provides a focus for games, swaps and jokes.

http://www.i3net.org/ser_pub/services/magazine/march99/page10.html

C.3.7 CHAT

CHAT (CHildren's Awareness of Technology) is a consortium based in England, Finland and Sweden. They are developing a CHAT database of research and development work in early years information and communications technology. The work is focused on Curriculum Integration, Communication and the identification of children's Personal Constructs.

In the nursery curriculum computers may be integrated directly into many existing play environments and this will undoubtedly increase their access to them. The computer can contribute enormously to the textual and numeric enrichment of children's play.

Communication between children is significant in its consequences for collaboration and for cognitive development and metacognition. Many studies have shown that when parents, teachers and children collaborate towards the same goals it leads to improved academic performance of pupils.

http://www.ioe.ac.uk/cdl/CHAT/welcome.htm

C.3.8 Swedish IT IS (IT @ School) program

The Swedish Government is investing 1,7 billion SEK (US $150 million) on a National Action Programme for ICT in Schools, ITiS. ITiS is an information and communication (ICT) project as well as a school development project. It is the most extensive investment in school development and in-service training in Sweden ever. The Action Programme covers the pre-school class, compulsory school, special school, sami school, upper secondary school, municipal adult education and, during 2002, folk highs schools.

The Swedish Government has drawn up the National Programme for ICT, (ITiS), in order to give teachers support in acquiring and exploiting the opportunities provided by ICT. This also means creating greater variety in the work of teachers and transforming the school into a more exciting working place for pupils and teachers. This can be achieved by overcoming obstacles and using ICT to develop the work of the school. Not by focusing on technology for its own sake, but rather by using it wisely to promote the learning of our children and youth.

Development begins with teachers. It is only when teachers feel they have a firm grasp of the new technology as a pedagogical tool that it can become a tool for change. Such confidence comes from teachers themselves taking responsibility for finding and acquiring knowledge of ICT and learning which is both professionally and personally relevant. As a result of adding new knowledge to their own experience and benefiting from the experiences of others, the individual grows in interaction with other teachers and pupils.

http://www.itis.gov.se/english/index_about_itis.html

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