Digital technology and Mediation — a Callenge to Activity Theory

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In spite of their differences Vygotsky and Leontiev equally confine to speak about mediational means and neglect to reflect on the medium which makes an object being a means. Vygotsky lived at the end of the «Gutenberg galaxy». He was not able to even notice the emergence of digital technology. Leontiev certainly lived in the years of emerging digitalization technology but he was still far away from that widely spreading out impact of computers on our daily life today. It is therefore no judgement about personal limitations when we say that Vygotsky and Leontiev really could not reflect neither on digital technology nor on its revolutionary importance as a new leading medium of a new age or society. Activity theory in its basic structure depends on book culture but does not notice this dependency, because of its loss of adequate concepts. Activity theory cannot escape its own theoretical limits and methodological constraints. For the time being, however, that is during ongoing transition processes, we are still forced to deal with the epistemological and communication theoretical structures of book culture because such an anachronism is rather unavoidable to the transition processes in all present societies. But activity theory is urged to test seriously its common grounds or interfaces with new emerging sciences like media history and media science and to check their specific potential in modelling the new forms of information processing and communication systems if it aims to be still functional in the future of the Digital Age.

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Yrjö Engeström, one of the best known theorists of present activity theory, wrote under the heading «mediation as a key»:

«It is somewhat amazing that in the recent theoretical discussion concerning the concept of activity, very little attention is paid to the idea of mediation» [3, p. 28].

That is a correct balance, indeed, and therefore Engestrom is also right calling the idea of mediation «the first prerequisite for any fruitful elaboration» when reflecting the importance of digital technology and its impact on the societal life as a whole. Even more important, however, is the emphasis, which characterizes the underlying theoretical understanding.

Mediation is not only a key, as Engestrom writes, it ought to be said: mediation is the key! From this point of view it is clear — though still not yet obvious — that the global process of digitalizing and digitalized mediation of every aspect of human practice and activity is the hardest challenge activity theory have ever met. I therefore accepted with great pleasure the proposal to speak about digital technology as a challenge to activity theory.

At first let me confirm that I do not intend to explain in great details what terms like «digital technology» or «web 2.0» or «New Media» exactly mean. Although I think that you certainly meet very similar differences in knowing and practical competencies concerning those «New Media» in your country as we do in ours, I suppose that all of you know what phenomena like e.g. facebook, youtube or other forms of social bookmarking are alike, since dealing with new technical devices within teaching and learning in higher education is a special object of your investigation long since, as far as I know.

But I think it being absolutely necessary to make clear what we are talking about, if we reflect on mediation and the Vygotskian or the activity theoretical approach to mediation in particular, leaving aside for the moment the differences between Vygotsky and Leontiev.

I'll therefore start first with some remarks on cultural-historical psychology and its model of mediation and try to analyse its structure and functioning.

In a second step I shall turn to Leontiev and describe the different model of mediation in activity theory. (The distinguishing between cultural historical psychology and activity theory is intentional as we will see later.)

With my last step I shall focus on the two theses which I like to present to you:

First — what is not really surprising after all — neither cultural-historical psychology nor activity theory is by itself able to solve the challenging task of mediation put by New Media or digital technology.

Second: Expanding the concept of mediation by means of media theory and media history, and reflecting activity theory from a historian's point of view we can recognize transformatory potential of digital technology equal to the revolutionary quality of book printing which formed a global culture and lasted for centuries.

I
Cultural historical psychology and its model of mediation

Vygotsky — strictly following the terminology of behaviorism* at the beginning of his career — puts a third factor into the scheme of stimulus-response, an auxiliary or «mediating stimulus», mediating between subject and object. This construction allowed him to use the methodology of both physiology and behaviorism and at the same time to integrate it into his instrumental psychology. The third factor still was a kind of stimulus, but a stimulus of its own, an artificial stimulus, an instrument to mediate between man and nature. Using «tools», originally serving to control other humans, now in order to control himself, man became aware of himself, and so freed himself from the determinism of nature.

That was the meaning of mediation in cultural-historical psychology. The intellectualization of behaviour by mediatisation made a difference between «inferior» (or «natural», «rudimentary», «primitive» or «elementary») and «higher» («artificial», «complex» or «instrumental») forms. Deciding factor of the difference is «its new, specific stimulus-response-relation»: While the lower forms are «totally determined» by immediate stimulation, the basic characteristics of higher forms consist in «self stimulation, that is in creating and using artificial mediational means and in controlling ones own behaviour by those means». In social life man created the most complicated systems of psychic communication, «without which labour activity and the whole social life would be impossible». To Vygotsky the most adequate means to psychic self-regulation are signs, language and scripture in particular. Signs are historical and societal both in origin and function. They come from the history of culture and served initially as «means of communication, means of influencing other humans» and later as «instruments of human activity»:

«These means of social communication therefore constitute the basis for the forming of those complex psychic relations, which emerge, when these functions come to be individual, that is the behaviour of a person» [27, p. 330].

From this point of view Vygotsky expresses his well known «genetic basic law of cultural development»:

«Every function in the child's cultural development appears twice: First, on the social level, and later, on the individual level; first, *between* people (*interpsychological*), and then inside the child (*intrapsychological*)» [24, p. 57].

This is the origin of using signs as mediating instruments, that is, as a solution of the problem of mediation in psychology, which Vygotsky himself called «instrumental psychology» and which later on was called «cultural-historical psychology» when the origin of those instruments ought to be emphasized.

But, considering Engestrom's transformation of Vygotsky's concept of mediational means into «mediational artefacts» — or «instrumentality» [2, p. 19] — it should be added, that Vygotsky in 1930 certainly speaks of «psychic tools», but just one year later he used the concept of sign (and more later the concept of meaning only). He rejects explicitly the identification of tool and sign, and even criticizes the subsumption of tools (as a means of labour) and sign (as a means of communication) under the same concept of «artefact» [25, p. 152, 154].

He sharply and explicitly criticized Claparede, Dewey, Wundt and Ernst Kapp, a then well known German philosopher of techniques, for their literal use of «intellectual tools», «psychic tools» or «language as a tool of thinking» and so on. He solely agreed with a metaphorical use and emphasized: The basis of any analogy between tool and sign is their mediating function only [25, p. 152—153]. Vygotsky's point is: tools and artefacts are no psychic phenomena at all!

What does that mean?

It means that Vygotsky distinguishes between the two forms of internal and external activity, and therefore consequently between two forms of mediational means — tools of the external activity, and signs/symbols of the internal activity. In doing so he insisted clearly in his genuine psychological interest, that is, in psychic processes and their specific form of mediation. Referring to the analogy of signs and tools or inner and outer activity respectively he took care to find an interface to dialectical and historical materialism.

But he sharply, even gruffly denied the simple attempts of his ideological enemies to walk off with the problem by sheer deduction from dialectical or historical materialism or even from the economic categories of «Capital»:

The theory of dialectic materialism cannot possibly be applied directly to psychology no more than to history and sociology. [...] Just as history is sociology in need of a mediating special theory of historical materialism, to show, of which particular importance to the respective groups of appearances the abstract laws of dialectic materialism are. For the same reason the up to now not yet existing but essential theory of a psychological materialism as a mediating science is required, which could explain, how the abstract guidelines of dialectic materialism have to be applied to a given section of appearances» [27, p. 251—252].

Unfortunately Vygotsky was unable to realize this program of a meta-theory between historical materialism and psychology. Nevertheless he seemingly speaks with words of modern media theory, when he depicts the effects of a leading medium on individual and social systems:

* All translations into English by the author.

The use of psychological instruments «changes the complete course as well as the entire structure of psychic functions» [27, p. 310]. «The use of mediational means [...] restructures the total psychic operation through and through» [25, p. 155]. «Culture creates specific forms of behaviour, modifies the activity of psychic functions, builds new layers within the developing system of human conduct» [25, p. 60, 155].

But it is advisable to read carefully and not misunderstand his rather vague use of notions like «instruments», «mediational means» and «culture». Taking into account the technological hierarchy of tool — machine — automat — computer we quickly become aware of the fact that Vygotsky mentions just tools, that is the lowest level of that hierarchy only. You will not even find the word «machine» in his writings, let alone automat or computer, digital technology respectively which he actually could not know. As for the epistemic hierarchy of data — information — knowledge — meaning we can realize that he refers on knowledge and meaning only, that is seemingly on the higher levels of this hierarchy. But we must not ignore the fact that his understanding of knowledge and meaning actually meant language and scripture, that is, the semantic systems of the book printing society. He acknowledged only two mediational means: natural and artificial, exactly like we know from the myths of book culture. And equally like that he saw scripture as the decisive divide, which separates one epoch of human mankind from the other, «namely barbarism and civilization» [25, p. 127]: The lacking contact with the Middle European «culture» of the book society was considered the main cause for «primitive» thinking. As to the Middle Asia expedition of Luria and its assessment by Vygotsky therefore Van der Veer/Valsiner write:

«They interpreted cultural differences in developmental terms and considered literacy and rational, abstract, scientific thinking as the highest achievements of human thinking» — «In the eyes of Vygotsky and Luria the access to (western) culture allowed the Uzbek population to make 'a leap of centuries' (Luria)» [20, p. 251—253; 21].

Also another and anything but unimportant one of the above mentioned myths of the book culture, I mean the linear understanding of history, is typical to Vygotsky, as can be shown by a last example. Reflecting the issue of periodization of consciousness in his essay on «The socialistic transformation of man»*, he quoted Trotsky (as he did already before) for his view of «super man». Trotsky distinguished between «primitive man» and «modern type» of man which he conceived as a transition to the «forming of a new type of human» in communist society. According to Vygotsky the transformation will finally be realized by mastering not only psychic processes but all functions determined by human nature, and so finally by learning to consciously restructuring even the «biological organization» of man onto a kind of superman. The linearity of thinking is obvious. What is changing is the form of behaviour from direct to mediated, and the volume of the conscious behaviour: from mastering the psychic to even mastering the physical processes. All this is an effect of mediational means which at any time remain equal. Their form is irrelevant, only their function is important.

It is obvious that this theoretical framework is obliged to book culture and to printing as leading medium — although this is anticipation for the moment. Insofar we can describe this model of mediation as finally unhistorical. At any rate, because of its dependence of the old leading medium it can hardly serve as an adequate instrument in order to grasp the emerging new leading medium and to understand the full range of present systemic meaning of digital technology.

II
The model of mediation in activity theory

To Leontiev, however, the problem of mediation was still not solved. He clearly followed Vygotsky supposing, that the mediatedness of human relations with the world marks the peculiarity of humans [8, p. 459], and he also accepted the mediating function of signs: *Sign is what matters*» [8, p. 451].

On the other hand he criticized Vygotsky — very early indeed — because of his understanding signs/meanings being means of mediation which could not be questioned. Leontiev's argument was: As far as the origin of signs/meanings cannot be explained, their emergence and function remains restricted to social, more precisely: linguistic, communication, resulting in:

«*Consciousness is a product of linguistic, actually of mental interaction*» [8, p. 457], in other words: «The social mind [determines] the personal and the personal mind determines the social» [8, p. 325].

That means, Vygotsky's solution of the problem of mediation ends in a circular reasoning like «classical French sociologies» [8, p. 459]:

«Society effects on men and man effects on society» [8, p. 325]**.

To Leontiev this conclusion, however, meant to psychology «an affirmation of rather exactly that [American] *culturology*»***, which could not be vindicated from the point of view of historical and philosophical materialism:

«The history of consciousness joins [in that theory] only with the history of the social mind, and not with the material history of society», for «only those cultural-historical facts prove to be determinant» [8, p. 459]****.

Leontyiv preferred an alternative solution. Instead of stalling with linguistic communication as the only mediating entity and thus considering the word a «Demiurge»***** of consciousness, he suggested to

* *Vygotskij L. S.* Socialističeskaja peredelka čeloveka. In: VARNITSO 1930, vol. 9—10, p. 36—44.
** See for the identical formulations in numerous texts: Leontiev 2005; 249; 257; 259; 331; 459.
*** See Leontiev 1982, 79 ff.
**** See Leontiev's criticism of the American culturology, 1982, 79—80.
***** See Leontiev 1982, 235; 2005, 247, 276.

explore, «what stands behind communication» [8, p. 325]. «Behind» linguistic communication, however, stands only the material activity itself.

«Vygotsky's thesis that consciousness is a product of the child's linguistic communication on condition of his activity in respect of its surrounding objective reality thus has to be reversed: The child's consciousness is product of its human activity in relation to the objective reality, which takes place on condition of speech, of linguistic communication» [9, p. 304]*.

His applicatory experiments in Char'kov yielded, that the appropriation of a meaning did not result in communication, but «originally from the child's external activity with material objects and in cooperative interaction» [10, p. 138]. In Leontiev's approach the formula subject — activity — object took the place of the formula subject — sign — object.

This had consequences. The object now appeared twice: first, as a material artefact and then as a mediational means of activity. Thus the tool concept lost its Vygotskyan function, because:

• Human activity is object-oriented ever since. «The term ‚activity without object' is senseless» [10, p. 85].

• The mediating object appears either as a tool or a goal or a motive of activity, according to the «status of structure within the system of an activity». Only within this system «objects can obtain the quality of stimulus', goals and tools. Taken out of this system, they lose those properties» [10, p. 108].

• The nature of tools «as a matter of course is not psychic» [11, p. 18], in fact they are «a material artefact, in which just procedures and operations and precisely not actions, not goals crystallize» [10, p. 106]. That is true to all human tools, which are objectifications of operations», so as well «the words language, which comprise by their meaning the way of their use, and so finally the logical and mathematical laws and formulae» [11, p. 18].

• Consciousness «is not the only existing, only possible, only imaginable form of psychic reflection» [8, p. 443]. Every human activity is mediated by psychic reflection that is by an internal activity, having the same structure as external activity. Therefore, «the in its form internal activity, emerging from the external practical activity», cannot be separated from it, «but remains in principle and even mutually connected with it» [11, p. 18].

On the one hand this point, to fetch back the mediating reflection into the material activity and to genetically explain it by activity itself, rendered superfluous the immediate interiorization of the mediational means by communication according to Vygotsky, and thus avoided the intellectualization. But on the other hand this caused a new form of immediacy between activity and consciousness. Leontiev solved this problem by a strict historical analysis whose results were published in his famous periodization «Problems of the development of the psyche». The central outcome of this book is the difference between «reflection *within* activity» and «reflection *as* activity» [13, p. 131].

Based on this assumption Leontiev formulated his own «basic law» of practical activity hurrying ahead and reflection lagging behind [13, p. 157].

Consequently Leontiev began, to reformulate from this point of view all of the concepts of Vygotsky: consciousness, higher psychic functions, genesis of speech, emergence and mastering of scientific concepts, and learning.

He of course then met the same problem as Vygotsky: the exigency of a philosophical foundation of his assumptions. In a posthumously published manuscript Leontiev explicated his understanding of Vygotsky's proposal for a psychological materialism:

«The philosophical issue of consciousness has to be distinguished from:

A. the issue of societal consciousness and

B. the issue of the consciousness of (societal) man.

The first is the subject of analysis of the historical sciences, of historical materialism.

The second is the subject of psychology» [8, p. 443].

And once more he repeats:

«Consciousness belongs to the nature of man — to the real subject of consciousness.

Taken in its relationship to objective reality, it has to be reflected by philosophical science — epistemology, logic (‚query of truth'); taken in its relationship to social life («considering the objective societal consequences»), it has to be reflected by sociology; taken in its relationship to the materializing life of men, it has to be reflected by psychology.

That means: *The theory of consciousness is necessarily a subject of psychology, but by no means does not and may not coincide with the theory of consciousness of Diamat or Histomat. To substitute psychological, that is concrete scientific assumptions on consciousness by epistemological assumptions or by assumptions of historical materialism is crassly erroneous*» [8, p. 444].

But he held, that psychology could achieve its scientific assumptions *within the framework* of historical materialism only, because it was the only way to give reasons for activity as an explanatory principle.

Although Leontiev in reconstructing the genesis of consciousness resorts to speech and in attempting to explain the emergence of speech harks back to gesture and «kinetic speech» both as independent media, which are not identical with labour** and develop actually in co-evolution***, monism coerced him into denying this meaning and subordinating gesture and speech to labour. Even though he occasionally concedes, that «the appearance of phonetic language was a revolution» [8, p. 475, 481], and that written speech «together with book printing» transformed into one of the most important, even «predominant form of human speech» and thus into «a capacious creative power» [8, p. 481], such

* In short: «Neither meaning, nor consciousness is the base of life, but life is the base of consciousness.» (Leontiev 1982, 98).

** See Leontiev 2005, 241f, 251f, 263, 283f.

*** Speech, «which emerges together with the development of labour». (Leontiev 2005, 267.)

appreciations finally remain accidental*. It does not mean, that Leontiev would have accepted either phonetic speech or printing like leading media in the sense of media history. He in fact affirms Giesecke's argument indirectly:

«Modern book cultures tied “intrinsic”, “true” information to human consciousness and gave to linguistic-conceptual knowledge a virtually absolutistic power on other, «inferior» forms of informations» [6, p. 78].

Clearly, Leontiev focused on a «general psychology» only [9], which in itself had no need for a historical observation of itself. In describing the real history of the psyche he therefore inevitably switched to the method of historical materialism, in other words, to the identification of activity and labour. Obviously his division into periods of historical structures of consciousness equals the well known periodization of societal labour: The phase of «primitive integrated» consciousness, not yet separated into external and internal or practical and mental activity (manual and mental work), was followed by the phase of «disintegrated», that is class consciousness (ibid.), characterized by its alienation of personal sense and societal meaning and finally by the phase of «reintegration» with its «new relation between sense and meaning» and with «a new psychological structure of consciousness» caused by liberation of human labour through communist society. But, according to Leontiev «class consciousness» is «*societal* consciousness» and thus explicitly a subject of historical materialism, *not* of psychology. According to Leontiev activity and labour are not identical, and even more: all categories of general psychology — activity, action; operation or motive, goal, condition or sense and meaning respectively — may not be huddled together with, deduced from or replaced by the categories of historical materialism or even the concepts of political economy.

«Because of the existing relations between these sciences, which reflect the objective relations of their objects, such a substitution makes the psychology of consciousness unsubstantial, but restricts the potentials for a further completive development of the other sciences of consciousness ...» [8, p. 444—445].

Nevertheless, since Yudin's essential and useful distinction between activity as an object and as a principle of explanation** the argument is rather common, Leontievs psychology and activity theory are identical. Actually that is by no means correct, and Yudin's distinction is very helpful to make that clear: Indeed, object of *psychology* is, according to Leontiev, activity. But that can only be legitimized in the framework of a *philosophy*, using activity as explanatory principle. Exactly this is Vygotsky's «psychological materialism» [27, vol. I, 253] as philosophy or worldview, as Leontiev expresses unmistakably clear with his famous letter to Vygotsky:

Today the developmental logic of the system of C[ultural] P[sychology] is in need of focussing on the issue of a philosophical understanding of its basic concepts and principles (Divergence between the actual content of analysis and the level of elaboration of its philos[ophical] foundations, of its underlying world view [...].)

This task [...] cannot be coped with for the price of adapting the C[ultural] P[sychology] to the «standard», in other words, it may not mechanically be squeezed into this or that philos[ophical] context. — It is by itself a philosophical system (a psychological philosophy! — a world view!)***.

Anyway, in summa Leontiev as well did not get beyond the limits of the leading medium but remained — at least in his works earlier than 1960 — within the boundaries of the book printing medium.

On the other hand, beginning with the 60ies when the Russian government forced the development of computer systems to making possible the moon rocket flights, Leontiev was in charge of doing psychological research on problems of man-machine-relations. He then published lots of highly interesting contributions which are rather unknown in the western world but can be seen as his approach to information technology. So I think it worthwhile to at least have a look on the results for the concept of mediation****.

In his first publications about the psychological meaning of automatically controlled machines in 1962 — the term «Computer» was not common then in the SU — Leontiev came to a point of view, which even at that time was much more open-minded to digitalization than the arguments of many of the scientists in the western world at present. Above all, in his assessment of the psychological consequences he freed himself of all restrictions by the theory of historical materialism, and focussed exclusively on the psychological components of activity and the possibility of their technical modelling.

According to Leontiev tools are externalized operations. This understanding lends the tool a conceptual extension far beyond Vygotsky's idea. On the one hand, to Leontiev even «the most modern machines» — as he called computers at that time — are «just a technical means, [...] a method to realize the productive activity» or «”algorithmized” and “automatized” actions», but on the other hand he considered them to be «objectified *human functions*» [11, p. 17]. However, in operations «only those interrelations of the action structure have been retained and fused, which replicate the objective relations of the objective conditions of their accomplishment» and therefore «as such can be uncoupled

* Even his concession, «the appearance of a certain bearer of generalization, which is the word, opens up *totally new and infinite perspektives*», has reference exclusively to «the developmental potentialities of the generalizing activity», that is to «the intellektual activity of thinking» itself (Leontiev 2005, 273. Italics GR.); resulting in: «The one and real source not only of the emergence, but of the subsequent formation of human speech and consciousness» is labour (ebd., 334; see also 259ff, 333 ff).

** See Yudin 1978; in German 1984, 2009.

*** Letter from 5. 2. 1932; Vygotsky 2009, 270.

**** Unfortunately those writings haven't been translated into English; so I have to quote them from my German translation.

from man» — «the forming of operations, metaphorically speaking, equals the death of formerly inventive actions» — then again they could in principle be modelled technically. So he did not balk at the then revolutionary consequence, which today still is frightening to many of his colleagues:

«What today occurs to human thinking like a not to be formalised creative action, that tomorrow already could have been changed into an operation. Thus there are no limits to a development of always ‚savvier' machines» [11, p. 19].

Hence, according to Leontiev, all existing barriers for the technical modelling of actions are temporary. When he was asked to assess the limits of capability of computers, he always spoke of «at present *really existing* automatic machines», whose «actual success [...] lies ahead in the near future» [11, p. 7].

Surprisingly Leontiev even in 1962 enunciated the idea (which is customarily associated with Marshal McLuhan) that man «in tools, by which labour is carried out, generates in a way new organs», which «he adds to the vitals of his body» and thus overcomes «the ‚biological idleness of his natural organs, powers and abilities». Very similar to McLuhan's comment on the socialization process of people by media Leontiev wrote — at first more in general:

«While learning to use tools man subordinates his motions to the societally emerged system of operations, which is materially ingrained in them. The tool changes the behaviour of people, it builds new abilities in him» [11, p. 11].

Then with reference to machines, including computers:

«What machines contribute to human activity by their work, at the same time give rise to the emergence of new abilities of man — of new functional systems of his brain, which appear like the “mobile physiological organs” (Ukhtomsky) of those abilities» [11, p. 19].

Leontiev obviously supposed, that with machines in general and computers in particular — seen as technically modelled former human operations — quasi human «organs» have been built and dislocated to the outside — much like our brain today no more serves as an adequate information store, because we may relocate our memory into a computer. Though Leontiev saw the then state of affairs of the digitalization development rather sceptical, he basically suspected already in 1962, however, the technical modelling even of brain functions, which today can use everybody, who has an internet account to his disposal and disposes of adequate media skills. These are e.g. the software developments of Web 2.0 like expansions of social bookmarking and their socially interactive memory stores, which are going to combine the memories of people, concerning a special object, and to make the combination available to everybody quasi as a collective brain. And these are networks like e. g. flickr, splashr, favr, del.icio.us, YouTube, facebook, Gravatar or technorati, but also Amazon, Google and E-bay, whose results are much more than a sum of particular brains, and whose «collective results of thinking» cannot at all be noted by men, but automatically by machines, as well as e. g. the results of «beta versions» or «open sources» concerning the collective improvement of software or the ranking of Google places.

Astonishingly Leontiev did not see any consequence for a changing of his general system of psychology: just abilities change but the system of consciousness keeps the same. On the other hand, his results characterize, although only in general and implicitly, the basic dependence of consciousness as a totality of human potentialities from the actual social-historical system of human mediational means. Even when the explicit concept of «medium» is still missing, Leontiev's approach provides us with an interesting and still useful interface with actual media theory and media history respectively. However, the more digital technology continues strengthening and widening out interactivity as a principle of all web 2.0 social services the more our traditional understanding of technology as a mono-causal amplifier of intentional actions will disappear.

III
Activity theory and the transformatory potential of digital technology — two hypotheses

First hypothesis

Thus concerning our first hypothesis we may resume our results as follows.

In spite of their differences Vygotsky and Leontiev equally confine to speak about mediational means and neglect to reflect on the medium which makes an object being a means. The reason is obvious: What goes without saying needs no thinking about. Humans are air breathing beings but don't even perceive it until the air is polluted. Even in big cities heavily pestered by smog people are in need for experiencing clear fresh air as a different medium to become aware of the difference although they of course are still breathing air. But not before getting under water — that is, within a totally different medium — they conceive what air as a medium really is and at the same time they understand that air is the leading medium to every land born being like water to every sea born animal. In terms of the same metaphor we may say that Vygotsky and Leontiev never came under the water of digitalization.

In the history of mankind there are several leading media. The most interesting ones especially to human sciences are communication media like language, scripture, and book printing. To say they are historical, means, they follow each other in history having their historical roots and conditions. To say they are leading, means, they impact every other medium and build the decisive framework for every societal communication system existing at a time. Therefore media theory speaks of leading or predominant media in terms of societal formations or cultures, eras, epochs, or ages — as e.g. Marshal McLuhan who used the metaphor «the Gutenberg Galaxy», in order to characterize the book

printing century as a long lasting era which had been coined by book printing as leading medium. In the same way at present many scientists refer to digital technology as the new leading medium in order to characterize the drastic and comprehensive impact of digital technology on every existing communication system. They then use notions like Information Age, Connected Age (Anne Zelenka) or Digital Age (MIT). Others speak of Information Society (Giesecke), Media Society (Flusser), Network Society (Castells), Knowledge Society (Willke), Meaning Society (Bolz) or simply Next Society (Drucker).

Coming back to Vygotsky and Leontiev.

We first have to take note of the fact that Vygotsky lived at the end of the «Gutenberg galaxy». He was not able to even notice the emergence of digital technology. Leontiev certainly lived in the years of emerging digitalization technology but he was still far away from that widely spreading out impact of computers on our daily life today. Up to his death in 1979 hard resistance against those «inhuman and hostile robots» was common with people in general and with scholars in human sciences as well. It is therefore no judgement about personal limitations when we say that Vygotsky and Leontiev really could not reflect neither on digital technology nor on its revolutionary importance as a new leading medium of a new age or society.

Second hypothesis

But may we as well assume that those historical and biographical restrictions are true to present activity theory?

One of the most interesting living scientist doing research in the tradition of Herbert Marshal McLuhan, Jack Goody, Erik A. Havelock, Walter Ong, Andre Leroi-Gourhan, Elizabeth Eisenstein or Jacques Derrida is the media theorist and media historian Michael Giesecke*. To answer my question I condense the theoretical guidelines of Giesecke's voluminous historical research on media within 10 arguments pointing out the consequences on activity theory.

1. There is neither information nor communication between systems without a medium, they be individual, social or cultural. Each new medium gives rise to a new epistemology, and this again leads to the discovery of new worlds. New world views emerge, that means, the position of man in relation to the world gets reformulated. Or as Postman puts it:

«Each epistemology is the epistemology of a period within the development of media» [15, p. 36—37]**.

2. In reliance to the given leading medium the understanding of what could be a tool or a helpful instrument changes. Existence, form and function of tools and instruments as well as the social rules of their application and use depend on the actually given medium and its information and communication systems. No exceptions are possible. If we take the notion of tools as an example we can see, that it is based on linearity and causality but not on interaction. The feedback of an action is a failure. If the handle of a hammer breaks when using, the hammer is no good as a tool. The feedback minimizing of objects on a tool makes it a good tool. But the creating of most possible feedback possibilities makes the interactive social networks effective.

Every leading medium constellation produces its own typical practices and products, activities and cooperation forms, its means, tools and devices as medium between man and environment, and it emerges symbolically generalized communication media to steer the communication between individual or social systems like e.g. power, law, money, knowledge or networks.

«Even the defining characteristics of what is human move and slip» [15, p. 290].

3. This basic impact of media on speech and thinking, feeling and knowledge, perception and cognition, aesthetics, epistemology, social rules and ways of reflecting the world got the media historians to argue in terms of media formations history. With respect to book printing e.g. they think it rather unbelievable what obstacles and barriers have been cleared out of the way to push through the typographic communication system: All linguistic conditions were restructured completely, Latin lost its monopoly, new standardized national languages with specific oral and scriptural forms emerged, status and function of dialects within the hierarchy of languages changed fundamentally, age-old religious myths were replaced by new ones, social norms valid for thousands of years have been smashed, the self image of the individual has been outlined through and through [4].

«New religiousness, enlightenment, democracy, and industrialization — everything has been given a push, accelerated and perfected by this medium. Each field of life has been made scriptural and is controlled by bookish knowledge» [6, p. 227]***.

4. To make things absolutely clear Giesecke emphasizes that the privileging and accelerating of a new medium equally to digital technology in those days and today depend basically on the potential, viability, and power people expect of it in realizing their social utopia.

* See Giesecke 4/2006, 2/1998, 2002 und 2006.

** See also G. Bateson 1981, 245, 577ff. For more details see Giesecke 2002, 303—330.

*** To Giesecke that is effective even to production. Quoting McLuhan who called the invention of Gutenberg «the basic form of any further mechanization» and referring to other historians of technology who argue that the principle of Gutenberg's mould returns up to modern age in every machine, Giesecke concludes, that without the printing machine indefinitely producing identical perfectly fitting pieces neither the industrial mass production nor the market economy and its distribution mechanisms would have been possible (1991, 80, 182; 2002, 225). Other than historical materialism he is convinced: «The typographical technology is the prototype of the production technology of the industrial era.» (Ibid., 229.)

In other words, a medium is a catalyst (McLuhan), not a cause.

«In order to become a catalyst of social transformations a medium has to draw social attention and to attract social projections. The more total the demand of those projection is — it could also be said: their megalomania is — the more important the catalytic effects to societal transformation will be» [4, p. 156].

5. But there are always different competing technologies with different promises of sense and value which forces them to start a predatory competition by developing sense creation processes, forming new semantic systems and ideologies. Because of the heavy cultural losses which come unavoidably together with a new medium cultures therefore are forced to justify their self definition by depreciating the old media and glorifying their own aims and goals, and by making mysteries of their historical outcomes and achievements as if they were unchangeable characteristics of man and would mark the top of the development of mankind.

6. The failure of scrutinizing the mysteries and ideologies of the book printing culture has an adverse effect on the critical analysis and shaping of the potentialities of the new medium and of activity theory as well. Giesecke describes eleven of such myths and mystifications which build the specific tradition of book culture [6, 223-257]. I just mention those few which can be found easily within activity theory:

- The myth of the rational linguistic information processing: Logical thinking and reason are more important and valuable than emotional intelligence what is effective to activity theory as well.
- The myth of knowledge being a result of individual efforts. There is hardly a chance for Surowiecki's «Wisdom of crowds» (2004) in activity theory.
- The myth of learning being an individual process only. There is no place in activity theory for the concept of learning systems (even computer systems), learning organizations or learning cultures.
- The myth of the «true (or objective) reality» being the only possible. Thinking of reality in terms of communication is not the business of activity theory.
- The myth of history being a steady linear process of accumulation of knowledge.
- The myth of the early cultures being «natural» and «direct», that is «non-mediated» and therefore minor, primitive or inferior, while books and reason are identified and privileged as «real» culture.

All these myths and mystifications are specific to book culture and its «imperialistic» (Giesecke) medium and cannot be found in any other earlier leading medium formation.

7. In every new medium formation — and that's true to the Digital Age as well — the sheer reproduction of the programs of a declining formation cannot, by no means, reproduce the achievements of the old medium but is condemned to fail against the new challenges and potentials of the new medium.

8. In order to stand these challenges we have to see through those myths, to understand there dependency and to grasp their historical necessity. That is the only way to get along with the problems of transformation processes, that is with its specifity of the concurrence of the inconcurrence of different leading media e. g. books and networks which both are still competing for their being privileged and generalized.

9. However, for being able to identify those myths as implications of a leading medium a scientific concept of medium is required. Neither tool nor sign or meaning are concepts adequate to identify and to distinguish different formations of cultures, societies or ages of a leading medium, or media formations. Nor are they adequate instruments to grasp the revolutionary quality of the transformation processes of cultures and societies introduced by the change of leading media. The concept of medium — not tool, sign or meaning — provides us with the methodological means necessary to form the model, the stages und laws of transition between different leading media which we so urgently are in need of.

10. To understand the limitations and restrictions of activity theory concerning the problem of mediation it seems to be useful to notice, that — according to Yudin* — the century of activity as explanatory principle in spite of all existing differences moves within a closed «space of thinking», which is finally based on the same fundamental problem of mediation whose origin is historically far beyond the activity theory of the 20th century. This historical constellation fixed the margin for perceiving the evolution of media, which results in restricting the attempts of modern activity theory in clearing its dependence and in adapting its methodology.

Activity theory in its basic structure depends on book culture but does not notice this dependency, because of its loss of adequate concepts. Activity theory cannot escape its own theoretical limits and methodological constraints. For the time being, however, that is during ongoing transition processes, we are still forced to deal with the epistemological and communication theoretical structures of book culture because such an anachronism is rather unavoidable to the transition processes in all present societies**. But activity theory is urged to test seriously its common grounds or interfaces with new emerging sciences like media history and media science and to check their specific potential in modelling the new forms of information processing and communication systems if it aims to be still functional in the future of the Digital Age.

* Judin, 1978.

** See *G. Rückriem, C. Ang-Stein, J. W. Erdmann.* Understanding media revolution — how digitalisation is to be considered. Lecture given at the Summer School of MGPPU, August 2010, Moscow, Russia. Revised version of the Lecture on FISCAR. Nordic Conference on Activity Theory, May 23—25, 2010, Aalto University, Helsinki, Finnland.

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Цифровые технологии и опосредование — вызов теории деятельности

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Несмотря на различия между взглядами Л. С. Выготского и А. Н. Леонтьева, они одинаково описывают орудия опосредования и в равной степени игнорируют вопрос о его носителе. Л. С. Выготский жил в конце «эры Гутенберга». Он не застал даже первых ростков цифровых технологий. Леонтьев жил в период, когда развитие цифровых технологий уже началось, но эта стадия развития была далека от всепроникающего влияния компьютеров на повседневную жизнь человека. Таким образом, мы не можем назвать личным упущением Л. С. Выготского и А. Н. Леонтьева тот факт, что они ничего не сказали о цифровых технологиях и об их исключительной значимости как нового ведущего орудия опосредования новой эры. По своей базовой структуре теория деятельности принадлежит до-цифровой, «книжной» культуре. В течение длительного переходного периода мы вынуждены иметь дело с эпистемологическими и коммуникационными аспектами теории деятельности, возникшей в «книжной» культуре, потому что данный анахронизм практически неизбежен в текущем переходном периоде. Требуется серьезный пересмотр основных положений теории деятельности в свете новых областей знания, таких как история и теория мультимедиа, а также проверка ее потенциала в моделировании новых форм обработки информации и коммуникационных систем в случае, если эта теория претендует на то, чтобы продолжать развиваться в Цифровую Эру.

Ключевые слова: теория деятельности, культурно-историческая психология, культурология, теория мультимедиа, история мультимедиа, культура, цифровые технологии, артефакты, инструменты, средства, объекты, орудия, опосредование, коммуникации, мифы «книжной» культуры, периодизация, формирование медиасферы.