Initial queries into the notion of Power Users of Technology

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- Investigating ideas of production, competence and identity

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Introduction

In this paper I shall address and investigate some ideas and hypotheses, which I find very important in order to understand the notion of "Power Users of Technology". The Power Users research initiative has noted and emphasises the heavy increase in children's, adolescents' or young people's[1] use of technology. What distinguishes the Power User research initiative and makes it qualitatively different from similar studies is that it is not merely looking into changed patterns in adolescents' use of technology; rather it is claiming that the young people themselves are changing their ways of learning due to the intensified use of technology:

> "We believe that how they think and what they do is revolutionary not evolutionary. They are leapfrogging over many of the more traditional ways that we think about learning. Their minds and their brains are developing in ways that most of us can't quite understand because we are not "wired" in the same ways that they have been" (Malyn-Smith and Guilfoy, 2003)

This citation, however, does prompt some questions to be critically investigated and further elaborated. One of the initial questions springing to mind is why we should assume that an increased use of information and communication technology represent some qualitative leap compared to former and contemporary technologies or media. Does ICT have special properties, which distinguishes it from earlier (and contemporary) youth culture phenomena like comics, TV or movies? Secondly, a range of questions related to learning emerges; how and from which learning theoretical perspectives can we understand the claim that ways of learning are changing. How can we conceptualise the meaning of "ways of learning are changing"? Though, these questions seem to rise from two separate domains I

[1] From here I shall primarily refer to 'adolescents' to represent these groups

shall argue that these two lines of enquiry are interwoven by drawing on socio-cultural perspectives on learning and practice.

The paper is organised around the following hypotheses and ideas:

1. ICT is an extensively productive technology. The concept of production encompasses the production of a range of entities such as artefacts, social relations, identities, communities and cultures. My claim would be that young people are increasingly becoming co-producers of their own environments and activities rather than being passive consumers.
2. IT is becoming an important tool of societal production, which has several interesting outcomes:
    a. Firstly, it points to a global democratisation of the tools of production, where the modes and possibilities for contributing to societal production are increased.
    b. Secondly, I believe this represents a re-emergence and empowerment of youngsters as they gain access to participation in societal relevant activities. Following the thought of ICT and production, youngsters now have access to real, authentic environments of societal production, through the internet and computer tools in general.
    c. In relation to mastering the societal tools of production, ICT is especially interesting in that young people are often far more competent in handling computers and internet than the former generations (Bjørnstad & Ellingsen, 2002, Stevns, 2004, Malyn-Smith, 2004). Could we be witnessing, a historical shift in the societal distribution of competences?

These hypotheses and ideas will be discussed theoretically also drawing on an examination of existing qualitative and quantitative studies of Scandinavian youngsters (Bjørnstad & Ellingsen, 2002, Stevns, 2004). The hypotheses will be exemplified by looking at an online gaming site as an example case illustrating the content of some of the hypotheses. Initially I will give a very brief introduction and description to socio-cultural theories. However, it is not my aim in this paper to delve into subtle differences between theories within this field or give an extensive theoretical account of the theories themselves; rather I hope that the theoretical perspective will emerge and become apparent through the discussions and analyses.

Theoretical perspective

Socio-cultural theories of learning and practice do not represent a uniform theoretical approach, but rather covers a wide range of theoretical approaches, which are concerned with matters of social practice, learning, technology and development. These approaches are increasingly merging without representing a uniform theoretical outlook. In this paper I draw on theoretical frameworks as apprenticeship learning or situated learning (Lave & Wenger, 1991, Nielsen & Kvale, 2002), activity theory (Engeström, 1987), cultural-historical psychology and development studies (Cole, 1996, Rogoff, 2003) social practice theories (Chaiklin & Lave, 1996) or social theories of learning (Wenger, 1998, Wenger, 2004). These perspectives can all be said to belong to a socio-cultural approach as they represent a broad network of theories sharing some central assumptions with only minor disagreements. The theories are formed by and have historically emerged from such diverse fields as psychology, social sciences, anthropology, artificial intelligence, human computer interaction, computer science and learning theories. Within this diverse constellation the field has grown out of a growing dissatisfaction with decontextualised, ahistorcial, acultural, individualist notions of human development, practice and learning (Engeström, 1987, Lave, 1988, Lave & Wenger, 1991) and instead socio-cultural theories stress the socio-historical and cultural nature of development of learning and practice. From a learning perspective the theories stress the constructed nature of knowledge but unlike theories drawing on a constructivist perspective (e.g. Jean Piaget, Ernst von Glaserfeld and Niklas Luhmann) that tend to focus more on knowledge construction as an individual, cognitive process, socio-cultural theories emphasises the cultural and socio-historical nature and development of knowledge and cognition. Socio-cultural theories share also assumptions with social constructionist line of thinking and theories of language and discourse; however, in socio-cultural theories, notions of socio-material practice are more prominent e.g. viewing technologies and material artefacts as co-constituting, re-shaping and transforming practice and culture. I find a citation of Barbara Rogoff trying to describe her overall approach and understanding to be very representative of socio-cultural theories:

> "[…] people develop as participants in cultural communities. Their development can be understood only in light of the cultural practices and circumstances of their communities – which also change" (Rogoff, 2003, p. 3-4)

From this citation it is also clear the historical dimension and focus on material conditions are of importance in studies of human practice, culture and learning. By taking such a view I will now turn to take a cultural-historic perspective on youth and technology as to initially point to some aspects which seem to be genuinely new in relation to the question of computers as having special properties compared to earlier and contemporary technologies.

A cultural-historical perspective on technology and adolescents

In other investigations of the computer technology different metaphors have been suggested to describe the primary role of the computer. Initially notions of calculation and number crushing were prevalent but as the role of the computer has developed it has been described as e.g. a tool, as a medium, as an infrastructure for collaboration and communication. These metaphors all emphasise different aspects of what computers are and can be used for; each without containing all the possibilities. The computer technology is special in the regard that it can represent and mimic all of our dominant audio-visual technologies and media in binary, digital form and that it contains software, which is programmable rather than mechanical (alterations of the functionality does not reside in mechanical restructuring but in re-programming/re-writing the functionality). Thus the computer contains the possibilities of creating and producing a vide range of cultural artefacts such as texts, images/movies, sounds, and even modes of production (e.g. working routines can be reified in a computer system, or one can produce programming languages, image editing programs, sound rippers and so forth). The internet further means that the distribution of these artefacts can now take place across limitations of time and space. The implications of these possibilities for production I shall return to after an analysis of the relations between production and learning and a perspective on adolescents' role in modern societies.

In activity theory the notion of production is prevalent, especially in the interpretation of the theory by Engeström (1987), who emphasises this aspect more than his predecessors (Vygotsky and Leontjev). In his writings the heritage from dialectical materialism is clear and there are strong linkages between material production/conditions, societal development and learning. What is interesting is the connection that Engeström creates between production and learning. He argued that a central problem of most contemporary learning theories was that they were not able to account for the creation of new knowledge or activities. This problem was rooted in that most theories were focused on the internalization, transfer or transmission of knowledge, as Jean Lave cogently summarises it:

> "Certainly, any simple assumption that *transmission* or *transfer* or *internalization* are apt descriptors for the circulation of knowledge in society faces the difficulty that they imply *uniformity* of knowledge […] The terms imply that humans engage first and foremost in the reproduction of given knowledge rather than in the production of knowledgeability as a flexible process of engagement with the world." (Lave, 1996, p. 12-13)

Engeström argued that a central learning process was the collective expansion and creation of new systems of activity, which he coined 'expansive learning'. This insight rose also out of a criticism rooted in an analysis of the con-

temporary state of the schooling system, where Engeström claimed that schools were facing increasingly aggravating tensions and contradictions in that students were kept out of meaningful roles in societal production in school:

> "No doubt the inner contradiction of school-going becomes increasingly aggravated as today's pupils are at an early age intensively drawn into the market as relatively independent consumers, even as producers of exchange values (as computer hackers, as sport stars and performers, etc.)" (Engeström, 1987, ch. 2)

What Engeström noted was the extent to which young people are increasingly becoming co-producers of their own cultural environment rather than merely consumers of these. This conflicts with their experience of school going where they are primarily positioned as consumers of knowledge, rather than being or becoming producers of knowledge. A similar criticism has been articulated in (Rogoff, 2003) where she contrast the role of adolescents in modern societies to the role of adolescents in preindustrial societies. In the latter adolescents are important co-participants and co-producers in their communities, whereas in the former adolescents activities are more often guided or decided by adults:

> Given little responsibility to society and little authority over certain, albeit small, domains of social life, modern adolescents seldom act as autonomous groups in constructive, socially meaningful ways. […] If young people are successful […] it is talented individuals or in activities organized by adults for adolescents like school sports, not through peer groups who plan their own actions […] peer-groups seemed to play larger social roles before their transition to modern and modernizing societies than they do today. (Schlegel & Barry, 1991 op. cit Rogoff, 2003, p. 173)

> "One can observe that the spare time of more and more children are organised far more than formerly seen, either in home – or in a professionalized, commercial way" (Bjørnstad & Ellingsen, 2002, p. 7 – My translation)

Similar differences in roles were also reported in the ethnographies that became central to the theory of situated learning (Lave & Wenger, 1991) and the understanding of learning as legitimate peripheral participation in communities of practice. A central part of learning in this theory is the increasing embedment and legitimization of the person in a social practice, which moves the perspective away from knowledge as an individual possession into the arena of an externalised, shared social practice. Both theories suggested that a large part of schoolwork were more directed towards gaining grades than creating meaningful learning and Engeström coined students as 'grade-makers' rather than 'sense-makers'. Further studies of schoolwork have arrived at similar results where the central activities of the students were directed more at "Doing or beating school" or "beating the system", rather than engaging themselves in a learning activity (Engeström, 1987, Pope, 2001):

> "These students explain they are busy at what they call "doing school". They realize that they are caught in a system where achievements depend more on doing – going through the correct motions – than on learning and engaging with the curriculum. Instead of thinking deeply about the content of their courses and delving into projects and

> assignments, the students focus on managing the work load an honing strategies that will help them to achieve high grades." (Pope, 2001, p. 4)

However, I believe that ICT and internet represent a re-empowerment of adolescents in relation to their possibilities of engaging in socially meaningful, societal relevant activities. I shall return to this point after presenting and discussing briefly two studies of Scandinavian adolescents.

Adolescents re-claiming territory and competence through the internet?

In this section I shall discuss two larger qualitative and quantitative studies that have been conducted in Scandinavia, though of course this discussion can't cover the richness and all aspects or details in the two studies. The first was a qualitative study of Norwegian adolescents and their use of especially internet (Bjørnstad & Ellingsen, 2002). The second analysed both quantitative and qualitative studies of adolescents' use of especially games and online games (Stevn, 2004). A central conclusion in both the studies are that the children feel and are far more competent in the use of ICT and internet than their parents and teachers. These differences in competence are also reported on a global scale (Malyn-Smith, 2004).

In (Bjørnstad & Ellingsen, 2002) it is apparent that the adolescents feel that the internet belongs to them – it is their domain, under their control and the rules or legislations of parents and teachers do not mean much to the adolescents, as they conceive of them as incompetent in the use of computers and internet. Further, it is clear from the studies that it is not in school or from parents adolescents acquire their competences in relation to computers and internet, but rather from their peers. The activities that the adolescents engage in are more directed at, what their peer-groups engage in and being part of those groups are important to the adolescents. However, a central issue is also that the adolescents do not feel that their competence or their activities are being especially appreciated by parents or teachers:

> "The interviewed express that they don't feel that these activities are being appreciated by the parents' generation. The adolescents operate in an arena, where contact with adults and grown-ups are minimal. Those activities that the adolescents feel they master on the internet seem as unnecessary and wasted on parents. The interviewed feel that they operate in areas that parents have neither insight into nor an understanding of." (Bjørnstad & Ellingsen, 2002, p. 25 – My translation)

> "It seems that the parents of the interviewees very much understand computer games as a second-rate or unsatisfying activity, which lack creativity and learning. This is directly in opposition to the conception of the interviewees. The understanding of computer games as second-rate is not only an idea of the parents. […] If one looks at the public media debate as well as the political debate, there is a very clear polarization between two cultural understanding of the internet and computer games. "High culture = good = art, Popular culture = bad = entertainment" (Stevn, 2004, p. 24 – My translation)

This sort of derogative discourse surrounding young people and their activities have also been reported as a part of adolescents conception of their experiences in upper secondary education in Denmark, where they feel that their cultural reality is de-legitimised and constructed as not being equal to the cultural activities defined as "high culture" by their teachers (Illeris et. al. 2002, Ryberg, 2003). In this vein both studies also speak of a cultural and generational gap between adolescents and their parents, in which the adolescents feel both very competent and empowered but at the same time they feel their activities are being de-legitimised by the older generation.
Further in (Bjørnstad & Ellingsen, 2002, p. 7-8) three trends for modern societies are mentioned, which they call an increasing "sleeping room" culture: Privatisation, Individualisation and Globalisation. *Privatisation* refers to that children are increasingly drawn away from the public sphere into a domestic sphere of protection and restriction and as before mentioned their activities are decided, organised and affected more and more by adults. *Individualisation* relates to children under the influence of media and peer-groups have become more individualised, in that they do not inherit their cultural preferences from their parents. This encompasses also a commercialisation of the adolescents, as adolescents have increasingly become a valuable market and are viewed as independent consumers (Bjørnstad & Ellingsen, 2002, p. 7). *Globalisation* is closely related to the latter as it refers to the trend that youth culture is increasingly becoming global rather than local, that is e.g. musical preferences and activities are increasingly becoming globally shared. On this background they portrait the internet as an "alternative public sphere" or a social and cultural playground in which the adolescents can try out different roles and lifestyles in an arena they conceive of as being their own; far from parental control.

In my interpretation the two studies represent an appreciative stance towards young people and their computer related activities. However, as appreciative they are, they do not in my opinion fully unravel the potential of their conclusions, which is partly because the primary aim of the investigations were to give an account and analysis of the adolescents view of themselves and their activities. This they certainly do very well, but in my opinion they lack a dimension in the consequences of their analyses. In my interpretation, it is because neither includes a learning perspective. In (Stevn, 2004) the notion of entertainment is being legitimised as valuable and not a second-rate activity, but this does not give much voice to the learning potential of games (e.g. Gee, 2003) though these perspectives are briefly mentioned. Also the notion of play and entertainment is prevalent in Bjørnstad & Ellingsens account with the use of the metaphor of an alternative public sphere or playground. The idea of identity becomes a joyful play activ-

ity in which the adolescents can test out different roles and lifestyles, but it is not connected to a theory of identity as a phenomenon of learning such as in Wenger's social theory of learning (Wenger, 1998, Wenger 2004). Also it is worth mentioning that both studies report that there might be an undermining of parents' authority because of the conceived gap in competences. This of course could be problematic, but it seems that we should equally think of this an empowerment of adolescents and their peer-groups, as it was mentioned in the previous section. We could think of the role of ICT as a breakage or transcendence of the "sleeping room culture", in which adolescent peer groups re-gain control of their activities and in which their preferences and identity are more affected by their peers than their parents. ICT gives the possibility of participating as a co-producer of one's own activities and communities, thus giving adolescents access to engagement in meaningful societal production, which is a point that will be investigated further in the coming sections.

ICT as the ultimate tool of production and participation

It is now time to return to a point, which was initially mentioned in the paper; namely that ICT contains possibilities of creating and producing a vide range of cultural artefacts such as texts, images/movies, sounds, and even modes of production. ICT represents a multi-mode way of producing various artefacts and a wide range of productional means are now available through the use of ICT, through a computer. These means of production and distribution were formerly reserved for heavy or expensive equipment only available through centralised production and distributional apparatus.

My claim then, is that the tools of production have thus been democratised as they are increasingly being decentralised. Producing e.g. a small newspaper, music, videos or even tv-programmes does not require a centralized and large production or distribution apparatus. People can produce blogs, which can compete with the attention of the established news media and convey other perspectives on e.g. international conflicts; with Winamp-tv[2] and shoutcast technology people can set up their own tv-station broadcasting movies or news. Using word processors, DTP-programs and image editing programs people can produce digital or physical texts, which are of a quality formerly reserved for a professional production apparatus and people (e.g. typographers) and have it globally distributed. In sum this points to that ICT represent a decentralization of the professional tools of production such as sound editing, image production, word processing, calculative power and modes of production. This formerly required large, ad-

[2] See for an example: http://www.winamp.com/about/article.php?aid=10572

vanced or expensive machinery but has now become tools of the common man. ICT can then be said to have expanded the possibilities for people worldwide to engage in advanced modes of societal production.

The notion of production derived from Engeström invokes strong pictures of goal-directedness, purposeful, coordinated collective work activities and labour in a traditional industrial sense. This interpretation of production has its shortcomings; especially the notion of identity or individual perspectives are not embedded in Engeström's framework. This however is taken as the point of departure in Wenger's social theory of learning as expressed in (Wenger, 1998, Wenger 2004). In his theory the notion of production is of another nature than in Engeström's interpretation. In Wenger's framework there is not a focus on the material outcomes of a labour activity; rather the notion of production is an ongoing process of creating or producing meaning within communities of practice – production can be understood as a production of meaningfulness. Through participation and engagement in communities of practice people develop more or less stable trajectories of identity. Learning is not only a matter of acquiring skills or specific knowledge but an ongoing negotiation of the meaning of and being part of a multiplicity of practices. Thus learning is not only a matter of knowing or doing, but also a continuous process of becoming:

> "So understood, learning transforms our engagement in the world as well as our being in the world. Learning is a therefore a social becoming, the ongoing negotiation of an identity that we develop in the context of participation (and non-participation) in communities and their practices." (Wenger, 2004, p. 4)

Wenger mentions also concepts, which bear resemblance to some of the before mentioned trends (privatisation, individualisation and globalisation) through his use of the concepts "personalisation of value creation" and "individualisation of trajectories of identity". The latter describes the trend that people are increasingly becoming unique intersections of forms of participation in a multiplicity of practices and communities. Though the construction of identity is not a personal, individual process in and of itself – but stems from the negotiations and participation in various communities – then we are increasingly becoming unique in that the patterns of participation in these different communities are unique from individual to individual. This process is due to many different factors such as globalisation, accessibility of information and access to a multiplicity of cultures and communities through e.g. television and internet. Thus people. In my interpretation, through the use of ICT, have unique possibilities of participating in cultural constellations and communities, which may not formerly have been available locally.

Wenger describes the concept of "personalisation of value creation" as actually transforming the ownership of the means of production, which poses quite a challenge to traditional labour theory. In a knowledge society the means of

production are not only bound to the production apparatus and the design of production, as was the case in an industrial setting. In a knowledge society value creation, according to Wenger, is more rooted in informal processes such as conversations, brainstorming, meaning making, creativity and pursuing ideas (Wenger, 2004, p. 21). This to Wenger represents a shift the focus from design of formal systems of production to an individual's personal engagement as a primary source of value creation. This is closely related to the notion of identity:

> Another consequence of the personalization of value creation is a shift in the ownership of the means of production. […] Talented practitioners consider their expertise to be a personal characteristic tied to their sense of meaning and identity, not merely as an organizational asset that is owned by their employers. (Wenger, 2004, p. 22)

When learning is taken to be a transformation of identity and shifting participation in various communities or cultural constellations, as Wenger and proponents of situated learning or apprenticeship learning argue (Nielsen & Kvale, 2002, Lave, 1996), this certainly sheds an interesting light on the learning potential of ICT and internet. In my interpretation ICT represents access to a wide range of practices, cultural constellations and communities in which people can engage and participate. If this is considered along with the claim that ICT represents a decentralization of the means of production and thereby a democratization of the tools of productions, then we could also speak of a democratization process of access to and an opening of participation in social practices and the production processes of these practices and communities. An interesting example of these movements and changes could be the newly launched open source online news service 'Wiki news'[3]. Wiki news is an online news source which is editable by any person on the web, meaning that anybody can contribute to the production of a news article, which is "distributed" worldwide. Also it opens to participation in a community of people devoted to open source development and democratization of knowledge. I shall not go deeper into this but merely highlighting it as an example of the claims of this paper. Instead I shall try to exemplify some of the points made through an account from an online-gaming site.

Entering the world of Enemy Territory

This example stems from one of many online community and resource sites that have emerged around people playing the game "Enemy Territory"[4]. In itself the game is not extraordinary or very different from a lot of other games, it is a first person shooter taking place during the Second World war where Axis and Allied troops fight each other

[3] http://en.wikinews.org/wiki/Main_Page

[4] http://enemy-territory.4players.de:1041/

in different maps using guns, air strikes, knives, grenades and other lethal devices to win the map. One can play a range of characters with different abilities (e.g., engineers, medics and soldiers). Each team must accomplish some objectives, which are best carried out as a team effort.

Of course entering and engaging in the game is a learning process in itself, but this is out of the range and ambition of this paper to analyze. What is interesting is that people engaging in the game have on their own initiative produced a vast amount of web pages, manuals, forums, scripts, graphics, customized maps, skins and much more for the community of ET-gamers. Discussion forums at this one ET-site contain 52.000 postings.

If we take seriously the notion of learning as being interwoven with contributing to practices and producing new artefacts and activities, or developing identity through participation in communities, the site is interesting. People engage heavily, either individually or collective, in producing new game maps, which are tested out by other gamers and discussed in the forums. People rip music and sound effect from famous tv-series and re-compile the sound tracks into special modifications of the game (mods), so that one for instance can enjoy the music and the sound of the weapons from the tv-series "Band of Brothers"[5], while playing the game. Others have created the town of Springfield from "The Simpsons" as a very special map to be played. The construction of a map is not a simple enterprise; it takes skills within 2D graphics, 3D graphics, programming, planning a plot for the map and designing or balancing the map so that it does not become uneven between the two teams or advantageous to special characters in the game. Through playing the game and especially by participating in the community by producing maps, discussing, creating screenshots etc. people can become recognized members of the ET-gaming community. For an example the retirement of a person from the gaming community can be recognized at the site[6]:

> "Yesterday Foon'r announced his retirement from being active in the online gaming scene. Foon has been one of the driving forces behind this site with his calm temper, active newsposting, and work on such features as the FAQ, and interveiws. He has exam's in around 6 month's, and these will largely impact his future life, thus it is very important he spends his time studying, rather than posting news on a community website. […] Foon will be missed by a lot of people. Good Luck with real life Foon`r. You've inspired and helped a lot of people in your time."

It seems obvious that people invest not only a lot of time, but also the citation above suggest that there is a strong sense of identity building and identification with the community of ET-gamers involved when people engage at such sites.

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[5] http://www.imdb.com/title/tt0185906/

[6] The message was posted on the community site as a news flash on the front page

It is very difficult to single out, in what this type of engagement at a gaming site means in relation to competences in school or in other settings (e.g. future work places). What I take from this short example is that people have the ability to engage in modes of production and the engagement of oneself in a constellation of communities, using ICT tools. Sites and communities like this opens for a multifaceted way of participating and contributing meaningfully to an ongoing social practice in which one can become a co-producer in the meaning-making process. Thinking of learning as engaging in co-productive process of creating or producing new activities and artefacts and engaging in the meaning making process of a community, I believe that the example shows ample possibilities for this to happen through ICT. One can engage in self-selected activities and communities and be a co-producer of the activities and the development of the community that surrounds them. Further one can engage in creative construction of various artefacts such as soundtracks, script programming, map-making and thereby being a part of societal real and authentic practice, which is meaningful to oneself and the community in which one participates. I believe phenomena like this example are many and that it represents an empowerment of adolescents. This can be both in the way that they achieve early mastery of important societal tools of production, but also in the way that they now increasingly engage in defining and setting the scene for their own activities.

Concluding remarks

In this paper I have tried to address the notion of power users through some initial and certainly still unfinished enquiries. The paper circles around two central questions, which I find important to address in order to do research into the notion of Power Users. Firstly, a question arose around why we should or could assume that increased use of ICT would present a qualitative leap compared to other media and technologies – does ICT have special properties which distinguishes it from other technologies? Secondly, a question of how we could understand notions or claims such as "ways of learning are changing" – from what theoretical grounds could this be understood.

These questions have been addressed in the paper through theoretical discussion and analysis of some initial hypotheses. I have claimed that ICT represent a fundamental democratization or re-distribution of the societal tools and modes of production. It is my claim that there is a wider access to and possibilities of engaging in production of artefacts and cultural activities that were formerly reserved for specialized organizations or institutions. This production required a professional production and distribution apparatus, which is now wider available to the common man through the use of ICT. ICT I have characterized as en extensively productive technology, which mimics and can represent a wide range of existing modes of production. Some examples could be texts, images, sound, videos and

even modes of production in themselves. Further the notion of production has been enlarged also to mean the production or co-production of identities, social relations, communities and cultures. In line with this and through the example taken from a gaming site, I have claimed that adolescents have increasingly become co-producers of their own environments and activities rather than being passive consumers. This actually could be said to be a re-empowerment, as adolescents and their peer-groups in other societal models are more engaged in defining and co-producing societal and cultural activities. Further it seems that adolescents are being empowered in that they are far more competent in both the use of ICT and in the understanding of the online cultural activities (probably adolescents have always been more adept at decoding end engaging in contemporary cultural phenomena) but ICT compared to many other phenomena is a societal very important tool of production, not only a youth culture phenomena. In this sense we are maybe witnessing a historical shift of competence in society. However, as we could see from the Scandinavian studies of adolescents and technology, the phenomena and activities adolescents are engaging in are not always recognised as valuable. I find it an important task to actually study further these phenomena, as I believe they need to be recognised as valuable learning experiences.

Throughout the paper there has been an attempt to couple the understanding of technology and its development, with notions from learning theory, as to address how we can meaningfully speak of ICT as changing ways of learning. The latter has been addressed not as a discrete line of enquiry but closely bound to the historical-cultural account of technology and societal development. I have argued, through the examples and the theory that adolescents have a wider access to both production and participation in real authentic environments of socially meaningful activities. Through the lens of socio-cultural theories of learning, ICT brings about multiple arrangements for engaging in a wide array of communities; it seems, that if we take production of activities and artefacts and participation and development of identity through engagement in a variety of cultural constellations to be a central part of learning; then ICT represent an important change in both participation and production. If we take notions from expansive learning or social theories of learning, in which being a co-producer and participant in socially meaningful activities are important ways of learning, then it seems that the patterns of participation and production are being changed by the increased use of ICT. I would claim that adolescents have the opportunity of increasingly engaging in learning activities; not only by being consumers of knowledge that others define, but rather as being the producers of their own activities, communities and cultures, in which they can continuously contribute to both a development of the activities, but also to a development of their own learning trajectories and competence. This is a rather general claim, and

this far, it can't tell us much or give detailed accounts of e.g. specific competences that are evolving, or which skills these youngsters might be building through their engagement in creative restructuring and co-production of cultural activities. But if the important factors of learning – as proposed by socio-cultural theories – are the novel creation of and participation in activities favouring skills more like brainstorming, meaning making, creativity and pursuing ideas, than the internalization of a predefined body of knowledge; then certainly ICT has a major role to play in this development process.

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