‘Interactivity’

Tracking a New Concept in Media and Communication Studies

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> ... interactivity is quintessentially a communication concept ... its time has come for communication research. Interactivity is a special intellectual niche reserved for communication scholars. (Sheizaf Rafaeli, 1988)

> in´ter.ac´tive
> 1. new technology that will change the way you **shop**, **play** and **learn**
> 2. a zillion-dollar **industry** (maybe)

The above quote is a quick, dictionary-like keyword definition of the concept ‘interactive’ as it appeared on the cover of *Newsweek* on May 31, 1993. Inside the magazine, under the title “An interactive Life. It will put the world at your fingertips...” readers were told that the ultimate promise of ‘interactivity’ was:

> a huge amount of information available to anyone at the touch of a button, everything from airline schedules to esoteric scientific journals to video versions of off-off-off Broadway. Watching a movie won’t be a passive experience. At various points, you’ll click on alternative story lines and create your individualized version of “Terminator XII”. Consumers will send as well as receive all kinds of data ... Videocamera owners could record news they see and put it on the universal network ... Viewers could select whatever they wanted just by pushing a button ... Instead of playing rented tapes on their VCRs, ... [the customers] may be able to call up a movie from a library of thousands through a menu displayed on the TV. Game fanatics may be able to do the same from another electronic library filled with realistic video versions of arcade shoot-’em-ups ... (1993: 38).

The cover and quote are in many ways characteristic.[1] In recent years, expectations of ‘interactivity’ and new ‘interactive media’ have been pushed to the breaking point in terms of what will become technologically possible, in terms of services that will be offered, in terms of economic gain, etc. Along with terms like ‘multimedia‘, ‘hypermedia‘, ‘media convergence‘, ‘digitization’ and ‘information superhighway’, ‘interactivity’ is presumably among the words currently surrounded by the greatest amount of *hype*. The concept seems loaded with positive connotations along the lines of high tech, technological advancement, hypermodernity and futurism, along the lines of individual freedom of choice, personal development, self determination – and even along the lines of folksy popularization, grassroots democracy, and political independence.

At the same time, it seems relatively unclear just what ‘interactivity’ and ‘interactive media’ mean. The positiveness surrounding the concepts and the frequency of their use seem, in a way, to be reversely proportional to their precision and actual content of meaning. Americans often use the expression *‘buzzwords’* to refer to words which, within a certain topic, appear to refer to something very important and which – for a given time – are heard constantly, but are often difficult to understand since in reality nobody seems to know what they mean. ‘Interactivity’ is currently one of the media community’s most used *buzzwords*. In that sense, it’s easy to agree with Sheizaf Rafaeli who starts his article on ‘interactivity’ by maintaining that, “Interactivity is a widely used term with an intuitive appeal, but it is an underdefined concept. As a way of thinking about communication, it has high face validity, but only narrowly based explication, little consensus on meaning, and only recently emerging empirical verification of actual role” (1988: 110).

Maybe this isn’t so surprising after all. The meaning of professional terms – including scien-

tific and academic terms – is often watered down once they win popular acceptance in daily usage. And with the explosive growth and decided success of interactive technologies and the interactive approach in recent years in the form of video recorders, videotext, telephone-based voice response systems, ATM cards, automatic tellers, on-line services, information kiosks, 'intelligent' household appliances and most importantly, computers and multimedia, Internet, intranets, WWW, networked computers – where it can be said that culture has lived out what we might call 'the interactive turn' – 'interactivity' has naturally entered common usage. And this watering down of the concept has not become less significant after the worlds of advertising and entertainment have annexed the term as a common, value added word in the effort to sell new products and services.

This kind of confusion of concepts is, however, inappropriate in an academic situation where it is necessary to know relatively precisely what terms refer to and which differences they make. At the same time, the concept of 'interactivity' (as will be shown) has a longer and more complicated tradition behind it than first meets the eye. There are, therefore, many good reasons to leave the *hype* and *buzz* behind and take a closer look instead at the background and construction of the concept of 'interactivity'.

The following is an attempt to track the concept of 'interactivity'.[2] First the concept's current placement in the fields of media and communication will be discussed, and its background in other traditions will be touched on. This will be followed by various representative attempts at definitions from academic studies and finally, based on this presentation, a new definition of 'interactivity' will be suggested.

'Interactivity' – Media Studies' Blind Spot?

> .... scholars are going to have to shift toward models that accommodate the interactivity of most of the new communication technologies. New paradigms are needed, based on new intellectual terminology. (Rogers & Chaffee, 1983)

While *Newsweek*, as previously cited, dared to publish a cover with a refreshing keyword definition, more serious definitions are harder to find in common reference works and handbooks from the fields of media and communication. Here the term 'interactivity' is most notable for its absence. The *Dictionary of Mass Media & Communication* doesn't list it. *A Dictionary of Communication and Media Studies* doesn't list it, nor does the *Handbook of Communication*. Even relatively new and updated handbooks like *Key Concepts in Communication and Cultural Studies* (O'Sullivan *et al.*, 1994) are silent when it comes to 'interactivity'. It certainly looks as though the authors of the handbooks completely disagree with this article's introductory quote, which cites Rafaeli's opinion that 'interactivity' should be of central and essential concern to students of communication.

Naturally, this blind spot, when it comes to the concept of 'interactivity' and 'interactive media', has an explanation. One way to clarify what may be blocking the view – and at the same time establish a framework for understanding the various concepts of interactivity currently in circulation – is to use the media typology developed by Bordewijk and Kaam.[3] Their typology is based on two central aspects of all information traffic: the question of who owns and provides the information, and who controls its distribution in terms of timing and subject matter.

By cross-tabulating these two aspects in relation to whether they are controlled by either a centralized information provider or a decentralized information consumer, a matrix appears with four principally different communication patterns, as illustrated in Figure 1.

1) If information is produced and owned by a central information provider and this center also controls the distribution of information, we have a communication pattern of the *transmission* type. This is a case of one way communication, where the significant consumer activity is pure reception. Examples would be classical broadcast media such as radio and TV but also, for example, listservs, or live broadcasts of conferences, real time radio, TV, multimedia etc. via the MBone.

2) If the exact opposite occurs and information is produced and owned by the information consumers who also control distribution, we have a *conversation* pattern of communication. This is a case of traditional two way communication, where the significant consumer activity is the production of messages and delivery of input in a dialog structure. Typical examples would be the telephone but also e-mail, maling lists, newsgropus, IRC, etc.

3) If information is produced and owned by an information provider, but the consumer retains control over what information is distributed and when,

Figure 1. Bordewijk and Kaam's Matrix for the Four Communication Patterns: Transmission, Conversation, Consultation and Registration

	Information produced by a central provider	*Information produced by the consumer*
Distribution controlled by a central provider	**1) Transmission**	**4) Registration**
Distribution controlled by the consumer	**3) Consultation**	**2) Conversation**

it is a *consultation* communication pattern. In this case, the consumer makes a request to the information providing center for specific information to be delivered. Here the characteristic consumer activity is one of active selection from available possibilities. Typical examples would be various *on-demand* services or on-line information resources such as FTP, Gopher, WWW etc.

4) Finally, if information is produced by the information consumer, but processed and controlled by the information providing center, we have a *registration* communication pattern. In this communication pattern the center collects information from or about the user. In this case, the characteristic aspect is the media system's storage, processing, and use of the data or knowledge from or about the user. Typical examples would be various types of central surveillance, registration systems, logging of computer systems etc.

Among these four information patterns, *transmission* is the only one that is characterized by one way communication from the information providing center to the consumer. In other words, there is no return or back-channel that makes an information flow possible *from* the information consumer to the media system. Until now, communication and media studies has primarily based its models and insights on the transmission pattern because of the dominant role played by mass communication research. This model has also followed certain preconceptions and basic concepts such as: sender, receiver, intention, effect, channel, media, etc. Communication patterns of the conversational type have naturally been studied within the field of interpersonal communication, but actually the work has been based on models from the transmission pattern. The two last communication patterns (consultation & registration) have been left practically unexplored by media researchers.

Current media developments including the arrival of 'new media' (such as the Internet, intranets, networked multimedia, WWW, Gopher etc.) have been more or less singularly characterized by a movement away from the transmission pattern toward the other three media patterns. These new media, which open up the possibility for various forms of input and information flow from information consumers to the system, can hardly be described using traditional one way models and terminology. Seen from this perspective, it might well be claimed that as developments proceed, existing media theory is increasingly less able to explain current media phenomena. Or it could be said that the new media represent a growing challenge to traditional media and communication research that necessitates a thorough rethinking of all central models and concepts.

There are already many who have pointed out this situation. Aside from Rogers & Chaffee, whose quote leads this section, Carrie Heeter's article, with the telling title: "Implications of New Interactive Technologies for Conceptualizing Communication" speaks out for "a need to reconceptualize communication, in part because of changes brought about by new telecommunication technologies" (1989: 217). Rice & Williams points out that "new media may, in fact, necessitate a considerable reassessment of communication research. Intellectual changes must occur to match the growing changes in communication behavior" (1984: 80). And Everett M. Rogers maintains that "The Communication Revolution now underway in Information Societies is also a revolution in communication science, involving both models and methods" (1986: 213), and that "Driving the epistemological revolution in communication science is the interactivity of the new communication technologies" (: 194).

Another, related problem that stems from historical, institutional politics rather than logical reasoning or scholarship has led mass media and interpersonal communication to split into two separate research institutions and scholarly traditions. In

many ways, the new media provide mediation between, or a combination of, mass media and interpersonal media – a kind of 'interpersonal mass media' – which falls outside of (or into the no man's land between) the two traditional areas of research interest.

Perhaps for these reasons, among others, the established media and communication research community has developed blind spots in relation to new interactive media. This general problem can only be mentioned briefly here,[4] as we proceed to follow another, more specific trail ...

'Interactivity' – The Background Behind the Concept

As Michael Jäckel (1995), among others, has pointed out, the concept 'interactivity' extends – perhaps not surprisingly – from the concept of 'interaction'. A concept which generally means: 'exchange', 'interplay', 'mutual influence'.

However, if we focus on individual fields of scholarship, the concept takes on many, very different meanings. In medical science, 'interaction' describes the interplay between two medications given at the same time. In engineering, 'interaction' refers to the relationship between, and actions of, two different materials under stress. In statistics, 'interaction' represents the common affect of several variables on an independent variable. In linguistics, it refers to the influence on language behavior of bi-lingual children (Jäckel 1995). In other words, the meaning of the concept 'interaction' depends on the context in which it is used. Concepts are called *multi-discursive* "when they can be found with significantly different meanings or connotations according to their use within different discourses" and thus "depend to a very large extent on their context for their meaning to be clear" (O'Sullivan 1994: 190). 'Interaction' can certainly be said to be a multi-discursive concept.[5]

However, none of the above definitions are particularly relevant in this context. Of primary importance in establishing the concept of 'interactivity' in this case, is how the term is understood in three other academic fields (cf. Goertz 1995; and Jäckel 1995): 1) The interaction concept of sociology, 2) the interaction concept(s) of communication studies, and finally 3) the interaction concept of informatics.

1) What does sociology's concept of 'interaction' look like? *Wörterbuch der Soziologie* writes: "Interaction is the most elemental unit of social events, where people adapt their behavior to each other, whether or not they follow mutual expectations or reject them. As coordinated action is not pre-programmed, a minimum of common meaning and linguistic understanding is necessary" (Krappmann, 1989: 310, emphasis deleted). Similarly the *International Encyclopedia of Communications* writes: "interaction occurs as soon as the actions of two or more individuals are observed to be mutually interdependent", i.e. "interaction may be said to come into being when each of at least two participants is aware of the presence of the other, and each has reason to believe the other is similarly aware", in this way establishing a "state of reciprocal awareness" (Duncan, 1989: 325). Understood in this way, according to sociology, interaction makes up "a basic constituent of society" (: 326).

The basic model that the sociological interaction concept stems from is thus the relationship between two or more people who, in a given situation, mutually adapt their behavior and actions to each other. The important aspects here are that clear-cut social systems and specific situations are involved, where the partners in the interaction are in close physical proximity, and 'symbolic interaction' is also involved. In other words, a mutual exchange and negotiation regarding meaning takes place between partners who find themselves in the same social context. A situation which communication and media studies would call communication. Within sociology then, it is possible to have communication without interaction (f.ex. listening to the radio and/or watching TV) but not interaction without communication.

2) As regards the concept of 'interaction' in communication and media studies, there is no such clear-cut answer since there appears to be several different concepts of 'interaction' involved.

If we look at the dominant trend within current communication and media studies, what might generally be called the 'cultural studies' tradition, one recurring trait is that the term 'interaction' is used as a broad concept that covers processes that take place between receivers on the one hand and a media message on the other. For the sake of simplicity, attention will be drawn to an example, more as a source of inspiration to than as a central representative of the 'cultural studies' tradition:

Wolfgang Iser wrote an essay in 1980 actually entitled "Interaction Between the Text and the Reader". He starts by claiming that "Central to the reading of every … work is the interaction between its structure and its recipient" (: 160). In brief, his approach is that the work can neither be reduced to the author's text nor the reader's subjectivity, but

must be found somewhere between these two polls. And if "the virtual position of the work is between the text and the reader, its actualization is clearly the result of an interaction between the two". It seems fairly obvious[6] that this is not 'interaction' in the sociological sense. What's missing is genuine reciprocity and an exchange between the two elements involved in that the text naturally can neither adapt nor react to the reader's actions or interpretations. The concept of 'interaction', as it is used here, seems to be a synonym for more non-committal terms such as 'relation', 'relationship', 'interpretation' or 'reading' etc.

The question immediately becomes whether it is relevant to use the concept of 'interaction', with its strongly sociological connotations, in connection with these phenomena which are actually certain types of active reception. O'Sullivan et al. point out a related problem in this conceptual watering down process when in *Key Concepts in Communication and Cultural Studies* under the reference "interaction/social interaction" they warn: "The phrase 'social interaction' has perhaps been used too frequently within communication studies – to the point of obscuring any one agreed interpretation. It would be inappropriate, for example, to describe an audience as 'socially interacting' when reading a book, or witnessing the death of Hamlet within a hushed and darkened theatre … because of the lack of observable reciprocation from others the social criteria are not satisfied" (1994: 155).

There are, however, also traditions within media and communication studies, where use of the concept of 'interaction' comes closer to the sociological meaning. One example might be research in interpersonal communication, where the object of study by definition lies within a sociological framework of understanding (see f.ex. Corner og Hawthorn, 1993). Another example might be traditional media sociology which often takes over the sociological interaction concept and uses it in a sense that shows solidarity with the sociological, primarily in relation to communication within groups of (media)audiences (f.ex. McQuail 1987: 228ff).

A third example might come from sociologically oriented media effect research which arose in connection with the so-called 'two-step flow'-model (Lazarsfeld). It starts with a critical look at the more simple and mechanistic one way models of the transfer of messages to an audience and instead shows that media messages are transmitted and processed during several steps. At first, the information is transmitted to relatively well informed individuals (*opinion leaders*); and in the next phase the information is brought to a broader, less well informed public via interpersonal communication. This model combines a mass communication model with a model for interpersonal communication within a mass media audience where the later represents 'interaction' in a traditional sociological sense. Related understandings of interaction in connection with media can be observed in 'uses and gratification' studies, symbolic interactionism, etc.

And a fourth example is Horton and Wohl's concept of 'para-social interaction'. Horton og Wohl's (1956) central insight is that the new mass media – particularly TV – has an especially characteristic ability to create an illusion of apparently intimate face-to-face communication between a presenter and an individual viewer. This illusion is created by close-ups of the presenter's face and gestures, simulated direct eye contact, the use of a direct address**,** personal *small talk*, a private conversational style, etc. To a certain degree, the technique makes the members of the audience react – and participate – as though they were in a face-to-face interaction in a primary group. Together these conditions create what Horton and Wohl call "[the] simulacrum of conversational give and take" (: 215) or 'intimacy at a distance'. It is this relationship between the TV presenter and the viewer which they call 'para-social interaction'. Horton og Wohl are fully convinced that this new form of (media) interaction is different from traditional social interaction and that the significant difference is precisely that media interaction is necessarily "one-sided, nondialectical, controlled by the performer, and not susceptible of mutual development" and can be characterized by the lack of effective reciprocity" (: 215). Even so, their main point is that the relationship between TV performers and viewers is in principle experienced and treated in the same way as daily communication and interaction. In other words, para-social interaction "is analogous to and in many ways resembles social interaction in ordinary primary groups" (: 228), which is also why it can (and should) advantageously be studied as interaction in the sociological sense.

To review then, it can be noted that the concept of interaction in media and communication studies is often used to refer to the actions of an audience or recipients in relation to media content. This may be the case *even though* no new media technology is being used which would open up the possibility for user input and two way communication, but on the contrary, to refer to traditional one way media. These references may also occur *even though* they

(often) don't refer to social situations where an interactive partner is physically present and *even though* the social situations are (often) not characterized by reciprocity and the exchange or negotiation of a common understanding. This is why we cannot speak of interaction in the strictly sociological sense.

In terms of media technologies which actually open up for input from the user, media researchers have not used the concept 'interaction' for quite a while. Instead they have used concepts which more technically refer to this possibility, for example: two way communication or 'return channel' systems. It was first with the use of the interaction concept in informatics that this began to change, which brings us to the third and final tradition mentioned previously.

3) How is the informatic concept of 'interaction' constructed? The basic model which this concept uses as its starting point is, contrary to the sociological tradition, (even though the concept has been partially taken from there) the relationship between people and machines which in this tradition is often called human-computer interaction (HCI) or man-machine interaction. Historically, this terminology originated from batch processing, where a large amount of data or programs were collected before being processed by a computer. Using a so-called 'dialogue' function, it was possible for the user to observe partial results, menu choices and dialog boxes and thereby continually influence the performance of the program via new input to 'dialogue traffic' or – in what came to be called – an 'interactive mode' (cf. Goertz 1995). 'Interaction' in the informatic sense, refers, in other words, to the process that takes place when a human user operates a machine. However, it doesn't cover communication between two people, mediated by a machine, – a process often referred to as *computer mediated communication* (CMC). Within informatics then, (in contrast to sociology) it is possible to have (human-machine) interaction without having communication, but not (computer mediated) communication without also having (human-computer) interaction.

A central characteristic of the informatic concept of 'interaction' is that the process between the human and the machine is, to a large degree, seen as *analogous* with communication between people. Another important trait is the central placement of the concept of 'control'. For example, in 1979 when a number of the leading researchers in the field gathered in Seillac, France for a workshop with the title "The Methodology of Interaction" it turned out that there was considerable disagreement about the definition of the 'interaction' concept. After lengthy debate, they arrived at this consensus definition, "Interaction is a style of control" (1979: 69). This is another instance where the informatic concept of interaction has a complicated double relationship to that from sociology. As far as an understanding of human-machine interaction as being *analogous with* communication between people, it can be said to have a certain – if metaphoric – affinity with the sociological concept. On the other hand the 'control' aspect clashes with it since control can be seen as the opposite of mutuality, reciprocity and negotiation.

The informatic concept of interaction is, as suggested, the most recent arrival of the three. Even so, as a field of research it (HCI) is perhaps the most well defined and well established, with its own conferences, journals, and paradigms, and it has also had a major influence on the media concept of 'interaction'.[7]

In summary, it can be said that while 'interaction' in the sociological sense refers to a *reciprocal* relationship between two or more people, and in the informatic sense refers to the relationship *between people and machines* (but not communication between people mediated by machines), in communication studies it refers, among other things, to the relationship between the text and the reader, but also to reciprocal human actions and communication associated with the use of media as well as (para-social) interaction via a medium. Obviously, as far as the concept of interaction is concerned, there is already considerable confusion.

But now let's start to track the concept of 'interactivity'. While sociology doesn't usually use the derivative 'interactivity', the concepts of 'interaction' and 'interactivity' in informatic and media studies appear to be synonymous. At the Seillac workshop mentioned above, the two concepts were connected by the consensus definition: "Interaction is a style of control and interactive systems exhibit that style" (1980: 69). Synonymous usage that, in connection with the arrival of 'new media', has also become widespread in the field of media studies. In this sense, the concept 'interactivity' or the combination 'interactive media' is most often used to characterize a certain trait of new media which differs from traditional media. The question is, which trait is it?

'Interactivity': Prototype, Criteria or Continuum?

> INTERACTIVE. Media as a computer smorgasbord – and you get to vary the recipes. Customers control what they see and can talk back to their machines. (*Newsweek*, 1993)

Taking a look at the collection of existing definitions of 'interactivity' spread throughout media studies and computer science, it seems that there are three principle ways of defining the concept: 1) as prototypic examples; 2) as criteria, i.e. as a given feature or characteristic that must be fulfilled, or 3) as a continuum, i.e. as a quality which can be present to a greater or lesser degree.

1. Interactivity as Prototype

A representative of the first type – definition by prototypic example – can be found in Jerome T. Durlak's *A Typology for Interactive Media*, where among the introduction's qualifying definitions it says: "Interactive media systems include the telephone; 'two-way television'; audio conferencing systems; computers used for communication; electronic mail; videotext; and a variety of technologies that are used to exchange information in the form of still images, line drawings, and data" (1987, p. 743).[8] This type of definition is, by it's very nature, never very informative, partly because it doesn't point out which traits qualify a given media as interactive or which aspects connect them, etc. Aside from that, the definition raises another principle question.

Among the examples of 'interactive media' listed above are also media which are used for interpersonal communication, in other words, media using the conversation pattern, such as the telephone, e-mail etc. In certain academic traditions (and possibly national languages) it isn't readily apparent that this type of interpersonal media should be considered 'interactive'. However, it isn't uncommon in large parts of the English/American academic literature.[9] Durlak and many others claim that interpersonal communication and especially face-to-face communication is the ideal type of interactive communication: "Face-to-face communication is held up as the model because the sender and receiver use all their senses, the reply is immediate, the communication is generally closed circuit, and the content is primarily informal or 'ad lib'" (1987: 744). According to this way of thinking, media whose communication form comes closest to face-to-face communication are therefore also the most 'interactive', whereby conversational media, such as video conferencing are considered more interactive than consultative media such as, say, computer-based online services.

As seen here, and in upcoming examples, the concept of 'interactivity' refers both to media patterns of the consultative and the conversational type. It also becomes clear that the concept of interactivity, understood in this way (in the form of the conversation communication pattern), is related to the sociological concept of 'interaction', understood as 'actions of two or more individuals observed to be mutually interdependent' and (in the form of the consultation communication pattern) borrows from the informatic concept of interaction, understood as 'actions between a human user and a machine' (cf. Goertz 1995).

2. Interactivity as Criteria

Examples of the second type of definition – interactivity defined as criteria, that is as a certain trait or feature that must be fulfilled – can be found, f.ex., in Rockley Miller's writing. He offers definitions of the terms 'interactivity', 'interactive' and 'interactive media'. 'Interactivity' is defined as "A reciprocal dialog between the user and the system" where both sociology's (mutual dialog) and informatic's (user and system) conceptual constructions appear once again; the adjective 'interactive' is understood as: "Involving the active participation of the user in directing the flow of the computer or video program; a system which exchanges information with the viewer, processing the viewer's input in order to generate the appropriate response within the context of the program..."; and the compound term 'interactive media' is said to mean: "Media which involves the viewer as a source of input to determine the content and duration of a message, which permits individualized program material" (1987).[10]

The strength of this set of definitions is that it is relatively exact. It's weakness is that it is narrowly tied to specific technologies (computer and video); that it primarily looks at interactivity from within the consultation communication pattern; and that even within the consultation pattern it excludes a number of services which are commonly considered interactive – services in which choices can only be made from continual transmissions (primarily TV services such as *near-video-on-demand*, *be-your-own-editor*, *teletext*, etc.) but where there is no actual processing of the user's input. On a more gen-

eral level, there are problems with defining 'interactivity' as criteria, or a given feature, as this example certainly should have demonstrated. Such definitions have a tendency to include and exclude very differing types of media which today are commonly thought of as interactive, in a relatively casual way. And, by extension, they have a tendency toward obsolescence and being quickly outdated by technological developments. Finally, based on criteria definitions, it is impossible to differentiate between different forms or levels of interactivity.

Another, perhaps more useful criteria definition, can be found in the *International Encyclopedia of Communications*, where John Carey suggests the following provisions for the keyword 'interactive media': "Technologies that provide person-to-person communications mediated by a telecommunications channel (e.g., a telephone call) and person-to-machine interactions that simulate an interpersonal exchange (e.g., an electronic banking transaction)" (1989: 328). The last example is explained in more depth a little further on: "most of the content is created by a centralized production group or organization", and "individual users interact with content created by an organization" (:328). This conceptual construction points more or less directly toward the conversational media type and the consultative media type respectively (and as a result, at the sociological and informatic concepts of interaction) which collectively make up 'interactive media'.

Once again there is a certain vagueness to the definition of the concept. For example, when Carey exemplifies "person-to-machine interaction", and the user as 'interacting with content' he writes, "For example, in some interactive cable television systems, viewers can respond to questions posed in programming. Typically their response is limited to pressing one of a few alternative buttons on their cable converter box, thereby indicating agreement with one of the opinion statements set out by the program producers" (:328). This example doesn't seem to point to the selection of pre-produced content and thereby at a consultation pattern, but rather shows the possibility of creating input which the media system processes and is able to use. In other words, a registration pattern – a (pattern) example, which the general definition seems to ignore.

More problematic perhaps, is the fact that the definition also excludes services based on the transmission pattern, such as teletext, *near-video-on-demand*, *be-your-own-editor*, datacasting, which make up the bulk of some TV systems so-called 'interactive services'. Carey himself seems aware of the problem and asks the question whether or not it is possible to draw such narrow boundaries. He writes, "Most scholars would not classify as interactive media those technologies that permit only the selection of content such as a broadcast teletext service with one hundred frames of information, each of which can be selected on demand by a viewer. However, the boundary between selection of content and simulation of an interpersonal communication exchange is not always definable in a specific application or service" (: 328). This definition of the concept has some of the same weaknesses as its predecessor: the tendency to exclude various media which are generally considered interactive and an inability to use the definition to differentiate between various forms and levels of interactivity, etc.

3. Interactivity as Continuum

The third possibility, which solves some of these problems (but at the same time may creates others) is to define interactivity not as criteria, but rather as a continuum, where interactivity can be present in varying degrees. One possible way to structure this type of definition is to base it on the number of dimensions it includes, so that we could speak of 1-dimensional, 2-dimensional, 3-dimensional ... and n-dimensional interactivity concepts. This will be explained in more depth in the following section.

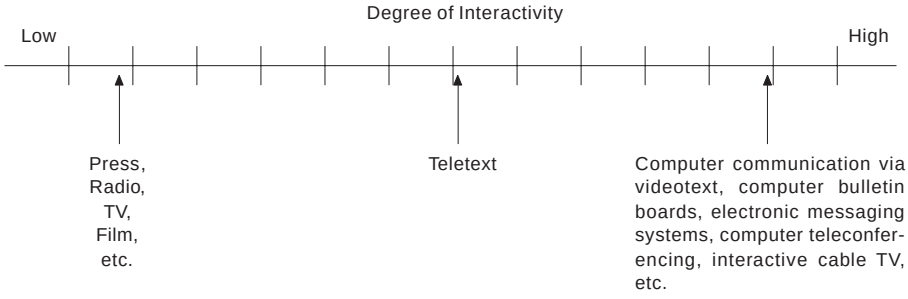
Interactivity's Continuum & Dimensions

> ...interactivity as it relates to communication technologies is a multidimensional concept. (Carrie Heeter, 1989)

1. 1-dimensional Concepts of Interactivity

One relatively simple model of interactivity as a continuum, which operates from only one dimension, can be found in the writing of Everett M. Rogers (1986). Rogers defines 'interactivity' as "the capability of new communication systems (usually containing a computer as one component) to 'talk back' to the user, almost like an individual participating in a conversation" (1986: 34). And – a bit farther down – "interactivity is a variable; some communication technologies are relatively low in their degree of interactivity (for example, network television), while others (such as computer bulletin boards) are more highly interactive" (: 211). Based on this definition, Rogers has created a scale, re-

Figure 2. E. M. Rogers' 1-dimensional Scale of "Selected Communication Technologies on an Interactivity Continuum" (1987: 34)



printed in Figure 2, in which he lists 'degrees of interactivity' for a number of selected communication technologies on a continuum from 'low' to 'high'.

As can be seen in Figure 2, Rogers primarily refers to the concept of 'interactivity' within the consultation pattern. The basic model is clearly 'human-machine interaction', understood in the context of interpersonal communication ('talking back'). It is also because of this consultative aspect (selection available between channels and programs) that classical transmission mass media such as TV and radio can be considered 'interactive' – although to a lesser degree. As is presumably also apparent, this attempt to sort and define is relatively rough and lacking in information – a trait that is intensified by Rogers failure to deliver explicit criteria for the placement of each media.

But there are several others – and perhaps more influential – uni-dimensional concepts of interactivity. As early as 1979, in connection with the development of videodisc technology, the Nebraska Videodisc Design/Production Group had already established a definition of various levels of interactivity. A classification, which was later accepted as an international ad hoc standard. The levels are as follows:

> *Level 0:* Linear playback only.
> *Level 1:* Linear playback plus search and automatic stops.
> *Level 2:* Videodiscs controlled by a computer program placed either directly on the videodisc or manually *loaded*. ... They include all of the level 1 capabilities plus program *looping*, branching and faster access time.
> *Level 3:* Videodiscs controlled by an external computer... More than one videodisc can be controlled by the same computer. Computer-generated text and graphics can be superimposed over videodisc images ... A variety of user input devices can be employed and user input can be registered and documented. (Lambert 1987: xi).

In this case, the definition and division of levels of interactivity are closely related to specific videodisc technology and, perhaps therefore, the concept of interactivity is primarily related to the consultation pattern of communication (although level 3 hints at the registration pattern).

Similar, but technologically more up-to-date, scales have since been defined by Klaus Schrape (1995), among others, who operates with 5 levels of interactivity:

> *Level 0:* Turn on/turn off and change channel (zapping).
> *Level 1:* A supply consist of more transmitted channels mutually displaced in time (parallel transmitted TV, multi-channel TV, multi-perspective TV), between which the viewer is able to choose.
> *Level 2:* Transmission of optional relevant supplementary information to the TV-signal, with or without relation to the program (f.ex. videotext).
> *Level 3:* Any form of stored content by individual request (passive user orientation).
> *Level 4:* Communicative interaction, active user orientation (direct return channel), two way communication: f. ex. videophone, interactive services etc.[11]

This division of levels and definitions also reveals close association with the technology of its time – now interactive and digital TV. However, it includes several types of information patterns, where the transition from level 0 to level 1 marks the

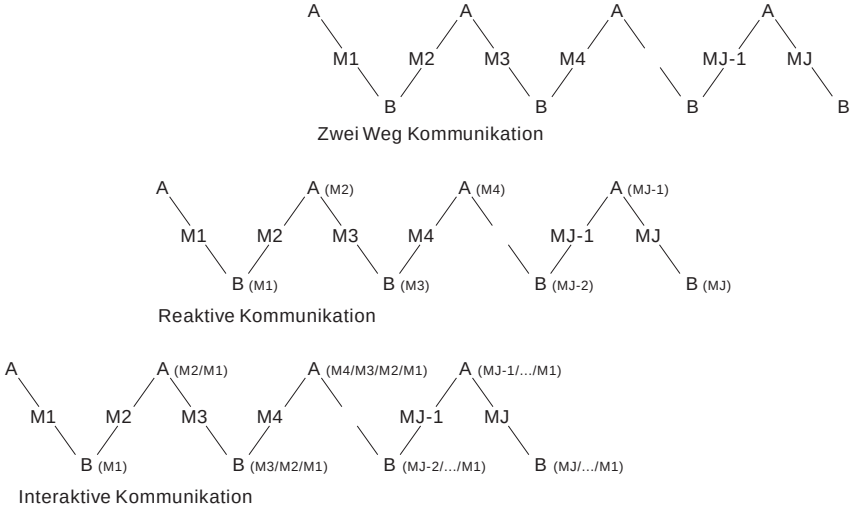
transition from transmission to consultation media and the transition from level 3 to level 4 marks the transition from consultation media to conversation media, referred to here as passive and active user orientation or stored content vs. communicative interaction. An obvious criticism of this model is that it places different types of interactivity, which don't appear to be similar, within the same dimension and on the same scale. It isn't readily apparent why a telephone conversation should be more interactive than searching an information database, since they involve very different types of communication traffic (conversation vs. consultation) with very different user goals and functions. If, f.ex., the purpose is to find exact, verifiable information, it obviously makes different qualitative and not just quantitative demands on the 'interactivity' than if the purpose is to negotiate a mutual agreement with a partner.

Sheizaf Rafaeli (1988) has also constructed a concept of interactivity based on one continual dimension, but with quite a different accent. Rafaeli's definition centers on the concept 'responsiveness', as a measure of a media's ability to be receptive and react in response to a given user, or more precisely, a measure of how much one message in an exchange is based on previous messages. This model uses three progressive levels in its continuum: 1) Two way communication takes place when messages are delivered both ways. 2) Reactive communication also requires that a later message reacts to a previous message. 3) Finally, full interactivity requires that a later message responds to a sequence of previous messages.[12] In this conceptual construction recursiveness plays a central role. A graphic illustration is shown in Figure 3.

'Responsiveness' obviously requires that the media registers and stores information about a given user's input and actions and can then adjust to the user's wishes and distinctive characteristics. This concept of interactivity refers therefore (contrary to f.ex. Rogers') primarily to the registration communication pattern. This aspect can be stated such that a media – in one sense or another – 'understands' the user, and in this way approaches themes related to 'smart technologies', 'artificial intelligence' etc. Once again, interpersonal communication functions as an ideal to be measured up to with characteristics similar to the sociological concept of interaction, and its requirement of reciprocity.

Finally, Jonathan Steuer (1995) represents the transition from 1-dimensional to 2-dimensional concepts of interactivity in that he has developed a 2-dimensional matrix based on a parameter of 'vividness' which refers to, "the ability of a technology to produce a sensorially rich mediated environment" (: 41) and 'interactivity', which refers to, "the degree to which users of a medium can influence the form or content of the mediated environ-

Figure 3. S. Rafaeli's 1-dimensional Concept of Interactivity Defined as 'Responsiveness' or 'Recursiveness' and Elaborated in Three Progressive Levels on the Continuum: Two Way Communication, Reactive Communication and Interactive Communication



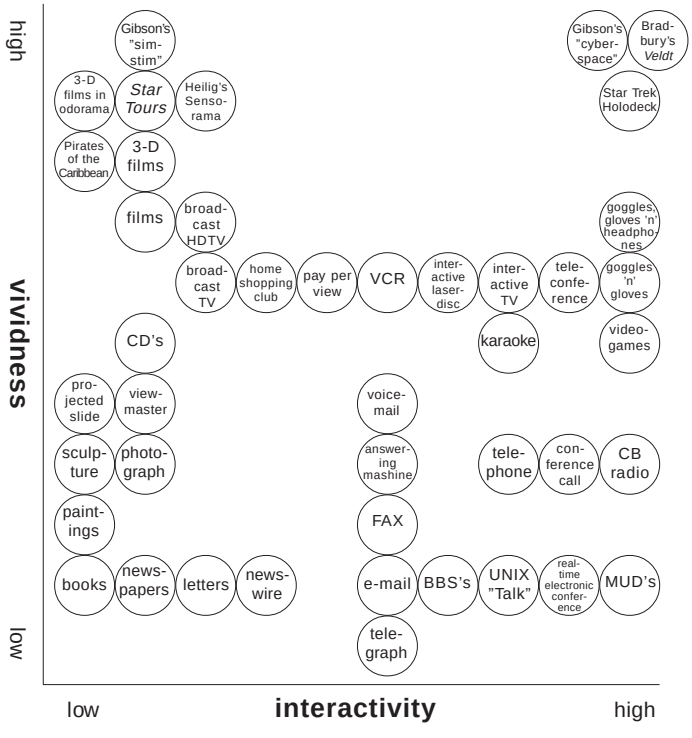
ment" (: 41). This definition focuses on the user's ability to input information (primarily the conversation pattern) which, among other things, means that the telephone and video games are considered much more interactive than *home-shopping* and *pay-per-view*. The reason that this 2-dimensional model has been placed as a subsection of the 1-dimensional concept of interaction is obviously that 'vividness' is not an aspect of interactivity but an independent dimension. Figure 4 shows Steuer's classification of a wide range of media technologies on the basis of the two dimensions. This chart also illustrates the classification's relatively noncommittal relationship to the empirical, since purely fictional media such as the 'Holodeck' from the science fiction movie *Star Trek* and 'cyberspace' from William Gibson's *Neuromancer* have been included on an equal basis with actual media (cf. Goertz 1995). Like many of the other attempts at systemization, Steuer's fails to deliver explicit criteria for placement on the continuum, but seems to follow more or less subjective – possibly arbitrary – criteria (: 51f.).

2. 2-dimensional Concepts of Interactivity

Bohdan O. Szuprowicz, among others, has presented a 2-dimensional concept of interactivity in *Multimedia Networking* (1995). Szuprowicz maintains that if you are to understand all the questions and problems in connection with what he calls 'interactive multimedia networking and communications', it's necessary "to define and classify the various levels and categories of interactivity that come into play" (: 14). For Szuprowicz, "interactivity" is "best defined by the type of multimedia information flows" (: 14), and he divides these information flows into three main categories:

1) 'User-to-documents' interactivity is defined as "traditional transactions between a user and specific documents" and characterized by being quite restricted since it limits itself to the user's choice of information and selection of the time of access to the information. There is little or no possibility of manipulating or changing existing content. 2) 'User-to-computer' interactivity is defined as "more exploratory interactions between a user and vari-

Figure 4. J. Steuer's (1995: 52) Classification of Various Media Technologies Using the Dimensions 'Vividness' and 'Interactivity'



ous delivery platforms" characterized by more advanced forms of interactivity which give the user a broader range of active choices, including access to tools that can manipulate existing material. 3) Finally, 'User-to-user' interactivity is defined as "collaborative transactions between two or more users" (: 14) in other words, information flows which make direct communication between two or more users possible, whether it is point-to-point, person-to-person, multipoint, multiuser, etc. This last form, contrary to the first two mentioned above, is characterized, among other things, by operating in *real time*.

Where the first dimension in the matrix is made up of these various information flows, the other is made up of other aspects, which these flows are dependent upon, here again divided into three categories: "access, distribution, and manipulation of multimedia content" (:15). Figure 5 unfolds Szuprowicz' 2-dimensional matrix and gives examples of how it might be filled out.

The description indicates that what Szuprowicz calls, 'user-to-user' interaction is related to the sociological concept of interaction, 'user-to-computer'-interaction is related to the informatic concept of interaction, while 'user-to-documents' interaction has an affinity to the interaction concept used by communication studies, as it is drawn up in Iser's text-reader model. Along the same lines, the 'user-to-user' information flow is similar to what has been called the conversation communication pattern. The 'user-to-documents' information flow parallels the consultation communication pattern, while the 'user-to-computer' information flow can be said to be a particularly elaborate version of the consultation communication pattern (or alternatively, to combine several communication patterns). From this perspective, it also becomes clear that Szuprowicz' differentiation between 'user-to-documents' and 'user-to-computer' is relatively unclear. In most specific cases, it would be difficult to determine whether the 'interactivity' is directed toward a document or toward a platform. The very formulation of the difference appears to refer mostly to the 'degree of manipulability' rather than an actual qualitative difference. This is why the difference is difficult to handle in practice – and to maintain in theory. Instead, this seems to be various forms of the consultation information pattern.

3. 3-dimensional Concepts of Interactivity

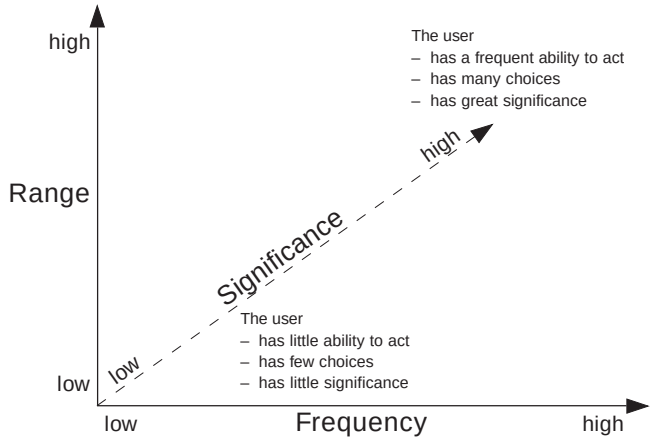
Continuing along the trail to the 3-dimensional concepts of 'interactivity', Brenda Laurel's writing gives us a privileged example. In several contexts (1986 & 1990), Laurel has argued that "interactivity exists on a continuum that could be characterized by three variables" specifically: 1) "frequency" in other words, "how often you could interact", 2) "range", or "how many choices were available" and 3) "significance", or "how much the choices really affected matters" (1991: 20).

Judged by these criteria, a low degree of interactivity can be characterized by the fact that the user seldom can or must act, has only a few choices available, and choices that make only slight difference in the overall outcome of things. On the other hand, a high degree of interactivity is characterized by the user having the frequent ability to act, having many choices to choose from, choices that significantly influence the overall outcome – "just like in real life" she adds (: 20).[13] Laurel doesn't provide a graphic illustration of the 3-dimensional continuum, but it might be illustrated by Figure 6. As the description of variables indicates, this concept of interactivity moves mostly within the

Figure 5. B.O. Szuprowizs' 2-dimensional Matrix Showing "Interactive Multimedia Information Flows" (1995: 15)

Object-oriented manipulation	Mail	Database	Groupware
Broadcast	newsletter	Information kiosk	Presentation
Interactive access	Hypermedia	Graphical user interface	Conferencing, training
	User-to-documents	User-to-computer	User-to-user

Figure 6. An Illustration of Brenda Laurel's 3-dimensional Continuum, Consisting of: 'Frequency', 'Range' and 'Significance'



framework of the consultation communication pattern since 'choice' is the recurring term. Understood in this way, the concept can be said to point out three aspects of 'interactivity' within the consultation communication pattern.

4. 4-dimensional Concepts of Interactivity

An example of a 4-dimensional concept of interactivity, in other words, where four dimensions of meaning constitute interactivity, can be found in the writing of Lutz Goertz, who simultaneously presents a considerably more elaborate attempt at a definition.[14] After a thorough discussion of various other attempts at definitions, Goertz isolates four dimensions, which are said to be meaningful for 'interactivity': 1) "The degree of choices available", 2) "The degree of modifiability", 3) "The quantitative number of the selections and modifications available" and 4) "The degree of linearity or non-linearity". Each of these four dimensions also makes up its own continuum which Goertz places on a scale. The higher the scale value, the greater the interactivity.

1) The "degree of choice available" concerns the choices offered by the media being used. There is considerable difference between, say, TV media where the receiver only chooses between various programs and perhaps the quality (sound level, brightness, etc.) of the program being received, and, on the other hand, a video game such as a flight simulator, where the user can select his position and speed in virtual space, various degrees of difficulty, opponents, points of view, perspective, etc. Goertz proposes the following scale for the continuum of choice:

> 0 No choice available except a decision about when reception starts and ends...
> 1 Only basic changes available in the quality of the channel (such as: light/dark, high/low or fast/slow),
> 2 As in 1, plus the ability to choose between selections in one choice dimension; choices occur simultaneously (such as television or radio programs)...
> 3 As in 2, but the selections available within the choice dimension are not time dependent (such as newspapers or video-on-demand),
> 4 As in 3, but there are two or more choice dimensions for a user to choose from (f.ex. video games with various levels of play, forms of presentation, forms of action and story lines to choose from). (Gortz 1995)

This dimension of interactivity falls within what has previously been described as the consultation communication pattern.

2) The "degree of modifiability" refers to the user's own ability to modify existing messages or add new content where these modifications and additions, it should be noted, are saved and stored for other users. In this dimension, there would be a great difference between TV media on the one hand, which doesn't offer any possibility of user input, and Internet news groups, on the other hand, which open up the possibility of letting the user

type and send any kind of written message which can then be read by all participants. Goertz draws up the following scale:

> 0 No modification possible with the exception of storing or erasing messages,
> 1 Manipulation or 'verfremdung' of messages is possible (f.ex. through the choice of sound or color),
> 2 Modification to some degree of random additions, changes, or erasure of content is possible,
> 3 Modification possible through random additions to, changes in, or erasure of any type of content (f.ex. computer word processors or graphics software, and in most media as a means of communication. (Goertz 1995: 486-7)

As the users possibility of input, the modifiability dimension falls within what has previously been described as the conversation communication pattern.

3) Besides the selection and modifiability dimensions the "quantitative size of the available selections and modifications" refers to the quantitative number of selections possible within each of the available dimensions. In this dimension, for example, there will be a significant difference between the choices available by terrestrially distributed television and the many choices and modifications possible in a word processing program. Goertz' scale is as follows:

> 0 No choice possible,
> 1 Some choice available (between 2 and 10 choices) within at least one selection or modification dimension (f.ex. television reception via terrestrial frequencies),
> 2 As in 1, plus more than 10 choices within one selection or modification dimension (A reader can choose from several hundred newspaper articles and reviews, teletext offers more than 100 pages though no other choices are available),
> 3 More than 10 choices available in *more than two* selection and/or modification dimensions (limited selection available as f.ex. in branched choices ...,
> or: an infinite or seamless selection available from *one* selection or modification dimension respectively (f.ex. video games which allow the user to write in a random name at the beginning),
> 4 An infinite or seamless selection available from all selection and/or modification possibilities (applies to media uses which allow participants random messages, f.ex. word processing programs, but first actually for all media which function as a means of communication). (Goertz 1995: 487)

4) Finally, the "degree of linearity/non-linearity" functions as a measure of the user's influence on the time, tempo and progression of the reception or communication. This dimension is to capture the difference between, f.ex., on the one hand a movie, where the movie goer doesn't have any influence on when the movie starts, where, or in which order the scenes are shown; and on the other hand a hypertext where the reader is free to determine what, when, and in which order something will be read:

> 0 The time and order of the material is completely controlled by the information producer or the sender (f.ex. television, radio, film),
> 1 The order of the material is determined by the information producer or sender, the user initiates the communication process and can stop or re-start it (video, records, other sound media),
> 2 As in 1, but the user determines the tempo of the reception (f.ex. books),
> 3 As in 2, the user can select single elements of information which have little or no connection to each other (f.ex. newspapers),
> 4 As in 3, the user can now retrieve elements of information which are highly connected (f.ex. references in an encyclopedia or via hypertext functions on a World Wide Web site). (Goertz 1995: 487)

Both the 3rd and the 4th dimensions refer primarily to the possibility of choice and thus fall into the consultation communication pattern.

According to Goertz, the actual (interactive) media landscape could be depicted in highly differentiated ways by using these four dimensions. As a simple multiplication also demonstrates, this 4-dimensional concept of interactivity results in no fewer than 500 different combination possibilities. Obviously, such a large number of possible combinations is impossible to deal with in actual practice. A system with more categories than actual media to put in those categories (where the map is bigger than the country to be mapped) is obviously not suitable. The purpose of constructing typologies or systems is to reduce the complexity, not to increase it. Aside from that, Goertz fails to observe one of his own premises. One of the fundamental preconditions specified is that the various interact-

ive dimensions must be selective but must not contradict themselves. As the above shows, the definition and scale for the 3rd dimension the "quantitative number of selections and modifications available" can't help but conflict with the two first dimensions which also apply to 'selection' and 'modification' possibilities, just as the 4th dimension the "degree of linearity/non-linearity" also expresses a certain aspect of the 'selection' dimension. This redundancy appears to be symptomatic when Goertz graphically illustrates the dimensions by means of 21 specific contemporary uses of media. In practice, only the first two dimensions, represented as 'selection' and 'modification' respectively are used. The resulting 2-dimensional matrix is shown in Fig. 7.[15]

Among many other things, this chart can be used to show that there are media which give the user a high degree of modifiability but a low degree of choice (such as e-mail) and, on the contrary, there are other media which give the user a low degree of modifiability but a very high degree of choice (such as multi-channel TV, pay-per-view, Gopher, World Wide Web). In this case as well, classical broadcast media such as radio and television are judged to have a certain – relatively low – measure of interactivity. And once again, media which use interpersonal communication (in other words, conversational media) are considered to have the highest degree of interactivity.

5. n-dimensional Concepts of Interactivity

Finally, there are concepts of interactivity which operate with more than four dimensions, only one of which will be dealt with here. In an article from 1989, "Implications of New Interactive Technologies for Conceptualizing Communication" Carrie Heeter starts by acknowledging the changes in new media technologies. Changes which according to the author necessitate a fundamental reconceptualization of the traditional communication models and understanding used in communication research. The auther especially points at "increased interactivity" as "a primary distinction of new technologies", and proposes to understand interactivity i relation to communication technologies as "a multidimensional concept", where six such "dimensions of interactivity" (: 211) are defined.

> The 1st dimension, also called "selectivity", concerns "*the extent to which users are pro-*

Figure 7. L. Goertz' Placement of 21 Specific Media Uses Based on the Dimensions "Degree of Selections Available" and "Degree of Modifiability" (1995: 489)

Selektions-möglichkeiten/ Modifikations-möglichkeiten	0	1	2	3	4
0	Kino Buch: Roman		TV, terr. TV, Kabel Pay-per-Channel Hörfunk Pay-per-View	Zeitung Videotext Buch: Sachbuch	information via Online-Dienst VR-Walk-through, z.B. virtuelles Museum
1					
2		SCALL		Homebanking	Videospiel
3		E-MAIL SEN-DEN		Mailbox	VR-Walk-through, z.B. Büroeinrichtung GESPRÄCH PC-Textver-arbeitung TELEFON VIDEOKONFE-RENZ

vided with a choice of available information" (: 222);

The 2nd dimension concerns *"the amount of effort users must exert to access information"* (: 223);

The 3rd dimension concerns *"the degree to which a medium can react responsively to a user"* (: 223);

The 4th dimension concerns "the *potential to monitor system use*" (: 224), understood as a form of feedback that automatically and continously registers all user behavior while on the media system;

The 5th dimension concerns "*the degree to which users can add information to the system that a mass, undifferentiated audience can access*" (: 224) ('many-to-many' communication).

And the 6th dimension concerns "*the degree to which a media system facilitates interpersonal communication between specific users"* (: 225) ('person-to-person' communication).

An interactivity concept of this type will naturally also allow a much finer division of interactive media, but once again the many dimensions and the high degree of complexity make it very difficult to deal with the concept on a practical basis. (Just illustrating a 6-dimensional graph leads to considerable difficulties.) It also becomes apparent that a number of the dimensions listed – as with Goertz – are not exclusive, but have a tendency to overlap each other. For example, there will be a fluid boundary between a user's ability to add information to the system (5th dimension) and several users ability to communicate with each other (6th dimension). The system's ability to monitor users (4th dimension) will be connected with its ability to respond sensitively (3rd dimension). The number of choices available (1st dimension) will unavoidably influence efforts to access the system (2nd dimension). This also implies that while the 5th dimension ('ease of adding information') and the 6th dimension ('facilitation of interpersonal communication') largely cover what has been called the conversation communication pattern, the 3rd dimension ('responsiveness') and 4th dimension ('monitoring of information use') are related to what has been called the registration communication pattern; and the 1st dimension ('choice available') and 2nd dimension ('effort users must exert') fall into the consultation communication pattern.

At the End of the Trail?

One possible and reasonably risk-free conclusion from this long tracking effort, might well be that the concept of interactivity (as well as the concept of interaction) is outrageously complex and has a long list of very different, specific variations. But it would be unsatisfactory to stop this tracking session with such a disappointing conclusion. In order to arrive at a more satisfactory narrative closure of our quest, a final attempt will therefore be made to suggest a more suitable concept of interactivity, based on the preceding presentations and discussions of the concept. Due to a lack of space, however, it will only be a brief suggestion.[16]

As indicated above there are good reasons to (re)establish a conceptual distinction between the concept of interaction and the concept of interactivity. Without being able to go into a detailed argumentation in this context, it would be expedient to retain the concept of 'interaction' in its original, strong sociological sense to refer to 'actions of two or more individuals observed to be mutually interdependent' (but not mediated communication), and to use the concept of 'interactivity' to refer to media use and mediated communication. Here derived concepts such as 'para-social interaction'- or perhaps even better 'social para-interaction' – may cover communication in media which in some way simulates interpersonal interaction.

The above review of the various concepts of interactivity has pointed out, among other things, the inappropriateness of definitions which are based too rigidly on specific historic technologies. It has also pointed out the inappropriateness of defining interactivity via a prototype or as criteria. A definition as a continuum appears to be more appropriate, and at least more flexible, in relation to the many varied levels of interactivity, the many differing technologies and rapid technological developments. It has also become clear that there are different forms of interactivity, which cannot readily be compared or covered by the same formula. There appears to be a particular difference in interactivity which consists of a choice from a selection of available information content; interactivity which consists of producing information via input to a system, and interactivity which consists of the system's ability to adapt and respond to a user. It might, therefore, be appropriate to operate with different – mutually independent – dimensions of the concept of interactivity. As it may have been apparent from the beginning, or has at least continually

been made apparent by this review, the various important aspects of the concept of interactivity can to a great extent be reduced to four dimensions which can be understood using the communication patterns: transmission, consultation, conversation and registration.

Based on this understanding interactivity may be defined as: *a measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication*. This concept of interactivity can be divided up into four sub-concepts or dimensions which could be called:

1) *Transmissional interactivity* – a measure of a media's potential ability to let the user choose from a continuous stream of information in a one way media system without a return channel and therefore without a possibility for making requests (f.ex. teletext, near-video-on-demand, be-your-own-editor, multi-channel systems, datacasting, multicasting).

2) *Consultational interactivity* – a measure of a media's potential ability to let the user choose, by request, from an existing selection of preproduced information in a two way media system with a return channel (video-on-demand, on-line information services, CD-ROM encyclopedias, FTP, WWW, Gopher etc.)

3) *Conversational interactivity* – a measure of a media's potential ability to let the user produce and input his/her own information in a two way media system, be it stored or in real time (video conferencing systems, news groups, e-mail, mailing lists etc.).

4) *Registrational interactivity* – a measure of a media's potential ability to register information from and thereby also adapt and/or respond to a given user's needs and actions, whether they be the user's explicit choice of communication method or the system's built-in ability to automatically 'sense' and adapt (surveillance systems, intelligent agents, intelligent guides or intelligent interfaces, etc.).

The difference between consultational and registrational interactivity is thus the difference between the user's choice of information content and the media system's choice of, or adaptation to, a method of communication, in other words, the *way* in which the communication system functions.

Since transmissional and consultational interactivity both concern the availability of choice – re-

Figure 8. The 'Cube of Interactivity': a 3-dimensional Representation of the Dimensions of Interactivity

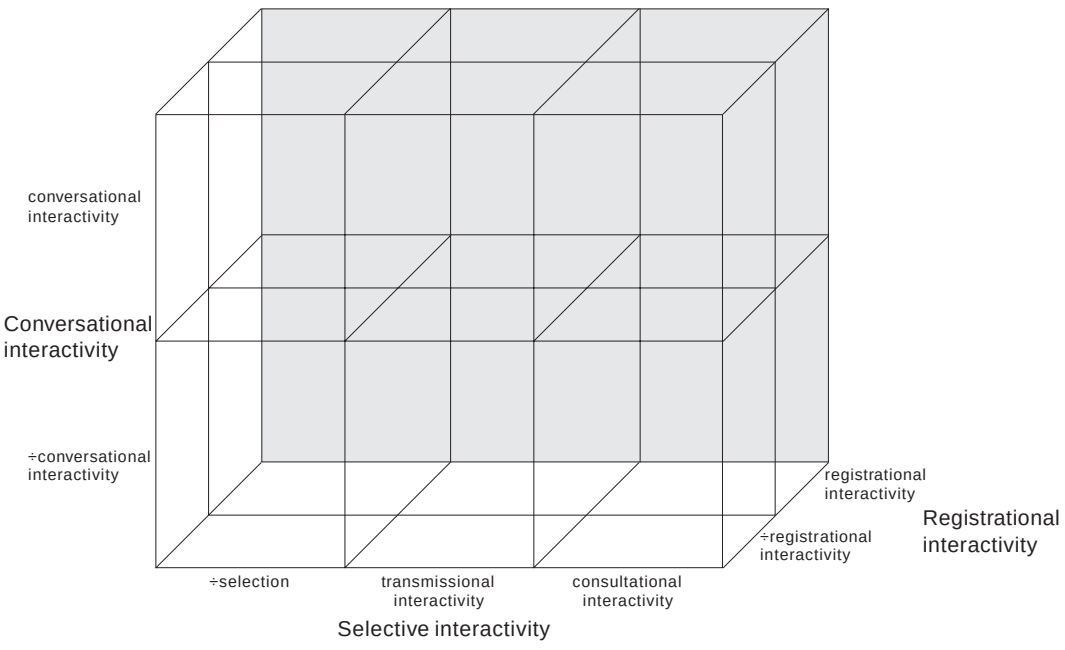
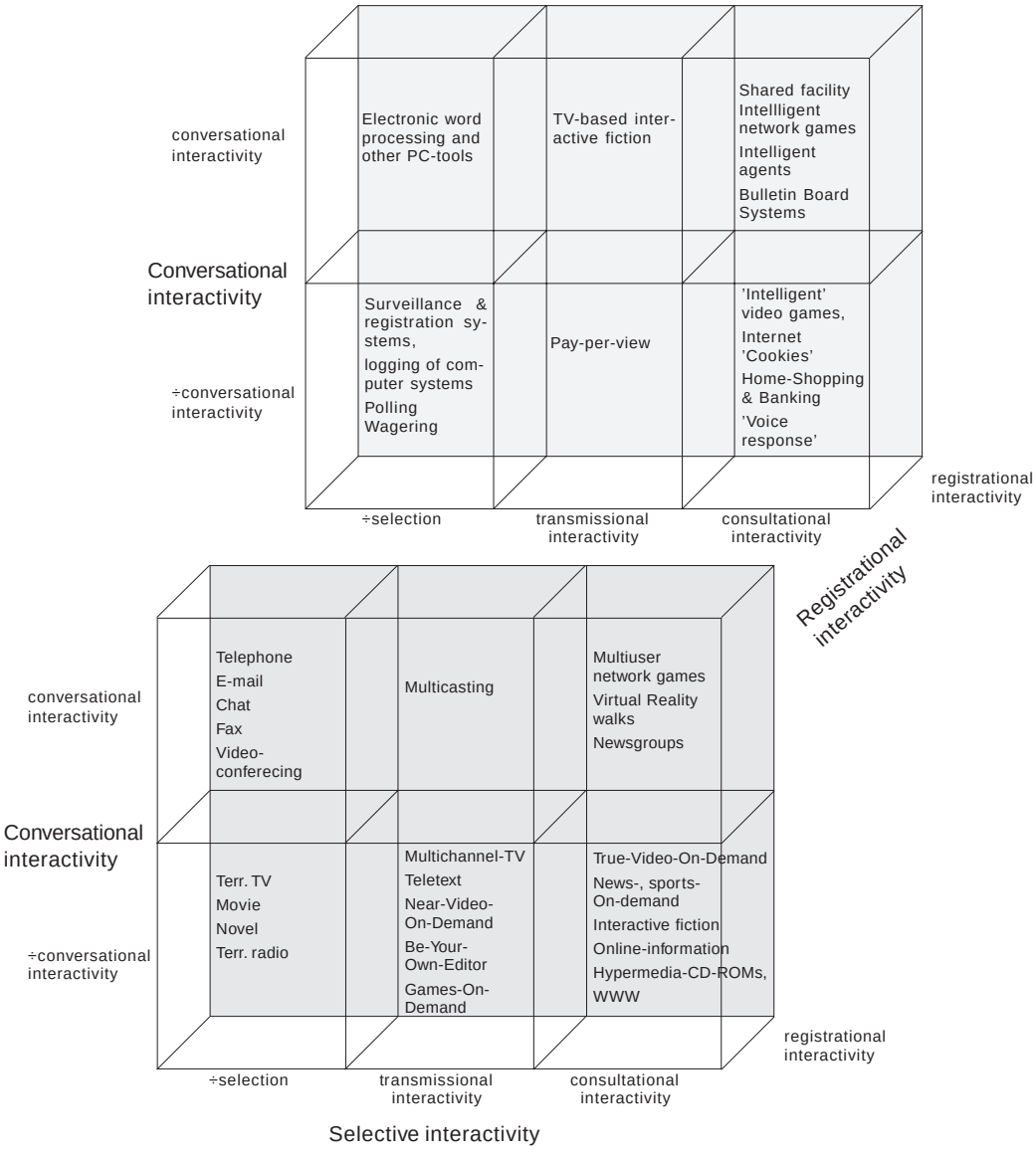


Figure 9. The 'Cube of Interactivity': a 3-dimensional Representation of the Dimensions of Interactivity



spectively with and without a request – it is possible to represent them within the same (selection) dimension. The four types of interactivity can then be presented in a 3-dimensional graphic model – an 'interactivity cube' – as attempted in Figure 8 and Figure 9, which in this form results in 12 different types of interactive media.

So this is where the trail ends, for the moment. Not a dead end, but not the complete resolution of our quest either, in the sense of finding the ultimate definition for 'interactivity'. Instead, this is a temporary and contemporary attempt at synthesizing a conceptual construction. Perhaps, more importantly, this is a contribution toward a hopefully greater understanding of the meaning of the concept of 'interactivity' in media and communication studies, and the importance of media and communication studies to the meaning of the concept of 'interactivity'.

Notes

1. Although in this case there is also a certain ironic distance.
2. There are several general articles which each deal with the concept of interactivity in different ways, f.ex.: Heeter (1989), Goertz (1995), Jäkel (1995) and Toscan (1995). Articles which I have borrowed from for this paper, in varying degrees.
3. The media typology can only be suggested here. See Jensen (1997b) for a more in depth presentation.
4. See Jensen (forthcoming) for more in dept treatment
5. There is an added finesse in the concept 'multi-discursive' here, since "the words used in other discourses will continue to resound, so to speak, in each case" (:190).
6. Which Iser also draws attention to – in an otherwise rather inconsistent argument – both by pointing out differences and similarities between social interaction and reading and thereby between the general (here: psychoanalytical) concept of interaction and the special text-reader relationship.
7. As seen in the above discussion of the 'multi-discursive' concept in note 5.
8. See also Rafaeli (1988:110f.)
9. Aside from Durlak (1987) see also Steuer (1995), Scharpe (1995) and Rafaeli (1988:110).
10. For examples of other criteria based definitions see Feldman (1991:8).
11. For similar scales see also Next Century Media's 7-level scale (Hackenberg, 1995).
12. Rafaeli's own more formal definition sounds like this: "*interactivity* is an expression of the extent that in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions" (1988:111).
13. In *Computers as Theatre,* "Interactivity and Human Action", Laurel modifies this model in favor of a more intuitively based definition, as well as pointing out other dimensions of meaning (1991:20f).
14. Another 4-dimensional concept of interactivity can be found in Dunn 1984, who operates with 350 possible combinations.
15. It should be noted that in another effort Goertz does establish an index or measurement of interactivity based on all four dimensions. This is a so-called 'sum-index' which results from scale values for each of the four dimensions simply being added together.
16. For a more detailed presentation, see Jensen (forthcoming).

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